

Self Study Report for Accreditation (2009 - 2014)

Submitted to
National Assessment and Accreditation Council (NAAC)
Bangaluru (Karnataka)



Indian Agricultural Research Institute
New Delhi – 110012
(Deemed to be a University)



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Published by

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PREFACE

Indian Agricultural Research Institute (IARI), the flagship institute of the Indian Council of Agricultural Research (ICAR), is popularly known as '*Pusa Institute*' and has a history of >100 years. Established in 1905, the Institute has a rich legacy of excellence in teaching, research and extension. It is ranked as number one institution among the Agricultural Universities in India. A formal course leading to a two year diploma, 'Associateship of IARI' in various fields of agriculture, started in 1923, was awarded to 903 graduates up to 1957. During 1958, IARI was granted the "deemed university" status by University Grant Commission and thus became the fore-runner of the agricultural university system in India. The unique feature of education in IARI, which is based on the model of course credit system of universities in USA, is that research, teaching and extension are fully integrated. The IARI ushered in the Green Revolution in 1960s by developing photo-insensitive high-yielding, and fertilizer and input responsive varieties in several crops, which could be grown in many parts of the country. The Alumni of IARI have been leading agricultural research programmes in India and in many countries of the world. Currently, instruction leading to the post graduate degrees (M.Sc., M.Tech. and Ph.D.) of the Institute is organized in twenty four subjects (disciplines). So far, 3552 M.Sc., 18 M.Tech. and 4402 Ph.D. students have been awarded degrees including 338 international students.

Ever since its establishment, the Institute played a pioneering role in creating excellent human resource through post-graduate teaching and spreading the vast knowledge through its effective outreach programmes. India needs second Green Revolution to feed over 150 crore population by 2030. The IARI is well poised to find solution to some of the problems that have surfaced in the post Green Revolution era, such as environmental and land degradation, water shortage, climate change, and emergence of new pest and diseases. The agricultural research and education system in India is covered under the service sector (GATS) and is likely to face tough competition from employment oriented and international standard education, which will be offered by private institutions having a tie-up with leading institutions elsewhere. The IARI will have to play a different role as a dynamic, progressive and competitive institution to lead Indian Agriculture to greater heights in the coming decades.

It is a matter of great satisfaction that ICAR's National Agricultural Education Accreditation Board (NAEAB) has accredited IARI for five years, w.e.f., 16-03-2015 to 15-03-2020. I have the privilege to present this Self-Study Report of IARI for the period 2009-2014 for accreditation to the National Assessment and Accreditation Council (NAAC). This compilation has been made possible through the strenuous and collective efforts of several stalwarts of the Institute over a period of nearly eight months. I express my sincere thanks to Dr. R.K. Jain, Dean & Joint Director (Edn.), IARI and the members of various Task Force constituted for this purpose. Thanks are due to the Heads and Professors of different Divisions for providing the needed information from time to time. I thank Drs. Viswanathan C, Anil Sirohi, I. Sekar, Mukta Chakrabarty and K.M. Manjaiah, who took great pains for compiling and editing this report. My appreciation is also for Shri A.K. Tyagi, Shri Ashok Kumar and the whole team of the Post Graduate School for their contribution in preparing this document.

(Trilochan Mohapatra)

Director



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ICAR - INDIAN AGRICULTURAL RESEARCH INSTITUTE

(A UNIVERSITY UNDER SECTION 3 OF UGC ACT. 1956)

NEW DELHI-110012 (INDIA)



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Declaration by the Head of the Institution

I certify that the data included in this Self- Study Report (SSR) are true to the best of my knowledge.

This SSR is prepared by the Institution after internal discussions and no part thereof has been outsourced.

I am aware that the Peer Team will validate the information provided in this SSR during the Peer Team visit.


(Director and Vice-Chancellor) 03/10/15

Place: New Delhi

Date: September 26, 2015



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Statement of Compliance
(Deemed University)

This is to certify that Indian Agricultural Research Institute, New Delhi (Deemed University) has complied with all the provisions of the following University Grants Commission (UGC) Regulations governing it:

- ❖ Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education 2010 and further amendments, if any, notified by the UGC.
- ❖ Minimum Standards and Procedure for the Award of M.Sc./Ph.D. Degree, Regulations 2009 and further amendments, if any, notified by the UGC.
- ❖ UGC (Institutions Deemed-to-be-Universities) Regulations 2010 and further amendments, if any, notified by the UGC.
- ❖ Specification of Degrees, March 2014 and further amendments, if any, notified by the UGC.
- ❖ Approval by the UGC and MHRD for main campus.


(Director & Vice-Chancellor) 03/10/15

Date: September 26, 2015





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1. INSTITUTE PROFILE

1. Name and Address of the University

Name	: Indian Agricultural Research Institute		
Address	: New Delhi		
City	: Pin: 110 012	State	: Delhi
Website	: http://www.iari.res.in		

2. For Communication

Designation	Name	Telephone with STD Code	Mobile	Fax	Email
Vice Chancellor / Director	Dr. Trilochan Mohapatra	O: 011-25843375, - 25842367	-	011-25846420	director@iari.res.in
Dean & Joint Director (Edn.)	Dr. R.K. Jain	O: 011-25842387	9810887248	011-25846420	dean@iari.res.in
Registrar	Mrs. Shashi Prabha Razdan	O: 011-25842390	8527544040	011-25846420	razdan57@iari.res.in

3. Status of the University

State Private University	
Central University	
University under Section 3 of UGC (Deemed University)	√
Institution of National Importance	
Any other (please specify)	

4. Type of University

Unitary	√
Affiliating	

5. Source of funding

Central Government	√
State Government	
Self-financing	
Any other (please specify)	



6. a) Date of establishment of the university

22/08/1958

b) Prior to the establishment of the university, was it a/an

- i) PG Centre Yes No
- ii) Affiliated College Yes No
- iii) Constituent College Yes No
- iv) Autonomous College Yes No
- v) Any other (please specify) Yes No
Research Institute

If yes, give the date of establishment : 01/04/1905

7. Date of recognition as a university by UGC or any other national agency

Under Section	dd	mm	yyyy	Remarks
i. 2f of UGC*	-	-	-	-
ii. 12B of UGC*	-	-	-	-
iii. 3 of UGC#	22	08	1958	-
iv. Any other^ (specify)	-	-	-	-

Enclose notification of MHRD and UGC for all courses / programmes / campus/ campuses.

8. Has the university been recognized

a) By UGC as a University with Potential for Excellence?

Yes No

If yes, date of recognition :

Not Applicable

b) For its performance by any other governmental agency?

Yes No

If yes, Name of the agency and date of recognition

April 17, 2015 from the National Agricultural Education Accreditation Board (NAEAB), ICAR

9. Does the university have off-campus centres?

Yes No

If yes, date of establishment : NA

Date of recognition : NA

10. Does the university have off-shore campuses?

Yes No

If yes, date of establishment : NA

Date of recognition : NA



11. Location of the campus and area

	Location*	Campus area (acres)	Built up area (m ²)
i. Main campus area	Urban	1235	571000
ii. Other campuses in the country	—	—	—
iii. Campuses abroad	—	—	—

(* Urban, Semi-Urban, Rural, Tribal, Hilly Area, Any other (please specify))

12. Provide information on the following: In case of multi-campus University, please provide campus-wise information

The Institute has only one campus in Pusa, New Delhi-110012.

- **Auditorium/seminar complex with infrastructural facilities:** One large auditorium; one seminar Hall in each Discipline
- **Sports facilities:**

Playground	Yes
Swimming pool	No
Gymnasium	Yes; Two
Any other (please specify)	Badminton, Basketball, Tennis, Snooker, volleyball & other Indoor games
- **Hostel**
 - Boys' Hostel**

i) Number of Hostels	5
ii) Number of inmates	460
iii) Facilities	Dining Halls, Common Room, Reading Room
 - Girls' hostel**

i) Number of Hostels	2
ii) Number of inmates	162
iii) Facilities	Dining Halls, Common Room, Reading Room
 - Family hostel**

i) Number of Hostels	1
ii) Number of inmates	48
iii) Facilities	Common Room, Reading Room
 - Working Women's Hostel - Not Applicable**

i) Number of Hostels	-
ii) Number of inmates	-
iii) Facilities	-
- **Residential facilities for faculty and non-teaching**

On Campus housing of different categories is available for teaching as well as non-teaching staff
- **Cafeteria**

Three cafeteria in student's hostels and two common cafeteria in campus cater to needs of students and faculty



- **Health centre - Nature of facilities available - inpatient, outpatient, ambulance, emergency care facility, etc.**

Institute dispensary with outpatient facilities is available. On campus doctor for any emergency is available with ambulance services. Several major hospitals are available within a radius of 5 kms.

- **Facilities like banking, post office, book shops, etc.**

One bank with 3 ATM counters, one post office, Mother dairy milk and vegetable booths, Kendriya Bhandar grocery store, and other shops for daily needs are available on campus within walkable distance from student hostels.

- **Transport facilities to cater to the needs of the students and staff**

One car is available with the MOHR office for routine student requirement. An air-conditioned bus is also available on demand with the Institute for student and staff.

- **Facilities for persons with disabilities**

Most of the buildings have ramps and are friendly for the disabled students.

- **Animal house**

Facility available with the Institute.

- **Incinerator for laboratories**

Two incinerators are available with the institute.

- **Power house**

Power is supplied by TPDDL with three substations at the campus. Diesel generators are available as power backup for emergency requirement in all disciplines.

- **Waste management facility**

Waste is collected at marked waste collection centres and removed from the campus by the Municipal Corporation of Delhi.

13. Number of institutions affiliated to the university

Not Applicable

14. Does the University Act provide for conferment of autonomy (as recognized by the UGC) to its affiliated institutions? If yes, give the number of autonomous colleges under the jurisdiction of the University:

Yes No Number

Not Applicable

15. Furnish the following information

Particulars	Number	Number of Students
a. University Departments		
Undergraduate	Nil	
Post graduate	24	~800
Research centres on the campus		
b. Constituent colleges	NA	-



c. Affiliated colleges	-	-
d. Colleges under 2(f)	-	-
e. Colleges under 2(f) and 12B	-	-
f. NAAC accredited colleges	-	-
g. Colleges with Potential for Excellence (UGC)	-	-
h. Autonomous colleges	-	-
i. Colleges with Postgraduate Departments	-	-
j. Colleges with Research Departments	-	-
k. University recognized Research Institutes/Centres	-	-

16. Does the university conform to the specification of Degrees as enlisted by the UGC?

Yes No

If the university uses any other nomenclatures, please specify.

17. Academic programmes offered by the university departments at present, under the following categories: (Enclose the list of academic programmes offered)

Programmes	Number
UG	-
PG	24
Integrated Masters	-
M.Phil.	-
Ph.D.	24
Integrated Ph.D.	-
Certificate	-
Diploma	-
PG Diploma	-
Any other (please specify)	-
Total	24

18. Number of working days during the last academic year.

284 days (Two hundred and eighty four days)

19. Number of teaching days during the past four academic years.

2011-12	2012-13	2013-14	2014-15
218	222	219	220



20. Does the university have a department of Teacher Education?

Yes No

If yes,

- Year of establishment (dd/mm/yyyy) : NA
- NCTE recognition details (if applicable) Notification : NA
No.:
Date: (dd/mm/yyyy)
- Is the department opting for assessment and accreditation separately?
Yes No

21. Does the university have a teaching department of Physical Education?

Yes No

If yes,

- Year of establishment (dd/mm/yyyy): NA
- NCTE recognition details (if applicable) Notification : NA
No.:
Date: (dd/mm/yyyy)
- Is the department opting for assessment and accreditation separately?: NA
Yes No

22. In the case of Private and Deemed Universities, please indicate whether professional programmes are being offered?

Yes No

If yes, please enclose approval / recognition details issued by the statutory body governing the programme.

23. Has the university been reviewed by any regulatory authority? If so, furnish a copy of the report and action taken there upon.

Yes, by NAEAB of ICAR

24. Number of positions in the university

Positions	Scientific staff				Total	Administrative Staff	Technical staff
	Research Management Personnel	Principal Scientist	Senior Scientist	Scientist			
Sanctioned by the UGC / University / State Government	6	65	170	337	578	457	698
<i>Recruited</i>	4	217 (46)	125 (83)	94 (307)	440	329	546
<i>Yet to recruit</i>					138	128	152
Number of persons working on contract basis	-	-	-	-	-	-	-



For Scientific Staff, the figures shown out of parentheses represent the number of scientists working in particular grade (assessment/direct recruitment/induction). The figures shown in the parentheses represent the number of scientists initially appointed by direct recruitment/induction in the grade (i.e., excluding assessment).

25. Qualifications of the teaching staff

SCIENTIST (Pay Band-3 of Rs.15600-39100 with RGP of Rs.6000)	Master's Degree in the Relevant Subject.
SENIOR SCIENTIST (Pay Band-4 of Rs.37400-67000 with RGP of Rs.9000)	<p>Essential</p> <p>a) For Disciplines other than Engineering subject Doctoral degree in relevant subject including relevant basic sciences with 8 years experience in the relevant subject as Scientist/Lecturer/Extension Specialist or in an equivalent position in the pay band-3 of Rs.15600-39100 with Grade Pay of Rs.5400/6000/7000/8000 having made contribution to research / teaching / extension education as evidenced by published work/innovations and impact.</p> <p>b) For Engineering disciplines Doctoral degree in relevant engineering subject with 6 years experience as Scientist / Lecturer / Extension Specialist or in an equivalent position in the pay band-3 of Rs.15600-39100 with Grade Pay of Rs.5400/6000/7000/8000 having made contribution to research teaching / extension education as evidenced by published work /innovations and impact.</p> <p>OR Master's degree in the relevant engineering subject with 10 years experience as Scientist/Lecturer/Extension Specialist or in an equivalent position in the pay band-3 of Rs.15600-39100 with Grade Pay of Rs.5400/6000/7000/8000 having made contribution to research /teaching/extension education as evidenced by published work innovations and impact.</p> <p>Desirable Specialization (to be defined) Note: Specialization (to be defined) could be made part of essential qualifications as per job requirements, if deemed necessary.</p>
PRINCIPAL SCIENTIST (Minimum pay of Rs.43000 in the Pay Band or Rs.37400-67000 with RGP of Rs.10000)	<p>Essential</p> <p>(i) Doctoral degree in the relevant subject including relevant basic sciences. (ii) 10 years experience in the relevant subject out of which at least 8 years should be as Scientist /Lecturer /Extension Specialist or in an equivalent position in the pay band-3 of Rs.15600-39100 with Grade Pay of Rs.5400/6000/7000/8000 and 2 years as a Senior Scientist or in an equivalent position in the Pay Band -4 of Rs.37400-67000 with Grade Pay of Rs.8700/9000. (iii) The candidate should have made contribution to research / teaching / extension education as evidenced by published work/innovations and impact.</p> <p>Desirable Specialization (to be defined)</p>

26. Emeritus, Adjunct and Visiting Professors

Emeritus	Adjunct Professor	Adjunct faculty	Visiting
6	17	20	-

27. Chairs instituted by the university

Nil



28. Students enrolled in the university departments during the current academic year, with the following details

Students	UG		M.Sc.		Integrated Masters		M.Phil.		Ph.D.		Integrated Ph.D.		D.Litt./ D.Sc.		Certificate		Diploma		PG Diploma	
	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F	*M	*F
From the state where the university is located	NA		1	1	NA		NA		1	2	NA		NA		NA		NA		NA	
From other states of India			145	48					434	132										
NRI students			-	-					-	-										
Foreign students			18	4					14	4										
Total			164	53					449	138										

*M - Male *F - Female

29. 'Unit cost' of education

(Unit cost = total annual recurring expenditure (actual) divided by total number of students enrolled)

(a) including the salary component = —

(b) excluding the salary component = Rs. 15,000/-

30. Academic Staff College

Not Applicable

31. Does the university offer Distance Education Programmes (DEP)?

Yes No

If yes, indicate the number of programmes offered. : NA

Are they recognized by the Distance Education Council?: NA

32. Does the university have a provision for external registration of students?

Yes No

If yes, how many students avail of this provision annually?

33. Is the university applying for Accreditation or Re-Assessment? If Accreditation, name the cycle.

Accreditation: Cycle 1 Cycle 2 Cycle 3 Cycle 4

Re-assessment

34. Date of accreditation* (applicable for Cycle 2, Cycle 3, Cycle 4 and re-assessment only)

NA

35. Does the university provide the list of accredited institutions under its jurisdiction on its website? Provide details of the number of accredited affiliated / constituent / autonomous colleges under the university

Not Applicable

36. Date of establishment of Internal Quality Assurance Cell (IQAC) and dates of submission of Annual Quality Assurance Reports (AQAR)

Prioritization, Monitoring and Evaluation Cell (PME Cell), established on July 19, 2010, looks after the responsibilities of coordinating and monitoring of research activities of the Institute including annual presentation of scientific work by the concerned scientist before the IRC/SRC.

37. Any other relevant data, the university would like to include

The Indian Agricultural Research Institute was the harbinger of India's 'Green Revolution' and continues its efforts to bring Evergreen Revolution for sustainable food security and alleviation of malnutrition in the country. During the last 110 years, IARI has played a crucial role in providing technologies, leadership and responding dynamically to the needs, challenges and opportunities of the Indian agriculture by redefining its mandate, plans and programs accordingly.

The institute is not only credited with the success of the Green Revolution but also brought about a radical transformation of Indian agriculture from traditional to modern by continuously employing advanced tools and technologies to address various problems in a more effective manner. Development of the most popular Basmati rice variety Pusa Basmati 1121, as well as its BLB and blast resistant derivatives coupled with wheat, HD 2967, which have received an unprecedented popularity within few years of their release, are some of glowing examples.



Green Revolution: Release of a postage stamp to commemorate quantum jump in wheat production by Mrs. Indira Gandhi in July 1968 at IARI



HD 2967: A high yielding breakthrough variety of wheat

IARI released a high yielding wheat variety HD 2967 for cultivation in the Northwestern Plains zone, the wheat bowl of India that is uniquely endowed with significant yield superiority over the variety PBW 343, a bench mark variety that ruled the region for over 15 years and also minor genes based resistance to the rusts which has almost wiped out PBW 343 since 2011-12. The variety has been welcomed by farmers so warmly that it has already occupied over 4 million hectares within 2 years of its release which is unprecedented spread for any variety in India of any crop.



The institute has, thus, served the country by developing appropriate technologies leading to self-sufficiency in food grains and diversification and export of agricultural produces. Our current export of agricultural produce hovers around one lakh crore (17.3 billion US \$ approx.), which can be increased significantly if agriculture can be made more competitive through technological advancements.



Pusa Basmati 1121: World's most traded Basmati rice variety

Basmati rice from the Indian subcontinent is highly priced in the International as well as domestic market for its unique grain, cooking and eating quality. Basmati rice cultivation is confined to the states of Punjab, Haryana, Western U.P., Uttarakhand, parts of Himachal Pradesh and Jammu & Kashmir. Basmati rice occupies around 2 million hectares. India is the highest exporter of Basmati rice and the variety Pusa Basmati 1121 notified in 2008 is the world's longest cooked rice and the most traded basmati rice globally with outstanding basmati grain qualities. Due to its outstanding performance in the farmers' field and quick acceptance in the trade, the area under Pusa Basmati 1121 started increasing since Kharif 2007. In Punjab it increased from 23,000 ha to 6,20,000 ha. In Haryana it increased from 1,73,000 ha to 5,69,000 ha and Western U.P. from 1,45,000 ha to 4,10,000 ha. In the years 2011 and 2012, Pusa Basmati 1121 occupied 70 and 73 % of the Basmati area respectively to account for 85% of the total exports. This variety is the most preferred variety by farmers with profitability ranging from Rs 80,000 to 1,20,000 per hectare. IARI continues to lead the Basmati rice improvement programme to enhance per day productivity as well as incorporate resistance against biotic/abiotic stresses.

IARI contributed significantly to climate change studies in India, quantification of greenhouse gas emission from Indian agriculture and Intergovernmental Panel on Climate Change of United Nations. The inventories of methane and nitrous oxide emission from Indian agriculture developed by IARI were accepted by the Govt. of India and subsequently by the United Nation Framework on Convention on Climate Change (UNFCCC). The inventories rationalized GHG emission estimates from Indian agriculture to the international agencies (INCCA, 2010).

IARI, since its establishment in 1905, has been striving to help in realizing the importance of agriculture as a vocational, professional and academic endeavor for those engaged in practicing agriculture. IARI has served as a mother institute in providing human resources to national agricultural research system. The contribution of IARI towards human resources development for the national and international agricultural research and education systems is unparalleled. IARI alumni, today, are heading and directing agricultural research, education and extension programmes in several key organizations, not only in India, but also in other countries. Three of the IARI alumni namely **Dr. M. S. Swaminathan, Dr. Sanjaya Rajaram and Dr. S. K. Vasal** have received "World Food Prize". The forward looking academic environment at the Institute attracts the most talented students available for agricultural sciences in the country and abroad. This feature has made IARI a distinct Institution enabling India to excel among the developing world.



2. CRITERIA-WISE INPUTS

CRITERION I: CURRICULAR ASPECTS

1.1 Curriculum Design and Development

1.1.1 How is the institutional vision and mission reflected in the academic programmes of the university?

Vision

To provide leadership for “*Science-led sustainable and globally competitive agriculture for food, nutrition and livelihood security*”.

Mission

To explore new frontiers of science, to develop human resources and policy guidelines for creating a vibrant, responsive and resilient agriculture”. In order to accomplish this mission, the Institute has been given the following mandates (www.iari.res.in):

1. To conduct basic and strategic research with a view to understand the processes, in all their complexity, and to undertake need-based research, leading to crop improvement and sustained agricultural productivity in harmony with the environment.
2. To serve as a centre for academic excellence in the area of post-graduate education and human resources development in agricultural sciences.
3. To provide national leadership in agricultural research, extension, and technology assessment and transfer by developing new concepts and approaches and serving as a national referral point for quality and standards.
4. To develop information systems, add value to information and serve as a national agricultural library and database.

Since its early years, the Institute has flourished as a centre for imparting post graduate training to officers of the State Departments of Agriculture in India, as also to other candidates, so as to equip them for manning superior posts in the fields of research, teaching and extension. With regard to educational standard and quality, it ranks among the best institutions of post graduate education in the world. A unique feature of the system of instruction at the Institute, which is largely modelled on the course-credit system, is that research, teaching and extension are fully integrated and also that the programme of instruction is broad-based so as to give the student a mastery not only in his/ her major field of specialization but also in supporting minor fields. The course curriculum is regularly updated to meet the global standards. Currently, the Institute is offering post graduate degrees in twenty four disciplines. The syllabi and delivery system is continuously updated to include emerging areas of research. Our faculties are given opportunity to obtain advance research and teaching expertise through various training programmes at International Institutes/Universities of repute. In fact, student to faculty ratio (~2) gives the opportunity for the students to interact more closely with the faculties and learn better.

The Institute has touched the livelihood of millions of Indian population by bringing “*Green Revolution*” to India. In this process, IARI and the alumni of IARI serving various SAUs and ICAR Institutes played a key role. IARI curricula set example for revision of curricula by ICAR, which is now followed in SAUs. The Institute maintains its leadership role in Agricultural Education in India.



1.1.2 Does the university follow a systematic process in the design and development of the curriculum? If yes, give details of the process (need assessment, feedback, etc.)

The Institute lays greater importance to design and development of the curriculum.

Board of studies (BOS) conducts faculty meetings and workshops with national and international experts are organized to design, develop and evolve course curriculum and research areas of the students. The curriculum development considers student centred learning, content focussing on evolving science, and national problems and inculcates trans-disciplinary learning. BOS recommendations of each discipline are discussed in “*Standing Committee on Course Curricula and Academic Affairs*” of the Institute. The recommendation of this committee is further discussed in the Academic Council of the Institute for ratification and approval (see flow chart).



1.1.3 How are the following aspects ensured through curriculum design and development?

A. Employability

The Institute provides high standards of education. The major sinks of employment for our students are the National Agricultural Research System (ICAR Institutes and State Agricultural Universities), Agriculture and allied Industries, State Agricultural Departments, International Research Institutes (mainly CGIAR Institutes), etc. Based on the expertise both theory and practical skill requirements of the above sector, the students are taught with regularly updated curriculum in each of the discipline. The students also have freedom to choose major and minor disciplines as well as courses within the minor and major disciplines. Thus the students were inculcated with overall science of the chosen discipline as well as specific expertise requirements. Most of the students of IARI get top ranks in Agricultural Research Service exam of ASRB, ICAR and employed as Scientists. Further, IARI students are sought after by CGIAR Institutes, State Agricultural Universities as well as private agricultural Industries.

B. Innovation

Agriculture science is progressing at very fast rate with the applications developments in basic sciences such as genomics, nanotechnology, systems biology, synthetic biology, and resource use in relation to climate change. IARI continuously innovates reprogramming of curriculum to include expanding opportunities in the new science, and improving teaching and learning opportunities. The Environmental Sciences discipline was introduced as early as 1993 to address global climate change issues and develop research and policy solutions.

In India about 30-40% of the agricultural produces are lost during post-harvest. To address this issue, Post Harvest Technology discipline was introduced. Computational biology is emerging fast as an important area of agricultural research, and to provide opportunity to the agricultural science students of different disciplines, IARI has introduced a course on Bioinformatics in 2012. In addition to the above disciplines, innovations were introduced for experiential learning of the students in all the disciplines.

C. Research

All the disciplines have ‘in-house’ as well as ‘external funded’ research programmes. The entire IARI faculties are involved in research as well as teaching. The research programmes are regularly monitored and improved by Research Advisory Committee, Institute Research Council and funding agencies. These bodies comprise of external experts and renowned scientists in various fields of agriculture, and help regular improvement in research programme is made. At the International level, the Institute has close linkages with some of the CGIAR’s International Agricultural Research Centres (IARCs), viz., ICRISAT, CIMMYT, IRRI, and ICARDA, and international organizations, viz., FAO, IAEA, USAID, UNDP,



WMO, UNIDO and UNEP. Several bilateral research linkages involving developed and developing countries also exist. These include linkages with USDA, selected universities in USA, Canada, Australia, World Bank, Rockefeller Foundation, European Commission, JAICA, JIRC, JSPS, ACIAR, AVRDC (Taiwan), etc. These linkages also provide opportunities to update and evolve curriculum to the International standards. The students also actively contribute to these research programmes through their Masters and Ph.D. thesis work.

1.1.4 To what extent does the university use the guidelines of the regulatory bodies for developing and/or restructuring the curricula? Has the university been instrumental in leading any curricular reform which has created a national impact?

The guidelines issued by various Govt. regulatory bodies including ICAR Deans’ Committee are duly considered in curriculum development and improvement in the respective disciplines. The curricula of the disciplines are always developed keeping in view of stake-holder (ICAR and SAUs, public and private Agricultural Industries, state agricultural departments, CGIAR institutes, etc.), National problems (problems faced by farmers, dwindling natural resources, climate change, etc.), Govt Policies, guidelines of Regulatory bodies, and International status of the research in each discipline.

1.1.5 Does the university interact with industry, research bodies and the civil society in the curriculum revision process? If so, how has the university benefitted through interactions with the stakeholders?

Yes. The institute has several public-private partnership (PPP) programmes through which the scientists do collaborative research with Institutes. The Institute licences several technologies to agricultural Industries. Thus, regular feedback from Industries and Institutes are received and used for curriculum revision process.

1.1.6 Give details of how the university facilitates the introduction of new programmes of studies in its affiliated colleges.

IARI has no affiliated colleges. However, the teaching programmes leading to M.Sc. and Ph.D. degrees in Agricultural Statistics, Bioinformatics, Computer Application, Molecular Biology & Biotechnology and Plant Genetic Resources are offered at the sister institutes namely ICAR-Indian Agricultural Statistics Research Institute (IASRI), ICAR-National Bureau of Plant Genetic Resources (NBPGR) and ICAR-NRC on Plant Biotechnology (NRCPB), which are located at this Institute’s campus. From the academic session 2014-15, IARI has also initiated outreach programmes with ICAR-Indian Institute of Horticultural Research, Bengaluru and ICAR-Central Institute of Agricultural Engineering, Bhopal for Ph.D. degree in Horticulture, Agricultural Engineering and Post Harvest Technology.

Besides, IARI also playing the crucial role in institution building in other countries, namely, in the establishment of Afghan National University of Agricultural Sciences and Technology, Afghanistan; and Advanced Centre for Agricultural Research and Education at Yezin Agricultural University, Myanmar.

1.1.7 Does the university encourage its colleges to provide additional skill-oriented programmes relevant to regional needs? Cite instances (not applicable for unitary universities).

Not applicable as no colleges are affiliated to IARI (unitary Deemed university).

1.2 Academic Flexibility

1.2.1 Furnish the inventory for the following:

a) Programmes taught on campus

IARI offers M.Sc./M.Tech. and Ph.D. degrees in the following 24 disciplines:

Discipline Code	Discipline	Sub-discipline
01	Agricultural Chemicals	Agricultural Chemicals
02	Agricultural Economics	Agricultural Economics



03	Agricultural Engineering	^a Agricultural Processing and Structure ^a ; Farm Power and Equipment ^a ; Soil and Water Conservation Engineering
04	Agricultural Extension	Agricultural Extension
05	Agricultural Physics	Agricultural Physics
06	Agricultural Statistics	Agricultural Statistics
07	Agronomy	Agronomy
08	Biochemistry	Biochemistry; and Nutrition
09	Bioinformatics	Bioinformatics
10	Computer Application	Computer Application
11	Entomology	Entomology
12	Environmental Sciences	Environmental Sciences
13	Genetics	Plant Breeding; and Genetics
14	Horticulture	Floriculture and Landscape Architecture; Fruit Science; Vegetable Science
15	Microbiology	Microbiology
16	Molecular Biology and Biotechnology	Molecular Biology and Biotechnology
17	Nematology	Nematology
18	Plant Genetic Resources	Plant Genetic Resources
19	Plant Pathology	Plant Pathology
20	Plant Physiology	Plant Physiology
21	Post Harvest Technology	Post Harvest Technology of Horticultural Crops ^a ; Post Harvest Engineering and Technology
22	Seed Science and Technology	Seed Science and Technology
23	Soil Science and Agricultural Chemistry	Soil Science; and Agricultural Chemistry
24	Water Science and Technology	Water Science and Technology

^aM.Tech. degree is awarded in these disciplines.

b) Overseas programmes offered on campus: Nil

c) Programmes available for colleges to choose from:

Not applicable as no colleges are affiliated to IARI.

1.2.2 Give details on the following provisions with reference to academic flexibility

a. Core / Elective options

Each Discipline has set of core courses in the general field of the student's major specialisation. In M.Sc./ M.Tech and Ph.D. programmes, the students are given academic flexibility to select one and two disciplines, respectively, as minor fields from the large range of disciplines available as choice. Further, a Ph.D. student can also select more than two disciplines as minor field, as "Split-minor" option is available. In this, the student needs to do 5 credits in each split minor. The student admitted in a discipline has flexibility to take courses of his/her interests and research needs in major and minor disciplines in consultation with his/her advisory committee.

b. Enrichment courses

In addition to the regular courses in the major and minor disciplines, students are offered with enrichment courses such as Library and Information Services, Technical Writing and Communication Skills, Basic Statistical Methods in Agriculture, History of Agriculture, Intellectual Property and its Management in Agriculture, Agricultural Research, Research Ethics, and Rural Development Programmes.

c. Courses offered in modular form

The Institute does not offer modular courses to the regular students of IARI. Modular courses are offered as special case for students from Institutes abroad. For examples modular courses in agronomy and horticulture have been offered to the students of M.Sc. ANASTU, Afghanistan.

d. Credit accumulation and transfer facility

Not available

e. Lateral and vertical mobility within and across programmes, courses and disciplines

Not available

1.2.3 Does the university have an explicit policy and strategy for attracting international students?

IARI is the most sought destination not only for domestic but also for international students. The Indian Agricultural Research Institute (IARI) is the country's premier national Institute for agricultural research, education and extension. It has served the cause of science and society with distinction through first rate

research, generation of appropriate technologies and development of human resources. The Institute has all along been adjusting and improving its policies, plans and programmes to effectively respond to the needs and opportunities of the nation. The Institute was the first to operationalize research, education and extension on the pattern of Land Grant Colin System of USA. The Institute launched M.Sc. and PhD programmes in various agricultural disciplines after it was declared as first deemed to be agricultural University by UGC in 1958. Since then it has acted as a centre of excellence in imparting agricultural education and training to many researchers in India and from more than 30 countries. The foreign students are admitted through DARE,



Bharat Ratna Dr. A. P. J. Abdul Kalam awarding degree at 37th Convocation of IARI

Ministry of Agriculture and are exempted from the All India Entrance Exam. To attract foreign students, about 30 supernumerary seats are especially allocated/reserved for foreign students in M.Sc./M.Tech./Ph.D. degree courses at IARI in an academic year. An honorary "Foreign Students' Adviser" is nominated by the Dean to look after the special problems of foreign students including general advise regarding Post Graduate School procedures, and social and cultural life. A Hospitality Committee functions under the Chairmanship of the Foreign Students' Adviser to look after the comfort of foreign students. So far, 3660 M.Sc., 25 M.Tech. and 4468 Ph.D. students have been awarded degrees including 349 international students. At present, the total number of students is 894 (240 M.Sc., 15 M.Tech. and 639 Ph.D.) which include 44 foreign students from 16 countries.

1.2.4 Have any courses been developed targeting international students? If so, how successful have they been? If 'no', explain the impediments.

No. However, our courses are developed to meet the International standards. International students specifically from developing countries are attracted to IARI.

1.2.5 Does the university facilitate dual degree and twinning programmes? If yes, give details.

Currently dual degree programme is not offered. In the past some Ph.D. students of IARI have undergone sandwich programme in which part of the research work was carried out in universities/Institutes abroad. In the recent past, collaboration with the International Rice Research Institute, Philippines, both Indian and foreign students of IARI undertook their research work at IRRI for the award of the IARI degree. Recently, the Institute has signed MoU with universities abroad such as the University of Nebraska and Kansas State University, USA.



1.2.6 Does the university offer self-financing programmes? If yes, list them and indicate if policies regarding admission, fee structure, teacher qualification and salary are at par with the aided programmes?

No self-financing programmes are offered

1.2.7 Does the university provide the flexibility of bringing together the conventional face-to-face mode and the distance mode of education and allow students to choose and combine the courses they are interested in? If 'yes,' give operational details.

IARI offers only face to face mode of education. However, recently, IARI has taken initiative for online teaching for students of ANASTU, Afghanistan.

1.2.8 Has the university adopted the Choice Based Credit System (CBCS)? If yes, for how many programmes? What efforts have been made by the university to encourage the introduction of CBCS in its affiliated colleges?

The Institute offers CBCS for students to select from the prescribed courses (core, elective or minor courses) in all the 24 M.Sc./M.Tech and Ph.D. programmes.

1.2.9 What percentage of programmes offered by the university follows

- a) Annual system : Nil
- b) Semester system : Nil
- c) Trimester system : 100%

1.2.10 How does the university promote inter-disciplinary programmes? Name a few programmes and comment on their outcome

The Institute has six schools (School of Basic Sciences, School of Crop Improvement, School of Crop Protection, School of Horticulture, School of Natural Resources Management and School of Social Sciences) encompassing the 24 disciplines in which courses are offered. The in-house research programmes funded by the Institute are developed in school mode. Since the student research is in line with the research programme of in-house projects, students have opportunity for trans-disciplinary learning. The Institute also has multi-disciplinary research centres such as Water Technology Centre, and Centre for Environment Science and Climate Resilient Agriculture which offer PG programme in Water Science & Technology and Environmental Sciences, respectively. Further, the courses offered by the Institute in collaboration with its sister Institutes such as Bioinformatics, Molecular Biology & Biotechnology and Plant Genetic Resources are also inter-disciplinary. About 41 courses of the Institute are offered as inter disciplinary courses as listed below. For example, the course on “Nanotechnology in Crop Protection” is offered together by five different disciplines.

Interdisciplinary courses offered by the Institute

Course code	Title and credits	Disciplines involved
AC 512/ ENT 512/ MB 512/ NEMA 513/ PL. PATH 521	Nanotechnology in Crop Protection (2+1)	Agricultural Chemicals, Entomology, Microbiology, Nematology, Plant Pathology
AE 510/ ES 510	Soil & Water Conservation Engineering (3+0)	Agricultural Engineering, Environmental Sciences
AE 530/PHT 530	Engineering Properties of Biological Materials (2+1)	Agricultural Engineering, Post Harvest Technology
AE 543/SST 543	Seed Processing (2+1)	Agricultural Engineering,
AE 608/ES 608	Renewable Energy Conversion Systems (2+1)	Agricultural Engineering, Environmental Sciences



AE 630/ PHT 630	Heat and Mass Transfer (3+0)	Agricultural Engineering, Post Harvest Technology
AE 631/PHT 631	Drying and Dehydration (2+1)	Agricultural Engineering, Post Harvest Technology
AG 502/ AP 502/ SSAC 502	Soil Fertility and Nutrient Management (3+1)	Agronomy, Agricultural Physics, Soil Science & Agricultural Chemistry
AG 504/WST 504	Principles and Practices of Water Management (3+1)	Agronomy, Water Science & Technology
AG 510/SSAC510 / WST 510	Management of Problem Soils and Waters (3+1)	Agronomy, Soil Science & Agricultural Chemistry, Water Science & Technology
AG 511/AP 511 AG 607/PP 607	Crop Ecology and Agrometeorology (3+1) Physiology and Biochemistry of Herbicide Action (3+1)	Agronomy, Agricultural Physics Agronomy, Plant Physiology
AP 503/SSAC 503	Fundamentals of Soil Physics (3+1)	Agricultural Physics, Soil Science & Agricultural Chemistry
AP 505/ SSAC 505	Soil Genesis, Classification and Survey (2+2)	Agricultural Physics, Soil Science & Agricultural Chemistry
AP 530/WST 530	Fundamentals of Meteorology and Climatology (3+1)	Agricultural Physics, Water Science & Technology
AP 611/SSAC 611	Soil Physical Environment and Plant Growth (3+1)	Agricultural Physics, Soil Science & Agricultural Chemistry
AS 571/BI 507/ GP 540/MBB 509	Bioinformatics - I (3+1)	Agricultural Statistics, Bioinformatics, Genetics, Molecular Biology & Biotechnology
AS 608/BI 512 BI 501/MBB 503	Bioinformatics – II (2+1) Molecular Cell Biology (3+0)	Agricultural Statistics, Bioinformatics Bioinformatics, Molecular Biology & Biotechnology
BI 502/CA 502	Introduction to Computer Application (1+1)	Bioinformatics, Computer Application
BI 503/CA 551	Mathematical Foundations in Computer Application (4+0)	Bioinformatics, Computer Application
BI 504/MBB 501	Principles Of Biotechnology (3+0)	Bioinformatics, Molecular Biology & Biotechnology
BI 505/CA 561	Principles of Computer Programming (2+1)	Bioinformatics, Computer Application
BI 506/CA 566 BI 508/BIO 602 BI 509/MBB 602	Database Management System (2+2) Protein Biosynthesis (3+0) Genomics and Proteomics (3+0)	Bioinformatics, Computer Application Bioinformatics, Biochemistry Bioinformatics, Molecular Biology & Biotechnology
ENT 611/ NEMA 605/ PL PATH 607 ES 502/WST 502	Plant Health Diagnostic and Management (2+2) Environmental Pollution (3+0)	Entomology, Nematology, Plant Pathology Environmental Sciences, Water Science & Technology
ES 503/PP 503	Global Climate Change and Agriculture (2+1)	Environmental Sciences, Plant Physiology
ES 505/MB 505 ES 604/SSAC 604	Microbial Ecology (3+1) Soil Organic Matter (3+0)	Environmental Sciences, Microbiology Environmental Sciences, Soil Science & Agricultural Chemistry
ES 606/SSAC 606	Soil and Water Pollution (2+1)	Environmental Sciences, Soil Science & Agricultural Chemistry
FLA 521/ SST 521	Planting Material and Seed Production in Flower Crops (2+1)	Floriculture and Landscape Architecture, Seed Science & Technology
FLA 622/ PHT 622	Value Addition in Ornamental Crops (1+1)	Floriculture and Landscape Architecture, Post Harvest Technology
GP 607/ PGR 607	Regulatory Mechanisms and Intellectual Property Rights (3+1)	Genetics, Plant Genetic Resources
HORT 601/PHT 601	Export Oriented Horticulture (3+1)	Horticulture, Post Harvest Technology



HORT 621/ PP621	Growth and Development of Horticultural Crops (3+2)	Horticulture, Plant Physiology
PATH 510/ SST 510	Seed Health Technology (3+2)	Pathology, Seed Science & Technology
PHT617/ PP 617	Physiology of Ripening and Senescence (2+1)	Post Harvest Technology, Plant Physiology
PP 608/ SST 608	Physiology of Seeds (2+1)	Plant Physiology, Seed Science & Technology
SST 511/VSC 511	Principles and Techniques of Vegetable Seed Production (4+1)	Seed Science & Technology, Vegetable Science

1.3 Curriculum Enrichment

1.3.1 How often is the curriculum of the university reviewed and upgraded for making it socially relevant and/or job oriented /knowledge intensive and meeting the emerging needs of students and other stakeholders?

The curricula of all the disciplines are revised once in five years. However, the curriculum is upgraded regularly to keep abreast of the emerging trends, stakeholder needs and global competition.

1.3.2 During the last four years, how many new programmes at UG and PG levels were introduced? Give details

Inter-disciplinary & Programmes in emerging areas

Bioinformatics is an emerging area of research and is critical for utilizing the rapidly growing omics data for crop improvement. Hence an inter-disciplinary course on M.Sc. Bioinformatics was introduced by the Institute from 2011-12. The course on Ph.D. Bioinformatics was introduced from the 2014-15 academic session. This course is taught by faculty members drawn from different disciplines of IARI such as Molecular Biology and Biotechnology, Computer Application, Genetics and Agricultural Statistics.

1.3.3 What are the strategies adopted for the revision of the existing programmes? What percentage of courses underwent a syllabus revision?

ICAR has a unified system of courses throughout NARS including IARI. To keep pace with the changes in the advancement of science, technology and education, the courses are revised every 5 years and the last revision took place in the year 2010-11. The curricula were revised in 2011 to provide greater professionalism to the PG School of IARI. Usually committee of academicians of high standards is constituted by the Academic council for the revision of curricula. For example, the Curricula Revision Committee comprising of Dr. Sudhir Kumar Sopory, Vice Chancellor, JNU, Delhi, with Dr. M. Mahadevappa, Director, JSS Rural Development Foundation, Mysore, Dr. S. Edison, former Director, CTCRI, Trivandrum, Dr. I.P. Abrol, Director, CASA, New Delhi and Dr. P.C. Chengappa, Former Vice Chancellor, UAS, Bengaluru contributed to PG course curricula revision process in 2011. More than 80 % of the courses underwent revision of syllabus. Another committee has been setup by ICAR for updation of course curriculum.

1.3.4 What are the value-added courses offered by the university and how does the university ensure that all students have access to them?

As the Institute offers CBCS, the students of the Institute have access to all the courses offered by the related disciplines.

1.3.5 Has the university introduced any higher order skill development programmes in consonance with the national requirements as outlined by the National Skills Development Corporation and other agencies?

The students of IARI are imparted with research, teaching and extension/communication skills. Skill development is an integral part in both M.Sc./M.Tech and Ph.D. programmes. Most courses have at least



one credit practical where students are given hands on experience in various techniques/skills required in their field of study. The students are imparted with teaching skills through term paper presentation and group discussions in many courses. Further, M.Sc./M.Tech students need to deliver one credit seminars, while Ph.D. students need to deliver two seminars in the major discipline and one seminar in minor discipline. Further, the students need to present their outline of research work and thesis work. All these presentations enhance the skills such as research literature analysis to identify research gaps, ability to develop research hypothesis and oral communication skill. Research work and thesis are compulsory for getting degree. During their research work, the students are trained to use the modern equipments and softwares available in their field of study. Research work and thesis also inculcate the students with analytical skills and written communication skills.

1.4 Feedback System

1.4.1 Does the university have a formal mechanism to obtain feedback from students regarding the curriculum and how is it made use of?

Yes. All the course leaders have to obtain feedback from the students in a prescribed format approved by the Academic Council. The feedback form is given to the student in the last class of each course. The feedback form is available as *Course Evaluation Proforma*, Annexure XV in the P.G. School Calendar. Each student need to fill and submit the feedback form to the Professor of the respective discipline. These feedbacks are used for improving the course and teaching. The feedback from the students on-roll and already passed-out is also considered for the award of IARI Best Teacher Award.

1.4.2 Does the university elicit feedback on the curriculum from national and international faculty? If yes, specify a few methods such as conducting webinars, workshops, online discussions, etc. and its impact

Large numbers of IARI alumni are serving as faculty in international institutes. Feedback is regularly obtained from national and international faculties through conference, workshops and symposia. Conference of Vice-Chancellors of Agricultural Universities and Directors of ICAR Institutes is held by ICAR every year. The XI Agricultural Science Congress in 2013 organized by the National Academy of Agricultural Sciences was held on the theme of “*Agricultural Education: Shaping India’s Future*”, and prepared the “*BHUBANESWAR DECLARATION*” for improving the agricultural education system in the country. The feedbacks from these conferences/workshops are used for improving curriculum.

1.4.3 Specify the mechanism through which affiliated institutions give feedback on curriculum enrichment and the extent to which it is made use of

IARI obtains feedback from sister Institutes which participate in teaching programmes of IARI.

1.4.4 What are the quality sustenance and quality enhancement measures undertaken by the university in ensuring the effective development of the curricula?

The Academic Council of IARI has constituted a “*Standing Committee on Course Curricula and Academic Affairs*”. This committee takes adequate measures to ensure the effective development of the curricula by considering inputs from various sources. The faculties are encouraged to contribute to the curricula development and their contribution to curricula development is given due weightage in awarding IARI Best Teacher Award.

Any other information regarding Curricular Aspects which the university would like to include: Nil



CRITERION II: TEACHING-LEARNING AND EVALUATION

2.1 Student Enrolment and Profile

2.1.1 How does the university ensure publicity and transparency in the admission process?

Admission for M.Sc./M.Tech is made through combined All-India Entrance Examination (AIEEA) conducted by Indian Council of Agricultural Research (ICAR) at 34 examination centres spread through the country. The entrance examination is widely publicized in National News Papers, and online advertisement is also given at the website of ICAR, ICAR-Deemed Universities (IARI, IVRI, NDRI, CIFE) and State Agricultural Universities (SAUs). The AIEEA is highly transparent, as most of the information on the entrance examination is available online. The student can apply online and download admit card from the website. The results are declared online.

In case of Ph.D. admission, 25% seats are filled through All India Competitive Examination-Senior Research Fellow PG Studies (AICE-SRF-PGS) conducted by the ICAR. Remaining 75% seats are filled by All India Entrance Examination conducted by the P.G. School, IARI. The examination is conducted at nine different cities spread across India viz., Bhopal, Coimbatore, Delhi, Guwahati, Hyderabad, Kolkata, Mumbai, Udaipur, and Varanasi. Both ICAR and IARI entrance exams are well advertised in National Newspapers and websites of ICAR and IARI. If the application is rejected, the reason for rejection is displayed online. The results of written exam as well as final results after interview are displayed on the Institute website.

2.1.2 Explain in detail the process of admission put in place by the university. List the criteria for admission: (e.g.: (i) merit, (ii) merit with entrance test, (iii) merit, entrance test and interview, (iv) common entrance test conducted by state agencies and national agencies (v) other criteria followed by the university (please specify)

As explained above, the admission for both M.Sc./M.Tech and Ph.D. are made through All India Entrance Examination conducted by ICAR and IARI. ICAR conducts exam in 19 Major subject groups. Each major group has 2 or more disciplines. The results are declared based on the major subject group-wise rank (marks) obtained by the candidates in the entrance examination. The candidates are called for Counselling at ICAR, New Delhi. The candidates give their choice of discipline (within the major subject group in which the candidate wrote the entrance exam) and university. Based on the merit list (rank in the entrance exam) and student's choice the discipline and University are allotted. Usually, the top ranking students in each major subject group opt IARI as first option.

For Ph.D. admission through IARI Entrance, selection of the candidate is based on 1) 10% weightage for academic attainments (High School to terminal degree), 2) 80% weightage for entrance examination (written). The minimum qualifying mark is 50% for General/OBC, 45% for SC/ST/PC candidates, and 3) the weightage for interview is 10%. Candidates qualifying in the entrance examination are called for interview in the ratio of maximum 1:4 (No. of seats: No. of students called for interview). The interview is held at respective Divisions of the Institutes. Based on the total marks obtained by the candidates in academic attainments, entrance examination and interview, Discipline-wise merit list and wait-list are prepared and displayed on the IARI website.

2.1.3 Provide details of admission process in the affiliated colleges and the university's role in monitoring the same

As mentioned earlier IARI has no affiliated Colleges. The Institute has outreach programmes with ICAR-Indian Institute of Horticultural Research (ICAR-IIHR), Bengaluru and ICAR-Central Institute of Agricultural Engineering (ICAR-CIAE), Bhopal. The students are admitted through IARI entrance examination and Interview. The students admitted to PG outreach programme of IARI at CIAE and IIHR normally carry out their course work at IARI and research work at these Institutes. The Dean & Joint Director (Education), and Academic Council of IARI guide and monitor these programmes.



2.1.4 Does the university have a mechanism to review its admission process and student profile annually? If yes, what is the outcome of such an analysis and how has it contributed to the improvement of the process?

Every year the admission process and profile of the students admitted by IARI is assessed by Examination Committee comprised of senior faculty members and Board of Studies of the respective disciplines. The emerging points are discussed in the Academic Council of the Institute. To attract large number of students, examination is conducted in many centres distributed throughout the country.

2.1.5 What are the strategies adopted to increase / improve access for students belonging to the following categories:

a) SC/ST

To improve the access of SC/ST students, the following measures are taken by the Institute:

- The Application cost is Rs. 1,000/- for General/OBC category, while it is only Rs. 500/- for SC/ST/PC (Persons with varied disabilities) category.
- The eligibility marks required for appearing in the entrance is kept less than that required for general/OBC candidates. For example, the eligibility marks required for appearing in Ph.D. Entrance exam of the Institute for General/OBC candidates: At least 60% marks OR an overall grade point average (OGPA) of 7.50 out of 10.00 OR 3.75 out of 5.00 OR 3.00 out of 4.00 OR 2.25 out of 3.00 in M.Sc./M.Sc. (Ag.)/M.Tech./M.E. In case of SC/ST/PC candidates, it is: At least 55% marks OR OGPA of 7.00 out of 10.00 OR 3.50 out of 5.00 OR 2.80 out of 4.00 OR 2.10 out of 3.00 in M.Sc./M.Sc. (Ag.)/M.Tech./M.E.
- Further, the minimum qualification marks need to be obtained in the entrance examination by the candidate for getting interview call is kept at 50% for General/OBC candidates, while it is kept at 45% for SC/ST/PC candidates.
- The number of seats is reserved as per reservation policy of Government of India.

b) **OBC:** The number of seats is reserved as per reservation policy of Government of India

c) **Women:** Nil

d) Persons with varied disabilities

- As mentioned in SC/SC, Persons with varied disabilities/PC are given relaxation in application cost, eligibility marks required for appearing in the entrance exam and minimum marks need to be scored in entrance exam for getting interview call.
- The number of seats are reserved as per reservation policy of Govt. of India

e) **Economically weaker sections:** Nil

f) **Outstanding achievers in sports and other extracurricular activities:** Nil

2.1.6 Number of students admitted in university departments in the last four academic years

The total number of students admitted in the 24 major disciplines of IARI in both M.Sc./M.Tech. and Ph.D. is about 350-420. As per the Govt reservation policy, the students are admitted. Usually about 20% students admitted are female students. The details of number of students admitted during the last four academic sessions are given below:

Category-wise admission in M.Sc./M.Tech. and Ph.D. Programmes

Categories	2011-12			%			2012-13			%			2013-14			%			2014-15			%		
	M	F	F	M	F	F	M	F	F	M	F	F	M	F	F	M	F	F	M	F	F			
SC	38	8	17.39	30	13	30.23	42	5	10.64	40	11	21.57												
ST	14	6	30.00	19	4	17.39	18	6	25.00	18	9	33.33												
OBC	81	16	16.49	82	20	19.61	86	12	12.24	95	31	24.60												



PC	4	2	33.33	5	1	16.67	3	1	25.00	5	0	0.00
General	117	31	20.95	118	37	23.87	125	29	18.83	128	44	25.58
Others (departmental)	5	1	16.67	11	1	8.33	10	2	16.67	10	1	9.09
Foreign students	19	4	17.39	20	8	28.57	17	4	19.05	22	3	12.00
Total	278	68	19.65	285	84	22.76	301	59	16.39	318	99	23.74

2.1.7 Has the university conducted any analysis of demand ratio for the various programmes of the university departments and affiliated colleges? If so, highlight the significant trends explaining the reasons for increase / decrease

Entrance Exam cum JRF fellowship exam is conducted by the Education Division of ICAR. Large numbers of students write in the JRF exam. The demand ratio for M.Sc./M.Tech admission is >20. Top ranking students opt for IARI. IARI is also the most sought destination for Ph.D. studies in agriculture in India. Five year average demand ratio is 10.42 per Ph.D. seat of IARI. Year-wise demand ratio is given below:

Year-wise demand ration for admission in Ph.D. courses at IARI

Year	Number of Students who wrote entrance exam	Number of students admitted	Demand Ratio
2011-12	1890	133	14.21
2012-13	1560	141	11.06
2013-14	1311	143	9.17
2014-15	1568	167	9.39
2015-16	1026	122	8.41
5 Year mean	1471	141.2	10.42

2.1.8 Were any programmes discontinued/staggered by the university in the last four years? If yes, please specify the reasons.

No programme was discontinued or staggered.

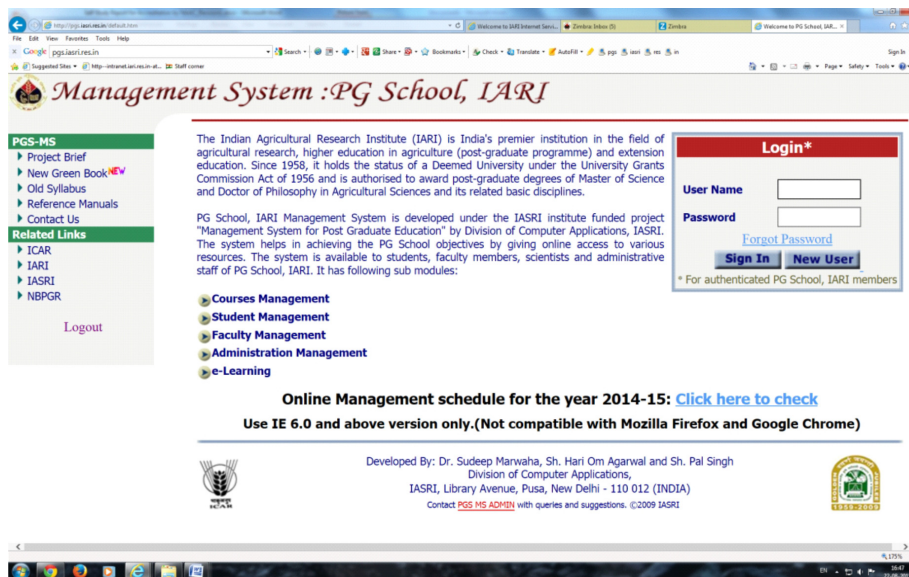
2.2 Catering to Student Diversity

2.2.1 Does the university organize orientation / induction programme for fresher's? If yes, give details such as the duration, issues covered, experts involved and mechanism for using the feedback in subsequent years

Yes. In order to make all fresh students fully conversant with requirements and working of the course credit system after Registration, one week Orientation Programme is arranged immediately after the admission. On the first day, all the freshers are invited to the Institute's auditorium where the Director and Dean of IARI address the students. All the Head of the Division and Professors are introduced to the students. The rules and regulations of the PG School including attendance, examinations and evaluations are explained to the students by the Registrar and Incharge-AIM Cell of the PG School. The rules and regulations of the PG hostel and facilities available to the students are explained to the students by the Master of Halls of Residence and Wardens of different hostels. On the next day, the students are given an online demonstration on the use of PG School online management system (<http://pgs.iasri.res.in>), which is used for registration of courses, submission of progress report, submission of PPW and ORW, etc. On the third day, the students are acquainted with the IARI library. The students are exposed to the type of literature collections available in the Library, methods to access various form of literatures (hard copy/ soft copy/online, etc.). For the next 4 days, orientation programme is given by the respective disciplines. Fresh students are welcomed by the faculty, technical staff and students of the Division, and a formal induction is made. The professor explains all the rules and regulations of the PG School regarding attendance, major and minor disciplines, Course structure, examination system, etc. Then, all the faculties introduce themselves, explaining their area of research, expertise, projects and facilities available in their



labs. During the orientation week, the newly admitted students are encouraged to freely meet the different faculty members in the discipline, visit their lab facilities and discuss possibilities of research problems in their respective areas of specialisation.



2.2.2 Does the university have a mechanism through which the “differential requirements of the student population” are analysed after admission and before the commencement of classes? If so, how are the key issues identified and addressed?

Yes. Most faculties conduct a quiz in the introductory class to assess the different levels of students and their differential teaching requirements and promote peer-learning. The faculties cover the required fundamental aspects in their initial classes to bring student population to the similar level. Students with deficiency in basic levels of specific subject are advised to consult required literature, and students with difficulties in English are asked to take special English courses (non-credit) offered by the Institute.

2.2.3 Does the university offer bridge / remedial / add-on courses? If yes, how are they structured into the time table? Give details of the courses offered, department-wise/ faculty-wise?

Yes. The Institute offer remedial courses to the students who have not done Agriculture courses during their Bachelor’s or Master’s degree programme. These students need to undergo introductory courses on agriculture during the first year of their study at IARI. All the international non-agricultural graduates admitted at IARI shall also have to complete the prescribed Remedial Courses on Introductory Agriculture as per the approved schedule given below for the same (See box). Besides, the students from non-English speaking countries undertake English language course.

Remedial Courses for students who have not done under graduation in Agriculture

Code No.	Title of Course	Name of the Discipline	Credit
AGR 001	Agronomy of Rainy Season Crops	Agronomy	1+2
AGR 002	Agronomy of Winter Season Crops	Agronomy	1+2
AGR 003	Agronomy of summer Season Crops	Agronomy	1+1
AGR 004	Soil and Environment	SSAC	2+1
AGR 005	Major Pests of Crops and Their Management	Entomology	1+2
AGR 006	Crop Morphology And Physiology	Plant Physiology	1+1
AGR 007	Principles of Horticultural Crops	Horticulture	2+1



AGR 008	On-farm Education and Visits to Different Institutions	Agricultural Extension	0+2
AGR 009	Principles of Post Harvest Technology	Post Harvest Technology	1+1
AGR 010	Elements of Genetics and Plant Breeding	Genetics	2+1
AGR 011	Crop Diseases and Their Management	Plant Pathology	1+1
AGR 012	Basics Of Seed Technology	Seed Science and Technology	1+1
AGR 013	Economic Botany and Plant Genetic Resources	Plant Genetic Resources	1+1
AGR 014	Fundamentals of Economics and Business Management	Agricultural Economics	1+1
AGR 015	Basics of Extension Education	Agricultural Extension	1+1
AGR 016	Basic Agricultural Engineering	Agricultural Engineering	1+1

2.2.4 Has the university conducted any study on the academic growth of students from disadvantaged sections of society, economically disadvantaged, physically handicapped, slow learners, etc.? If yes, what are the main findings?

Nil.

2.2.5 How does the university identify and respond to the learning needs of advanced learners?

No specific mechanism exists to identify and respond to the needs of advanced learners. However, in each disciplines students with advanced learning ability are given with advanced research publications and given advance training in the area of research.

2.3 Teaching-Learning Process

2.3.1 How does the university plan and organise the teaching, learning and evaluation schedules (academic calendar, teaching plan, evaluation blue print, etc.)?

Academic calendar is prepared by the P.G. School following the norms of P.G. School calendar for each trimester, trimester break and summer vacations days. Number of working days are considered which are sufficient to cover the courses as per the credit allocated. The Academic calendar is approved by the Dean and then issued to all the Professors of teaching disciplines for preparing the teaching plan.

The Deemed University statutes provide for the constitution of a Board of Studies in each discipline. The Board is represented by Professor (Chairman), Head of the Division (Ex-officio member), one scientist each of Principal Scientist, Senior Scientist and Scientist cadre and one student representative to act as member. The Board of Studies is reconstituted before commencement of each academic year. Professors of each discipline conduct faculty meeting and Board of Studies meeting before the beginning of each trimester to decide the course leader and course associates for each course offered in the coming trimester. Then teaching and course evaluation plans are prepared by each course leader in consultation with course associates. The teaching and course evaluation plans are uploaded by the course leader in “*Management System for Post Graduate Education*” at least a week before start of the trimester. This can be accessed by the students online before registration.

2.3.2 Does the university provide course outlines and course schedules prior to the commencement of the academic session? If yes, how is the effectiveness of the process ensured?

Yes. All the course leaders need to upload the class-wise course schedule online in the IARI P.G. School Management System (<http://pgs.iasri.res.in>). This is monitored by the Professors of the respective discipline, and they ensure that the class schedule is uploaded prior to the start of the trimester. The students can access the course schedule online using the IARI P.G. School Management System. Often, a hard copy of the class schedule is also given to the student in the first class of each course.

2.3.3 Does the university face any challenges in completing the curriculum within the stipulated time frame and calendar? If yes, elaborate on the challenges encountered and the institutional measures to overcome these.

No, we do not face any challenge in completing the curriculum within stipulated time-frame and calendar.



2.3.4 How is learning made student-centric? Give a list of participatory learning activities adopted by the faculty that contributes to holistic development and improved student learning, besides facilitating life-long learning and knowledge management.

The teaching-learning process is made student-centric (learner centric) by assigning:

- Seminar topics are selected by student. They prepare the presentations and discuss with faculties for clarifications wherever the need arises.
- The students are given the task of identifying relevant articles related to course and different topics from refereed national and international journals for term paper presentations in each course
- The students are given choice to select research guide and choice of research topics for their Ph.D. dissertations
- The students of each discipline are encouraged to have student clubs. These clubs organize invited lectures from eminent scientists from other institutes.

The Institute has very healthy student-teacher ratio, and students are encouraged to interact with faculty in the teaching-learning process. The Institute provides world class laboratory and field facilities for all students, and thus students can learn and gain expertise in their area of interest.

2.3.5 What is the university's policy on inviting experts / people of eminence to deliver lectures and/or organize seminars for students?

The Board of Studies of each Discipline identify few eminent scientists/professors who have made significant contributions in research and teaching in their field of specialization and recommend them for recognizing as Adjunct Professor and Adjunct Faculty. The Dean considers the recommendation of Board of Studies with the approval of the Chairman, Academic Council & the Director IARI and notifies certain reputed scientists as Adjunct Professor and Adjunct Faculty. Such faculty members will be required to deliver at least 10 lectures in a year to cover a part of a regular course. They shall be paid remuneration for not more than 25 lectures at approved rates prevailing at the relevant time. The Dean with the approval of Chairman, Academic Council may denotify any of the Adjunct Professor and Adjunct Faculty in case he/she is unable to continue. Currently the Institute has 17 Adjunct Professors and 22 Adjunct faculties. Discipline-wise number of Adjunct Professor and Adjunct Faculty who are teaching at IARI are given below (See Box):

Discipline-wise number of Adjunct Professor and Adjunct Faculty at IARI

Discipline Code	Discipline	Adjunct Professor	Adjunct Faculty
01	Agricultural Chemicals	1	-
02	Agricultural Economics	1	1
03	Agricultural Engineering	2	1
04	Agricultural Extension	-	4
05	Agricultural Physics	-	-
06	Agricultural Statistics	-	-
07	Agronomy	2	1
08	Biochemistry	1	-
09	Bioinformatics	-	-
10	Computer Application	-	-
11	Entomology	-	1
12	Environmental Sciences	-	1
13	Genetics	3	1
14	Horticulture	2	4
15	Microbiology	-	1
16	Molecular Biology and Biotechnology	1	-
17	Nematology	1	-
18	Plant Genetic Resources	-	-



19	Plant Pathology	2	-
20	Plant Physiology	-	2
21	Post Harvest Technology	-	1
22	Seed Science and Technology	-	2
23	Soil Science and Agricultural Chemistry	1	2
24	Water Science and Technology	-	-

2.3.6 Does the university formally encourage blended learning by using e-learning resources?

Yes. The institute encourages learning by using e-learning resources.

2.3.7 What are the technologies and facilities such as virtual laboratories, e-learning, open educational resources and mobile education used by the faculty for effective teaching?

The internet connections made available in all the labs in each Department. Each department also has a computer lab for students. Each Divisional library and the Central library are provided with computer and internet facilities. Free wi-fi facility is given to all the students in the Division. All the students' hostels have also been provided with computers with internet connections and also free wi-fi in the hostels. The Institute's central library subscribes to CD-ROM databases, online journals and books. These provide e-learning opportunities and facilitate quick e-survey of the literature for research work.

2.3.8 Is there any designated group among the faculty to monitor the trends and issues regarding developments in Open Source Community and integrate its benefits in the university's educational processes?

No.

2.3.9 What steps has the university taken to orient traditional classrooms into 24'7 learning places?

Each Division and student hostel has a computer lab with sufficient number of computer systems with internet facility. This facility is available for the students all the time for accessing e-learning resources, journals, books, etc. The students are provided with modern multimedia teaching aids like power point slides and CD-ROMs.

2.3.10 Is there a provision for the services of counsellors / mentors/advisors for each class or group of students for academic, personal and psycho-social guidance? If yes, give details of the process and the number of students who have benefitted.

The Institute provides an all-round counselling to its students and helps them find suitable jobs through the placement cell, which is headed by a senior level scientist and ably assisted by a secretary and the President, PG School Students' Union. To cite an example, this cell has organized more than 5 such interactions in the last few years and these have led to placement of some of the students of the Institute in private organizations in the country. In addition to the placement cell, there is also a Business Development Cell in the Institute. Together, they organize IARI-Industry business meets with participation of students and faculty members. This provides a ready platform for the students to directly interact with potential employers.

The Students Counselling and Placement Cell was created in 2002. Since then, it has been active in organizing industry meets during the convocation period. This provides an opportunity to the students for one-to-one interaction with the industry representatives and for seeking suitable employments. In addition, the Cell receives several requests from private and public sector organizations, which are circulated among the students. The students are then interviewed 'on campus' and jobs offered to them. Most of our students get selected either for higher studies or for jobs. Presently, the unemployed graduates are only about 2% in M.Sc./M.Tech. and 4% in Ph.D. The placement pattern of outgoing M.Sc./M.Tech. students in the recent years is as follows: Agricultural universities and research organizations (2%), Agricultural Research Service (20%), Union Public Service Commission (5%), contractual JRF/ SRF (3%), and

enrolment for Ph.D. programme (70%). Those who finish their Ph.D. programmes got jobs in the Agricultural Research Services, SAUs, private organizations, State agricultural departments and traditional universities, etc.

Each division has a designated Professor, who acts as counsellor for students of that discipline. Within a trimester of joining the Institute, a student advisory committee was constituted. The student is given full freedom to choose the chairman of the advisory committee and then in consultation with the Chairman, student selects the members of the advisory committee. This advisory committee guides the student on his academic, research and personal aspects.

2.3.11 Were any innovative teaching approaches/methods/practices adopted/put to use by the faculty during the last four years? If yes, did they improve learning? What were the methods used to evaluate the impact of such practices? What are the efforts made by the institution in giving the faculty due recognition for innovation in teaching?

Smart-class room facilities have been developed in most Divisions. During the last five years, most faculties have developed ICT enabled teaching material and practical manuals. All the disciplines have audio-visual teaching aid facility, interactive boards and smart class rooms. Practical/project work centred courses have been developed. The Institute gives due weightage to the innovative teaching method developed by faculties while awarding Best Teacher Award of the Institute.



2.3.12 How does the university create a culture of instilling and nurturing creativity and scientific temper among the learners?

Each department organizes various scientific activities such as debates, seminars, group discussions, poster presentations, and practical exercises of curriculum in each trimester to nurture critical thinking, creativity and scientific temper among students. Research work is mandatory under the CBCS of the Institute for all the students. These events instil and nurture creativity and scientific temper among the students. IARI awards merit medals and Best Student of the Year medal every year for outstanding academic performance of student.

2.3.13 Does the university consider student projects mandatory in the learning programme? If yes, for how many programmes have they been (percentage of total) made mandatory?

a) Number of projects executed within the university

Research work is mandatory for both Master and Ph.D. programmes. All the students admitted to M.Sc./M.Tech and Ph.D. programme must conduct research work, and submit a thesis for completing the degree programme. Hence, the number of student research projects is equivalent to number of students admitted.

b) Names of external institutions associated with the university for student project work

To assess in-depth knowledge, qualifying examination by an External Examiner is conducted. External Institutions are not directly involved in the student project. The external institutions are indirectly



associated with enhancing the quality of the student research work as thesis is sent for external examination to other Institutes. These feedback/comments received are used for improvement of the student research work.

c) Role of faculty in facilitating such projects

Faculty (Chairperson and members of advisory committee) plays important role in formulation and implementation of student research projects. A faculty member shall ordinarily function as the Chairperson of the Advisory Committee of not more than 4 students and in any case of not more than 5 students in order to closely guide the students. The programme of studies indicating the Plan of Post Graduate Work (PPW) of each student and Outline of Research Work (ORW) are finalised by the student's Advisory Committee which shall give considerable latitude in the choice of courses, taking into account the requirement needed to provide training for a high level of scholarship and research in that particular field. Every trimester, an advisory committee meeting is held to review and guide the student research. Faculty arranges necessary facilities for student research.

2.3.14 Does the university have a well-qualified pool of human resource to meet the requirements of the curriculum? If there is a shortfall, how is it supplemented?

The Institute has well qualified faculties. Currently the Institute has no shortfall in human resources. However, to utilize the vast experience of eminent scientists, the Institute has a pool of recognized Adjunct Professor and Adjunct faculty.

2.3.15 How are the faculty enabled to prepare computer-aided teaching/learning materials? What are the facilities available in the university for such efforts?

All the faculties are provided with Computer and Internet facilities to prepare computer-aided teaching/learning materials. Each Division has class rooms with LCD projection facilities and smart class room.

2.3.16 Does the university have a mechanism for the evaluation of teachers by the students/alumni? If yes, how is the evaluation feedback used to improve the quality of the teaching-learning process?

At the end of each course, the course Evaluation Proforma is given to the students and the feedback duly filled in by the concerned students are obtained and submitted to the Professor and Dean for assessment of the course and the faculty. The feedback is used to improve the quality of teaching-learning process.

2.4 Teacher Quality

2.4.1 How does the university plan and manage its human resources to meet the changing requirements of the curriculum?

So far, Post-Graduate courses in agriculture are not available online. Faculty is thus encouraged to develop large number of online courses.

2.4.2 Furnish details of the faculty

The faculty at IARI includes the scientists working at IARI and its sister Institutes located at New Delhi, namely, IASRI, NBPGR, NRCPB, NIAP, IIMR, NCIPM. The scientists working at IIHR, Bengaluru and CIAE, Bhopal are also including in the faculty.

Highest Qualification	Principal Scientist		Senior Scientist		Scientist		Total
	Male	Female	Male	Female	Male	Female	
Ph.D.	163	58	130	37	66	37	491
PG	2	0	0	0	10	4	16
Total No. of permanent teachers	165	58	130	37	76	41	507

(Principal Scientist = Professor; Senior Scientist = Associate Professor; Scientist = Assistant Professor)



2.4.3 Does the university encourage diversity in its faculty recruitment? Provide the following details (department / school-wise)

The faculty of the Institute consists of scientists in various grades viz. Principal Scientist, Senior Scientist, and Scientist. The Institute has a sanctioned strength of 578 Scientists. This includes 337 Scientist, 170 Senior Scientist, 65 Principal Scientists and 6 research management positions. Currently the total number of faculties are 507. The Agricultural Scientists Recruitment Board (ASRB) of ICAR recruit scientists through Agricultural Research Service (ARS) exam. The President of ICAR Society is the Appointing Authority to the service. The salient features of the ARS are as follows:

- i) To attract, recruit and train the most promising graduates and post-graduates from the universities as may have an aptitude for research in various branches of agriculture.
- ii) To induct proven talent and experience into the Council by direct recruitment of highly qualified scientists on a permanent or a tenurial basis.
- iii) To generate a scientific culture and opportunity for continuous professional growth and life-long specialization without any constraint and to promote individual and collective for improving the productivity of research and application of knowledge in matters relating to all aspects of agriculture.
- iv) To promote team work and genuine professional collaboration particularly on an inter-disciplinary basis and eliminate unhealthy rivalry.
- v) To enable a scientist to advance in his career while continuing to work on problems relating to a particular crop, animal or area of agricultural study, for an extend period of time.
- vi) To give explicit recognition to the research management function and to ensure that those desiring and having an aptitude for research management and co-ordination responsibilities are able to concentrate on the task of effective planning and implementation of research programmes and promoting organized cooperation.
- vii) To develop an effective system of career planning, management and advancement.
- viii) To ensure that interchange of scientists between positions involving research performance and research management responsibilities takes place smoothly and reciprocally.
- ix) To facilitate mobility of scientists from one Institute of the ICAR to another as also from the ICAR to sister organizations like universities, CSIR, BARC, etc.
- x) To facilitate scientific attention to the problem areas in the country where potential for agricultural growth is yet to be converted into wealth, meaningful to the people.

Best talent is appointed as Scientist and often top most ranked scientists in the ARS exams opt for IARI. Career Advancement Scheme (CAS) is followed for regular promotion of scientists.

Department/ School	% of faculty from the same university	% of faculty from other universities within the State	% of faculty from universities outside the State	% of faculty from other countries
IARI, New Delhi	65%	2%	33%	Nil

2.4.4 How does the university ensure that qualified faculty are appointed for new programmes / emerging areas of study (Biotechnology, Bio-informatics, Material Science, Nanotechnology, Comparative Media Studies, Diaspora Studies, Forensic Computing, Educational Leadership, etc.)? How many faculty members were appointed to teach new programmes during the last four years?

The Agricultural Scientists Recruitment Board (ASRB) of ICAR recruits scientists through Agricultural Research Service (ARS) exam. The scientists who obtain top ranks opt for IARI. For recruitment of Senior Scientists and Principal Scientists, the Institute sends its requirements and eligibility for these posts to ASRB. The Institute participates in the selection process for ensuring the quality of the Senior Scientists



and Principal Scientists. Recently, faculties were recruited for Biotechnology and Bio-informatics courses. Besides, for recruiting faculty for new discipline, flexi-positions of Senior Scientist are kept.

2.4.5 How many Emeritus / Adjunct Faculty / Visiting Professors are on the rolls of the university?

Currently the Institute has 17 Adjunct Professors and 22 Adjunct faculties.

2.4.6 What policies/systems are in place to academically recharge and rejuvenate teachers (e.g. providing research grants, study leave, nomination to national/international conferences/seminars, in-service training, organizing national/international conferences etc.)?

The Institute provides grants to each Division through plan and non-plan allocation. Further, the faculties are encouraged to apply for research grants from external funding agencies. Currently, about 24 projects from ICAR - National Agricultural Science Fund, 5 Foreign Aided Projects and 143 Externally Funded Projects from DBT/DST/CSIR etc. are being carried out by the faculties.

Young faculties are encouraged to apply for 3 to 12 months training at internationally renowned Institutes abroad. Within India, the faculties are sent to short-term trainings. Most faculties are encouraged to attend National and International conferences. The Institute organizes several national and international short-term training courses and refresher courses in specialized areas for the scientists of NAREES under the programmes of “Centres of Excellence” and “Centres of Advanced Studies”.

In addition, some special training courses were also organized for the benefit of professionals, farmers and extension workers. During 2014-15, 74 training programmes were organized by IARI. The details are given below:

Important Training programmes organized by the Institute during 2014-15

Name of Discipline & the training programme	Dates/Month	No. of trainees
Agricultural Chemicals		
Training on “Pesticide/Formulation Testing and Quality Assessment” for Mongolian trainees	June 16- 26, 2014	2
Agricultural Engineering		
Motor Winding for Entrepreneurs	November 17-26, 2014	10
National training on “Project Formulation, Risk Assessment, Scientific Report Writing and Presentation”	February 17-21, 2015	20
National training on “Project Formulation, Risk Assessment, Scientific Report Writing and Presentation”	February 24 - 28, 2015	20
Agricultural Extension		
Training in EDP for Farm Women and Farmers in Four Villages of Hapur District	April 3- 5, 2014	28
Farmers’ Workshop on Direct Seeded Rice (DSR)	June, 2014	90
Farm Entrepreneur and Stakeholders Meet for Developing Agri-entrepreneurship at Naveen Mandi, Hapur	June, 2014	500
<i>Krishak Gosthi</i> on Weed Management in Direct Seeded Rice (DSR)	July, 2014	60
Field Visit to DSR Demonstration Plots	July, 2014	60
<i>Krishak Gosthi</i>	September, 2014	80
Futuristic Agricultural Extension Approaches and Tools	September, 3-23, 2014	25
Training of IARI Students on Life Skills and Leadership Development	September 16-20 2014	24
Training of Technical Officer on Enhancing Motivation for High Job	September 22-24, 2014	20
Training of Technical Officer on Enhancing Motivation for High Job	September 25-27, 2014	26
Field Visit	September, 2014	105
Extension Strategies for Up-scaling of Farmer-led Innovations for Extension Professionals	October 9-16, 2014	20



Training on Weed Control for Zero-tillage System and Farmers- Scientists Meet on Nutrient Resource Management (NRM) Technologies	November, 2014	220
Empowering Farmers for Agricultural Entrepreneurial Ventures : Building Trainers' Skills	November 25 - December 15, 2014	19
Training on Weed Management in Zero-tillage System in Wheat and <i>Krishak Gosthi</i> in NICRA villages	December, 2014	100
Training on <i>m-krishi</i>	January 21, 2015	18
Training on Conservation Agriculture	January 21, 2015	18
Trainings on Pest Management in Wheat at Mumtajpur, Lokra and Turkapur villages	January 17, 2015	100
Trained on Improved Mustard and Wheat Production Technologies for Farmers and Post Masters at KVK, Sheopur	February 24, 2015	100
Training on Protected Cultivation of Tomato	February, 2015	15
Training on Improved Wheat Production Technologies for Farmers and Post - Office Staff	March, 2015	50
Field Day on Zero Tillage in Wheat in NICRA villages	March, 2015	50
Training on IMP in Vegetable in NICRA villages	March, 2015	30
Training on Zero Tillage	March, 2015	50
Agricultural Physics		
Winter School on "Soil-Plant-Water Relations under Conservation Tillage Practices for Sustainable Agriculture"	November 5-25, 2014	20
Short training course on Remote Sensing and GIS for natural resource management for students of Jamia Millia Islamia, New Delhi.	March 19-21, 2015	20
Centre for Environment Science and Climate Resilient Agriculture		
Training Workshop on "Development of Greenhouse Gas Emission Inventory for Agriculture"	May 6-7, 2014	40
Training Workshop on "Eddy Covariance Flux Measurement"	December 4-5, 2014	20
Entomology		
Model Training Course (MTC) on "Mass Production Technologies of Natural Enemies of Crop Pests"	November 24 - December 1, 2014	19
Floriculture and Landscaping		
Model Training Course on "Avenues in Floriculture for Livelihood"	December 10-17, 2014	22
Food Science & Post Harvest Technology		
Valorization of Horticultural and Arable Crops	December 4-11, 2014	18
Postharvest Management and Processing of Horticultural Produce	March 17-21, 2015	18
Fruits and Horticultural Technology		
Model Training Course (MTC) on "Management of Production Problems of Horticultural Crops for Enhancing Productivity and Quality"	January 27 - February 3, 2015	18
Microbiology		
Training Program on Biofertilizers (VAM production, Compost production, Azotobacter liquid formulation) for Licencees	2014-15	13
Indo-German Collaborative Workshop on "Microbial Ecology and Application of Inoculants in Bio-control"	April 7-10, 2014	32
Plant Pathology		
Genomics of Plant Virus for Diagnosis and Utilisation as Gene Expression Tool	October 15- November 6, 2014	18
Genetic and Pathogenic Characterization towards Managing Nationally Important Plant Pathogens Causing Wilt and Blight	January 13- February 2, 2015	22
MTC on "Eco-friendly Management of Major Diseases of Crops"	October 27- November 3, 2014	9



Plant Physiology		
ICAR short course on “Non-destructive Phenotyping and Phenomics for Dissection of Abiotic Stress Tolerance, Gene Discovery and Crop Improvement”	July 14-23, 2014	25
Soil Science and Agricultural Chemistry		
11 th Advanced Level Training on Soil Testing, Plant Analysis and Water Quality Assessment	September 4-24, 2014	19
Seed Science & Technology		
Training on “Maintenance Breeding : Training-cum-Exposure Visit”	September 26-27, 2014	23
Training on “Identification of Rice Varieties” for Senior Scientists, Exporters and Progressive Farmers.	September 30, 2014	65
An Orientation Programme on “Identification of <i>Basmati</i> Varieties for Surveyors”	October 14, 2014	40
Training on “ <i>Pramukh Prakshetra Faslon Mein Beej Utpadan Prodyogiki</i> ”	January 21-23, 2015	25
Training on “Maintenance Breeding: Training-cum-Exposure Visit”	March 3-4, 2015	25
Thirteen Trainings Organized for Farmers under Seed Village Scheme during <i>Kharif</i> and <i>Rabi</i> seasons on Different Aspects of Quality Seed Production	<i>Kharif</i> 2014 <i>Rabi</i> 2014-15	96 164
Vegetable Science		
Model Training Course on “Promotion and Organization of Scientific Nutrition Gardening for Household Health Security and Tackling of Malnutrition”	January 17-24, 2015	
Vegetable Field Day	January 29, 2015	
Water Technology Centre		
Two One-day Training Programmes for Grass Root Level Workers of Delhi Jal Board on “Water Conservation and Management”	September 2-4, 2014	55
Two One-day Capacity Building Programs for 33 farmers of Anand, Gujarat and 46 farmers of Balod, Chhattisgarh on “Micro Irrigation Technologies for Improving Water Productivity and Yield”	September 16-29, 2014	79
Training Programme on “Micro Irrigation Technologies for Increasing the Water Use Efficiencies” for the Farmers from Alwar district, Rajasthan	September 29 - October 1, 2014	26
Three One-day Training Programmes on Precision Farming Technologies (i.e., Micro Sprinkler, Drip Irrigation & Fertigation, Polyhouse, Insect Proof Net house, etc.) for farmers from Chhattisgarh and Karnataka state	November 10, 14 & 27, 2014	153
Training on Precision Farming Technologies, (i.e., Micro Sprinkler, Drip Irrigation & Fertigation, Polyhouse, Insect Proof Net House, etc.) for farmers from Alwar	November 24-26, 2014	26
Two Field Day Training Programmes at Muzaffarnagar, Uttar Pradesh	November 29-30, 2014	
Model Training Programme entitled “Enhancing Water Productivity in Agriculture through the Application of Modern Tools/Techniques of Water Management in Crops”	December 18-25, 2014	20
Training Program on “Micro Irrigation Technologies for Increasing the Water Use Efficiencies” for farmers from Alwar	February 4-5, 2015	25
Training Program on “Drip Irrigation & Fertigation, Poly House, Insect Proof Net House, Mulching and Sprinkler” for farmers from Ramgarh, Alwar	February 23- 25, 2015	25
Centre for Agricultural Technology Assessment and Transfer		
Skill Development Training & Exposure Visit of Farmers, Entrepreneurs and Officials	April 2-11, 2014	19
Skill Development Training & Exposure Visit of Farmers, Entrepreneurs and Officials	August 4- 13, 2014	25
Skill Development Training & Exposure Visit of Farmers, Entrepreneurs and Officials	September 1 -10, 2014	20



Improved Horticultural Technologies for Horticultural Officers of Himachal Pradesh	October 27-31, 2014	18
Seed Production and Improved Crop Production Technology for Farmers	March 17-23, 2015	16
Training on Seed Production Technology	March 24-27, 2015	20
International Training on “Bio-fertilizers and Bio-pesticides in Agriculture” for Scientists from Iraq	June 6 -20, 201	4
International Training on “Bio-organic fertilization” for Scientists from Iraq	June 6 -20, 2014	4
Zonal Technology Management and Business Planning & Development Unit		
Mustard Day	March 4, 2015	37
Agribiz Idol Camp cum Incubation Workshop	May 9, 2014	175
Regional Station, Pusa (Bihar)		
Quality Seed: An important Input in Green Revolution	March 17-26 , 2015	50
Regional Station, Indore		
PPV & FR Act Awareness Training Programme	January 24, 2015	200
Regional Station, Katrain		
<i>Sabji Fasal Evam Unki Beejotpaadan Takneekiyan</i>	June 20-21, 2014	25
<i>Madhya Parvatiye Kshetron Me Sabji Evam Unki Beejotpaadan Takneekiyan</i>	October 30-31, 2014	25
Regional Station, Shimla		
Training programme on “Nursery Production of Temperate Fruits” organized at Horticultural Research Farm, Dhanda under IARI, R.S. Shimla	November 21, 2014	80
Training Programme on “Production and Nursery Management of Temperate Fruits” at Ghumarvin, Bilaspur	February 21, 2015	75

2.4.7 How many faculty received awards / recognitions for excellence in teaching at the state, national and international level during the last four years?

In 2010, IARI won the Sardar Patel Outstanding ICAR Institution Award for the year 2010 jointly with the Tamil Nadu Agricultural University, Coimbatore for its outstanding contribution in the field of agricultural research, education and extension. The Award carries Rupees 10,00,000 in cash, a citation and a plaque. The Institute was conferred the Environment Leadership Award of Agriculture Today, 2011 for its pioneering work on development of sustainable agriculture, protection of environment, mitigation and adaptation to climate change and environmental policy planning for the benefit of farming community. The award carries a memento and a citation. IARI received Quality Management System Standard Certificate, NS-EN ISO 9001: 2008/ISO 9001:2008 of KVQA for providing education, research and training in the field of agriculture. Indian Agricultural Research Institute got first rank (AAAA+) among the Agricultural Universities in India and also included in the top 100 Universities of the BRICS countries (CAREERS 360, Outstanding Universities Survey, March 2014). Most faculties have received national and international awards. The details of the awards received by the faculties are given in the report of the Divisions.

2.4.8 How many faculty underwent staff development programmes during the last four years (add any other programme if necessary)?

Academic Staff Development Programmes	Number of faculties participated in the programmes (Value in parenthesis for participation in abroad programmes)			
	2011-12	2012-13	2013-14	2014-15
HRD programmes (Seminar, Symposia & Scientific Meetings)	545 (52)	544 (22)	579 (41)	665 (46)
Summer / Winter schools, workshops, etc.	113 (10)	143 (14)	188 (14)	138 (6)
Others	146 (15)	132 (9)	154 (14)	116 (6)



2.4.9 What percentage of the faculty have

- | | |
|---|--------|
| a) been invited as resource persons in Workshops / Seminars/ Conferences organized by external professional agencies? | : 100% |
| b) participated in external Workshops / Seminars /Conferences recognized by national / international professional bodies? | : 100% |
| c) presented papers in Workshops / Seminars / Conferences conducted or recognized by professional agencies? | : 100% |
| d) teaching experience in other universities / national institutions and other institutions? | : 60% |
| e) industrial engagement? | : 50% |
| f) international experience in teaching? | : 40% |

2.4.10 How often does the university organize academic development programmes (e.g.: curriculum development, teaching-learning methods, examination reforms, content / knowledge management, etc.) for its faculty aimed at enriching the teaching learning process?

The Institute organizes several scientific meetings during which these aspects on curriculum development, teaching-learning methods, examination reforms, and content / knowledge management are discussed. During the convocation week, students' presentations for Merit medal awards are made. The significant achievements of the all the student research is presented by the professor of each discipline. Further, student academic and research progresses are also made by the Head of the Division and School Coordinators during IRC and RAC meetings. During these programmes renowned scientists and academicians are called as experts and their suggestions on enriching the teaching learning process are incorporated appropriately.

2.4.11 Does the university have a mechanism to encourage

- a) Mobility of faculty between universities for teaching?
Nil
- b) Faculty exchange programmes with national and international bodies? If yes, how have these schemes helped in enriching the quality of the faculty?

Several of the Institute's faculties are invited to deliver lectures in the regular courses and specialized training programmes of the other Institutes. Similarly, the Institute also invites several eminent scientists from different Institutes. During the past four year about 249 foreign visits have been made by the Institute's faculties for various academic programmes. These programmes enrich the research and teaching quality of the faculties.

The Institute has also signed an MOU in 2015 for collaborative research and education programme with University of Nebraska, USA. The Institute is also playing very important role in institution building in other countries, namely, in the establishment of 1) Afghan National University of Agricultural Sciences and Technology, Afghanistan and 2) Advanced Centre for Agricultural Research and Education at Yezin Agricultural University, Myanmar.

2.5 Evaluation Process and Reforms

2.5.1 How does the university ensure that all the stakeholders are aware of the evaluation processes that are in place?

The evaluation system consists of course work, written comprehensive examination (both in major and minor fields), pre-qualifying viva-voce exam, qualifying viva-voce exam, thesis evaluation and thesis viva-voce. The student should pass all these exams to earn the degree. Upon admission, every student is provided with P.G. School, IARI Academic Calendar which has the details of examination and evaluation system.



Besides, at the beginning of the trimester, the Course Leader will announce the exams to be held and the evaluation procedure in the class. The Post Graduate School has adopted 10 point OGPA scale from the academic session 2001-2002. The main highlights of the 10 point OGPA scale are as follows:

OGPA	Description of Performance
9.0 to 10.0	90 to 100%; I st Class with distinction
8.0 to 8.99	80 to 89%; I st Class
7.0 to 7.99	70 to 79%; II nd Class
6.0 to 6.99	60 to 69%; Pass
Below 6.00	less than 60%; Fail (F)
Incomplete	I

Minimum requirement of OGPA

For passing a course and to continue on the PG School rolls	: 6.0
For obtaining the degree	: 6.5
For competing for IARI Merit Medal	: 8.0 and above

All M.Sc./M.Tech./Ph.D. students will be required to maintain the minimum OGPA as mentioned above.

Trimester Examinations

All students shall have to take examinations given by the instructors concerned in the various courses registered by them in that particular trimester both in the major and minor fields. The types of examinations and the weightage attached to each, including practicals shall be announced by the Course Leader at the commencement of the trimester. Generally, the examination shall be of the following types:

- Short quizzes (announced and unannounced) to be held periodically (2-3 quizzes)
- Mid-term examination to be held between the sixth and seventh week of commencement of the trimester.
- Term paper(s) as may be decided by the Course Leader. The term papers given should be presented in the class.
- Final trimester examination: The written and practical examinations held at the end of each course followed by an oral discussion with the student before the marking is done.

A schedule of final trimester examination for each trimester shall be circulated by the Post Graduate School. All examinations prescribed shall be taken by the student and absence from examination shall not be permitted without valid reasons such as illness, to be certified by the Institute's Medical Officer. The student, however, has to obtain written permission from the instructor concerned before absents himself from any examination. Make-up Examination is normally permitted except in final examination. Normally no make-up examination shall be permitted in lieu of the missed final trimester examination except with the approval of the Dean, if the student was unable to appear in the exam due to severe illness.

After having successfully completed the major portion of the course work required (at least 75%) as judged from the minimum average grade point prescribed for passing (6.50 out of 10.00), a pre-comprehensive oral examination shall be held by a common departmental committee to be nominated by the Board of Studies of the discipline. The pre-comprehensive oral examination shall be conducted only after the student has successfully completed the written qualifying examination in the major and/or minor fields. Thereafter, a qualifying examination shall be held to test each student's general mastery of the concerned scientific discipline and his/her general fitness for becoming a candidate for the degree. For qualifying examination, an external examiner is called from within the Institute (for M.Sc./M.Tech.) or from other Institutes (for Ph.D.).

The written qualifying examination in the major field both for the M.Sc./M.Tech. and Ph.D. shall be arranged/evaluated externally as per the following terms:



	Master's programme	Weightage	Doctoral programme	Weightage
Major subject	One paper	50%	Two papers (one paper by external Examiner)	25+25=50%
Minor subject	One paper	25%	One paper	25%
Viva-voce	Internal	25%	External	25%
Qualifying Marks	60%		60%	
Paper setting	Internal		Internal	
Evaluation	External		External	
Grading	2 Credit		2 Credit	
	Grade 0-10 scale		Grade 0-10 scale	

2.5.2 What are the important examination reforms initiated by the university and to what extent have they been implemented in the university departments and affiliated colleges? Cite a few examples which have positively impacted the examination management system.

No change in the examination pattern is introduced.

2.5.3 What is the average time taken by the university for declaration of examination results? In case of delay, what measures have been taken to address them? Indicate the mode / media adopted by the university for the publication of examination results (e.g. website, SMS, email, etc.).

The Institute declares results within one week of the final exam of the trimester. Examination results are uploaded by the Course Leader in the P.G. School Online Management System (<http://pgs.iasri.res.in>). The students can see the results using the P.G. School Online Management System. The results are also displaced in the notice board of the Divisions.

2.5.4 How does the university ensure transparency in the evaluation process? What are the rigorous features introduced by the university to ensure confidentiality?

The evaluated answer sheets are shown to the students by the Course Leader before finalization of examination results. If any discrepancy is found, it is rectified.

2.5.5 Does the university have an integrated examination platform for the following processes?

No.

2.5.6 Has the university introduced any reforms in its Ph.D. evaluation process?

Yes. The Institute has adapted some standards for the award of Ph.D. degree. Research publication is mandatory for thesis submission. Two articles should have been published in refereed journals with NAAS rating of 5 or more.

2.5.7 Has the university created any provision for including the name of the college in the degree certificate?

No colleges are affiliated to IARI.

2.5.8 What is the mechanism for redressal of grievances with reference to examinations?

The student and the PG School Student union can submit representation for redressal of grievances with reference to examinations. The BOS in the respective Division addresses the grievances. In case the problem is not solved, it is referred to the Dean.

2.5.9 What efforts have been made by the university to streamline the operations at the Office of the Controller of Examinations? Mention any significant efforts which have improved the process and functioning of the examination division/section

The institute has introduced P.G. School online management system from 2010 (<http://pgs.iasri.res.in>). The students register online in this platform. The faculty submits results online using this system which enables fast and accurate processing and declaration of the examination results.



2.6. Student Performance and Learning Outcomes

2.6.1 Has the university articulated its Graduate Attributes? If so, how does it facilitate and monitor its implementation and outcome?

All the programmes offered by the Institute require dissertation work, seminars, presentation of outline of research work, thesis seminars. A student advisory committee is constituted for each student in the first trimester of the programme. The Institute offers a unique system of formation of student advisory committee. The students were given the list of faculties who are eligible to guide the students and the potential research problems. The students give their options on the chairperson for their Advisory Committee. Based on the order of merit of the students (rank obtained in the All India Entrance Exam conducted for admission by ICAR/the Institute), the Board of Studies of the Department allots chairperson to each student. The student in consultation with the chairperson, select the members of the advisory committee. This committee guide the student and monitor their performance regularly. Student advisory committee meetings are held once in a trimester to monitor and guide the students. Further all the students daily interact with their guide faculty (Chairperson of the Advisory Committee), in whose lab the student primarily conducts research work.

All the students are given opportunity to work in well-equipped labs in the division which are regularly modernized based on the requirement of curriculum and advancement in research methodology. Study tours and field trips, assignments are part of most courses. Experts in specialized field of research are invited to deliver special lectures to the students to update the students on current trends in the research and development.

2.6.2 Does the university have clearly stated learning outcomes for its academic programmes? If yes, give details on how the students and staff are made aware of these?

Collection and analysis of data on student learning outcomes is carried out through course evaluation and student feedback on the performance of teachers. The feedback from the students is used by the Board of Studies (BOS) for curriculum improvement and by the faculty for improving the teaching and quality of research. The performances as assessed by the students are communicated to the faculty through the BOS of the respective discipline.

2.6.3 How are the university's teaching, learning and assessment strategies structured to facilitate the achievement of the intended learning outcomes?

The course evaluation proforma is obtained from the student. This gives students' feedback on the performance of teachers and course content. The feedback issued by the Board of Studies and faculty for improving the course content and quality of teaching.

2.6.4 How does the university collect and analyse data on student learning outcomes and use it to overcome the barriers to learning?

The Institute collects and analyses data on student learning outcomes through student feedback on the performance of teachers at the end of each course. The feedback is communicated to the faculty for improving the quality of teaching.

2.6.5 What are the new technologies deployed by the university in enhancing student learning and evaluation and how does it seek to meet fresh/ future challenges?

The students are given real life problems that are faced by farmers. To conduct research to solve the problem, students are provided with state-of-art lab and field facilities of the Institute. Most of the faculties of the Institute have advanced training in the leading research labs in their field of specialization. These faculties impart the modern technique based highly specialized expertise to the students to solve the challenging problems. In fact, about 20% of the Jawaharlal Nehru Award for best postgraduate research by ICAR is received by IARI students.



CRITERION III: RESEARCH, CONSULTANCY AND EXTENSION

3.1 Promotion of Research

3.1.1 Does the university have a Research Committee to monitor and address issues related to research? If yes, what is its composition? Mention a few recommendations which have been implemented and their impact

The Institute is a constituent unit of the Indian Council of Agricultural Research, which is a Society registered under the Societies Registration Act XXI of 1960. The Director is the principal executive officer of the Institute. The Institute has five main bodies which are responsible for broad policy matters and decision making in the field of research, post-graduate education and training, extension education and administration. These are:

- A. Board of Management (BOM)
- B. Executive Council (EC)
- C. Academic Council (AC)
- D. Institute Research Council (IRC)
- E. Extension Council (EC)

The highest policy making body of the Institute is the Board of Management. The Institute Research Council is responsible for the formulation of research projects and monitoring of their progress and application. All the matters relating to post-graduate education and training are decided by the Academic Council which is supported by Board of Studies in each discipline and four Standing Committees. The Extension Council is responsible to formulate the extension education and transfer of technology programme and to monitor the progress of extension education. All the administrative matters and policy decisions are implemented by the Executive Council. The details of composition, powers and functions, and action on the proceedings are given below:

A. Board of Management (BOM)

Powers and functions of BOM

The powers and functions of the Board of Management are:

- i. To consider the proposals for Five Year Plan and Annual Plan of the Institute, and submit the same to the ICAR.
- ii. To periodically review the progress of development schemes of the Institute.
- iii. To consider proposals for the annual budget of the Institute and to allocate funds to various Divisions/ Projects of the Institute.
- iv. Policy issues relating to the officers of the Institute including the rights and obligations of the staff.
- v. To consider the items of expenditure which are beyond the powers of the Director of the Institute.
- vi. To consider the action taken on the recommendations of the Grievances Cell and Institute Joint Council.
- vii. To appoint such committees as may be deemed necessary for proper functioning of the Institute.
- viii. Any other item, as may be desired by the Director or other members of the Board or as may be required to be considered as per delegation of powers as per directions of the Governing Body whether contained in any manual, orders issued or other instructions approved by the Governing Body.

Composition of BOM

- | | | |
|---|----------|------------|
| i. Director, IARI | Chairman | Ex-officio |
| ii. Dean & Joint Director (Education) | Member | -do- |
| iii. Two members of the Governing Body (to be nominated by the President, ICAR for a period of 3 years) | Members | |



iv. Heads of Divisions of related groups of disciplines and Project Coordinators (to be nominated by the President of the Society by rotation for a period of 2 years, total number not to exceed 8)	Members	
v. Joint Director (Research)	Member	Ex-officio
vi. Joint Director (Extension)	Member	Ex-officio
vii. Vice-Chancellor of an Agricultural University (to be nominated by the President, ICAR for a period of 3 years)	Member	
viii. One representative from the ICAR (to be nominated by the Director-General, ICAR for a period of 3 years)	Member	
ix. Director, IVRI/NDRI (to be nominated by rotation for a period of 2 years by the Director-General, ICAR)	Member	
x. Commissioner, Ministry of Agriculture	Member	Ex-officio
xi. One eminent scientist in the field of research done in the Institute but not employed by ICAR (to be nominated by the President, ICAR for a period of 2 years)	Member	
xii. One eminent educationist concerned with the research of the Institute, but not employed by ICAR (to be nominated by the President, ICAR for a period of 2 years)	Member	
xiii. Two non-official persons representing agricultural interest (to be nominated by the President, ICAR for a period of 2 years)	Members	
xiv. Financial Adviser, ICAR or his nominee	Member	Ex-officio
xv. Development Commissioner, Rohilkhand Division	Member	-do-
xvi. Joint Director (Administration) / Member- Chief Administrative Officer, IARI	Secretary	-do-

Note: a. Divisions of the Institute are grouped into schools of Crop Improvement, Resource Management, Crop Protection, Horticulture, Basic Sciences and Social Sciences, and nominations at S.No. (iv) are made from each of these groups.

b. The President, ICAR may in the interest of efficient and smooth functioning of the Institute, alter the number or members of the Board.

Termination of ex-officio membership of BOM

Where a person is a member of the Board by virtue of the office or appointment which he/she holds, his/her membership of the Board terminates when he ceases to hold that office or appointment.

Termination of membership of officers of BOM

Membership of the Board is terminated on the happening of any of the following events:

- On the expiry of the period of membership for which nominated.
- Death, resignation, lunacy or conviction for a criminal offence involving moral turpitude.
- When a member himself/herself declines to serve on the Board or his/her employer refuses to grant him/ her permission to serve on the Board.
- When a member does not attend three consecutive meetings of the Board without proper leave.
- The President of the Society may at any time terminate the membership of any one or more of the members and sometime may terminate the membership of all members.
- If a casual vacancy arises during the term of the member, such vacancy is filled in like manner as the original vacancy and the person nominated/appointed to fill the vacancy shall subject to the provisions of (a) and (b) above, hold office for the unexpired portion of term.

Resignation

When a member desires to resign his/her membership of the Board, he/she is forwards his/her letter of resignation to the Member-Secretary who forthwith submits the same for the consideration. The resignation takes effect from the date of its acceptance by the Chairman.

Quorum

- Six members of the BOM constitute the quorum.



- ii. The BOM meets as often as necessary and in any event at least once in each quarter of the year, the year for this purpose being the financial year commencing on the first of April and ending on the 31st March of the following calendar year.

Date, time and place of meeting

The BOM meetings are held on a date, time and place as determined by the Chairman.

Notice for meeting and its service

- i. All meetings of the BOM are called by a notice in writing by the Member-Secretary.
- ii. Every notice calling the meeting of the BOM states the date, time and place of the meeting, and is served upon every member of the Board of Management not less than 10 clear days before the day and appointed for the meeting.

Validation of proceedings of meeting

Any inadvertent omission to give notice, or non-receipt or late receipt of notice by any member does not invalidate the proceedings of the meetings.

Action on the proceedings

- i. The proceedings of the Board of Management are forwarded to the Director-General immediately.
- ii. The Director-General enjoys power to review/cause to be reviewed any decision of the Board of Management when he considers the same is not in consonance with the rules, general policy, practice or the priorities of the Council, provided that any order on the basis of such review is passed within a period specified by the Governing Body.

Wherever the Institute has reasons to differ from the views of the Board of Management, the reasons for disagreement are recorded and the proceedings of the meeting of the Board of Management are forwarded to the Director-General and the recommendations of the Board of Management are not operative or acted upon. The Board of Management is serviced and supported by four Councils viz. Executive Council, Academic Council, Staff Research Council, and Extension Council.

B. Executive Council (EC)

Functions of EC

- i. The Executive Council is the main task implementing body on administrative matters. The powers and functions of this Council are those as may be delegated by the Board of Management.
- ii. The membership of the Executive Council is regulated mutatis mutandis in accordance with the provisions of relevant rules.

Composition

- i. Director, IARI : Chairman
- ii. Dean & Joint Director (Education) : Member
- iii. Joint Director (Research) : Member
- iv. Joint Director (Extension) : Member
- v. Deputy Director General (Crop Sciences), ICAR : Member
- vi. Eight Managerial Scientists (Project Director/Head of the Division), Members; at least one from each of the six schools - Crop Improvement, Resource Management, Crop Protection, Basic Sciences, Horticulture and Social Sciences (to be nominated by the Board of Management for a period of 2 years)
- vii. One representative of Project Coordinators (to be nominated by the Board of Management for a period of 2 years) : Member



- viii. One representative from the Regional Station/other outstations (to be nominated by the Board of Management for a period of 2 years) : Member
- ix. Joint Director (Administration) : Member-Secretary

C. Academic Council (AC)

Powers of AC

- i. The Academic Council is the main consultative, deliberative and task implementing body in the fields of education and training.
- ii. The Academic Council is responsible for broad policy matters on academic issues without dealing with individual cases.
- iii. The Academic Council has the control and general regulatory powers on matters relating to education and training.
- iv. The Academic Council is responsible for the maintenance of standards of instruction, education and examination within the Post Graduate School and exercises such other powers and duties as are conferred on it.
- v. The Academic Council is responsible for the determination of equivalence of degrees of candidates applying for admission from other universities and is the final authority to make selection out of the applicants for admission.
- vi. The Academic Council performs in relation to academic matters, all such duties, as may be necessary, for the proper conduct of the programmes of post graduate education.

Functions of AC

- i. The Academic Council meets as often as necessary and in any event at least once in each trimester of the year, the year for this purpose being the academic year commencing from August and ending in July.
- ii. The Academic Council meeting is held on such date, time and place as may be determined by the Chairman.
- iii. All meetings of the Academic Council are called by notice in writing by and under signature of the Member-Secretary.
- iv. Every notice calling for the meeting of the Academic Council states the date, time and place of the meeting and is served upon every member of the Academic Council not less than 10 clear days before the day appointed for the meeting. However, in case of an emergency the Academic Council meeting can be convened at a short notice giving clear 48 hours for the members to attend the meeting.
- v. Any inadvertent omission to give notice, or non-receipt or late receipt of notice by any member does not invalidate the proceedings of the meetings.
- vi. The draft proceedings of the meeting of the Academic Council are circulated to all the members of the Academic Council for comments, which are communicated to the Post Graduate School office within a period of 10 days of such circulation. The comments, if any, are placed for discussion at the next meeting of the Academic Council.
- vii. Proceedings of the meeting of the Academic Council are also circulated to Project Directors, Heads of Divisions and Regional Stations.
- viii. The proceedings of the meetings of the Academic Council are placed in the very next meeting of the Board of Management for information.
- ix. It is the responsibility of each of the representative of the various Divisions to interact regularly with the Head of the Division and with post-graduate faculty of the Division, to keep them informed of



actions of the Academic Council and matters under discussion by the Academic Council. The representative is expected to bring to the attention of the Academic Council important views of the Divisions with respect to matters under discussion.

- x. Any item suggested for inclusion in the agenda should reach the Post Graduate School Office at least 15 days in advance of the proposed date of the meeting of the Academic Council.
- xi. Agenda note for the meeting of the Academic Council is normally made available to the members at least one week in advance of the meeting. If any member wants to seek some clarifications on the agenda items, this may be made at the time of the meeting; in case the member is not in a position to attend the meeting, a written note expressing his views may be sent to the Chairman for consideration.
- xii. Members of the Academic Council who are not in a position to attend the meeting of the Council for unavoidable and exceptional reasons should formally seek prior leave of absence from the Chairman of the Academic Council.
- xiii. The membership of the Academic Council is personal as the Academic Council discharges certain statutory functions. A member cannot depute his nominee to attend meetings of Academic Council on his behalf.

Composition of AC

- i. Director, IARI : Chairman
- ii. Dean and Joint Director (Education) : Vice-Chairman
- iii. Joint Director (Research) : Member
- iv. Joint Director (Extension) : Member
- v. Deputy Director-General (Education), ICAR : Member
- vi. All Project Directors : Members
- vii. Four eminent scientists/educationists from outside the IARI distinguished in the field of education including agricultural education (for the period of two years)
- viii. All Professors of teaching disciplines (or where there is no Professor, the Head of the Division), Professor, NRL and Professor, WTC.
- ix. Director, Indian Agricultural Statistics Research Institute, New Delhi : Member
- x. Director, National Bureau of Plant Genetic Resources, New Delhi : Member
- xi. Master of Halls of Residences : Member
- xii. Two representatives from the post-graduate faculty : Members
- xiii. Two students' representative : Members
 - a. President, PGSSU
 - b. Elected students' representative to the Academic Council
- xiv. Joint Director (Administration)/Registrar : Member-Secretary

Membership of EC

Four eminent scientists/educationists are nominated by the Chairman of the Academic Council on the recommendation of the Dean. The tenure of their membership is two years, the first two of them retiring through draw of lots at the end of the first year. The two representatives from the post-graduate faculty are elected through a process of an annual election by secret ballot by the faculty members. The following rules and procedures are observed for election of the two faculty members to the Academic Council.

- i. All faculty members, other than those designated as ex-officio members of either the Board of Management or the Academic Council, are eligible to be elected.



- ii. Members are normally elected for a term of two years such that one vacancy is filled every year. A sitting member may only be re-elected for a second time in direct sequence but not for the third term.
- iii. In case a vacancy is caused on account of an elected member's ineligibility or inability to complete his term, election to fill the vacancy is held in the prescribed manner for the remaining period of the term provided that the remaining period is not less than one year.
- iv. Nominations are invited for each vacancy from faculty members. Each faculty member is permitted to nominate one person and forward the nomination duly seconded, directly to the Dean or any other duly authorized officer of the Post Graduate School by name in a closed cover.
- v. The election will be by a secret, single non-transferable vote to be cast at the specified place on the specified date provided that the faculty members located at Regional Stations are permitted to cast their vote by post. The detailed instructions in this regard are laid down by the Dean with the approval of the Chairman of the Academic Council.
- vi. A candidate receiving the highest number of votes is declared elected.
- vii. In case of a tie between two candidates, the issue is settled by toss of coin after getting the agreement of both the candidates.
- viii. The two students' representatives are appointed in the following manner:
 - a. The President, Post Graduate School Students' Union (PGSSU), IARI is an ex-officio student representative in the Academic Council.
 - b. The second student representative is elected every year by secret ballot by the members of the PGSSU through the same election process adopted for electing the Executive of the Post Graduate School Students' Union.
 - c. The tenure of the student representative is one year.
 - d. In case of resignation of the student representative from the Academic Council, the vacancy is filled by holding an election.
- ix. Membership of the Academic Council stands terminated on the happening of any of the following events:
 - a. Upon the expiry of the period of membership for which nominated.
 - b. Death, resignation, lunacy or conviction for a criminal offence involving moral turpitude.
 - c. When the member declines to serve on the Academic Council or the member's employer refuses to grant permission to serve on the Academic Council.
 - d. When a member does not attend three consecutive meetings of the Academic Council without informing the Academic Council.

D. Institute Research Council (IRC)

Powers and functions of IRC

- i. Consideration and evaluation of the Research Projects (RPF I). The Principal Investigator makes the presentation of the research project to the IRC. The IRC rejects/recommends the Research Project along with its duration.
- ii. Consideration and evaluation of the on-going projects (RPF II Annual Research Progress Reports), after these have been assessed by an expert. The IRC makes specific recommendations about the achievements and shortcomings of the projects.
- iii. Advise on the fostering of linkages between the groups/divisions/institutes in respect of multi-disciplinary projects/multilocation projects.



- iv. Monitor the follow-up action on the recommendations of QRTs with respect to technical programmes of the Institute.
- v. Any other function as may be assigned to it by the Director of the Institute or the Director-General, ICAR.

Note:

- All meetings of the IRC are called by notice in writing by and under the hand of the Member-Secretary. An omission to give notice, or late receipt or non-receipt of notice by any member does not invalidate the proceedings of the meeting.
- One third of the members of the IRC constitute the quorum for any meeting of the IRC.
- The IRC meets twice in a calendar year at the Headquarters of the Institute, on a date and time to be determined by the Chairman of the IRC.
- Action on the proceedings of the IRC is initiated immediately after the same are approved by the Chairman and circulated to all concerned. The Member-Secretary of the IRC monitors the follow-up action, which is reported at the next meeting of the IRC.

Composition of IRC

- | | | |
|--|---|------------------|
| i. Director, IARI | : | Chairman |
| ii. Joint Director (Research) | : | Member |
| iii. Heads of Divisions | : | Members |
| iv. All Principal Investigators of Projects | : | Members |
| v. 2-3 Subject Matter Specialists representing major disciplines of the Institutes from outside the Institute nominated by the Director of the Institute | : | Members |
| vi. Scientist-in-Charge PME | : | Member-Secretary |

E. Extension Council (EXC)

Powers and functions of EC

- i. To review current extension programmes and progress.
- ii. To suggest changes in the programmes as deemed desirable and appropriate.
- iii. To review the position with regard to the provisions and use of extension facilities.
- iv. To promote inter-disciplinary extension with outside agencies and institutions.
- v. To bring about balanced horizontal and vertical coordination of extension activities.
- vi. To recommend steps on action desirable for all-round progress of extension and their application. The membership of the Extension Council is regulated mutatis mutandis in accordance with the provisions of relevant rules.

Composition of EC

- | | | |
|--|---|----------|
| i. Director, IARI | : | Chairman |
| ii. Dean and Joint Director (Education) | : | Member |
| iii. Joint Director (Research) | : | Member |
| iv. Joint Director (Extension) | : | Member |
| v. Deputy Director General (Extension) or his nominee | : | Member |
| vi. Head, Division of Extension | : | Member |
| vii. Four scientists in management position of the Institute | : | Members |



- viii. Five scientists of IARI nominated by Board of Management : Members
- ix. One scientist from Regional Stations : Member
- x. One representative of Ministry of Agriculture, Govt. of India : Member
- xi. One Project Coordinator : Member
- xii. Two representatives of State Government : Members
- xiii. One extension scientist representing SAUs : Member
- xiv. Director (Farm Information), Ministry of Agriculture, GoI : Member
- xv. Joint Director (Administration) : Member-Secretary

To achieve the goals and objectives of the Institute, it is not only necessary to take appropriate decisions at various levels but also essential to translate them into prompt action. The Institute has evolved a mechanism to ensure that teaching and non-teaching staff working at different cadres and post-graduate students participate in the decision making process. The Act and Statutes of the Institute have made provision to create authorities which help the Board of Management and the Academic Council to take decisions on academic, research and extension activities pertaining to staff and students' welfare. These organs make recommendations to the Board of Management and the Academic Council to facilitate the apex bodies to take decisions. Besides, the Institute has also been empowered to appoint committee(s), standing or temporary, as deemed necessary for its proper functioning. Various organs provided under the constitution of the Institute as well as those constituted by the ICAR facilitate taking decisions for the smooth functioning of the Institute. These are:

- A. Board of Management (BOM)
- B. Academic Council (AC)
- C. Executive Council (EC)
- D. Institute Research Council (IRC)
- E. Extension Council (EXC)
- F. Research Advisory Committee (RAC)
- G. Quinquennial Review Team (QRT)

The recommendations of the Standing Committees provide the basis for decision making by the Academic Council. Admission to Master's programmes in different disciplines takes place on the recommendations of ICAR, based on the merit list of All India competitive examination. Admission to Ph.D. programmes in various disciplines takes place through an all India competitive examination followed by an interview, both conducted by IARI. The decisions with regard to academic activities of the Institute are taken at three levels. The Dean & Joint Director (Education) takes decisions regarding the constitution of Board of Studies.

At the Divisional level, the Board of Studies takes decisions and/or makes recommendations to the Academic Council. The Director in the capacity as Chairman of Academic Council is responsible for decisions on allotment of funds to the faculty. Besides, the Academic Council is also empowered to take independent decisions on academic matters and translate them into action. Finally, the Board of Management gives assent to the recommendations made by the Academic Council on all policy matters. Similarly, the Staff Research Council and the Extension Council make recommendations on all matters pertaining to research and extension activities to be carried out by the Institute. Students are also actively involved in the decision making process at various levels in the various academic and co-curricular activities of the Institute. The Sports and Cultural Committee under the Chairmanship of the Dean & Joint Director (Education) oversees the co-curricular activities. The Students' Council is authorized to review various student programmes. Student meets are organized periodically by the Director to discuss the students'



problems/suggestions and to find out solutions to them as far as possible. The Students' Council assists the Academic Council in taking decisions on the problems of students in academic matters. The Joint Director (Administration) of the Institute provides the necessary support to the Director in taking decisions regarding service matters of both faculty and staff. The sub-committees of Board of Management provide the necessary inputs, guidelines and suggestions to improve the administrative machinery of the Institute. Apart from the Board of Management, and sub-committees, various other committees are constituted wherever necessary to provide suggestions/guidelines for taking appropriate decisions pertaining to service and other matters of general importance.

Institutional Planning and Monitoring Processes

- i) The national priorities as decided by different high level committees' recommendations, regional committee meetings, round table conferences, brain storming sessions, etc., held by IARI/ICAR are taken into consideration while formulating the research programmes of the Institute.
- ii) The recommendations of Quinquennial Review Team (QRT), and Research Advisory Committee (RAC) from time to time, after approval of ICAR, are implemented in the research and related activities of the Institute.
- iii) The research priorities of the Institute are based on the projections, as envisaged in Plan Documents, Perspective Plan and Vision Documents.
- iv) Need-based and national problem oriented research programmes are taken up. Post-graduate research programmes are so planned that they are supplementary and complementary to various research programmes in each discipline.
- v) The research programme prioritization in the Regional Stations is oriented mainly towards the regional problems.
- vi) The deliberations and recommendations emanating from the Staff Research Council meetings held at half-yearly (at divisional level) intervals also form the basis for research planning for the ensuing year.
- vii) The Institute Research Council has a major role in monitoring research, teaching, and extension activities of the Institute. The Council has the mandate for the preparation of perspective development plan for the deemed university/institute including post-graduate research. The IRC is also responsible to assess and evaluate the performance of current research programmes including externally funded projects. External experts are appointed from time to time for evaluation of the research in different disciplines, and development of a sound knowledge-base including statistical information on various activities of the university/institute which helps in making proper projections for future programmes.

F. Research Advisory Committee (RAC)

Powers and functions of RAC

- i) To suggest research programmes based on national and global context of research in the thrust areas.
- ii) To review the research achievements of the Institute and to see that these are consistent with the mandate of the Institute.
- iii) Any other function that may be specifically assigned by the Director-General, ICAR.

In case the Director of the Institute has reasons to differ from the views of the Research Advisory Committee, having regard to his accountability as Head of the Institute, he should after recording the reasons, in writing, forward the same with the proceedings of the meeting of the Research Advisory Committee to the Director-General, for his decision. Till such time a final decision on such matters is taken by the Director-General, the recommendations of the Research Advisory Committee are not operative or acted upon.



Composition of RAC

An eminent scientist from outside the ICAR system nominated by the Director-General, ICAR	Chairman
4-5 external experts (including retired scientists of ICAR) representing the major areas of research and development programmes of the Institute nominated by the Director-General, ICAR	Members
Director of the Institute	Member
Deputy Director-General (Crop Science), ICAR	Member
Two persons representing agricultural/rural interests of the Management Committee of the Institute for the period of their membership of the Management Committee	Member
One senior level scientist of the Institute nominated by the Director	Member Secretary

G. Quinquennial Review Team (QRT)

The ICAR has established a tradition of Quinquennial Reviews (QRs) to provide a mechanism of transparency and accountability to the Governing Body of the ICAR. Quinquennial review is the responsibility of the Institute to be carried out in collaboration with the subject matter division at ICAR (HQ) and is conducted once in every five years. The five-year review (achievement audit) is an essential review mechanism for monitoring the progress of research, its relevance and impact and providing guidelines for the ICAR for taking steps for the fulfilment of the mission and achievement of the goals of the Institute.

Composition of QRT

An eminent scientist having specialized knowledge of any of the subjects and areas of research covered by the Institute/Project/KVK/ TTC and possessing wider knowledge and experience of such critical reviews in the ICAR or other research organizations.
A scientist with broader knowledge and experience.

The composition of 8 QRT members is made through joint consultations among the Chairman of the QRT and ICAR Headquarters, and the Institute/Project Director/ Head of the Project

Target Setting, Monitoring and Evaluation

While formulating a research project, the targets in the form of deliverables and activity milestones are delineated. The progress of the activity milestones is monitored during the Institute IRC meetings involving outside experts/subject-matter specialists and evaluation of the same is done on the information furnished in RPF II and RPF III of the project by the Head of the Division, Joint Director (Research) and Director of the Institute. For evaluation of externally-funded projects like NAIP, a separate project monitoring and evaluation committee is in place in addition to the Institute.

As per the recent directives and guidelines received from the Council, the quantifiable monitorable targets of individual scientists are monitored at six monthly intervals. The report on the targets achievement with the comments and grading by the Director of the Institute is submitted to the Council twice a year for monitoring at the Council level.

In addition to the above, quarterly performance review of the research targets, HYPM and RFD targets assigned to the Institute are also undertaken at the Council level.

Linkage of RAC with IRC and BOM

The IRC meetings are held twice a year to review the progress of the projects. The proceedings of the annual IRC meetings are presented before the RAC for consideration and approval. The Institute projects



as approved by the IRC and externally funded national and international projects along with salient achievements are placed before RAC for consideration and approval. The proceedings of RAC containing the directives and guidelines are circulated within the Institute for necessary implementation after the approval of the Council.

3.1.2 What is the policy of the university to promote research in its affiliated / constituent colleges?

Not applicable as IARI has no affiliated colleges.

3.1.3 What are the proactive mechanisms adopted by the university to facilitate the smooth implementation of research schemes/projects?

a) *Advancing funds for sanctioned projects*

For the in-house projects, Budget Estimate (BE) is usually released by the Institute in the month of April every year, and the Revised Estimate (RE) is released between November-December. Based on the budget availability, each division allocates budget for its in-house projects after discussing it in DBRC (Divisional Budget and Research Committee). For the external funded projects funds are received as and when the funding agency releases, and the PI is informed.

b) *Providing seed money*

No specific allotment of seed money to the newly appointed/joined on transfer. The DBRC (Divisional Budget and Research Committee) decides the budget allocation. In general, basic facilities such as Computer with Internet and printers, and working lab are provided to the newly joined scientists.

c) *Simplification of procedures related to sanctions / purchases to be made by the investigators*

The Institute follows Govt. of India procedures for all purchases. For most consumable items used in the research, the Institute has rate contracts with several firms. This makes purchase easier. The equipments costing less than 10 lakhs rupees are purchased by limited tender, while that costs more than 10 lakhs are purchased through global tender. The principal investigator of the project is delegated with full powers for all purchases, appointment of project staff and sanctioning their salaries.

d) *Autonomy to the principal investigator / coordinator for utilizing overhead charges*

The overhead charges are used to pay the water and telephone bills of the Division where the project is operating. The remaining money is used by the Institute to pay electricity charges, maintenance of the building and create new facilities.

e) *Timely release of grants*

The Institute releases Budget Estimate (BE) is usually released by the Institute in the month of April every year, and the Revised Estimate (RE) is released between November-December.

f) *Timely auditing*

Auditing is completed in the month of April every year.

g) *Submission of utilization certificate to the funding authorities*

Usually the UC is submitted to the funding agencies in time, i.e., submitted in May.

3.1.4 How is interdisciplinary research promoted?

a) *Between/among different departments / schools of the university*

IARI has six schools. Each School has a School Coordinator, who in consultation with Heads of the Divisions in that School, coordinates formulation and implementation of the projects. All the scientists are encouraged to participate in inter-disciplinary research. IARI has the following six schools:

- i) The School of Crop Improvement consists of Division of Genetics, Division of Seed Science & Technology, and IARI Regional Stations at Shimla, Karnal, Indore, Pusa Bihar, Aduthurai, Dharwad and Wellington.



- ii) The School of Crop Protection consists of Division of Plant Pathology, Division of Entomology, Division of Nematology, Division of Agricultural Chemicals, and IARI Regional Station at Kalimpong and Pune.
- iii) The School of Basic Sciences consists of Division of Plant Physiology and Division of Biochemistry.
- iv) The School of Natural Resource Management (NRM) consists of Division of Division of Agronomy, Division of Agricultural Physics, Division of Soil Science & Agricultural Chemistry, Centre for Environment Science and Climate Resilient Agriculture (CESCRA), Water Technology Centre, Division of Agricultural Engineering, Division of Microbiology and Agricultural Knowledge Management Unit.
- v) The School of Social Sciences consists of Division of Agricultural Economics, Division of Agricultural Extension, Agricultural Technology Information Centre (ATIC) and Centre for Agricultural Technology Assessment and Transfer (CATAT).
- vi) The School of Horticultural Science consists of Division of Vegetable Science, Division of Fruits & Horticultural Technology, Division of Floriculture & Landscaping, Division of Post Harvest Technology, Centre for Protected Cultivation Technology (CPCT) and IARI Regional Station, Katrain.

Research programmes are formed School-wise to promote interdisciplinary research. Several inter-school research programmes spanning across involving the School of Crop Improvement and the School of Crop Protection, the School of Crop Improvement and the School of Basic Sciences, the School of Crop Improvement and the School of NRM, the School of Horticultural Science and the School of Crop Protection, the School of Horticultural Science and the School of Basic Sciences, the School of Horticultural Science and the School of NRM, the School of Social Sciences with all other schools are being implemented. Similarly the ICAR programme on National Initiative on Climate Resilient Agriculture (NICRA) and several other external funded projects are being operated across Division and Schools of the Institute.

b) Collaboration with national/international institutes /industries

The Institute collaborates with several national/international institutes/industries to conduct research and transfer technologies. IARI is head quarter for two All India Coordinated Research Projects (AICRPs), and National Coordinated Centres for a large number of All India Coordinated Programmes of ICAR. At present, however, the Institute serves as the headquarters/centre of the following coordinated research projects:

Project Head Quarters

Project Name	Division
All India Coordinated Project on Nematodes	Nematology
All India Coordinated Research Project on Floriculture	Floriculture & Landscaping
All India Network Project on Pesticide Residues	Agricultural Chemicals
National Centres functioning at IARI under AICRPs	
All India Network project on Biofertilizers	Microbiology
All India Coordinated Project on Long Term Fertilizer Experiments	Soil Science & Agricultural Chemistry
AICRP on Soil Test Crop Response Correlations	Soil Science & Agricultural Chemistry
All India Network Project on Pesticide Residues	Agricultural Chemicals
AICRP on Floriculture	Floriculture & Landscaping R.S. Katrain
AICRP on Renewable Energy Sources for Agriculture and Agro-based Industries	Environmental Sciences
AICRP on Sub-Tropical Fruits	Fruits and Horticultural Technology
AICRP on N.S.P. (Crops)	Seed Science and Technology & R.S. Karnal
AICRP on Soybean	Microbiology



In addition, the Institute is currently participating/coordinating several external funded multi-institutional projects funded by NASF-ICAR (24 projects), Foreign Aided Projects (5 projects), and several external funded projects from DBT, DST, CSIR, etc.

At the International level, the Institute has close linkages with some of the CGIAR's International Agricultural Research Centres (IARCs), viz., ICRISAT, CIMMYT, IRRI, and ICARDA. It also has linkages with other international organizations, viz., FAO, IAEA, USAID, UNDP, WMO, UNIDO and UNEP. Several bilateral research linkages involving developed and developing countries also exist. These include linkages with USDA, selected universities in USA, Canada, Australia, World Bank, Rockefeller Foundation, European Commission, JAICA, JIRC, JSPS, ACIAR, AVRDC (Taiwan), etc.

The CGIAR set up of generation Challenge Programme of wheat rolled into its last phase along with China and Australia by successfully implementing the marker assisted recurrent selection improving four population of wheat through multi institutional involvement of Punjab Agricultural University, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Agricultural Research Institute Pune. The ICAR-ACIAR programme on molecular breeding of wheat was able to identify gene for resistance to stem rust and tag it with molecular markers. A major programme on prediction technology for weather conditions with the University of Nebraska, USA has been launched during the year. The ICARDA-IARI, CIMMYT-IARI programme of pulse and wheat improvement, conservation agriculture have led to development and validation of technology suitable for vulnerable areas of agricultural production primarily under drought stress.

3.1.5 Give details of workshops/ training programmes/sensitization programmes conducted by the university to promote a research culture on campus.

The Institute organizes several national and international short-term training courses (regular, adhoc and individual) and refresher courses in specialized areas for the scientists of NAREES under the programmes of "Centres of Excellence" and "Centres of Advanced Studies". In addition, some special training courses are also organized for the benefit of professionals, farmers and extension worker. During 2014-15, about 74 trainings and field visits were conducted in which 3768 trainees participated.

3.1.6 How does the university facilitate researchers of eminence to visit the campus as adjunct professors? What is the impact of such efforts on the research activities of the university?

The Board of Studies of each Discipline identifies few eminent scientists/professors who have made significant contributions in research and teaching in their field of specialization and recommend them for recognizing as Adjunct Professor. The Dean considers the recommendation of Board of Studies with the approval of the Chairman, Academic Council & the Director IARI and notifies certain reputed scientists as Adjunct Professor.

3.1.7 What percentage of the total budget is earmarked for research? Give details of heads of expenditure, financial allocation and actual utilization.

The Institute's budget for the year 2014-15 was about rupees 67654.46 lakhs, of which about 17.87 % was spent on research (i.e. fellowship, creating labs & infrastructure, purchase of equipments, books & journals; repair and maintenance of equipments; travel for research purpose; Research and operational expenditure etc.) excluding the salaries to the faculties.

Detailed head-wise Budget for the year 2014-15

S. No.	Name of the Head	Plan (Rs in Lakhs)	Non-plan (Rs in Lakhs)	Total (Rs in Lakhs)
A	Grants for creation of Capital Assets (CAPITAL)			
1	Works	1083.00	32.96	1115.96
2	Equipments	1204.64	84.41	1289.05



3	Library books & Journals	500.00	18.36	518.36
4	Vehicles & Vessels	-	17.33	17.33
5	Furniture & Fixtures	70.00	50.02	120.02
	CAPITAL Total	2857.64	203.08	3060.72
B	Grant in aid-Salaries (REVENUE)			
	Salaries, wages & others	-	29535.62	29535.62
C.	Grant in aid-General (REVENUE)			
	1. Pension & other retirement benefits	-	20900.00	20900
	2. TA for domestic travel	202.14	76.00	278.14
	3. Research and operational	1804.12	1065.00	2869.12
	4. Administrative Expenses			
	Infrastructure	-	3685.00	3685.00
	Communication	-	87.00	87.00
	Repair & maintenance of equipments, vehicles etc.		279.00	279.00
	Others	-	3994.90	3994.90
	Total Administrative expenses	1149.45	8045.90	9195.35
	Miscellaneous Expenses			-
	HRD	52.93	12.50	65.43
	Fellowships	84.00	616.58	700.58
	Others	200.00	532.50	732.50
	Total miscellaneous	336.93	1143.58	1480.51
	Total of Grant in aid: General (REVENUE)	3492.64	31230.48	34723.12
	Total of Grant in aid: Salaries+ General (REVENUE)	3492.64	60766.10	64258.74
	TOTAL (CAPITAL+REVENUE)	6350.28	60969.18	67319.46
	Tribal sub-plan expenditure	215.00	-	215.00
	NEH expenditure	-	-	0.00
	Loans and advances	-	120.00	120.00
	GRAND TOTAL	6565.28	61089.18	67654.46

3.1.8 In its budget, does the university earmark funds for promoting research in its affiliated colleges? If yes, provide details.

Not applicable as it has no affiliated colleges.

3.1.9 Does the university encourage research by awarding Post-Doctoral Fellowships/Research Associateships? If yes, provide details like number of students registered, funding by the university and other sources.

The Institute does provide Research Associateships/Senior Research Fellowships etc. under external funded projects operating in the Institute.

3.1.10 What percentage of faculty have utilized the sabbatical leave for pursuit of higher research in premier institutions within the country and abroad? How does the university monitor the output of these scholars?

Most of the faculties (about 60%) have the experience of post-doctoral research works in the International Institutes of high academic research repute. Provision of Sabbatical Leave has not been utilized by the faculty.

3.1.11 Provide details of national and international conferences organized by the university highlighting the names of eminent scientists/scholars who participated in these events.

The Institute organizes national as well international scientific meetings. During the past four years the Institute has organized about 916 academic programmes. The details of the meetings during the past four year are given below:



Scientific meetings organized by the Institute during the past four years

Type	2011-12	2012-13	2013-14	2014-15	Total
Workshops	16	183	25	24	248
Seminars	11	216	5	9	241
Summer/winter schools	3	129	10	3	145
others	88	49	104	41	282
Total	118	577	144	77	916

In addition several foreign delegation and international scientists visit the Institute every year. For example, in 2014-15 alone about 24 visits were made by foreign delegation and international scientists.

Foreign visitors to the IARI during April 1, 2014 to March 31, 2015

S.No.	Visitor (s)/Delegation	Date of visit
1.	Dr. Stephen Turner, Founder and CTO, Pacific Bioscience of California Inc.	25.06.2014
2.	A delegation led by Mr. Ir. Ferial Lubis MM, Head of Evaluation and Reporting, Department of Processing and Marketing of Agricultural Product, Ministry of Agricultural, Indonesia	26.06.2014
3.	An 8-member delegation from the Ministry of Agricultural, Food Security and Cooperative, Tanzania.	8.7.2014
4.	A Five-member delegation from Surinam led by Mr. Rene B.L.Lievelt, Director, Ministry of Agricultural, Animal husbandry and Fisheries (MAAHF)	1.8.2014
5.	Dr. Narendra N. Das, Research Scientist, Jet Propulsion Lab (NASA), California, USA	13.8.2014
6.	A 15- member delegation from Nepal, Ministry of Agricultural and Development, Govt. of Nepal	2.9.2014
7.	Dr. Dath Mita, Senior Crop Analyst, International Production Assessment Division, USDA and Mr. John Slette and Mr. S.K. Singh, US Embassy, New Delhi	2.9.2014
8.	Dr. Ronnie Green, Vice-chancellor, University of Nebraska-Lincoln Institute of Agricultural and Natural Resources, USA	12.9.2014
9.	Dr. Aliazam Khosravi, Research Counsellor of Embassy of Islamic Republic of Iran	22.9.2014
10.	A 10- member delegation from Japan	25.9.2014
11.	An 11- member delegation from Afghanistan, Afghan National Agricultural Sciences and Technology University, Kandahar, Afghanistan.	25.9.2014
12.	Dr. Masa from Japan	29.9.2014
13.	A 5- member delegation from Uganda's National Planning Authority, Uganda	10.12.2014
14.	A 5-member delegation led by Mr. Raul Urteaga Trani, Coordinator General for International Affairs, Mexico	21.10.2014
15.	Parliamentary Standing Committee on Agriculture	7.11.2014
16.	A study visit by Indian-German Bilateral Cooperation meeting	16.12.2014
17.	A 13- member delegation from Wyoming Leadership Education and Development Programme, USA	9.1.2015
18.	A - 33 member delegation from the University of Nebraska Lincon, Nebraska, USA	12.1.2015
19.	A- 6 member delegation from French Ministry of Agriculture, France	14.1.2015
20.	A delegation led by HE I. Batikoto Seruiratu, Minister of Agriculture and Maritime Development and National Disaster Management, Fiji	27.1.2015
21.	A- 3-member delegation from CIMMYT	4.2.2015
22.	A-20 member delegation led by H.E. Mr. Akram Chehayeb, Minister of Agriculture, Lebanon	06.2.2015
23.	A 6-member delegation from Morocco	09.2.2015
24.	Dr. Rezazadeh, Pro Vice-chancellor and Dr. Nikzad, International Relation Officer, Orumieh University, Iran	20.3.2015
25.	A 6-member delegation from Nepal	25.3.2015



Ms. Hillary Clinton visit to IARI on 19-07-2009



Delegates Uganda's National Planning Authority – 2014

3.2 Resource Mobilization for Research

3.2.1 What are the financial provisions made in the university budget for supporting students' research projects?

All the students are provided with fellowship and contingency. Further, about 50% of the budget allocated for research purpose in plan and non-plan budget of the Institute is used for student research and education.

3.2.2 Has the university taken any special efforts to encourage its faculty to file for patents? If so, how many have been registered and accepted?

The Institute has a Zonal Technology Management and Business Planning and Development (ZTM&BPD) Unit for IP management, technology commercialization and fostering entrepreneurship through business incubation. The Institute is the birth place of green revolution in the Country. Since then, it played a major role in increasing food grain production of the Country. Several IARI technologies have been commercialized and brought livelihood security to the millions of farmers. Here some of the major achievement in IP management, technology commercialization and fostering entrepreneurship during 2014-15 are summarized.

Technology Commercialization

Under lab to land initiative during 2014-15, 30 innovative technologies from North Zone -1 of ICAR were transferred to 144 industry partners which resulted around Rs. 1.54 crore revenue. Among the technologies commercialized, the IARI's wheat variety HD 3086 was in great demand and licensed to 109 Industry Partners, creating historical record for ICAR system, followed by wheat vars. HD 3090 & HD 2967; rice vars. PB 1509 & Pusa 1612; mustard vars. Pusa Mustard 25, Pusa Mustard 26, Pusa Mustard 28, Pusa



Mustard 29 & Pusa Mustard 30, Nanofertilizer Technology, STFR Meter, VAM Technology, Compost Inoculant, PSB carrier based Biofertilizer, Rhizobium carrier based Biofertilizer, Blue Green Algae (BGA), and *Trichoderma* Bio Pesticide, etc.

Some recent technologies and their details are given below:

CROP VARIETIES

WHEAT

HD3086 (Pusa Gautami)

- Bread wheat variety released for timely sown irrigated conditions of North Western Plains Zone (NWPZ) of the country.
- Average yield: 5.46 t/ha and yield potential: 7.1 t/ha.
- It is resistant to yellow rust and brown rusts.
- This thermo tolerant variety has high protein content (12.5%), sedimentation value (37ml), Glu-1 Score (10/10) and extraction rate (70.5%) suitable for bread making



HD 2967

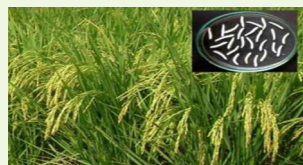
- High yielding wheat variety released earlier for timely sown irrigated cognitions for NWPZ in 2011.
- It was also released for timely sown irrigated conditions of north eastern plain zone (NEPZ).
- It gave an average yield of 4.5t/ha with 6.5t/ha of potential yield.
- It has resistance to yellow and brown rust



RICE

Pusa Basmati 1121

- World's most traded Basmati rice variety globally with outstanding basmati grain qualities.
- Due to its outstanding performance in the farmers' field and quick acceptance in the trade, the area under Pusa Basmati 1121 started increasing since Kharif 2007. In Punjab it increased from 23,000 ha to 6,20,000 ha.
- In Haryana it increased from 1,73,000 ha to 5,69,000 ha and Western U.P. from 1,45,000 ha to 4,10,000 ha.
- In the years 2011 and 2012, Pusa Basmati 1121 occupied 70 and 73 % of the Basmati area respectively to account for 85% of the total exports.
- This variety is the most preferred variety by farmers with profitability ranging from Rs 80,000 to 1,20,000 per hectare.



Pusa Basmati 1509

- Pusa Basmati 1509 is high yielding Basmati rice variety with seed to seed maturity of 120 days.
- It has non-lodging and non-shattering habit with grain and cooking quality superior to Pusa Basmati 1121.
- It offers several advantages over other Basmati rice varieties in the country such as 25-30 days earliness compared to popular Basmati rice variety Pusa Basmati 1121, can help saving upto 5-6 irrigations (about 33% saving of irrigation water)
- Being short statured this variety produces almost half biomass and thus will reduce environmental pollution due to burning of paddy straw.



PEARLMILLET

- **Pusa Composite 612** is suitable for rainfed and irrigated conditions of Maharashtra, Tamilnadu, Karnataka, Andhra Pradesh.

- Average seed yield is 25.0 q/ ha.
- It is a dual purpose variety which can be used both for fodder and grain.
- It matures in 80-85 days. Resistant to downy mildew both under field as well as artificial conditions.
- It fits in normal and late sown conditions.



MUSTARD

Pusa Mustard 29 (LET-36)

- It is a single **zero (<2% erucic acid)** variety of Indian mustard
- Recommended for Delhi, Haryana, Jammu, Punjab and northern Rajasthan.
- It gave an average seed yield is 21.69 q/ ha, with a potential seed yield of 30.05 q/ha.
- It takes 143 days to mature.
- Its seeds are dark brown in colour, small in size (4.0 g/ 1000 seeds) with 37.2% average oil content across locations.



Pusa Mustard 30 (LES-43)

- It is a **single zero (<2%erucic acid)** variety of Indian mustard
- Recommended for U.P., M.P. and eastern Rajasthan.
- It gave an average seed yield of 1.8.t/ha with potential seed yield of 3.1.t/ha.
- It is medium maturing (137 days) variety
- Its seeds are dark brown in colour, medium in size (5.38 g/ 1000 seeds) with 37.7% average oil content.



CHICKPEA

Pusa 2085

- is a large seeded (1000 seed weight 36 g) Kabuli chickpea variety
- Released by SVRC for NCR region.
- Average yield is 2.0 t/ha with a genetic yield potential 3.0 t/ha
- It has resistance against dry root rot and stunt; moderately resistant to wilt and botrytis gray mold and tolerant to collar rot.
- It's beige coloured, uniform, attractive and shining seed possess high protein (23.6%) and hydration capacity (0.40).



Pusa 5023 (Pusa Shaktiman)

- Released for 'National Capital Region of Delhi'
- Moderately resistant against Fusarium wilt, dry root rot
- Excellent cooking quality, attractive and extra-bold seed size *kabuli* type
- Average yield in Delhi state is 25.30 q/ha.

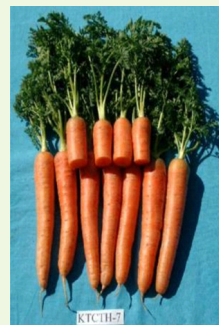




VEGETABLES

Carrot hybrid Pusa Nayanjyoti (KTCTH 7)

- The first orange coloured temperate carrot hybrid developed by a public sector institution in India and released.
- It is suitable for Himachal Pradesh and also other regions of India, where temperate types of carrot are grown.
- Its average yield potential of this hybrid is 39.6 t/ha
- Its roots are orange, uniform, attractive, smooth, cylindrical and stumpy with small indistinct self-coloured core.



Carrot variety Pusa Rudhira

- Released for Delhi state and NCR.
- Its average yield is 330 q/ha.
- It gives more than 50% higher yield over check Pusa Kesar, besides, being self core red coloured with delayed bolting.
- It matures in 85-90 days



FRUITS

Papaya variety Pusa Nanha variety

- Evolved through mutation.
- It is exceptionally dwarf (1 m); fruiting starts at 30 cm height from ground level.
- It is suitable for planting in pots and under high density planting systems.



Mango Hybrid Amrapali

- A hybrid of Dashehari x Neelum is distinctly dwarf, highly regular, precocious and prolific in bearing.
- It is ready for harvest by the third week of July.
- The fruit is small to medium (120 to 160g), fibreless, excellent in taste and has plentiful pulp (74.8%) with high T.S.S. (22.80° Brix).
- The hybrid has also the highest carotenoid content (16,830 ug/100g pulp) and its pulp can be used as colour additive for juices of other mango varieties.
- Being dwarf in stature, this variety is ideally suited for high density planting.



Mango Hybrid PUSA PRATIBHA (Amrapali × Sensation)

- The plants are semi-vigorous and suitable for closer planting (6 m x 6 m).
- A regular bearer starts fruiting in 4th year of planting.
- The fruits are attractive in shape bright red peel develops at ripening and has orange pulp.
- On per plant basis, it yields about 3.0 times higher than Dushehari, which includes 'On' and 'Off' year of fruiting



POST-HARVEST TECHNOLOGIES

Pusa fruit drinks – elixir of life

- At the time of higher production of fruits, prices are very less in the market.
- To combat this situation, more income can be generated by making Pusa fruit drinks.
- The qualities of these drinks are as below:



Jamun drink Aonla drink

- No synthetic colour or flavour
- Absolutely safe even for small children
- Products are made from fresh harvests of Pusa Institute farms
- Prepared under strict supervision and guidance of scientists for quality assurance by using GMP and HACCP products
- Contains natural antioxidants, vitamins and minerals
- The Institute provides entrepreneurship development training to prepare fruit drinks.

Pusa soya nut

- Rich in quality protein and fat
- Unique source of flavonoids, reduce cholesterol, inhibit bone deterioration, relieve menopause symptoms and possess anti-cancer activity
- Rich in total antioxidants and phenolics
- Highly acceptable among different age groups
- It is free from any off flavour
- TIA has been reduced by 90%



Ripe mango powder – to combat vitamin A deficiency

Various types of product can be made from Mango pulp. The technology for making Ripe Mango Powder by drying ripe mango pulp has been developed by the Institute which is very suitable to combat vitamin A deficiency.

Uses

- Mango ice-cream
- Baby foods
- Beverages
- Mango yoghurt
- Mango lassi
- Mango shake
- Fruit flavoured milk
- Ready-to-eat mango cereals
- Good adjunct in the ice cream industry



Dehydrated ripe mango slices

Due to excellent flavour, fragrance, taste and nutritive value, mango is the choicest fruit among the consumers in India. It has great potential for value addition and diversification to give a boost to food industry, create employment opportunities and give better returns to the farmers. Mango is used as fresh or in processed form into several value added products such as pickles, *amchur*, squash, *panna* etc. Recently, the Institute has developed 'Dehydrated Ripe Mango Slices and Powder' technology.

- The dehydrated ripe mango slices could be converted into powder, which can be used as a base material for the development of beverages and as a source of raw material when the fresh mangoes are not available.



NRM Technologies

- **Pusa Hydrogel** is a semi-synthetic, cross-linked derivative cellulose-graft anionic polyacrylate polymer.
- It has water absorption potential of 17000-35000%.
- Designed specially to be used under tropical/sub-tropical conditions and has a swelling potential of minimum 350 times in pure water at temperature as high as 50°C.
- It is applied to the soil @ 1.5kg/acre and has been found very promising for a range of crops viz., chickpea, wheat, mustard, soybean, maize, tomato, potato, onion, cauliflower and chrysanthemum.





- Experimental studies as well as field evaluation conducted by other ICAR institutes, AICRPs, voluntary organizations, KVKs, ITC Ltd.
- Hydrogel applicator weighing around 250 kg attached to a 45 hp tractor has been developed for precise and mechanical application of hydrogel on 1 acre in an hour.

NPK Liquid Bio-fertilizer

- The NPK liquid formulation is a unique formulation that has a nitrogen fixing (*Azotobacter chroococcum*), P solubilizing (*Pseudomonas striata*) and K-solubilizing (*Bacillus* sp.) bacteria.
- The three cultures are compatible and coexist in the liquid formulation.
- These are convenient and easy to use
- No loss in plant growth promoting activities, even on long storage.
- Highly effective and can be used in different types of soils
- Has Nitrogen fixing- *Azotobacter*, P-solubilizing - *Pseudomonas striata* and K- solubilizing- *Bacillus* sp.
- Application of NPK formulation can help to augment 25-30 kg N, 20-25 kg P₂O₅ and 10-15 kg K ha⁻¹.



Pusa Soil Test Fertilizer Recommendation (STFR) Meter

- It is a programmable, portable, low-cost, digital equipment that brings soil testing at farmers' doorstep.
- It analyzes five soil parameters namely pH, EC, organic carbon, available P and available K.
- It also gives soil test-based crop-specific fertilizer prescriptions.
- It can be used by village panchayats for on-spot soil testing, as also to offer employment to rural youth in the village itself.
- It is licensed to two firms, and M/s. Genesis AgriTech, New Delhi has already started its commercial production.
- Pusa STFR Meter, comprising equipment, a mini-shaker and a reagent kit, is now available in the market at MRP of Rs. 30,000/-.



FARM Machinery

Aqua ferti-seed drill

- A tractor drawn aqua ferti-seed drill with constant head gravity feed metering of aqueous fertilizer has been developed for sowing of wheat in dry land areas.
- Actual field capacity and field efficiency of the machine are 0.36 ha/h and 67%, respectively.
- The percentage increase in soil moisture near the seeds are 241, 196 and 117 % at application rate of 8000, 6700 and 6000 l/ha respectively.
- The estimated cost of the machine is Rs. 27,000 with BEP 49% of annual utility of 200 hours and pay back period of 3 years.



Pusa Basmati Rice Thresher

- It can thresh basmati rice without visible or invisible injury to kernels with higher threshing efficiency (99%).
- Significant reduction in cost for threshing (up to 83 %) than conventional method of threshing.
- It reduces labour requirement by 88 percent than conventional method.
- This machine can be towed to field hence, it further reduces labour and power requirement for handling material to threshing site. It also reduces the losses which occur in handling of bulk material.



- The higher capacity (1000-1500kg/h) reduces the threat of weather vagaries as with it one can complete threshing well in time. Timely completion of the operation also enables farmers to complete other required farm operation for consecutive crop in time and harness its benefits.
- The approx. cost of the machine is Rs. 2.0 lakhs.

Pusa Vegetable Seed Extractor

- Pusa Vegetable Seed Extractor is an ergonomically efficient machine, which increases the efficiency of seed extraction process.
- The machine is available in both manually operated and power operated models. The manual machine is of low cost and it includes a rough-surfaced rotating cylinder, a metallic sieve and a hopper. The motor operated model of the machine is also available.

Technical details

A. Manually Operated

Input capacity : 60 kg/h tomato, 25-30 kg/h brinjal, 80-100 kg/h bottle gourd

Power source : One person

Weight : 60 kg; Estimated cost : Rs. 15,000/-

B. Power Operated

Overall dimension (l × w × h) : 1700 × 1200 × 1600 mm

Input capacity : 500 kg/h brinjal, 450 kg/h bottlegourd and 200 kg/h ash gourd

Power source : 2 hp electric motor, single phase

Weight : 125 kg; Estimated cost : Rs. 50,000/-



Mobile Animal Feed Block Formation Machine

- Animal feed blocks can be made by using the Mobile Animal Feed Block Machine in the field itself. The mobility facilitates the formation of feed blocks at a location of convenience. The blocks can be stored for a period of one year.
- Transportation becomes easy owing to reduction in volume.
- There are three main components: a frame, two hydraulic cylinders, and a power pack. The major specifications are as follows:
 - Overall dimension (l × w × h) : 5300 × 1950 × 2150 mm
 - Capacity : 100-125 kg/h
 - Power source : 6.5 hp diesel engine
 - Weight : 1500 kg
 - Trolley size : 3 m × 1.5 m
 - Block size : 15 cm × 15 cm
 - Estimated cost : Rs. 4,58,500/-
- The weight of blocks ranges between 0.50 kg and 2.5 kg



Pusa Solar Powered Knapsack Sprayer

- Knapsack Sprayers are widely used by small and marginal farmers to spray plant protection chemicals by operating lever @ 16-20 troke/minute which induces fatigue to workers along with greater variation in spray pressure causing inconsistency of application and in turn adversely affecting pest control and in long run it may lead to ground water pollution.
- In light of the above problem, solar powered spraying system has been developed which can be even fitted with the 2 existing sprayer.
- The diaphragm type pump is able to create 4 kg/cm pressure without pulsation, which is sufficient for fine & uniform spray.
 - Equipped with constant pressure system which gives quality spray i.e. uniformity, fine spray, effective & efficient control of pest is achievable.
 - The acid-lead or Li-O battery can be charged by SPV panel of 60W.





- The fully charged battery is able to operate the sprayer for 6 hour continuously, which is adequate for a day operation.
- It enhances field capacity considerably and makes it suitable for row crop applications.
- A 100 mesh filter is provided just before nozzle, which enhances spray quality by filtering the spray material and prevents nozzle from clogging.
- Over and above, it is able to reduce farmer's drudgery as the lever operation has been replaced by solar powered.

Evaporatively Cooled Cart for Mobile Retail Vending of Fruits and Vegetables

- ICAR-IARI has developed a mobile vending Cart (Rehri) to house an evaporatively cooled chamber to store fresh vegetables safely for short duration by controlling the environment around them while in storage.
- Suitable modifications in the design of the cart have been made to give an additional storage area of more than 8.0 cubic feet below the main platform and between the four wheels of the cart.
- The available space of 1120x480x450 mm on the existing cart is utilized for this purpose.
- Provision have been made for arrangements for making the lower section evaporative cooled so that fruits and vegetables can be kept safely for a longer period of time at the retail vendor's level.
- Provision of cooling pads and water channels for water application and distribution around the additional 8.0 cu ft. storage space for vegetables and fruits has been made.
- Also, on top of the platform, provision has been made to apply water to the pads through two stationary funnels/bucke arrangements.
- The minimum and maximum temperature drop in the storage chamber was 5°C and 10°C, respectively, whereas rise in relative humidity was found to be between 5% and 15% during the months of March-April.
- Tomato, cabbage, cauliflower, carrots and Methi (leafy vegetable) can be stored in the cart.
- The vegetables could be safely stored for 7 days (except Methi) and their quality was found to be acceptable.
- The cart has been modified to run with solar energy with fan and lighting system.



PROTECTION TECHNOLOGIES

Neem coated urea for enhanced N- use efficiency

- Neem Formulations – EC, SL and CRF
- Reduced Aza-A Concentrate and Formulations
- 7-17% yield increase in rice
- Azadirachtin Concentrate (20-25%) Effective @ 300 ppm against
- Atherogonia soccata on maize, wheat, and barley
- Plutella xylostella on cabbage
- Lipaphis erysimi on rapeseed
- Helicoverpa armigera on sorghum and chickpea
- Bemisia tabaci on soybean and tobacco
- Effective in protecting maize, mustard, cabbage, sorghum, moong, cowpea, pigeon pea and tobacco for a range of pests
- Thermo- and photo stable product
- Effective against Helicoverpa armigera



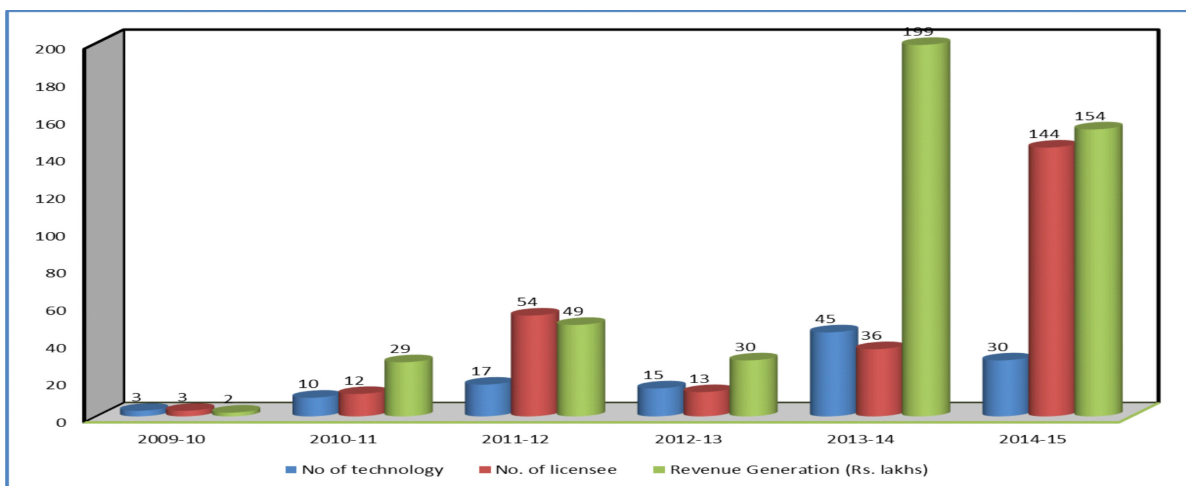
Pusa 5SD and Pusa Biopellet 10 G

- The novel seed dressing bio-formulation “Pusa 5SD” has been developed from the potential isolate of *Trichoderma harzianum* (IARI P-4; MTCC No. 5371) for the management of soil and seed borne diseases of crop plants.
- The formulation showed longer shelf (viability) life and suitable for 2 years of storage at room temperature 25.8^o C.
- The novel soil application bio-formulation “Pusa Bio-pellet 10G” has been developed from the potential isolate of *Trichoderma harzianum* (IARI P-4; MTCC No. 5371) for the management of soil and seed borne diseases of crop plants.
- The formulation has longer shelf (viability) life as 1.5 years of storage at room temperature 25.8^o C.



Diagnostic reagent and Plant Virus Detection Chip

High quality polyclonal antibodies for rapid and reliable detection of viruses are available. Besides, for multiple virus detection, a ‘Chip’ has been developed.



Revenue generated through licensing of the technologies during 2009-15

Intellectual Property Rights

A. Patent Application Filed

Six patents applications with six renewals of existing patents were filed, along with two responses to First Examination Report (FER) and one hearing and four amendments.

Some of important patents awarded to the faculties of the Institute are:



Title	Inventor
A process for the preparation of neem oil emulsion concentrate EW (emulsion oil in water)	Lalit Kumar , B.S.Parmar
A process of preparing a herbicidal composition against <i>Phalaris minor</i> from neem and the herbicidal composition prepared thereof	Shashi Bala Singh, Gita Kulshrestha
Improvement in/or relating to synthesis of 4-methyl 6 alkyl-2H pyran-2 ones as potential fungicides	P. Dureja, Tarun K. Chhatopadhyay
A process for the detoxification of chlorpyrifos residues in drinking water	Madhuban Gopal,Ram Niwas and others
Improvement in or relating to the preparation of powdered Azadirachtin A- rich concentrate from neem seed kernel	P. Dureja, R.S.Tanwar and S.K.Handa
Improvement in/or relating to preparation of reduced azadirachtin (S) biopesticides	Suresh Walia, Vandana Sharma, Jitendra Kumar, Balraj Singh Parmar
Additives for improved photostability of Azadirachtin-A	Prem Durja Sapna Johnson and Swaran Dhingra
Improvement in/or relating to the preparation of thiophanate methyl	Prem Dureja, S.S.Tomar
A process for the production of blue green algal biofertiliser	Brahma Dutta Kaushik

The details of patents filed in 2014-15 are as follows:

Number of Patent filed by the IARI during 2014-15

S. No.	Name of innovation/technology/process	Application/ registration no.	Date of filing
1.	Rapid detection of large cardamom chirke virus	2362/DEL/2014	August 20, 2014
2.	Insecticidal formulation of novel strain of <i>Bacillus thuringiensis</i> AK47	2361/DEL/2014	August 20, 2014
3.	Process for obtaining high purity Phycocyanin from Cyanobacteria	3981/DEL/2014	December 29, 2014
4.	Nanofabrication process involving clay minerals as receptacles for manufacturing advanced nanomaterials including novel fertilizers	959/DEL/2014	Complete specification filed on March 4, 2015
5.	Nanofabrication of phosphorus on kaolin mineral receptacles	989/DEL/2014	Complete specification filed on March 4, 2015
6.	Beneficiation of phosphate rock for the segregation of phosphorus containing heavy metal free minerals	1042/DEL/2014	Complete specification filed on March 4, 2015
Trade Mark application filed/renewed			
1.	“flexiCFF”	2796885	August 25, 2014
2.	PUSA Trade Mark (Renewal)	1333632	December 10, 2014

B. Applications for Protection of Plant Varieties under PPV&FRA

Varieties protected under PPV&FRA

1.	<i>Triticum aestivum</i> L. (wheat) HD 3043	REG/2015/325	February 19, 2015
2.	<i>Triticum aestivum</i> L. (wheat) HD 3086	REG/2015/326	February 19, 2015

Agribusiness Incubation

ZTM&BPD Unit, IARI an Agri Business Incubator incubates new start-up businesses by providing physical space, shared services, business and legal advice and financial and assist them until ‘graduation’. This year following activities were under taken.



A. Agribusiness Incubation Programme

- For the first time, in agribusiness sector, on-line entrepreneurial ecosystem was created by launching four months “Agribusiness Incubation Program” on 25th April, 2014 for providing a platform for identifying next generation of agri business leaders from India’s emerging agri-business innovation ecosystem, thereby buttressing them to develop and set up viable business models based on innovative ideas in association with ZTM & BPD Unit, IVRI, Izatnagar and BPD units of NDRI, Karnal, BAU, Ranchi, CIPHET, Ludhiana and CIIE, Ahmedabad. Ten business proposals were selected for two months mentorship programme at ZTM&BPD Unit, IARI.
- ZTM&BPD Unit organized “AgriBiz Idol Camp cum Incubation Workshop” on May 9, 2014 at IARI, New Delhi. Ten (out of 32) business plans presented before the selection committee were selected for long term mentoring. Five proposals/ideas were submitted to MSME for funding.

B. MSME Scheme for Business Incubation

Ministry of MSME, Govt. of India, New Delhi sanctioned a project, for supporting “Startup companies with innovative ideas” to ZTM&BPD Unit. As a result of technical and business mentoring, following five incubates got the grant of Rs. 5.0 lakhs each, which helped them setting up of their viable business ventures.

S.No.	Name of the project	Name of the incubatee
1	Production and marketing of high quality hybrid and OP seeds of vegetable and field crops	Mr. L.K. Pandey
2	Innovations, production and marketing of quality Soya products under brand name of Soya Nutri Nuts	Mr. Kundan Kumar
3	Manufacturing of bio-fertilizers and bio-pesticides	Mr. Jaideep Pareek
4	Utilization of waste mango kernel for extraction of rich mango kernel butter and oil	Ms. Tuba Siddiqui
5	Biscuit-making from nutritionally rich traditional millets in combination with the wheat flour	Mr. Bhopinder Mehta

C. Marketing and Networking Platform

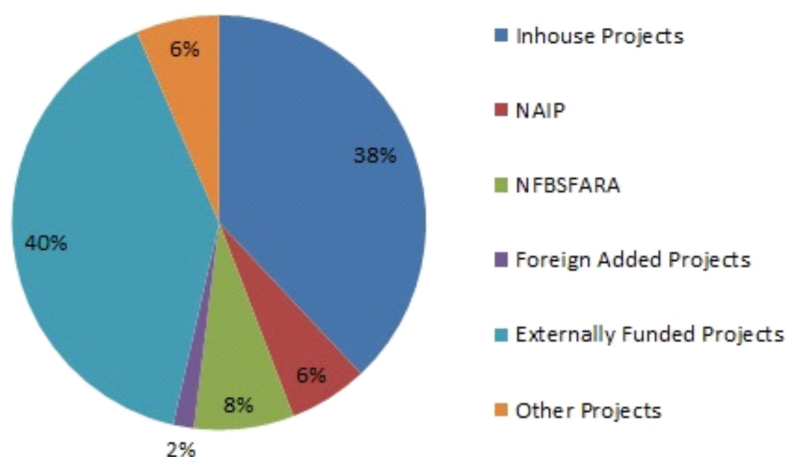
ZTM&BPD Unit provided the Marketing and Networking Platform in *Pusa Krishi Vigyan Mela* to its incubatees and industry partners in ZTM enclosure. Twenty incubates and industry partners participated and showcased their products/technologies, services which were of benefit to the farming community as well as other stakeholders of agricultural development.

The ZTM & BPD Unit, IARI won the Gold in Flame Award-2014, under the category “Agriculture/ Dairy Initiative of the Year” for the campaign “*Translating Research into Prosperity*” for successful materialization of inventions from lab to land. The award was conferred by the Hon’ble rural marketing goliaths of Rural Marketing Association of India on March 20, 2015.

3.2.3 Provide the following details of ongoing research projects of faculty:

The institute has various ongoing research projects under following categories:

- In-house Projects (117)
- National Agricultural Innovation Project (NAIP) (19)
- ICAR - National Funds for Basic Strategic and Frontier Application Research in Agriculture (NFBSFARA) (24)
- Foreign Aided Projects (5)
- Externally Funded Projects (123)
- Projects funded by other Agencies (20)



The percent share of research projects from different agencies

3.2.4 Does the university have any projects sponsored by the industry / corporate houses? If yes, give details such as the name of the project, funding agency and grants received.

The scientists of this Institute take up several consultancy services, contract research, contract service and contract training projects sponsored by the industry / corporate houses. The resources generated during the past four years are given below:

Type	2011-12 (Rs.)	2012-13 (Rs.)	2013-14 (Rs.)	2014-15 (Rs.)	Total (Rs.)
Consultancy services	4,18,470	21,12,000	3,95,700	33,80,103	63,06,273
Contract research	-	-	7,600	14,29,348	14,36,948
Contract service	-	59,210	-	24,38,388	24,97,598
Training	-	1,45,000	-	29,84,213	31,29,213
Total	4,18,470	23,16,210	4,03,300	1,02,32,052	133,70,032

Details of the recently completed sponsored contract projects/consultancy

Name of the Project	Sponsoring industry / corporate houses	Division of IARI
Effective and affordable biological agents (entomopathogenic nematodes and other bio-agents) for the management of white grub menace on sugarcane crop	Western UP for an NGO- FARMER	Division of Nematology
High density CFU microbial formulation	International Panaacea Limited, New Delhi	Division of Plant Pathology
Bio-efficacy trial and residual analysis in potato under controlled application of chlorpropham 50% HN	M/s. Rajhans Fertilizers Ltd. Indore	Division of PHT
Bioefficacy of capsaicin and bicolor against sucking insects of Okra, Brinjal and Chillies	M/s. Sree Ramcides Chemicals Pvt. Ltd., Chennai	Division of Entomology
Weather and remote sensing based crop yield modelling for use in crop insurance	ICICI Lombard General Insurance Co. Ltd., Mumbai	Division of Agricultural Physics
Bio-fuel plant effluents and recommending a suitable effluent management system	Agni Bio-Power Energy Pvt. Ltd. Mohali, Punjab	CESCRA
Evaluation of bio-efficacy of new herbicide molecule PIH 485 (25% WG) on weeds in wheat and rabi maize and residual toxicity	M/s P.I. Industries Limited, Gurgaon	Division of Agronomy



Bio-efficacy and phytotoxicity studies of Insure Perform 12% FS against seed borne diseases in wheat	BASF India Ltd, Mumbai	IARI Regional Station, Karnal
To study the Bioefficacy of insecticide incorporated insect-proof net as a cladding material for different protected structures to ward off major sucking insect & pests for cultivation of important vegetables and flowers	Vestergaard Frandsen Group	Centre for Protected Cultivation Technology
Validating the efficacy of solo clodinafop-propargye and its combination and sequential application with other herbicides, and in combination with adjuvants against the resistant <i>Phalaris minor</i> Retz populations/biotypes	Syngenta India Ltd., Mumbai	Division of Agronomy
Management of Rice and Brinjal diseases through bioproducts-Biogold and MC TEC-2	M/s Jai Shree Rasayan Udyog Limited, Delhi	Division of Plant Pathology
Impart training in capacity development on Plant Protection for Ministry of Agriculture, Irrigation of livestock of Islamic Republic of Afghanistan	UNDP	Division of Plant Pathology
Economic feasibility study on identification of investment opportunities in Kenya, Malawi and Mozambique for cultivation of pulses	State Trading Corporation of India Ltd, New Delhi	Division of Agricultural Economics
Supervised field trials on residue and persistence of Tebuconazole 430 SC on Cabbage	M/s Bayer Crop Science Ltd, Bayer House, Mumbai	Division of Agricultural Chemicals
Supervised field trials on residue and persistence of Spiromesifen 240 SC on Cucumber	M/s Bayer Crop Science Ltd, Bayer House, Mumbai	Division of Agricultural Chemicals
Supervised field trials on residue and persistence of Flubendiamide 480 SC on Okra	M/s Bayer Crop Science Ltd, Bayer House, Mumbai	Division of Agricultural Chemicals
Supervised field trials on residue and persistence of Picoxystrobin 7.5% + Propiconazole 12.5% w/w SC in Wheat	M/s E.I. Dupont, 7th Floor, Tower C, Sec-25 A, DLF City Phase-III, Gurgaon	Division of Agricultural Chemicals
Development and Evaluation of Basmati rice threshing system	Basmati Export Development Foundation (BEDF)	Division of Agricultural Engineering/PHT
Multilocation field trials of Pusa Hydrogel	National Research Development Corporation (NRDC)	Agricultural Chemicals
Nutrient delivery system in crop plants to augment acquisition, translocation and utilization efficiency	Virtual Fertilizer Research Centre/ International Fertilizer Development Centre	Division of Plant Physiology

3.2.5 How many departments of the university have been recognized for their research activities by national / international agencies (UGC-SAP, CAS; Department with Potential for Excellence; DST-FIST; DBT, ICSSR, ICHR, ICPR, etc.) and what is the quantum of assistance received? Mention any two significant outcomes or breakthroughs achieved by this recognition.

The Institute has received several DBT projects and projects from other National and International funding agencies.

Indian Council of Agricultural Research (ICAR) through its scheme on Centre for Advanced Faculty Training (CAFT) has been supporting the faculty and scientists of National Agricultural Research System



(NARS) in the cutting edge areas of agriculture and allied sciences to meet capacity building demands in terms of teaching, research, training and extension. There are 31 such centres established all over the country to build the teaching, research, training and extension competencies of faculty of NARS. Of which 5 CAFTs are awarded to the Institute and its sister Institutes which are part of the PG School, IARI. During the XI plan alone about 36 training programmes were organized by these CAFT benefitting 624 participants involved in teaching and research. The details of CAFT Centres under PG School, IARI and programmes organized during XI plan are given below:

Details of CAFT Centres under PG School, IARI and programmes organized during XI plan.

CAFT Centre	No. of trainings organized	No. of participants
CAFT in Plant Pathology Division of Plant Pathology	8	152
CAFT in Economics Division of Agricultural Economics	5	75
CAFT in Agricultural Extension Division of Agricultural Extension	6	129
CAFT in Biochemistry Division of Biochemistry	6	92
CAFT in Agri. Statistics & Computer Application Indian Agricultural Statistics Research Institute New Delhi-110012	11	176
Total	36	624

3.2.6 List details of

a) Research projects completed and grants received during the last four years (funded by National/ International agencies)

The Scientists of this Institute receive externally funded projects from the national agencies such as AIREA, Directorate of Horticulture, HPSC&ST, DRDO, MSME, DBT, DST, ICAR, CPRI (Mini Mission - HP), CSIR, NCPA, Ministry of Water Resources, Ministry of Environments & Forest (MOFPI), DAC, NABARD, Indian Meteorological Department (IMD), BARC, PPV&FRA, NASFB (ICAR), etc. In addition, it receives projects from International agencies such as Bill Melinda Gates Foundation (BMGF), International Center for Agricultural Research in the Dry Areas (ICARDA), International Maize and Wheat Improvement Center (CIMMYT), Harvest Plus Consortium International Food Policy Research Institute (IFPRI), International Water Management Institute (IWMI), CIARC, International Rice Research Institute (IRRI), USAID U.S. Agency for International Development (USAID), University of Sydney & Indo-Australian Programme, IPNI India Programme, etc. The details of the projects are described in “*Evaluative Report of the Department*”. Number of projects running in the Institute for the past four year summarized as below:

Number of externally funded projects running at IARI from 2011-12 to 2014-15:

Funding agency	No. of projects			
	2011-12	2012-13	2013-14	2014-15
National Funding agencies	154	165	183	158
International Funding agencies	4	5	5	10

b) Inter-institutional collaborative projects and grants received

i) All India collaboration

IARI is the lead centre to coordinate the accelerated crop improvement programme for breeding rust resistant wheat varieties involving 10 centres, improving quality in maize which has enabled several SAUs



and ICAR institutes to upgrade and update themselves with new tools and techniques. Under the NAIP and NASF (ICAR), IARI is lead centre to develop state of art facilities and infrastructure on food science and phonemics led sciences. The NICRA programme of ICAR performed significantly by developing new genotypes for minimizing the negative impact of climate change in wheat by recombining QTL combinations for drought and heat tolerance apart from documenting the mitigation and adaptation phenomena to changing climate in rice and wheat.

In lieu with the consortia mode of project of ICAR, the Institute has been encouraging linkages and professional collaborations among national institutes to work on major research focus on 'Molecular breeding' for improvement of tolerance to biotic and abiotic stress, yield and quality traits in crops, and 'Hybrid technology' for higher productivity in selected field and horticultural crops. The Institute also identified some of the priority research areas through other ICAR Consortium Research Platforms as Mega seed platform, Genomics platform, Diagnostic and Vaccines, Energy platform, Water platform, Conservation Agriculture Platform, Farm mechanization and precision farming, etc. IARI also participates in All India Coordinated Research Projects (AICRPs) as lead centre for three projects and cooperating centre for nine projects (the details are given in section 3.1.4)

Some of the collaborative projects that are recently completed or running at IARI:

S. No.	Name of the projects	Lead/cooperating centre	Date of start	Date of end
1.	Establishment of consortium for e-Resources in Agriculture (CeRA) of Component-I (O&M) (ICAR-NAIP)	Lead Centre-USI, IARI New Delhi	2007-08	31.3.2014
2.	Understanding plant-nematode interactions using RNAi (ICAR-NAIP)	Lead Centre - IIT Kanpur Cooperating Centre: Division of Nematology, IARI	7.1.2008	31.3.2014
3.	Award of the Project entitled, Allele Mining and Expression Profiling of Resistance and Avirulence-genes in Rice-Blast Pathosystem for Development of Race Non-Specific Disease Resistance (ICAR-NAIP)	Lead Centre: NRCPB Cooperating Centre: Division of Genetics and Division of Plant Pathology, IARI.	7.1.2008	31.3.2014
4.	Novel strategies for molecular diagnosis of plant viruses (ICAR-NAIP)	Lead Centre: Division of Plant Pathology, IARI.	9th July, 2008	31.3.2014
5.	A Biopesticide mediated value chain for clean vegetables (ICAR-NAIP)	Lead Centre: CSK Himachal Pradesh Krishi Vishvavidyalaya, Palampur-176062; Cooperating Centre: IARI	1.9.2008	31.3.2014
6.	Nature of interactions among the entomopathogenic nematodes, their bacterial symbionts and the insect hosts (ICAR-NAIP)	Lead Centre: IARI	1.1.2009	31.3.2014
7.	Protected Cultivation of High Value Vegetables and Cut Flowers - A value Chain Approach to be operated under Production Consumption System (ICAR-NAIP)	Lead Centre: IARI	1.3.2009	31.3.2014
8.	Studies on the ecology and taxonomy of whitefly <i>Bemisia tabaci</i> in India, its symbiosis with various obligate and facultative bacterial symbionts (ICAR-NAIP)	Lead Centre: University of Delhi Cooperating Centre: IARI, New Delhi	6.4.09	31.3.2014



9.	Development and Maintenance of Rice Knowledge Management Portal under sub-component Information Communication and Dissemination System (ICDS) (ICAR-NAIP)	Lead Centre: Directorate of Rice Research, Hyderabad Cooperating Centre: USI, IARI	April, 2009	31.3.2104
10.	Decision Support system for Enhancing Productivity in Irrigated Saline Environment using Remote Sensing, Modelling and GIS (ICAR-NAIP)	Lead Centre: CSSRI, Karnal Cooperating Centre: WTC, IARI	May, 2009	31.3.2014
11.	Strengthening of Digital library and information management under NARS (e-GRANTH) (ICAR-NAIP)	IARI, New Delhi (Lead Centre)	May, 2009	31.3.2014.
12.	Bioprospecting of genes and allele mining for abiotic stress tolerance Dr. B. M. Prasanna CCPI Division of Genetics (Maize) (ICAR-NAIP)	(11 coop. Centres) NRCPB, (Lead Centre) IARI, New Delhi – (Coop. Centre)	4.5.2009	31.3.2014
13.	Achieving Improved Livelihood Security through Resource Conservation and Diversified Farming System approach in Mewat	CCHAU, Hissar, (Lead Centre) IARI, New Delhi (Coop. Centre)	April, 2009	31.3.2014
14.	Strategies to enhance adaptive capacity to climate change in vulnerable regions (ICAR-NAIP)	IARI, New Delhi (Lead Centre)	Sept., 09	31.3.2014
15.	Zonal Technology Management and BPD Unit at IARI, Delhi under the NAIP. (ICAR-NAIP)	IARI, New Delhi (Lead Centre)	2008-09	31.3.2104
16.	Developing Commissioning, operating and managing an online system for Net / ARS – Prelim Examination by ASRB, ICAR under Component – I of NAIP. (ICAR-NAIP)	ASRB, ICAR, New Delhi (Lead Centre) IARI, New Delhi (Cooperating Centre)	2010-11	31.3.2014
17.	To understand the nature of diversity in lac insects of <i>Kerria</i> spp. in India and the nature of insect x host interaction (ICAR-NAIP)	Lead Centre: Indian Institute of Natural Resins and Gums, Ranchi, Jharkhand-834 010 Cooperating Centre: Division of Entomology, IARI New Delhi.	7.1.2009	31.3.2014
18.	Increasing the efficiency of microbial production of bioethanol from agricultural biomass	Lead Centre: Division of Microbiology	1.1.2011	31.12.2015
19.	Extraction and Micro-encapsulation of Nutraceutical for Effective Delivery into Different Food Matrices. (NASF, ICAR)	Lead Centre: Division of Post Harvest Technology, IARI	1.1.2011	31.12.2015
20.	Phenomics of moisture deficit and low temperature stress tolerance in rice (NASF, ICAR)	Lead Centre: Division of Plant Physiology, IARI Cooperating Centre: : NRCPB, IASRI, IIT-D, UDSC, IGKV, CRRI, CAU, ICAR-RC NEH	15.2.11	31.12.2015
21.	Use of RNAi technology in developing low phytate soybean and rice (NASF, ICAR)	Lead Centre: Division of Biochemistry, IARI Cooperating Centre: Kolkata University	1.6.2011	31.5.2015



22.	Decision Support System for Enhancing Water Productivity of Irrigated Rice-Wheat Cropping System (NASF, ICAR)	Lead Centre: W.T.C., IARI; Cooperating Centre: Dir. of Water Management, Bhubaneswar, Odisha	1.6.2012	31.5.2016
23.	Decision Support System for Enhancing Productivity of Grapes under Moisture and Temperature Stress Conditions (NASF, ICAR)	Lead Centre: NRC for Grapes, Pune Cooperating Centres: CESCRA, IARI	June-2012	May-2016
24.	Crop simulation studies to understand the effect of moisture and temperature stress on growth and yield of wheat (NASF, ICAR)	Lead Centre: IARI, New Delhi Cooperating Centre: Directorate of Wheat Research, Karnal).	1.6.2012	31.5.2016
25.	Enhancing Use Efficiency of Micronutrients : Novel Delivery Systems (NASF, ICAR)	Lead Centre: IARI, New Delhi Cooperating Centre: Agharkar Research Institute (ARI), Pune).	1.6.2012	31.5.2017
26.	Understanding plant-nematode interactions: Identification of plant and nematode genes involved in disease development (NASF, ICAR)	Lead Centre: IIT, Kanpur Ludhiana ; Collaborating Centre: among others - IARI, New Delhi	1.6.2012	31.5.2016
27.	Development of spectroscopic methods for detection and quantification of adulterants and contaminants in fruit juices and milk (NASF, ICAR)	Lead Centre: Central Institute of Post-Harvest Engineering & Technology (CIPHET), Ludhiana Cooperating Centres: IARI, New Delhi	1.6.2012	31.5.2016
28.	Bioremediation of agrochemicals and heavy metals present in Yamuna and drainage water used for irrigation in urban and peri-urban agricultural areas (NASF, ICAR)	Lead Centre: University of Delhi; Cooperating Centres: IIT, New Delhi and IARI, New Delhi	1.6.2012	31.5.2016
29.	Development of Genetically engineered vaccines against economically important poultry viral diseases (NASF, ICAR)	Lead Centre: Indian Veterinary Research Institute, Bareilly, UP; Cooperating Centre: IARI, New Delhi –	1.6.2012	31.5.2016
30.	Use of machine vision for distinguishing among crop varieties (NASF, ICAR)	Lead Centre: CIAE Bhopal Cooperating Centres: IARI New Delhi); NBPGR, New Delhi and CDAC, Kolkata	1.7.2012	31.5.2015
31.	Role of Archaeobacteria in Alleviation of Salinity and Moisture Stress in Plants (NASF, ICAR)	Lead Centre: IARI, New Delhi Cooperating Centre: Directorate of Groundnut Research, Junagadh).	1.8.2012	31.7.2015
32.	Polymeric Nano Materials for Packaging and Efficient Delivery of Nutraceuticals (NASF, ICAR)	Lead Centre- IARI, New Delhi	1.4.2013	31.3.2016
33.	Relationship between <i>Sclerotium rolfsii</i> , <i>Rhizoctonia solani</i> , the soil and climate variables in three major cropping system in the country and identification of markers for resistance to <i>Sclerotium rolfsii</i> (NASF, ICAR)	Lead Centre- Directorate Groundnut Research; Cooperating Centre among others-IARI, New Delhi	1.4.2013	31.3.2018



34.	Common basis of defense induction in rice and mustard against sucking and gall insects pests(NASF, ICAR)	Lead Centre- DRR, Hyderabad; Cooperating Centre among others: Div. of Entomology, IARI	1.4.2013	31.3.2016
35.	The role of bacterial endosymbionts in shaping the insect-virus relationship in <i>Bemisia tabaci</i> (NASF, ICAR)	Lead Centre- University of Delhi; Cooperating Institutions among others: Div. of Entomology, IARI	1.4.2013	31.3.2016
36.	Development of sucrose sensor for phenotyping of soil moisture-deficit stress tolerance in rice (NASF, ICAR)	Lead Centre- IARI, New Delhi; Cooperating Institution: Indian Statistical Institute; ICAR-NBPGR, New Delhi; Jadavpur University, Kolkata.	1.4.2013	31.3.2016
37.	Understanding the mechanism of Non-Host Resistance (NHR) against rust and blast in rice and wheat (NASF, ICAR)	Lead Centre- IARI, New Delhi; Cooperating Centre: Indian institute of Science Education Research, Kolkata	1.4.2013	31.3.2016
38.	The relationship of Phytoplasma with its host plants and insect vectors (NASF, ICAR)	Lead Centre- University of Delhi; Cooperating Centre: Div. of Entomology, IARI	1.4.2013	31.3.2016
39.	Bioremediation of contaminants in polluted sites: use of weedy plants (NASF, ICAR)	Lead Centre- Directorate of Weed Science Research, Jabalpur Cooperating Centres: WTC, IARI	1.4.2013	31.3.2017
40.	Chemo-profiling of potential phytoacaricides and their functional characterization for controlling resistant cattle ticks (NASF, ICAR)	Lead Centre-IVRI, Izzatnagar- 243122 Cooperating Centres: NBRI, Lucknow; IARI, New Delhi; Collage of Veterinary and Animal Science, Wayanand, Kerala-673576.	1.4.2013	31.3.2016
41.	Enhancing phosphorus availability in alfisols: hydrogel based input delivery approach (NASF, ICAR)	Lead Centre -IARI, New Delhi	1.10.2013	30.9.2015
42.	Outreach Programme of IIHR Bangalore - "Diagnosis and management of leaf spot diseases of field and horticultural crops" (ICAR XI Plan - IIHR Bangalore)	Lead Centre- IIHR Bangalore; Cooperating Centre: Division of Plant Pathology, IARI	2007	31.3.2014
43.	Harnessing arbuscular mycorrhizae for biofertilization in horticultural crops under the theme "Nutrient Management, PGPR and Biocontrol" of the Network project on AMAAS (ICAR - XI Plan – NBAIM)	Lead Centre- CPCRI-Kasargod F&HT - Cooperating Centre	1.4.2008	2013-14
44.	Root and Establishment trades for greater water use efficiency in wheat" (Short title "Physiological: Water use efficiency (Root Traits) [Indo-Australian Programme (ICAR - Plan of DWR)]	Lead Centre: DWR, Karnal Cooperating Centre: Division of Genetics/R.S. Indore, IARI Centre	2009-10	31.3.2014

45. Molecular markers for broadening the genetic base of stem rust resistance genes effective against strain Ug99" (Project short title - "Biotic Stress (Rusts)" [Indo-Australian Programme (ICAR - Plan of DWR)])	Lead Centre: DWR, Karnal Cooperating Centre: Division of Genetics; IARI, R.S. Wellington	December - 2009	31.3.2014
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3.3 Research Facilities

3.3.1 What efforts have been made by the university to improve its infrastructure requirements to facilitate research? What strategies have been evolved to meet the needs of researchers in emerging disciplines?

The Institute continuously improves its infrastructure to update its research facilities in all the disciplines. Most of the disciplines have state of art research infrastructure in their respective fields. Along with the general divisional laboratory facilities, the Institute takes pride in having developed sophisticated specialized laboratories in all the fields of agricultural sciences. Realizing the need for inter disciplinary and advanced research, the Institute expanded its infrastructure to meet the needs of emerging disciplines by creating the following facilities:

National Phytotron Facility: The Institute established a National Phytotron Facility in 1997. This is the first facility of its kind in the country, which is used to study the live responses of plants under controlled conditions and the possible impact of climate change and greenhouse gases. It has a self-contained area of 2700 m², housing 22 Growth Chambers and 10 Green Houses. The facility is made available to the plant scientists belonging to ICAR, Council of Scientific and Industrial Research (CSIR), State Agricultural Universities (SAUs), traditional universities and agro-industries to understand the complicated interaction of physiochemical environments and living systems, especially the plants and their pathogens.



Centre for Soil, Plant and Water Analysis: Soil testing service in India began in 1955-56 with the soil testing laboratory at IARI as the hub to coordinate with all the other soil testing laboratories in the country. This laboratory, called as Centre for Soil, Plant and Water Analysis, is well known among research and extension agencies, as well as farmers for its advanced facilities, reliability of the analyses, and efficient advisory services. The Centre is equipped with advanced analytical facilities including ICP-MS, Atomic Absorption Spectrophotometer (AAS), N-Analyzer, etc.

Radio Tracer Laboratory: Established in 1955 in the Division of Soil Science & Agricultural Chemistry, this Laboratory was the first of its kind in the country. It is well-equipped for research on application of radio-isotopes for optimum use of fertilizers, and analysis of soil and plant nutrients.

Advanced Centre for Plant Virology: In 1988, the Institute created an Advanced Centre for Plant Virology in the Division of Plant Pathology to generate basic knowledge on economically important plant viruses and virus like pathogens for their effective management and also to train young scientists in various areas of advanced virology. The centre is recognized as a lead centre in plant virology, not only in the country, but in the region as well. It has been playing an important role in identifying viruses, supplying diagnostic tools and training to the young brains. The Centre has been developed with state-of-the-art laboratories for electron microscopy, production of monoclonal and polyclonal antibodies, cloning of viral genomics, sequencing, and disease diagnosis and plant transformations.



Central Seed Testing Laboratory (CSTL): The Seed Testing Laboratory of the Institute has got the status of CSTL under the Ministry of Agriculture, Government of India, and is serving as a Referral Laboratory for all the 96 seed testing labs located in different parts of the country. It is a member laboratory of International Seed Testing Association (ISTA), Zurich, Switzerland, and is in the process of obtaining ISTA accreditation through regular trainings, the laboratory is imparting skills to the personnel of the State Seed Testing Labs of the country.



Quality Seed Facility: Through a Japan Grant-Aid-Project, national seed facility has been established for seed research, processing and storage. Under this project, infrastructure has been developed, highly sophisticated equipments have been put in place and state-of-the-art technologies have been used in seed science and technology. The National Facility is sufficient enough to provide medium-term storage for 4.5 tonnes of authentic seed samples of all released varieties (approx. 5000) from the National Agricultural Research System (NARS).

Pesticide Referral Laboratory: National Pesticide Referral Laboratory was established under Team of Excellence, National Agricultural Technology Project in 2002. The establishment of this laboratory was a step towards global competitiveness in generating reliable data, ensuring quality produce, export certification and developing human resources in pesticide residue analysis. All the facilities as per international standards required for pesticide residue analysis in various substrates have been established with modern equipments such as FT-IR Spectrophotometer, Gas Chromatograph, High Performance Liquid Chromatograph, GC-Mass Spectrometer and Rotary Flash Evaporator. The laboratory has been accredited vide no ISO/IEC 17025 by National Accreditation Board for Testing and Calibration Laboratories (NABL).

Phenomics Facility: The Phenomics Facility has been developed in 2012-13 under the Project National Initiative on Climate Resilient Agriculture (NICRA). It is the first field phenomics facility in the world. In addition, automated non-destructive high precision phenomics facility is being established under the funding support of National Agricultural Science Fund of ICAR.

Nutraceutical Laboratory: The Nutraceutical Laboratory was established in 2010 and is located in the Division of Agricultural Chemicals. It is a state-of-the-art facility for isolation, purification and chemical characterization of bioactive compounds, in vitro efficacy evaluation and formulation.

Satellite Data Reception, Processing and Management Facility: A state-of-the-art satellite data reception and management facility was established in the Division of Agricultural Physics in 2012. It is first of its kind in the NARS of India. The facility comprises roof-mounted antenna system with Radar and laboratory with hardware and software to directly receive and process remote sensing images in real time from USA, European and Chinese satellite sensors. The system will provide data to registered users of ICAR institutes, SAUs etc. Over the web and act as a catalyst to expand the utilization of remote sensing data for different soil atmospheric-plant applications.



3.3.2 Does the university have an Information Resource Centre to cater to the needs of researchers? If yes, provide details of the facility.

Yes. Agricultural Knowledge management Unit (AKMU) and IARI Library which serves as Information Resource Centre to cater the needs

of the researchers. The IARI library is one of the oldest and possibly the best in South Asia. Prior to India's Independence, the library was dedicated to Lord Linlithgow and is known as "Linlithgow Library". It has the status of National Agricultural Library of India, and is regarded as one of the 10 best agrobiological libraries of the world. It houses over 6 lakhs publications including 1 lakh books/monographs, 3,50,000 journal volumes, 45,000 bulletins, 15,000 post graduate thesis, 10,000 pamphlets, 30,000 news clippings, 30,000 reports, and other reference materials. The Library functions as the repository of FAO, IDRC and AVRDC publications and also as the National Depository for CGIAR institutes publications. The library has, on its roll, 2000 members and serves about 80,000 visitors every year. A training cell has been established with the financial support from LIS-NATP for Scopus demonstration to scientists of IARI, OVID database training, and interactive learning programme and for practical classes of the students of USI and AIS courses and various other training/demonstrations of the Institute. Under a memorandum with C-DAC a total of 5143 books having 32.5 lakhs pages have been digitized and are available for consultation under the name "digital library of India". Further digitization of old and rare documents and institutional publications of all types is being done under *e-Granth* project of National Agricultural Innovation Project (NAIP).

3.3.3 Does the university have a University Science Instrumentation Centre (USIC)? If yes, have the facilities been made available to research scholars? What is the funding allotted to USIC?

Each discipline has a common facility lab for providing free access to the students. The various divisions of the Institutes are adequately equipped with sophisticated instrumentation facilities such as: Atomic absorption spectrophotometer, Confocal microscopy microarray, Scanning electron microscope, X-ray Diffraction, Super critical fluid extraction, Mass Spectrometer, NMR Spectrometer, Amino Acid Analyzer, Ultracentrifuges, Gamma Ray Spectrometer, Infrared Spectrometer, Nitrogen Emission Analyzer, Walk-in-growth chambers, PRs, Bioreactors, Ballistic Particles delivery System, Differential Thermal Analyzers, GCMS, Gas Chromatographs, Auto Nitrogen Analyzer, Refrigerated Centrifuges, Scintillation and GM Counters, Nano drop, UV Spectrophotometer, Infrared Gas Analyzer, Tritium Enrichment Plant, Gamma Irradiation Chambers, Lyophilizer, Food Extruder, HPLCs, Refrigerator Shakers, Electrophorator, microarray facility, Sanger DNA sequencer, Next Generation Sequencing platforms, etc. These are available to all the researchers in IARI as per their research needs. Further, National Phytotron Facility serves as common facility to conduct controlled environment experiments, generation advancement of breeding lines in the off season, experiment on transgenics, etc.



The Institute has a total farm area of 500 ha, nearly 85% of the farm area is irrigated and the rest is available for rainfed/dryland research of different crops. The irrigation systems consist of underground pipeline with a chain of interlinked 20 tube wells and two storage reservoirs. There is sewage treatment plant and the treated water is used for irrigating rice and other crops grown for seed purpose. To meet the research and technology development need of protected agriculture, specially horticulture, vegetable seed production and nursery production, about 10 ha area of the farm has been put under variable types of temperature, humidity and fertigation controlled glass and plastic houses. The Institute has established Farm Operation Service Unit (FOSU) in 1977 to take care of planning and providing various operational and machinery services and irrigation to the IARI farm research.

3.3.4 Does the university provide residential facilities (with computer and internet facilities) for research scholars, post-doctoral fellows, research associates, summer fellows of various academies and visiting scientists (national/international)?

Yes. IARI is a fully residential campus for the students. Institute has five hostels for Boys (Hemant, Vasant, Shishir, Grishm and Sharad), one for Girls (Varsha) and one Saraswati Apartment for married students.



These are spacious, well-furnished hostels. Apart from hygienic foods, hostels provide recreational facilities including TVs, indoor games, book shop, hair dressing saloon etc. Each hostel has its own wardens, a member of faculty who administers the hostels.

Internet facility for IARI Post Graduate Students: Internet and intranet and Wi-Fi connectivity has been provided at all the hostels and guest houses for trainees and visiting faculty. Creation of this facility in students' hostels is a step forward in the area of knowledge dissemination and awareness for establishing a healthy and productive relationship between scientists and students for overall national agricultural development. The facility is made available to IARI students free of charge. The course schedules along with contents and suggested reading are also available on IARI intranet system.

3.3.5 Does the university have a specialized research centre/workstation on-campus and off-campus to address the special challenges of research programmes?

Yes. The Institute has specialized research centres such as National Phytotron Facility, Advanced Centre for Plant Virology, Water Technology Centre, Centre for Environmental Science and Climate Resilient Agriculture (CESCRA), Centre for Protected Cultivation Technology, Centre for Agricultural Technology Assessment and Transfer and Agricultural Knowledge management Unit (AKMU) to address the specialized research needs. Further, the Institute has the following Regional Stations for specific purposes:

- Amartara Cottage, Shimla, Himachal Pradesh (Horticultural technology)
- Indore, Madhya Pradesh (Wheat breeding, particularly durum quality wheat)
- Kalimpong, West Bengal (Plant virus research)
- Karnal, Haryana (Seed research and production)
- Katrain, Himachal Pradesh (Vegetable research and vegetable seed production)
- Pune, Maharashtra (Plant virus research)
- Pusa, Bihar (Wheat, pulses and fruits research)
- Tutikundi, Shimla, Himachal Pradesh (Wheat and barley breeding)
- Wellington, Tamil Nadu (Wheat breeding, germplasm collection and maintenance)

The Institute also has Off-Season Nurseries for rice at Aduthurai, Tamil Nadu and for pulses at Dharwad, Karnataka.

3.3.6 Does the university have centres of national and international recognition/repute? Give a brief description of how these facilities are made use of by researchers from other laboratories.

The Institute has Centres and facilities of national recognition. These include National Phytotron Facility, Advanced Centre for Plant Virology, Water Technology Centre, Centre for Environmental Science and Climate Resilient Agriculture (CESCRA), Centre for Protected Cultivation Technology and Advanced Centre for Plant Virology. In addition, the Institute has nationally recognized labs such as Centre for Soil, Plant and Water Analysis, Radio Tracer Laboratory, Central Seed Testing Laboratory (CSTL), Quality Seed Facility, Pesticide Referral Laboratory, Nutraceutical Laboratory and Satellite Data Reception, Processing and Management Facility. These facilities are accessible to the faculty and students of the Institutes, and for others on payment basis.

The Institute also has National Microbial, Nematode and Insect Collections and Conservation Facilities. Right from the inception of the Institute when it established Herbarium Cryptogamae Indiae Orientalis (HCIO) with more than 6000 specimens and a National Pusa Insect Collection in 1905, which has more than 5 lakh insect specimens. Later on, an Indian Type Culture Collection of Fungi (1936) which has more than 3300 live fungal cultures, a National Collection of Nematodes (1969) and a National Rhizobial Collection (1986) were also established. These collections are national wealth and very useful resources for taxonomic studies. The Institute has also developed a National Facility for Conservation and Utilization of Blue Green Algae and Azolla.



3.4 Research Publications and Awards

3.4.1 Does the university publish any research journal(s)? If yes, indicate the composition of the editorial board, editorial policies and state whether it/they is/are listed in any international database.

The IARI PG School Publishes the “Pusa AgriScience” Journal. The ISSN of this journal is 0973-7324. It is recognized by the National Academy of Agricultural Sciences, New Delhi, and is given with 2.2 NAAS rating.

3.4.2 Give details of publications by the faculty:

An important mandate of the Institute is to develop an information system, add value to information and share the information nationally and internationally. Publications in the form of research papers in peer reviewed journals, books/ book chapters, popular articles, etc. are an integral component of the information system. The Institute scientists brought out quality publications in the form of research papers in peer reviewed journals, books/ book chapters, popular articles, etc. both in English and Hindi. The details of these publications are given below:

Type of publications	Number of publications			
	2011-12	2012-13	2013-14	2014-15
Research papers published in journals	636	822	545	529
Symposia/conference papers	609	484	360	439
Books	32	39	55	35
Chapters in books	269	201	437	280
Popular Articles	250	294	294	371

Apart from these publications, the Institute brought out several regular and *ad hoc* technical publications both in English and Hindi. The details of faculty-wise publications are given in the report of the respective Divisions.

3.4.3 Give details of

a) faculty serving on the editorial boards of national and international journals

About 60% of the faculties are serving as reviewer/editor in national and international journals.

b) faculty serving as members of steering committees of international conferences recognized by reputed organizations / societies

The following scientific professional societies operate from the different disciplines of IARI.

- Indian Society of Agricultural Science
- Indian Society of Agronomy
- Indian Society of Agro-Physics
- Indian Society of Extension Education
- Indian Society of Genetics & Plant Breeding
- Indian Society of Horticultural
- Indian Society of Plant Physiology
- Indian Society of Seed Technology
- Indian Society of Soil Science
- Indian Society of the Clay Minerals
- Society for Plant Physiology and Biochemistry
- Society for Community Mobilization and Sustainable Development (MOBILIZATION)

These societies have life members from National and International Institutes, and many of the executives of these societies are the faculties of IARI.



3.4.4 Provide details of

a. Research awards received by the faculty and students

Each year the faculties of IARI won several awards including the top most award of ICAR for Agricultural Research and teaching namely Rafi Ahmad Kidwai Award and Bharat Ratna C. Subramaniam Outstanding Teacher Award, respectively. Students of IARI have excelled in winning laurels for the Institute. Among the various awards received by the students for academic excellence are the Jawaharlal Nehru Award of the ICAR for best thesis and the Young Scientist Award of the Indian Science Congress Association. Every year 3-5 students win these awards for their Ph.D. research work. The details of the awards received by the faculties and students are given in “*Evaluative Report of the Departments*”.

b. National and international recognition received by the faculty from reputed professional bodies and agencies

Many faculties of the Institutes are Fellow of Professional Science societies of specialized disciplines, Fellow of National Academy of Agricultural Sciences, Fellow of National Academy of Sciences India, Fellow of Indian National Science Academy and Fellow of Indian Academy of Sciences. The details are given in “*Evaluative Report of the Departments*”.

3.4.5 Indicate the average number of successful M.Phil. and Ph.D. scholars guided per faculty during the last four years. Does the university participate in *Shodhganga* by depositing the Ph.D. theses with INFLIBNET for electronic dissemination through open access?

The Institute does not participate in *Shodhganga*. However, the IARI library has all the thesis submitted to the Institute in electronic form also as each student has to submit a soft copy of the thesis along with hard copy before getting his/her degree.

3.4.6 What is the official policy of the university to check malpractices and plagiarism in research? Mention the number of plagiarism cases reported and action taken.

The faculties take at most care to check malpractices and plagiarism if any. Recently the Institute has purchased “TURNITIN” software. The students are asked to submit Turnitin plagiarism check report along with his thesis for evaluation.

3.4.7 Does the university promote interdisciplinary research? If yes, how many interdepartmental / interdisciplinary research projects have been undertaken and mention the number of departments involved in such endeavours?

The institute undertakes most of the research projects in interdisciplinary mode. All the in-house projects currently running in the Institute are running interdisciplinary within the School and across Schools. Several inter-school research programmes spanning across involving the School of Crop Improvement and the School of Crop Protection, the School of Crop Improvement and the School of Basic Sciences, the School of Crop Improvement and the School of NRM, the School of Horticultural Science and the School of Crop Protection, the School of Horticultural Science and the School of Basic Sciences, the School of Horticultural Science and the School of NRM, the School of Social Sciences with all other schools are being implemented. Similarly the ICAR programme on National Initiative on Climate Resilient Agriculture (NICRA) is being across 13 disciplines of IARI namely CESCRA, Division of Genetics, Division of Plant Pathology, Division of Entomology, Division of Plant Physiology, Division of Biochemistry, Division of Agronomy, Water Technology Centre, Division of Soil Science and Agricultural Chemistry, Division of Agricultural Physics, Division of Microbiology, Division of Agricultural Extension and Division of Agricultural Economics.

3.4.8 Has the university instituted any research awards? If yes, list the awards.

The Institute offers seven Institute level awards. In addition, Divisional level awards are also given. All the scientists working in Agriculture in the country are eligible for these award except for the Best Teacher Award for which only the faculties of P.G. School, IARI are eligible.



The details of awards given by IARI

Name of the Award	Details of the Award
Institute Level Awards	
B.P. Pal Memorial Award	<p>This Award was instituted in the year 1995 in the memory of late Dr. B.P. Pal, former Director of IARI and the first Director General of the reorganised ICAR. The credit of establishment of the Post Graduate School at IARI in the year 1958 also goes to Late Dr. Pal. Dr. Pal willed a major portion of his moveable and immovable property to IARI.</p> <p>Dr. B.P. Pal Award is awarded to the Scientists (Staff and Students) working at the Indian Agricultural Research Institute or its sub-stations for best piece of original research in Genetics and Plant Breeding during 3 to 5 years preceding the award. The award carries sum of Rupees 50,000/- and periodicity of 3 years and a Medal.</p>
Hooker Award	<p>This award is given once in two years for outstanding contributions in any field of research in agriculture, animal husbandry and fisheries leading to increase in food production. The award has been instituted on the basis of a legacy bequeathed to the Institute by Mr. and Mrs. Richard Hooker of Longmeadow, Massachusetts, USA.</p> <p>A prize of the value of Rupees 15,000/- in cash or kind or both plus a scroll for outstanding research in any field or subject within the purview of research in agriculture, animal husbandry and fisheries. Prize money is exempted from income tax vide Ministry of Finance, Government of India order No. F. No. 199/23/83-IT (AI). Dated 27.2.1981.</p>
Sukumar Basu Memorial Award	<p>This award is given once in two years for the outstanding research in Agriculture including Animal Husbandry and Forestry. The Award has been instituted on the basis of the amount donated by late Dr. Sib Das Basu, M.B. DIH; DPH; Ex - Joint Director of Health Service, Govt. of West Bengal to commemorate the name of his brother, late Dr. Sukumar Basu.</p> <p>A prize of the value of Rupees 10,000/- and a scroll for outstanding research in agriculture including animal husbandry and forestry. The Academic Council will, however, have the power to vary the amount of the award provided the expenditure is met out of the return on the capital. Prize money is exempted from income tax vide Ministry of Finance, Government of India order No. F. No.199/23/80-IT (AI) dated 27.2.81.</p>
Shri Harikrishna Shastri Memorial Award	<p>The Award will carry a sum of Rupees 25,000/- and a commendation certificate for outstanding contribution in Agricultural Sciences. The award shall be made annually.</p>
Rao Bahadur Dr. B. Viswanath Award	<p>This Award has been instituted from the academic year 2004-2005 in the field of Agricultural Sciences to commemorate the memory of late Rao Bahadur Dr. B. Viswanath, the first Indian Director of the Indian Agricultural Research Institute, New Delhi.</p> <p>The Award will carry a sum of Rupees 1,00,000/- (Rs. one lakh only), a Medal and a Citation. The award shall be made for outstanding original research work, inventions/discoveries, both fundamental and applied as evidenced by research publications, monographs and patents etc.</p>
A.B. Joshi Award	<p>This Award has been instituted from the academic year 2011-12 to commemorate the memory of late Dr. A.B. Joshi, the first Indian Dean of the Indian Agricultural Research Institute, New Delhi. The award carries a sum of Rs. 1,00,000/- , a medal and a citation. The Award shall be made once in two years with a standing of 25 year's outstanding contributions in the field of agricultural research and education.</p>
Best Teacher Award	<p>Since 1995, Best Teacher Award is presented to five faculty members of Post Graduate School for their outstanding contributions to teaching at IARI. The Best Teacher Award is fully funded by ICAR.</p> <p>All the Teachers/Scientists/Extension Specialists working under the Institute shall be eligible to make an application before the last date prescribed in the proforma circulated for the purpose.</p>



	<p>The participating teacher should have minimum of 5 years teaching experience in the subject of his/ her specialisation.</p> <p>A maximum of five Best Teacher Awards are available in IARI as per ICAR guidelines, i.e., faculty strength of more than 300.</p> <p>The Best Teacher Award shall contain Plaque, Scroll with a cheque of Rupees 10,000/- to an awardee to be conferred at the time of Convocation.</p>
Divisional Level Awards	
S.S. Bains Memorial Award	<p>Instituted by the Scientific Staff of IARI and Indian Farmers Fertiliser Cooperatives Ltd. (IFFCO) in the memory of late Dr. Sher Singh Bains, erstwhile Head of the Division of Agronomy, Indian Agricultural Research Institute, New Delhi. The award carries a prize money of Rupees 2,000/- plus a medal and is awarded for Ph.D. thesis for the outstanding contribution in the field of Agronomy once in two years.</p>
R.D. Asana Endowment Lecture Scheme	<p>To be bestowed upon an eminent and distinguished Plant Physiologist in the country who has helped in the promotion and progress of the discipline of Plant Physiology through research and teaching. Payment of an honorarium of Rupees 2,000/- and a plaque is recommended.</p>
D.N. Puri Memorial Award	<p>Dr. D.N. Puri Memorial Award donated by Mrs. Nirmal Puri w/o Late Dr. D.N. Puri carries a sum of Rupees 10,000/- in cash and a commendation certificate. The award shall be made once in two years for either fundamental or applied research including inventions, discoveries, etc. leading to results of practical value in the discipline of Agronomy.</p> <p>All research workers up to the age of 60 years and actively engaged in research in the discipline of Agronomy in India shall be eligible for the said Award.</p>
P.B. Sarkar Memorial Endowment Lecture Award	<p>Dr. P.B. Sarkar Memorial Endowment Lecture Award carries a sum of Rupees 10,000/- in cash and a commendation certificate. The Award shall be made once in two years for either fundamental or applied research including inventions, discoveries, etc. leading to results of practical value in the discipline of Agricultural Chemicals.</p> <p>All research workers up to the age of 60 years and actively engaged in research in the discipline of Agricultural Chemicals in India shall be eligible for the said Award.</p>
K.M. Singh Memorial Award	<p>This award has been instituted in the memory of Dr. K.M. Singh, former Head, Division of Entomology at IARI for outstanding scientist in the field of Entomology. The Award will carry a sum of Rupees 10,000/- with a Commendation Certificate. The award shall be made once in two years. The award shall be made for either fundamental or applied research including invention, discoveries, etc. leading to results of practical value in the discipline of Entomology.</p>
Shri B. Lakshminarayana Memorial Award	<p>With the approval of Academic Council, IARI in its meeting held on 15th March, 2002, this Award was instituted in the name of Shri B. Lakshminarayana in the field of Soil Science, Agricultural Chemistry and Agricultural Physics. The Award will carry a sum of Rs. 10,000/- and a Commendation Certificate. The award shall be made biennially.</p>
P.N. Behl Award	<p>Dr. P. N. Behl Award in the Field of Crop Sciences is given to outstanding research workers (up to the age of 45 years) who are engaged in crop science research in ICAR institutes, SAUS and other institutes. The award carries a sum of Rs 50000/- with commendation certificate. The awardee will be required to deliver a lecture on his/her research contributions especially during the last 10 years. The award shall be made for notable and original research (both in fundamental and applied) in the relevant field as evident from the publications, monographs, papers, patents, varieties and technologies developed, disseminated and adapted technologies by the stakeholders.</p>



3.4.9 What are the incentives given to the faculty for receiving state, national and international recognition for research contributions?

The Institute gives various awards listed in the previous section for outstanding research contributions. In addition, ICAR guidelines for intellectual property management and technology transfer/commercialization is followed by the Institute for sharing the benefit money with the inventors. Ownership of IP generated in ICAR or caused to be generated by ICAR shall vest in the ICAR. It will be either the sole owner or a joint owner of an IP depending upon mutually agreed terms that would be set out prior to the generation of that IP along with other collaborators/partners. Individual scientists/staff of ICAR responsible for the creation of its IP shall be recognized as the True and First Inventors/Innovators. ICAR will provide incentive and share the benefits accrued from commercialization of its IPR enabled technologies with its scientists/ innovators to encourage innovativeness. For all the commercialized technologies, license fee and royalty are collected. From this 60% money is given to the Institute by ICAR. A major share of this money goes to faculties who invented/developed the technology.

3.5 Consultancy

3.5.1 What is the official policy of the university for structured consultancy? List a few important consultancies undertaken by the university during the last four years.

During the year 2014-15, ZTM & BPD Unit facilitated and finalized 17 Consultancy, Contract Research and Collaborative Research Projects worth Rs. 57,57,048, as per the prescribed guidelines from ICAR. The details are described in section 3.2.4 above.

3.5.2 Does the university have a university-industry cell? If yes, what is its scope and range of activities?

Yes. The Institute has a Institute-industry cell called “Zonal Technology Management and Business Planning and Development (ZTM&BPD) Unit”. The mission of the ZTM&BPD Unit is, “*Translating Research into Prosperity*” which is achieved by doing IP management, technology commercialization and fostering entrepreneurship through business incubation.

3.5.3 What is the mode of publicizing the expertise of the university for consultancy services? Which are the departments from whom consultancy has been sought?

Industries approach Scientist through ZTM&BPD unit or directly. Then, ZTM&BPD unit mediates drafting of MOU/Contract for the consultancy research. Consultancy has been sought from most of the Departments of the Institute.

3.5.4 How does the university utilize the expertise of its faculty with regard to consultancy services?

The ZTM&BPD Unit facilitates consultancy projects. Every year significant number of consultancy and contract research projects are undertaken. The details are discussed in section 3.2.4 above and in the “*Evaluative Report of the Departments*”.

3.5.5 List the broad areas of consultancy services provided by the university and the revenue generated during the last four years.

The Institute has taken up consultancy and contract research in the areas of Agricultural Chemicals, Environment Science and Climate Resilient Agriculture, Protected Cultivation Technology, Agricultural Economics, Agricultural Engineering, Post-harvest Technology, Agricultural Physics, Agronomy, Entomology, Nematology, Plant Pathology, Plant Physiology and Genetics. The Institute generated a revenue of Rupees 133,70,032 during the last four years. The details are discussed in section 3.2.4 above and in the “*Evaluative Report of the Departments*”.



3.6 Extension Activities and Institutional Social Responsibility (ISR)

3.6.1 How does the university sensitize its faculty and students on its Institutional Social Responsibilities? List the social outreach programmes which have created an impact on students' campus experience during the last four years.

The Institute give equal importance to research, education and extension. Since its inception at Pusa (Bihar) in 1905, the Institute is actively involved in extension and educate the farmers of the region. This is evident from the fact that famous Pusa Wheat (NP series) varieties then developed by the Institute became very popular amongst the farmers. This state of affairs continued even after shifting of the Institute to its present location in New Delhi in 1936. The IARI started its extension activities in a formal and modest way through its Intensive Cultivation Scheme in Delhi territory during 1949-50. Since then, a number of innovative extension approaches and methodologies have been experimented and developed, which subsequently became the basis and forerunner for many extension programmes and activities in the country. The concepts of seed village production unit and national demonstration took shape in 1965. Krishi Vigyan Mela and mini-kit demonstration (1972), Integrated Area Development Programmes, Operational Research Projects (1975-76), Lab-to-Land Programme (1979), Integrated Whole Village Agricultural Development Programme (1985), Single Window System, and Farmer to- Farmer Quality Seed Programme (1986), etc. were initiated by the Institute for effective linkages between the research Institute and the development departments to transfer technologies generated by scientists. The Division of Agricultural Extension has played greater emphasis on training the farmers in package of practices, credit, storage and marketing aspects. In recent years, two innovative models of technology transfer viz., IARI-Post Office model and IARI-Rakra model have attained great successes. The Division, through its CATAT and ATIC units, imparts training, provide advice and technical information to the extension workers and farmers, and also develops and distributes folders, pamphlets and other extension literature. The Publication Unit of IARI also caters to the needs of technical and extension publications. The Joint Director (Extension) and the Extension Council (EC) monitor and guide the extension programme of the Institute. The Students of the School of Social Studies actively interact with farmers and other stakeholders during the course work as well as surveys for their research work.

3.6.2 How does the university promote university-neighbourhood network and student engagement, contributing to the holistic development of students and sustained community development?

The students are taken to the field visit to the satellite villages of the Institute located around Delhi. All the students participate in the annual Krishi Mela organized by the Institute.

3.6.3 How does the university promote the participation of the students and faculty in extension activities including participation in NSS, NCC, YRC and other National/International programmes?

The Institute does not have a formal NSS or NCC.

3.6.4 Give details of social surveys, research or extension work, if any, undertaken by the university to ensure social justice and empower the underprivileged and the most vulnerable sections of society?

Many of the M.Sc. and Ph.D. research work carried out by M.Sc. and Ph.D. students of the School of Social Sciences involves social surveys of farmers, rural youth and women. Based on the feedback received, several training programmes are being organized every year to the farmers, rural youth and women. Further, the feedback is given to the Institute research system for development of technologies for improving the rural livelihood, agricultural production and farm profit. Some of the achievements are:

- Conceptualization of national demonstration project; system of single window delivery of services; development of seed village and farmer-to-farmer seed exchange system and rural social centre for cooperative societies.
- Identification of stages of need and deliberation in adoption decision process in addition to conventional five stages of awareness, interest, evaluation, trial and adoption.



- Standardization of various psychological scales of measurement including the famous socio-economic status and risk orientation constructs.
- Development of fourteen training modules on managerial skills for enhancing effectiveness of extension professionals and organizations.
- Identification of appropriate extension methods, communication system and media mix for credible dissemination of information and technology. Findings that non-institutional sources are more important at initial stages of adoption, while institutional information sources are more important at later stages of adoption have been highly beneficial for devising extension strategies.
- Development of expert system of extension for strengthening computer-aided information services related to crop management for farmers and other end users.
- Socio-economic assessment of Bt cotton cultivation in India
- Action research on dynamics of gender empowerment; group behaviour and mobilization of farmers and farm women; development and functioning of SHGs; assessment and promotion of ergonomically designed drudgery reducing technologies; adoption of viable income generating farm & non-farm based enterprises; and farming system development.
- Through action research, entrepreneurship development modules were developed for rural youth to enhance the employment and income generation opportunities and usher in social-economic stability and prosperity in rural areas.
- Validation of indigenous technological knowledge was carried out through farmer participatory on-farm experimentation and criteria based ranking technique, which empowered farmers for grassroots experimentation, creativity and valuing local wisdom.
- Through conduction of series of training programmes for master trainers, the Division contributed immensely towards capacity building of extension professionals.
- Researches taken up in the new areas like scientific productivity and creativity; organizational climate; socio-economic assessment of Tawa and Narmada Sagar dams and modern farm technologies; evaluation of extension systems; simulation of adoption behaviour; media research; evaluation and impact of development programmes (ATMA, Watershed, NREGA); axiomatic theory building; ICT application for development; rural livelihood security; gender empowerment; risk, perception and adaptation related to climate change; have broadened the horizon of extension research and scaled up the methodologies.
- National extension programme for networking and sharing of strengths in agricultural technologies with state agricultural universities has led to significant impact in wider diffusion of proven technologies and problem solving.
- IARI - Civil organizations partnership based extension has resulted in wider assessment, dissemination and upscaling of viable technologies at a speedy rate.
- IARI - Post office linked extension has proven time and cost-effective mechanism for dissemination of improved seeds and cultivation practices among farmers.
- Cyber extension has led to information accessibility and informed decision making among farmers.

3.6.5 Does the university have a mechanism to track the students' involvement in various social movements / activities which promote citizenship roles?

The Institute has Alumni association which track the students. IARI alumni have occupied prominent positions both nationally and internationally. Some of the prestigious positions occupied by the alumni include the position of Member, Planning Commission; Director General, ICAR and Secretary, Department of Agricultural Research and Education; Deputy Director General, ICAR; Assistant Director General, ICAR; Chairman, Union Public Service Commission; Chairman, Agricultural Scientists



Recruitment Board; Secretary, Department of Biotechnology, Government of India; Director, Indian Agricultural Research Institute; and Vice Chancellors of several State Agricultural Universities/Deemed-to-be universities/central universities. Internationally, IARI alumni have occupied senior positions in the CGIAR Institutions, other foreign R&D organizations and institutions and foreign universities.

List of some IARI alumni who occupied prominent positions in international institutions

- Dr. M.S. Swaminathan, Director General, IRRI
- Dr. R.S. Paroda, DDG, ICARDA, Syria and Chairman, GFAR
- Dr. D. Jha, Research Fellow, IFPRI, Washington, DC
- Dr. Ratan Lal, Professor, Ohio State University, USA
- Dr. N.C. Pant, Director, Commonwealth Institute of Entomology, London
- Dr. B.R. Subbarao, Entomologist, Common Wealth Institute of Entomology, London, UK
- Prof. Ajay Man Singh, Director, National Production Research Institute, University of West Indies, Kingston, Jamaica (WI)
- Dr. M. Malipatil, Agriculture Australia, Australia
- Dr. Z.R. Khan, ICICE, Nairobi
- Dr. M. Prasanna, CIMMYT, Nairobi
- Dr. H.C. Sharma, ICRISAT, Hyderabad
- Dr. Pritam Singh, Specialist of Insect Artificial Diets, New Zealand
- Dr. Ulagaraj, Eminent Entomologist, Florida, USA
- Dr. D. Bastia, Professor, Duke Medical Collage, USA
- Dr. H.K. Jain, DDG, ISNAR, Netherlands
- Dr. R.P. Singh, ICRISAT, Canada
- Dr. R.P. Thakur, ICRISAT, Canada
- Dr. S.D. Singh, ICRISAT, Canada
- Dr. Suresh Pandey, ICRISAT, Canada
- Dr. J.P. Singh, ICRISAT, Kenya
- Dr. M.C. Saxena, ICARDA, Aleppo, Syria

3.6.6 Bearing in mind the objectives and expected outcomes of the extension activities organized by the university, how did they complement students' academic learning experience? Specify the values inculcated and skills learnt.

Most students are exposed to the field problems faced by the farmers during various extension activities, Krishi Mela, study survey, etc. This helps them to understand real-life problems and design research project to address these problems.

3.6.7 How does the university ensure the involvement of the community in its outreach activities and contribute to community development? Give details of the initiatives of the university which have encouraged community participation in its activities.

The research programmes in the social sciences school have been focused on economic and policy research on all issues related to agricultural technologies, and on transfer of the technologies to the farmers and industries. Currently, economic and policy research on technology assessment, public and private investment in agriculture, energy use in agriculture, rural non-farm employment, market reforms and FDI in retail, innovations in credit delivery and farmers access to institutional credit, plant variety protection and impact of changing trade regimes on agricultural exports are the major priority areas of research. The Agricultural



Extension and Technology Transfer programmes have concentrated on the demonstration and evaluation of the technologies and varieties developed by the Institute, and also on developing innovative models for technology transfer. Some of the priority areas include cyber extension, analysis of alternative extension models, constraints in adoption of improved technologies, entrepreneurship development, gender empowerment, and market-led extension. The other initiatives include frontline demonstrations, participatory seed production, training of farmers, farm women and rural youth, and collaboration with various agencies including farmers' groups, ICAR institutes, SAUs and voluntary organizations, etc. Besides, on-farm testing, farm advisory services, publications, Single Window-Delivery System, Pusa Helpline, Pusa Agricom and Pusa Krishi Vigyan Mela are also of prime importance. These extension programmes resulted in enhancing entrepreneurship among rural youth, capacity building of self-help groups for gender empowerment and developing agricultural entrepreneurs in seed production.

Some examples of the activities which encouraged community participation during this year are given below:

The IARI Post Office Linkage Model designed and validated for effective outreach mechanism for frontline extension system, has been expanded in partnership with Krishi Vigyan Kendras (KVKs) in 55 districts of 14 states covering 110 branch offices. The prioritization of IARI technologies for agri-enterprise ventures in participatory mode revealed that farmers are keenly interested in protected cultivation, seed production, floriculture, bio-fertilisers and value addition of IARI technologies for commercial uptake.

The intervention on development of market led extension models/model villages through technology integration resulted in enhancing the productivity of different crops and income of farmers significantly through adoption of IARI technologies. For performance assessment of IARI varieties, a total of 163 demonstrations of wheat, palak, pea and lentil were conducted in these villages during *Rabi* 2014-15. Under the National Extension Programme (NEP) in collaboration with selected ICAR institutes and SAUs, IARI varieties and technologies were disseminated through 306 demonstrations were conducted on wheat, mustard, lentil, chickpea, palak, pea, carrot, and brinjal in 15 locations during *Rabi* 2013-14. During *Kharif* 2014, a total of 332 demonstrations of paddy, moong, pigeon pea, bajra, bottle gourd, tomato, chillies and okra covering an area of 103.72 ha were conducted. Under IARI-Voluntary organizations collaborative program (32 VO), a total of 1461 demonstrations covering an area of 432 hectares of IARI varieties were conducted in 26 locations. The Annual *Pusa Krishi Vigyan Mela* of the Institute was organized during March 10-12, 2015 on the theme "*IARI Technologies for Inclusive Growth*". Around 1 lakh visitors from different parts of the country including farmers, farm women, extension personnel, entrepreneurs, students, etc., visited the *mela*.

The Agricultural Technology Information Centre (ATIC) is effectively providing products, advisory services, technologies and information to the farmers and other stakeholders through a single window delivery system. The farmers are also given farm advise through Pusa helpline (011-25841670, 25846233, 25841039 and 25806300), Pusa Agricom (1800-11-8989), exhibitions, farm literatures and letters. A second level of kisan call centre (1800-180-1581) has also been established at ATIC to provide solutions to the problems/queries of farmers of Delhi state. Demonstrations were also conducted in crop cafeteria, medicinal garden, nutrition garden and fruit orchard for showcasing the IARI technologies to the farmers.

The Institute's KVK maintained to play a catalytic role in enhancing farm profitability, combating the problem of unemployment/underemployment and improving income of farmers, rural women and youth. A total of 42 on-farm trials on different field/farm related aspects including animal husbandry were conducted during *Kharif* 2014. A total of 354 FLDs covering an area of 123.5ha on oilseeds, pulses, cereals and vegetable crops were conducted during *Rabi* 2013-14 and *Kharif* 2014 for dissemination of location specific crop technologies in the area. A total of 112 trainings were organized for target groups which benefitted 1518 male and 723 female participants. Extension initiatives such as field days, women in agriculture day, field visits, farm-advisory services, exhibitions, soil and water testing and publication of quarterly newsletters were also undertaken.



3.6.8 Give details of awards received by the institution for extension activities and/ contributions to social/community development during the last four years.

The details are provided in the “Evaluation Report of the Departments”.

3.7 Collaboration

3.7.1 How has the university’s collaboration with other agencies impacted the visibility, identity and diversity of activities on campus? To what extent has the university benefitted academically and financially because of collaborations?

The IARI has linkages with various national and international institutes/organizations. At national level the Institute has close linkages with almost all field and horticultural crops research institutes, centres, project directorates, coordinated projects as well as a few other selected institutes of the ICAR. Similar linkages exist for natural resource and socioeconomic research institutes. Collaboration exists with almost all state agricultural universities (SAUs), selected conventional universities, several of the institutes of the CSIR and departments of Ministry of Science and Technology such as the Departments of Biotechnology, Space Research, Meteorology, and several other ministries/ departments/ organizations/ banks of the Government of India, besides some private organizations/banks. The Institute benefitted from faculty exchange and training.

3.7.2 Mention specific examples of how these linkages promote Curriculum development, Internship, On-the-job training, Faculty exchange and development, Research, Publication, Consultancy, Extension, Student placement

The collaboration of the SAUs and International Institutes help understand the need of these potential employers of the students of the Institute in terms of knowledge and expertise expected from the students. This helps in curriculum development, teaching special topics and specific trainings to the students during their studies. The collaboration of the Institute with Industry help students get direct exposure to the needs of the industry, and equip themselves with necessary theoretical and experimental expertise. This helps students to get placement in industries.

3.7.3 Has the university signed any MoUs with institutions of national/international importance/other universities/industries/corporate houses etc.? If yes, how have they enhanced the research and development activities of the university?

The Institute has also signed an MOU in 2015 for collaborative research and education programme with University of Nebraska, USA. Earlier, it has signed MoU with Kansas State University, USA. The Institute is also playing very important role in institution building in other countries, namely, in the establishment of 1) Afghan National University of Agricultural Sciences and Technology, Afghanistan and 2) Advanced Centre for Agricultural Research and Education at Yezin Agricultural University, Myanmar. The Institute

3.7.4 Have the university-industry interactions resulted in the establishment / creation of highly specialized laboratories / facilities?

The Institute collaborate with industry mainly on technology refinement and outscaling. The labs were developed mainly from the funding by public sector organizations and international organizations.

Any other information regarding Research, Consultancy and Extension, which the university would like to include: Nil

**CRITERION IV: INFRASTRUCTURE AND LEARNING RESOURCES****4.1 Physical Facilities****4.1.1 How does the university plan and ensure adequate availability of physical infrastructure and ensure its optimal utilization?**

There are prescribed guidelines laid by National Agricultural Education Accreditation Board (NAEAB), ICAR and the Institute strictly follows them.

4.1.2 Does the university have a policy for the creation and enhancement of infrastructure in order to promote a good teaching-learning environment? If yes, mention a few recent initiatives.

As above

4.1.3 How does the university create a conducive physical ambience for the faculty in terms of adequate research laboratories, computing facilities and allied services?

The Institute has bodies like “Board of Management”, Research Advisory Committee etc. to monitor physical facilities.

4.1.4 Has the university provided all departments with facilities like office room, common room and separate rest rooms for women students and staff?

The Institute has excellent State-of-the-art facilities.

4.1.5 How does the university ensure that the infrastructure facilities are disabled-friendly?

As in 4.1.3.

4.1.6 How does the university cater to the requirements of residential students? Give details of Capacity of the hostels and occupancy (to be given separately for men and women), Recreational facilities in hostel/s like gymnasium, yoga centre, etc. and Broadband connectivity / wi-fi facility in hostels.

There are 8 hostels including those for girls and married students. Detailed information about the infrastructure and other physical facilities available are given below for different hostels.

Information about different hostels

S. No.	Details	Vasant Hostel	Hemant Hostel	Shishir Hostel	Sharad Hostel	Varsha Hostel	Saraswati Apartment	Sukhatme Hostel	Rituraj Hostel
1	Boys/ Girls/ married students	Boys	Boys	Boys	Boys/ married students	Girls	married students	Boys	Boys
2	No. of living rooms	102	100	180	43	114	55	28	38
3	No. of guest rooms	-	4	12	1	5	-	-	-
4	Office/ others	6	6	4	7	15	1	-	2
5	No. of toilet blocks	8	8	12	9	13	In each flat	5	4
6	Catering facility	5 messes. 1 canteen	Shared with Vasant Hostel	2 messes. 1 canteen	2 messes	1 mess. 1 canteen	-	1 mess	-
7	Indoor games	*TT snooker, Carom, badminton, etc.	*Badminton	*TT, badminton, Basket Ball, etc.	*Badminton	TT, badminton, Basket Ball, Gym, etc.	Badminton, Children play yard	TT, badminton, Basket Ball, Gym, etc.	*



8	Wi-fi/ Broadband connectivity	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility	Television facility, newspaper and magazine facility

* Common Gym facility and Sports ground facilities are provided

4.1.7 Does the university offer medical facilities for its students and teaching and non-teaching staff living on campus?

A qualified Medical Officer looks after the health of the students, and is incharge of the Institute Dispensary located in the vicinity of the Hostels. The Medical Officer resides on the Institute campus and is thus available during day and night. The medical service is provided free to students at the dispensary. In addition, all the staff are eligible for Central Government Health Scheme (CGHS), and get all the medical treatment and benefit as per government rule.

4.1.8 What special facilities are available on campus to promote students' interest in sports and cultural events/activities?

The Post Graduate School encourages extracurricular activities that enrich cultural, physical and social life of students. Spacious playgrounds are provided near the student hostels and necessary facilities exist for outdoor games like cricket, football, hockey, volleyball, tennis, badminton and various athletic events. There are facilities also for indoor games in each hostel. There is a Students' Sports Fund to which every student subscribes at the beginning of each academic year.



4.2 Library as a Learning Resource

The IARI library is one of the oldest and possibly the best in South Asia. Prior to India's Independence, the library was dedicated to Lord Linlithgow and is known as "Linlithgow Library". It has the status of National Agricultural Library of India, and is regarded as one of the 10 best agrobiological libraries of the world. It houses over 6 lakhs publications including 1 lakh books/monographs, 3,50,000 journal volumes, 45,000 bulletins, 15,000 post graduate thesis, 10,000 pamphlets, 30,000 news clippings, 30,000 reports, and other reference materials. The Library functions as the depository of FAO, IDRC and AVRDC publications and also as the National Depository for CGIAR institutes publications. The library has, on its roll, 2000 members and serves about 80,000 visitors every year. A training cell has been established with the financial support from LIS-NATP for Scopus demonstration to scientists of IARI, OVID database training, and interactive learning programme and for practical classes of the students of USI and AIS courses and various other training/demonstrations of the Institute. Under a memorandum with C-DAC



a total of 5143 books having 32.5 lakhs pages have been digitized and are available for consultation under the name “digital library of India”. Further digitization of old and rare documents and institutional publications of all types is being done under e-Granth project of National Agricultural Innovation Project (NAIP).



4.2.1 Does the library have an Advisory Committee? Specify the composition of the committee. What significant initiatives have been taken by the committee to render the library student/user friendly?

Yes, Library has an Advisory Committee namely “Library Advisory Committee”. The Committee consists of twelve members comprising of HOD’s/Professors of different Schools, Incharge Library Services and President of the PG School Student Union. Dean and Joint Director Education is the Chairman of the Committee and Coordinator of IARI Library is Co-Chairman. The committee has taken various initiatives, to make IARI Library user friendly. Some of the initiatives taken are providing Wi-Fi facility, Extension of library timings, subscription of Periodicals, Subscription of CD ROM etc.

4.2.2 Provide details of the following:

- a. **Total area of the library** : 73880 sq. ft.
- b. **Total seating capacity** : 140
- c. **Working hours (on working days, on holidays, before examination, during examination, during vacation)**

The library remains open throughout the year except on three national holidays, viz. 26th January, 15th August and 2nd October. The timings on working days are: 8.30 AM to 8.30 PM, while the timings on second Saturday, Sunday and Government holidays are 9.00 AM to 1.00 PM. Library services during General Shift are provided from 9.30 AM to 4.30 PM, stack rooms and lending facilities are available up to 7 PM. Lunch break timings are from 1.00 PM to 1.30 PM but users services are available in lunch time also.

d. Layout of the library (individual reading carrels, lounge area for browsing and relaxed reading, IT zone for accessing e-resources)

Library has two reading halls, one student facility unit, CD-ROM facility unit for IT zone. One language lab is also available for training and accessing the e-resources.

e. Clear and prominent display of floor plan; adequate signboards; fire alarm; access to differently-abled users and mode of access to collection

Map is displayed at the Ground Floor which gives information about different sections at various floors of IARI Library. A chart is available at the entrance which gives information about Incharges of the Technical Sections. IARI library has a layout plan, adequate signboards, fire alarm etc. at entrance gate. Library provides open access for users and publications are arranged in a proper classified manner.



Access of literature is given to differently-abled users through online consortium/ Network connectivity and library staff available in stacks for help. A proposal has already submitted for providing the ramp for differently-abled users and will be made available very soon.

4.2.3 Give details of the library holdings

a) *Print (books, back volumes and theses)*

Books and monographs	= 1,31,501 books
Bound volumes of Journals	= 2,50,000
Bulletins	= 21,500
Post-Graduate theses	= 15,023
Pamphlets	= 5,200
Reports and other reference materials	= 12,500

b) *Average number of books added during the last three years* = 1101 books

The Institute also provides contingency money to purchase textbooks required for them in both M.Sc./ M.Tech and Ph.D. programmes.

c) *Non Print (Microfiche, AV):* Nil

d) *Electronic (e-books, e-journals):*

Under the NAIP subproject on CeRA, the website of CeRA (<http://cera.iari.res.in> and <http://jgateplus.com> - revised version of <http://cera.jccc.in>) has been updated. During 2013–14, more than 35 lakhs out of the total of 85.68 lakhs (during 2008-2013) full text articles and more than 15,000 out of total of 77,000 (during 2008-2013) articles have, respectively, been downloaded and distributed among researchers in CeRA. Based on downloads of full text articles and applying corrections to the extent of 10% of downloads, CeRA has enabled a cost saving which works out to more than Rupees 50 crores for NARS till 2014; not to mention the easy online availability. Also, analyses reveal that there is improvement in the quality and quantity of research publications after the establishment of CeRA to the extent of 10% compared to Pre-CeRA period for institutes under Crop Science Division, ICAR. Nearly 2424 on line journals are available for full text from nine publishers.

e) *Others*

Each M.Sc./Ph.D. student submits three copies of the thesis, of which one copy each is deposited in the Central Library, Divisional library and with the major adviser. Additionally the student has to submit PDF of his/her thesis to Central Library. The student also submits with the thesis five copies of the abstract of the thesis.

4.2.4 What tools does the library deploy to provide access to the collection?

- OPAC : Yes
- Electronic Resource Management package for e-journals: CeRA (please refer to section 4.2.3 above)
- Federated searching tools to search articles in multiple databases: Yes, through DELNET
- Library Website: <http://www.iari.res.in>
- In-house/remote access to e-publications: All the journals subscribed by the institute and other online resources of IARI library are freely available to the staff and students of the Institute through INTRANET.

4.2.5 To what extent is ICT deployed in the library? Give details with regard to

a. Library automation	Yes, fully automated
b. Total number of computers for general access	30 in language lab, 20 in reading halls, CD-Rom and student facility unit



Total numbers of printers for general access	2
Internet band width speed 2 mbps 10 mbps 1 GB	
Institutional Repository	World bank and CGIAR
Content management system for e-learning	Krishkosh and Krishiprabha
Participation in resource sharing networks/consortia (like INFLIBNET)	Krishikosh, Krishiprabha, CeRA consortium, etc.

4.2.6 Provide details (per month) with regard to

a) Average number of walk-ins	5650
b) Average number of books issued/returned	725
c) Ratio of library books to students enrolled	370
d) Average number of books added during the last four years	1435
e) Average number of login to OPAC	325
f) Average number of login to e-resources	550
g) Average number of e-resources downloaded/printed	235
h) Number of IT (Information Technology) literacy trainings organized- in house training for KOHA and CD-Rom	

4.2.7 Give details of specialized services provided by the library with regard to

a. Manuscripts	: No
b. Reference	: Yes
c. Reprography/Scanning	: Yes
d. Inter-library Loan Service	: Yes
e. Information Deployment and Notification	: Yes
f. OPACS	: Yes
g. Internet Access	: Yes
h. Downloads	: Yes
i. Printouts	: Yes
j. Reading list/ Bibliography compilation	: Yes
k. In-house/remote access to e-resources	: Yes
l. User Orientation	: Yes
m. Assistance in searching Databases	: Yes
n. INFLIBNET/IUC facilities	: Yes

4.2.8 Provide details of the annual library budget and the amount spent for purchasing new books and journals.

About Rs. 2.5 crores (Plan) and Rs. 25 lakhs (Non Plan & P.G. funds) were spent on purchasing new books and journals.

4.2.9 What initiatives has the university taken to make the library a 'happening place' on campus?

IARI Library has the most updated collection of publications/ Journals (Foreign and Indian) in the field of Agriculture. Services are provided to Scientists / Farmers/ students/ Users from all over India. Library also provides CD ROM facility to Scientists/ Farmers/ students/ Users from all over the country. Further Meetings/ Conferences of Delegates from various countries are held in the Conference Room of IARI Library Building.



4.2.10 What are the strategies used by the library to collect feedback from its users? How is the feedback analysed and used for the improvement of the library services?

Suggestions box is kept at the entrance of IARI Library for feedback of users. Issues are discussed with Senior Officers at the appropriate level.

4.2.11 List the efforts made towards the infrastructural development of the library in the last four years

Established the language lab in 2012 with 30 computers in IARI Library. Daily class of English language of duration two (2) hours is taken for students of IARI by English Teacher. Wi-Fi facility has been provided in the library. Photocopy Machines, Printers etc. have been purchased for smooth functioning of the library.

4.3 IT Infrastructure

4.3.1 Does the university have a comprehensive IT policy with regard to

- IT Service Management : Yes
- Information Security : Yes
- Network Security : Yes
- Risk Management : Yes
- Software Asset Management : Yes
- Open Source Resources : Yes
- Green Computing : No

4.3.2 Give details of the university's computing facilities i.e., hardware and software

- Number of systems with individual configurations : 1000
- Computer-student ratio : 1:1
- Dedicated computing facilities : Yes
- LAN facility : Yes
- Proprietary software : Yes
- Number of nodes/ computers with internet facility : 1000+
- Any other (please specify) : The IASRI, part of the PG School of IARI, has established recently a supercomputer named '**ASHOKA**' (**A**dvanced **S**upercomputing **H**ub for **O**MICS **K**nowledge in **A**griculture). It is the most advanced computational inclusion in the National Agricultural Research and Education System. The state-of-art facility is first of its kind dedicated exclusively for Indian agricultural research. The supercomputing hub is poised to bridge the gap between genomic information and knowledge by utilizing statistical and computational sciences. The hub hosts microsatellites markers of pigeonpea, tomato, buffalo, goat and other agricultural commodities of global importance to help scientists for development of elite varieties and breeds. ASHOKA is a milestone facility fostering biotechnological research in the country



4.3.3 What are the institutional plans and strategies for deploying and upgrading the IT infrastructure and associated facilities?

Library is providing access of CD-ROM (Three International Databases-CABI, AGRIS, & Zoological Records) and one English language software i.e. GOLS. All the disciplines have computer-aided LCD projection facilities and some disciplines have smart classroom facilities.

4.3.4 Give details on access to on-line teaching and learning resources and other knowledge and information database/packages provided to the staff and students for quality teaching, learning and research.

In IARI Library Language lab with 30 computers, Interactive board, Projector is available. All the disciplines have a computer room facility for students. All the staff are provided with desk-top computer with internet connection and printer. All the staff and students are provided with free wi-fi connectivity in each discipline. Library Information Services (LIS - 501) One Credit course of P. G. School is conducted by IARI Library for Students so as to enable them to retrieve the information from International Databases and other Databases. This course of Library Information Services is computer aided.

4.3.5 What are the new technologies deployed by the university in enhancing student learning and evaluation during the last four years and how do they meet new / future challenges?

Initiatives have been taken for online teaching for the students of Afghanistan in ANASTU, Kandahar.

4.3.6 What are the IT facilities available to individual teachers for effective teaching and quality research?

Each division is equipped with classrooms with computer-aided LCD projection and interactive boards. All the faculties are provided with desktop computer with internet connection and printer. Most relevant journals are available online to the faculties through IARI Subscription. Institute is also in the process of developing high quality studio for online teaching to “reach the unreached”.

4.3.7 Give details of ICT-enabled classrooms/learning spaces available within the university? How are they utilized for enhancing the quality of teaching and learning?

Smart classroom facilities have been created in several Divisions and are being regularly used for teaching purpose.



4.3.8 How are the faculty assisted in preparing computer- aided teaching-learning materials? What are the facilities available in the university for such initiatives?

Institute encourages the faculty for the preparation of e-learning materials. Few e-manuals have been proposed. Institute is in the process of initiating Massive Open Online Courses (MOOC) for distant learning.

4.3.9 How are the computers and their accessories maintained?

The Institute has a separate Unit called as Agricultural Knowledge Management Unit (AKMU) to look after IT infrastructure and policy. AKMU looks after web-site of Institute and provides online sources for the conduct of examination etc.



4.3.10 Does the university avail of the National Knowledge Network connectivity? If so, what are the services availed of?

Access of full text articles is given through consortium of ICAR for 2300 online Journals of different foreign publishers, to users of IARI library.

4.3.11 Does the university avail of web resources such as Wikipedia, dictionary and other education enhancing resources? What are its policies in this regard?

Agricultural & Scientific Information is available through search engine, DOAJ (Directory of Open Access Journals) which can be accessed through IARI web page.

4.3.12 Provide details on the provision made in the annual budget for the update, deployment and maintenance of computers in the university.

2014-15: 47 lakhs; 2015-16: 50 lakhs

All the disciplines and Library gets funds through P.G. grant and budget under both plan and non-plan for repair and maintenance of the computers and other ICT facilities.

4.3.13 What plans have been envisioned for the gradual transfer of teaching and learning from closed university information network to open environment?

Publications which were published pre-1950 have been digitized under different projects C-DAC, Noida and e-Granth Project of NAIP (World Bank) which are available on webpage of "Digital Library of India" and web page of ICAR/IARI. The e-Granth was started from May 2009 with 12 Libraries of ICAR Institutes and SAUs' as consortia partners and IARI as the lead center. Under the project, 677 books were directly catalogued in WorldCat through Connexion Software of Online Computer Library Center (OCLC) which are accessible in WorldCat (catalogue of 71,000 libraries of the world). IARI Library is also selected to digitize important institutional repositories including old and rare publications and 37,09,163 pages were scanned during reported period. Two hundred ninety two publications were uploaded in Krishikosh. Quality check of PDF and metadata of 3019 publications consisting of total 5,78,470 pages were digitized under e-Granth Project of NAIP. Library plans to establish e-Library with a collection of e-Books / audio-video. A proposal already has been submitted for purchase 250 e-books.

4.4 Maintenance of Campus Facilities

4.4.1 Does the university have an estate office / designated officer for overseeing the maintenance of buildings, class-rooms and laboratories? If yes, mention a few campus specific initiatives undertaken to improve the physical ambience.

The Institute has sections of Estate & Protocol and Works, Maintenance & Engineering Unit (W & ME unit) which takes care of the maintenance of buildings, class-rooms and laboratories. During the past four years many class rooms and laboratories were renovated and modernized in each disciplines. Student hostels were also renovated.

The Farm Operation and Service Unit (FOSU) also modernized its implements and irrigation system to provide efficient and timely farm operation services required for the research work of students and faculties.

4.4.2 How are the infrastructure facilities, services and equipments maintained? Give details.

Works, Maintenance & Engineering Unit (W & ME unit) looks after the infrastructure facilities, resources etc. In each five year plan, the Institute receives significant amount of money to purchase modern equipments required for state of art research and teaching. Each discipline receives about five lakhs from the Institute (under plan and non-plan budget) for repair and maintenance of equipments. In addition, large number of external funded projects provide fund to purchase new equipments and maintenance of existing equipments. Most of civil works related maintenance requirement is taken care of by the W & ME unit of the IARI.

Any other information regarding Infrastructure and Learning Resources which the university would like to include: Nil



CRITERION V: STUDENT SUPPORT AND PROGRESSION

5.1 Student Mentoring and Support

5.1.1 Does the university have a system for student support and mentoring? If yes, what are its structural and functional characteristics?

Each student has an Advisory Committee which regularly monitor and guide the student in course and research works. The student based on his rank in merit list of admission selects a faculty as Chairperson of the Advisory Committee. The Chairperson and the student then select the members of the Advisory Committee depending upon the research requirements and minor fields of study. This committee is approved by Dean. Normally Advisory Committee meeting of each student is held once in a trimester to mentor and support the student in his/her course and research work. The student gets guidance from the chairperson almost on a daily basis once he/she starts research work.

Students are free to contact their mentor for academic guidance and any other study related problems. Besides, one Professor position is created in each discipline. Professor addresses student's academic issues which remain unresolved at mentor level.

5.1.2 Apart from classroom interaction, what are the provisions available for academic mentoring?

Apart from class room interaction, students interact with the lab groups adding to academic excellence in the subject. Also there are special lectures at Divisional or Institute level by reputed national and international scientists which support academic mentoring.

5.1.3 Does the university have any personal enhancement and development schemes such as career counselling, soft skill development, career-path-identification, and orientation to well-being for its students? Give details of such schemes.

The Institute is a centre of advance learning in the field of agriculture and each student specialises in a particular branch of agriculture science. The student thus joins the degree programme with a vision to his career. The institute however has a student placement cell which liaisons with private firms for job prospects to the students. Students are offered competitive opportunities to join Agricultural Research Service of the country. Avenues to serve as faculty in universities in India and abroad are also open to our students.

Beyond this the Institute offers 'Tutorial' classes in English as many students with rural background and foreign students from non-native English speaking countries. In order to develop the creative writing and oratory skills all the departments require students to present a written report (term papers) on the topics assigned for each course of study and give a brief oral presentation on the same. Two Seminars in M.Sc. and three in Ph.D are integral part of the course curriculum to impart oral communication skills to the students.

5.1.4 Does the university provide assistance to students for obtaining educational loans from banks and other financial institutions?

No. The Institute does not provide any assistance for educational loans as every student admitted in the Institute gets monthly fellowship and cheap hostel accommodation. Thus educational loan is not required for supporting the studies of the student.

5.1.5 Does the university publish its updated prospectus and handbook annually? If yes, what are the main issues / activities / information included / provided to students through these documents? Is there a provision for online access?

The admission process to the M.Sc. and Ph.D courses is through national level entrance examinations. The prospectus with information on seats, subjects, syllabus, discipline, academic requirements, fee structure, fellowship, awards and medals, hostels etc. is published every year along with the admission application form. The detailed information on every aspect is available on the IARI website (www.iari.res.in)



5.1.6 Specify the type and number of university scholarships / freships given to the students during the last four years. Was financial aid given to them on time? Give details (in a tabular form) for the following categories: UG/PG/M.Phil./Ph.D.

All the students admitted in the IARI will be awarded with the Institute fellowship. However, the students are free to avail fellowships from other sources ICAR, CSIR, UGC, DST, Rajeev Gandhi National Fellowship, etc.

The details of different fellowships awarded to IARI students

SNo.	Name of the Scholarship/ Fellowship	2011-12	2012-13	2013-14	2014-15
1.	ICAR - JRF	193	195	130	140
2.	ICAR - SRF	56	55	55	29
3.	UGC JRF/SRF	10	23	19	20
4.	CSIR JRF/SRF	57	27	33	23
5.	INSPIRE (DST, GOI)	87	104	85	74
6.	Rajiv Gandhi National Fellowship	39	28	60	64

*Rest all other students are granted IARI-JRF/SRF

5.1.7 What percentage of students receive financial assistance from state government, central government and other national agencies [Kishore Vaigyanik Protsahan Yojana (KVPY), SN Bose Fellow, etc.]?:

Nil

5.1.8 Does the university have an International Student Cell to attract foreign students and cater to their needs?

International students join the Institute through ICAR, under the Government of India Exchange programmes with world nations. The Institute does not admit the international student directly. An honorary "Foreign Students' Adviser" is nominated by the Dean to look after the special problems of foreign students including general advise regarding Post Graduate School procedures, and social and cultural life. A Hospitality Committee functions under the Chairmanship of the Foreign Students' Adviser to look after the comfort of foreign students.

5.1.9 Does the university provide assistance to students for obtaining educational loans from banks and other financial institutions?

No, the university does not provide any assistance for educational loans; however every student admitted gets a monthly fellowship and educational loans are not required. There is a student welfare fund to support students in case of emergency needs.

5.1.10 What types of support services are available for

Overseas students: Overseas students are provided furnished accommodation in the hostel. There is a position of international students advisor who can be approached for any difficulties faced by them. English is the medium of instruction. Course in English language is offered by the Institute and is open for all students including international students to register

Physically challenged / differently-abled students: Most of the Divisions have ramps to facilitate trouble-free movement. Other concessions as per government guidelines are available to the differently abled students. In entrance tests of the Institute relaxation of 5% in qualifying mark is provided.

SC/ST, OBC and economically weaker sections: For SC, ST, and OBC students seat reservation is as per the government of India guidelines. In admission entrance tests of the Institute relaxation of 5% in qualifying marks is provided to SC and ST students. A special cell (SC/ST/OBC Cell) is functional to facilitate their needs.

SC/ST observers are integral part of the interview admission committees. The institute is very sensitive to any complaints received from SC/ST students and has a strong redressal mechanism.



Students participating in various competitions/conferences in India and abroad: Students are encouraged to participate in various competitions/conferences. They are provided financial assistance for travel and registration from the contingency grants allocated to every student.

Health centre, health insurance etc: Institute has a medical dispensary where consultation and medicine for students is free. Routine test facilities are available. The institute supports reimbursement of emergency hospital billing at CGHS rates.

Skill development (spoken English, computer literacy, etc.): Any student can register for English classes for improving writing as well as speaking skills. Computer facilities are provided in each department as well as hostels for skill development.

Performance enhancement for slow learners: Teacher to student ration is very low in our system. Slow learners are invited separately by the mentors/faculty and provided with additional study material and guidance.

Exposure of students to other institutions of higher learning/ corporates/ business houses, etc.: Students have opportunities to visit other institutions under study tours. Also while attending seminars/ conferences/ symposia they also get a chance to interact with faculty of other institutions

Publication of student magazines: Post Graduate Student's Union publishes a Student's publishes a magazine annually. It is a collation of the literary thoughts of students and also the compilation of the different student activities held year around.

5.1.11 Does the university provide guidance and/or conduct coaching classes for students appearing for Civil Services, Defence Services, NET/SET and any other competitive examinations? If yes, what is the outcome?

No. The Institute doesn't provide any guidance or training/coaching for civil services or any competitive examination

5.1.12 Mention the policies of the university for enhancing student participation in sports and extracurricular activities through strategies / schemes such as additional academic support and academic flexibility in examinations, special dietary requirements, sports uniform and materials and any other (please specify)

IARI is a flagship institution of agricultural research and teaching. One of the main mandates of the institute is to develop human resource for agricultural research and teaching at par with the world. The Institute supports the students to participate in Inter-University sports and cultural events by bearing all the cost incurred for registration, boarding and lodging of the team members. Attendance relaxation for the participating team members is also provided.

5.1.13 Does the university have an institutionalized mechanism for students' placement? What are the services provided to help students identify job opportunities, prepare themselves for interview, and develop entrepreneurship skills?

IARI has a placement cell with the following objectives.

- Identify interests of students for placement in MNCs, R&Ds, Govt. Sectors etc.
- To develop rapport and contacts with HRD groups of various organizations
- To bring together the above parties into a same platform

Any demand from the prospective employers is circulated for information to the students. As such no campus recruitment is held.

5.1.14 Give the number of students selected during campus interviews by different employers (list the employers and the number of companies who visited the campus during the last four years).

As such no campus recruitment camps are held as most of our students get absorbed in Agricultural Research Service or Universities as scientists/faculties even before completion of their Ph.D degree programs.



5.1.15 Does the university have a registered Alumni Association? If yes, what are its activities and contributions to the development of the university?

IARI has a registered Alumni Association (Regd. No. S/23621/1992). The alumni meet is held annually and is a platform for exchanging ideas between the new and old alumnus. Also, it occasionally organises symposia/meetings with an objective to serve the Institute. The alumnus can register himself/herself online using the link provided at IARI website.

5.1.16 Does the university have a student grievance redressal cell? Give details of the nature of grievances reported. How were they redressed?

Institute grievance committee also handles the student matters. Rarely issues have reached the grievance committee as most of the issues are settled at the Professor or Dean level.

5.1.17 Does the university promote a gender-sensitive environment by (i) conducting gender related programmes (ii) establishing cell and mechanism to deal with issues related to sexual harassment? Give details.

Institute has Women Cell for Complaints related to sexual harassment. Students can also file their grievance if any to this cell. Upon receipt of the grievance, the Cell will take all necessary measures to provide immediate relief to aggrieved women, conduct a preliminary inquiry of the incident and suggest appropriate punitive and corrective measures to be taken by the University. The Cell shall *suo moto* take cognizance of any activity that contains a potential threat to the safety, security and dignity of women and take/recommend measures to mitigate and overcome the threat. The Cell shall also suggest measures to improve the safety and security measures in the Institute especially with respect to women employees and students.

5.1.18 Is there an anti-ragging committee? How many instances, if any, have been reported during the last four years and what action has been taken in these cases?

IARI is a no ragging institution since inception. There is an anti-ragging committee to look into any case of ragging if reported. Students can file their complaints to the Dean or MOHR w.r.t. ragging. No case of ragging has been reported so far.

5.1.19 How does the university elicit the cooperation of all its stakeholders to ensure the overall development of its students?

The Institute takes regular feedbacks from the students regarding teaching by faculty. Decisions of the Academic Council are implemented to improve and strengthen the teaching programs. Suggestions of the alumni also help guide overall development of the students and academics at the Institute.

5.1.20 How does the university ensure the participation of women students in intra- and inter-institutional sports competitions and cultural activities? Provide details of sports and cultural activities where such efforts were made.

IARI is an equal opportunity institution. Women students have been provided with gym and other sports facilities in their own hostels. Participation of women in literary and cultural is good but is less in sports.

5.2 Student Progression

5.2.1 What is the student strength of the university for the current academic year? Analyse the Programme-wise data and provide the trends for the last four years.

The current strength of students of the Institute is given in the following table:

Programme-wise data and provide the trends

Student Progression	% average for the last four years
PG to Ph.D.	~95%
Ph.D. to Post-Doctoral	Not applicable
Employed	>90 % of the students who have completed their Ph.D. programme have been employed as Scientists in ICAR through Agricultural Research Service (ARS), and faculty in SAUs and other universities.
Campus selection	
Other than campus recruitment	

5.2.2 What is the programme-wise completion rate during the time span stipulated by the university?

All the teaching programmes are completed within the prescribed time-schedule and there is no extension of session in any course.

5.2.3 What is the number and percentage of students who appeared/ qualified in examinations like UGC-CSIR-NET, UGC-NET, SLET, ATE / CAT / GRE / TOFEL / GMAT / Central / State services, Defence, Civil Services, etc.?

The University does not maintain record of students appearing/qualifying in NET/ GATE/ CAT/GRE etc. In most of the cases students attempt these examinations after completion of their Post Graduate courses and at present there is no mechanism to get information on these aspects. The majority of the students join Agricultural Research Service of the ICAR as scientists. During the past four years more than 200 students from IARI have joined ARS.

5.2.4 Provide category-wise details regarding the number of Ph.D./ D.Litt./D.Sc. theses submitted/ accepted/ resubmitted/ rejected in the last four years.

All the thesis submitted by the students of IARI have been accepted during the past four years.

5.3 Student Participation and Activities

5.3.1 List the range of sports, cultural and extracurricular activities available to students. Furnish the programme calendar and provide details of students' participation.

Sports and Games: Athletics (Men & Women), Badminton (Men & Women), Basketball (Men & Women), Chess (M & W), Cricket (Men), Football (Men), Handball (Women), Kabaddi (Men), Kho-Kho (Men & Women), Wt. Lifting & Best Physique (Men), Table-Tennis (Men & Women), Volleyball (Men & Women)



Cultural: A two day cultural event is organised in the Institute every year. The best performers are selected to represent IARI in the Inter-Agri-University Youth festival usually organised at NDRI, Karnal. Students get a chance of holistic development by participating in the other extracurricular activities like: Essay, Debate, Clay Modelling, Rangoli, etc. competitions. MOHR office supports the PGSSU in organizing these activities.

5.3.2 Give details of the achievements of students in co-curricular, extracurricular and cultural activities at different levels: University / State / Zonal / National / International, etc. during the last four years.

Reverie 2014, NDRI, Karnal: A team of twenty five students represented IARI for the 19th All India Inter University Youth Festival “Reverie 2014” organized by NDRI, Karnal from 24th to 26th April, 2014.



The IARI team lifted the winner trophy for events including quiz, fashion show, duet song, story writing (Hindi and English), mehendi and runner up trophy for events like poster making, painting, group song and antakshari.

5.3.3 Does the university conduct special drives / campaigns for students to promote heritage consciousness?

The Institute has not conducted any special drive for promoting heritage consciousness.

5.3.4 How does the university involve and encourage its students to publish materials like catalogues, wall magazines, college magazine, and other material? List the major publications/ materials brought out by the students during the last four academic sessions.

The Literary committee of the PGSSU invites articles, poems, photographs etc. from the student community for publication in the Annual Magazine. In the last two years, magazines Pankhudi and Ankur have been published.

5.3.5 Does the university have a Student Council or any other similar body? Give details on its constitution, activities and funding.

The Institute doesn't have a body by the name of Student Council, but its role is taken up by the Students' Union called the "**The Post-Graduate School Students Union (PGSSU)**" after the name of the institution, the Post-Graduate School of the Indian Agricultural Research Institute, New Delhi. The Union is run by the students and for the students.

The following are the aims and objectives of the PGSSU

- To inculcate a spirit of fellow feeling and a mutual contact among the members.
- To promote the social and cultural welfare of the members and to raise the tempo of athletic activities in the Post-Graduate School.
- To encourage the intellectual development of the members.
- To arouse among the members a spirit of social service.
- To provide an opportunity to the members to train themselves in the art of self-government and group leadership.
- To promote the consciousness of the members regarding the aims and working of various national and international student organization and
- To represent the Post-Graduate School students' body on the national as well as intellectual plane.
- To find out immediate solution for all such problems as may jeopardize the common interest of the members by meeting, discussions and making suggestions, if necessary, to the concerned authorities.
- To promote the establishment of close relations between the students and the members of teaching staff of the Post-Graduate School. To maintain contacts with the ex-alumni of the Post-Graduate School and Associates of the I.A.R.I., New Delhi.

The funding for the students PGSSU and cultural, sports, magazine and other activities is by the students and matching grant by the institution.

5.3.6 Give details of various academic and administrative bodies that have student representatives on them. Also provide details of their activities.

- Student representatives are members in the following academic and administrative bodies:
- The Academic Council
- Standing committee on faculty and discipline
- Standing committee on scholarship, financial assistance and academic progress



- Standing committee on students' problems and discipline, welfare, board and residences
- Board of Studies
- Library Advisory Committee

The Academic Council: The Academic Council is the main consultative, deliberative and task implementing body in the fields of education and training. It is responsible for broad policy matters on academic issues without dealing with individual cases. The Academic Council is responsible for the maintenance of standards of instruction, education and examination within the Post Graduate School and exercises such other powers and duties as are conferred on it. The Academic Council is responsible for the determination of equivalence of degrees of candidates applying for admission from other universities and is the final authority to make selection out of the applicants for admission. Director, IARI is the Chairman of the Council. PGSSU President and an elected academic council student are members of the Academic Council. They represent the student's point of view w.r.t. academic matters taken up for discussion. Term of student representatives is one year. The details of the constitution, members and powers are discussed in the previous sections. The other committees that support academic council and academic activities are discussed below:

Standing committee on faculty and discipline: The Standing committee on faculty and discipline formulates guidelines regarding administration of faculty members, their duties, and obligations, and other related faculty matters. Also it deals with representations from individual faculty members regarding allotment of students, constitution of Advisory Committee, teaching of courses, representation in Board of Studies, and grant of laboratory and other facilities. PGSSU President is a member of the committee to present the students issues relating to above mentioned subjects.

Standing committee on scholarship, financial assistance and academic progress: This committee has a mandate for making procedures for reviewing the academic progress of students. Also looks into individual cases of students regarding extension of time limit for submission of thesis and cases of poor academic performance. It is also responsible for formulation of terms and conditions for the award of various scholarships and fellowships and procedure for assistance from Students' Welfare Fund. PGSSU President is a member of the committee to present the students issues relating to above mentioned subjects.

Standing committee on students' problems and discipline, welfare, board and residences: This committee deals with representations from students regarding the constitution of Advisory Committee, dropping/adding of courses, relief from Post Graduate School, maximum period of absence on leave, and removal of names from the rolls of Post Graduate School, etc. Other issues which fall in the purview of committee are: Use of the Institute's facilities in terms of equipment, chemicals, etc. by the students, Cases relating to students' discipline, amenities in the hostel including food services, Organisation of co-curricular and extra-curricular activities, Rules regarding hostels, including guests, overstay etc., Placement of students for employment. PGSSU President, an elected lady students' representative from PGSSU, EC Member, and an elected students' representative in the Academic Council are the student representatives in this committee.

Board of Studies: Each Discipline has a, 'Board of Studies' committee which has the responsibility of reviewing the instructional programme of the discipline concerned in respect of each trimester, preparing recommendations for revision, addition or deletion of courses, organisation of the teaching of courses in each trimester in the discipline concerned and considering all matters relating to improvement and conduct of Post Graduate School. One Ph.D. third year student serves as student representative to this Committee. The term is one year.

Library Advisory Committee: The Committee has advisory role in the functioning of library and recommends purchase of books and subscription of research journals. PGSSU President is a member of the committee to present the students requirement and issues relating to library. The term of the student representative is of one year.



CRITERION VI: GOVERNANCE, LEADERSHIP AND MANAGEMENT

6.1 Institutional Vision and Leadership

6.1.1 State the Vision and the Mission of the University

Vision of IARI is to provide leadership for “*Science-led sustainable and globally competitive agriculture for food, nutrition and livelihood security*”.

The mission of IARI is as follows:

To explore new frontiers of science, to develop human resources and policy guidelines for creating a vibrant, responsive and resilient agriculture”.

In order to accomplish this mission, the Institute has been given the following mandates (www.iari.res.in):

1. To conduct basic and strategic research with a view to understand the processes, in all their complexity, and to undertake need-based research, leading to crop improvement and sustained agricultural productivity in harmony with the environment.
2. To serve as a centre for academic excellence in the area of post-graduate education and human resources development in agricultural sciences.
3. To provide national leadership in agricultural research, extension, and technology assessment and transfer by developing new concepts and approaches and serving as a national referral point for quality and standards.
4. To develop information systems, add value to information and serve as a national agricultural library and database.

6.1.2 Does the mission statement define the institution’s distinctive characteristics in terms of addressing the needs of the society, the students it seeks to serve, the institution’s tradition and value orientations, its vision for the future, etc.?

Yes. The IARI is the country’s premier national Institute for agricultural research, education and extension. It has served the country by developing appropriate technologies through basic, strategic and need-based research resulting in crop improvement and agricultural productivity in harmony with the environment leading to the Green Revolution and continues to contribute significantly to the Nation’s agricultural growth. IARI served as a centre for academic excellence in the area of postgraduate education and human resource development in agricultural sciences. The institute continues to fulfil its mandate to make Indian agriculture locally, regionally and globally competitive.

6.1.3 How is the leadership involved

The administrative and technical head of IARI is its Director. The Board of Management with the Director as its chairman, served by four Councils, namely, Research Advisory Council, Academic Council, Extension Council and Executive Council, provides the overall management direction. The Director is assisted by four Joint Directors i.e., Joint Director (Research), Joint Director (Education) & Dean, Joint Director (Extension) and Joint Director (Administration). The Joint Director (Administration) looks after the day-to-day administrative work. The leadership is actively involved in the above mentioned aspects through various decision-making bodies of the Institute, formal and informal meetings and discussions with the faculty and students and regular visits to the fields and labs of various disciplines. In ensuring the organization’s management system development in the following key activities:

- Implementation and continuous improvement
- Interaction with its stakeholders
- Reinforcing a culture of excellence
- Identifying organizational needs and striving to fulfill them



6.1.4 Were any of the top leadership positions of the university vacant for more than a year? If so, state the reasons

No

6.1.5 Does the university ensure that all positions in its various statutory bodies are filled and meetings conducted regularly?

Yes. The details of these statutory bodies, constitution, membership and function are discussed in the previous section 3.1.

Academic Council Board of Management Extension Council Research Advisory Committee Institute Research Council General Council	As per set guidelines, meetings are held regularly.
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6.1.6 Does the university promote a culture of participative management? If yes, indicate the levels of participative management

As a formal institutionalized system, the institute has the bodies like Academic Council, Executive Council and General Council which have representatives from the profession and industry, alumni, MHRD, professional bodies, faculty and students.

Many of the activities of the Institute are shared by the management with the faculty for information as well as comments. Meetings of the Heads of the Departments and Professors are held regularly. Each Department also regularly conducts faculty meetings. Board of Studies (BOS) meetings are conducted regularly at least once in a trimester. As explained earlier, selected faculties and one student representative are members of BOS. In general, the management is easily available to faculty and students to discuss problems, issues or any other aspects as and when required.

6.1.7 Give details of the academic and administrative leadership provided by the university to its affiliated colleges and the support and encouragement given to them to become autonomous

Not Applicable as no other colleges are affiliated.

6.1.8 Have any provisions been incorporated or introduced in the University Act and Statutes to provide for conferment of degrees by autonomous colleges?

IARI is 'Deemed-to-be-University' since 1958 under UGC 1956 Act and is authorized to award post graduate degree of M.Sc./M.Tech. and Ph.D in the field of Agricultural sciences.

6.1.9 How does the university groom leadership at various levels? Give details

Faculty is involved in various committees of the Institute. Faculty is also responsible for the estate management, hostels and students' activities. In each division, there is a nominated professor who is responsible for all the student related issues in the division. Each professor is assisted by a number of course leaders. The course leaders are entrusted with the responsibilities for facilitating the particular course related arrangements. The academic activities of each discipline are monitored and guided by Board of Studies where Professor is Chairperson, and selected faculties and one student representative are members. Similarly each discipline has a Divisional Budget and Research Committee (DBRC) with Head of the Division as Chairperson, and some selected Faculties as members. DBRC helps the Head of the Division in research and budget management of the Division. Principal Investigators of various externally funded projects are given full autonomy in their project management (recruitment of project staff procurement, etc). Thus, a large fraction of the faculties are involved in various decision making processes and thus enable them to develop leadership skills.



6.1.10 Has the university evolved a knowledge management strategy? If yes, give details.

Yes, The Institute has established a Unit named “*Agricultural Knowledge Management Unit*” for this purpose.

6.1.11 How the following values are reflected in the functioning of the university?

Contributing to the national development: The Institute has developed and transferred several agrotechnologies that have enhanced farm profit, agricultural production and nutritional security. It is continuing its leadership role in agricultural research, education and extension,

Fostering global competencies among students: The Institute provided globally competent education to the students and helps develop expertise in the emerging fields of research and development. Most of its faculties have post-doctoral research experience and joint exchange programmes inviting international experts for lectures and discussions.

Inculcating a sound value system among students: The Institute provides a healthy working environment for students and teachers, and also promotes use of technology through the introduction of new technological tools. Hard work and perseverance are core values of our students and faculty.

Quest for excellence: Faculty and the students are always striving for excellence through their teaching, research and studies.

6.2 Strategy Development and Deployment

6.2.1 Does the university have a perspective plan for development? If yes, what aspects are considered in the development of policies and strategies?

The Institute has been the flagship of India’s agricultural research and technology development. It functions on the premise that research is the engine of science-led agricultural growth. The perspective plan sets IARI’s path of scientific research, technology development and extension and human resource development leading to the realization of new paradigms for achieving the congruence among enhanced productivity, sustainability, ecological and environmental security and socio-economic equity.

Vision and mission

The Institute, over the past 110 years, had responded most dynamically to the needs, challenges and opportunities of Indian agriculture and adjusted its mandate, plans and programmes accordingly to deliver agrotechnologies and human resource for meeting the demands of the Nation. The mission of the Institute is to explore new frontiers of science and knowledge, and to develop human resources and policy guidance to create a vibrant, responsive and resilient agriculture. In order to realize this mission, the Institute has the mandate to conduct basic and strategic research and to undertake need based research that leads to crop improvement and sustained agricultural productivity; to serve as a centre for academic excellence; and to provide leadership in its various activities. The vision of the Institute is to steer the policies, strategies, priorities, programmes and activities of IARI to meet the emerging challenges and opportunities and to maintain its leadership role.

Teaching and learning

The Post Graduate School of IARI continues to spearhead the development of trained manpower required for agriculture research, education, extension and entrepreneurship in the country. So far, the Institute has been concentrating on developing the manpower to meet the national demands in all the major disciplines of agricultural sciences. Now that the country has developed a much stronger base for higher education in agriculture at the SAUs and deemed universities which are also playing an important role in human resource development, IARI has a good opportunity to concentrate on the development of trained manpower in frontier areas of agricultural sciences through introduction of new courses and disciplines.

Research and Development

To realize the mission laid down by the Institute, i.e., to explore new frontiers of science and knowledge, to develop human resources and policy guidance to create a vibrant, responsive and resilient agriculture, the mandate of the Institute is as follows:



- To conduct basic and strategic research with a view to understanding the processes, in all their complexity, and to undertake need-based research that leads to crop improvement and sustained agricultural productivity in harmony with the environment
- To serve as a centre for academic excellence in the area of post-graduate education and human resources development in agricultural sciences
- To provide national leadership in agricultural research, extension, and technology assessment and transfer by developing new concepts and approaches and serving as a national referral point for quality and standards
- To develop information systems, add value to information, share the information nationally and internationally, and serve as a national agricultural library and database.

Presently the research, education, and extension activities of the Institute are carried out through a network of 20 discipline-based divisions, 2 multidisciplinary centres, 8 regional stations, 2 off season nurseries, 10 centres of AICRP and a common set of service units. The Institute also serves as the headquarters of 3 All India Coordinated Research Projects. In addition, National Research Centre on Plant Biotechnology, NCIPM, Directorate of Maize Research, IASRI and NBPGR are located in the campus, and participate in the teaching programme of the Institute.

The Institute is moving upstream with an increased thrust on strategic and basic researches which will not only keep enriching the stream of scientific knowledge, technology generation and product development, but would also enhance the nation's competitiveness in this age of scientific revolution. IARI has strengthened its existing key areas of research and education and barged into newer frontier areas such as molecular biology and biotechnology, genetic engineering, phenomics and genomics aided crop improvement, nanotechnology, novel agrochemicals, biologicals, nutraceuticals, precision and organic farming and biofuels and others. While crop improvement and breeding will continue to be its major mandate, the thrust is being shifted to new strategic areas. The Institute provides leadership in environmental related new and emerging areas such as climate change, impact of CO₂ enrichment on crop productivity, greenhouse gas emission from different crops and cropping systems, development of technologies to mitigate emission of greenhouse gases and development of technologies for climate resilient agriculture.

Human Resource Planning and Development

IARI rightly deserves the sobriquet “Mother Institute” as its *alumni* form the backbone of teaching, research and research management of agriculture in the country. The contribution of IARI towards human resources development for the national and international agricultural research and education systems is unparalleled.

The Institute plays a key role in training manpower for the expanding agricultural extension system in the states, especially in agricultural universities. It has effectively demonstrated the relevance of new technologies and designed new extension strategies for technology dissemination. In the process, it has also provided valuable scientific feed-back to the scientists. The infrastructural facilities which have been developed at IARI during the recent years provide ideal conditions for advanced level trainings in the frontier areas like crop biotechnology, phenomics, post-harvest technology, integrated soil and nutrient management, integrated pest management, environment management, water management, application of nuclear science in agricultural research, eco-friendly technologies, agricultural management, economic assessment, etc. New ‘breed’ of human resources would be needed to deal with IPR and bio-safety issues and the uncommon opportunities arising from biotechnological and information system revolutions.

The IARI Library, playing the role of National Agricultural Library of India, maintains the tempo of its growth and development with a collection of 6.0 lakh publications—books, monographs, scientific journals, research bulletins, theses and electronic data bases, etc. It serves 2000 registered members of its own besides serving 8000 research scholars visiting the Library and availing photocopying, bibliographic and electronic literature services.



Community Engagement

The changing socio-economic scenario also calls for stimulation and support of micro-enterprises with greater focus on rural entrepreneurship development through agribusiness extension system with sound farmer-advisory services based on demand driven technologies. Local self-government in the form of Panchayati Raj institutions is expected to play an important role in promoting and transferring suitable technologies at village level and generating effective linkages with various development agencies. Inter-sectoral micro-level planning for rural development involving different sectors like forestry, environment, irrigation, agro-industry, health and education will become a necessity for synergizing their collective output. Women empowerment through capacity building programmes will also have to be developed to ensure livelihood security.

Internationalization

At the international level, the Institute has close linkages with several of the CGIAR's international agricultural research centres (IARCs), more particularly with ICRISAT, CIMMYT, IRRI, IFPRI, INSAR, IIMI, ICARDA and IPGRI and CABI. Among other international organizations, FAO, IAEA, USAID, UNDP, WMO, UNIDO (through ICGEB) and UNEP have been the closest allies. Several bilateral research linkages involving developed and developing countries exist. These include linkages with USDA, selected universities in USA, Rockefeller Foundation, European Commission, ODA, DANIDA, IDRC, SIDA, JAICA, JIRC, CSIRO, ACIAR, MASHAV (Israel), IRRDB, AVRDC, (Taiwan), PPIC, etc.

The PG School should be able to generate substantial resources through enhanced enrolment of foreign and NRI-sponsored students. On the lines of the universities, the Institute will need some flexibility in the ICAR rules and guidelines in sourcing such additional funds. The capacity of the Institute will further be strengthened to prepare projects capable of attracting funding from international sources, both multilateral and bilateral, such as the World Bank, UNDP/FAO, other UN agencies, CGIAR (mostly through joint and partnership activities), consortia, ACIAR, JAICA, JIRCA and the European Commission.

Industry Interaction

The researches carried out at IARI have generated an environment for industrialization and exports. For example, Pusa Basmati 1 has led to the modernization of rice mills and exports. The horticultural crops, through increased production, have induced a growth in the processing industry and exports of value added products. The private agro-chemical industries got a boost from the indigenous technologies for pesticides and agro-chemicals developed at the Institute for commercial adoption.

The Institute has established a Business Development Cell for looking after the commercialization of IARI technologies, IPR issues, filing of patents, etc. Some of the successful technologies, processes, etc., generated and commercialized are listed as follows: Neem based pesticide formulations; Additives for improved photo stability of Azadirachtin-A; Greenhouse environment management and protection system; Micro controller for greenhouse environment control; Animal feed block formation machine; Vegetable and fruit grader; Rock phosphate enriched biogas slurry; Pusa zero energy cool chamber; Diagnostics for viruses.

6.2.2 Describe the university's internal organizational structure and decision making processes and their effectiveness.

The administrative and technical head of IARI is its Director. The Board of Management, with the Director as its chairman, served by four councils, namely, Research Advisory Committee, Academic Council, Extension Council and Executive Council, provides the overall management direction. The Director is assisted by a Joint Director (Research), a Dean & Joint Director (Education) and a Joint Director (Extension), who is equivalent to the Directors of ICAR institutes, which are not deemed universities. Joint Director (Administration) looks after the day-to-day administrative work. The Comptroller has the overall charge of the audit and accounts matters. Presently, the research, education, and extension



activities of the Institute are carried out through a network of 20 discipline-based divisions, 2 multidisciplinary centres, 8 regional stations, 2 off-season nurseries, 10 centres of AICRP and a common set of service units. The Institute also serves as the headquarters of 3 All India Coordinated Research Projects.

The Institute has a total sanctioned strength of 3,221 comprising 598 scientific, 530 administrative, 730 technical and 1,363 supporting staff.

6.2.3 Does the university have a formal policy to ensure quality? How is it designed, driven, deployed and reviewed? No formal policy is in vogue.

6.2.4 Does the university encourage its academic departments to function independently and autonomously and how does it ensure accountability?

Yes. IARI encourages all its academic departments to function independently. However, to ensure accountability, some of the critical decisions on academics are made through Dean and Director to ensure coordination and accountability.

6.2.5 During the last four years, have there been any instances of court cases filed by and against the institute? What were the critical issues and verdicts of the courts on these issues?

No

6.2.6 How does the university ensure that grievances or complaints are promptly attended to and resolved effectively? Is there a mechanism to analyze the nature of grievances for promoting better stakeholder- relationship?

The institute has a Vigilance Section as well as a Grievance Committee for redressal of the grievances.

6.2.7 Does the university have a mechanism for analyzing student feedback on institutional performance? If yes, what was the institutional response?

Student feedback system is prevailing. Institutional response is to implement the positive and effective points.

6.2.8 Does the university conduct performance audit of the various departments?:

No

6.2.9 What mechanisms have been evolved by the university to identify the developmental needs of its affiliated institutions?

Not Applicable

6.2.10 Does the university have a vibrant College Development Council (CDC) or Board of College and University Development (BCUD)? If yes, detail its structure, functions and achievements.

No. However, Institute has Board of Management (BoM) Committee in place (for details: see Section 3.1.1).

6.3 Faculty Empowerment Strategies

6.3.1 What efforts have been made to enhance the professional development of teaching and non-teaching staff?

Faculty development programme is a regular activity under Institute HRD. Faculty members can undergo 6 month training in any premier national institute of their choice. The faculty of the Institute also avail various fellowships to undergo short term and long term international trainings. The Institute also proposes to develop a band of scientists trained in international agriculture and also to make them familiar with IPR/PBR regimes, various international conventions and their implications so that they become a major resource for international agriculture development. Technical staffs are trained regularly for skill enhancement. Administrative staffs were also given need based trainings on e-administration.



6.3.2 What is the outcome of the review of various appraisal methods used by the university? List the important decisions.

Yet to be identified

6.3.3 What are the welfare schemes available for teaching and non-teaching staff?

For teaching staff, Faculty Club is functional. Recreation Club caters to the welfare needs of the non-teaching staff. In addition, baby care centres and crèches are also available. All the staffs are provided with CGHS card for their health care. The Institute's dispensary is freely accessible to all staff and students for regular medical needs.

6.3.4 What percentage of staff have benefitted from these schemes in the last four years? Give details.

All faculty and staff benefit from these schemes, if they are eligible according to the parameters of a scheme.

6.3.5 What are the measures taken by the university for attracting and retaining eminent faculty?

IARI has eminent position in the field of agriculture research, education and extension in India. Most of the professionals are keen to join the institute. There is no problem in retaining the faculty. Provision of institutional consultancy is an added incentive for the faculty. Different awards have been instituted for faculty. Best Teacher award is definitely a source of motivation for the faculty. Posts of Adjunct professor and faculty have been created for getting distinguished scientists in their respective fields.

6.3.6 Has the university conducted a gender audit during the last four years? If yes, mention a few salient findings.

No

6.3.7 Does the university conduct any gender sensitization programmes for its faculty?

No

6.3.8 What is the impact of the University's Academic Staff College Programmes in enhancing the competencies of the university faculty?

The Institute has no academic staff college programmes of its own. However, all the faculties are getting a 3 months training at ICAR-National Academy of Agricultural Research Management (NAARM), Hyderabad. Senior level faculty have also been sent for short term training at NAARM. These programmes help enhance the competencies of faculties.

6.4 Financial Management and Resource Mobilization

6.4.1. What is the Institutional mechanism available to monitor the effective and efficient use of financial resources?

The Institute has strong in-built mechanism to monitor the effective and efficient use of financial resources. The budgetary allocation is made both under Plan and Non-Plan grant of financial year to various Divisions/Regional Stations/Sections/Units. The expenditure against each heads and sub-heads is monitored through Financial Management System – ERP. The Non-Plan grant is also commensurate with the revenue receipts earned by Institute during the financial year.

The ICAR has delegated powers to the Director of the Institute for certain re-appropriation within the sub-heads. Similarly, there are certain ceiling based expenditure like refreshments, honoraria etc. There is also a body of BoM (Board of Management) in the Institute which ensures that the powers which are beyond the Director's delegated power are scrutinized and recommended to ICAR headquarters for the sanction of next higher authority i.e. Director General, ICAR and Secretary, DARE. Additional Secretary, DARE and Finance Adviser, ICAR is also the member of BoM.



Director has further delegated the financial powers to Joint Directors and Heads of the Divisions and Officers I/c of various Units. The Finance Section of Institute is headed by Comptroller who is entrusted with proper budgetary monitoring.

The Council also sets the target of resource generation/revenue receipts to Institute/Deemed University every year on the basis of its evaluation of Institute's resources base and potential. Apart from generation of revenue receipts, the Institute/Deemed University also generates "Surplus Fund" through Professional Service Fee and income from intellectual property management and commercialization of Transfer of Technology.

6.4.2. Does the university have a mechanism for internal and external audit? Give details.

The Institute/Deemed university has sound mechanism of Three Tier Audit viz. External Audit through the Office of Director General of Audit, Central Expenditure (C&AG), Internal Inspection through designated through designated CA firm of ICAR headquarter and Internal Audit through Internal Audit Section of Finance Wing of IARI.

6.4.3. Have the accounts been audited regularly? What were the audit objections, if any, and how were they complied with?

Yes, the Annual Accounts of the Institute are prepared by the Finance Wing of the Institute and Office of DGACE each year audits and the Accounts of Institute.

The audit objections are meticulously settled by the concerned Divisions and Sections. Comptroller of Institute/Deemed University liases the external audit with the concerned Divisions and Sections of the Institute/Deemed University. There is a sound mechanism of settlement of Audit Paras through Audit Review Committee of Council.

6.4.4. Provide the audited income and expenditure statement of academic and administrative activities of the last four years

The audited Balance Sheet, Income and Expenditure statements and Receipt and Payment accounts of the last four years have been submitted to ICAR headquarters & the same have been accepted.

6.4.5. Narrate the efforts taken by the University for Resource Mobilization.

The Institute under the Crop Science subject matter division is a constituent unit of ICAR. The Institute is fully funded by Plan and Non-Plan grant of Govt. of India. The faculty also bring large number of external funded project in which 5-15% of recurring budget is given as Institutional charges. Further, substantial income is also generated through its revenue resources especially through Professional Service fee and income through commercialization of technology of intellectual property management.

6.4.6. Is there any provision for the university to create a corpus fund? If yes, give details.

There is no provision for corpus fund.

6.5 Internal Quality Assurance System

6.5.1 Does the university conduct an academic audit of its departments? If yes, give details.

It can be stated that there is an Implicit Academic Audit. Academic audit of the Institute is a continuous process where the performances of the divisions are discussed in the meetings of the Institute Research Council and Research Advisory Committee. During the convocation week, experts are called to evaluate the professors' presentations on faculty and student achievements. At the faculty level, there are meetings of the Board of Studies represented by all the Departments. Students' feedback is also taken into account. Therefore, there are sufficient checks available for academic evaluation of the operations of the divisions.

6.5.2 Based on the recommendations of the academic audit, what specific measures have been taken by the university to improve teaching, learning and evaluation?

Suitable measures/actions are taken by the Institute to implement the recommendations.



6.5.3 Is there a central body within the university to continuously review the teaching learning processes? Give details of its structure, methodologies of operations and outcome?

Academic Council, being the Apex Statutory Body, along with its Standing Committees and Board of Studies in respective disciplines periodically reviews academic progress, while research and academic progresses are reviewed by Institute Research Council (IRC) and Research Advisory Committee (RAC).

6.5.4 How has IQAC contributed to institutionalizing quality assurance strategies and processes?

Prioritization, Monitoring and Evaluation Cell (PME Cell) looks after the responsibilities of coordinating and monitoring of research activities of the Institute including annual presentation of scientific work by the concerned scientist before the IRC/RAC.

6.5.5 How many decisions of the IQAC have been placed before the statutory authorities of the University for Implementation?

The recommendations of the Research Advisory Committee (RAC) are put up to ICAR for approval and the suggestions are used for refinement of the research projects.

6.5.6 Does the IQAC have external members on its committees? If so, mention any significant contribution made by such members.

An outside expert in the field of Agricultural Research chairs the presentations during Research Advisory Committee (RAC) meeting. The composition, duties and functioning are discussed in Section 3.1.1.

6.5.7 Has the IQAC conducted any study on the incremental academic growth of students from disadvantaged sections of society?

The recommendations of the RAC and /academic council are put up to ICAR for approval and the suggestions are used for refinement of the research projects. However, the institute is contemplating to constitute an empowered cell to monitor and evaluate the post graduate courses and thus suggest corrective measures, wherever necessary.

6.5.8 What policies are in place for the periodic review of administrative and academic departments, subject areas, research centres, etc.?

Periodic review is conducted three times in a year by Academic Council, once in a year by RAC, IRC and Extension Council.

Any other information regarding Governance, Leadership and Management which the university would like to include: Nil



CRITERIA VII: INNOVATIONS AND BEST PRACTICES

7.1 Environment Consciousness

7.1.1 Does the university conduct a Green Audit of its campus?

No stringent Green audit is being conducted. However, it has been initiated with the following steps:

- Biomass utilization unit has been set up to utilize the leaf fall from the rice vegetation and crop residues of the Institute to develop compost.
- Swach Bharat Mission of Govt of India is being sincerely followed.

7.1.2 What are the initiatives taken by the university to make the campus eco-friendly?

- Energy conservation: Solar panels have been installed in hostels.
- Use of renewable energy: The Institute is using LED, CFL, star-rated power equipments, etc. which consume lesser electricity *vis-a-vis* illumination and result in lesser energy utilization.
- Water harvesting and ground water recharge: The institute has constructed sufficient number of water harvesting tanks and ground water recharge structures.
- Development of novel environmentally sustainable de-centralized wastewater treatment technologies with low CAPEX/ OPEX.
- Efforts for Carbon neutrality
- Plantation: Institute can boast of huge green surroundings.
- Hazardous waste management: Taken care of by Radiological safety office and Institute Biosafety Committee
- E-waste management: The Institute has firm commitments to dispose of e-waste and other such hazardous materials in proper prescribed fashion.

7.2 Innovations

7.2.1 Give details of innovations introduced during the last four years which have created a positive impact on the functioning of the university.

Given the thrust on interdisciplinary research and technology development and matrix mode of management, more related Divisions/Centres/Directorates were grouped under one School. Accordingly, the 20 divisions, 2 multi-disciplinary centres, 8 Regional Research Stations and 2 Off-season Nurseries, 3 all India coordinated research projects with headquarters at IARI, and a common set of service units, have been grouped in six Schools.

7.3 Best Practices

7.3.1 Give details of any two best practices which have contributed to better academic and administrative functioning of the university.

Format for Presentation of Best Practices

1. Title of the Practice

- *Academic best practice*

All round Personal Leadership development for students

Introduction of non-academic subjects like Ethics, Communication, IPR issues and English language for beginners.

A new set of well designed, short-duration self-financed courses in agri-business, IPR, contract farming, and supply/marketing of agricultural products, including herbal medicines, and agro-tourism to attract the youth in farming who will eventually be the torch bearers of the new agriculture movement.



- **Administrative best practice**

On line PG Management System
Streamlining of RTI
Redressal of grievances

2. Objectives of the Practice

What are the objectives or intended outcomes of this “best practice” and what are the underlying principles or concepts of this practice (in about 100 words)?

India is going through a reformatory phase. Education and technology have a significant role in effecting a change for the nation. It is the foremost duty of the educational institutions to think “out of the box” and impart learning that will be intertwined with living and livelihood.

3. The Context

What were the contextual features or challenging issues that needed to be addressed in designing and implementing this practice (in about 150 words)?

Given a curriculum that was bounded by a discipline based syllabus and strict time table for lectures, the unconventional courses have been visualized as a means to break the mould and to encourage both teachers and students to develop appropriate skills for real life situations.

4. The Practice

Describe the practice and its uniqueness in the context of India higher education. What were the constraints/ limitations, if any, faced (in about 400 words)?

Classes covering the theme areas are held regularly. Interactions between students, faculty, members of the industry, etc. are held. Regular reviews are conducted for assessing students’ progress.

5. Evidence of Success

Provide evidence of success such as performance against targets and benchmarks, review results. What do these results indicate? Describe in about 200 words.

These exercises are very successful as these help the students for their placements in different organizations.

6. Problems Encountered and Resources Required

Please identify the problems encountered and resources required to implement the practice (in about 150 words).

The constraints are mainly workforce and resources. However, effective utilization of the available resources held the key with systematic distribution of work. Moreover, to implement these practices in a very effective manner, it requires collaborations with professionals as resource persons.

7. Notes

Optional: Please add any other information that may be relevant for adopting and implementing the Best Practice in other institutions (in about 150 words).

Introduction of Online management system is a unique exercise and effort.



3. Evaluative Report of the Departments

i) Division of Agricultural Chemicals

1. Name of the Department:

Division of Agricultural Chemicals

2. Year of establishment:

November 14, 1966

3. Is the Department part of a School/Faculty of the university?

School of Plant Protection

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Horticulture, Soil Science and Agricultural Chemistry, Seed Science and Technology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Division of Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Horticulture, Soil Science and Agricultural Chemistry, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)		8		
Senior Scientist (Associate Professor)		4		
Scientist (Assistant Professor)		4		



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
V.T. Gajbhiye	Ph.D.	Principal Scientist & Head of the Division	Agricultural Chemicals (Pesticide Residue Chemistry)	35	5	3
I. Mukherjee	Ph.D.	Principal Scientist & Professor	Agricultural Chemicals (Pesticide Residue Chemistry)	30	10	1
S.B. Singh	Ph.D.	Principal Scientist	Agricultural Chemicals (Pesticide Residue Chemistry)	29	8	1
Neera Singh	Ph.D.	Principal Scientist	Agricultural Chemicals (Pesticide Residue Chemistry)	25	4	5
Suman Gupta	Ph.D.	Principal Scientist	Agricultural Chemicals (Pesticide Residue Chemistry)	22	6	1
N.A. Shakil	Ph.D.	Principal Scientist	Development of Agrochemicals, from natural and synthetic origins, working on amphiphilic and nanopolymers	22	6	1
Anupama	Ph.D.	Principal Scientist	Development of hydrogels for increasing water efficiency	20	4	-
Rajesh Kumar	Ph.D.	Principal Scientist	Development of Agrochemicals, nitrification inhibitors	20	6	-
Supradip Saha	Ph.D.	Senior Scientist	Development of Nutraceuticals	15	1	-
V.S. Rana	Ph.D.	Senior Scientist	Development of Agrochemicals from botanical sources	12	-	-
Tirthankar Bannerjee	Ph.D.	Senior Scientist	Agricultural Chemicals (Pesticide Residue Chemistry)	12	-	-
Mukta Chakraborty	Ph.D.	Senior Scientist	Development of Agrochemicals from botanical sources	30	-	-
Aditi Kundu	Ph.D.	Scientist	Development of agrochemicals from microbial origin	4	-	-
D.J. Sarkar	Ph.D.	Scientist	Development of delivery systems like hydrogels for increasing water efficiency	3	-	-
Anirban Dutta	Ph.D.	Scientist	Development of delivery systems like hydrogels for increasing water efficiency	2	-	-
Indu Chopra	Ph.D.	Scientist	Development of Agrochemicals, from natural and synthetic origins, working on amphiphilic and nanopolymers	2	-	-

**12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:**

S.No.	Name of the Faculty	Status
1.	Dr. Sureah Walia	Emeritus Scientist
2.	Dr. Madhuban Gopal	Emeritus Scientist

13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M. Sc. = 1 and Ph.D.= 1

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical			
2.	Administrative			
3.	Supportive			

16. Research thrust areas as recognized by major funding agencies:

New Pesticidal molecules, Nanopesticides, Novel agrochemical formulation, Pesticide safety, nano sensors

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Drs. V.T. Gajbhiye, Irani Mukherjee, Suman Gupta, Tirtankar Banerjee	Project funded by Ministry of Food Processing Industries	-	Rs. 200 lakhs
Drs. V.T. Gajbhiye, Irani Mukherjee, Shashi Bala Singh, Neera Singh, Suman Gupta and Tirtankar Banerjee	ICAR-NFBSFARA funded project Nanotechnology for remediation of pesticides		Rs. 100 lakhs
Dr. Shashi Bala Singh	Enhancing Phosphorus Availability in Alfisols: Hydrogel Based Input Delivery Approach-NFSBR-ICAR Associate	-	Rs. 80 lakhs
Dr. Neera Singh	Molecular mechanism of salicylic acid mediated improvement in shelf life and fruit quality of tomato –DST –Co-PI	-	Rs. 40 lakhs
Dr. Neera Singh	Biodegradation of pesticides under changing climate and metagenomic profiling of functional microbes-DBT-Co-PI	-	Rs. 24 Lakhs
Dr. Rajesh Kumar	ICAR-NASF project: Chemo-profiling of potential phyto-acaricides and their functional characterization for controlling resistant cattle ticks Co-PI	-	[Total budget – Rs 219.80271lakhs and IARI budget - 48.57lakhs
Dr. Rajesh Kumar	National Fertilizer Limited: Evaluation of nitrification inhibitors in crops	-	7.96 lakhs



Drs. Anupama and Dhruva J. Sarkar	ICAR-NFBSFARA funded project "Enhancing Phosphorus Availability in Alfisols: Hydrogel Based Input Delivery Approach	-	Rs 80 lakhs
Drs. Anupama and Dhruva J. Sarkar	ICAR-Consortium research platform on Nanotechnology project: Drs. Anupama, Dhruva J Sarkar	-	
Dr. Anupama	ICAR-NFBSFARA funded project "Enhancing Use Efficiency of Micronutrients : Novel Delivery Systems"	-	
Dr. Supraip Saha	ICAR NAIP funded project-2 ICAR-NFBSFARA funded project -2		
Dr. Aditi Kundu	ICAR-NFBSFARA funded project -1 DBT project-1		

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

- Project:** Chemo-profiling of potential phyto-acaricides and their functional characterization for controlling resistant cattle ticks (Funded by NASF, ICAR)

Institutes: IVRI, Izatnagar, IARI, New Delhi; NBRI, Lucknow; CVAS, Pookode, Kerala

Total Budget (for IARI): Rs. 48.57lakhs

b) International collaboration

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

20. Research facility/centre with

State recognition

None

National recognition

All India network Project on Pesticide Residues –Delhi Centre (1986-till date)

Pesticide Referral Laboratory (2000-till date)

NMR facility

LC-MS-MS facility

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable

22. Publications, Awards & recognitions, significant achievements:



Publications

Name of Scientist	Total number of publication : International Journals and National Journals	Number of Patents	Awards/ Recognitions (Name of Award/Year)	Member of Society	Foreign visits/training/ deputation (Name of Training programmes and its duration)	Books/ Book chapter	Significant contributions till date in bullet form
V.T. Gajbhiye	134:81+53	Nil	Best Teacher Award, 2010	SPS, India	Nil	Nil	<p>Evaluated over 70 plant protection schedules of insecticides, fungicides, herbicides etc. on agronomic as well as horticultural crops.</p> <p>Dissipation and rate kinetics of pesticides in soil and water has been studied.</p> <p>Volatilization losses of soil applied pesticides has been studied for the first time in India.</p> <p>Based on monitoring studies at Farrukhabad, UP, a mathematical model has been developed for the transport of pesticides from agricultural field to the river.</p> <p>Developed techniques for remediation of water from pesticides and other contaminants.</p> <p>Guided 3 PhD and 5 MSc students</p>
Irani Mukherjee (Professor)	Total: 96; International : 76 National : 20	Filed 2	<p>Punjabrao Deshmukh Woman Agricultural Scientist Award -2002, (awarded in 2003)</p> <p>IARI Best Teacher Award 2008 (awarded in 2009 convocation)</p> <p>All India Post Graduate Fellowship (by UGC during 1978-1980)</p> <p>Member, Meeting organized by AOAC, International (Washington, USA) to discuss the Analytical Methods for Pesticide Residue Analysis in water and cold drinks, 2006</p> <p>External Expert in various committees and boards in PAU, CSKV, Palampur, BCKV, Kalyani</p>	<p>Member of Indian Science Congress</p> <p>Member of Society of Pesticide Science</p> <p>Member of Indian Society of weed Science</p> <p>Member Indian Chemical Society, Kolkata</p> <p>Fellow Indian Chemical Society, Kolkata</p> <p>Quality Manager and Technical Manager of ISO 17025 Pesticide Referral Laboratory</p> <p>Division of Agricultural Chemicals, IARI, New Delhi. (NABL accredited)</p> <p>Assistant Secretary, Society of Pesticide Science, 2007-2010.</p> <p>Treasurer, Society of Pesticide Science, 2010-2012.</p>	<p>Summer School on Environmental Chemistry and Ecotoxicology on organized by UNEP and RECETOX, Masyrak University, Brno, Czech Republic June 27 to July 3, 2010.</p>	<p>Book Chapters -13</p> <p>Books edited-3</p> <p>E - Books -4-LAP Publishers</p>	<p>The recalcitrant nature of non-toxic β-HCH was established, disputing the earlier hypothesis of its conversion into the insecticidal γ-isomer of HCH. This work has provided impetus and input to the ban of the use of HCH mixture in agriculture (Pesticide Science UK, 1993, 39: 61-64).</p> <p>Accreditation of Pesticide Referral Laboratory and preparation of documents of Quality and Laboratory Procedure Manual for accreditation (copy attached).</p> <p>Isomerization of α-endosulfan into β-isomer in the environment has been established to explain the mechanism of persistence in different components of the environment (Pesticide Science UK, 1994, 40: 103-106).</p> <p>Method validation for the determination of cypermethrin and deltamethrin in cereal, lindane, pp-DDT, op-DDT, pp-DDE, a-endosulfan in water and vegetables by multiresidue gas chromatographic method, (copy of document attached).</p> <p>Measurement of Uncertainty determination of lindane in water, cypermethrin in cereal, deltamethrin in vegetables and methyl parathion in soil, (copy of document attached).</p> <p>Work instructions for protocols for estimation of pesticides in water, soil and vegetables for Pesticide Referral Lab</p>



<p>Editorial Board Member Journal Pesticide Science and Annals of Plant Protection 2001- 2003 Co-editor Pesticide research Journal</p>	<p>An innovation in clean-up technique as a part of analytical protocol was devised for HCH and DDT in milk (Bull Environ Contam Toxicol USA, 1996, 56: 381-388).</p> <p>Gas chromatographic method of analysis of thermolabile oxydemeton methyl has been developed (Fresenius J Analytical Chemistry, Germany, 1993, 347: 126-128.)</p> <p>Greening of the method of analysis of chlorothalonil in the clean-up process by substituting the use of sulfuric acid was introduced (Fresenius J Analytical Chemistry, Germany, 1995, 351: 590-591).</p> <p>An analytical protocol for the estimation of fluvalinate in tea has been developed for the first time (Pestology, 1987, 11: 5-10).</p> <p>A protocol for simultaneous estimation of carbamates in drinking water conforming to BIS standards by HPLC was developed</p> <p>A protocol for simultaneous estimation of OCs, Ops and synthetic pyrethroids in drinking water conforming to BIS standards by GLC was developed</p> <p>A protocol for the estimation of multi-class pesticide residues used in IPM and non-IPM package of fruits and vegetables as per Codex standards was developed (copy of project report).</p> <p>Protocol for the study of metabolism of azoxystrobin in grapes, rice, soil and water (copy of project)</p> <p>Protocol of metabolism and translocation of bispyribac sodium in rice, soil and water</p> <p>Decontamination and bioremediation protocols were devised for the more recalcitrant xenobiotics such as endosulfan, chlorpyrifos, betacyfluthrin and by microbial route and metribuzin, metolachlor, pendimethalin, lactofen, quinalphos and atrazine by soil solarization (Bull Environ. Contam Toxicol. (USA) (2000), 64: 40-46</p> <p>Pesticide-free IPM modules for cabbage, chilli and tomato have been developed (Three Folders on IPM free packages have been made and disseminated</p> <p>Development of IPM package for Residue Free Cabbage</p> <p>Development of IPM package for Residue Free Chilli</p> <p>Development of IPM package for Residue Free Tomato</p> <p>Pesticide-free IPM modules for mango and apple have been developed</p>
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Shashi Bala Singh	115 International – 67 National – 48		IARI Best Teacher Award in 2005 ISWS Gold Medal, 2013 Fellow, Indian Society of Weed Science, 2010 Fellow, Society of Plant Protection Science, 2011 General Secretary, Society of Pesticide Science India, 2013 Treasurer, IUPAC International conference, 2008 Invited Expert by Ministry of Health, Govt. of India to Examine the CSE Report on Analysis of Pesticide Residues in Soft Drinks, 2006 Member, Meeting organized by AOAC, International (Washington, USA) to discuss the Analytical Methods for Pesticide Residue Analysis in water and cold drinks, 2006	Five Indian Science Congress Association Society of Pesticide Science India Indian Society of weed Science Society of plant Protection		3-Books 7-Book Chapters	A package of practices involving rational pesticide spray schedules has been evolved for 40 pesticides in various crops so as to ensure maximum efficacy and safety to the consumers (Annual Reports of All India Network Project on Pesticide Residues, during 1987-2014). Development of decontamination protocol of chlorpyrifos in drinking water conforming to BIS standards has been achieved (Patent filed). Technology for the estimation and analysis of persistent organic pollutants and PCBs in the environment (National Monitoring of Persistent Organic Pollutant Pesticides and PCBs in the Environment under Global Monitoring Plan (GMP))
							Developed analytical methods (GC, HPLC, ELISA) for extremely low dose and high potency pesticides (nearly 19 single and 12 multi-pesticide) which helped in safety evaluation of the harvested produce and soil for which field trial were also conducted. Developed new environment friendly extraction techniques like microwave assisted extraction (MAE) and solid phase extraction (SPE) for pesticide residue analysis. Proposed biochemical mechanism of <i>Phalaris minor</i> resistance to isoprotruron. A patent for the preparation of herbicidal composition from neem for weed control filed. Nearly 3 dozen of metabolites prepared for different pesticides which served as reference standards in various studies. IPM packages for cabbage, chilli, tomato, mango and apple developed that proved useful in producing pesticide residue free vegetables and fruits for promoting the export and maintaining the environment sustainable in the long run. Detected an oxo-impurity in anilofos and it was assessed on rice crop in finding out the cause behind phytotoxicity. Field soil of Indo-Gangetic plain monitored which helped in pin pointing the source and cause of pollution of water of river Ganga. High gibberellin producing <i>Fusarium</i> strains identified. Microbial detoxification of atrazine, pendimethalin, alachlor and bifenthrin studied for reclaiming contaminated soil.



Neera Singh	International - 62 National - 13	Nil	Co-opted member for ICAR committee for Decontamination of Endosulfan, 2012 Editor, Weed Science, Annals Pl. Protec. Sci. Member of Editorial Board, for Indian J Weed Sci. External Expert in various committees and boards in ICMR, UPSC, IGNOU, ICAR	BOYSCAST Fello-2001 Humboldt Fellow 2005 NAAS Associate 2006	Society of Pesticide Science India	BOYSCAST Fellowship – 6m Humboldt Fellowship – 1 y	Book chapters - 3	14 Bacterial isolates and 1 non sporulating fungal strain characterized by molecular techniques and sequences submitted to NCBI those have potential in PAHs and bifenthrin bioremediation respectively. Antifungal traits of a bioagent <i>Bacillus subtilis</i> strain RP24 characterized. Validated thermal, chemical, GAC adsorption and ozonation techniques for pesticide remediation from water. Monitored persistent organic pollutants (POPs) by active and passive sampling in air samples. Explored the use of flyash for the retention of highly mobile pesticides in soil. Effect of ozonation technique, which is recommended for pesticide removal, studied on quality parameters of fruits. Identified and analysed the organic acids responsible for P-solubilization in soil under stress conditions. Tillage practice and soil amendments like fly ash, compost and biochars are very helpful in reducing the downward mobility of metolachlor, metribuzin, atrazine, metsulfuron-methyl and pyrazosulfuron in soil profile. Studies on interaction of pesticides with soil matrix and persistence of pesticides in soil have generated useful information on behaviour of these pesticides in soil ecosystem. Microbial/ phytoremediation technologies to degrade atrazine, simazine, hexachloro cyclohexane isomers in soil/waste water Modified clays used for pesticide removal from water and carrier for controlled release formulations
Suman Gupta	Total research publications-70 International -50 National -20		ICAR Lal Bahadur Shastri Young Scientist Award for the Biennium 1999-2000 in the area of Crop Protection Meritorious Scientist Award 2005, in the area of Agricultural Chemicals, given by Society of Plant Protection Sciences, IARI, New Delhi IARI Best Teacher Award 2013	Society of Pesticide Science, India Indian Science Congress	Participated in UNEP sponsored 6 th Summer School on Environmental Chemistry and Ecotoxicology from 28 June-3 July 2010 in Brno, Czech Republic.		Part of the team which was involved in conceptualizing and establishing NABL accredited Pesticide Referral Laboratory in the Division Studied environmental fate behaviour like sorption, persistence and leaching of new generation pesticides like flufenacet, dithiopyr, □-cyfluthrin, thifluzamide, acetamiprid, thiamethoxam, metaflumizone, pyraclostrobin kresoxim methyl etc. Proposed safe waiting period for single/ combination mix pesticides on number of vegetable crops Developed multiresidue methods for trace level analysis of multiclass pesticides in rice, tea, vegetables etc. Involved in teaching and guiding PG students	



Najam Akhtar Shakil	Total: 84 International: 51 National: 33	4	SPPS Outstanding Scientist Award (2011); Society of Plant Protection Sciences, India Affiliated member of IUPAC (2008 – till date) Appointed Member, Editorial Board of the J. Environ. Sci. Health, Part B published by Taylor & Francis Group, LLC, Philadelphia, PA (USA) (2009-till date) Chair, Plenary Session, 13 th IUPAC Congress on Pesticide Chemistry, 2014 at San Francisco, CA, USA during 10-14 th August 2014	Life Member of 3 Professional Societies	Visiting Research Scholar at Institute for Nano Science and Engineering Technology (INSET), Department of Chemistry, University of Massachusetts (Lowell, USA). May 2001 - April 2002 NAIP International Training on Nano Science in Nutraceutical Development 21 st January – 22 nd March 2010 at Institute of Nanoscience and Engineering Technology (INSET), University of Massachusetts Lowell, MA, USA Chair, Plenary Session during 13 th IUPAC International Congress on Pesticide Chemistry at San Francisco, California, USA from 10 th to 14 th August 2014	Books: 2 Books edited: 2 Book chapters: 8	Development of agrochemicals from natural and synthetic sources Green chemistry approach to synthesis of bioactive compounds Enzyme catalysed reactions for the synthesis of organic molecules Chemical profiling of aroma compounds in Basmati rice Amphiphilic polymers based formulations Technologies for the preparation of amphiphilic polymers based nano formulations of azadirachtin-A, carbofuran, β -cyfluthrin, thiamethoxam, imidacloprid, and thiram have been licensed to two companies Process for the preparation of nano formulations of β -carotene with improved bioavailability and targeted delivery Preparation of anti-oxidant and anti-bacterial di-aryl-indazol-3-ols Know how developed for the production of lycopene (antioxidant) from tomato and steviol glycosides (natural sweetener) from <i>Stevia rebaudiana</i> have been transferred to two companies
Rajesh Kumar	73 = 39 (International journals) + 34 (Indian journals)	6	NAAS Associate 2011 onwards	Society of Pesticide India, New Delhi Society of Plant Protection Sciences	Short course on "Nanotechnology and Plant Disease Management" 18-27 June, 2013, TNAU, Coimbatore	3/16	Developed nanosulphur with improved fungicidal and miticidal properties. Developed nanohexaconazole, 2-6 times more active than the commercial formulation against different Developed nitrification inhibitors for improving nitrogen use efficiency <i>Rhizoctonia solani</i> isolates.
Supradip Saha	International Journals : 51 National Journals : 7	2 (Filed)	Annexure-A	Society of Pesticide Science, India	National Agricultural Innovation Project (World bank funded) foreign training for 89 days at Michigan State university, East Lansing, Michigan, US in the area of nutraceuticals (July 2-Sept 28, 2013).	7 book chapters	Annexure-B



Annexure-A

- Merit medal for outstanding Academic Performance during Ph.D. (2003), Indian Agricultural research Institute, New Delhi
- ICAR award for outstanding interdisciplinary team research for the biennium 2007-08. The award was conferred on 16th July, 2010
- Pran Vohra Award, 2010-11 by Indian Science Congress Association, Kolkata.
- Selected for NAAS Associate conferred by National Academy of Agricultural Sciences, New Delhi
- Received “Aryabhatta Samman, 2013” by Vigyan Bharti (Swadeshi Science Movement of India), New Delhi
- Awarded “Lal Bahadur Shastri Young Scientist Award, 2013” in the NRM and Ag. Engineering Section by ICAR, N.D.

Annexure-B

- For the purpose of developing nutraceuticals from fruits and vegetables, stable acylated anthocyanins were extracted and purified from black carrot and red cabbage. Non-acylated anthocyanins were also extracted from jamun, *Berberis lyceum*, and purple corn. Constitutive anthocyanins were also characterized using chromatographic and spectroscopic techniques
- Anthocyanins were further stabilized by developing inclusion complex with beta-cyclodextrin. Phytosomal complex was also developed in order to regulate the bio-availability of anthocyanin molecules
- Bench scale know-how has been developed for simple and cost effective extraction, isolation and purification of lycopene from tomato. HPLC method for the estimation of lycopene and other carotenoids was also standardized (Indian patent Filed (909/DEL/2013))
- An improved process has been developed for production of chilli oleoresins and concentrates rich capsaicinoids (pungent principle), capsanthin (food colour). The method also extracted tocopherol and phytosterols along with capsaicinoids
- Chromatographic methods have been developed for the analysis of insecticide synergist like dillapiole and dihydrodillapiole, tocopherol isomers, capsaicinoids along with tocopherol and phytosterols, anthocyanins, carotenoids and phycocyanin
- *Diploknema butyracea* and *S. mukorossi* saponins exhibited significant antifungal activity against three and two fungi, respectively. Monodesmosides of hederagenin and hydroxyprotobassic acid exhibited significant reduction in antifungal effect, whereas further removal of sugar moiety yielded loss in activity. The antifungal activity was associated with their aglycone moieties, and esterification of the hydroxyl group change in antifungal activity
- Process utilizing agro-waste based growth medium for the mass production of *Bacillus thuringiensis* sub species *galleriae/colmeri* with earlyness, profuse sporulation, and cost effectivity. The strain is found highly insecticidal against *P.xylostella*, *P. brassicae*, *T. ni*, *T. orichalcea*, *C. binotalis*, *H. recurvalis* and *H. armigera* (Indian patent Filed (1627/DEL/2008))
- Participated in developing quality protein maize with high lysine and tryptophan. Furthermore, screening of normal maize lines as well as high b-carotene lines and analysed for the development of corn with high pro-vitamin A along with enriched lysine and tryptophan



- Nutraceutical technologies were commercialized to two industries. MoU signed between Indian Agricultural Research Institute, New Delhi and M/S. Ozone Biotech, Faridabad, Haryana and M/S. Pratishta Industries, Secunderabad, AP at cost of Rs. 7.5 and 8.0 L, respectively
- Published 58 articles in peer reviewed journals and 7 book chapters
- Awarded ICAR award for outstanding interdisciplinary team research, Pran Vohra Award by ISCA, Kolkata, NAAS Associateship by NAAS, New Delhi, Aryabhata Samman by Vigyan Bharti, New Delhi and Lal Bahadur Shastri Young Scientist Award by ICAR for the scientific contribution to the society



Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

S. No.	Publications	NAAS Rating
1.	Kaushik G, Gopal M and Thakur IS (2010) Evaluation of performance and community dynamics of microorganisms during treatment of distillery spent wash in a three stage bioreactor. <i>Bioresource Technol</i> 101: 4296-4305.	10.75
2.	Singh N, Berns AE, Hennecke D, Hoerner J, Koerdel W and Schaeffer A (2010) Effect of soil organic matter chemistry on sorption of trinitrotoluene and 2,4-dinitrotoluene. <i>J Hazardous Mat</i> 173: 343-348.	9.93
3.	Saha S, Walia S, Kundu A and Pathak, N (2013) Effect of mobile phase on resolution of the isomers and homologues of tocopherols on a triacetyl stationary phase. <i>Analyt. Bioanalyt. Chem.</i> 405: 9285-9295.	9.66
4.	Shakil N.A., Singh MK, Sathiyendiran M, Kumar J and Padaria JC (2013) Microwave Synthesis, Characterization and Bio-efficacy Evaluation of Novel Chalcone based 6-Carboxy-2-cyclohexen-1-one and 2H-Indazol-3-ol Derivatives. <i>European Journal of Medicinal Chemistry</i> , 59, 120-131.	9.5
5.	Aggarwal N, Kumar R., Dureja P, Khurana J.M. (2011) Synthesis, antimicrobial evaluation and QSAR analysis of novel nalidixic acid based 1,2,4-triazole derivatives. <i>European Journal of Medicinal Chemistry</i> 46: 4089-4099.	9.5
6.	Khurana J M, Magoo D, Aggarwal K, Aggarwal N, Kumar R, Srivastava C (2012) Synthesis of novel 12-aryl-8,9,10,12-tetrahydrobenzo[a]xanthene-11-thiones and evaluation of their biocidal effects. <i>European Journal of Medicinal Chemistry</i> , 58, 470-477.	9.5
7.	Gupta A, Sharma S, Saha S, Walia S 2013. Yield and nutritional content of <i>Pleurotus sajorajaju</i> on wheat straw supplemented with raw and detoxified mahua cake. <i>Food Chem.</i> 141: 4231-4239.	9.33
8.	Chatterjee N S, Gupta S and Varghese E (2013) Degradation of metaflumizone in soil: Impact of varying moisture, light, temperature, atmospheric CO ₂ level, soil type and soil sterilization. <i>Chemosphere</i> 90: 729-736.	9.14

Publication: NAAS Rating 8-9

S. No.	Publications	NAAS Rating
1.	Aggarwal N, Kumar R, Srivastava C, Dureja P and Khurana J M (2010) Synthesis of Nalidixic acid Based Hydrazones as Novel Pesticides. <i>J Agric Food Chem</i> 58 (5): 3056-3061.	8.91
2.	Bhatia A, Sasmal S, Jain N, Pathak H, Kumar R and Singh A (2010) Mitigating nitrous oxide emission from soil under conventional and no-tillage in wheat using nitrification inhibitors <i>Agric Eco Environ</i> 136: 247-253.	8.86
3.	Kulshrestha G and Kumari A (2010). Fungal degradation of chlorpyrifos by <i>Acremonium</i> sp. strain (GFRC-1) isolated from a laboratory enriched red agricultural soil. <i>Biol Fert Soils</i> 47(2): 219-225.	8.51
4.	Kulshrestha G and Kumari A (2010). Simultaneous Degradation of Mixed Insecticides by Mixed Fungal Culture Isolated from Sewage Sludge. <i>J Agric Food Chem</i> 58, 11852-11856.	8.91
5.	Saha S, Walia S, Kumar J and Parmar BS (2010) Structure-biological activity relationships in triterpenic saponins: the relative activity of protobassic acid and its derivatives thereof against plant pathogenic fungi. <i>Pest Manag Sci</i> 66: 825-831.	8.59
6.	Saha S, Walia S, Kumar J Dhingra S and Parmar BS (2010) Screening for Feeding Deterrent and Insect Growth Regulatory Activity of Triterpenic Saponins from <i>Diploknema butyracea</i> and <i>Sapindus mukorossi</i> . <i>J Agric Food Chem</i> 58: 434-440.	8.91
7.	Shankarganesh K., Walia S., Dhingra, S., Subramanyam B., Ramesh Babu S. (2011). Effect of dihydrodillapiol on pyrethroid resistance associated esterase inhibition in an Indian population of <i>Spodoptera litura</i> (Fabricius). <i>Pestic. Biochem. Physiol.</i> 102: 86-90.	8.11
8.	Singh N., Singh S.B. (2011) Translocation and degradation of pyrazosulfuron ethyl in rice soil. <i>Pest Manag. Sci.</i> 67: 1451-1456.	8.59



9.	Ghosh RK and Singh N (2012) Managing metolachlor and atrazine leaching losses using lignite fly ash. <i>Ecotoxicol. Environ. Safety</i> 84: 243-248.	8.20
10.	Saha S, Dutta D, Karmakar R and Ray DP (2012) Structure-toxicity relationship of chloroacetanilide herbicides: relative impact on soil microorganisms. <i>Environmental Toxicology and Pharmacology</i> . 34, 307-314.	8.01
11.	Singh SB, Singh N and Sharma R (2012) Persistence of pyrazosulfuron in rice field and laboratory soil under Indian tropical conditions <i>Pest Manag. Sci.</i> 68: 828-833.	8.59
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Publication: NAAS Rating 6-8

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97.	Reddy SN, Gupta S and Gajbhiye VT (2013) Effect of moisture, organic matter, microbial population and fortification level on dissipation of pyraclostrobin in soils. <i>Bull. Environ. Contam. Toxicol.</i> 91: 356-361.	7.11
98.	Saha A , Shabeer ATP, Gajbhiye VT, Gupta S and Kumar R (2013) Removal of mixed pesticides from aqueous solutions using organoclays: Evaluation of equilibrium and kinetic model. <i>Bull. Environ. Contam. Toxicol.</i> 91: 111-116.	7.11
99.	Saha, S., Walia, S., Kundu, A, Kaur, C, Sisodia, R (2014) Capsaicinoidtocopherol and sterols content in chili (<i>Capsicum</i> sp.) by Gas chromatographic-mass spectrometric determination. <i>International Journal of Food Properties</i> DOI:10.1080/10942912.2013.833222	6.88
100.	Saini P, Gopal M, Kumar R and Srivastava C (2014) Development of pyridalyl nanocapsule suspension for efficient management of tomato fruit and shoot borer (<i>Helicoverpa armigera</i>). <i>Journal of Environmental Science and Health, Part B</i> 49 (5): 344-351.	7.21
101.	Sanjeev P, Chaudhary DP, Sreevastava P, Saha S, Rajenderan A, Sekhar JC and Chikkappa GK (2014) Comparison of fatty acid profile of specialty maize to normal maize. <i>Journal of the American Oil Chemists' Society</i> . DOI 10.1007/s11746-014-2429-y	7.59
102.	Singh N, Raunaq and Singh SB (2013) Effect of fly ash amendment on persistence of metribuzin in soils. <i>J. Environ. Sci. Health B</i> 48: 108-113.	7.21
103.	Singh N, Raunaq and Singh SB (2013) Reduced downward mobility of metribuzin in fly ash amended soils <i>J. Environ. Sci. Health B</i> 48: 587-592.	7.21
104.	Singh N, Raunaq and Singh SB (2014) Effect of fly ash on metsulfuron-methyl sorption and leaching in soils. <i>J. Environ. Sci. Health B</i> 49: 366-373	7.21
105.	Singh S.B., Das T.K. and Kulshrestha G. (2013) Persistence of fenoxaprop ethyl and its acid metabolite in soil and wheat crop under Indian tropical conditions, <i>J. Environ. Sci. and Health Part B</i> 48:324-330.	7.21
106.	Singh SB and Singh N (2013) Degradation behaviour of pyrazosulfuron ethyl in water as affected by pH. <i>J. Environ. Sci. Health B</i> 48: 266-271.	7.21
107.	Singh SB, Das TK and Kulshrestha G (2013) Persistence of fenoxaprop ethyl and its acid metabolite in soil and wheat crop under Indian tropical conditions <i>J. Environ. Sci. Health B</i> 48: 324-330.	7.21
108.	Vignesh, M., Hossain, F, Nepolean, T., Saha, S., Agrawal, P.K., Guleria, S.K., Prasanna, B.M., Gupta, H.S. 2012. Genetic variability for kernel β -carotene and utilization of <i> crtRB1 3' </i> TE gene for biofortification in maize (<i>Zea mays</i> L.). <i>Indian Journal of Genetics and Plant Breeding</i> 72(2): 189-194.	6.20



23. Details of patents and income generated:

1. Anupama, Sarkar DJ and Parmar BS (2010) Novel super absorbent/s and method of obtaining the same. Indian Patent application no. 1292/DEL/2010 filed 02.06.2010.
2. Kumar J, Nisar K, Walia S, Madurai B, Kumar A and Parmar BS (2010) Polymeric seed coats based on bioactive botanicals. Indian Patent No. 244542 (Application No. 1746/DEL/2006).
3. Kumar R, Aggarwal N, Srivastava C, Khurana J M and Dureja P (2010) Novel naphthyridine based hydrazines as potent agrochemicals. Indian Patent application No. 2964/DEL/2010 filed 13.12.2010.
4. Anupama, Kumar R and Parmar BS (2011) A novel superabsorbent hydrogel and method of making the same. Indian Patent No. 250349 [Application No. 3462/DEL/2005 filed 23.12.2005. Publication Date: 05/09/2008]
5. Gopal M, Roy S C, Roy I, Pradhan S, Srivastava C, Gogoi R, Kumar R and Goswami A (2011) Nanoencapsulated hexaconazole: A novel fungicide and the process for making the same. Indian Patent Application No. 2051/DEL/2011 filed 21/07/2011.
6. Gopal M, Roy S C, Ghose M, Dasgupta R, Devakumar C, Subrahmanyam B, Srivastava C, Gogoi R, Kumar R and Goswami A (2011) Samfungin: A novel fungicide and the process for making the same. Indian Patent Application No. 1599/DEL/2011 filed 07/06/2011.
7. Gopal M, Niwas R and Kumar R (2012) A product and process for the decontamination of pesticide residues from vegetables by using safe reagent. Indian Patent Application No. 258/DEL/2012 filed 31/01/2012.

24. Areas of consultancy and income generated:

—

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Nil

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. V.T. Gajbhiye	1. Member of Bureau of Indian Standards 2. Member of Central Insecticide and registration committee 3. Member of Committee on Endosulfan	Editor Pesticide Research Journal	
Dr. Irani Mukherjee	Member of Course committee of at Amity university	Co- Editor Pesticide Research Journal Member editorial board of Indian journal of Plant Protection	
Dr. Shashi Bala Singh	External Expert in various committees and boards in ICMR, UPSC, IGNOU, ICAR	Editor, Weed Science, Annals Pl. Protec. Sci. Member of Editorial Board, for Indian J Weed Sci.	
Dr. Neera Singh		Co- Editor Pesticide Research Journal	

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

**28. Student projects**

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:

Nil

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Nil

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	2	3	-	-
Ph.D.	16	6	-	37.50	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Entrepreneurs	In last 7 years only one student is entrepreneur

36. Diversity of Staff

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	14.29
From universities from other States from	85.71
Universities outside the country	None



37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All are Ph.D.

38. Present details of departmental infrastructural facilities with regard to:

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: two
- Student's laboratories: one
- Research laboratories: 14

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities:
ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

40. Number of post graduate students getting financial assistance from the university:

—

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from:

Yes

- a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renounced Universities and Institutes.

- b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

- c) Alumni and employers on the programmes offered and how does the department utilize the feedback?**

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

S.No.	Name and address	Passing Year
1.	Dr. B.S. Parmar, Joint Director Research, IARI, New Delhi	



44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa Krishi Vigyan Mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni

Weaknesses

- International with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Centre for Advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

Opportunities

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.



Challenges

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department

Enhancement of the quality of human resources

- Efforts will be made to enable the scientists through upgradation of knowledge and skill.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encouraged to go for 6-12 months training at world leading Institutes through ICAR/ DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
- Monthly seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.



ii) Division of Agricultural Economics

1. Name of the Department:

Division of Agricultural Economics

2. Year of establishment:

1960

3. Is the Department part of a School/Faculty of the university?:

School of Social Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Agricultural Extension, Water Science & Technology, Library, Genetics, Environmental Sciences, Simulation & Informatics and IASRI.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

Division of Agricultural Extension, Division of Genetics, AKMU, IARI and NCAP and IASRI, New Delhi

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

Staff	Cadre strength	Filled	Vacant position	Actual (including CAS and MPS)
Principal Scientist (Professor)	3	7	-	2
Senior Scientist (Associate Professor)	4	2	-	-
Scientist (Assistant Professor)	10	5	-	-



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. Suresh Pal	Ph.D.	Head	Agricultural Development & Policy Farm Management and Resource Economics	29	2	3
Dr. Alka Singh	Ph.D.	Professor	Agricultural Development & Policy Farm Management and Resource Economics	23	6	2
Dr. Amit Kar	Ph.D.	Principal Scientist	Agricultural Marketing and Trade Farm Management and Resource Economics	17	5	3
Dr. I. Sekar	Ph.D.	Principal Scientist	Agricultural Finance & Project Analysis Farm Management and Resource Economics	16	3	
Dr. Pramod Kumar	Ph.D.	Principal Scientist	Agricultural Finance & Project Analysis Agricultural Development & Policy	17	6	1
Dr. A.A. Reddy	Ph.D.	Principal Scientist	Agricultural Marketing	1	-	
Dr. D.R. Singh	Ph.D.	Senior Scientist	Agricultural Development & Policy Farm Management and Resource Economics	15	6	-
Dr. Suresh A.	Ph.D.	Senior Scientist	Agricultural Development & Policy	10	-	-
Dr. P. Anbukkani	Ph.D.	Scientist	Agricultural Development and Natural Resources Economics	5	-	-
Dr. P. Venkatesh	Ph.D.	Scientist	Agricultural Development & Policy	8	-	-
Mrs. Nithyashree M.L.	M.Sc.	Scientist	Agricultural Development & Policy	4	-	-
Dr. P.S. Birthal	Ph.D.	Principal Scientist	Agricultural Development & Policy	19	-	-
Dr. M.B. Dangagiri	Ph.D.	Senior Scientist	Production Economics & Finance	17	-	-
Dr. Shinoj P.	Ph.D.	Scientist	Agricultural Marketing and Prices Analysis	7	-	-
Dr. S.K. Srivastava	Ph.D.	Scientist	Agricultural Marketing	2	-	-
Dr. Kingsly Immanuelraj	Ph.D.	Scientist	Markets and Trade	3	-	-

Besides above there is one scientist in the discipline who is faculty and research guide in the sister institute, IASRI, New Delhi.

1. Dr G.K. Jha, Principal scientist, Division of Agricultural Economics, IARI (Agricultural Statistics) is faculty and research guide in IASRI, New Delhi.

**12. List of senior visiting fellows, adjunct faculty, emeritus professors:**

S. No.	Name of the Faculty	Status
1.	Dr. Mruthyunjaya, Former National Director, NAIP, New Delhi	Adjunct Professor
2.	Dr. S.S. Acharya, Former Director, Institute of Development Studies, Jaipur	Adjunct Professor
3.	Dr. Praduman Kumar, Former Prof. & Head, Division of Agricultural Economics, IARI, New Delhi	Adjunct Faculty
4.	Dr. V.C. Mathur, Former Professor, Division of Agricultural Economics, IARI, New Delhi	Emeritus Scientist, IARI, New Delhi
5.	Dr. B.C. Barah, Former Director, NCAP, New Delhi	NABARD Chair Professor

13. Percentage of classes taken by temporary faculty – programme-wise information:

These resource persons are involved in several courses of the Division and in certain courses they contribute 20-30% of total classes.

14. Programme-wise Student Teacher Ratio:

Faculty student ratio is 1: 1.68

Research guide student ratio is 1: 4.57

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Category	Sanctioned	Filled	Actual
Technical	30	9	9
Administrative	5	4	4
Supportive	8	6	6

16. Research thrust areas as recognized by major funding agencies:

1. Knowledge, Science and Technology for Agriculture

This programme focuses on research impact assessment and foresight analysis with an objective to improve targeting and effectiveness of agricultural research. The issues of R&D investment, science and technology policy, intellectual property rights etc., are accorded high priority.

2. Agricultural Production, Natural Resources and Environment

This programme aims to examine research issues related to agricultural production, natural resources and environment in the context of climate change. Specific research areas are input use efficiency, sustainability of natural resources, especially land and water, commodity modeling and adaptations to climate change.

3. Policy, Investment and Inclusive Agricultural Growth

Research work under this programme analyses ways and means to enhance effectiveness of public policy, investments and technology in achieving inclusive growth. Efficiency of public investment, public-private partnership and business investment in the context of liberalization are other important research areas.

4. Agricultural Markets and Value Chains

Development and efficient functioning of agricultural markets is essential to provide quality inputs and remunerative prices to farmers. This programme supports research on reforms in input and output markets, direction of trade and its impact on growth and welfare, impact of regional trade agreements, development on value chains and future outlook of agricultural commodity markets.



5. Local Governance and Delivery of Farm Services

The roles of state and society in agricultural development are changing rapidly. There is emphasis on participation of stakeholders, increasing role of village-level institutions, and participation of business sector in delivery of improved technology and services to farmers. Studies under this theme analyze these issues

6. Livelihood Security, Poverty and Gender

Inclusive growth has been one of the main development objectives. Agricultural growth involving disadvantaged regions and sections of the society is essential to meet this objective. Research work under this programme explores ways to promote livelihood options for rural poor and empowerment of rural women.

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

1. "Policy and Institutional Options for Inclusive Agricultural Growth" funded by National Agricultural Innovation Project, ICAR. Total resource generated is Rs.171.678 lakhs/-
2. "Edible oilseeds supply and demand scenario in India: Implications for Policy" Ministry of Agriculture, Govt of India. Total resource generated is Rs.28 lakhs/-
3. "R&D management in agriculture: An analysis of rainfed farming system in India" funded by NABARD. Total resources generated is Rs 10 lakhs/-
4. "Economic Analysis and Prospects of non-edible oilseeds in India" from Ministry of new and renewable energy resources, Govt. of India. Total resource generation was Rs 23.98 lakhs.
5. "Pesticide use and sustainability of Agriculture: emerging issues and policy options" from ICAR-APCESS. Total resource generated is Rs.4.5 lakhs.
6. "Impact of Labour migration on agricultural economy of Indo-gangetic plains of India" from ICAR-APCESS. Total resource generated is resource generated is Rs.17.83 lakhs.
7. "Economic analysis of total factor productivity of crop sector in the Indo-gangetic plain of India by District and Region" from NATP. Total resource generated is Rs.24.24 lakhs.
8. "Developing a Decision support system for Agricultural commodity market outlook" funded by NAIP. Total resource generated is Rs.31.97 lakhs.

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

1. "Policy and Institutional Options for Inclusive Agricultural Growth". National Agricultural Innovation Project, ICAR. (Total grant is Rs.171.678 lakhs/-). Associated institutions are GIDS, Lucknow, ISEC, Bangalore and CRIDA, Hyderabad.
2. "Developing a Decision support system for Agricultural commodity market outlook" funded by NAIP. (Total grant is Rs.31.97 lakhs). Associated institution is NCAP, New Delhi.
3. "Pesticide use and sustainability of Agriculture: emerging issues and policy options" from ICAR-APCESS. (Total grant is Rs.4.5 lakhs). Associated institutions is NCIPM, New Delhi.
4. "Economic analysis of total factor productivity of crop sector in the Indo-gangetic plain of India by District and Region". (Total grant is Rs.24.24 lakhs). Associated institutions are NCAP, New Delhi, CCS HAU, Hisar, CSAU&T, Kanpur, RAU, Bihar and BCKV, West Bengal.

b) International collaboration:

1. ASTI Project entitled "Assessment of Agricultural R&D Indicators in India" funded by IFPRI, Washington DC (US\$9000) collaboration with IFPRI, Washington DC, USA.

**19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received:**

None

20. Research facility/centre with:

The Division is having computer laboratory for post-graduate research students which is well equipped with internet and statistical software for social science researchers.

State recognition: None

National recognition: None

international recognition: None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable

22. Publications**Faculty-wise distribution of publications**

	Suresh Pal	Alka Singh	V.C. Mathur	Amit Kar	Puran Chand	Pramod Kumar	G.K. Jha	A.A. Reddy	I. Sekar	D.R. Singh	A. Suresh	P. Venkatesh
Number of papers published in peer reviewed journals (national/international)	20	19	22	9	1	11	47	8	10	7	3	6
Monographs	8	3	1				3		1	2		2
Chapters in Books	4	3	2	1	1	1	1		2			
Edited Books												
Books with ISBN with details of publishers												
Number listed in International Database												
Citation Index-range/average												
SNIP range/average												
SJR range/average												
Impact Factor-range/average												
h-index												

Publications/Conference Papers/Others 2014-15

1. Mondal Biswajit, Alka Singh, Dharam Raj Singh and I. Sekar (2014), Watershed-livestock linkages: A study in Bundelkhand region of Madhya Pradesh, Indian Journal of Animal Research, 48 (3): 262-269. (NAAS rating :6.03)
2. Mondal Biswajit, Alka Singh, Girish Kumar Jha and B.S. Kalra (2014), Socio-economic impact of watershed development programmes in Bundelkhand region of Madhya Pradesh, India, International Journal of Agricultural Statistical Science, Vol.10, No.1, pp. 181-187. (NAAS rating :6.00)
3. Jayakumara R., Varadan & Pramod Kumar (2014), Indigenous knowledge about climate change: Validating the perceptions of dryland farmers in Tamil Nadu, Indian Journal of Traditional Knowledge, Vol. 13 (2): pp. 390-397. (NAAS rating :6.49)



4. Sekar, I., (2014). Supply of rice commodity in India: insights on domestic production performance, *Indian Journal of Agricultural Sciences*. 84 (8): 905-913. (NAAS rating: 6.2)
5. Jha, G. K. C. Mazumder, J. Kumari and G. Singh (2014). Nonlinear principal component based fuzzy clustering: A case study of lentil genotypes, *Indian Journal of Genetics and Plant Breeding*, 74(2), 189-196. (NAAS rating :6.2)
6. Sundaramoorthy, C. , V.C. Mathur and Girish Kumar Jha (2014), Performance of India's cotton based textile trade: A constant market share analysis, *Journal of Cotton Research and Development*, 28 (2): 334-341. (NAAS rating :3.44)
7. Sundaramoorthy, C. G.K. Jha, Suresh Pal and V.C. Mathur (2014), Market integration and volatility in edible oil sector in India, *Journal of the Indian Society of Agricultural Statistics*, 68 (1), 67-76. (NAAS rating :5.5)
8. Venkatesh, P. and Suresh Pal (2014), Impact of plant variety protection on Indian seed industry, *Agricultural Economics Research Review*, Vol. 27 (No.1), January-June, 2014, pp 91-102. (NAAS rating :5.68)
9. Anbukkani P., Pramod Kumar, KadirvelGovindasamy and Vijayalakshmi (2014) Developing Optimal Plan for Efficient Management of Dairy Farms in Tamil Nadu *Indian J. Dairy Sci.* 67(3). (NAAS rating :4.19)
10. Chauhan S.S., S. K. Jha , G. K. Jha and D. K. Sharma (2014). Water absorption Kinetics of pearl millet grains. *Journal of Agricultural Engineering* 51 (1), 16-22. (NAAS rating :4.27)
11. Praveen, K.V., (2014), Evolution and emerging issues in fertilizer policies in India, *Economic Affairs*, 59(2), 163-173. Praveen, K.V., (2014), Evolution and emerging issues in fertilizer policies in India, *Economic Affairs*, 59(2), 163-173. (NAAS rating: 4.69).
12. Reddy AA (2014). Profitability and use in cropping systems, *Indian Journal of Dryland Agricultural Research and Development*, 29(1), 97-106. (NAAS rating 4.70)
13. Reddy AA, Radhika Rani and GP Reddy (2014). Labour Scarcity and Farm Mechanization: A Cross State Comparison, *Indian Journal of Agricultural Economics*, Conference issue July- September 2014 (in press) (NAAS rating 5.04)
14. Reddy D. N., Reddy A. A. and Bantilan MCS (2014) The Impact of Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) on Rural Labor Markets and Agriculture, *India Review*, Vol. 13, (3), 2014, PP 251-273.
15. Reddy (2014) Rural Labor Markets: Insights from Indian Villages, *Asia-Pacific Development Journal* (June issue) published by ESCAP-UN (in press)
16. Suresh, A. and S. S. Raju (2014) Poverty and sustainability implications of groundwater based irrigation: Insights from Indian experience, *Economic Affairs*, Vol 59 (2): 311-320
17. Ramasundaram, P., A. Suresh, J. Samuel and S. Wankhade (2014) Welfare gains from application of first generation biotechnology in Indian agriculture: The case of Bt cotton, *Agricultural Economics Research Review*, Vol 27 (1): 73-82.
18. Suresh. A., S. Wankhade and K.R. Chaudhary (2014) Instability in prices of selected non-vegetarian commodities in India: An analysis of post-liberalisation period, *Asian Journal of Dairy and Food Research*, Vol 33(2): 109-118.
19. K.Inbasekar, (2014) "Pulses Production: Challenges and Strategies". *Economic Affairs*. September, 2014, 59(3): 403-414 (NAAS rating 4.69).
20. Praveen, K.V., (2014), Evolution and emerging issues in fertilizer policies in India, *Economic Affairs*, 59(2), 163-173. (NAAS rating – 4.69)

Publications/Conference Papers/Others 2013-14

1. Nithyashree, M.L. and Suresh Pal (2013), "Regional Pattern of Agricultural Growth and Rural Employment in India: Have Small Farmers Benefitted?", *Agricultural Economics Research Review* Vol. 26 (Conference Number) 2013 pp 1-1. [NAAS rating: 5.68]



2. Thomas, Lijo, G. K. Jha and Suresh Pal (2013), External market linkages and instability in Indian edible oil economy: implication for self-sufficiency policy in edible oils. *Agricultural Economics Research Review*, 26(2), 185-198. [NAAS rating: 5.68]
3. Venkatesh, P. and Suresh Pal (2013), “Determinants and Valuation of Plant Variety Protection in India”, *Journal of Intellectual Property Rights*, 18: 448-456. [NAAS rating: 6.00]
4. Jha, G. K. (2013), Energy growth linkage and strategy for meeting the energy demand in Indian agriculture, *Agricultural Economics Research Review*, 26 (Conf.), 119-127. [NAAS rating: 5.68]
5. Anuja, R., A. Kar, G. K. Jha and R. Kumar (2013), Price dynamics and market integration of natural rubber under major trade regimes of India and abroad, *Indian Journal of Agricultural Sciences*, 83(5), 555-560. [NAAS rating: 6.18]
6. Sendhil, R., A. Kar, V. C. Mathur and G. K. Jha (2013), Price discovery, transmission and volatility: Evidence from agricultural commodity futures. *Agricultural Economics Research Review*, 26(1), 41-54. [NAAS rating: 5.68]
7. Sendhil, R., Kar, Amit, Mathur, V. C. and Jha, Girish K. (2013), Price Discovery, Transmission and Volatility: Evidence from Agricultural Commodity Futures. *Agricultural Economics Research Review*, 26 (1): 41-54. [NAAS Rating: 5.68]
8. Srivastava, S. K., V. C. Mathur, R. Kumar, N. Sivaramane, and G. K. Jha (2013), Household demand and supply of milk and milk products in India: regional trends and future projections. *International Journal of Agricultural and Statistical Sciences*. 9(1), 353-363. [NAAS rating: 6.00]
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3. H. Prasain, P. Thulasiraman, R. K. Thulasiram and G. K. Jha (2010). Performance Evaluation of PSO-based Algorithm for Option Pricing on Homogeneous Multi-core Architecture, Proc. of the 2010 IASTED Computational Intelligence Conf., Maui, HI, USA, Aug. 2010.
4. G. K. Jha, Alka Singh and Suresh Pal (2011). Energy use in Indian Agriculture: An Econometric Investigation. XIII Annual Conference of the Society of Statistics, Computer and Applications, NAARM, Hyderabad, India, February.

Discussion Paper

1. Gupta, H.S., Suresh Pal, Alka Singh and I. Sekar (2010), Agricultural Growth and Diversification for Food and Nutritional Security, Discussion Paper 2010-01, Division of Agricultural Economics, IARI, New Delhi.

**Book Chapter**

1. Tripp R, R Hu and S. Pal (2010), Rice Seed Provision and the Evolution of Seed Markets. Rice in Global Economy, In S Panday, D Byerlee, D Dawe, A Doberman, S Mohanty, S Rozelle and B Hardy, IRRI, P 213-230.
2. Singh, Alka and Suresh Pal (2010) “The Changing Pattern and Sources of Agricultural Growth in India”, in Julian M. Alston, Bruce A. Babcock and Philip G. Pardey (eds), The Shifting pattern of Agricultural production and productivity worldwide, The Midwest Agri-business Trade Research and Information Centre, IOWA State University, USA.
3. Singh, Mahendra and V. C. Mathur. (2011), “Horticulture Development in and Sustainable Growth of Agriculture Sector in India: A Critical Analysis, in Nath, Prem and Gaddagimath, P. B. (Eds), Horticulture and Livelihood Security, Scientific Publishers (India).
4. Koundal K. R., J. P. Saxena and Pramod Kumar (2011), Public- Private Partnership in Agricultural Technologies at IARI” In: Relevance of IPR: Status and Prospects, (2011) Edited by: Dominic Keating, AbhaAgnihotri and AjitVarma Published by: IK International, New Delhi, India (in press).
5. Sekar, I., Kumar, B. G. S. 2011. Innovations in Agriculture and Natural Resources Management. Edited Agrawal, B., ‘Poverty Eradication and Development through Innovations’, New Century Publishers, New Delhi.
6. Puran Chand, Geeta Bisaria, Balraj Singh and Mahindra Singh (2011). Package of practices of Vegetables Crops “Study on Peri-urban Agriculture and its Management in Delhi”, undertaken in the Division of Agricultural Economics, IARI, New Delhi.

23. Details of patents and income generated:

None

24. Areas of consultancy and income generated:

—

25. Faculty selected nationally/internationally to visit other laboratories/institutions/industries in India and abroad:

Name	Institutions and Industries visited
Dr. Suresh Pal	Bangkok from 29.4.2010 to 30.4.2010 to attend workshop on Measuring and Analyzing Agricultural R&D Investment and Capacity Trends in South Asia Ghana from 5.12.2011 to 9.12.2011 to attend conference on “Agriculture R&D Investing in Africa’s Future. USA from 10.9.2012 to 15.9.2012 to attend Advisory Committee of Agril. Science and Technology Indicators program of CGIAR. Cambodia from 6.5.2013 to 7.5.2013 to attend International workshop. Cambodia from 25.9.2013 to 27.9.2013 to attend International conference on Agricultural Transforming in Asia: Policy Options for Food & Nutritional Security.
Dr. I. Sekar	Turkey from 31.5.2010 to 4.6.2010 to attend workshop on Impact Assessment of Agricultural Research.
Dr. Alka Singh	USA from 1.6.2011 to 30.6.2011 for Economics Policy Research under NAIP project “Policy and Institutional Options for Inclusive Agricultural Growth.
Dr. AmitKar	USA from 14.6.2011 to 14.7.2011 for Farmers’ Participation in High Value Markets under NAIP project “Policy and Institutional Options for Inclusive Agricultural Growth.
Dr. G.K. Jha	Canada from 2.7.2008 to 1.7.2009 for BOYCAST Fellowship
Dr. Suresh A.	USA from 7.12.2013 to 6.3.2014 to attend training in the area of Policy Analysis/Climate Change (Social Sciences).



26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Suresh Pal	Re-elected as member of the Research Programmes Committee of ISAE, Mumbai for the year 2011.	-	-
Dr. Suresh Pal	Elected as Secretary of the AERA (India) for the year 2012.	-	-
Dr. V.C. Mathur	Elected as Treasurer of the AERA (India) for the year 2012	-	-
Dr. V.C. Mathur	Emeritus Scientist.	-	-
Dr. G.K. Jha	-	Editorial Board, AERA	-

27. Faculty recharging strategies (UGC, ASC, Refresher/orientation programs, workshops, training programs and similar programs):

CAFT trainings were organized for teachers and researchers of NARS.

1. "Institutional Change for Inclusive Agricultural Growth" from 15.2.2011 to 7.3.2011 and 18 participants attended this training.
2. "Quantitative Methods for Agricultural Policy Research" (Under NAIP project "Policy and Institutional Options for Inclusive Agricultural Growth) from 17 – 22 October, 2011 and 18 participants attended the training.
3. "Agricultural Growth, Diversification and Food Security" from 15.11.2011 to 5.12.2011 and 13 participants attended this training.
4. "Agricultural Research Planning and Impact Assessment" (Under CAFT-ICAR Scheme) from 17.8.2012 to 6.9.2012 and 25 participants attended this training.
5. "Markets, Trade and Institutions for Agricultural Development" from 27.1.2014 to 16.2.2014 and 22 participants attended this training.
6. "Innovations and Agribusiness for Inclusive Agricultural Growth" from 9.9.2014 to 29.9.2014 and 17 participants attended this training.

28. Student projects: None

Percentage of students who have done in-house projects including interdepartmental projects:

All Master's and doctoral students are required to have completed thesis work based on divisional thrust research areas.

Percentage of students doing projects in collaboration with other universities/ industry/institute:

None

29. Awards/recognitions received at the national and international level by

a) Faculty

Name	Awards/Recognitions
Dr. Suresh Pal	Member of the Research Programme Committee of the Indian Society of Agricultural Economics, Mumbai (2010) Member of the Research Programme Committee of the Indian Society of Agricultural Economics, Mumbai (2011) Secretary of the Agricultural Economics Research Association (India) (2012)
Dr. Alka Singh	Best Teacher Award (2010)
Dr. V.C. Mathur	Joint Secretary of Agricultural Economics Research Association (2010) Joint Secretary of Agricultural Economics Research Association (2011) Treasurer of the Agricultural Economics Research Association (2012) Best Teacher Award (2013)



Dr. I. Sekar	D.K. Desai Award for Best Research paper (2010)
Dr. G.K.Jha	Distinguished Scientist Award ECOBASM-2014 BOYCAST Fellowship Award (2008)
Dr. Pramod Kumar	D.K. Desai Award (2009)
Dr. P.S. Birthal	NAAS Recognition Award for Social Science (2014)

Doctoral / post doctoral fellows: Not applicable

b) Students

- 13 M.Sc. students got IARI Gold Medal Award
- 11 Ph.D. students got IARI Gold Medal Award
- Two Ph.D. students got Smt.Nihar Bala Ghose Medal
- Two Ph.D. students got ICAR Jawaharlal Nehru Award for outstanding Ph.D. work in Agricultural Economics.

30. Seminars/Conferences/Workshops organized and the source of funding (national/international) with details of outstanding participants, if any.

One annual conference of Agricultural Economics Research Association was conducted by the Division in 2012. One national conference was conducted in 2010.

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass per centage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	4	-	-	-
Ph.D.	47	6	1	12.76	2.12

33. Diversity of students:

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students from other countries
M.Sc.	Nil	Nil	70%	30%
Ph.D.	80	Nil	20	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

- All students are selected for M.Sc. and Ph.D. programme after clearing All India competitive examinations.
- 7 students selected for Indian Economic Service.
- 17 students selected for Agricultural Research Service.
- 1 student is in State Services.
- 1 student is in SAU as Assistant Professor.
- 1 student is in Reserve Bank of India.



- 16 Ph.D. students have cleared NET.
- 2 M.Sc. students have cleared NET.

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M. Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	None
Employed Campus selection Other than campus recruitment	After completion of their degree maximum students get job either through ARS, IES and other State services. There is no campus selection.
Entrepreneurs	None

36. Diversity of staff:

Percentage of faculty who are graduates	
Of the same university	
From other universities within the state	
From universities from other States from	
Universities outside the country	

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

None

38. Present details of departmental infrastructural facilities with regard to

a.	Library	One well equipped divisional library containing journals and books for staff and students.
b.	Internet facilities for staff and students	One computer for each staff for research and other work.
c.	Total number of class rooms	One
d.	Class rooms with ICT facility	One
e.	Student's laboratories	One computer lab equipped with internet and necessary software for post-graduate students of the Division.
f.	Research laboratories	Not required

39. List of doctoral, post-doctoral students and Research Associates: Not applicable

- from the host institution/university
- from other institutions/universities

ICAR holds M.Sc. entrance and IARI holds Ph.D. entrance examination at National level.

S.No.	Name of the Ph.D. student	Host/other institute/university
1.	Ms. Kokila Jayaram, Ph.D.	Other University
2.	Mr. Abimanyu Jhajhria, Ph.D.	Other University
3.	Ms. Lisa Mariam Varkey, Ph.D.	IARI
4.	Mr. Punit Kumar, Ph.D.	Other University
5.	Mr. Harish Kumar Kallega, Ph.D.	Other University



6.	Ms. Aarathi L.R., Ph.D.	IARI
7.	Mr. Ajesh P., Ph.D.	IARI
8.	Mr. Sathish Gowda C.S., Ph.D.	Other University
9.	Mr. Balaji S.J., Ph.D.	Other University
10.	Ms. Anuja A.R., Ph.D.	IARI
11.	Mr. Shivaswamy G.P., Ph.D.	Other University
12.	Mr. Siddharth Bhardwaj, Ph.D.	IARI
13.	Mr. Prabhat Kishore, Ph.D.	IARI
14.	Mr. Prakash P., Ph.D.	IARI
15.	Mr. Rajesh T., Ph.D.	Other University
16.	Ms. Renjini V.R., Ph.D.	Other University
17.	Ms. Ankita Kandpal, Ph.D.	IARI
18.	Mr. Vikram Yogi, Ph.D.	IARI
19.	Mr. Kiran Kumar T.M., Ph.D.	IARI
20.	Ms. S. Ujwala Rani, Ph.D.	IARI
21.	Mr. Utkarsh Tiwari, Ph.D.	IARI

S.No.	Name	Designation	Qualification	Host/other institute/university
1.	Mr. Gajab Singh	RA	M.Phil. (Stats.)	Other University
2.	Mr. Nitin Pal	SRF	M.Phil. (Stats.)	Other University
3.	Mr. Amit Kumar	SRF	M.Phil. (Stats.)	Other University
4.	Ms. Shalini Raghav	SRF	Ph.D.	Other University

40. Number of post graduate students getting financial assistance from the university

All the students get fellowship from IARI, ICAR and DST

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Yes, it is being utilized for improving course contents and teaching methods.

b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Yes, it is being utilized for improving course contents and teaching methods.

c. alumni and employers on the programmes offered and how does the department utilize the feedback?

Yes, they are invited to deliver special lectures and few of them are Adjunct Professor and Adjunct faculty.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and address	Passing Year
1.	Dr. Mruthyunjaya, Former National Director, NAIP, New Delhi	1977
2.	Dr. D. Jha, Former Vice Chancellor, NCAP, New Delhi	1969
3.	Dr. Parmatma Singh, Former Vice Chancellor, RAU, Bikaner	1970



4.	Dr. Ramesh Chand, Director, NCAP, New Delhi	1984
5.	Dr. K.C. Hiremath, Former Professor, UAS, Dharwad	1973
6.	Dr. B.C. Bareh, Former Chair Professor, NABARD	1976
7.	Dr. P.G. Chengappa, Former Vice Chancellor, UAS, Dharwad	1980
8.	Dr. H.S. Vijay Kumar, Director of Education, UAS, Dharwad	1984
9.	Dr. Shashanka Bhide, Senior Research Councilor, NCAER, New Delhi	1975
10.	Dr. Rajvir Singh, Former Member, CACP, New Delhi	1971

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts

For enrichment of the students three special lectures involving external experts from different countries namely Ms. Didem Bilmez, Visiting Scholar, Uludaş University, Turkey, Dr. Aart-Jan Verschoor, Senior Manager (Economics & Biometrical Services) Agricultural Research Council, Pretoria, South Africa and Dr. Timothy Mark Cadman, Griffith University, Australia were held in the Division. Besides that, brainstorm on topical issues and faculty seminars were organized.

45. List the teaching methods adopted by the faculty for different programmes.

Black board, white board, LCDs and class room, assignment, term papers, quizzes and final papers are the teaching methods adopted by the faculty for different programmes.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level Professor monitors the academic activities while the Dean & Joint Director (Edn.) is responsible at Institute level.

47. Highlight the participation of students and faculty in extension activities.

They take active participation in Pusa Krishi Vigyan Mela being organized by the Institute once in every year.

48. Give details of “beyond syllabus scholarly activities” of the department.

Sports at Institute, regional, all India Universities level, study tours, inter-university Youth Festival, National level article writing competition are held.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The major research contributions in recent years related to:

- * Temporal and spatial trends in level and priorities of public and private sector investments impacting agricultural growth.
- * Estimation of relationship between energy use and agricultural growth and the demand projections of energy for Indian agriculture.
- * Trend in rural employment, agricultural growth and wages, and wage determinant model.
- * Revealed comparative advantage indices for agricultural commodity groups in India, and estimation of India's trade potential through the augmented gravity model.



- * The level of integration between domestic and international markets as well as futures and spot markets for agricultural commodities and estimation of the trading efficiency in terms of price transmission, price discovery and extent of volatility in prices.
- * Analysis of the effect of modern retails on the prices of agricultural commodities and the consumer's behavior, perception and attitude towards different retail systems.
- * The role of IPR in the development of Indian seed industry and interfacing the role of public and private sectors in seed industry.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths:

- Scientists equipped with improved quantitative and software skills, highly motivated.
- Dynamic course curricula of international standard.
- State of art infrastructure.
- Highly placed alumni.

Weaknesses:

- Teaching and research programmes of the division are threatened for want of adequate number of experienced faculty and trained research manpower challenges
- Inter-institutional linkages for policy research and teaching focusing new parameters and mandate in view of commercialization and globalization of agriculture
- Focus on applied nature of agricultural economics research like market research and decision support system, technology evaluation and climate change.

Opportunities:

- Centrally located with close proximity to reputed national and international institutions for higher interactions.
- Better opportunities of human capacity building.
- Guest/visiting scientists lecture

Challenges:

- Competition from ICAR and other institutes/SAUs and other Universities.
- Linkages with International research Organizations.
- Regular updating of technology and manpower in core area is needed.
- Further strengthening of discipline with skilled manpower.

52. Future plans of the department

- Strengthening students' research work in especially in the areas of agricultural growth modeling, crop modeling and simulation, climate change etc.
- Enhancing Human capacity development for agri-business development
- To enhance research quality and research publications especially of PhD students
- Training to young faculty in core areas of research in the discipline in reputed national and international institutions
- Higher academic interactions by organizing seminars, workshops and brain storm sessions.



iii) Division of Agricultural Engineering

1. Name of the Department:

Division of Agricultural Engineering

2. Year of establishment:

1945

3. Is the Department part of a School/Faculty of the university?

School of Natural Resource Management (NRM)

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Tech. and Ph.D.

5. Interdisciplinary programmes and departments involved:

The Division provides PG teaching in three sub-disciplines i.e. Farm Machinery & Power, Soil & Water Conservation Engineering and Agricultural Processing and Structures. The Division is part of School of Natural Resource Management (NRM) and closely working with all eight Divisions / units of NRM. In addition, the Division has collaboration with the schools of crop improvement, crop protection and social sciences.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester system

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Post harvest Technology, CESCRA, Seed Science and Technology.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned	Filled	Actual (including CAS \$ MPS)
Principal Scientist/ Senior Scientists	26	14	

**11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance**

S.No.	Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./M. Phil. students guided for the last 4 years
1.	Dr. D.V.K. Samuel	Ph.D.	Head (Engineering)	Agricultural Structures and Process Engg./ Post Harvest and Food engg.	37	5
2.	Dr. Indra Mani	Ph.D.	Professor	Farm power equipment	21	2
3.	Dr. Pramod Kumar Sharma	Ph.D.	Principal Scientist	Farm power equipment	25	1
4.	Dr. Adarsh Kumar	Ph.D.	Principal Scientist	Farm power equipment	25	1
5.	Dr. Jagannath Prasad Sinha	Ph.D.	Principal Scientist	Farm power equipment	20	3
6.	Er. Jaikumar Singh	M. TECH.	Principal Scientist	Farm power equipment	37	3
7.	Dr. Pramod Kumar Sahoo	Ph.D.	Principal Scientist	Farm power equipment	21	2
8.	Dr. Sangeeta Chopra	Ph.D. and post doc. from MSU, USA	Principal Scientist	Energy Science and Technology	18	1
9.	Dr. Shiv Pratap Singh	Ph.D.	Principal Scientist	Farm power equipment	22	nil
10.	Dr. H.L. Kushwaha	Ph.D.	Sr. Scientist	Farm power equipment	12	1
11.	Dr. M. Muthamil Selvan	Ph.D.	Sr. Scientist	Farm power equipment	11	nil
12.	Dr. Mrityunjai Kumar Singh	Ph.D.	Sr. Scientist	Farm power equipment	13	nil
13.	Dr. Tapan Kumar Khura	Ph.D.	Sr. Scientist	Farm power equipment	8	nil
14.	Dr. Arjamadutta Sarangi	Ph.D. with post doc experience (2 years)	Principal Scientist	Soil and Water Conservation Engg	16	6
15.	Dr. D.K. Singh	Ph.D.	Principal Scientist	Soil and Water Conservation Engg	21	5
16.	Dr. AbhijitKar	Ph.D.	Principal Scientist	Agricultural Structures and Process Engg.	PHT Div. will provide information	
17.	Dr. A.K. Mishra	Ph.D.	Principal Scientist	Soil and Water Conservation Engg	19	2



18.	Dr. Murtaza Hasan	Ph.D.	Sr. Scientist	Soil and Water Conservation Engg	15	3
19.	Dr. Neelam Patel	Ph.D.	Sr. Scientist	Soil and Water Conservation Engg	17	5
20.	Dr. Sunil Kumar Jha	Ph.D.	Principal Scientist	Agricultural Structures and Process Engg.	PHT Div. will provide information	
21.	Dr. Satish Lande	Ph.D.	Scientist	Farm power equipment	4 months	Nil

12. List of senior visiting fellows, adjunct faculty, and emeritus professors

Adjunct Professor

1. Prof. B. S. Pathak Former Dean, PAU Ludhiana
2. Prof. Gajendra Singh, Former DDG Engineering, ICAR.

Adjunct faculty:

1. Dr. Ranjan Srivastava , Ex- Principal Scientist, IARI

13. Percentage of classes taken by temporary faculty – programme-wise information

Nil

14. Programme-wise Student Teacher Ratio

M.Tech.= 2:1.04, Ph.D.= 2:2.66

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	35	22	22
2.	Administrative	10	5	5
3.	Supportive	65	25	25

16. Research thrust areas as recognized by major funding agencies

- Farm power and energy,
- Sensor based precision farm equipment, on farm processing equipment,
- Solar energy in agricultural use , human engineering,
- Enhancing water productivity in rice-wheat cropping system
- Crop modelling for prediction of yield and water productivity under changing climate scenarios, climate change

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

- a) National: Five
- b) International: None



c) Total Grants received: 253 lakhs (External Projects listed below)

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Dr. Indra Mani Dr. Adarsh Kumar Dr. P.K. Sharma Dr. Tapan Kumar Khura Dr. Kushwaha Dr. Satish Lande	Establishment of Farm Machinery Testing Facility (MOA, GOI)	Nil	100.1
Dr. P.K. Sahoo Dr. Indra Mani	Design and Development of Pneumatic Precision Planter for Vegetable Crops. (DST)	Nil	50
Dr. Adarsh Kumar Er. J.K. Singh	Development of intervention for man load carrying on Indian farms (DST)	Nil	25.63
Dr. S.P. Singh Dr. M.K. Singh	Ergonomics studies for increasing working efficiency and productivity of farm workers	Nil	15.27
Dr. Adarsh Kumar Er. J.K. Singh	AICRP Engineers and Safety in Agriculture	Nil	50.9

Internal Projects

- Design and development of machinery for mechanization of horticultural crops
- Development of ergonomic protocols and gadgets for reduced occupational health hazards and drudgery
- Design and development of equipment for resource conservation technology
- Design and development of solar powered machines and gadgets for processing and storage of agricultural produce.

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration with NFL

Project: Development of Urea Ammonium Nitrate (UAN) application system for enhanced nutrient use efficiency (Funded by Department of Fertilizer, GOI (70 %) and National Fertilizer Ltd. (30%)) **Institutes:** IARI, New Delhi. **Total Budget (for IARI):**Rs. 89.66lakhs

b) International collaboration- Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

DST: Two projects, MOS: 1 project, AICRP project: 1, Platform project -1

20. Research facility / centre with

State recognition

None

National recognition

National Standard Farm Machinery Testing Facility is being developed

International recognition

None

21. Special research laboratories sponsored by/created by industry or corporate bodies

DSS, modelling and Geospatial data analysis laboratory created under NAIP and NASF projects



22. Publication

	DVK Sam uel	Indra Mani	PK Sharma	Adarsh Kumar	JP Sin ha	JK Singh	PK Sahoo	San-geeta Chopra	SP Singh	H.L. Kushwaha	M. M. Selvan	M K Singh	TK Khura	A Sa-rangi	D. K. Singh	Murtaza Hasan	N Patel	Satish Lande	
Number of papers published in peer reviewed journals (national / international)	23	21	5	29	4	4	11	8	2	3	11	2	7	29	32	12	23	4	
Monographs																			
Chapters in Books							3	5		3	11	4	1	2	1	2			
Edited Books		1									13								
Books with ISBN with details of publishers	1										13			1		1			
Number listed in International Database																			
Citation Index – range / average																			
SNIP range / average																			
SJR range / average																			
Impact Factor– range / average																			
h-index														15					



NAAS Rating > 8

1. Chandra R, Vijay VK, Subbarao PMV, Khura TK. 2011 Performance evaluation of a constant speed I.C. engine on CNG, methane enriched biogas and biogas *Applied Energy*, 88(11), 3969–3977, *Applied Energy* 88(11), 3969–3977, 2011.) (NAAS rating :11.26)
2. Chandra R, Vijay VK, Subbarao PMV, Khura TK. 2012. Production of methane from anaerobic digestion of jatropha and pongamia oil cakes. *Applied Energy*, v.93, 2012 May, p.148(12) (ISSN: 0306-2619) (NAAS rating :11.26)
3. Abedinpour, M., Sarangi, A. Rajput, T.B.S, Singh, M. (2014). Prediction of maize yield under future water availability scenarios using the AquaCrop model, *Journal of Agricultural Sciences, Cambridge*, 152, 558–574 (NAAS rating : 8.89)
4. Tripathi, V K, T B S Rajput & Neelam Patel 2014 Performance of different filter combinations with surface and subsurface drip irrigation systems for utilizing municipal waste water *Irrigation Science*, Vol.32, pp 379- 391. NASS Rating :8.84
5. Jha,S.K., Sethi,S.,Srivastav,M.,Dubey,A.K.,Sharma,R.R.,Samuel,D.V.K., and Singh,A.K (2010): Firmness characteristics of mango hybrids under ambient storage.*J.FoodEngg* 97(2):208-212 (NAAS rating : 8.58)
6. Kumar, P., Sarangi, A., Singh, D.K., Parihar, S.S., Sahoo, R.N. (2015) Simulation of salt dynamics in the root zone and yield of wheat crop under irrigated saline regimes using SWAP model, *Agricultural Water Management*, 148:72-83(NAAS rating : 8.2)
7. BasediyaAmratlal.,Samuel,D.V.K and BeeraVimla(2011). Evaporative cooling system for storage of fruits and vegetables – A review., DOI 10.1007/s 13197-011-0311-6, AFSTI /Springer Publication. (NAAS rating : 8.02)
8. Sethi,Shruti,Samuel,D.V.K. and Khan Islam. 2011. Development and quality evaluation of quick cooking dhal – A convenience product, *Journal of Food Science Technology* DOI 10.1007/S 13197-011-0534-6, AFSTI/Springer(published on-line),30th September,2011. (NAAS rating : 8.02)
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22. Dhingra Devinder and Sangeeta Chopra (2013) Livelihood security through agro-processing *Indian Farming* 63(7) 44-49.
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23. Details of patents and income generated: 4

Patent granted:

Jha SN, Chopra S, Kingsley ARP (2012) Method of determining maturity of intact mango in tree. *Indian Patent 250880*, New Delhi, Indian Patent Office.

Two patents filed in last four years

1. Dhingra Devinder and Chopra Sangeeta(2012)'Ohmic Heating System for Thermal Processing of food Products of Non Flowable Nature' filed on 23 May 2012. Application No1574/DEL/2012.
2. M. MuthamilSelvan, CK Thankamani, and SJK Annamalai. Filed Patent entitled 'Power operated Potting Machine for Horticultural Nursery'. CBR No. 14526 dt 8/12/2011, Application No. 3455/MUM/2011 at Patent Office, Government of India, Mumbai.
3. PUSA Pigeonpea Stripper: 2011; App.No. 253/DEL/2011
4. PUSA Basmati Rice Thresher: 2013; App. No. 1802/DEL/2013
5. Fruit coring machine

24. Areas of consultancy and income generated

- There is a revolving fund scheme in the division. It is on 'Prototype manufacturing of agricultural implements'. The revenue generated was around 300 lakhs in the last four years from 2010-1014.
- Six machines have been licensed to private organizations and Rs. 7.6 lakhs generated from the licensing of the technologies.

25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

- 1) Dr. D. V. K. Samuel visited UC Davis, USA, 2013.
- 2) Dr. P.K.Sahoo visited University of California, Davis, CA, USA
- 3) Dr. A. Sarangi visited Texas A&M University, USA during 2011, visited IISc, Bengaluru and IIT, Mumbai
- 4) Dr. Sangeeta Chopra completed her post doc research successfully from Michigan State University, USA from March to December 2014.



26. Faculty serving in

a) National committees b) International committees c) Editorial Boards d) any other (please specify)

Name	National/International Committees	Editorial Boards	Any other
Dr. Indra Mani	Member of IARI Hindi Publications Committee, Secretary General of ISAE, President ARS Forum	Co-Editor of Agricultural Mechanization in Asia, Africa and Latin America, Editor of Krishika,	
Dr. D.K.Singh	Member Institute Internet Committee, Member of Committee for preparing detailed perspective plan for undertaking water harvesting conservation recharging in Muzaffarnagar Distt. Of UP.	Editor of Journal of Agricultural Engineering	
Dr. Adarsh Kumar	QRT member for AICRP on ESA (Ergonomics and safety in Agriculture), 2012-2013. Committee member for DST project evaluation.		
Dr. P.K.Sahoo	Member ICAR PG Examination Committee	Editor of Journal of Agricultural Engineering	
Dr. A. Sarangi	Member of CSIR SRF/RA Selection Committee in the area of "Agro-, Bio-, Physics, Chemical and Food Technology (ENG/42)" held at "Human Resource Development Group (HRDG), CSIR Complex, Library Avenue, Pusa, New Delhi – 110 012" during 18 th – 19 th December 2014 2. External Examiner of Environmental Engineering course (SWE414) at CAE&PHT, CAU, Gangtok on 15 th December 2014 3. External examiner of M.Tech. Thesis of student at PAU, Ludhiana 4. Member of meeting on WEAP model application organized by NIH, Roorkee during 3-14, March, 2015 at New Delhi.		
Dr. Neelam Patel	Member of BIS Food and Agriculture Division committee Member of Potential and Prospects of micro irrigation in India, MoA, GOI.		
Dr. Muthamil Selvan:		Referee of Indian Journal of Agricultural Sciences (ICAR), Journal of Agricultural Engineering (ISAE), Agricultural Reviews, Indian Journal of Agricultural Research (Karnal)	

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, Workshops, training programs and similar programs).

The faculty undergoes trainings/ workshops/seminars/conferences from time to time.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects: 90%

Percentage of students doing projects in collaboration with other universities / industry / institute: 10%



29. Awards / recognitions received at the national and international level by

a) Faculty

Name	Awards/Recognitions
Dr. Indra Mani	Bharat Ratna Dr. C Subramaniam outstanding teacher award (2012), ICAR, New Delhi Fellow Indian Society of Agricultural Engineers, 2012 ISAE, New Delhi Co-operating Editor of International Journal AMA Japan 2012.Farm Machinery Industrial research Corporation Tokyo Japan Ground water augmentation Award 2010Ministry of water Resources , Government of India Outstanding book award 2010.Indian Society of Agricultural Engineers (ISAE), India Best paper award 2010 ISAE
Dr. T.B.S. Rajput	Bharat Ratna C Subramaniam Outstanding Teacher Award – 2011
Dr. D.K.Singh	Commendation Medal of Indian Society of Agricultural Engineers- 2011
Dr. Neelam Patel	Fertilizer Association of India Award Ram Nath Singh Award ISAE book Award Leadership award for Soil conservation of india
Dr. A. Sarangi	Best Teacher Award-2014 Shankar Memorial Award Best paper Award (twice) by ISAE, India
Dr. Sangeeta Chopra	Distinguished Service Certificate (2012-13) ISAE, India Best poster presentation award by Indian Society of Animal Production and Management toGanie Asif Ali, Kaur Daljeet, Chopra Sangeeta , Nagra SS and Rai D R (2011) Performance and welfare of laying pullets under different cooling systems during summer, <i>National Symposium</i> on 'Emerging Management Concepts for Sustainable Livestock and Poultry Production', GADVASU, November 2-4, 2011

b) Doctoral/post-doctoral fellows

Dr. Satish Lande completed his Ph.D. in 2014.

Dr. Sangeeta Chopra completed her post doctoral research work at School of Packaging, MSU, USA.

c) Students

Three students received Best paper award by ISAE for the research paper

Three students received ISTE M. Tech Thesis award comprising of Rs 10000 cash.

One student received Fertilizer Association of India Award.

30. Seminars/ Conferences/ Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Training on Project formulation, risk assessment, scientific report writing and presentation was conducted for 5 days.	2 nos. 17 – 21 February, 2015, 24 – 28 February, 2015.
NAIP National Training on Project formulation, risk assessment, scientific report writing and presentation was conducted for 5 days	6 nos. 26 – 30 September, 2011 27 – 31 August, 2012 11 – 15 December, 2012 12 – 16 March, 2013 29 July – 3 August, 2013 9 – 13 December, 2013
One day training on “Design and Maintenance of Protected Structures” by Course Director Dr. M.Hasan	14 th Feb 2014
One day training on “Production Technologies for Protected Cultivation” by Course Director Dr. M.Hasan	18 th Feb 2014
Summer school on Advances in Micro-Irrigation and Fertigation from for 25 scientists sponsored by ICAR.	5 - 25 November, 2012



31. Code of ethics for research followed by the departments

As per ISO 9001-2008 standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	2	-	-
Ph.D.	108	6	5	5.55	4.62

33. Diversity of students

—

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

ARS: 16

NET:16

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs in different organizations including civil services and few go abroad for post doc.
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Entrepreneurs	One student is an entrepreneur

36. Diversity of staff:

Percentage of faculty who are graduates-	
Of the same university	Nil
From other universities within the state	Nil
From universities from other States from	100%
Universities outside the country	Nil

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period- One

38. Present details of departmental infrastructural facilities with regard to

- Library: Yes
- Internet facilities for staff and students: Yes
- Total number of class rooms:



- d) Class rooms with ICT facility- Three
- e) Student's laboratories- Six
- f) Research laboratories -- same as above

39. List of doctoral, post-doctoral students and Research Associates

M.Sc.

S.No.	Roll No.	Name of student	University of Graduation
1.	20375	Bholuram Gujar	College of Agri.Engg, JNKVV Jabalpur –480004(M.P)
2.	20376	Shekh Mukhtar Mansuri	College of Agri.Engg, JNKVV Jabalpur –480004(M.P)
3.	20377	Ajita Gupta	College of Agri.Engg, JNKVV Jabalpur –480004(M.P)
4.	20378	Kumari Chanchala Priya	College of Agriculture Engineering, Rajendra Agricultural University, Pusa, Samastipur-848125 (Bihar)
5.	20379	Jatoth Veeranna	College of Agricultural Engineering, Madakasira- Anantapur -515301 under Acharya NG Ranga Agricultural University, Hyderabad (A.P)
6.	20502	Vaibav Chaudhary	Baba Saheb Dr. B.R.A. College of Agriculture Engineering & Technology, Etawah-206001 under Chandra Shekhar Azad University of Agriculture & Technology, Kanpur-UP
7.	20503	Arti Kumari	College of Agriculture Engineering, Rajendra Agricultural University, Samastipur-848125(BIHAR)
8.	20504	Alka Mishra	College of Agri.Engg, JNKVV Jabalpur –480004(M.P)
9.	20505	Hitesh Bijaraiya	College of Agricultural Engineering & Technology, Junagadh Agricultural University- 362 001 (Gujarat)
10.	20506	Sharddha Ahirwar	College of Agri.Engg, JNKVV Jabalpur –480004(M.P)
11.	20510	Hasan Mirzakhani fchi	Mechanical Engineering-Agricultural Machines Shahrekord University, Shahrekord,Iran P.O. Box: 115

Ph.D.

S.No.		Name of the Ph.D. student	Host/other institute/university
1.	9925	Bibwe Bhushan Ratnakar	Others
2.	9927	Vairat Amita Dinkar	Others
3.	9928	Siddanagouda Yadachi	IARI
4.	9932	Rajurkar Gajanan B.	IARI
5.	9933	Mukesh Kumar	Others
6.	10072	Mohammad Muzamil	IARI
7.	10073	Roaf Ahmed Parray	Others
8.	10074	Shyam Nath	IARI
9.	10075	Saci Kumar	IARI
10.	10076	Pittala Rajaiah	Others
11.	10077	Vibhute Sagar Dattatraya	IARI
12.	10078	Sujeet Desai	IARI
13.	10079	Jitendra Kumar	IARI
14.	10236	Man Mohan Deo	IARI
15.	10237	Bikram Joyti	Others
16.	10238	Pawan Jeet	IARI
17.	10239	Ravindra Rande D	IARI



18.	10382	Thingujam Bidyalakshmi Devi	Others
19.	10385	Arun Kumar	Others
20.	10386	Krishna kumar P	Others
21.	10389	Shahzad Faisal	Others
22.	10391	Prem Kumar Sundaram	Others
23.	10392	Pabitra Mohan Barik	IARI
24.	10394	Jaya Sinha	IARI
25.	10396	Narayan Totaram Borkar	IARI
26.	10397	Manish Debnath	IARI
27.	10398	Laulina Kumari	IARI
28.	10399	Yogesh Pandey	Others

S.No.	Name	Designation	Qualification	Host/other institute/ university
1.	Anilendu Pramanik	RA	Ph.D.	Other University
2.	Ravindra Tiwari	SRF	M.Tech.	Other University
3.	Prabhakar Shukla	RA	M.Tech.	Other University

40. Number of post graduate students getting financial assistance from the university.

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Yes

The methodology was based on the industry–institution–farmer interaction and feedback through annual workshop.

42. Does the department obtain feedback from

a) faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Yes and it utilizes the feedback to make changes in the courses to make them more effective.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Yes and it utilizes the feedback to make changes in the course content, way of delivery and make them more useful for the students.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

Yes and effect changes to make the programme better and more useful to students.

43. List the distinguished alumni of the department (maximum 10)

1. Dr. A. P. Srivastava, ND, NAIP
2. Dr. N. P. S. Sirohi, Ex ADG (Engg.)
3. Dr. S. K. Tandon, Ex ADG (Engg.)
4. Dr. R. K. Gupta, Program Leader, TCS
5. Dr. Beji George, GM, Indian Railway Services
6. Dr. Anil Ramteke, Joint Director, Director of Enforcement, Ministry of Finance



44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts.

1. Prof. Anwar Alam, Dr Anwar Alam, Secretary, NAAS, NASC Complex, Dev Prakash Shastri Marg, Pusa, New Delhi 110 012, on the occasion of Freshers' welcome programme.
2. Dr. Julie Carrier, Professor, Biological and Agricultural Engineering College of Engineering, University of Arkansa,
3. Dr. Dharmendra Saraswat, Associate Professor/ Extension Engineer- GeoSpatial, Biological and Agricultural Engineering
4. Prof. Anwar Alam delivered a lecture on "Emerging challenges before AgrilEngg. professionals and researchable issues".
5. Dr. Lalit Verma Professor and Head, Department Agricultural and Bio-system Engineering, University of Arkansas, USA on Agricultural Engineering research and education in USA. It was attended by Prof G Singh Ex DDG Engg in addition to faculty and students.
6. Dr. Julie Carrier, Professor Department Agricultural and Bio-system Engineering, University of Arkansas, USA on bio-energy.
7. Dr. Dharmendra Saraswat Associate Professors Department Agricultural and Bio-system Engineering, University of Arkansas, USA on precision agriculture.
8. Professor Shlomo Navarro, a world renowned researcher on grain storage on "Advanced Storage Technologies". It was attended by our Director Dr H S Gupta in addition to Prof G Singh Ex DDG Engg and faculty and students.
9. Dr. Digvir Jayas (Vice-President, Research and International, University of Manitoba a talk on storage technologies. It was attended by Prof G Singh Ex DDG Engg, Dr H S Chauhan, Ex dean Pantnagar in addition to faculty and students.
10. Dr. Ajit Srivastava, Prof. & Chair, Biosystems and Agri. Engineering, Michigan State University gave a seminar on "The Role of Agricultural Engineering in Feeding the World". It was attended by our Director Dr H S Gupta in addition to Prof G Singh Ex DDG Engg, Divisional faculty and students.

45. List the teaching methods adopted by the faculty for different programmes.

Power Point slides and interactive digital board were used during delivery of class room lectures for different course modules and lecture notes and soft copy of the slides were handed over to students.

Students were provided with the course rationale, content and the list of text books and related journals in the beginning of each course offered during different trimesters of the academic year. Besides this the use of scientific search engines and bibliographic data base viz. SCIRUS, SCOPUS and CERA was demonstrated to students for searching the course related research work.

Students were evaluated for their presentations skills during term paper presentation on assigned topics related to the course. Students who participated more in discussions by asking questions and giving clarifications were given weightage. This helped students not only to develop in depth understanding of the allotted topics but also improve their presentation skills.

Students were imparted hands on training on use of GIS (ArcGIS), RS (ERDAS Imagine) softwares, SWAT, AnnAGNPS, PMWIN, Aqua Crop and DSSAT models (Processing MODFLOW for Windows), ANN, ANFIS and MARS soft computing tools, MATLAB and developed DSSs' and GIS based interfaces, which are used to solve the real field problems. Instructions on the procedure to download, install, prepare input data files and run these models were imparted to students. Such activity was found to be useful not only to develop their modeling skill but also to decide on research hypothesis during M.Tech and Ph.D. programmes.



46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The Division regularly organizes research reviews by standing committee, special meeting with experts, qualifying exams for entry at Ph.D. level through external examiners and performance monitoring through their performance in competitive exams.

47. Highlight the participation of students and faculty in extension activities.

The students and faculty participate in *Kisan Melas*, and extension projects through CATAT, ATIC, Extension Division, Lab-to-Land and farmers participatory research programme. A National ground water augmentation award was conferred to the institute from Ministry of Water Resources for the period 2011-2012.

48. Give details of “beyond syllabus scholarly activities” of the department.

Many lectures with faculty on ethics and values, expert lectures on career opportunities abroad and extra-curricular activities like debates etc., are being organized from time to time.

49. State whether the programme/department is accredited/graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The contributions of the Division are as follows:

Machines for Accelerated Compost making

- Pusa Compost Turner- cum- Mixer
- Pusa Compost Sieving Machine
- Pusa Compost Loader

Animal Feed Making Machines

- Animal Feed Block Formation Machine
- Pusa Mobile Feed Block Machine
- Urea Molasses Mineral Block Machine
- Powered Animal Feed Mixer
- Animal Feed Crusher

Machineries for Rainfed Agriculture

- Pusa Aqua-ferti Seed drill
- Pusa Hydrogel Applicator

Machinery for vegetable mechanization

- Pneumatic precision planter
- Pusa Carrot Planter and Harvester
- Two bed carrot Harvester
- Okra Planter
- Okra Seed Extractor
- Onion Seed Extractor
- Vegetable Seed Extractor

Other Machines

- Solar Powered 3-Head Sprayer
- Pusa Power operated Two-row Maize Planter
- Pusa Power Operated Winnower



Pusa wheel Hand Hoe
Safety gadgets for Chaff-cutter
Pusa Basmati Thresher

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strength: Strong faculty, good workshop and laboratories, good infrastructural facilities, part of a deemed university,

Weaknesses: Less international collaboration, limited capital funds, Linkage with industry

Opportunities: Use of electronics and automation in farm machinery equipment, Involving other departments in precision farming.

Challenges: Linkage with industry, International collaboration have to be done.

52. Future plans of the department.

The future plans of the division are

New Research projects

- Mega research programme on “Water, Energy, Mechanization and Environment.”
- Technologies related to precision and conservation agriculture (DSR technology, Planting and harvesting machines for commercially grown flowers and vegetables, Spectral reflectance based variable rate urea applicator, Sensor based site specific fertilizer applicator, mechanical applicator for urea briquettes, Small engine powered multi-purpose machines, Sowing and threshing machines of seed spices).
- Urea ammonia Nitrate (liquid fertilizer) application system (basal, foliage and fertigation).
- Autoprobe soil sampling technology for Precise sampling which will lead to Precise Planting and Precise Nutrient Management.
- Post- Harvest Engineering: This sub-discipline will be strengthened by addition of more scientists. Farmers friendly and smart sorting, grading and packaging technologies will be developed for primary processing centers. Research on technologies for core processing facilities will be undertaken by developing linkage with MOFPI. In addition, an emphasis will be on development of functional food for Individual (age specific and health specific), Price leveling food ingredients (made of Onion, Potato and Tomato). Research work on value addition to locally produced grains, fruits and vegetables which will lead to income to local growers and entrepreneurs.
- **Agricultural Energy and Power:** In addition to programmes on energy management in agriculture for enhanced efficiency; the emphasis will be on

Solar Technology: Use of solar technology for spraying, pumping and primary processing and storage through system integration using mechatronics particularly Maximum Power Point Tracking (MPPT) and Pulse Width Modulation (PWM) The small solar gadgets for other farm tools including automation devices and solar refrigerators of small capacity for small growers. Use of electronics for farm power machinery equipment.

Bio-Energy: Decentralize bio-methanation, Absorption based storage system, Research on biomass other than wood for fuel purpose (Second and third generation bio-fuels) international collaboration will be sought.

Biomass and residue management : Variable density biomass compaction technology for different use (energy and animal feed)

- **Technology Commercialization:** Commercialization of the machines will be ensured by involving industry /manufacturers from proof-of-concept, laboratory stage, pilot stage to finally ready to be launched stage.
- In addition to development of business models and entrepreneurship for manufacturer of farm machinery, custom hiring of farm equipment and establishment of operation of agro processing units, greater emphasis will be on the following



Start-up business in engineering technologies – Training / Technical advice through ZTM and BPD. Commercialization, Consultancy and Contract Research

Technology dissemination through different means including Farmers participatory action research programme (FPARP). Licensing of the developed technologies .Entrepreneur model for different technologies.

Physical and infrastructural facilities

- Model farm machinery testing and training centre and processing training facility.
- MIS based National database on mechanization and farm energy and its beneficial use for research and policy planning
- Establishment of **Mechatronics lab** and second & third generation bio-fuel lab
- **Skill development centre** in mechanization, processing and structures and irrigation systems.

Linkages with other research units and developed departments –

Strong linkage with all the Divisions and centers of NRM, social sciences, crop improvement and crop protection. Linkage with CIAE, CIPHET, CSIR institutes, Corporate (NFL), ministries like MoA, MNRE, MoF&C, MoFPI. International linkage with universities in USA, Canada and Japan.

Management Goal:

In addition to existing activities the Division will aim at the following

Technology forecasting - Think Tank / Enlightened Group Meeting for giving research ideas and insights for new projects well in advance.

Visibility Planning must be there to take the Division to new heights like National and International recognitions and awards.

Farmers first basis working mode. Different stake holders like farmer groups, NGOs, SHGs, CHGs and progressive farmers will be invited for MOUs through ZTM and BPD

Project wise **Monthly review** of research progress.

Post Graduate Teaching:

Faculty training in reputed national and international laboratory. Smart class room / facilities for virtual class.

The Division will be developed as **Centre of Excellence in PG teaching and training in Agricultural Engineering.**

Strong industrial linkage through Industry – Institution interface and in-plant training. Courses will be upgraded based on industry needs.

The students' research projects leading to prototype and process development will be selected based on farmers and industry needs.



iv) Division of Agricultural Extension

1. Name of the Department:

Division of Agricultural Extension

2. Year of establishment:

1960-61

3. Is the Department part of a School/Faculty of the university?

School of Social Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Sc. (Agricultural Extension)

Ph.D. (Agricultural Extension)

5. Interdisciplinary programmes and departments involved

The postgraduate students register minor courses in Agricultural Economics, Agricultural Statistics, Environmental Sciences, Agronomy, Vegetable Sciences, Post-Harvest technology and Fruits and Horticulture.

Postgraduate students of Agricultural Economics offer courses in Agricultural Extension as minor.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

Nil

7. Details of programmes discontinued, if any, with reasons

Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester (Choice based credit system)

9. Participation of the department in the courses offered by other departments

The students of Agricultural Economics registered for PG exam of Extension as minor discipline. The Extension faculties deliver lectures in these courses and guide dissertation of Economics students.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned	Filled	Vacant positions	Actual (including CAS & MPS)
Professor	02	02	0	02
Associate Professors	08	05	03	05
Asst. Professors	10	06	04	06
Others	-	-	-	-



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph. D.
Dr. J. P. Sharma	Ph.D.	Joint Director (Extension)	Communication, Entrepreneurship development in Agriculture & Agri-business	29	4	0
Dr. Premlata Singh	Ph.D.	Professor and Head (Acting)	Gender Empowerment in Agriculture and Extension system Management	26	1	2
Dr. R. N. Padaria	Ph.D.	Principal Scientist	Extension systems, Socio-economic Assessment, Farmer Participatory Research, Climate change adaptation	20 years, 9 months	0	4
Dr. Rashmi Singh	Ph.D.	Principal Scientist	Entrepreneurship Development and Sociological Issues in Agricultural Extension	24	7	0
Dr. Monika Wason	Ph.D.	Principal Scientist	Extension Management, Training and Gender Studies	20	4	0
Dr. B. K. Singh	Ph.D.	Principal Scientist	Extension and Transfer of technology (ToT)	29	3	2
Dr. J.P.S. Dabbas	Ph.D.	Principal Scientist	Extension and Transfer of technology (ToT), Mass media	29	0	0
Dr. M.S. Nain	Ph.D.	Senior Scientist	Agricultural Communication, Extension Training, Entrepreneurship, diffusion studies	17	3	0
Dr. R. Roy Burman	Ph.D.	Senior Scientist	Extension system, ICT and Communication	15	1	0
Dr. V. Lenin	Ph.D.	Senior Scientist	Extension Systems, Adoption, Livelihood, Communication, ICT	17	0	0
Dr. J.R. Mishra	Ph.D.	Senior Scientist	Agricultural Extension, Transfer of Technology, Agri-business	15	0	0
Dr. Nishi Sharma	Ph.D.	Senior Scientist	Agricultural/Home Sc. Extension, Transfer of Technology, Participatory Extension, Adoption, Gender Empowerment	29	0	0
Dr. Nafees Ahmad	Ph.D.	Senior Scientist	Agricultural Extension, Adoption and Diffusion, Agricultural Management, Research Methodology	15	0	0
Dr. N. V. Kumbhare	Ph.D.	Scientist	Participatory Extension, Impact assessment & Transfer of technology	15	0	0
Dr. V. Sangeetha	Ph.D.	Scientist	ICT, Women Empowerment and Communication	4 years 10 months	0	0
Dr. Sujit Sarkar	Ph.D.	Scientist	Impact assessment & Research methods	2 years 2 months	0	0
Mr. Girijesh Singh Mahra	M.Sc.	Scientist	Communication & Management	1 year 2 months	0	0

**12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:**

S. No.	Name of the Faculty	Status
1.	Dr. P. N. Mathur, Former Joint Director (Extn) IARI, New Delhi	Adjunct Faculties
2.	Dr. B. S. Hansra, Professor, Amity School of Agriculture, Amity University, New Delhi	Adjunct Faculties
3.	Dr. B. P. Sinha, Former Head, Division of Agricultural Extension, IARI	Adjunct Faculties
4.	Dr. V. V. Sadamate, Former Advisory (Agriculture) Planning Commission	Adjunct Faculties

13. Percentage of classes taken by temporary faculty – programme-wise information

NA

14. Programme-wise Student Teacher Ratio:

M.Sc. = 10/17 = 0.58:1 and Ph.D. 23/17 = 1.35: 1

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

	Sanctioned	Filled	Actual (including CAS & MPS)
Administrative staff	06	03	04
Technical staff	40	12	12
Others (Supporting staff)	17	09	09

16. Research thrust areas as recognized by major funding agencies

- Extension System and Management
- Climate Change Adaptation
- Entrepreneurship Development in Agriculture
- Livelihood Security
- Knowledge Management
- ICT in Agriculture Extension
- Gender Empowerment
- Farming System Development

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.**In-house projects:**

Title	PI
Cyber Extension Model for Agricultural Development: An Action Research.	Dr. R. R. Burman
Analyzing and Devising Extension Models and Strategies for Sustainable Agricultural Development.	Dr. R. N. Padaria
Constraints in Adoption of Improved Technologies and Yield Gap in Selected Pulses and Cereals: A Comparative Study.	Dr. M. S. Nain
Enhancing Entrepreneurship among Rural Youth.	Dr. Rashmi Singh



Gender Empowerment Through SHG's: Designing and Validation of Capacity Building Training Modules for Enhancing the Effectiveness of SHG's.	Dr. Monika Wason
Development of Innovative Agricultural Extension Models	Dr. R. N Padaria
Maximising Farm Profitability through Entrepreneurship Development and Farmer Led Innovation	Dr. Rashmi Singh
Enhancing Nutritional Security and Gender Empowerment	Dr. V. Sangeetha

External funded projects (National):

Title of Research Projects	Name of PI	Associates	Funding Agency	Total grants received (Lakh rupees)
Visioning, Policy Analysis and Gender (V- PAGE) (NAIP)	Dr. Premlata Singh (IARI center)	Dr. Amit Kar (Agril. Economics)	NAIP (ICAR) (Lead centre NCAP)	--
Developing Agricultural Entrepreneurs in Vegetable Seed Production	Dr. Rashmi Singh	Dr. J.P. Sharma, Dr. M.S. Nain, Dr. R. R. Burman Dr. S.K. Dubey Dr. B. S. Tomar Dr. Sudipta Basu Dr. Raj Kumar Dr. Ravindra Kumar Dr. T. K. Behera Dr. Balraj Singh	NABARD	39 Lakhs
Livelihood & nutritional security of tribal dominated areas through integrated farming system and technology models (NAIP)	Dr. J. P. Sharma	Dr. A. D. Munshi Dr. R. R. Sharma Dr. S K Yadav Dr. Manish Srivastava Dr. Nishi Sharma Dr. Rajvir Sharma Dr. Pratibha Sharma Dr. R. R. Burman	NAIP (ICAR)	51.27 lakhs

18. Inter-institutional collaborative projects and associated grants received

- a) National collaboration b) International collaboration

Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

None under these programmes.

20. Research facility / centre with

State recognition	√
National recognition	√
International recognition	√

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Nil



22. Publications (from the period of 2010-2014):

	Sharma J. P.	Singh P	Padaria R N	Singh R	Wason M	Singh BK	Dabbas JPS	Nain MN	Burman RB	Lenin V	Mishra JR	Sharma Nishi	Nafees Ahmad	Kumhare NV	V San- getha	Sarkar S	Mahra G
Number of papers published in peer reviewed journals (national/international)	17	33	16	12	8	12		15	16	1		4		8	10	6	2
Monographs	0																
Chapters in Books	20	27	07	25	10	2		23	15	3	1	3		9	12	7	-
Edited Books	6	1	-	2	5	1		1	2	2	-	2		4	-	1	-
Books with ISBN with details of publishers	2	1	-	2	-	-		1	2	-	-	-		2	-	1	-
Number listed in International Database																	
Citation Index – range / average																	
SNIP range / average																	
SJR range / average																	
Impact Factor– range / average																	
h-index																	



- (i) Number of papers published in peer reviewed journals (national/international)
 National: 129
 International: 08
- (ii) Monographs: Nil
- (iii) Chapters in Books: 119
- (iv) Edited Books: 06
1. Singh Premlata, Sharma J.P., Burman R.R. Kumbhare and Sarkar Sujit (Eds.). (2014). Agricultural Extension: A Handbook Vol I & II Publisher: PG School, IARI, New Delhi, (ISBN: 978-93-83168-12-5)
 2. Singh Rashmi, Sharma, J. P., Rao D. M., Nain M. S. and Burman R. R. (2012). Entrepreneurship Development in Agriculture 2012 Biotech Publishers, New Delhi, 397 pp. ISBN: 976-81-7622-258-7
 3. Sharma, J. P.; Dubey, S. K.; Roy Burman, R. and Sharma, Nishi (Eds.) (2011). Agro-enterprises for Rural Development and Livelihood Security. New India Publishing Agency, New Delhi, xvi+450p, (ISBN: 9380235-85-2)
 4. Singh Dan and Singh B. K. Agricultural Extension & Rural Development. (2011) Narendra Publishing House. 2011. New Delhi.
 5. Singh, Baldeo; Bahal, Ram; Roy Burman, R. and Kumbhare, N. V. (Eds.) (2010). New Dimensions of Agricultural Research and Extension. IARI, New Delhi.
 6. Sharma Nishi et. al (Eds.). (2010). *Rajasthan ke Janajatiya Kshetron mein phalon ke keet rog va kharpatvar avm unka niyantran*, IARI, New Delhi p 100.
- (v) Books with ISBN with details of publishers: 03
1. Singh Premlata, Sharma J.P., Burman R.R. Kumbhare and Sarkar Sujit (Eds.). (2014). Agricultural Extension: A Handbook Vol I & II Publisher: PG School, IARI, New Delhi, (ISBN: 978-93-83168-12-5)
 2. Singh Rashmi, Sharma, J. P., Rao D. U. M., Nain M. S. and Burman R. R. (2012). Entrepreneurship Development in Agriculture, Biotech Publishers, New Delhi, 397 pp. ISBN: 976-81-7622-258-7
 3. Sharma, J. P.; Dubey, S. K.; Roy Burman, R. and Sharma, Nishi (Eds.) (2011). Agro-enterprises for Rural Development and Livelihood Security. New India Publishing Agency, New Delhi, xvi+450p, (ISBN: 9380235-85-2)
- (vi) Number listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete, Dare Database - International Social Sciences Directory, EBSCO host, etc.): Nil
- (vii) Citation Index – range / average: Nil
- (viii) SNIP: Nil
- (ix) SJR: Nil
- (x) Impact Factor – range / average: NA
- (xii) h-index: Nil

**Some of the important publication from 2010- 2014****Publication: NAAS Rating Above 6**

V P Chahal, M S Nain, Rashmi Singh and S S Chandel. 2014. A Study on Cognitive and Psychomotor Factors of Hill Farmers on Adoption of Agri-Horti Farming System. Indian Journal of Agricultural Sciences.	6.0
S. K. Dubey, R. R. Burman, J. P. Sharma, K. Vijayaragavan, V. Sangeetha, Ishwari Singh and H. S. Gupta. 2014. Can post offices of rural India be the driver for agricultural technology dissemination? Experiences of action research. Current Science.	6.83
Kumbhare N.V., Dubey S.K., Nain M.S. and Bahal Ram. 2014. Micro analysis of yield gap and profitability in pulses and cereals. Legume Research- An International Journal	6.14
Dubey, Shantanu Kumar, Burman, R. R., Vijayaragavan, K., Sharma, J. P., Singh, Ishwari, Sangeetha, V. and Gupta, H. S. 2012. Linking research institute with post offices for dissemination of agricultural technologies: an action research. Indian Journal of Agricultural Sciences	6.0
Sujit Sarkar, R. N. Padaria, K Vijayaragavan, R R Burman, H Pathak, P Kumar and G K Jha. 2014 Assessing the impract of climate change in Arid Ecosystem of India. Range Management and agroforestry. Vol 35 (2)	6.17
Lenin, V., Singh, B., Kumar, P., and Vijayaragavan, K. 2013. Agricultural extension in India – the effectiveness of the Agricultural Technology Management Agency. Outlook on Agriculture	6.37
V. Sangeetha, Ram Bahal, Premlata Singh and P. Venkatesh. 2013. Impact Assessment of Non-government Organization Led Self Help Groups on Empowerment of Rural Women in South India. Outlook on Agriculture	6.37

Publication: NAAS Rating Below 6

Halen Kassa, Premlata Singh, Nishi Sharma and V.Sangeetha. 2014 . Extension system and farmers linkage effectiveness in Agricultural Universities of Ethopia and India. The Journal of Research ANGRAU	3.86
Naik, V.Ravinder and R.N.Padaria. 2014. Attitude of farmers towards ICT based extension services. Bioinfolet	3.75
Subhashree Sahu, J. P. Sharma, R. R. Burman, Premlata Singh, N. V. Kumbhare, Eldho Varghese. 2014. Factors Contributing to Success and Sustainability of Farms Produce Promotion Society (FAPRO). Journal of Community Mobilization and Sustainable Development	3.46
Sukanya Barua and Monika Wason. 2014. Gender Participation and Constraints Analysis for Implementation of Tribal Sub Plan in West Bengal. Indian Res. Journal of extension Education	3.92
Raina V., Nain M.S., Hansra B.S. and Khajuria Shalini. 2014. Knowledge and Adoption Level of Flower Cultivation in Jammu Region. Journal of Community Mobilization and Sustainable Development.	3.46
Rajesh Bishnoi, Premlata Singh, Manohar B. Dhadwad, V. Sangeetha. 2014. Men and Women Farmers' Perception about Climate Change in Arid Ecosystem of Rajasthan. Environment and Ecology.	4.09
Slathia P.S., Nain M.S., Sharma J.P., Ali Liaqat, Chahal V.P. and Kumar Rakesh. 2014. NGO in Socioeconomic Development of Rural Women: A Case Study. Journal of Community Mobilization and Sustainable Development	3.46
Madan Singh, R. Roy Burman, J. P. Sharma, V. Sangeetha and M. A. Iquebal. 2014. Structural and Functional Mechanism of Mobile Based Agro-advisory Services and Socio-Economic Profile of the Member Farmers. Journal of Community Mobilization and Sustainable Development	3.46
Dhiraj K. Singh and Premlata Singh. 2014. Study of effective implementation of Agricultural Technology Management Agency through case studies in Bihar. International Journal of Agriculture, Environment and Biotechnology.	4.10
Shafi Afroz, Rashmi Singh, R. R. Burman, Sangeetha V. and Rajender Prasad. 2014. An Innovative Participatory Video for Agricultural Information Dissemination: A case of Digital Green. Journal of Community Mobilization and Sustainable Development.	3.46
Dhiraj K. Singh and Premlata Singh. 2014. Constraints in implementation of strategic Research and Extension Plan of Agricultural Technology Management Agency in Bihar. Bioinfolet	3.75
Litan Das, M.S. Nain, Rashmi Singh and R. Roy Burman. 2014. Constraints in Marketing of Fruits as Perceived by the Fruit Growers and NERAMAC in Assam. Journal of Community Mobilization for Sustainable Development.	3.46
Sharma Nishi, Wason Monika, Singh Premlata, Padaria R.N., Sangeetha, V. and Kumar, N. 2014. Assessing Effectiveness of SHGs in improving Livelihood Security and Gender Empowerment . Economic Affairs	4.69



M.S. Nain, Ram Bahal, Shantnu K. Dubey and N.V. Kumbhare. 2014. Adoption Gap as the Determinant of Instability in Indian Legume Production: Perspective and Implications. Journal of Food Legumes	3.19
Rajesh Bishnoi, Premlata Singh and V. Sangeetha. 2014 Awareness Assessment of Men and Women farmers' about Climate Change in Arid Ecosystem. PUSA Agri Science.	2.2
Patil, Sridhar; V.Ravinder Naik and R.N.Padaria. 2013. Adoption of improved dairy farming practices in South-West Delhi district	3.46
Dhiraj K. Singh and Premlata Singh. 2013. Effectiveness of Training Programmes under Agricultural Technology Management Agency in Bihar. Journal of Community Mobilization and Sustainable Development.	3.92
Rashmi Singh. 2012. A Critical Study of the Entrepreneurship Development Process among Women. Journal of Business Diversity	-
Burman, R. R., Dubey, S. K., Jha, Girish Kumar, Singh, Gajab, and Sharma, Manoj Kumar. 2012. Analysis of production gap, marketing and processing status and associated constraints for major oil seeds in the state of Rajasthan and Gujarat. Journal of Community Mobilization and Sustainable Development	3.46
Monika Wason, Premlata Singh, R.N.Padaria and K.Vijayaragavan. 2012. Assessment of Training Needs of Self Help Group Members. Indian Journal of Extension Education.	3.26
V. Sangeetha, Premlata Singh and P. Venkatesh. 2012. Behavioral Change of Self Help Group (SHG) members- An effort by Non-Governmental Organization (NGO). Madras Agricultural Journal	3.98
S. Paul, K. Vijayaragavan and Premlata Singh. 2012. Best Practices of Agricultural Scientists. Pusa Agri. Science	2.2
Kumar P. and M. S. Nain and Peshin R. 2012. Changing face of agricultural extension: from a P to 4Ps- A review. Agricultural Reviews	3.31
Mukherjee, Anirban; Bahal, Ram; Roy Burman, R.; Dubey, S. K. and Jha, G. K. 2012. Conceptual Convergence of Pluralistic Extension in Aligarh District of Uttar Pradesh. Journal of Community Mobilization and Sustainable Development	3.46
Vishnugauda, J.P. Sharma and Premlata Singh. 2012. Constraints involved in Post harvest management, marketing and export of pomegranates. Asian Journal of Extension Education	2.93
H.D. Venu Prasad and Premlata Singh. 2012. Contract Farming of Gherkin: Comparative Study of Terms and Conditions. Environment and Ecology.	4.09
H.D. Venu Prasad, Premlata Singh, Prabhala and Vinayak Nikam. 2012. Contract farming: Growth in export of Gherbin in Karnataka. Environment and Ecology	4.09
Lenin, V., Baldeo Singh, and Vijayaragavan, K. 2012. Coordination among agencies delivering extension services under Agricultural Technology Management Agency. Journal of Agricultural Extension Management	2.78
Pankaj K Sinha, Rashmi Singh and V.K. Yadav. 2012. Correlates and Facilitative factors for baby corn enterprise development in Haryana. Journal of community mobilization and sustainable development	3.46
G. Vimal Raj, Rashmi Singh and K Vijayaragavan. 2012. Correlates of Successful Agripreneurship: A Study of Awardee Farmers of Tamil Nadu. Karnataka J. Agric. Sci.,	3.50
Slathia P.S., Paul N., Nain M.S., Nanda R., and Peshin R. 2012.	
Credibility crisis among Agriculture Extension Functionaries in Jammu & Kashmir. Indian Journal of Extension Education	3.26
H.D. Venu Prasad, Premlata Singh, Itigi Prabhakar and Vinayak Nikam. 2012. Ecological Implications of Gherkin Contact Farming. Environment and Ecology	4.09
Sharma, J. P.; Sharma, Nishi; Dubey, Shantanu Kumar; Burman, R. R.; Gupta, Shashi and Jiyawan, Ram. 2012. Evaluating Capacity Building programme for Livelihood and micro-Enterprise Development. Journal of Community Mobilization and Sustainable Development	3.46
Johnson B., K. Vijayaragavan and Premlata Singh. 2012. Extent of Adoption of system of Rice Intensification (SRI) practice in India. Indian Journal of Extension Education.	3.26
Mukherjee, Anirban; Bahal, Ram; Roy Burman, R. and Dubey, S. K. 2012. Factors Contributing Farmers' Association in Tata Kisan Sansar: A Critical Analysis. Indian Res. J. Ext. Edu.	3.92
V.Sangeetha, Monika Wason, Premlata Singh, R.N.Padaria, Nishi Sharma and Vijay Babu. 2012. Impact Assessment of Self Help Groups on Empowerment of Rural Women in Andhra Pradesh. Journal of Community Mobilization and Sustainable Development	3.46
Jaganathan, D.; Bahal, Ram; Roy Burman, R. and Lenin, V. 2012	
Knowledge of Farmers on Organic Farming in Tamil Nadu. Indian Res. J. Ext. Edu.	3.92



Raju, J.P. Sharma, Premlata Singh and R.N. Padaria. 2012.	
Socio-economic impact of watershed development. Journal of Community Mobilization and Sustainable Development.	3.46
Raju, J.P. Sharma, Premlata Singh and R.N. Padaria. 2012.	
Social process and people's participation in watershed development. Journal of Community Mobilization and Sustainable Development	3.46
Venu Prasad H.D., Premlata Singh and V.K. Chaturvedi. 2012.	
Socio-economic impact analysis of contract farming of gherkin in Karnataka. Indian Journal of Extension Education	3.26
Arindam Nag, Rashmi Singh, R. Roy Burman and Bagish Kumar. 2012. Use of Rice Cultivation Technology in High and Low Rice Productive Districts of West Bengal: Constraints Analysis. Environment & Ecology	4.09
Johnson, K. Vijayaragavan and Premlata Singh. 2012.	
Successful and Unsuccessful cases in SR. The Andhra Agricultural Journal	3.51
Kumar P. and M. S. Nain .2012. Technology use pattern and constraint analysis of farmers in Jammu district of Jammu and Kashmir state of India. Journal of Community Mobilization and Sustainable Development	3.46
N.V.Kumbhare, R.N.Padaria and V.K.Chaturvedi. 2011. Household Food Security under Changing Agricultural Scenario. International Journal of Extension Education	4.15
N.P.Singh, R.P.Singh, Ranjit Kumar, R.N.Padaria, Alka Singh and NishaVarghese. 2011. Farm level impacts and determinants of labour outmigration in Indo-Gangetic Plains of India. Indian Journal of Agricultural Economics	5.04
N.P.Singh, R.P.Singh, RanjitKumar, R.N.Padaria, Alka Singh and NishaVarghese. 2011. Labour migration in Indo-Gangetic Plains: Determinants and Impacts on Socio-economic welfare. Agricultural Economics Research Review	5.68
Slathia P.S., N. Pal and M.S. Nain. 2011. Awareness among farming community regarding Kissan Call centres in Jammu region. International Journal of Extension Education	4.15
Nag, Arindam; Singh, Rashmi and Roy Burman, R. 2011.	
Changes in Technology Use in Rice Cultivation in Low and High Rice Productive Districts of West Bengal. Journal of Community Mobilization and Sustainable Development	3.46
Premlata Singh, Joginder Singh and Rahul. 2011.	
Drudgery reduction of farm women: An ergonomic assessment of improved agricultural tool and implements. Indian Journal of Extension Education	3.26
Mukherjee, Anirban, Ram Bahal, R. Roy Burman, S. K. Dubey and G. K. Jha . 2011. Effectiveness of Tata Kisan Sansar in Technology Advisory and Delivery Services in Uttar Pradesh. Indian Res. J. Ext. Edu.	3.92
Rashmi Singh and Sinha B.P. 2011. Entrepreneurial Performance of Women: Psychological Mainsprings, Sociological Facilitators and Inhibitive Factors. International Journal of Extension Education	4.15
Peer Q. J. A., Nain M. S. and Kumar P. 2011. Farmers' Perceptions on Challenges and Opportunities for Commercializing Pear (Pyrus communis) in Kashmir Valley of J&K State Journal of Research	3.1
Sajesh V. K.,P., Ramasundaram & Premlata Singh. 2011. Impact of Self Help Groups on Empowerment of Rural Women: A case of Kudumbasree programme in Kerala. Indian Journal of Extension Education	3.26
Johnson B. Vijayaragavan K. Premlata Singh, V.C. Mathur, Seema Jaggi and D.K. Sharma. 2011. Innovations and Local Adoptions of System of Rice Intensification. Pusa Agri. Science	2.2
Kumar A., Ajrawat B, Singh U. and Nain M. S. 2011.	
Interests and Activities of Rural Youth in relation to Education: A Study of Samba District of J&K. Research Journal of Agricultural Sciences	3.51
V. Raina, M.S. Nain, B.S. Hansra and D. Singh. 2011. Marketing Behaviour and Information Sources Utilization Pattern of Flower Growers. Journal of Community Mobilization and Sustainable Development.	3.46
Naryanan, Premlata Singh, K.Vijayaragavan, D. U. M, Rao, V.C. Mathur and Seema Jaggi. 2011. Profile of Self Help Micro-entrepreneurs Under Swarna Jayanti Swarozgar Yojana in Tamil Nadu. Pusa Agri. Science	2.2
Jha, Girish Kumar; Burman, R. R.; Dubey, S. K. and Singh, Gajab. 2011. Yield Gap Analysis of Major Oilseeds in India. Journal of Community Mobilization and Sustainable Development	3.46
Singh D., Nain M.S. , Hansra B.S. , Raina V. 2011. Trends in Non Basmati Rice Productivity and Factors of Yield Gap in Jammu Region. Journal of Community Mobilization and Sustainable Development	3.46



Arnab Biswas, Baldeo Singh & Premlata Singh. 2011. Socio-economic impact of contract farming. Indian Journal of Extension Education	3.26
Vishnugauda, J.P. Sharma and Premlata Singh. 2011. Technological gap in pomegranate cultivation. Indian Journal of Extension Education	3.26
Shirke V. S., Ajotikar M. V., Sharma, J. P. and Sonwane, H. P. 2011. Adoption Analysis of Agricultural Coverage in Selected Indian National Dailies. Asian Journal of Extension Education	2. 93
Sah Uma, Dubey Shantanu Kumar and Sharma J. P. 2011. Potato Marketing in North east Region of India: A diagnostic Study. Journal of Community Mobilization and Sustainable Development .6 (I)	3.46
Yadav VPS, Yadav SK, Hudda RS, Sharma JP and Sharma Karamjit. 2011. Extent of Transfer of Crop Production Technologies in Dryland Farming. Journal of Community Mobilization and Sustainable Development. 6 (I)	3.46
Nain M.S. and Parveen Kumar. 2010. A Study of Women Participation and Decision Making in Farm Management . Journal of Community Mobilization and Sustainable Development	3.46
Roy Burman, R., Lakhan Singh and Singh, A. K. 2010. Analysis of Linkage Mechanism of Krishi Vigyan Kendra. Journal of Community Mobilization and Sustainable Development	3.46
Amol Bhalarao, J.P. Sharma, DUM Rao and Premlata Singh. 2010.	
Assessment of extent of value addition in banana. Journal of Community Mobilization and Sustainable Development	3.46
Helan S., Premlata Singh & K. Vijayaragavan. 2010. Constraints of linkages among University Research, Extension and Farmers in India and Ethiopia: A Critical Analysis. Indian Journal of Extension Education	3.26
Arun Kumar S. & Premlata Singh. 2010. Exploratory study on the motivational factors of contract farming. Indian Journal of Extension Education	3.26
Nain M.S. and S.S. Chandel. 2010. Determinants of Farmers' Training Need in Agri-horti Farming System: A Study of Doda District of J&K State . Journal of Community Mobilization for Sustainable Development	3.46
G. Vimal Raj, Rashmi Singh and K Vijayaragavan. 2010. Extent of Adoption of Best Practices by Award Winning Agripreneurs of Tamil Nadu. Journal of Community Mobilization for Sustainable Development	3.46
V. Sangeetha, Ram Bahal, Premlata Singh, Pramod Kumar and P. Venkatesh. 2010. Facilitating and Hindering Factors for Success of Self Help Groups. Journal of Community Mobilization for Sustainable Development	3.46
Lenin, V., and Gajanana, T.M. 2010. Marketing of aonla fruits. Indian Journal of Arid Horticulture	3.06
Roy Burman, R., Singh, S. K. and Singh, A. K. 2010. Gap in Adoption of improved Pulse Production Technologies in Uttar Pradesh. Indian Res. J. Ext. Edu.	3.92
Sarkar, Sujit and R. N.Padaria. 2010. Farmers' Awareness and Risk Perception about Climate Change in Coastal Ecosystem of West Bengal. Indian Research Journal of Extension Education Vol.12. No.2	3.92
S.Sarkar, R.N.Padaria, N.Sivaramane and K.Vijayaragavan. 2010.	
Assessment of farmers' vulnerability and adaptation to climate change in Sunderban Ecosystem. Indian Journal of Extension Education	3.26
Manjunatha B L, Rao Uma Maheswara and Sharma J. P. 2011. Socio-psychological Characteristics of Samaj Shilpi Dampatis vis-à-vis the Performance of Village Self Reliance Campaign. Journal of Community Mobilization and Sustainable	3.46

23. Details of patents and income generated: Nil

24. Areas of consultancy and income generated: Nil

25. Faculty selected nationally / internationally to visit other laboratories/institutions /industries in India and abroad

Name of Faculty	Detail of visit
Dr. Rashmi Singh	Invited as international expert on women entrepreneurship organized by Asian Productivity organization on the workshop for women on the management of small and medium food processing enterprises Makassar, Indonesia, 2011.
Dr. R. R. Burman	Deputed to Myanmar to develop Detailed Project Report for establishing Advanced Centre for Agricultural Research and Education (ACARE) from September 12 – 16, 2011. Deputed to participate in Workshop on “Food Value Chain Analysis: Tools and Applications” organised by IRRI, Philippines at Bangkok, Thailand from December 4 – 8, 2013.



26. Faculty serving in a) National committees b) International committees c) Editorial Boards d) any other (please specify)

Name of Scientist	National Committee	Editorial Boards
Dr. J. P. Sharma	Member, Sub-group VII on Out-reach programmes, Linkages, ITKs and Backstopping for Small and Marginal Holdings under Working Group on Agricultural Research and Education for XII th Plan, Planning Commission, Govt. of India	Chief Editor of Journal of Community Mobilization Member, Editorial Board. International Journal of Applied Science and Humanities (ISSN No. 0976-1217) Member, Editorial Board, Asian Journal of Extension Education, College of Agriculture, Pune, Maharashtra Society of Extension Education
Dr. Premlata Singh	Member Task Force Committee for Biotechnology based programme for women. Member of selection committee, UPSC.	Chief Editor Indian Journal of Extension Education (2009-2011) Editor- Pusa Agri Science
Dr. B.K. Singh		Joint Secretary of Society of Extension Education, Agra Secretary of Indian Society of Extension Education, New Delhi
Dr. R.N. Padaria	Expert member for review of core projects of DST Worked as member secretary of the sub-committee on ITKs and extension system for small holding system of Working Group on Agricultural Education of Planning Commission-XII plan.	Chief Editor of Indian Journal of Extension Education(2012-2015)
Dr. Rashmi Singh	Selection committee of UPSC APO participants/Experts Forum at NPC, New Delhi.	Member in Editorial board, Annals of Agricultural Sciences, New Delhi Reviewer for Karnataka Journal of Agricultural Sciences and NISCAIR journal
Dr. R.R. Burman		Assistant Chief Editor of International Journal of Bio-resources and Stress Management (IJBSM) Member, Editorial Board of Indian Research Journal of Extension Education Member, Editorial Board, Journal of Community Mobilization for Sustainable Development Member, Editorial Board, Current Advances in Agricultural Sciences
Dr. Nishi Sharma	Member of Executive councilor Indian Society of Extension Education (north zone) Member of expert committee at IGNOU in course development committee Member of Rural Agricultural Programme Advisory Committee of AIR, New Delhi	Member, Editorial Board, Journal of Community Mobilization



27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs)

Trainings attended by the faculty

Name of the scientists	Topic of training	Period
Dr. Premlata Singh	Emotional Intelligence at the Work Place, Centre for Organizational Development, Hyderabad	4-8 Feb- 2013
	Pre RMP (Research Management Position) Training on Leadership Development, NAARM, Hyderabad	15-26 July, 2014
	Masters training- Climate Change, Agriculture and Gender in South Asia (CGIAR)- Climate Change, Agriculture & Food Security (CCFAS), New Delhi	25-26 Nov, 2011
Dr. B. K. Singh	MIS training for scientific staff, IASRI, New Delhi	30 Sep- Oct 1, 2013
Dr. Rashmi Singh	Faculty development programme (Trainers' Training course on Entrepreneurship Development) at Entrepreneurship Development Institute of India, Ahmadabad, Gujarat	3-14 March, 2013
	DST sponsored EDI training Course for Women Scientists on Entrepreneurship Development at Entrepreneurship Development Institute of India, Ahmadabad, Gujarat	18 -22 March, 2014
Dr. Monika Wason	Training on advances in analytical tools for social sciences at NAARM Hyderabad	17-26 September, 2014
	Entrepreneurship development and management at Entrepreneurship Development Institute of India, Ahmadabad, Gujarat	2-6 February, 2015
Dr. M. S. Nain	Refresher course on Agriculture Research Management, NAARM, Hyderabad	14-28, July, 2014
	National workshop on upscaling of farmers' innovations at NASC Complex, New Delhi	3 September 2013
	National training programmes formulation, risk management, scientific working and presentation, IARI, New Delhi	11-15 December, 2012
	Course on creative writing in Agriculture, IIMC at New Delhi	14-18 February, 2011
	Managing agricultural innovations in era of globalization at Division of Agricultural Economics at IARI	25-30 Oct, 2010
Dr. R. R. Burman	Training Programme on Data Analysis using SAS under the Consotria-based research Project "Strengthening Statistical Computing for NARS", organised by IASRI, New Delhi	22 – 27 November, 2010
	International Workshop on 'Food Value Chain Analysis' IRRI, Philippines, Bangkok, Thailand	4-8, December, 2013
Dr. V. Lenin	MDP workshop on Priority setting, Monitoring and Evaluation of agricultural research projects at NAARM, Hyderabad	18-22 June, 2013
	CAFT training programme on Agricultural web application development using content management tools at IASRI, New Delhi	Sep 24- October 14, 2014
	Training programme on video production at Digital Green, New Delhi	13-15November 2014
Dr. J. R. Mishra	CAFT training programme on Futuristic agricultural extension approaches and tools at Division of Agril Extension, IARI, New Delhi	03-23 September, 2014
Dr. Nishi Sharma	MIS training for scientific staff, IASRI, New Delhi	7-8 th Oct, 2013
Dr. N. V. Kumbhare	NAIP National Training on Project Formulation, Risk Assessment, Scientific Report Writing and Presentation at Division of Agricultural Extension, IARI, New Delhi	30 th July to 3 rd August, 2013



	Short course on Multimedia Digital Content Development” held at National Academy of Agricultural Research Management, Hyderabad Experiential Learning and Andragogical Methods for Developing Entrepreneurial Human Resources organized by Division of Agricultural Extension, IARI, New Delhi Methodological Advances in Extension Research organized by Division of Agricultural Extension, IARI, New Delhi	August 22-31, 2012. September 11-October 1, 2012. February 5-25, 2010.
Dr. V. Sangeetha	IT-based Decision Support System for Digital Content Development at NAARM, Hyderabad Summer School on Advances in Educational Methodology and Instructional Technology at NAARM, Hyderabad CAFT course on Andragogical Methods for Developing Entrepreneurial Human Resource at Division of Agricultural Extension, IARI, New Delhi MIS training for scientific staff, IASRI, New Delhi Training programme on video production at Digital Green, New Delhi	5-15 October, 2010 5-25 July, 2012 Sep 11-October 01, 2012 11-12 th November, 2013 13-15 November 2014
Dr. Sujit Sarkar	CAFT training programme on Advances in methodological paradigm and tools in Extension Research at Division of Agril extension, IARI, New Delhi Training programme on video production at Digital Green, New Delhi	Sep 17- Oct 7, 2013 13-15 Nov, 2014
Mr. Girijesh Mahra	Training programme on video production at Digital Green, New Delhi	13-15 Nov, 2014

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects: Nil

Percentage of students doing projects in collaboration with other universities /industry/institute of students doing projects in collaboration with other universities /industry/institute: Nil

29. Awards/recognitions received at the national and international level by (Last five year 2010- 2014)

a) Faculty

S.No.	Name of the Scientist	Name of the Awards
1.	Dr. J. P. Sharma	Shanti Prasad Goel Award by MOBILIZATION, New Delhi (2011) Best Scientist Award by Young Farmers Association, Punjab (2011) Achievement Award 2011 by SADHNA, Dr. Y S Parmar university of Horticulture & Forestry, Nauni, Solan, H. P. (2011)
2.	Dr. J. P Sharma Dr. Ram Bahal Dr. Premlata Singh Dr. R. N. Padaria Dr. Rashmi Singh Dr. M.S. Nain Dr. R. Roy Burman Dr. N. V. Kumbhare Dr. V. Sangeetha	Presidential Appreciation Award by INSEE, Nagpur (2011)
3.	Dr. B. K. Singh	G. S. Vidyarathi memorial Award, ISEE, New Delhi (2011) Dr. B. L. Beghla Award (2011)



4.	Dr. Rashmi Singh	International Expert on Women Entrepreneurship by Asian Productivity Organization, Japan (2011)
5.	Dr. M.S. Nain	Young Scientist Award by Society of Extension Education, Agra (2011) ISEE Fellow by Indian Society of Extension Education, New Delhi (2011) Fellow Mobilization Award (2012)
6.	Dr. V. Sangeetha	Best Paper Presentation Award by Mobilization (2011)
7.	Dr. N. V.Kumbhare	Appreciation Award by International Society of Extension Education(2011) Presidential Appreciation Award Society for Community Mobilization for Sustainable Development, New Delhi (2012) Appreciation Award by Indian Council of Agricultural Research (ICAR) (2012)
8.	Dr. J. P Sharma Dr. Premlata Singh Dr. R. N. Padaria Dr. Rashmi Singh Dr. M.S. Nain Dr. R. Roy Burman Dr. N. V. Kumbhare Dr. V. Sangeetha	Presidential Appreciation Award by ICAR and APAARI (2012)
9.	Dr. R. N. Padaria	Best teacher Award, IARI, 2012 on 51 th Convocation (Golden Jubilee) (2012)
11.	Dr. Nishi Sharma	Best Paper Award (2012) Fellow Mobilization Award (2011)
12.	Dr. Premlata Singh	Best teacher Award, IARI, 2014 on 52 nd Convocation (2014)
13.	Dr. R. R. Burman	Best oral paper presentation award by society of Extension Education, Agra(2014)
14.	Dr. Sujit Sarkar	Best Oral paper presentation award by Society of Extension Education, Agra (2014) Best case study award by ACCESS (2014)

b) Students/ Ph.D. Fellow

S. No.	Year	Name of The Scientists(s)/ Staff/ student	Designation	Name of the Awards/ Recognition	Contributions
1.	2010	Subhadeep Roy	Ph.D. student	IARI Merit Medal	Ph. D. research
2.	2013	Dr. Sudipta Paul	Ph.D. student	IARI Best Student	Overall performance in PG studies (Ph. D.)
3.	2013	Ms. Reshma Gill	M.Sc. student	IARI Merit Medal	M. Sc. Research
4.	2014	Dr. B. L. Manjunatha	Ph.D. student	IARI Best Student	Overall performance in PG studies (Ph. D.)
5.	2014	Sh. Rajesh Bishnoi	M.Sc. student	IARI Merit Medal	M. Sc. Research
6.	2014	Ms. Hema Baliwada	Ph.D. student	Best Paper Award	International Conference organised by INSEE from 5 th – 8 th , 2013 at UAS, Bangalore

30. Seminars/Conferences/Workshops organized and the source of funding (national/international) with details of outstanding participants, if any

Seminar/ conference Workshop	Source of funding
Brainstorming Session on Methodological Issues in Extension Researches: Way Forward at Division of Agricultural Extension, IARI, New Delhi on April 26, 2013	ICAR
Stakeholders Interaction involving 10 national and multinational retail chain outlets (June 1, 2013) (Linking farmers to market)	ICAR
National Workshop on IARI Post office Linkage Model on April 11, 2013	ICAR



Interaction Meet on Synergistic Convergence for Maximising Farm Profitability at Naveen Mandi, Hapur on June 2, 2014.	ICAR
Stakeholders' Workshop on Innovative Extension Models and Approaches, at Division of Agril Extension, IARI, New Delhi on Oct 10, 2014.	ICAR
International conference with ICAR, INSEE on Innovative Approaches for Agricultural knowledge Management: Global Extension Experiences, Nov 9-12, 2011.	ICAR/ INSEE

31. Code of ethics for research followed by the departments:

As per ISO 9001- 2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	2	3	-	-
Ph.D.	76	1	5	1.31	6.57

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students From other countries
M. Sc.	Nil	Nil	100%	Nil
Ph. D.	78.2 %	Nil	100 %	13.04%

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

Name of Examination	Number of students qualified
UGC- JRF	13
ICAR – NET	25
UGC- NET	23
DST	05
ARS	18
Civil Examination	03
Assistant Professor	02
State Government	01
Total	90

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil
PG to Ph.D.	78.2 %



Ph.D. to Post-Doctoral	All students after Ph. D. get jobs.
Employed Campus selection Other than campus recruitment	72.7 %
Entrepreneurs	No Entrepreneur

36. Diversity of staff

Percentage of faculty who are graduates: NA	
Of the same university	Nil
From other universities within the state	11.76
From universities from other States from	88.23
Universities outside the country	Nil

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

Dr. V. Sangeetha, Scientist, Division of Agricultural Extension

Dr. Sujit Sarkar, Scientist, Division of Agricultural Extension

38. Present details of departmental infrastructural facilities with regard to

a) Library	A repository of books and thesis, journals and other publications.
b) Internet facilities for staff and students	Wi fi, LAN accessed at library, PG laboratory, class room, information room, training halls
c) Total number of class rooms	3
d) Class rooms with ICT facility (Smart classroom)	3
e) Student's laboratories	1
f) Research laboratories (Audio-Visual lab)	1

39. List of doctoral, post-doctoral students and Research Associates (2010-14)

- from the host institution/university
- from other institutions/universities

ICAR holds M. Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level

S.No.	Name of the M. Sc. student	University of Graduation
1.	Channaveersh R. Motagi	University of Agricultural Sciences, Dharwad, Karnataka
2.	Rabeesh KUI. Verma	Narender University of Agriculture and Technology, Faizabad (U.P.)
3.	Alok Kr. Sahoo	Odisha University of Agriculture and Technology, Bhubaneshwar, Odisha
4.	Krishna D. Karjigi	University of Agricultural Sciences, Dharwad, Karnataka
5.	Sunil Kumar	Institute of Agricultural Sciences, B. H. U.
6.	Ashish Singh	Institute of Agricultural Sciences, B. H. U.
7.	Abhinav Bagdas	Vishva Bharti Shanti Niketan University, Bolpur, West Bengal
8.	Udai Pandit	Bihar Agricultural University, Sabour, Bihar
9.	Sukanya Som	Vishva Bharti Shanti Niketan University, Bolpur, West Bengal
10.	Jasna V. K.	Kerala Agricultural university, Padannakkad, Kerala

**List of doctoral from the host institution/university**

Sl. No.	Name of the Ph. D. student	Host/other institute university
1.	Subhadeep Roy	IARI
2.	Abadi Teklehaimanot	Other university
3.	Saka Cahandrashekar	Other university
4.	Johnson B.	IARI
5.	Narayanan G.	IARI
6.	Shinogi K. C.	IARI
7.	Mahesh Malgatti	IARI
8.	Chandravanshi Yaduvanshi Manikanhaiya	IARI
9.	Sudipta Paul	Other university
10.	Dhiraj K. Singh	IARI
11.	Leela Ram Gurjar	IARI
12.	Dhadwad Manohar Bhaurao	IARI
13.	Manoj	IARI
14.	Nikam Vinayak Ramesh	IARI
15.	L. Manjunatha	IARI
16.	Venu Prasad H D	IARI
17.	Sujit Sarkar	IARI
18.	Vankudothu Ravinder Naik	Other university
19.	Rakesh Kumar K.	IARI
20.	Rakesh, E. S.	IARI
21.	Dipika Hajong	IARI

Post-doctoral fellow:

Dr. Kietrele Walker (Dr. C. V. Raman P. D. Fellowship for African Nationals (September, 2013-Jan, 30, 2014))

40. Number of post graduate students getting financial assistance from the university.

The IARI merit fellowship is granted to cent (100%) per cent students for pursuing post graduate programme. Also some of the students are granted fellowships form other institutions namely DST (05) and UGC fellowships (13).

41. Was any need assessment exercise undertaken before the development of new programme(s) ? If so, highlight the methodology.

Not applicable

42. Does the department obtain feedback from**a. Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**

Yes, Faculty members update their course on regular basis. And the feedback is discussed in professor's meeting.

b. Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

The feedbacks are collected from the students after completion of every trimester through standardized evaluation proforma of IARI for every course. Based on the feedback from the students, the necessary changes



in course curriculum, teaching methods and facilities are created in the Division. Based on the feedback the faculty are also identified as Best teachers.

c. alumni and employers on the programmes offered feedback and how does the department utilize the feedback?

The alumni of the Division assemble in IARI-Alumni meet on the last day of convocation programme every year and share their feedback for strengthening the P. G. programme.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and address	Passing Year
1.	Dr V.V. Sadamate, Former Advisor (Agriculture), Planning Commission, Government of India	1975
2.	Dr. Devesh Kishore, Professor Emeritus, Pt. Makhanlal Chaturvedi University of Mass Communication and Journalism	1968
3.	Dr. G. Trivedi, Former Vice Chancellor, RAU, Samastipur	1963
4.	Dr. G L Ray, Former Professor, Bidhan Chandra Krishi Visavidyalya Agricultural university, West Bengal	1967
5.	Dr. S. P. Mishra, Former Vice Chancellor, Dev Sanskriti Vishwavi Dyala, Haridwar Uttarakhand	1979
6.	Dr. N. P. Singh, Director General AIDMAT, New Delhi	1974
7.	Dr. M. P. Akhouri, Executive Director, NISBUD	1973
8.	Dr. K. Vijayaragavan, Former Joint Director (Extension), IARI	1983
9.	Dr. S. V. Supe, Former Associate Dean, Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra	1971
10.	Dr. B. P. Sinha, Former Head, Division of Agricultural Extension, IARI	1970

44. Give details of student enrichment programmes (special lectures/ workshops/seminar) involving external experts

The division organized capacity building programmes for the PG students on “Life Skill and Leadership Development” and also invited the Swami Maharaj ji of Ramakrishna Ashram for motivation of the student on occasion of Birthday of Swami Vivekananda.

Dr. Swanson’s lecture on “Role of ATMA for Converging Pluralistic Extension Approach” in 2009. Students are involved in organizing seminar (INSEE, global forum on women in agriculture mobilization), workshops and also have interaction with the experts from across the country and out.

45. List the teaching methods adopted by the faculty for different programmes

The faculties of the Division use smart class room for teaching the PG students. The faculties use the advance technologies for teaching like interactive ICT based presentations. Other teaching methods are-Lecture, group discussion, brain storming, micro lab exercise, educational and psychological game, field visits, simulation exercises, experiential learning.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The PG teaching of IARI follows trimester system. How far the objective of the courses are achieved is tested through meticulous examination system of IARI which comprises of quiz, Mid-term evaluation, Final examination, term papers and practical examination. Beside formal examination, the students are asked to fill the evaluation proforma for every course after each trimester to ensure that the teaching objectives are met. There is provision for pre qualification and qualifying exams (External experts). Major and Minor comprehensive examinations after completion of course work.

47. Highlight the participation of students and faculty in extension activities.

Students and faculties are regularly involved in different extension activities under the project and practical of PG course curriculum. They actively participate in different field visits, and yearly Pusa *Krishi Vigyan Mela*.

**48. Give details of “beyond syllabus scholarly activities” of the department**

The students of the Division reflected their creativity and excellence by outstanding performance in different extra-curricular activities like-

Name of the students	M.Sc/ Ph.D.	Event in which participated	Remarks
Shakti Parthiban	Ph.D.	PGSSU Election	President
Litan Das	MSc	PGSSU Election	PGSSU Alumni Representative
Anshida Beevi C. N.	Ph.D.	Merit award from Department of Education; Lakshadweep	
Sukanya Som	M. Sc.	(i) Interdivisional Literary Fest ‘Vai-khari -14’ (ii) 14 th All India Inter Agricultural Universities Youth Festival, Bengaluru (iii) Debate Competition	(i) Winner of Sahitya Prtibha (Female) (ii) On-the spot painting Winner Winner
K. Ravi Kumar	M.Sc.	----	AIASA National President
Abhinaya Bagdas	M. Sc.	Debate Competition	Winner
Ashish Santhosh Murai	Ph. D.	Interdivisional Sports Fest Ash-wamedh '14 (i) Badminton Doubles (ii) Volleyball	(i) Winner (ii) Runner up
Pankaj Kumar Sinha	Ph. D.	President (i) PGSSU Election (ii) Interdivisional Sports Fest Ash-wamedh '14 400 m	Winner
Renu Balakrishnan	Ph.D.	PGSSU Election	PGSSU Vice President
Alok kumar Sahoo	M. Sc. (Ist year)	Dance, Song, skit	Extension Division
Sushil Kumar	M. Sc. (Ist year)	Got First prize in Group Western	----
		Third Group Hindi	Participation Award
		Second Duet Hindi	In Renaissance 2014
Rabeesh	M. Sc. (Ist year)	Dance, Song, Skit, Quiz	---
Krishna	M. Sc. (Ist year)	Dance, Song, Skit, Quiz	---
Channaveersh	M. Sc. (Ist year)	Dance, Song, Skit, Quiz	---

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied

The Division of Agricultural extension took leadership role in conceptualizing new model, capacity building programme and academic development for last 50 years in the country. The division was pioneer in developing following extension models and approaches which helped the country to serve the farmers-

- 1) National demonstration project (1964)-helped to achieve green revolution
- 2) Operational research project (1975)- covered poor farmers
- 3) Lab to land programme (1979)-introduction of bottom up approach



- 4) Single window system (1986)-one stop platform to get the technology
- 5) CAS (1994)- For capacity building programme of extension functionaries
- 6) ATIC (1998)- Single window system
- 7) Rural social centre (2002)- Framers hub of technology
- 8) National extension programme (2007)- Collaborative programme of IARI SAUs & ICAR institute and VOs.
- 9) IARI-Post office linked extension model (2009)- Using post office to reach the unreached farmers across the country.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths

- Specialized faculties in different areas of extension research.
- Well equipped smart class room, training hall, computer lab, seminar hall.
- Centre of advanced faculty training in Extension.
- Effective network between field and lab, farmers, agri-entrepreneurs.

Weakness

- Inadequate number of supporting staff
- Financial constraints
- Time constraints

Opportunities

- The linkages between entrepreneurs, farmers, lab, and other institution may be utilized for collaborative academic programmes.
- Avenues for development and effective dissemination of innovative agricultural technologies.
- Empowerment of farmers and other stakeholders.

Challenges

- Fields are far away from the Division
- Reorient extension for emerging agricultural challenges like climate change, ICT revolution for small farmers, farmers based organizations.
- Train and update faculty members for meeting the challenges
- Extension policies

52. Future plans of the department.

- Developing new extension approaches and modals keeping the changing agricultural and socio-economic scenario in mind.
- Developing new ICT enabled multimedia lab and strengthening existing lab.
- Introducing Post-Doc programme in extension
- Have international trainings- International centre for advance faculty training.



v) Division of Agricultural Physics

1. Name of the Department:

Agricultural Physics, IARI., New Delhi

2. Year of establishment:

1962

3. Is the Department part of a School/Faculty of the university?

Natural Resource Management (NRM)

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Agronomy, CESCRA, Soil Science and Agricultural Chemistry, and Water technology center

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

EDUSAT with IIRS Dehradun

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in –CESCRA, Soil Science and Agricultural Chemistry, Agronomy and WTC

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled
Principal Scientist (Professor)	1	1
Senior Scientist (Associate Professor)	5	2
Scientist (Assistant Professor)	10	9



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. (Mrs.) Pramila Aggarwal	Ph.D.	Professor & Head	Modeling water, solute and heat transport in soil, Soil and water conservation, Soil physical aspects of resource conservation technologies, Spatial variability of soil properties Soil physics	20	5	5
Dr. A.K. Jain	Ph.D.	Principal Scientist	Physics, Computer Applications	7	0	0
Dr. P. Krishnan	Ph.D.	Principal Scientist	Biophysics	4	1	0
Dr. K.K. Bandyopadhyay	Ph.D.	Principal Scientist	Soil Physics and Soil Water Conservation	4	1	0
Dr. Deb Kumar Das	Ph.D.	Sr. Scientist	Agricultural Meteorology, Integrated Pest Management	4	1	0
Dr. V.K. Sehgal	Ph.D.	Sr. Scientist	Agril. Meteorology	10	3	0
Dr.(Mrs.) Ananta Vashisth	Ph.D.	Senior Scientist	Physics, Biophysics, Agricultural Meteorology	17+		1
Dr. R.N.Sahoo	Ph.D.	Sr. Scientist	Remote Sensing Applications	14	2	4
Dr. Debashis Chakraborty	Ph.D.	Sr. Scientist	Soil Physics, Geoinformatics	14	3	1
Dr. Joydeep Mukherjee	Ph.D.	Sr. Scientist	Micrometeorology, Agrometeorology, Crop Simulation modeling	1	0	0
Dr. Sanatan Pradhan	Ph.D.	Scientist	Soil Physics, Remote Sensing	5	0	0
Dr. Nilimesh Mridha	Ph.D.	Scientist	Remote Sensing & GIS	0	0	0
Dr. R.S. Jaat	M.Sc.	Scientist	Biophysics		0	0

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

Nil

13. Percentage of classes taken by temporary faculty – programme-wise information:

None

14. Programme-wise Student Teacher Ratio:

M. Sc. = 6:5 and Ph.D = 12:5

**15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position**

Sl.No.	Category	Sanctioned	Filled
1.	Technical	12	12
2.	Administrative	6	6
3.	Supportive	11	11

16. Research thrust areas as recognized by major funding agencies:

Satellite agrometeorology, Phenomics, Senutrient Global climate change, abiotic stress tolerance, post harvest physiology and nutrient use efficiency.

17 Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Title	Budget (Rs. in lakhs)	Duration	Principal Investigator	Sponsored by
National programme on isotopes fingerprinting of waters of India network (I-WIN)	4.96	2007-2012	Dr. P.S. Datta	DST, Govt. of India
Strengthening of digital library and information management under NARS (e-Granth)	853.89	2009 – 2013	Dr. A.K. Jain	NAIP Consortium Project
Spatial and temporal characterization of soil physical health of Panipat and Sonapat districts in alluvial plains of Haryana under different conservation tillage practices for sustainable agriculture	33.30	2009-2012	Dr. (Mrs.) P. Aggarwal	DST, Govt. of India
High temperature stress response and associated changes in growth and yield of rice	35.63	2010-2012	Dr. (Mrs.) P. Krishnan	DST, Govt. of India
Crop simulation studies to understand the effect of moisture and temperature stress on growth and yield of wheat	178.00	June 2012-June 2015	Dr. (Mrs.) P. Krishnan	NFBSFARA, ICAR
Web enabled weather based decision support system for forewarning and management of important insect pests and diseases of mustard in Delhi NCR-A pilot study	35 .00	1.4.2011-31.3.2014	Dr. D.K. Das	DST, Govt. of India
Technique development for soil wetness and applications under RISAT-UP	12.65	Feb. 2011- March 2013	Dr. V.K. Sehgal	SAC, Ahmedabad
National initiative on climate resilient agriculture	3688.80	Feb. 2011- March 2012	Dr. V.K. Sehgal, Co-PI	ICAR
National initiative on climate resilient agriculture	800.0	April 2012- March 2017	Dr. V.K. Sehgal, Co-PI	ICAR
Consultancy project on 'Weather and remote sensing based crop yield modelling for use in crop insurance'	7.65	Feb. 2012-March 2013	Dr. V.K. Sehgal	ICICI Lombard, Mumbai
Integrated agromet advisory services (Delhi Unit)	5.33 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Earth Sciences
Integrated agromet advisory services (Delhi Unit)	4.5 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Earth Sciences
Forecasting agricultural output using space, agrometeorology and land based observations	5.76 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Agriculture
Forecasting agricultural output using space, agrometeorology and land based observations (FASAL)	5.28 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Agriculture



Estimation of soil parameters and soil fertility zonation using hyperspectral data	6.43	Jan. 2010-June 2011	Dr. R.N. Sahoo	SAC, Ahmedabad
Retrieval of crop biophysical parameters from hyperspectral-BRDF through inversion of radiative transfer model	60.00	April 2011-March 2014	Dr. R.N. Sahoo	DST, Govt. of India
Strategies to enhance adaptive capacity to climate change in vulnerable regions	1158.12	Sept. 18, 2009 – March 31, 2014	Dr. R.N. Sahoo, Associate Investigator	NAIP-GEF
Phenomics of moisture deficit and low temperature stress tolerance in rice	4162.76	24.2.2011-31.3.2016	Dr. R.N. Sahoo, Co-operative Investigator	NFBSFARA, ICAR
Decision support system for enhancing water productivity of irrigated rice-wheat cropping system	144.15	June 2012- March 31, 2015	Dr. K.K. Bandyopadhyay, Co-PI	NFBSFARA, ICAR

18. Inter-institutional collaborative projects and associated grants received:

c) National collaboration

Title	Budget (Rs. in lakhs)	Duration	Principal Investigator	Sponsored by
Strengthening of digital library and information management under NARS (e-Granth)	853.89	2009 – 2013	Dr. A.K. Jain	NAIP Consortium Project
Crop simulation studies to understand the effect of moisture and temperature stress on growth and yield of wheat	178.00	June 2012-June 2015	Dr. (Mrs.) P. Krishnan	NFBSFARA, ICAR
Web enabled weather based decision support system for forewarning and management of important insect pests and diseases of mustard in Delhi NCR-A pilot study	35 .00	1.4.2011-31.3.2014	Dr. D.K. Das	DST, Govt. of India
Technique development for soil wetness and applications under RISAT-UP	12.65	Feb. 2011- March 2013	Dr. V.K. Sehgal	SAC, Ahmedabad
National initiative on climate resilient agriculture	3688.80	Feb. 2011- March 2012	Dr. V.K. Sehgal, Co-PI	ICAR
National initiative on climate resilient agriculture	800.0	April 2012- March 2017	Dr. V.K. Sehgal, Co-PI	ICAR
Consultancy project on 'Weather and remote sensing based crop yield modelling for use in crop insurance'	7.65	Feb. 2012-March 2013	Dr. V.K. Sehgal	ICICI Lombard, Mumbai
Integrated agromet advisory services (Delhi Unit)	5.33 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Earth Sciences
Integrated agromet advisory services (Delhi Unit)	4.5 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Earth Sciences
Forecasting agricultural output using space, agro-meteorology and land based observations	5.76 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Agriculture
Forecasting agricultural output using space, agro-meteorology and land based observations (FASAL)	5.28 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Agriculture
Estimation of soil parameters and soil fertility zonation using hyperspectral data	6.43	Jan. 2010-June 2011	Dr. R.N. Sahoo	SAC, Ahmedabad



Retrieval of crop biophysical parameters from hyperspectral-BRDF through inversion of radiative transfer model	60.00	April 2011- March 2014	Dr. R.N. Sahoo	DST, Govt. of India
Strategies to enhance adaptive capacity to climate change in vulnerable regions	1158.12	Sept. 18, 2009 – March 31, 2014	Dr. R.N. Sahoo, Associate Investigator	NAIP-GEF
Phenomics of moisture deficit and low temperature stress tolerance in rice	4162.76	24.2.2011-31.3.2016	Dr. R.N. Sahoo, Co-operative Investigator	NFBSFARA, ICAR
Decision support system for enhancing water productivity of irrigated rice-wheat cropping system	144.15	June 2012- March 31, 2015	Dr. K.K. Bandyopadhyay, Co-PI	NFBSFARA, ICAR

d) International collaboration : Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

Title	Budget (Rs. in lakhs)	Duration	Principal Investigator	Sponsored by
Web enabled weather based decision support system for forewarning and management of important insect pests and diseases of mustard in Delhi NCR-A pilot study	35 .00	1.4.2011- 31.3.2014	Dr. D.K. Das	DST, Govt. of India
Consultancy project on 'Weather and remote sensing based crop yield modelling for use in crop insurance'	7.65	Feb. 2012-March 2013	Dr. V.K. Sehgal	ICICI Lombard, Mumbai
Integrated agromet advisory services (Delhi Unit)	5.33 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Earth Sciences
Integrated agromet advisory services (Delhi Unit)	4.5 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Earth Sciences
Forecasting agricultural output using space, agrometeorology and land based observations	5.76 for the year 2011-12	Extended upto 2017	Dr. (Mrs.) Ananta Vashisth	Ministry of Agriculture
Forecasting agricultural output using space, agrometeorology and land based observations (FASAL)	5.28 for the year 2012-13	Extended upto 2017	Dr. (Mrs.) A. Vashisth	Ministry of Agriculture
Estimation of soil parameters and soil fertility zonation using hyperspectral data	6.43	Jan. 2010-June 2011	Dr. R.N. Sahoo	SAC, Ahmedabad
Retrieval of crop biophysical parameters from hyperspectral-BRDF through inversion of radiative transfer model	60.00	April 2011- March 2014	Dr. R.N. Sahoo	DST, Govt. of India

20. Research facility / centre with

State recognition

Satellite data reception, processing and management centre under NICRA project

National recognition

FASAL and Agro advisory with IMD and Edu-Sat with IIRS , Dehradun

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable



22. Publications:

	Pramila Aggarwal	A.K. Jain	P. Krishnan	K. K. Bandyopadhyay	Deb Kumar Das	V.K. Sebgal	Ananta Yashisth	R.N.Sahoo	Debashis Chakraborty	Joydeep Mukherjee	Sanatan Pradhan
Number of papers published in peer reviewed journals (national / international)	20		11	32	36	35	15	38	36	12	31
Monographs	-		-	4		1	-	-		-	
Chapters in Books	10		14	9		7	21	17	8	5	1
Edited Books	-		1	-		-	-	3		2	
Books with ISBN with details of publishers	-		1	-		-	1				
Number listed in International Database			1	-							
Citation Index – range / average				-							
SNIP range / average				-							
SJR range / average				-							
Impact Factor–range / average				-		0-3.89					
h-index				18		6.0			11		3

Some of the important publication from 2010-2014

Publication: NAAS Rating Above 8

1. Aggarwal, P., Mittal, R.B., Maity, P. and Sharma, A.R. 2009. Modification of hydrothermal regimes under bed planted wheat. *Geoderma* 153(3-4), 312-317. (NAAS rating 8.35)
2. Amirinejad, A.A., Kamble, K.H., Aggarwal, P., Chakraborty, D., Pradhan, S. and Mittal, R.B. 2011. Assessment and mapping of spatial variation of soil physical health in a farm. *Geoderma* 160(3-4), 292-303. (NAAS rating 8.35)
3. Bandyopadhyay, K.K. and Lal, R. 2014. Effect of land use management on green house gas emissions from water stable aggregates. *Geoderma* 232-234:363-372. (NAAS rating 8.35)



4. Bandyopadhyay, K.K. and Lal, R. 2014. Effect of land use management on green house gas emissions from water stable aggregates. *Geoderma* 232-234:363-372. (NAAS rating 8.35)
5. Chakraborty, D., Garg, R.N., Tomar, R.K., Singh, Ravender, Sharma, S.K., Singh, R.K., Trivedi, S.M., Mittal, R.B., Sharma, P.K. and Kamble, K.H. 2010. Synthetic and organic mulching and nitrogen response in wheat (*Triticum aestivum* L.) in a semi-arid environment. *Agric. Water Manage.* 97 (5), 738-748. (NAAS rating 8.2)
6. Chattaraj, S., Chakraborty, D., Sehgal, V.K., Paul, R.K., Singh, S.D., Daripa, A. and Pathak, H. 2014. Predicting the impact of climate change on water requirement of wheat in the semi-arid Indo-Gangetic Plains of India. *Agriculture, Ecosystem and Environment* 197, 174-183. (NAAS rating 8.86)
7. Choudhury, B.U., Singh, A.K. and Pradhan, S. 2013. Estimation of crop coefficients of dry-seeded irrigated rice-wheat rotation on raised beds by field water balance method in the Indo-Gangetic plains, India. *Agricultural Water Management* 123, 20-31. (NAAS rating 8.20)
8. Das, B., Chakraborty, D., Singh, V.K., Aggarwal, P., Singh, R., Dwivedi, B.S. and Mishra, R.P. 2014. Effect of integrated nutrient management practice on soil aggregate properties, its stability and aggregate-associated carbon content in an intensive rice-wheat system. *Soil and Tillage Research* 136, 9-18. (NAAS rating 8.37)
9. Das, S., Krishnan, P., Nayak, M. and Ramakrishnan, B. 2014. High temperature stress effects on pollens of rice genotypes. *Environmental and Experimental Botany* 101, 36-46. (NAAS rating 8.58)
10. Das, T.K., Bhattacharyya, R., Sudhishri, S., Sharma, A.R., Saharawat, Y.S., Bandyopadhyay, K.K., Sepat, S., Bana, R.S., Aggarwal, P., Sharma, R.K., Bhatia, A., Singh, G., Datta, S.P., Kar, A., Singh, B., Singh, P., Pathak, H., Vyas, A.K. and Jat, M.L. 2014. Conservation agriculture in an irrigated cotton-wheat system of the western Indo-Gangetic Plains: Crop and water productivity and economic profitability. *Field Crops Research* 158, 24-33. (NAAS rating 8.47)
11. Kar, G., Kumar, A. and Singh, Ravender 2009. Spatial distribution of soil hydro-physical properties and morphometric analysis of a rain fed watershed as a tool for sustainable land use planning. *Agric. Water Manage.* 96, 1449-1459. NAAS rating 8.2)
12. Krishnan, P., Singh, R., Verma, A.P.S., Joshi, D.K. and Singh, S. 2014. Changes in seed water status as characterized by NMR in developing soybean seed grown under moisture stress conditions. *Biochemical Biophysical Research Communications* 444, 485-490. (NAAS rating 8.41)
13. Mishra, A.K., Aggarwal P. Bhattacharya, R., Das, T.K., Sharma A.R. and Singh R. . 2015. Least limiting water range for two conservation agriculture cropping systems in India. *Soil Tillage Res.* 150, 43-56). (NAAS rating 8.37)
14. Narjary, B., Aggarwal, P., Singh, A., Chakraborty, D. and Ravender Singh 2012. Water availability in different soils in relation to hydrogel application. *Geoderma* 187-188, 94-101. (NAAS rating 8.35)
15. Saha, S., Chakraborty, D., Lata, Madan Pal, Nagarajan, S. 2011. Impact of elevated CO₂ on utilization of soil moisture and associated soil biophysical parameters in pigeon pea (*Cajanus cajan* L.). *Agriculture, Ecosystems and Environment* 142, 213– 221. NAAS rating 8.86)
16. Santra, P., Sahoo, R.N., Das, B.S. and Gupta, V.K. 2009. Estimation of soil hydraulic properties using spectral reflectance in visible and near infrared region. *Geoderma* 152, 338-349. (NAAS rating 8.2)
17. Vashisth, Ananta and Nagarajan, S. 2010. Effect on germination and early growth characteristics in sunflower (*Helianthus annuus* L.) seeds exposed to static magnetic field. *J. Plant Physiol.* 167, 149–156. (NAAS rating 8.7)

Publications with NAAS rating 6-8

1. Adhikary, P.P., Chandrasekharan, H., Chakraborty, D. and Kamble, K.H. 2010. Assessment of groundwater pollution in west Delhi, India using geostatistical approach. *Environ. Monit. Assess.* 167(1-4), 599-615. (NAAS rating 7.59)
2. Adhikary, P.P., Chandrasekharan, H., Chakraborty, D., Kumar, B. and Yadav, B.R. 2009. Statistical approaches



- for hydrogeochemical characterization of groundwater in west Delhi, India. *Environ. Monit. Assess.* 154, 41-52. (NAAS rating 7.59)
3. Aggarwal P, Kumar,R. and Yadav,B. 2013. 'Hydrophysical characteristics of a sandy loam soil under bed planted maize'. *Indian Journal of Agricultural Sciences* Vol 83(5): 498-503 .(NAAS rating 6.6)
 4. Ahmed, M., Aggarwal, P., Garg, R.N., Bhattacharyya, R., Singh, R., Kamble, K.H. andYadav, B. 2014. Effect of resource conservation technologies on soil structural conditions in temporary waterlogged alluvial plains of the river Yamuna. *Indian Journal of Agricultural Sciences* 84(1), 81-89. (NAAS rating 6.6)
 5. Bal, S.K., Choudhury, B.U., Sood, A., Saha, S., Mukherjee, J., Singh, H. and Kaur, P. 2013. Relationship between leaf area index of wheat crop and different spectral indices in Punjab. *Journal of Agrometeorology* 15(2),16-20. (NAAS rating 6.15)
 6. Barman, D., Sehgal, V.K., Sahoo, R.N. and Nagarajan, S. 2010. Relationship of bidirectional reflectance of wheat with biophysical parameters and its radiative transfer modelling using PROSAIL. *J. Indian Soc. Remote Sens.* 38, 35-44. (NAAS rating 6.34)
 7. Bhaduri, D., Purakayastha, T.J., Patra, A.K. and Chakraborty, D. 2014. Evaluating soil quality under a long-term integrated tillage-water-nutrient experiment with intensive rice-wheat rotation in a semi-arid Inceptisol, India. *Environmental Monitoring and Assessment* 186, 2535-47. (NAAS rating 7.59)
 8. Chakraborty, D., Garg, R.N., Tomar, R.K., Dwivedi, B.S., Aggarwal, P., Singh, Ravender, Behera, U.K., Thangasamy, A. and Singh, D. 2010. Soil physical quality as influenced by long-term application of fertilizers and manure under maize-wheat system. *Soil Science* 175 (3), 128-136. (NAAS rating 7.05)
 9. Chakraborty, D., Watts, C.W., Powelson, D.S., Macdonald, A.J., Ashton, R.W., White, R.P. and Whalley, W.R. 2014. Triaxial testing to determine the effect of soil type and organic carbon content on soil consolidation and shear deformation characteristics. *Soil Science Society of America Journal* 78, 1192-1200. (NAAS rating 7.82)
 10. Chattaraj, S., Chakraborty, D., Garg, R.N., Singh, G.P., Gupta, V.K., Singh, S. and Ravender Singh 2013. Hyperspectral remote sensing for growth-stage-specific water use in wheat. *Field Crop Res.* 144, 179-191. (NAAS: 7.7)
 11. Das, B., Chakraborty, D., Singh, V.K., Aggarwal, P., Singh, R. and Dwivedi, B.S. 2014. Effect of organic inputs on strength and stability of soil aggregates under a rice-wheat rotation. *International Agrophysics* 28, 163-168. (NAAS rating 7.03)
 12. Dhakar, R., Sehgal, V.K. and Pradhan, S. 2013. Study on inter-seasonal and intra-seasonal relationships of meteorological and agricultural drought indices in the Rajasthan State of India. *Journal of Arid Environments* 97, 108-119. (NAAS rating 7.77)
 13. Dhakar, R., Sehgal, V.K., Nagar, S., Rao, V.U.M., Bapuji Rao, B., Vijay Kumar, P., Subba Rao, A.V.M. and Dupal, R. 2013. Impact of drought on spatio-temporal pattern of phenology in Rajasthan. *Journal of Agrometeorology* 15, 58-63. (NAAS rating 6.15)
 14. Gazala, I.F., Sahoo, R.N., Pandey, R., Mandal, B., Gupta, V.K., Singh, R. and Sinha P. 2013. Spectral reflectance pattern in soybean for assessing yellow mosaic disease. *Indian Journal of Virology* 24 (2), 242-249.(NAAS rating 6.36)
 15. Krishnan, P., Chopra, U.K., Verma, A.P.S., Joshi, D.K. and Chand, I. 2014. NMR relaxation characterisation of seed water status in developing maize kernels grown at different nitrogen levels. *Journal of Bioscience and Bioengineering* 117(4), 512-518. (NAAS rating 7.74)
 16. Kumar, J., Vashisth, A., Sehgal, V.K. and Gupta, V.K. 2013. Assessment of aphid infestation in mustard by hyperspectral remote sensing. *Journal of the Indian Society of Remote Sensing* 41(1), 83-90. (NAAS: 6.7)
 17. Mahajan, G.R., Sahoo, R.N., Pandey, R.N., Gupta, V.K. and Kumar, D. 2014. Using hyperspectral remote sensing techniques to monitor nitrogen, phosphorus, sulphur and potassium in wheat. *Precision Agriculture* 15(2), 227-240. (NAAS rating 7.73)
 18. Mamta Kumari, Chakraborty, D., Gathala, M.K., Pathak, H., Dwivedi, B.S., Tomar R.K., garg, R.N., Singh,



- Ravender, Ladha, J.K. (2011) Soil aggregation and associated organic C fractions as affected by tillage in a rice-wheat rotation in north India. *Soil Science Society of America Journal*, 75, 2, 560-567. (NAAS rating 7.82)
19. Mandal, K.G., Hati, K.M., Bandyopadhyay, K.K. and Tripathi, A.K. 2013. Land surface modification and crop diversification for enhancing productivity of a Vertisol. *International Journal of Plant Production* 7(3), 455-472. (NAAS rating 7.15)
 20. Mondal, S., Chakraborty, D., Tomar, R.K., Ravender Singh, Garg, R.N., Sidhu, G.S., Aggarwal, P. and Behera, U.K. 2013. Tillage and residue management effect on hydro-physical environment of a sandy loam soil under pigeon pea-wheat rotation in a semi-arid climate of India. *Indian Journal of Agricultural Sciences* 83(5), 502-507. (NAAS: 6.6)
 21. Narjary, B. and Aggarwal, P. 2014. Evaluation of soil physical quality under amendments and hydrogel applications in a soybean-wheat cropping system. *Communications in Soil Science and Plant Analysis* 45(9), 1167-1180. (NAAS rating 6.42)
 22. Patle, G.T., Singh, D.K., Sarangi, A., Rai, A., Khanna, M. and Sahoo, R.N. 2013. Temporal variability of climatic parameters and potential evapo-transpiration. *Indian Journal of Agricultural Sciences* 83 (5), 518-524. (NAAS rating 6.18)
 23. Pradhan, S., Bandyopadhyay, K.K., Sahoo, R.N., Sehgal, V.K., Singh, R., Joshi, D.K. and Gupta, V.K. 2013. Prediction of wheat grain and biomass yield under different irrigation and nitrogen management practices using canopy reflectance spectra model. *Indian Journal of Agricultural Sciences* 83(11), 1136-43. (NAAS rating 6.18)
 24. Pradhan, S., Chopra, U.K., Bandyopadhyay, K.K., Krishnan, P., Singh, R. and Jain, A.K. 2013. Soil water dynamics, root growth and water and nitrogen use efficiency of rainfed maize in a semi-arid environment. *Indian Journal of Agricultural Sciences* 83(5), 542-548. (NAAS rating 6.18)
 25. Pramanik, P. and Aggarwal, P. 2013. Comparison of thermal properties of three texturally different soils under two compaction levels. *African Journal of Agricultural Research* 8(28), 3679-3687. (NAAS rating 7.0)
 26. Prasannakumar, N.R., Chander, S. and Sahoo, R.N. 2014. Characterization of brown plant hopper damage on rice crops through hyperspectral remote sensing under field conditions. *Phytoparasitica* 42, 387-395. (NAAS rating 6.72)
 27. Prasannakumar, N.R., Chander, S. and Sahoo, R.N. 2014. Characterization of brown plant hopper damage on rice crops through hyperspectral remote sensing under field conditions. *Phytoparasitica* 42, 387-395. (NAAS rating 6.72)
 28. Prasannakumar, N.R., Chander, S., Sahoo, R.N. and Gupta V.K. 2013. Assessment of brown plant hopper, (*Nilaparvata lugens*) [Stal], damage in rice using hyperspectral remote sensing. *International Journal of Pest Management* 59(3), 180-188. (NAAS rating 6.72)
 29. Prasannakumar, N.R., Chander, S., Sahoo, R.N. and Gupta V.K. 2013. Assessment of brown plant hopper, (*Nilaparvata lugens*) [Stal], damage in rice using hyperspectral remote sensing. *International Journal of Pest Management* 59(3), 180-188. (NAAS rating 6.72)
 30. Ranjan R., Chopra, U.K., Sahoo, RN., Singh, A.K. and Pradhan, S. 2012. Assessment of plant nitrogen stress through hyperspectral indices. *International J. of Remote Sensing* 33(20), 6342-6360. (NAAS: 7.5)
 31. Saha S., Chakraborty, D., Sharma, A.R., Tomar, R.K., Bhadraray, S., Sen, U., Behra, U.K., Purakayastha, T.J., Garg, R.N., and Kalra, N. 2010. Effect of tillage and residue management on soil physical properties and crop productivity in maize (*Zea mays*)–Indian mustard (*Brassica juncea*) system. *Indian J. Agric. Sci.* 80(8), 679-685. (NAAS rating 6.6)
 32. Saha, S., Sehgal, V.K., Nagarajan, S. and Pal, M. 2012. Impact of elevated atmospheric CO₂ on radiation utilization and related plant biophysical properties in pigeon pea. *Agricultural and Forest Meteorology* 158, 63-70. (NAAS: 7.9)



33. Singh, R.K., Chakraborty, D., Garg, R.N., Sharma, P.K. and Sharma, U.C. 2010. Effect of different water regimes and nitrogen application on growth, yield, water use and nitrogen uptake by pearl millet. Indian J. Agric. Sci. 80 (3), 213-216. (NAAS rating 6.18)
34. Singh, R.K., Chakraborty, D., Garg, R.N., Subba Rao, Y.V., Sharma, D.K. and Sharma, U.C. 2009. Soil organic carbon and nutrient uptake vis-à-vis growth and yield of pearl millet as influenced by water and nitrogen in Typic Haplustept soil. Indian J. Agric. Sci. 79(5), 359-363. (NAAS rating 6.18)
35. Singh, S.S., Mukherjee, J., Kumar, S. and Idris, M.2013. Effect of elevated CO₂ on growth and yield of rice crop in open top chamber in sub-humid climate of eastern India. Journal of Agrometeorology 15(1), 1-10. (NAAS rating 6.15)
36. Vashisth, Ananta and Nagarajan, S. 2009. Characterization of water binding and germination traits of magnetically exposed maize seeds equilibrated at different relative humidity at two temperatures. Indian J. Biochemistry & Biophysics 46, 184-191. (NAAS rating 7.03)

23. Details of patents and income generated:

None

24. Areas of consultancy and income generated:

Weather and remote sensing based crop yield modelling for use in crop insurance

Rs. 20,000/- for using facilities of hyperspectral remote sensing laboratory.

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Name	Institutions and Industries Visited
Dr P Aggarwal	Visited Indian Institute of Science to attend workshop on 'Modeling water flow and contaminant transport in soils and groundwater using the HYDRUS software packages', 2012
Dr A Jain	Visited different libraries at USA under eGranth sub project of NAIP, Oct. 24-31, 2010.
Dr. K.K. Bandyopadhyay	Pr. Scientist, deputed to attend Workshop Seasonal weather forecasts linked pre-harvest estimates of crop production: Methodological approaches, IWMI, Colombo, Sri Lanka under CGIAR program on CCAFS-South Asia, April 16-18, 2012.
Dr. V.K. Sehgal	Deputed to attend Workshop Seasonal weather forecasts linked pre-harvest estimates of crop production: Methodological approaches, IWMI, Colombo, Sri Lanka under CGIAR program on CCAFS-South Asia, April 16-18, 2012.
Dr. V.K. Sehgal	Deputed to attend CCAFS-JRC Workshop Crop yield estimation in tropical regions: Concepts, applications and challenges for heterogeneous smallholder environment, European Commission-Joint Research Centre, Ispra, Italy, June 13-14, 2012
Dr. V.K. Sehgal	Visited France to attend and present a paper at Global Science Conference on "Climate Smart Agriculture-2015.
Dr. V.K. Sehgal	IARI-Nebraska Univ. Partnership Workshop Drought monitoring and early warning system , NASC Complex, New Delhi
Dr. R.N. Sahoo	Sr. Scientist, deputed for Short Training Program Advances in thermal hyperspectral imaging, CRPGL, Luxembourg sponsored by DST, July 16-20, 2012.
Dr. R.N. Sahoo	Senior Scientist, deputed to Natl. Drought Mitigation Centre, Univ. of Nebraska, Lincoln, USA for training (Aug. 29-Sept. 24, 2011) on Drought monitoring from remote sensing under NAIP-GEF funded project.



Dr. D. Chakraborty	Scientist, Training under the Rothamsted International Post-Doctoral Fellowship for a period from 7-3-2012 to 6-3-2013 at the Rothamsted Research, Harpenden, United Kingdom
	Delegate Cereals 2012: The largest British agriculture and farm, show Boothby Graffoe, Lincolnshire, U.K. June 13-14, 2012
	Delegate, Annual Meeting British Society of Soil Science , Univ. of Nottingham, U.K. Sept. , 4-5, 2012
	Delegate, Workshop New measurement methods in soil physics: Future frontiers , Rothamsted Research, U.K. ,Oct. 1-2, 2012
	Resource Speaker (A compilation of research on Indian water-logged soils and my experiences with Rothamsted) , British soil physics group meeting, Univ. of Reading, U.K. Nov. 27, 2012

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr K K Bandyopadhyay	NAAS Journal Evaluation Committee	Indian Journal of Agricultural Physics	Zonal Member (north-zone), Agriculture and forestry section, <i>Indian Science Congress Association</i> . Ex-Officio Member, Executive Council, <i>Indian Society of Soil Science (Delhi Chapter)</i> .
Dr Pramila Krishnan	Panel member, Selection committee for the award of Full bright US-India fellowships, 2012-15	Indian Journal of Agricultural Physics	
Dr. V.K. Sehgal	ICAR Task Force on 'Krishi Geo Portal' Member, Steering Committee on FASAL Programme of IMD.	Indian Journal of Agricultural Physics	Secretary, Indian Society of Agro Physics, New Delhi, 2010-12. Vice-President, Indian Society of Remote Sensing (Delhi Chapter), 2014-16.
Dr J. Mukherjee	-	Indian Journal of Ecology, Journal of Agro Meteorology	Treasurer, ISRS, Delhi Chapter
Dr R N Sahoo	Co-coordinator for developing Natl. Science Document plan on Hyperspectral Remote Sensing (HRS) and Network Program on HRS & act as leader for Agriculture theme.		Secretary, Indian Society of Remote Sensing, Delhi Chapter, 2011 onwards
Dr. D. Chakraborty	NAAS Journal Evaluation Committee		Secretary, Indian Society of Agrophysics, 2012 onwards
Dr Ananta Vashisht			Treasurer, Indian Society of Agrophysics, 2010-13
Dr D K Das			Assistant Secretary, Indian Society of Agrophysics, 2013-15
Dr Sanatan Pradhan			Assistant Secretary, Indian Society of Agrophysics, 2010-13

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.



28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:

a) Faculty

Dr. Debashis Chakraborty became Associate, NAAS (2010-15). Got Rothamsted International Post-Doctoral Fellowship Award.

Poster awards

Best poster presentation award: 3rd Intl. Agronomy Congress *Agriculture diversification, climate change management and livelihoods*, IARI, New Delhi, Nov. 26-30, 2012 for the paper entitled 'Effect of conservation agriculture practices on C-sequestration and water and system productivity in wheat based cropping systems' authored by *Das, T.K., Sharma, A.R., Singh, B., Pragat Singh, Singh, P., Bandyopadhyay, K.K., Aggarwal, P., Sudhishri, S., Sharma, R.K., Pathak, H. and Jat, M.L.*

Best paper award: 3rd Intl. Agronomy Congress *Agriculture diversification, climate change management and livelihoods*, IARI, New Delhi, Nov. 26-30, 2012 for the paper entitled 'Low cost drip as a precision irrigation tool in Bt cotton cultivation' authored by *Sankaranarayanan, K., Praharaj, C.S., Nalayini, P., Bandyopadhyay, K.K. and Gopala Krishnan, N.* (published in *J. Indian Society of Agronomy* 55(4), 312-318).

Best oral presentation award: Natl. Symp. *Space technology for food & environmental security*, NASC Complex, New Delhi, Dec. 5-7, 2012 for the paper entitled 'Geospatial assessment of agricultural vulnerability to climate change in Indo-Gangetic Plains of India' authored by Singh, M.R., Sehgal, V.K., Singh, A., Jain, N. and Pathak, H.

Best oral presentation award: Natl. Symp. *Climate change and Indian Agriculture: Slicing down the uncertainties*, CRIDA, Hyderabad, Jan. 22-23, 2013 for the paper entitled 'Comprehensive methodology for assessment of agricultural vulnerability to climate change: A case study of Indo-Gangetic Plains of India' authored by Sehgal, V.K., Singh, M.R., Jain, N. and Pathak, H.

Aryabhata Samman of Vigyan Bharati: 3rd Natl. Conf. *Innovations in Indian science, engineering & technology*, NPL, New Delhi, Feb. 25-27, 2013 for the paper entitled 'Reflectance based rapid and non-destructive estimation of lycopene content and ripening stage of tomato fruits' authored by Paul, V., Pandey, R., Sahoo, R.N., Gupta, V.K. and Singh, A.

Dr.(Mrs) Ananta Vashisth- 1st prize (oral presentation) National scientific Hindi seminar Ministry of Earth Sciences, New Delhi from February 8, 2010.

Best paper award (*Second prize in general category*): Natl. Symp. on *GIS and remote sensing in infrastructure development*, Pune, Dec. 1-3, 2010 for the paper entitled 'Assessment and mapping environmental vulnerability to agricultural drought in Rajasthan: A geospatial approach' authored by Sehgal, V.K., Dhakar, R. and Ravender Singh

Best paper award (*First prize in student category*): Natl. Symp. on *GIS and remote sensing in infrastructure development*, Pune, Dec 1-3, 2010 for the paper entitled 'Assessment of water and nitrogen stress on wheat using hyperspectral remote sensing' authored by Ranjan, R., Chopra, U.K., Sahoo, R.N., Sehgal, V.K. and Pradan, S.

b) Students

Sudipta Chattaraj got IARI Gold Medal (M.Sc) - 2010

Debashish Chakraborty got IARI Gold Medal (M.Sc) - 2011



Raj Kumar Das Dhakkar got IARI Gold Medal (M.Sc) - 2012

Bappa Das got IARI Gold Medal (M.Sc) - 2013

Bappa Das got Best student of the year (M.Sc) - 2013

Saurav Saha got IARI Gold Medal (PhD) - 2015

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Trainings organized

Department of Space Sponsored EDUSAT based off-campus training programme on 'Basics of remote sensing, geographical information system and global positioning system', IIRS, Dehradun and Division of Agricultural Physics, IARI, New Delhi (Aug. 1 – Nov. 8, 2011) No. of participants : 33 Institute Co-ordinator : Dr. R.N. Sahoo Asstt. Co-ordinator : Dr. (Mrs.) K.H. Kamble



Department of Science and Technology Sponsored Short Course on 'Hyperspectral remote sensing for agriculture', Division of Agricultural Physics, IARI, New Delhi (Aug. 2-11, 2011) No. of participants : 20 Course Director : Dr. R.N. Sahoo Course Co-ordinator : Dr. S. Pradhan



DSpace user training under eGranth project, IARI, New Delhi, June 25-26, 2012. No. of participants : 20 Organizer: Dr. A.K. Jain

Department of Space Sponsored EDUSAT based distance learning programme on *Basics of remote sensing, geographical information system and global positioning system*, transmitted by IIRS, Dehradun through SIT facility, Division of Agricultural Physics, IARI, New Delhi, Aug. 06-Oct. 17, 2012. No. of participants : 18 Institute Co-ordinator : Dr. R.N. Sahoo Asstt. Co-ordinator : Dr. (Mrs.) K.H. Kamble



Directorate of Extension (Department of Agriculture and Cooperation) Sponsored Model Training Course on *Assessment of soil-plant-atmosphere system for improving resource use efficiency in agriculture*, Division of Agricultural Physics, IARI, New Delhi, Sept. 4-11, 2012. No. of participants : 20 Course Director : Dr. K.K. Bandyopadhyay Course Co-ordinator : Dr. S. Pradhan



DSpace admin training under eGranth project, IARI, New Delhi, Sept. 10-11, 2012. No. of participants : 20 Organizer: Dr. A.K. Jain

Koha LMS training under eGranth project, IARI, New Delhi, Dec. 12-13, 2012. No. of participants : 10 Organizer: Dr. A.K. Jain
Koha LMS training under eGranth project, IARI, New Delhi, Dec. 19-20, 2012. No. of participants : 13 Organizer: Dr. A.K. Jain



Department of Science and Technology Sponsored Short Course on *Hyperspectral remote sensing for agriculture*, Division of Agricultural Physics, IARI, New Delhi, Feb. 18-27, 2013. No. of participants : 25 Course Director : Dr. R.N. Sahoo Course Co-ordinator : Dr. S. Pradhan



Department of Space Sponsored EDUSAT based distance learning programme on *Basics of remote sensing, geographical information system and global positioning system*, transmitted by IIRS, Dehradun through SIT facility, Division of Agricultural Physics, IARI, New Delhi, August 05-Nov. 12, 2013. No. of participants : 31 Institute Co-ordinator : Dr. R.N. Sahoo Asstt. Co-ordinator : Dr. (Mrs.) K.H. Kamble

Department of Space Sponsored EDUSAT based distance learning programme on *Microwave remote sensing for natural resources*, transmitted by IIRS, Dehradun through SIT facility, Division of Agricultural Physics, IARI, New



Delhi, Feb. 03-March, 29, 2014.No. of participants : 27Institute Co-ordinator : Dr. R.N. SahooAsstt. Co-ordinator : Dr. (Mrs.) K.H. Kamble

Department of Space Sponsored EDUSAT based off-campus training programme on Advance Course on ‘Hyperspectral remote sensing’, IIRS, Dehradun and Division of Agricultural Physics, IARI, New Delhi (Feb. 13-March 30, 2012)No. of participants: 36Institute Co-ordinator: Dr. R.N. SahooAsstt. Co-ordinator: Dr. (Mrs.) K.H. KambleDivision of Agricultural Physics and Indian Society of Agrophysics organized jointly the 4th Dr. B.P. Ghildyal Memorial lecture, which was given by Dr. L.S. Rathore, Director General, India Meteorological Department, Ministry of Earth Sciences, Govt. of India delivered the lecture on the topic *Weather information for sustainable agriculture in India* on December 13, 2013 at NRL Auditorium, IARI, New Delhi.



Workshop/National Conference organized

Workshop on *Strategies for implementation of open source software Koha* in SAU'S & ICAR Institutes Libraries, UAS, Bangalore, Sept. 6-7, 2011 (under *eGranth project*).No. of participants: 30Organized by: Dr. A.K. Jain



Natl. Conf. of Agricultural libraries and user community on *Role of agricultural libraries in knowledge management*, ANGRAU, Hyderabad, March 15-16, 2012 (under *eGranth project*)No. of participants: 150Conf. Director: Dr. A.K. Jain



Workshop of *eGranth partners* under *eGranth project*, TANUVAS, Chennai, Aug. 27-28, 2012.No. of participants : 35 Organizer: Dr. A.K. Jain



Review Workshop *NFBFARA sponsored projects on Decision support system*, Division of Agricultural Physics, IARI, New Delhi, Oct. 22, 2012.Organizer: Dr.(Mrs.) P. Krishnan

Workshop-cum-Regional Review Meeting for *North-west region under FASAL project*, Division of Agricultural Physics, IARI, New Delhi, Nov. 8-9, 2012.Organizer: Dr.(Mrs.) A. Vashisth

Pre-symposium tutorials on:1. Advances in spectrometry for earth remote sensing (Co-ordinator: Dr. R.N. Sahoo).2. Computational intelligence in remote sensing (Co-ordinator: Dr. V.K. Panchal, DTRL, DRDO, New Delhi).3. LiDAR technology and its applications (Co-ordinator: Dr. Anil Kumar, IIRS, Dehradun), Division of Agricultural Physics, IARI, New Delhi, Dec. 3-4, 2012. No. of participants: 80 Overall Co-ordinator: Dr. R.N. Sahoo

Natl. Symp. Space technology for food & environmental security, NASC Complex, New Delhi, Dec. 5-7, 2012. Organizing Secretary: Dr.(Mrs.) U.K. Chopra

Workshop *Indian Remote Sensing Satellite (IRS) Series: A saga of 25years*, TERI Univ., New Delhi, Jan. 31, 2014. Organizer: Dr. R.N. Sahoo



**31. Code of ethics for research followed by the departments**

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	4	-	-	-
Ph.D.	17	4	1	23.5	5.88

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	-
Ph.D.	88.24	NIL	11.76	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.

All others are selected as ARS scientist or Assistant Professor

Many continuing career as researcher abroad

No student of the discipline is Jobless.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job
Entrepreneurs	-

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	0
From universities from other States from	100
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All are Ph.D. except Mr R S Jaat



38. Present details of departmental infrastructural facilities with regard to:

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: two
- Student's laboratories/research laboratories: 9

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities:

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

Sl.no.	Name of M.Sc. student	University of Graduation
1.	MamtaKumari	Banaras Hindu University
2	Rajeev Ranjan	Banaras Hindu University
3	BhaskarNarjary	UBKV, West Bengal
4	SudiptaChattaraj	UBKV, West Bengal
5	NilimeshMridha	BCKV, West Bengal
6	RajkumarDhakar	MPKV, Rahuri, Maharashtra
7	SauravSaha	BCKV, West Bengal
8	SurajitMondal	BCKV, West Bengal
9	Jitendrakumar	Banaras Hindu University
10	DebasishChakraborty	UBKV, West Bengal
11	SarathChandran M. A	KAU, Karela
12	NeetuMeena	SKNRAU, Bikaner Rajasthan
13	Bappa Das	BCKV, Mohanpur Nadia, West Bengal
14	Amit Kumar Singh	Banaras Hindu University
15	MukhtarAhmead	UBKV, West Bengal
16	Paulson Thomas	KAU, Thrissur, Kerala
17	Amit Kumar Mishra	Banaras Hindu University
18	RekhaKumariMeena	Banaras Hindu University
19	SumantaChatterjee	BCKV, Mohanpur Nadia, West Bengal
20	AvinashGoyal	Dr. BSKKV, Dapoli, Maharashtra
21	ShilpiVerma	Banaras Hindu University
22	Koushik Banerjee	BCKV, Mohanpur Nadia, West Bengal
23	Victor Banerjee	BCKV, Mohanpur Nadia, West Bengal
24	Prosenjit Barman	BCKV, Mohanpur Nadia, West Bengal
25	Alka Rani	PAU Ludhiana
26	BrijeshYadav	Swami Keshwanand Rajasthan Agril. Univesity,Rasthan
27	Pragya Singh	Banaras Hindu Huniversity



Sl.no.	Name of Ph.D. students	University of graduation
1	PragatiMaity	UBKV, West Bengal
2	Karun Kumar Choudhary	MPKV, Rahuri, Maharashtra
3	SanatanPradhan	OUAT, Bhubneshwar, Orissa
4	Rahul Tripathi	Banaras Hindu University
5	AliashrafAmirijad	Srilanka
6	H.K. Kadupitiya	Srilanka
7	Nishant Kumar Sinha	Banaras Hindu University
8	BhaskarNarjary	UBKV, West Bengal
9	SudiptaChattaraj	UBKV, West Bengal
10	S. Suthakar	Srilanka
11	SunayanSaha	BCKV, West Bengal
12	Rajeev Ranjan	Banaras Hindu University
13	SauravSaha	BCKV, West Bengal
14	NilimeshMridha	BCKV, West Bengal
15	Rakesh Kumar	BAU, Ranchi
16	AbhishekDanodia	PanjabAgril. University
17	Sushil Kumar Kharia	Junagadh, UniJoonagarh, Gujarat
18	AditiSrivastava	Hansraj College, Delhi University

S.No.	List of M.Sc. student	Qualifications	Name of the post	University of Graduation
1.	Ms.Priyanka	MCA	SRF	Banasthali University, Rajasthan
2.	Ms.Malti		RA	
3.	Manu Choudhary	MCA	SRF	GGSIPIU
4.	Ravi Srivastav	MCA	SRF	Punjab Technical University
5.	Rajendra Singh Baloda	M.Sc(Ag.) Entomology	RA	Rajasthan Agril. University, Bikaner
6.	RuchikaSinghal	MCA	RA	GGSIPIU
7.	Jitendra	Ph.D	RA	Allahabad Agril. University
8.	AshishTiwari	RA	MCA	IME College Ghaziabad
9	Gopal	SRF	MSc	Instt. of Ecology & Environmental

40. Number of post graduate students getting financial assistance from the university

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology

Not applicable

42. Does the department obtain feedback from

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.



b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

1. Dr. A.K. Singh, DDG (NRM), Vice-chancellor, Gwalior
2. Dr. P.K. Sharma, Vice-chancellor, Jammu & Kashmir
3. Dr. K. K. Katoch, Vice-chancellor, HPKV, Palampur
4. Dr. Ravinder Kaur, Director, IARI, New Delhi
5. Dr. R.K. Misra, Senior Soil Physicst , Australia University
6. Dr. C. L. Acharya, Ex. Director, ISSS, Bhopal
7. Dr. N. V. K. Chakravarty, Expert, NRDMS project proposal committee ,DST, Agril. Physics, IARI, New Delhi
8. Ms. Shelton Padua,
9. Dr. Debapriya Dutta, Counselor(S&T) Embassy of India 2107, MASSACHUSETTS AVE, NW WASHINGTON D.C
10. Dr. Ramesh Kumar Sharma, Commissioner, IAS officer , H.P.

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.



49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

Research Programmes & Services

Mandates of the Division:

To conduct strategic research for understanding the physical processes of crop plants growing under varying soil and atmospheric environments for enhanced and sustainable agricultural productivity.

To organize upgraded post-graduate research and teaching activities in the areas of Soil Physics, Agricultural Meteorology, Plant Biophysics and Remote Sensing.

To maintain on-farm meteorological observatory and create agro-physical information database, for use by students, researchers and planners.

To prepare real time/medium range weather based agro-advisory bulletins for the farmers of Delhi.

To conduct regular training courses on Soil Physics, Agricultural Meteorology and Remote Sensing and their applications in agricultural resource planning and management at National and International levels.

Thrust Areas:

Tillage induced soil property changes and its linkages with growth and yield of crops.

Quantification of crop-weather interaction in relation to growth and yield of crops under variable inputs.

Pest-weather relationship with reference to phenology of crops and development of predictive model.

Delineation of productivity of crops in Indo-gangetic plain regions using remote sensing, GIS, simulation models and relational database layers.

Weather based agro-advisory services on real time basis to farmers of Delhi for agricultural operations using medium range weather forecast.

Development of dynamic simulation models for soil and crop processes understanding and agri-production estimates.

Designing crop growth monitoring and early warning system using Remote Sensing, GIS and Simulation Models.

Regional energy and water balance estimates for resource management and sustained agricultural productivity.

Biological and physical basis of growth and yield of crops.

Retrieval of plant, soil and agro-meteorological parameters using remote sensing for sustainable development of agro-ecosystem.

Salient Achievements

Soil Physics and Soil & Water Conservation

Least Limiting Water Range (LLWR) is a better indicator of soil structural quality, water availability and available water capacity. To avoid water stress, irrigation should be given at 2 MPa soil strength.

Evaluated eight soil quality indices based on soil physical, chemical and biological properties and compared soil quality under different proportions of nitrogenous, inorganic and organic fertilizer applications in maize-wheat and rice-wheat cropping systems.



Quantified the impact of resource conservation technologies on soil physical environment. Compared to conventional tillage, higher nitrate concentration was retained under bed planting technique. Enhanced water and nutrient use efficiencies in wheat, tomato, maize and soybean were the benefits accruing due to better soil physical environment under bed planting.

A simple one-layer soil water balance model was developed for calculating radiation balance components, potential and actual evapo-transpiration of crop using weather, crop and soil parameters.

Physical rating index (PI) was computed by including easily determinable soil physical parameters and linked with the crop capability. PI of soil series of Delhi region was determined for evaluation of their production potential under normal water and fertilizer input levels.

Under limited irrigation, application of rice husk @ 8 t ha⁻¹ moderated soil temperature maintained better residual soil moisture status, leading to 5-7% higher grain yield and 10-17% higher water use efficiency. This technology is beneficial for rain fed wheat in India.

Penetration resistance, two days after watering, could be used as an indicator of compaction instead of bulk density.

Agro-meteorology

A thumb rule was developed to forewarn the onset of white rust disease in mustard using cumulative hours of certain ranges of temperature, relative humidity and actual bright sunshine hours.

A forewarning hypothesis (thumb rule) was developed using the degree days concept to forewarn, one month in advance, the peak of aphid and kaltenbach (*Lapaphis erysimi*) infestation in mustard.

De-branching technology was developed for improvement of canopy micro-environment and reduction in insect-pests in mustard cultivars.

Thermal response curves were developed, served as ready reference for expressing the relationship of growing degree days (GDD) with leaf area index (LAI) and biomass production and the curves can be used for predicting biological and economical yield of crop in advance.

A model was developed to predict powdery mildew development in mango. Performance of two weather-based models viz., Campbell-Diaz and SPAW in predicting the soil moisture in the root zone was evaluated.

Remote Sensing and GIS

An improvement was made in universally used satellite remote sensing based index called 'Trend Adjusted Vegetation Condition Index' for better identification of agricultural drought which not only separates the effect of weather and ecology on crops but also accounts for changes in crop production technology over time.

Designed, demonstrated and validated a methodology to assess agricultural drought vulnerability and map its intra-seasonal variations in Rajasthan State. The kharif season drought vulnerability can be used by planners and state agencies to prioritize areas for drought mitigation while its intra-seasonal variability can be used to design area-specific crop contingency measures.

Quantitative assessment of physico-chemical parameters of soils representing different soil series and soil orders were done using Hyperspectral remote sensing technique.

Based on probability of rainfall anomalies, Satellite-derived crop health, soil properties and irrigation availability, a methodology was devised to map the proneness of crop area for early, mid and late season agricultural drought. The agricultural drought proneness was mapped for the states of Rajasthan, Madhya Pradesh, Gujarat and Maharashtra.

Identified the trends in crop phenology parameters for Indo-Gangetic plains using 20-years Satellite remote sensing data. The kharif season in general, is showing an increase in duration, early start of season and early occurrence of peak vegetation stage. In contrast, rabi season in general is showing decrease in duration, and delay in start of season and also occurrence of peak vegetation stage.

Homogenous fertility units were generated through use of remote sensing data and recommended dose of N:P:K were worked out for targeted yield of rice, wheat and maize crops using QUEFTS model.

A one-dimensional index (Total Information Content Index) was developed for characterizing the natural resources using multi-spectral remote sensing data both from ground and space based sensors.

Developed methodology for monitoring the incidence of rust in wheat and leaf folder in rice, aphid in mustard and yellow vein mosaic virus in soybean through remote sensing.

The spectral indices Water index or normalized water index-1 or normalized water index-3 recorded at milking stage can be successfully used to monitor the crop water stress and also predict the wheat yield.

Hybrid soil quality index developed with remotely sensed indicators found to be statistically at par with the conventionally developed index. Computation of this index at regional scale using remote sensing inputs will help in identifying sustainable cropping system for different regions.

Identified the wave length for detection of yellow-vein-mosaic virus infection in soybean.

Using red edge technique, predictive equation for wheat crop was developed to detect nitrogen stress at field scale.

Derived cropping system and its performance indicators through simple and advanced classification techniques of hyper-temporal satellite data.

A composite index called vegetation health index (VHI) was developed from the satellite derived parameters of leaf area index, leaf moisture and leaf chlorophyll for spatial monitoring of wheat health. This index is very useful for crop stress monitoring, yield prediction and for devising area specific management practices.

Plant-Biophysics

The combinations of field strength and duration of static magnetic treatment to seeds was optimized for maize, chickpea and sunflower, which gave best results in terms of shoot and root length, shoot and root dry weights. Improved functions of root could be used for extracting water and nutrients from the deeper soil layers. Hence this technology can be used under limited water conditions.

Analysis of water sorption isotherms revealed that magnetic exposure of seeds decreased the number of strong and multi-molecular but increased weak binding sites.

Technology developed

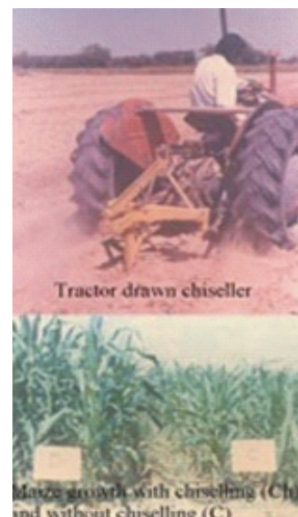
Chiselling technology

Chiselling technology was developed to reduce the sub-surface mechanical impedance of soils.

It involves chiselling of dry soil to 30-45 cm depth at 50-120 cm distance depending upon the location of impedance layers and row to row spacing of the plants.

A chisel, generally mounted in place of a plow, is used to break sub-surface soil layer.

The chiselling encourages deep root growth, increases infiltration of rain and irrigation water, thereby increases the water storage in the sub-surface soil and improves aeration in the root zone of temporarily water logged soil and enhanced the productivity of wheat and maize by 23 and 41 percent, respectively.



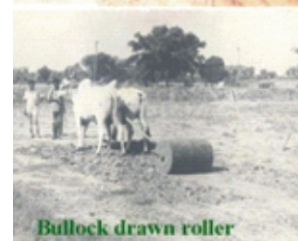
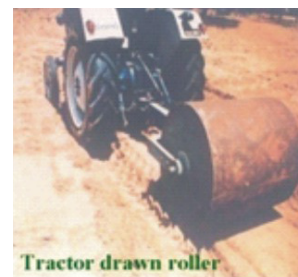


Soil compaction technology

It involves making of 4-20 passes of a tractor or bullock drawn roller (depending upon its weight), at optimum moisture or within 24 hours of irrigation/heavy rainfall.

The compacted sandy or loamy sand soils have 30-75 per cent reduced infiltration rate and require 40 per cent less water in each irrigation.

Enhances the production potential of these soils by 15 per cent. Compaction also resulted in higher moisture retention by soil and thereby the leaching losses were reduced to a large extent.



Mulching technology

Use of polyethylene mulch during winter to increase the temperature by about 2°C while during summer season, use of straw mulching can reduce the soil temperature to the extent of 5°C .

Polyethylene mulch can reduce soil water depletion by 75% from the top layer whereas it could be 25% less depletion in rice husk mulch compared to control. The downward soil water flux from top layer can also reduce by 4.3 and 1.8 times from mulched (polyethylene and rice husk, respectively) than un-mulched plot even 21 days after irrigation.

Use of polyethylene mulch in maize, soybean and chickpea can enhance production by 10 to 20 %.



Bed planting technology

Bed planting with 37.5 cm wide beds and 30 cm furrows is optimum configuration which is better than conventional planting for growing 3 rows of wheat in rabi, 1 row of maize and 2 rows of soybean in kharif.

This improves water use efficiency (12 %), increase nitrate retention in beds (20-40 %) depending on growth stage, increase winter soil temperature (2 oC) in wet soil and in dry soil (0.5 oC) resulting in enhanced crop yield (5-10%).

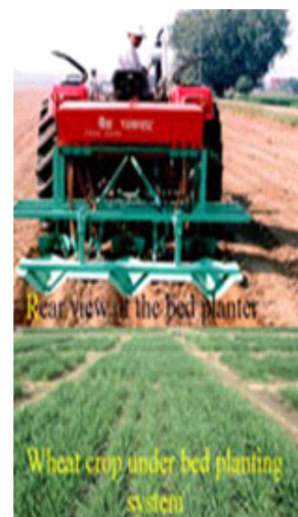
Thumb rule for aphid infestation in mustard

The Thumb Rule, 'lower the degree-day accumulation rates in January, higher the probable peak aphid population' was developed and validated over a number of seasons and found valid.

One can forewarn the aphid infestation level during the crop season, about 4-5 week in advance.

Thumb rule for white rust in mustard

White rust disease would appear in the mustard crop, if sum of hours in consecutive ten days with



Temperature ranging from 10-20 °C > 150 hours

Relative humidity more than 80 % > 80 hours

Actual bright sunshine hours < 10 hours

De-branching technology in mustard

De-branching facilitated higher radiation penetration thus reduces the white rust disease and increases yield in mustard.

De-branching at 50 days after sowing upto the height of 40 cm significantly increased water use efficiency (14-18%), radiation use efficiency (10-18 %) and seed yield (6-10%) as compared to control plots.



White rust in mustard

Use of trap crop for reducing insecticide spray in mustard

Pusa gold attracted aphids first and helps in reducing the aphid attack on other varieties. Therefore Pusa Gold can be used as trap crop to overcome the aphid infestation in other varieties and hence to reduce the number of insecticides spray. It can be a viable component of Integrated Pest Management (IPM).



Improved indicator for detection of agricultural drought

Agricultural drought is a slow onset, complex and least understood disaster.

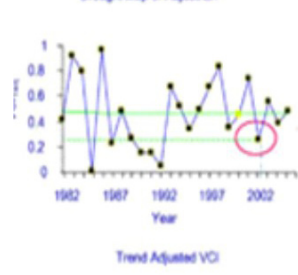
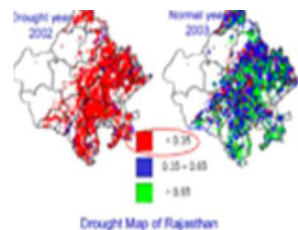
Early warning of agricultural drought is an essential preparedness for food and livelihood security.

Indicator 'Trend Adjusted Vegetation-Condition Index', for agricultural drought detection for early warning was developed.

A value less than 0.35 indicate drought.

The 'Trend Adjusted VCI' identified most of crop area under agricultural drought in year 2002 (shown in red colour).

In contrast, year 2003 was a normal year with very less crop area under agricultural drought (shown in green colour).



Estimation of soil fertility parameters from remote sensing

Developed methodology to estimate soil physico-chemical properties from ground and satellite remote sensing.

Estimated N, P, K, SOC, CaCO₃, silt and clay for soils in Punjab.

Useful for generating soil quality and fertility maps.

Helpful in recommending site specific nutrient management.



51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Major Strengths of the Division:

A truly multi-disciplinary Division working in the research and teaching on physical aspects of SPAC from field to regional scale.

The majority of scientific staff of the Division is young and dynamic and are involved in research in frontier areas at par with the world.

Seven externally funded projects (DST, NFBSEARA, NAIP) in the Division and involvement of the few astute Scientists in national level ministerial committees.

Good publications in International Journals: Already we have around 20 international publications every year from the Division.

Very good infra-structure and physical facilities: 9 well developed working labs (3 each in Soil Physics, Plant Physics and Remote sensing) including satellite data reception and processing center along with Meteorological observatory, AWS and *large aperture scintillometer* installed in experimental field.

Major Weaknesses

Low awareness about the scope and reach of the Discipline of Agricultural Physics among the policy makers.

Due to the dropping of Agricultural Physics discipline from ARS, students from the Division working in the areas related to Remote Sensing, Soil Physics and Plant Physics feel uncertain about job opportunities in ICAR and rush to other organisations such as IMD, ISRO and SAUs. So the efforts put by faculty in grooming students are not helping in building up second line of Agricultural Physics scientists which will create a big void in future.

Students with pure physics background are not able to get admission in the discipline due to agriculture paper. If at least one seat in Ph.D. is reserved for getting a student from Pure physics background and a separate syllabus is kept for Ph.D. entrance exam for this option, it will help the division in overcoming the existing weakness.

Opportunities

Introduction of separate seats for Scientists with specialization in the area of remote sensing and GIS in agriculture and reserving few seats allotted for Soil Science discipline for Scientist with specialization in Soil Physics.

With advancement of technology at fast pace in the area of remote sensing and GIS, automatic data recording weather instruments, development of web enabled GIS based websites, statistical and mathematical softwares, easy accessibility of crop growth and environmental monitoring models has opened vast avenues for research in Agriculture Physics.

Threats

Due to less absorption of students of the Division in ARS stream mainly from Soil Physics and Remote sensing sub disciplines, future research in the both areas will decline in ICAR.

52. Future plans of the department

Proposed research plan 1

Risk assessment and management of hydro-climatic hazards for reducing soil degradation and sustaining production (in collaboration with Water Technology Center)

Work done so far

A general working methodology has already been developed for identification of agriculture zones vulnerable to climate change in IGP at district level. All the key hydro-climatic, agronomic and socio-economic parameters indicating the exposure, sensitivity and adaptive capacity of vulnerability were identified, ranked and assigned weights for calculation of vulnerability index.



Besides two important websites <http://www.creams.iari.res.in> and <http://14.139.56.72.8090/dst/ncrforecast/index.html> for monitoring the spatio-temporal abiotic and biotic stresses (attack by aphids, painted bug, white rust and alternaria in brassica) due to weather variability have been developed in the Division.

Critical gaps

Further refinement of hydro-climatic hazard assessment for delineation of agricultural drought prone areas on block level of ACZ6 (in terms of both their severity as well as frequency of occurrence) based on available IMD weather data and available water resources data needs to be done for developing climate smart agricultural technologies.

Again development of appropriate composite indices from real time data on weather and crop conditions received at the Division's satellite data reception center is needed for forwarning of hydro-climatic hazards to the farmers of the region.

Development of weather based forewarning models for pest and disease attack for major crops are also very essential for ensuring sustainable food production. Besides studies on shrinking cultivable land and yield gaps in past decade are required for planning strategies to increase production and resources use efficiencies to meet future growing food demand.

Proposed plan and outcome

For developing climate smart agriculture for ACZ6, maps of available water (rain, surface and ground water) along with water foot print of the region (based on past IMD weather data) will be prepared for delineation of agriculture drought vulnerable zones and accordingly mitigating and adaptive strategies will be suggested.

Similarly change in net cropped area in past 25 years will be prepared by using remote sensing imageries. Potential and actual crop yield maps of the area will be prepared to study yield gaps and management strategies such as for bridging the gaps will be identified.

For quantifying the frequency and severity of abiotic stresses to crops (drought, flood, heat or cold wave) on spatial and temporal basis, the above mentioned first website linked to satellite data reception center will be used for generating spatio-temporal maps of EVI, NDVI, land surface temperature and rainfall for the study region, which will be used for computing various indices like SPI, CCI etc. for forecasting agricultural drought or flood on spatio-temporal scales so that contingency plans can be made to reduced the impact of these hazards.

Remote sensing techniques (use of SEBEL model) will also be used to predict water foot prints of the region and results will be validated through measurement of ET by *Large apperature scintillometer* and *Eddy covariance flux tower*.

Besides, impact of biotic stress (pest and disease attack on crop) due to changes in weather conditions will be studied by developing above mentioned GIS linked second website (Geopest-DSS) for forewarning of pest and disease attack at various growth stages in rice and wheat for timely suggestion of appropriate control measures.

Forecast of crop yields will also be done to help government in agricultural policies decisions of the study area.

Gramin Krishi Mausam Sewa Kendra of the Division will provide hydro climatic hazard alerts and crop management advices to the farmers of the region through SMS, daily local papers and through <http://www.iari.res.in> for stabilizing the yields of the region.

Proposed research plan 2:

Development of sensors for nutrient detection in soil-plant system using hyper spectral remote sensing (in collaboration with IIT's)

Proposed plan and outcome

A new plan to be started under precision agriculture platform. A narrow range of bands for detecting various concentrations of N, P and K in plant and soil will be identified by conducting lab and field trials so that appropriate filters/sensors could be designed by electronics department of IITs. Such sensors will be used in precision farming.



Proposed research plan 3

Retrieval of bio-physical parameters using hyperspectral BRDF and multispectral remote sensing data for crop health prediction.

Work done so far

A canopy radiative transfer model based on anisotropic reflectance pattern of crop was calibrated for characterizing vegetation (on field scale) through forward modelling as well as retrieval of bio-physical parameters of wheat and soybean from satellite imageries through inverse modelling on regional scale for forecasting crop health.

Gaps

Model has only been tested for wheat and soybean crops in Punjab and Haryana regions.

Proposed plan

Model has to be calibrated for different locations, crops and growth stages and results should be validated for testing its efficiency in prediction of crop health.

Plant Physics

Proposed research plan 4:

Screening of drought and heat tolerant varieties (in collaboration with Genetics , Seed Science & Plant Physiology Divisions)

Work done so far

Few hundred of wheat varieties from Genetics Division have been screened for drought and heat tolerance by measuring spin-lattice and spin-spin relaxation time of leaf sample using Minispec mq series with operational radio freq. range up to 23MHz based on the principal of nuclear magnetic resonance.

Gaps

Screening of drought and heat tolerance is needed for other cereal and legume crops.

Plan of work and outcome

Screening of drought and heat tolerant varieties of other cereal crops such as maize, jowar, bajra etc. will be done for their use in drought and heat wave prone areas under arid to semi-arid climate.

Proposed research plan 5:

Studying the effect of terminal heat stress on grain quality.

Work done so far:

Screening of different crop varieties for grain quality assessment.

Gaps:

Limited information on grain quality of latest screened drought and heat tolerant varieties of wheat.

Plan of work and outcome:

Effect of shift in date of sowing of normal as well as late sown varieties of cereals, legumes and oil seed crops (adaptation strategies to climate change) on grain quality will be assessed by measuring carbohydrate content, protein and oil content using infrared grain analyser (by measuring the height of absorption peaks for C-H, N-H and O-H bonds of NIR radiations).

Proposed research plan 6:

Phenomics of water and heat stress tolerance in rice and wheat varieties.

Work done so far:

It was identified that 800 and 1240 nm bands will be most suited for computing NDWI (a measure of plant water stress) at different stages of wheat .



Gaps:

Similar work is required for identifying bands for crop stress detection due to other biotic and abiotic stresses in different crops varieties.

Plan of work:

High throughput phenotyping (imaging through hyperspectro-radiometer (NIRS) and visual cameras mounted on unmanned aerial vehicle (drone) along with automated environmental data collection system) at different crop stages will provide a powerful tool to screen stress tolerance (moisture and heat) in different varieties of rice and wheat.

Proposed research plan 7

Use of High Volume Instrument system (HVI) for cotton fibre properties information.

Plan of work:

It's a new instrument and can be used for quick generation of more precise fiber properties information of cotton (such as length, length uniformity, strength colour, maturity and micronaire) for commonly grown cotton varieties.

SOIL PHYSICS

(in collaboration with Soil Science and Agronomy)

Proposed research plan 8:

Restoration of soil health and resource use efficiency under CA practices

Work done so far

Problem of subsurface compaction in rice-wheat and cotton- wheat were alleviated by adoption of CA practices which resulted in better soil structure and more availability of soil water as reflected in widening of least limiting water range for both systems. Root water uptake / actual transpiration rate for wheat crop simulated between 90-120 DAS by Hydrus 2D model was also higher and evaporation losses were lower under CA practices because of more residue retention.

Gaps

Calibration of Hydrus 2D (for 2D simulation of water, nutrient and heat transport in soil as well as actual root water uptake) is required for comparing water productivity along with temporal fluctuations in soil water and temperature under different CA systems and their linkages with crop growth models.

Plan of work and outcome

Long-term studies on mechanical and hydrothermal behaviour of soil under different conservation agriculture for maize-wheat and pigeon pea system will be done which will involve preparation of soil penetration resistance curves, computation of S index, LLWR and other soil quality indicators along with simulation of water, nutrient and heat transport in soil and also separating water transpired by crop and evaporated from soil surface will help in estimating saving in water use by adoption of a particular conservation agriculture practice.

Proposed research plan 9

Development of DSS for recommendation of site specific CA practices based on soil properties, climate and socio-economic condition.

Research work done so far

Survey in farmers' fields of Sonapat and Panipat districts revealed that two of the most prevalent CA technologies were bed planting and zero tillage. Vegetables growing bed planted areas mostly had medium to fine textured soils, easy access to market and availability of fresh water. Zero tillage was practiced mainly by farmers to timely sow wheat in fine textured soils and low lying areas where soils remain moist till mid-November.



Gaps

No DSS for recommendation of site specific CA practices (type of tillage and residue retention) is available.

Proposed activities and outcome

A DSS for recommending appropriate CA practice including the type of tillage implement and amount of residue to be retained based on weighted average of scores of different soil, climate and socio-economic parameters will be developed for NCR.

Proposed research plan 10:

Development of crop growth models for forecasting yields of major crops of the region

Work on calibration and validation of crop growth models such as Infocrop, DSSAT and APSIM has started and after completing it, simulation of bio-physical parameters will be done both on field as well as regional scale. Besides work on two more models Aqua crop and Hydrus 2D is under progress to predict crop ET which will be linked to crop yield.



vi) Agricultural Statistics, Bioinformatics, and Computer Application

1. Name of the Department:

ICAR-Indian Agricultural Statistics Research Institute

2. Year of establishment:

1959

3. Is the Department part of a School/Faculty of the university?

Yes, School of Social Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D. - Agricultural Statistics

M.Sc. and Ph.D. -Computer Application

M.Sc. and Ph.D. -Bioinformatics

5. Interdisciplinary programmes and departments involved:

Agricultural Statistics, Computer Application and Bioinformatics

6. Courses in collaboration with other universities, industries, foreign institutions, etc.: None

7. Details of programmes discontinued, if any, with reasons: None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

Some of the faculty have Dual Faculty Membership (Agricultural Statistics and Bioinformatics; Computer Application and Bioinformatics). The faculty is thus involved in guiding students and taking courses of both the disciplines.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff (Agricultural Statistics)	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	16*	16	0	
Senior Scientist (Associate Professor)	04*	04	0	
Scientist (Assistant Professor)	10	10	0	

* One faculty each is placed at ICAR-IARI.



Staff (Computer Application)	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	02*	02	0	
Senior Scientist (Associate Professor)	02	02	0	
Scientist (Assistant Professor)	11*	04	0	

* Two faculty members placed at ICAR-NBPGR and one at ICAR-NRCPB.

@ Two faculty members placed at ICAR-NBPGR, two at ICAR-NRCPB and one at Division of Genetics, IARI.

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance (2009 – 2015)

Agricultural Statistics

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. UC Sud	Ph.D.	Director, IASRI	Sample Surveys	20 years	02	01
Dr. VK Gupta	Ph.D.	ICAR National Professor	Design of Experiments	31 years	00	00
Dr. Anil Rai	Ph.D.	Principal Scientist, Head, CAB in and Professor (Bioinformatics)	Sample Surveys	20 years	01	03
Dr. Seema Jaggi	Ph.D.	Professor (Agril. Statistics)/ (Computer Application)	Design of Experiments, Statistical Computing	20 years	01	03
Dr. KN Singh	Ph.D.	Principal Scientist and Head, F&ASM	Statistical Modeling and Forecasting	04 years	00	00
Dr. Rajender Parsad	Ph.D.	Principal Scientist	Design of Experiments	20 years	01	01
Sh. SD Wahi	M.Sc.	Principal Scientist	Statistical Genetics	28 years	03	--
Dr. LM Bhar	Ph.D.	Head, Statistical Genetics	Design of Experiments	17 years	05	01
Dr. AK Paul	Ph.D.	Principal Scientist	Statistical Genetics	17 years	03	--
Dr. Tauqueer Ahmad	Ph.D.	Principal Scientist	Sample surveys	17 years	03	--
Dr. A.R. Rao	Ph.D.	Principal Scientist	Statistical Genetics	17 years	02	01
Dr. GK Jha	Ph.D.	Principal Scientist	Sample Surveys, Statistical Modelling	17 years	04	--
Dr. Cini Varghese	Ph.D.	Principal Scientist	Design of Experiments	15 years	04	01
Dr. Himadri Ghosh	Ph.D.	Principal Scientist	Statistical Modeling and Forecasting	11 years	03	--
Dr. Anil Kumar	Ph.D.	Principal Scientist	Design of Experiments	05 years	--	--
Dr. Prachi Misra Sahoo	Ph.D.	Senior Scientist	Sample Surveys, GIS/RS	13 years	--	--
Dr. Hukum Chandra	Ph.D.	Senior Scientist	Sample Surveys	12 years	02	--
Dr. Amrender Kumar	Ph.D.	Senior Scientist	Statistical Modeling and Forecasting	12 years	--	--
Md. Wasi Alam	Ph.D.	Senior Scientist	Statistical Modeling and Forecasting	12 years	--	--
Dr. Prawin Arya	Ph.D.	Senior Scientist	Statistical Modeling and Forecasting	12 years	--	--



Dr. Sanjeev Panwar	Ph.D.	Scientist	Statistical Modeling and Forecasting	04 years	--	--
Dr. Ranjit Kumar Paul	Ph.D.	Scientist	Statistical Modeling and Forecasting	04 years	--	--
Dr. Mir Asif Iqubal	Ph.D.	Scientist	Statistical Modeling and Forecasting	04 years	--	--
Dr. BN Mandal	Ph.D.	Scientist	Design of Experiments	04 years	--	--
Dr. Susheel Kumar Sarkar	Ph.D.	Scientist	Design of Experiments	04 years	--	--
Dr. Eldho Varghese	Ph.D.	Scientist	Design of Experiments	04 years	--	--
Dr. Kaustav Aditya	Ph.D.	Scientist	Sample Surveys	03 years	--	--
Dr. Bishal Gurung	Ph.D.	Scientist	Statistical Modeling and Forecasting	02 years	--	--
Dr. Sukanta Dash	Ph.D.	Scientist	Design of Experiments	02 years	--	--
Dr. Arpan Bhowmik	Ph.D.	Scientist	Design of Experiments	01 year	--	--

Computer Application

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Students Guided	
					M.Sc.	Ph.D.
Dr. AK Choubey	Ph.D.	Head, (CA)	Computer Application	01 year	--	--
Dr. Rajni Jain	Ph.D.	Principal Scientist (at NIAP)	Computer Application	08 years	03	--
Dr. Sudeep	Ph.D.	Senior Scientist	Computer Application	13 years	04	--
Dr. Alka Arora	Ph.D.	Senior Scientist	Computer Application	14 years	03	--
Ms. Anu Sharma	M.Sc.	Scientist	Computer Application	11 years	02	--
Ms. Shashi Dahiya	M.Sc.	Scientist	Computer Application	14 years	01	--
Md. Samir Farooqui	M.Sc.	Scientist	Computer Application	14 years	--	--
Sh. KK Chaturvedi	M.Sc.	Scientist	Computer Application	13 years	--	--
Sh. SN Islam	M.Sc.	Scientist	Computer Application	11 years	--	--
Sh. SB Lal	M.Sc.	Scientist	Computer Application	11 years	--	--
Dr. Anshu Bharadwaj	Ph.D.	Scientist	Computer Application	11 years	--	--
Dr. Sangeeta Ahuja	Ph.D.	Scientist	Computer Application	13 years	--	--
Sh. Pal Singh	M.Sc.	Scientist	Computer Application	05 years	--	--
Dr. Mukesh Kumar	Ph.D.	Scientist	Computer Application	03 years	--	--
Dr. N Srinivasa Rao	Ph.D.	Scientist	Computer Application	01 year	--	--
Dr. AK Mishra	Ph.D.	Scientist (at IARI)	Computer Application	01 year	--	--



Bio-informatics

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. Anil Rai	Ph.D.	Professor (Bioinformatics)	Agricultural Statistics	05 years	02	--
Dr. KC Bansal	Ph.D.	Director, NBPGR		05 years	--	--
Dr. Rajender Parsad	Ph.D.	Principal Scientist	Agricultural Statistics	05 years	--	--
Dr. Seema Jaggi	Ph.D.	Principal Scientist	Agricultural Statistics	05 years	--	--
Dr. AR Rao	Ph.D.	Principal Scientist	Agricultural Statistics	05 years	02	--
Dr. Sudeep	Ph.D.	Senior Scientist	Computer Application	05 years	--	--
Sh. SB Lal	M.Sc.	Senior Scientist	Computer Application	05 years	--	--
Md. Samir Farooqui	M.Sc.	Senior Scientist	Computer Application	05 years	--	--
Ms. Anu Sharma	M.Sc.	Senior Scientist	Computer Application	05 years	--	--
Dr. TR Sharma	M.Sc.	Principal Scientist	Plant Biotechnology	05 years	01	--
Dr. Kishore Gaikward	Ph.D.	Principal Scientist	Plant Biotechnology	05 years	--	--
Dr. T Napoleon	Ph.D.	Principal Scientist	Plant Biotechnology	05 years	--	--
Dr. PK Singh	Ph.D.	Principal Scientist	Plant Biotechnology	05 years	--	--
Dr. KV Bhatt	Ph.D.	Principal Scientist	Plant Biotechnology	05 years	01	--
Dr. SS Malra	Ph.D.	Senior Scientist	Plant Biotechnology	05 years	--	--
Dr. Sunil Archak	Ph.D.	Senior Scientist	Plant Biotechnology	05 years	--	--
Dr. DC Mishra	Ph.D.	Scientist	Agricultural Statistics	05 years	--	--
Dr. Sarika	Ph.D.	Scientist	Agricultural Statistics	05 years	--	--
Sh. Sanjeev Kumar	M.Sc.	Scientist	Agricultural Statistics	05 years	--	--
Dr. Mir Asif Iquebal	Ph.D.	Scientist	Agricultural Statistics	05 years	--	--
Dr. Monendra Grover	Ph.D.	Senior Scientist	Bioinformatics	05 years	--	--
Dr. UB Angadi	Ph.D.	Senior Scientist	Computer Application	05 years	--	--
Sh. KK Chaturvedi	M.Sc.	Scientist	Computer Application	01 years	--	--



12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S.No.	Name of the Faculty	Status
1.	Dr. Prajneshu (Agricultural Statistics)	Emeritus Scientist, ICAR (continuing)
2.	Dr. VK Sharma (Agricultural Statistics)	Emeritus Scientist, ICAR (completed)
3.	Dr. RC Goyal (Computer Application)	Emeritus Scientist, ICAR (continuing)

13. Percentage of classes taken by temporary faculty – programme-wise information: Nil

14. Programme-wise Student Teacher (Guide) Ratio:

	M.Sc. (Ag. Stat.) / Ph.D. (Ag.Stat.)	M.Sc. (CA) / Ph.D. (CA)	M.Sc. (Bioinformatics) / Ph.D. (Bioinformatics)
Faculty	17	07	12
Student	15	15	10
Ratio	1:1.33	1:0.47	1:1.2

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	215	82	
2.	Administrative	84	76	
3.	Supportive	92	61	

16. Research thrust areas as recognized by major funding agencies:

Agricultural Statistics: Design of Experiments, Modeling and Forecasting, Spatial Modeling, Sample Surveys, Geoinformatics, GIS/Remote Sensing, Statistical Genetics.

Computer Application: Development of information systems/ expert systems, Web based inferential systems in agriculture, Software development, Algorithm development

Bioinformatics: Modelling of biological data, Genome wide association studies, Protein structure modeling and docking, Prediction of miRNA and its targets.

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Total Grants Received (Lakh Rupees)
Dr. Seema Jaggi	Experimental designs in the presence of indirect effects of treatments. (DST)	-	10.5936
Dr. Rajender Parsad	Information system for planning and analysis of experiments on All-India Coordinated Research Project on Vegetable Crops (AICRP-VC)	-	4.5000
Dr. Tauqueer Ahmed	Study to test the developed alternative methodology for estimation of area and production of horticultural crops. IASRI component of CHAMAN program under MIDH (Deptt. of Agri. & Cooperation, Min. of Agri.)	-	549.3800
Dr. Anil Kumar	Bioacoustics tool: A novel non-invasive approach for different monitoring of health and productivity in dairy animals. (DBT)	-	9.3000
Dr. Hukum Chandra	Development of innovative approaches for small area estimation of crop yield, socio-economic and food insecurity parameters. (ICAR)	-	35.0000



Dr. Ranjit Kumar Paul	Network project on market intelligence Impact assessment of agricultural research and development. (ICAR-NIAP)	-	37.4100
Dr. Mir Asif Iquabal	Whole genome based SNP mining and development of breed signatures for dairy and dual-purpose indigenous cattle. (DBT) ICAR Network Project on Transgenics in Crops (ICAR-NRCPB)	-	70.5430 29.5500
Dr. Kaustav Aditya	Pilot study for developing state level estimates of crop area and production on the basis of sample sizes. (Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture)		929.8916
Dr. AK Gupta	Pilot study for estimation of seed, feed and wastage ratios for major food grains. . (Ministry of Statistics & Programme Implementation, Central Statistical Office)	-	90.9848
Dr. Sudeep	Phenomics of moisture deficit and low temperature stress tolerance in rice. (NFBSFARA, ICAR)	-	58.9000
Sh. Sanjeev Kumar	A new distributed computing framework for data mining (DIT): Modelling network of gene responses to abiotic stress in rice. (NFBSFARA, ICAR)	-	120.2000
Dr. Dinesh Kumar	Whole genome sequencing and development of allied genomic research in two commercially important fish-Labeo rohita and Clarias batrachus. (DBT)	-	18.1000

List of on-going research projects (Institute Funded)

1. A study on STAR and SV families of non-linear time-series models for describing cyclicity and volatility in agriculture: 21.05.2013-30.04.2015.
2. Project Information & Management System of ICAR (PIMS-ICAR): 01.01.2009-30.04.2015.
3. A study of modelling and forecasting of time-series with long memory process: 01.05.2013-30.04.2015.
4. Development of web-based Mushroom expert system. (Collaboration with lead centre: DMR, Solan): 01.04.2011-31.03.2015.
5. Development of efficient methodology and web-based application for protein structure comparison: 18.04.2013-17.04.2015.
6. Estimation of heritability under correlated errors: 04.01.2014-03.01.2016.
7. Planning, designing and analysis of experiments planned on stations under the Project Directorate for Farming Systems Research-IV: 01.04.2012-31.03.2017.
8. Calibration estimators under two stage sampling design when study variable is inversely related to auxiliary variable: 01.05.2014-30.04.2016.
9. Factorial experiments with minimum level changes in run sequences: 16.08.2013-15.02.2016.
10. Minimal response surface designs for resource optimization in agricultural experiments: 04.09.2014-03.09.2017.
11. Study on volatility spillover of agricultural commodity prices: 12.05.2014-11.05.2016.
12. Planning, designing and analysis of data relating to experiments for AICRP on long term fertilizer experiments: 01.04.2012-31.03.2017.



13. Development of 16s rRNA rumen specific microbes database. (Collaboration with NIANP, Bangalore): 23.07.2014-31.03.2017.
14. Multilabel functional classification of abiotic stress related proteins: 20.03.2014-14.08.2016.
15. Results framework document management system in ICAR (RFD-MS): 09.05.2014-30.04.2017.
16. Planning, designing and analysis of “On Farm” Research (OFR) experiments planned under Project Directorate for Farming Systems Research: 01.04.2012-31.03.2017.
17. Information system for designed experiments: 01.04.2012-31.03.2017.
18. Development of statistical approach for prediction of eukaryotic splice sites: 03.09.2013-31.08.2015.
19. Development and application of electronic learning and diagnostic modules for health management of dogs. (Collaboration with IVRI, Izatnagar): 01.07.2014-31.12.2015.
20. Modelling and construction of transcriptional regulatory network using time-series gene expression data: 22.05.2014-21.11.2016.
21. National Information System on Agricultural Education Network in India (NISAGENET-IV): 01.04.2012-31.03.2017.
22. Strengthening and refining of Maize AgriDaksh (Collaboration with Lead Center: Directorate of Maize research, New Delhi): 01.04.2011-31.03.2016.
23. Management system for post graduate education –II.: 01.04.2012-31.03.2017.
24. Development of a tool for comparison of protein 3D structure using graph theoretic approach: 18.03.2014-31.01.2017.
25. Estimation of breeding value using longitudinal data: 23.04.2014-22.10.2016.
26. A optimal block designs for comparing test treatments with control treatment(s)-an algorithmic approach: 18.02.2015-17.02.2018.
27. Tobacco Agridaksh: An online expert system: 20.10.2014-20.10.2017.
28. Developing a comprehensive web based system for agriculturally important microbes. (Collaboration with NBAIM, Mau) : 01.04.2015-31.03.2017.
29. Implementation of ICAR-ERP, unified communication and web hosting solution: 10.04.2015- 09.04. 2018

List of on-going research projects (Externally Funded)

1. Information system for planning and analysis of experiments on All-India Coordinated Research Project on Vegetable Crops: 05.02.2014-31.03.2015
2. Pilot study for estimation of seed, feed and wastage ratios for major food grains. (Funded by MOS&PI, Central Statistics Office, New Delhi.): 01.07.2013-30.06.2015
3. Whole genome sequencing and development of allied genomic research in two commercially important fish- *Labeo rohita* and *Clarias batrachus*. (DBT): 10.09.2013-09.09.2016
4. Development of innovative approaches for small area estimation of crop yield, socio-economic and food insecurity parameters: 09.12.2013-08.12.2016
5. A new distributed computing framework for data mining (DIT): 15.10.2012 (01.11.2012 w.e.f.-IASRI)-14.10.2015
6. Whole genome based SNP mining and development of breed signatures for dairy and dual-purpose indigenous cattle. Funded by DBT: 09.07.2014-08.07.2017
7. Network project on market intelligence: 13.02.2014-31.03.2017



8. Modelling network of gene responses to abiotic stress in rice. (NFBSFARA), ICAR: 01.04.2013-31.03.2016
9. Experimental designs in the presence of indirect effects of treatments. (DST): 01.10.2011-30.09.2015
10. Phenomics of moisture deficit and low temperature stress tolerance in rice. (NFBSFARA), ICAR: 15.02.2011-30.12.2015
11. Bioacoustics tool: A novel non-invasive approach for different monitoring of health and productivity in dairy animals. (DBT): 01.02.2013-31.01.2016
12. Study to test the developed alternative methodology for estimation of area and production of horticultural crops. IASRI component of CHAMAN program under MIDH, Funded by Deptt. of Agri. & Cooperation, Min. of Agri., GOI: 16.09.2014-15.06.2017
13. Impact assessment of agricultural research and development. Funded by ICAR: 01.01.2015 (Association of IASRI w.e.f. 12.01.2015)- 31.03.2017
14. Pilot study for developing state level estimates of crop area and production on the basis of sample sizes. Funded by Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture, GOI, New Delhi: 16.02.2015-15.02.2017
15. ICAR Network Project on Transgenics in Crops (NPTC): 27.01.2015-31.03.2017

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

Inter-Institutional Collaborative Projects	Grant
Information system for planning and analysis of experiments on All-India Coordinated Research Project on Vegetable Crops (AICRP-VC) Institutes: IASRI New Delhi and IIVR Varanasi	4.5000
Bioacoustics tool: A novel non-invasive approach for different monitoring of health and productivity in dairy animals. (DBT) Institutes: NDRI Karnal and IASRI New Delhi	9.3000
Network project on market intelligence Impact assessment of agricultural research and development. (ICAR-NIAP) Institutes: NIAP New Delhi and IASRI New Delhi	37.4100
Whole genome based SNP mining and development of breed signatures for dairy and dual-purpose indigenous cattle. (DBT)	70.5430
ICAR Network Project on Transgenics in Crops (ICAR-NRCPB)	29.5500
Phenomics of moisture deficit and low temperature stress tolerance in rice. (NFBSFARA, ICAR) Institutes: IARI New Delhi, NRCPB New Delhi, IASRI New Delhi, IIT Delhi, IGKV Raipur, CRRRI Cuttack, CAU Umiam, ICAR RC-NEH Umiam	58.9000
A new distributed computing framework for data mining. (DIT) Institutes: BITS Pillani and IASRI New Delhi	120.2000
Whole genome sequencing and development of allied genomic research in two commercially important fish- Labeo rohita and Clarias batrachus. (DBT)	18.1000

b) International collaboration

Mapping the cultural authority of science across Europe and India (MACAS-EU & India):

Institutes: LSE London and IASRI New Delhi

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

As given in item 17.



20. Research facility / centre with

State recognition

National recognition ICAR Data Centre

International recognition Super computer ASHOKA
(Advanced Supercomputing Hub for Omics Knowledge in Agriculture)

21. Special research laboratories sponsored by / created by industry or corporate bodies:

NA

22. Publications (2009 onwards): Agricultural Statistics

	UC Sud	VK Gupta	Seema Jaggi	Rajender Parsad	Anil Rai	KN Singh	SD Wahi	LM Bhar	AK Paul	Taqueer Ahmed	AR Rao	Cini Varaghese	Himadri Ghosh	Prachi Misra Sahoo	Hukum Chandra
Number of papers published in peer reviewed journals (national / international)	5	4	12	13	3	4	4	2	12	3	8	9	11	2	12
Monographs															
Chapters in Books		1	6	2			1			2	1	3		2	
Edited Books															
Books with ISBN with details of publishers		1		1											1
Number listed in International Database															
Citation Index – range / average															
SNIP range / average															
SJR range / average															
Impact Factor– range / average															
h-index															

	Wasi	Prawin	Anil Kumar	Sanjeev	RK. Paul	Asif	BN Mandal	Susheel	Eldho	Kaustav	Bishal	Sukanta	Arpan
Number of papers published in peer reviewed journals (national /international)	3	3	11	8	9		4	8	6	2	1	2	1
Monographs													
Chapters in Books		2	2			1			3				2
Edited Books													
Books with ISBN with details of publishers							1						



Number listed in International Database																
Citation Index – range / average																
SNIP range / average																
SJR range / average																
Impact Factor– range / average																
h-index																

Bioinformatics

	Anil Rai	Seema	Rajender	AR Rao	Sudeep	SB Lal	Samir	Anu Sharma	DC Mishra	Sarika	Sanjeev Kumar	Asif	Monendra Grover	UB Angadi	KK Chaturvedi	Dinesh
Number of papers published in peer reviewed journals (national /international)	8								4	6		10	1			
Monographs																
Chapters in Books	1			1			1	1		1		2			1	3
Edited Books																
Books with ISBN with details of publishers													1			1
Number listed in International Database																
Citation Index – range / average																
SNIP range / average																
SJR range / average																
Impact Factor– range / average																
h-index																

Computer Application

	A.K. Choubey	Rajni	Sudeep	Alka	Anu	Shahi	Samir	KK Chaturvedi	SN Islam	SB Lal	Anshu	Sangeeta	Pal Singh	Mukesh	Srinivasa
Number of papers published in peer reviewed journals (national /international)		1		1	3	2	4	2	1				4		
Monographs															
Chapters in Books		2	1	3		1	2	3	2		3	1			
Edited Books															
Books with ISBN with details of publishers															
Number listed in International Database															
Citation Index – range / average															



SNIP range / average																			
SJR range / average																			
Impact Factor–range / average																			
h-index																			

Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

Research Papers Published with NAAS Rating > 9

S. No.	Publications	NAAS Rating
1.	Chambers, R, Chandra, H, Salvati, N and Tzavidis, N (2013). Outlier robust small area estimation. <i>J. Roy. Statist. Soc., Series B</i> , 76(1), 47-69.	10.81
2.	Iquebal, MA, Sarika, Arora, Vasu, Verma, Nidhi, Rai, Anil and Kumar, Dinesh (2013). First whole genome based microsatellite DNA marker database of tomato for mapping and variety identification. <i>BMC Plant Biology</i> , DOI: biomedcentral.com/1471-2229/13/197/abstract .	10.35

Research Papers Published with NAAS Rating > 8-9

S. No.	Publications	NAAS Rating
1.	Sarika, Arora, Vasu, Iquebal, MA, Rai, Anil and Kumar, Dinesh (2012). <i>In silico</i> mining of putative microsatellite markers from whole genome sequence of water buffalo (<i>Bubalus bubalis</i>) and development of first Buff Sat DB. <i>BMC Genomics</i> , 14(43) , 1-8.	8.1
2.	2013	
3.	Dass, TK, Paul, AK and Yaduraju, NT (2013). Density-effect and economic threshold of purple nutsedge (<i>Cyperus rotundus</i>) in soybean. <i>J. Pest. Sci.</i> I-10 ISSN 1612-4766.	8.17
4.	Iquebal, MA, Sarika, Dhanda, SK, Arora, V, Dixit, SP, Raghava, GPS, Rai, A and Kumar, D (2013). Development of a model webserver for breed identification using microsatellite DNA marker. <i>BMC Genetics</i> , DOI: biomedcentral.com/1471-2156/14/118/abstract .	8.81
5.	Karak, T, Bhattacharyya, P and Paul, RK (2013). Assessment of co-compost quality by hysic-chemical and exploratory data analysis. <i>CLEAN – Soil, air, water</i> . DOI: 10.1002/clen.201200143.	8.05
6.	Karak, T, Bhattacharyya, P, Paul, RK and Das, DK (2013). Metal accumulation, biochemical response and yield of Indian mustard grown in soil amended with rural road side pond sediment. <i>Ecotoxicology Environ. Safety</i> , 92,161-173.	8.2
7.	Kaur, Charanjit, Nagal, Shweta, Nishad, Jyoti, Kumar, Ravinder and Sarika (2013). Evaluating eggplant (<i>Solanum melongena</i> L.) genotypes for bioactive properties: A chemometric approach. <i>Food Res. Intt.</i> http://authors.elsevier.com/sd/article/S096399691300536X .	9.01

S. No.	Publications	NAAS Rating
1.	Abeynayake, NR and Jaggi, Seema (2009). A review of block designs with neighbor effects. <i>J. Appl. Statist.</i> , 10, 85-103.	6.9
2.	Gupta, VK, Singh, Poonam, Kole, Basudev, Parsad, Rajender (2009). Construction of efficient unbalanced mixed-level supersaturated designs. <i>Statist. Probab. Lett.</i> , 79, 2359-2366.	7.0
3.	Iquebal, MA, Prajneshu and Ghosh, Himadri (2009). Application of genetic algorithm optimization technique for fitting non-linear Richards growth model. <i>Ind. J. Agric. Sci.</i> , 79, 399-401.	6.6
4.	Mandal, BN, Prasad, Rajender, Gupta, VK and Sud, UC (2009). A family of distance balanced sampling plans. <i>J. Statist. Planm. Inf.</i> , 139, 860-874.	7.2
5.	Nisar, K, Kumar, Jitendra, Kumar, MB Arun, Walia, Suresh, Shakil, Najam A, Parsad, Rajender and Parmar, Balraj S (2009). Pesticidal seed coats based on azadirachtin-A: Release kinetics, storage life and performance. <i>Pest. Manage. Sci.</i> , 65(2), 175-182.	7.7



6.	Paul, AK, Kundu, MG, Singh, S and Singh, Pal (2009). Heritability of growth curve parameters of pigs. <i>Ind. J. Anim. Sci.</i> , 79(7), 716-719.	6.6
7.	Paul, AK, Kundu, MG, Singh, S and Singh, Pal (2009). Some aspect of efficiency of early selection in pigs. <i>Ind. J. Anim. Sci.</i> , 79(7), 729-731	6.6
8.	Sarika, Jaggi, Seema and Sharma, VK (2009). Second order response surface model with neighbour effects. <i>Comm. Statist. - Theory Methods</i> , 38, 1393-1403.	6.9
9.	Sarkar, Susheel Kumar, Lal, K and Jha, GK (2009). Non-linear growth models for pigs. <i>Ind. Vete. J.</i> , 86, 796-799.	6.0
10.	Sharma, Anu, Varghese, Cini and Rao, AR (2009). Software for the analysis of repeated measurements designs. <i>Ind.J. Anim. Sci.</i> , 79(4), 445-448.	6.6
11.	Yadav, Dinesh Kumar, Singh, Gurmej, Jain, Anand, Singh, Surendra and Paul, AK (2009). Fitting of growth models and evaluation of Marwari sheep under field conditions. <i>Ind. J. Anim. Sciences</i> , 79(12), 1242-1244.	6.6
2010		
12.	Jaggi, Seema, Sarika and Sharma, VK (2010). Response surface analysis incorporating neighbour effects from adjacent units. <i>Ind. J. Agril. Sci.</i> , 80(8), 719-723.	6.6
13.	Kumar, Jitendra, Nisar, Keyath, Shakil, N.A., Walia, Suresh and Parsad, Rajender (2010). Controlled release formulations of metribuzin: Release kinetics in water and soil. <i>J. Env. Sci. Health, Part B: Pesticides, Food Contaminants, and Agricultural Wastes</i> , 45(4), 330-335.	7.3
14.	Madke, PK, Lathwal, SS, Singh, Yajuvendra, Kumar, Anil and Kaushik, Vinay (2010). Study of behavioural and physiological changes of crossbred cows under different shelter management practices. <i>Ind. J. Anim. Sci.</i> , 80(8), 771-774.	6.6
15.	Rao, AR, Choudhary, SK, Wahi, SD and Prabhakaran, VT (2010). An index for simultaneous selection of genotypes for high yield and stability under incomplete genotype \times environment data. <i>Ind. J. Genet.</i> , 70(1), 80-84.	7.5
16.	Salvati, N, Chandra, Hukum, Giovanna, R and Chambers, R (2010). Small area estimation using a nonparametric model based direct estimator. <i>Comput. Statist. Data Anal.</i> , 54(9), 2159-2171.	7.5
17.	Sarkar, Basudeb, Verma, RPS, Parsad, Rajender and Shoran, Jag (2010). Diversity among barley germplasm collection in India. <i>Ind. J. Genet. Plant Breed.</i> , 70(3), 234-239.	6.6
18.	Singh, Surendra, Vasisht, AK, Paul, AK, Sharma, SC and Bhar, LM (2010). The effect of farms on growth pattern of crossbred cattle. <i>Ind. J. Anim. Sci.</i> , 80(4), 373-375.	6.6
19.	Yadav, DK, Singh, G, Jain, A, Paul, AK and Singh, S (2010). A comparison of nonlinear models for describing growth in Muzaffarnagar lambs under field conditions. <i>Ind. J. Anim. Sci.</i> , 80(6), 581-583.	6.6
2011		
20.	Abeynayake, NR, Jaggi, Seema and Varghese, Cini (2011). Neighbour balanced bipartite block designs. <i>Comm. Statist.-Theory Methods</i> , 40, 4041-4052.	6.7
21.	Behra, SK, Singh, MV, Singh, KN and Todwal, Sandeep (2011). Distribution variability of total and extractable zinc cultivated acid soils of India and their relationship with some selected soil properties. <i>Geoderma</i> , 162, 242-250.	7.7
22.	Chambers, R, Chandra, H and Tzavidis, N (2011). On bias-robust mean squared error estimation for linear predictors for domains. <i>Survey Methodology</i> , 37(2), 153-170.	7.4
23.	Chandra, H and Chambers, R (2011). Small area estimation under transformation to linearity. <i>Survey Methodology</i> , 37(1), 39-51.	7.4
24.	Chandra, H, Salvati, N and Sud, UC (2011). Disaggregate-level estimates of indebtedness in the state of Uttar Pradesh in India-An application of small area estimation technique. <i>J. Appl. Statist.</i> , 38(11), 2413-2432.	6.9
25.	Choudhary, AK, Singh, D and Iquebal, MA (2011). Selection of pigeonpea (<i>Cajanus cajan</i>) genotypes for tolerance to aluminum toxicity. <i>Plant Breeding</i> , 130(4), 492-495.	7.6
26.	Ghosh, H and Prajneshu (2011). Statistical learning theory for fitting multimodal distribution to rainfall data: An application. <i>J. Appl. Statist.</i> , 38(11), 2533-2545.	6.9
27.	Ghosh, H, Iquebal, MA and Prajneshu (2011). Bootstrap study of parameter estimates for nonlinear Richards growth model through genetic algorithm. <i>J. Appl. Statist.</i> , 38, 491-500.	6.9
28.	Goyal, P, Chahar, M, Mathur, AP, Kumar, Amrender. And Chattopadhyay, C (2011). Morphological and cultural variation in different oilseed brassica isolates of alternaria brassicae from different geographical regions of India. <i>Ind. J. Agril. Sci.</i> , 81(11), 1052-1058.	6.6



29.	Karak, T, Abollino, O, Bhattacharyya, P, Das, KK and Paul, RK (2011). Fractionation and speciation of arsenic in three tea gardens soil profiles and distribution of as in different parts of tea plant (<i>Camellia Sinensis L.</i>). <i>Chemosphere</i> , 85, 948-960.	7.9
30.	Kumar, J, Jaiswal, V, Kumar, Amrender, Kumar, N, Mir, RR, Kumar, S, Dhariwal, R, Tyagi, S, Khandelwal, M, Prabhu, KV, Parsad, Rajender, Balyan, HS and Gupta, PK (2011). Introgression of a major gene for high grain protein content in some Indian bread wheat cultivars. <i>Field Crops Res.</i> , 123(3),187-280.	7.7
31.	Kumar, Prem, Saxena, KK, Singh, N Okendro, Nayak, Ashok K, Tyagi, BC, Ali, S, Pandey, NN and Mahanta, PC (2011). Application of multivariate statistical techniques for water quality characterization of Sarada Sagar Reservoir, India. <i>Ind. J. Fish.</i> , 58(4), 21-26.	6.2
32.	Malik, N, Biswas, AK, Raju, CB and Mandal, BN (2011). Bio-monitoring of heavy metal pollution in a fishery reservoir of Central India. <i>Fresenius Environ. Bull.</i> , 20(12), 3381-3386.	7.1
33.	Mandal, BN, Gupta, VK and Parsad, Rajender (2011). Construction of polygonal designs using linear integer programming. <i>Comm. Statist.-Theory Methods</i> , 40, 1787-1794.	6.7
34.	Pateria, DK, Jaggi, Seema and Varghese, Cini (2011). Universally optimal circular neighbour balanced block designs under mixed effects model. <i>Utilitas Mathematica</i> , 85, 33-43.	6.6
35.	Paul, AK, Alam, Wasi and Singh, Pal (2011). Average linkage method clustering rice (<i>Oryza sativa</i>) producing states of India. <i>Ind. J. Agril. Sci.</i> , 81(8), 756-759.	6.6
36.	Prajneshu and Ghosh, H (2011). Application of generalized lambda distribution for unimodal data. <i>Ind. J. Agril. Sci.</i> , 81, 533-538.	6.6
37.	Rao, P Srinivasa, Reddy, P Sanjana, Rathore, Abhishek, Reddy, Belum VS and Panwar, Sanjeev (2011). Application of GGE biplot and AMMI model to evaluate sweet sorghum hybrids for genotype × Environment interaction and seasonal adaptation. <i>Ind. J. Agril. Sci.</i> , 81(5), 438-444.	6.6
38.	Samanta, S, Prajneshu and Ghosh, H (2011). Modelling and forecasting cyclical fish landings: SETARMA nonlinear time-series approach. <i>Ind. J. Fish.</i> , 58, 39-43.	6.2
39.	Sarika, Iquebal, MA and Chattopadhyay, C (2011). Modelling and forecasting of pigeonpea (<i>Cajanuscajan</i>) production using autoregressive integrated moving average methodology. <i>Ind. J. Agril. Sci.</i> , 81(6), 520-523.	6.6
40.	Singh, Anupma, Sarkar, Dhurba Jyoti, Parmar, Balraj S, Singh, AK, Parsad, Rajender and Kumar, Anil (2011). Studies on novel nanosuper absorbent components: Swelling behaviour in different environments and effect on water absorption and retention properties of sandy loam soil and soil less medium. <i>J. Appl. Polymer Sci.</i> , 120, 1448-1458.	7.5
41.	Singh, N Okendro, Paul, Amrit Kumar, Singh, N Gopimohon, Singh, Pal and Alam, Wasi (2011). Modeling seasonal growth of fish using modified Gompertz model with sine wave function. <i>Ind. J. Anim. Sci.</i> , 81(6), 648-650.	6.6
42.	Singh, N. Okendro, Sarma, Debajit and Singh, N Gopimohon (2011). Length-weight relationship of <i>Tor putitora</i> (Hamilton) considering different stages of its lifespan. <i>Ind. J. Fish.</i> , 58(1), 35-38.	6.2
43.	Sonawane, MN, Varghese, Cini and Jaggi, Seema (2011). Repeated measurements designs for comparing two disjoint sets of formulations in bioequivalence trials. <i>J. Appl. Statist. Sci.</i> , 19(1), 89-98.	6.9
2012		
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23. Details of patents and income generated:

Nil

24. Areas of consultancy and income generated: —**25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:**



Name	Institutions and Industries Visited
Dr. UC Sud	Workshop related to the project: Harmonization and Dissemination of unified agricultural production statistics in Bangladesh, Rio-de-janeiro, Brazil to presents a paper entitled” Distt. Level Crop-yield estimation under spatial small area model”
Dr. Hukum Chandra	Deputed as a member, Scientific committee for attending First Asian International Statistical Institute Satellite Conference at Bangkok, Ethiopia as a FAO Consultant
Dr. Prachi Misra Sahoo	Visited Oman to provide consultancy to Min. of Agriculture and Fisheries, Sultanate of Oman.
Dr. Mir Asif Iquebal	Attended International training in Bioinformatics at Iowa State University
Dr. Sarika	Attended International training in Bioinformatics at Iowa State University
Md. Samir Farooqui	Attended International training in Bioinformatics and comparative Genomics at Iowa State University.
Sh. K.K. Chaturvedi	Was deputed at Cornell University, Ithaca, USA for receiving training on Bioinformatics
Dr. DC Mishra	Attended training in the area of computational biology at Deptt. of Bioinformatics and Bio-statistics, Uni. Of Louisville, Kentucky, USA
Dr. Susheel Kumar Sarkar	Attended training on Integrated building multi-year course (IB-MYC) year 2 under generation challenge programme at Zaragoza, Spain

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. UC Sud	Hony. Secretary of ISAS, President Instt. of Applied Statistics and Development Studies, Lucknow Member empowered committee for awards, fellowship for Outstanding and Meritorious Research Work in Min. of Stat. & Programme Implementation		
Dr. VK Gupta	Vice President of ISAS, President Instt. of Applied Statistics and Development Studies, Lucknow Elected Member of International Statistical Instt., Neitherlands Member Screening committee for awards, fellowship for Outstanding and Meritorious Research Work in Min. of Stat. & Programme Implementation Member School Board of Physical Science, Shillong President Soc. of Stat., Computer Applications	Associate Editor in Agril. Research Associate Editor in International Journal of Computation and Theoretical Statistics Associate Editor, Journal of Statistical Theory and Practice	
Dr. Prajneshu	President Instt. of Applied Statistics and Development Studies, Lucknow	Associate Editor, Journal of Statistical Theory and Practice	
Sh. SN Islam		Member Editorial Board Annals of Agril. Research	
Rajender Parsad	Member Bureau of Indian Standards Joint Secretary of ISAS, President Instt. of Applied Statistics and Development Studies, Lucknow Elected Member of International Statistical Instt., Neitherlands	Member Editorial Board, Pusa Agri.Science, Journal of IARI Executive Editor, Soc. of Stat., Computer Applications	



Dr. Alka Arora	Member Management Committee of Computer Society of India Member, Executive Council ISAS Member Executive Council, Soc. of Stat., Computer Applications		
Sh. KK Chaturvedi		Member Editorial Board Current Trends in Technology and Sciences, Member Editorial Board, International Journal of Advanced Res. And Computer and Communication Engineering Member Editorial Board International Journal of Emerging Technology an Advanced Engineering	
Dr. Hukum Chandra	Joint Secretary ISAS Elected Member of International Statistical Instt., Neitherlands	Member Editorial Board International Journal of Advancements and Developments in Statistical Science. Associate Editor Journal of Model Assisted Statistics and Application Associate Editor, Soc. of Stat., Com. Applications	
Dr. LM Bhar	Joint Secretary ISAS	Joint Secretary, Managing Editor Soc. of Stat., Com. Applications	
Dr. Sudeep	Member, Executive Council ISAS		
Dr. AK Paul	Member, Executive Council ISAS		
Sh. SB Lal	Member, Executive Council ISAS		
Sh. KK Chaturvedi	Member, Executive Council ISAS	Member of Editorial Board, Journal of computer science and engineering	
Sangeeta Ahuja	Member, Executive Council ISAS		
Dr. Prawin Arya	Member, Executive Council ISAS		
Sh. S.N. Islam	Member, Executive Council ISAS		
Mir Asif Iquebal		Editorial Indian Society of Pulses Res. & Development	
Md. Samir Farooqui		Member Editorial Board, Jour. of Farming System Research and Development	
Dr. Eldho Varghese		Associate Editor Journal of Model Assisted Statistics and Application	
Dr.N. Srinivasa Rao	Vice-president Medicinal and aromatic plants association of India		
Dr. Seema Jaggi	Member Executive Council, Soc. of Stat. and Computer Applications		
Dr. Susheela Kaul	Member Executive Council Swadeshi Science Movement of Delhi		

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminar, workshops, winter schools, summer schools, training and other events.



28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department.

Percentage of students doing projects in collaboration with other universities/industry/institute: None

29. Awards/recognitions received at the national and international level (2009 onwards) by:

a) Faculty

Name	Awards/Recognitions
Dr. VK Gupta	ISAS Fellow Sankhyiki Bhushan Award by ISAS
Dr. Seema Jaggi	ICAR's Bharat Ratna Dr. C. Subramaniam award for Outstanding Teacher Prof. PV Sukhatme Gold Medal Award by ISAS
Dr. Rajender Parsad	National Award in Statistics for Young Statistician by Ministry of Statistics and Programme Implementation. ISAS Fellow Prof. PV Sukhatme Gold Medal Award Fellow of National Academy of Agricultural Sciences
Dr. Hukum Chandra	Lal Bahadur Shastri Outstanding Young Scientist Award of ICAR Dr. DN Lal Memorial Lecture Award
Dr. Dinesh Kumar	Fellow Award by Society of Applied Biotechnology
Dr. Anil Rai	Team Award from Indian Society of Agricultural Engineering
Dr. Himadri Ghosh	Bose-Nandi Award for the best publication in the section "Applications of Statistics" of the Calcutta Statistical Association Bulletin
Dr. Bishal Gurung	Dr. GR Seth Memorial Young Scientist Award of ISAS
Dr. Ranjit Kumar Paul	Dr. GR Seth Memorial Young Scientist Award of ISAS
Dr. Anil Kumar	Smt. Kadambini Devi Award by The Indian Society of Animal Production and Management in the National Seminar & XX Annual Convention Young Professional Award-2011 of the Society for Community Mobilization for Sustainable Development Young Scientist Award 2010 by Hi-Tech Horticultural Society

b) Students:

Name of student	Award
Dr. Eldho Varghese	IARI Merit Gold Medal for best Ph.D. student
Dr. Arpan Bhowmik	IARI Merit Gold Medal for best Ph.D. student
Sh. Pradip Basak	IARI Merit Gold Medal for best M.Sc. student

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Symposia/Workshops Organised Under Various Projects

S.No.	Title	Venue	Date	Sponsored by	Participant
Workshops under MIS/FMS					
1.	User Training Workshop of MIS/FMS Project MIS (6 Batches) Finance HRMS & Self Service HR(2 Batches) Payroll & Pension	IARI, New Delhi	02-09 September & 23-28 September 2013 09-12 September 2013 16-19 September 2013 20-21 September 2013	NAIP	168 33 47 23



2.	User Training Workshop of MIS/FMS Payroll & Pension Finance Purchase & Store Project MIS (4 Batches)	NDRI, Karnal	02-03 September 2013 04-05 September 2013 06-07 September 2013 09-19 September 2013	NAIP	44 43 47 148
3.	Sensitization Training/Workshop on MIS/FMS Solution	IASRI, New Delhi	25 September 2013	NAIP	31
4.	Data Sensitization workshop	IILR, Ranchi	30 October 2013		47
5.	User Training Workshops Project MIS – 15 Batches Purchase and Stores HRMS and Self Service HR Payroll and Pension Workshop of MIS/FMS	IARI, New Delhi	01-19 October and 23-24 and 28-29 October, 2013 30-31 October 2013 25-26 October 2013 11-12 Nov 2013	NAIP	47 20 42 360
6.	User Training Workshops HRMS and Self Service HR Payroll and Pension Financials Procurements and Stores Project MIS – 3 Batches	NAARM, Hyderabad	11-12 November 2013 13-14 November 2013 18-21 November 2013 22-23 November 2013 25-30 November 2013	NAIP	13 17 20 17 83
7.	User Training Workshops Financials HRMS and Self Service HR Payroll and Pension Project MIS – 8 Batches Purchase and Stores	IASRI, New Delhi	06-09 November and 11-14 November 2013 07-08 November and 22-23 November 2013 18-19 November 2013 18-19 November, 25-30 November and 02-12 December 2013 20-21 November 2013	NAIP	41 26 19 145 14
8.	User Training Workshops HRMS and Self Service HR Financials Payroll and Pension Purchase and Stores Project MIS – 3 Batches MIS/FMS solution	CIFE, Mumbai	29-30 November 2013 25-28 November 2013 02-03 December 2013 04-05 December 2013 6-12 December 2013	NAIP	27 40 31 28 75

31. Code of ethics for research followed by the departments:

As per ISO 9001 – 2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	-	-	-	-
Ph.D.	-	-	-	-	-



33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc. (Ag. Stat.)	Nil	Nil	100	Nil
M.Sc. (CA)	Nil	Nil	71.42	28.57
M.Sc. (Bioinformatics)	Nil	Nil	100	Nil
Ph.D. (Ag. Stat.)	100	Nil	Nil	Nil
Ph.D. (CA)	Nil	Nil	Nil	Nil
Ph.D. (Bioinformatics)	83.33	Nil	16.66	Nil

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

All students are selected for M.Sc. and Ph.D. after clearing All India Competitive Examinations and all get fellowships.

Our students are selected as ARS Scientists or Assistant Professor.

Many continuing carrier as researcher abroad.

No student of the disciplines are jobless.

2014-15

Agricultural Research Service 6

Indian Statistical Service 2

State Agricultural University 1

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No. M.Phil
PG to Ph.D.	Above 90%
Ph.D. to Post-Doctoral	All students after Ph.D. get jobs and only few go abroad for Post Doc.
Employed Campus selection Other than campus recruitment	All our students get 100% (atleast class – 1 (job) and many have more than job in hand and before the completion of their degree.
Entrepreneurs	--

36. Diversity of staff:

Percentage of faculty who are graduates			
Of the same university	None		
From other universities within the state	10% Ag. Stat	12% CA	12% Bioinformatics
From universities from other States from	Ag. Stat. 90%	CA 88%	Bio 88 %
Universities outside the country	None		

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

Agricultural Statistics : Ph.D. 05

Computer Application : Ph.D. 02

Bioinformatics : Ph.D. 00

**38. Present details of departmental infrastructural facilities with regard to:**

- Library: one
- Internet facilities for staff and students: Every room / laboratory/class room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Eight
- Class rooms with ICT facility: One
- Student's laboratories: Three
- Research laboratories: Nine

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S.No.	Name of the M. Sc. student	University of Graduation
M.Sc. (Agricultural Statistics)		
1	Ms.Priyanka Anjoy	UBKV, Cooh Behar, West Bengal
2	Kuldeep Aswal	GBPUA&T, Pantnagar, UK
3	Gopal Saha	UBKV, Cooh Behar, West Bengal
4	Amit Saha	BCKV, Mohanpur, West Bengal
5	Subhrajit Satpathy	MPKV, Rahuri, Maharastra
6	Nobin Chandra Paul	UBKV, Cooh Behar, West Bengal
7	Prakesh Lakra	BHU, Varanasi, U.P
8	Sushil Kumar	RAU, Samantipur, Bihar
9	Sumeet Saurav	UAS, Dharward, Karnataka
10	Shyamsundar Parui	BCKV, Mohanpuri, West Bengal
11	Rahul Banerjee	UBKV, Cooch Behar, West Bengal
12	Nitin Varshney	AAU, Anand, Gujarat
13	Rajeev Kumar	BHU, Varanasi, U.P
14	Pankaj Das	UBKV, Cooch Behar, West Bengal
15	Kthuteng Moagist Innocent	
M.Sc. (Computer Application)		
16	Md. Ashraful Haque	Visva Bharti University
17	Ms. Shabana Begam	MPKV, Rahuri, Maharastra
18	Parvez Mallick	BCKV, Mohanpur, West Bengal
19	Ms. Sonica Priyadarshini	BHU, Varanasi, U.P
20	Ms. Sapna Nigam	DU
21	Mudenge Fabrice	
22	Karangwa James	
23	Ms. Ipshita Roy Chowdhury	BCKV, Mohanpur, West Bengal
24	Murari Kumar	BAU, Sabor, Bihar
25	P.N.Somanna.	UAS, Bengaluru
26	Sanober Alam	BAU, Sabor
27	Ms. Sanchita Neha	UBKV, Cooh Behar, West Bengal
28	Niranjan Nayak	UBKV, Cooh Behar, West Bengal
29	Linkon Kumar Saha	UBKV, Cooh Behar, West Bengal



30	Saravanakumar R.	TNAU, Coimbatore
31	M. Subashchandra Singh	DU
32	Mayanglambam Surchand Singh	DU
M.Sc. (Bioinformatics)		
33	Ms.Soumya Sharma	BHU, Varanasi, U.P
34	NaliniKanta Choudhury	OUAT, Chirlona, Sambalpur, Odisha
35	Anubhav Roy	BCKV, Mohanpur, West Bengal
36	Sandeep Kumar Verma	Chandra Shekar Azad University of Agriculture, Kanpur, U.P.
37	Bulbul Ahmed	Central Agricultural University, Imphal
38	Ms.Arfa Anjum	UAS, Raichut, Karnatak
39	Md. Asif Khan	BHU, Varanasi, U.P
40	Ms. Priyanka Guha Majumdar	UBKV, Cooh Behar, West Bengal
41	Animesh Kumar	BHU, Varanasi, U.P
42	Saket Kumar Karn	BAU, Sabor, Bihar

S.No.	Name of the Ph.D. student	Host/other institute/ university
Agricultural Statistics Ph.D.		
1	Mohd. Harun	IARI
2	Sadikul Islam	IARI
3	Pratheesh P Gopinath	IARI
4	Rajeev Ranjan Kumar	IARI
5	Pramod Kumar Moury	IARI
6	Saurav Guha	IARI
7	Pradip Basak	IARI
8	Shwetank lall	IARI
9	Arvind Kumar	IARI
10	Achal Lama	IARI
11	Himadri Shekhar Roy	IARI
12	Ms. Anindita Datta	IARI
13	Ms. Manju Mary Paul	IARI
14	Pratyush Dasgupta	IARI
15	Ranganath H.K.	IARI
16	Yashavanth B.S.	UAS, Bengaluru
17	Chiranjit Mazumder	IARI
18	Ram Kumar Choudhary	IARI
19	Nirupam Ghosh	IARI
M.Sc. (Computer Applications) Ph.D.		
20	Chandan Kumar Deb	IARI
21	Sreekumar Biswas	IARI
M.Sc. (Bioinformatics) Ph.D.		
22	Ms. Sayanti Guha Majumdar	IARI
23	Ms. Purru Supriya	IARI
24	Neeraj Budhlakoti	IARI
25	Amit Kairi	IARI
26	Tanmaya Kumar Sahu	Other University
27	Chiranjib Sarkar	IARI

**40. Number of post graduate students getting financial assistance from the university:**

All the students get fellowship either from IARI, ICAR, UGC, DST and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not Applicable

42. Does the department obtain feedback form: Yes

- a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty taken into consideration for revising course curricula as well as improve teaching – learning evaluation.

- b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is revised to improve and students' suggestions are taken into consideration for further improvement.

- c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

The suggestions received from the alumni. from time to time are incorporated in the teaching and learning curriculum.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and address	Passing Year
1.	B.B.P.S. Goel Former Director, IASRI	1974
2.	Dr. S.D. Sharma Former Director, IASRI Vice Chancellor, Haridwar University	1975
3.	Dr. V.K. Gupta, National Professor	1983
4.	Dr. V.K. Bhatia Former Director, IASRI	1985
5.	Dr. U.C. Sud Director IASRI	1989

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures are held regularly and students and faculty attend seminars, workshops and conferences regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board and LCDs assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The Professors of the disciplines of Agricultural Statistics, Computer Application and Bioinformatics monitor academic activities and Director, IASRI and Dean, IARI also monitor the various programmes.



47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities specially during Pusa Krishi Vigyan Mela.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

A brief discussion on the research achievements of the Institute in different areas of Agricultural Statistics and Informatics (Computer Application and Bioinformatics) are outlined below.

Design of Experiments

- The Institute has made many notable contributions in both basic research and innovative applications of the theory of statistical designs and analysis of experimental data. Some of the areas are:
- Designs for single factor experiments which include variance balanced, efficiency balanced, and partially efficiency balanced designs; designs for tests versus control(s) comparisons; designs for multi-response experiments; crossover designs; designs with nested structures; structurally complete and incomplete row-column designs; neighbour balanced designs; optimality and robustness aspects of designs.
- Designs for multi-factor experiments which include confounded designs for symmetrical and asymmetrical factorials; block designs with factorial structure; response surface designs, mixture experiments for single and multifactor experiments; Orthogonal main effect plans; orthogonal arrays; supersaturated designs.
- Designs for bioassays; microarray experiments and agroforestry experiments.
- Diagnostics in designed field experiments.
- Computer aided construction of efficient designs for various experimental settings.
- The scientists of the Institute participate actively in planning and designing of experiments in the NARES and have also involved themselves in the analysis of experimental data.
- Basic research work carried out on balanced incomplete block designs, partially balanced incomplete block designs, group divisible designs, α -designs, reinforced α -designs, square and rectangular designs, nested designs, augmented designs, extended group divisible designs, response surface designs, experiments with mixtures etc. have been adopted widely by the experimenters in NARES.
- Designs for factorial experiments such as response surface designs and experiments with mixtures have been used for food processing and value addition experiments; soil test crop response correlation experiments; experiments with fixed quantity of inputs and ready to serve fruit beverage experiments, etc.
- The analytical techniques based on mixed effects models and biplot developed for the analysis of data generated from Farmers Participatory Trials for resource conservation agriculture have been used by Rice-Wheat consortium for Indo-Gangetic plains for drawing statistically valid conclusions.
- The analytical techniques for the analysis of data from the experiments conducted to study the post harvest storage behaviour of the perishable commodities like fruits and vegetables are being widely used in NARES.
- Planning, designing and analysis of data relating to experiments under AICRPs on (i) IFS; (ii) LTFE; (iii) STCR; (iv) Rapeseed and Mustard; (v) Sorghum; (vi) Wheat and barley and (vii) Vegetable Crops.



- For dissemination and e-advisory on designed experiments, developed a Design Resources Server (www.iasri.res.in/design) which is being viewed throughout the globe and used extensively in NARES.
- The status of experimentation is now changing and with the support provided in terms of suggesting efficient designs and analyzing the data using modern complicated statistical tools, the research publications of the agricultural scientists are finding a place in high impact factor international journals.

Sample Surveys

The subject of sampling techniques helps in providing the methodology for obtaining precise estimates of parameters of interest. The Institute is involved in evolving suitable sample survey techniques for estimation of various parameters of interest relating to crops, livestock, fishery, forestry, horticulture, perishable commodities like flowers, vegetables and allied fields.

- Significant contributions have been made in theoretical aspects of sample surveys like successive sampling, systematic sampling, cluster sampling, sampling on successive occasions, sampling with varying probabilities, controlled selection, balanced sampling plans, rank set sampling, nonsampling errors, analysis of complex surveys, various methods of estimation such as ratio and regression methods of estimation, use of combinatorics in sample surveys and of late small area estimation as well as use of calibration approach in developing improved estimators.
- The methodology for General Crop Estimation Surveys (GCES), cost of cultivation studies for principal food crops, cash crops and horticultural crops, Integrated Sample Surveys (ISS) for livestock products estimation, fruits and vegetable survey are being adopted throughout the country and many Asian and African countries.
- Methodology based on small area estimation technique for National Agricultural Insurance Scheme, also called Rashtriya Krishi Bima Yojana, suggested by IASRI has been pilot tested in the country.
- The sample survey methodology for imported fertilizer quality assessment, estimation of fish catch from marine and inland resources, flower production estimation, area and production of horticultural crops estimation, etc. has been developed and passed on to the user agencies.
- Integrated methodology for estimation of multiple crop area of different crops in North Eastern Hilly Regions using Remote Sensing data has been developed.
- Sampling methodology for estimation of post harvest losses has been successfully adopted in AICRP on Post Harvest Technology for assessment of post harvest losses of crops/commodities.
- Reappraisal of sampling methodologies, evaluation and impact assessment studies like studies to make an assessment of Integrated Area Development programmes, High Yielding Varieties programmes, Dairy Improvement programmes, Evaluation of cotton production estimation methodology etc. have been undertaken. Most of the methodologies developed are being adopted for estimation of respective commodities by the concerned state departments.
- The Institute is regularly publishing the Agricultural Research Data Book since 1996. It contains information pertaining to agricultural research, education and other related aspects compiled from different sources.
- For providing e-advisory and e-learning in sample surveys, initiated a Sample Survey Resources Server (<http://js.iasri.res.in/ssrs/>) which also provides calculator for sample size determination for population mean and population proportion among other material.

Statistical Genetics and Genomics

The Institute has made very significant contributions in statistical genetics for improved and precise estimation of genetic parameters, classificatory analysis and genetic divergence, etc.

- Developed procedures for estimation of genetic parameters; construction of selection indices; studying G × E interactions; progeny testing and sire evaluations; detection of QTLs, classification of genotypes using molecular marker data, etc.



- The modification in the procedure of estimation of genetic parameters has been suggested for incorporating the effect of unbalancedness, presence of outliers, aberrant observations and non-normality of data sets.
- Procedures for studying genotype environment and QTL environments interactions have been used for the analysis of data generated from crop improvement programmes.
- The research work on construction of selection indices, progeny testing and sire evaluation have been used for animal improvement programmes.
- The Institute has initiated research in the newer emerging area of statistical genomics such as rice genome functional elements information system; comparative genomics and whole genome association analysis. The establishment of a National Agricultural Bioinformatics Grid (NABG) is a landmark in this direction.
- Supercomputing facility (High Performance Computing System) has been established for biological computing and bioinformatics
- A number of databases and web services have been developed which include pigeonpea microsatellite database, buffalo microsatellite database, genome sequence submission portal, livestock EST database, insect barcode database.

Statistical Modelling for Biological Phenomena

Statistical modeling of biological phenomena is carried out by using linear and non-linear models, non-parametric regression, structural time series, fuzzy regression, neural network and machine learning approaches.

- The Institute has made significant contributions in developing models for pre-harvest forecasting of crop yields using data on weather parameters; agricultural inputs; plant characters and farmers' appraisal.
- The models have been developed using weather and growth indices based regression models, discriminant function approach, markov chain approach, bayesian approach, within year growth models and artificial neural network approach.
- Methodologies for forewarning important pests and diseases of different crops have been developed which can enable the farmers to use plant protection measures judiciously and save cost on unnecessary sprays.
- The methodology developed for forecasting based on weather variables and agricultural inputs was used by Space Application Centre, Ahmedabad, to obtain the forecast of wheat yield at national level with only 3% deviation from the observed one.
- Models developed for forewarning of aphids in mustard crop were used by Directorate of Rapeseed and Mustard Research, Bharatpur to provide forewarning to farmers which enabled them to optimize plant protection measures and save resources on unnecessary sprays consecutively for three years.
- Forecasting of volatile data has been attempted through non-linear time series models. Such models were developed for forecasting onion price, marine products export, lac export, etc. Modelling and forecasting of India's marine fish production was carried out using Wavelet methodology.
- Non-linear statistical models were developed for aphid population growth and plant diseases. Modelling and forecasting of India's marine fish production was carried out using wavelet methodology. The models developed have potential applications in long term projections of food grain production, aphid population, marine fish production, etc. These models were used by Directorate of Rapeseed and Mustard Research, Bharatpur to provide forewarning to farmers which enabled them to optimize plant protection measures.
- Created a web solution for estimation of compound growth rate and several other resources.

Econometrics

The Institute has made significant contributions in understanding the complex economic relationship of the factors like transportation, marketing, storage, processing facilities; constraint in the transfer of new farm technology to the farmers field under different agro-climatic conditions of the country.



- Some of the important contributions of the Institute are measurement of indemnity and premium rates under crop revenue insurance, production efficiency and resource use, impact of micro-irrigation, technological dualism/technological change, return to investment in fisheries research and technical efficiency of fishery farms, the impact of technological interventions, price spread and market integration, price volatility and the dietary pattern of rural households.

Information Communication Technology

IASRI is a pioneer in introducing computer culture in agricultural research and human resource development in information technology in the ICAR. The Institute has the capability of development of Information Systems, Decision Support Systems and Expert Systems. These systems are helpful in taking the technologies developed to the doorsteps of the farmers.

- The Institute has developed information systems for agricultural field experiments, animal experiments and long term fertilizer experiments conducted in NARES as research data repositories.
- A comprehensive Personnel Management Information System Network (PERMISnet) has been implemented for the ICAR for manpower planning, administrative decision making, and monitoring. A Project Information and Management System Network (PIMSnet) was developed and implemented for concurrent monitoring and evaluation of projects. This is being developed as a Project Information and Management System for all ICAR projects. A National Information System on Agricultural Education Network in India (NISAGENET) has been designed, developed and implemented so as to maintain and update the data regularly on parameters related to agricultural education in India.
- Online Management System for Post Graduate Education has been developed and implemented for PG School, IARI, New Delhi. The Institute has taken a lead in the development of Expert Systems on wheat crop, maize crop and seed spices. AgriDaksh has been developed for facilitating the development of expert systems for other crops.
- Web based software for Half Yearly Progress Monitoring (HYPM) of scientists in ICAR (<http://hypm.iasri.res.in>) has been developed and implemented from 1st April 2012 for online submission of data regarding the proposed targets and the achievements for the half yearly period. It would be possible to monitor online progress of the scientists, manpower status, research projects, prioritized activities and salient research achievements at institute/SMD/ICAR level.
- Realizing the need of integration of databases to prepare a comprehensive knowledge warehouse that can provide desired information in time to the planners, decision makers and developmental agencies, Integrated National Agricultural Resources Information System (INARIS) has been developed. The data warehouse comprises of databases on agricultural technologies of different sectors of agriculture and related agricultural statistics at districts/state/national levels, population census including village level population data as well as tehsil level household assets and livestock census. Subject-wise data marts have been designed, multi-dimensional data cubes developed and published in the form of on-line decision support system. It is being developed as knowledge data warehouse through the development of Knowledge Management for Agricultural Research and Technologies (KMART). The system also provides facility of spatial analysis of the data through web using functionalities of Geographic Information System (GIS).
- Strengthened Statistical Computing facilities in NARS, helped in capacity building in the usage of high end statistical computing and developed Indian NARS Statistical Computing Portal for providing service oriented computing to the researchers of NARS, which has paved the way for publishing agricultural research in high impact factor journals.
- A number of software and web solutions have been developed for the agricultural research workers: Statistical Package for Agricultural Research (SPAR) 2.0, Statistical Package for Block Designs (SPBD) 1.0, Statistical Package for Factorial Experiments (SPFE) 1.0, Statistical Package for Augmented Designs (SPAD) 1.0, Software for Survey Data Analysis (SSDA) 1.0, Statistical Package for Animal Breeding (SPAB) 2.1, Online Analysis of Block Designs, Web Generation and Analysis of Partial Diallel Crosses etc.



51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths

- Scientists with diverse expertise, high motivation and dedication.
- Globally Competitive Statistical and Computational Expertise
- Dynamic course curricula of International standard
- High Power Computing Facility
- Automated Institutional Library
- Highly placed alumni

Weaknesses

- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Dearth of technical support, Working hand and supporting staff.

Opportunities

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.

Challenges

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.
- Multidisciplinary approach required
- More expertise in computational aspects of massive data set

52. Future plans of the department

Human Resource Development

Creation of adequate and quality human resources is the basic need of any organization to keep its vibrancy. Therefore, it is of importance to develop quality trained manpower in Agricultural Statistics and Informatics to address emerging challenges of Agricultural research and extension. This would be achieved through

- Preparing text books and teaching material in electronic format for Post-Graduate degree programmes in Agricultural Statistics, Computer Applications and Bioinformatics
- Modernize education system in terms of infrastructure and faculty
- Including problem solving approach in curricula
- Conducting training programmes under Centre of Advanced Faculty Training
- Conducting summer and winter schools
- Conducting customized and ad-hoc National and International training programmes



- Introducing professional certificate courses for inservice scientists so as to establish linkages with the state departments of agriculture, animal husbandry, horticulture and fisheries
- Creating Human Resource in the area of Data Analytics in the form of a PG Diploma
- On-line training and e-Learning programmes
- Content generation, development, management and dissemination of all informatics and databases

Research

- Need based, cost effective and efficient designs and advanced analytical techniques for Agricultural Systems Research
- Forecasting and forewarning models for agricultural systems
- Modelling of climate change and its impact on agriculture.
- Statistical Modelling of biological phenomena using nonlinear time-series, nonlinear support vector machine, symbolic data analysis and stochastic differential equations.
- Statistical techniques applied to plant and animal breeding research, particularly, estimation of efficient and robust genetic parameters
- Development of statistical and computational analytical techniques for genomic data
- Estimation and projections of economic parameters
- Development and application of small area estimation techniques for estimation of parameters relating to crops, livestock, fishery and socio-economic aspects.
- Development of methodology for improving area and production estimates, estimation of cost of production, harvest and post harvest losses, and assessment and evaluation of agricultural development programmes.
- GIS based decision support system using data warehouse and data mining facilities.
- Application of Remote Sensing and Geographical Information System in improving crop area and production statistics and natural resource management.
- Software solutions for knowledge management including decision support systems/ expert systems of various crops/commodities/resources in agriculture
- Development of computational techniques and algorithms for knowledge extraction and management
- Strengthening Statistical Computing for NARS
- Development of web based Statistical software for agricultural research including software for generation of designs, analysis of sample survey data, animal breeding and plant breeding data, forecast models, etc.



vii) Division of Agronomy

1. Name of the Department:

Division of Agronomy

2. Year of establishment:

1923

3. Is the Department part of a School/Faculty of the university?

Yes, School of Natural Resource Management

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Courses with Soil Science and Agril. Chemistry, Agril. Physics, Plant Physiology and Water Technology Centre etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

Nil

7. Details of programmes discontinued, if any, with reasons:

Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester system

9. Participation of the department in the courses offered by other departments:

Soil Science and Agril. Chemistry, Agril. Physics, Plant Physiology, Agricultural Extension and Water Technology Centre etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned	Filled	Actual (including CAS and MPS)
Professor/Principal Scientist	03	03	10
Associate Professors/ Senior Scientist	09	03	4
Asst. Professors/Scientist	17	12	4
Total	29	18	18



Besides above there are six permanent faculties in the discipline who are posted at sister department or sister institute as follows:

1.	Dr. A.K.Singh, Principal Scientist, Indian Institute of Maize Research (IIMR), New Delhi	Permanent faculty in the discipline of Agronomy from the sister institute
2.	Dr. Ashok Kumar, Principal Scientist, Indian Institute of Maize Research (IIMR), New Delhi	Permanent faculty in the discipline of Agronomy from the sister institute
3.	Dr. Y.V.Singh, Principal Scientist, CCBGA, New Delhi	Permanent faculty in the discipline of Agronomy from the sister division
4.	Dr. Rajendra Kumar, Senior Scientist, Water Technology Centre, New Delhi	Permanent faculty in the discipline of Agronomy from the sister discipline
5.	Dr. C.M. Parihar, Scientist, Indian Institute of Maize Research (IIMR), New Delhi	Permanent faculty in the discipline of Agronomy from the sister institute
6.	Dr. S.L. Jat, Scientist, Indian Institute of Maize Research (IIMR), New Delhi	Permanent faculty in the discipline of Agronomy from the sister institute

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./M.Phil. students guided for the last 4 years
Dr K.S. Rana	Ph.D.	Principal Scientist	Dryland agronomy	28	5
Dr D.S. Rana	Ph.D.	Principal Scientist	Crop diversification	23	5
Dr L.K. Idnani	Ph.D.	Principal Scientist	Water management	24	1
Dr. U.K.Behra	Ph.D.	Principal Scientist	Farming System	20	1
Dr Y.S. Shivay	Ph.D.	Principal Scientist	Nutrient management	22	1
Dr Ashok Kumar	Ph.D.	Principal Scientist	Nutrient management	21	1
Dr T.K. Das	Ph.D.	Principal Scientist	Weed management	22	3
Dr Y.V. Singh	Ph.D.	Principal Scientist	Nutrient management/ organic farming	15	2
Dr Dinesh Kumar	Ph.D.	Principal Scientist	Nutrient management	19	4
Dr A.K.Singh	Ph.D.	Principal Scientist	Maize Agronomy	20	1
Dr. Shiva Dhar	Ph.D.	Principal Scientist	Nutrient Management/ Organic Farming	19	4
Anil K. Choudhary	Ph.D.	Senior Scientist	Cropping System	8	0
Dr. AnchalDass	Ph.D.	Senior Scientist	Water management	13	0
Dr. Ramanjit Kaur	Ph.D.	Senior Scientist	Water Management	9	0
Dr. C.M. Parihar	Ph.D.	Scientist	Dryland farming	5	0
Dr. S.L. Jat	Ph.D.	Scientist	Conservation Agriculture	5	0
Dr. R.S. Bana	Ph.D.	Scientist	Conservation Agriculture	5	0
Dr. Seema Sepat	Ph.D.	Scientist	Conservation Agriculture	5	0
Dr. Vijay Pooniya	Ph.D.	Scientist	Nutrient management	4	0



12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

1. Dr S.N. Sharma, Former Principal Scientist, Division of Agronomy, IARI, New Delhi

13. Percentage of classes taken by temporary faculty – programme-wise information

Not in all programs but in specific courses only around 5%.

14. Programme-wise Student Teacher Ratio:

M.Sc. : 1:1.84; Ph. D. : 1:1.46

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual:

	Sanctioned	Filled	Actual (including CAS and MPS)
Technical Staff	26	21	21
Administrative staff	08	06	4

16. Research thrust areas as recognized by major funding agencies:

Conservation Agriculture, Dryland Farming, Cropping System Research, Nutrient management

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

1. Conservation Agriculture for Enhancing Productivity and Resource-use Efficiency (IARI-CIMMYT Collaborative Challenge Programme)
2. Ministry of Rural Development funded project: Management of solid waste (kitchen waste) through rapid composting
3. Strategies to enhance adaptive capacity to climate change in vulnerable regions (World bank-GEF Project)
4. Evaluation of zinc, boron and sulphur coated urea /fertilizer in rice, wheat and maize crop (Contractual Research Project, (Rs. 14,89,787/-)

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

Ministry of Rural Development funded project: Management of solid waste (kitchen waste) through rapid composting

Strategies to enhance adaptive capacity to climate change in vulnerable regions (World bank-GEF Project)

Evaluation of zinc, boron and sulphur coated urea /fertilizer in rice, wheat and maize crop (Contractual Research Project, (Rs. 14,89,787/-)

b) International collaboration

Conservation Agriculture for Enhancing Productivity and Resource-use Efficiency (IARI-CIMMYT Collaborative Challenge Programme)

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

None

20. Research facility / centre with

State recognition

None

**National recognition**

None

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies

N.A.

22. Publications:

Particulars	Number
Research papers	117
International	
• NAAS rating \geq 5.0	44
• NAAS rating $<$ 5.0	01
National	
• NAAS rating \geq 5.0	75
• NAAS rating $<$ 5.0	02
Popular articles	35
Bulletins/book/book chapters	31
Extension folders	07
Papers presented	70

**Some of the Important Publication from 2010-2014
NAAS Rating Above 6.0****2009-10**

1. Kumar, Ashok and Shiva Dhar. 2010. Evaluation of organic and inorganic sources of nutrients in maize (*Zea mays*) and their residual effect on wheat (*Triticum aestivum*) under different fertility levels. *Indian Journal of Agricultural Sciences* 80(5): 364-71.
2. Parihar, C.M, Rana, K.S. and Parihar, M.D. 2009. Crop productivity, quality and nutrient uptake of pearl millet (*Pennisetum glaucum*) Indian mustard (*Brassica juncea*) cropping system as influenced by land configuration and direct and residual effect of nutrient management. *Indian Journal of Agricultural Sciences* 79 (11): 927-30.
3. Sharma, A.R. and Behera, U.K. 2009. Nitrogen contribution through *Sesbania* green manure and dual purpose legumes in maize–wheat cropping system: agronomic and economic considerations. *Plant and Soil* 325: 289-304.
4. Sharma, A.R. and Behera, U.K. 2009. Recycling of legume residues for nitrogen economy and higher productivity in maize (*Zea mays*)–wheat (*Triticum aestivum*) cropping system. *Nutrient Cycling in Cropping Systems* 83: 197-210.
5. Sharma, A.R. and Behera, U.K. 2010. Green leaf manuring with prunings of *Leucaena leucocephala* for nitrogen economy and improved productivity of maize (*Zea mays*)–wheat (*Triticum aestivum*) cropping system. *Nutrient Cycling in Agroecosystems* 86: 39-52.
6. Sharma, A.R., Singh, Ratan, Dhyani, S.K. and Dube, R.K. 2009. Moisture conservation and nitrogen recycling through legume mulching in maize (*Zea mays*)–wheat (*Triticum aestivum*) cropping system. *Nutrient Cycling in Agroecosystems* 87(2): 187–197.
7. Tadesse, Besufekad, Das, T.K. and Yaduraju, N.T. 2010. Effect of some integrated management options on parthenium interference in sorghum. *Weed Biology and Management* 10 (3): 160-169.



2010-11

1. Ahlawat, I.P.S. and Gangaiah, B. 2010. Effect of land configuration and irrigation on sole and linseed (*Linum usitatissimum*) intercropped chickpea (*Cicer arietinum*). *Indian Journal of Agricultural Sciences* 80 (3): 250-253.
2. Ahlawat, I.P.S. and Gangaiah, B. 2010. Response of Bt cotton (*Gossypium hirsutum*) hybrids to irrigation. *Indian Journal of Agricultural Sciences* 80(4): 271-274.
3. Babu, Subhash, Yadav, Gulab Singh, Verma, S.K., Singh, R.P. and Sharma, Rajvir. 2010. Influence of anilofos formulations on *Echinochloa colonain* transplanted rice (*Oryza sativa* L.) *Pesticide Research Journal* 22(1): 10-13.
4. Choudhary, R.L., Kumar, D., Shivay, Y.S., Lata, Singh, G. and Singh, N. 2010. Performance of rice (*Oryza sativa*) hybrids grown by system of rice intensification with plant growth promoting rhizobacteria. *Indian Journal of Agricultural Sciences* 88(10): 917-920.
5. Das, T.K. and Yaduraju, N.T. 2011. Effects of missing-row sowing supplemented with row spacing and nitrogen on weed competition and growth and yield of wheat. *Crop & Pasture Science (Australian Journal of Agricultural Research)* 62 (1): 48-57.
6. Das, T.K., Sakhuja, P.K. and Zelleke, Habtamu. 2010. Herbicide efficacy and non-target toxicity in highland rainfed maize of Eastern Ethiopia. *International Journal of Pest Management* 56 (4): 315-325.
7. Hazra, D., Das, T.K. and Yaduraju, N.T. 2011. Interference and economic threshold of horse purslane (*Trianthema portulacastrum*L.) in soybean cultivation in northern India. *Weed Biology and Management* 11(2): 72-82.
8. Kumar, Ashok and Shiva Dhar. 2010. Evaluation of organic and inorganic sources of nutrients in maize (*Zea mays*) and their residual effect on wheat (*Triticum aestivum*) under different fertility levels. *Indian Journal of Agricultural Sciences* 80(5): 364-71.
9. Kumar, D., Devakumar, C., Kumar, R., Das, A., Panneerselvam, P. and Shivay, Y.S. 2010. Effect of neem-oil coated prilled urea with varying thickness of neem-oil coating and nitrogen rates on productivity and nitrogen-use efficiency of lowland irrigated rice under Indo-Gangetic plains. *Journal of Plant Nutrition* 33:1939–1959.
10. Kumar, Jitendra, Nisar, Keyath, Sakil, N.A. and Sharma, Rajvir. 2010. Residue and bio-efficacy of cotrolled release formulations of metribuzin against weeds in wheat. *Bulletin of Environmental Contamination and Toxicology* (NAAS: B115/8.3).
11. Nain, L., Rana, A., Joshi, M., Jadhav, S.D., Kumar, D., Shivay, Y.S., Paul, S. and Prasanna, R. 2010. Evaluation of synergistic effects of bacterial and cyanobacterial strains as biofertilizers for wheat. *Plant and Soil* 331: 217-230.
12. Sharma, S.N., Prasad, R., Shivay, Y.S., Dwivedi, M.K., Kumar, S., Davari, M.R., Ram, M. and Kumar, D. 2010. Relative efficiency of diammonium phosphate and mussoorie, rock phosphate on productivity and phosphorus balance in a rice–rapeseed–mungbean cropping system. *Nutrient Cycling in Agroecosystems* 86: 199-209.
13. Sharma, S.N., Shivay, Y.S., Prasad, R., Dwivedi, M.K., Davari, M.R. and Kumar, S. 2010. Relative efficiency of diammonium phosphate and Mussoorie rock phosphate + phosphate solubilizing bacteria on productivity and phosphorus balance in rice-potato-mungbean cropping system. *Journal of Plant Nutrition* 33(7): 998–1015.
14. Shivay, Y.S., Krogstad, T. and Singh, B.R. 2010. Mineralization of copper, manganese and zinc from rock mineral flour and city waste compost for efficient use in organic farming. *Plant and Soil* 326(1): 425–435.
15. Shivay, Y.S., Prasad, R. and Rahal, A. 2010. Genotypic variation for productivity, zinc utilization efficiencies and kernel quality in aromatic rices under low available zinc conditions. *Journal of Plant Nutrition* 33(12):1835–1848.
16. Shivay, Y.S., Prasad, R. and Rahal, A. 2010. Studies on some nutritional quality parameters of organically or conventionally grown wheat. *Cereal Research Communications* 38(3): 345-352.
17. Thomas Abraham, Sharma, U.C., Thenua, O.V.S. and Shivakumar, B.G. 2010. Effect of levels of irrigation and fertility on yield and economics of chickpea (*Cicer arietinum*) and Indian mustard (*Brassica juncea*) under sole and intercropping systems. *Indian Journal of Agricultural Sciences* 80(4): 372-376.



18. Tuti, M.D. and Das, T.K. 2010. Optimizing dose, volume rate and time of application upon post-emergence use of metribuzin for weed control in soybean. *Pesticide Research Journal* 22(2): 146-150.

2011-12

1. Kumar, Bipin, Sharma, Rajvir, Singh, ShashiBala (2012) Evaluation of harvest residues of Cyhalofop- Butyl in Paddy soil. *Bulletin of Environmental Contamination and Toxicology* (Published online)
2. Miri Khalid and Rana D.S. 2012. Evaluation of sweet sorghum (*Sorghum bicolor*) genotypes for biomass, sugar and ethanol production under different levels of nitrogen. *Indian Journal of Agricultural Sciences* 82(3):195-200
3. Rana, K.S. and Bana, R.S. (2012). Studies on aqua-fertilization with and without nitrogen in wheat (*Triticum aestivum*) under rainfed conditions. *Research on crops*. 13(2):453-455 (NAAS rating = 6.3)
4. Singh, G., Kumar, D., Shivay, Y.S. and Singh, N. (2011). Agronomic evaluation of zinc-enriched urea formulations in scented rice (*Oryza sativa*). *Indian Journal of Agricultural Sciences* 81 (4): 366–370.
5. Singh, ShashiBala, Sharma, Rajvir and Singh, Neera (2011). Persistence of pyrazosulfuron in rice-field and laboratory soil under Indian tropical conditions. *Pest Management Science* (Published online) (NASS Impact factor 7.7)
6. Suri, I.K., Prasad, R. and Shivay, Y.S. 2011. Zinc oxide-neem oil conditioning for improving the quality of the micronutrient fertilizer zinc sulphate hepta hydrate. *Current Science* 100(1): 27-28.
7. Das, T. K. and Yaduraju, N. T. 2011. Effects of missing-row sowing supplemented with row spacing and nitrogen on weed competition and growth and yield of wheat. *Crop & Pasture Science* (Australian Journal of Agricultural Research) 62 (1): 48-57.
8. Asres, Bekele and Das, T. K. 2011. Diversity and integrated management of weeds in highland wheat of Northern Ethiopia. *Plant Protection Quarterly* (Australia) 26 (1): 8-16.
9. Kumar Mukesh, Das, T. K. and Yaduraju, N. T. 2012. An integrated approach for management of *Cyperus rotundus* (purple nutsedge) in soybean – wheat cropping system. *Crop Protection* 33: 74-81.
10. Yadav, G.S., Kumar, D., Shivay, Y.S. and Singh, N. 2011. Agronomic evaluation of zinc-enriched urea formulations in scented rice (*Oryza sativa*). *Indian Journal of Agricultural Sciences* 81(04): 366-370.

2012-13

1. Ansari, M.A. and Rana K.S. 2012. Effect of transpiration suppressant and nutrients on productivity and moisture use efficiency of pearl millet (*Pennisetum glaucum*) – pigeonpea (*Cajanus cajan*) intercropping system under rainfed conditions. *Indian Journal of Agricultural Sciences* 82(8): 676-680
2. Behera, U.K., Panigrahi, P and Sarangi, A. 2012. Multiple water use protocol in integrated farming systems for higher productivity. *Water Resources Management* 26: 2605-23.
3. Choudhary, Anil K., Thakur, S.K. and Suri, V.K. 2013. Technology transfer model on integrated nutrient management technology for sustainable crop production in high value cash crops and vegetables in North-Western Himalayas. *Communications in Soil Science and Plant Analysis* 44 (11): 1684-1699.
4. Das, T. K. and Yaduraju, N.T. 2012. The effects of combining modified sowing methods with herbicide mixtures on weed interference in wheat. *International Journal of Pest Management* 58(4): 311-320.
5. Dass, Anchal, Singh, Nain, Ajit, Sudhishri, S. and Chandra, Subhash. 2012. Simulation of maturity duration and productivity of two rice varieties under system of rice intensification using DSSAT v 4.5/CERES-Rice model. *Journal of Agro-meteorology* 14(1):26-30.
6. Dodamani, B. M. and Das, T. K. 2013. Density and nitrogen effects on interference and economic threshold of common lambsquarters in wheat. *Journal of Pest Science*. DOI 10.1007/s10340-013-0478-x (Published online on 24 January 2013).



7. Jha, A.N., Srivastava, C. and Shiva Dhar. 2012. Resistance in wheat genotypes to rice (*Oryza sativa*) weevil (*Sitophilus oryzae*). *Indian Journal of Agricultural Sciences* 82(12):
8. Kumar, D., Shivay, Y.S. Dhar, S., Kumar, C. and Prasad, R. 2013. Rhizospheric Flora and the Influence of Agronomic Practices on Them: A Review. *Proceedings of the National Academy of Sciences, India, Section B: Biological Sciences* 83(1): 1-14. DOI 10.1007/s40011-012-0059-4.
9. Miri, Khaled and Rana, D.S. 2012. Evaluation of sweet sorghum (*Sorghum bicolor*) genotypes for biomass, sugar and ethanol production under different levels of nitrogen. *Indian Journal of Agricultural Sciences* 82 (3): 195–200.
10. Panigrahi, P., Sharma, R.K., Parihar, S.S., Hasan, M. and Rana, D.S. 2013. Economic analysis of drip-irrigated kinnow mandarin orchard under deficit irrigation and partial root zone drying. *Irrigation and Drainage* 62: 67–73.
11. Parihar, C.M., Rana, K.S., Jat, M.L., Jat, S.L., Parihar, M.D., Kantwa, S.R., Singh, D.K. and Sharma, S. 2012. Carbon footprint and economic sustainability of pearl millet-mustard system under different tillage and nutrient management practices in moisture stress conditions. *African Journal of Microbiology Research* 6(23): 5052-506.
12. Pooniya, V. and Shivay, Y.S. 2013. Enrichment of *Basmati* rice grain and straw with zinc and nitrogen through ferti-fortification and summer green manuring crops under Indo-Gangetic Plains of India. *Journal of Plant Nutrition* 36(1): 91-117.
13. Pooniya, V., Shivay, Y.S., Rana, A., Nain, L. and Prasanna, R. 2012. Enhancing soil nutrient dynamics and productivity of *Basmati* rice through residue incorporation and zinc fertilization. *European Journal of Agronomy* 41: 28-37.
14. Rana, A., Joshi, M., Prasanna, R., Shivay, Y.S. and Nain, L. 2012. Biofortification of wheat through inoculation of plant growth promoting rhizobacteria and cyanobacteria. *European Journal of Soil Biology* 50:118-126.
15. Rana, A., Saharan, B., Nain, L., Prasanna, R. and Shivay, Y.S. 2012. Enhancing micronutrient uptake and yield of wheat through bacterial PGPR consortia. *Soil Science and Plant Nutrition* 58: 573-582.
16. Rana, K.S. and Bana, R.S. 2012. Productivity and water use efficiency of wheat (*Triticum aestivum* L.) as influenced by aqua-fertilization under rainfed conditions. *Research on Crops* 13(2): 453-455
17. Rana, K.S. and Bana, R.S. 2012. Studies on aqua-fertilization with and without nitrogen in wheat (*Triticum aestivum*) under rainfed conditions. *Research on crops* 13(2): 453-455.
18. Sharma, Rajvir and Pankaj. 2012. Direct and residual effect of different herbicides applied in maize (*Zea mays*) on weed dynamics and productivity of maize and succeeding wheat (*Triticum aestivum*). *Indian J. of Agric. Sci.* 83(1):77-82.
19. Shekhawat, K. and Shivay, Y.S. 2012. Residual effects of nitrogen sources, sulphur and boron levels on mungbean (*Vigna radiata*) in sunflower (*Helianthus annuus*) – mungbean system. *Archives of Agronomy and Soil Science* 58(7): 765-776.
20. Shivay, Y.S. and Prasad, R. 2012. Zinc-coated urea improves productivity and quality of *Basmati* rice (*Oryza sativa* L.) under zinc stress condition. *Journal of Plant Nutrition* 35: 928–951.
21. Subhash Babu, Rana, D.S., Dasharath Prasad and Suresh Pal. 2013. Effect of sunflower stover and nutrients management on productivity, nutrient economy and phosphorus use efficiencies of pigeonpea (*Cajanus cajan*) – sunflower (*Helianthus annuus*) cropping system. *Indian Journal of Agricultural Sciences* 83(2): 203–209.
22. Suri, V.K. and Choudhary, Anil K. 2012. Fertilizer economy through VA-mycorrhizal fungi under STCR targeted yield model in maize–wheat–maize crop sequence in Himalayan acid Alfisol. *Communications in Soil Science and Plant Analysis, USA.* 43 (21): 2735-2743.
23. Suri, V.K. and Choudhary, Anil K. 2013. Effect of VA-mycorrhizal fungi and phosphorus application through STCR precision model on crop productivity, nutrient dynamics and soil fertility in soybean (*Glycine max*)–wheat (*Triticum aestivum*)–soybean crop sequence in an acid Alfisol. *Communications in Soil Science and Plant Analysis* 44 (13): 2032-2041.



24. Verma, S.K. and Idnani, L.K. 2012. Crop water use, nutrient content and uptake as influenced by irrigation and nitrogen management in potato (*Solanumtuberosum*) – maize (*Zea mays*) cropping system. *Indian J. Agric. Sci.* 82 (12): 1032-1038.

2013-14

1. Bana, R.S., Shivay, Y.S., Sepat, S., Rana, K.S. and Pooniya, V. 2013. Effect of summer forage crops and phosphogypsum-enriched urea on productivity of basmati rice-wheat cropping system. *Research on crops* 14(3):649-653
2. Suri, V.K. and Choudhary, A.K. 2013. Effect of VA-mycorrhizal fungi and phosphorus application through STCR precision model on crop productivity, nutrient dynamics and soil fertility in soybean (*Glycine max*)–wheat (*Triticum aestivum*)–soybean crop sequence in an acid Alfisol. *Communications in Soil Science and Plant Analysis* 44 (13): 2032-2041. [DOI:10.1080/00103624.2013.783921].
3. Suri, V.K. and Choudhary, A.K. 2013. Effect of Vesicular Arbuscular Mycorrhizae and Applied Phosphorus through Targeted Yield Precision Model on Root Morphology, Productivity and Nutrient Dynamics in Soybean in an Acid Alfisol. *Communications in Soil Science and Plant Analysis* 44 (17): 2587-2604. [DOI:10.1080/00103624.2013.803569].
4. Suri, V.K. and Choudhary, A.K. 2013. Glycine-Glomus-Phosphate Solubilizing Bacteria interactions lead to fertilizer phosphorus economy in soybean (*Glycine max* L.) in a Himalayan Acid Alfisol. *Communications in Soil Science and Plant Analysis*. 44 (20): 3020-3029. [DOI:10.1080/00103624.2013.829085].
5. Suri, V.K., Choudhary, A.K. and Kumar, A. 2013. VAM fungi spore populations in different farming situations and their effect on productivity and nutrient dynamics in maize and soybean in Himalayan acid Alfisol. *Communications in Soil Science and Plant Analysis*. 44 (22): 3327-3339, [DOI: 10.1080/ 00103624.2013.848283].
6. Suri, V.K. and Choudhary, A.K. 2014. Comparative performance of geographical isolates of *Glomusmosseae* in field crops under low input intensive P–deficient acid Alfisol. *Communications in Soil Science and Plant Analysis*. 45 (1): 101-110. [DOI:10.1080/00103624.2013.849726].
7. Kumar, A., Suri, V.K., and Choudhary, A.K. 2014. Influence of Inorganic Phosphorus, VAM Fungi and Irrigation Regimes on Crop Productivity and Phosphorus Transformations in Okra (*Abelmoschusesculentus* L.)–Pea (*Pisumsativum* L.) Cropping System in an Acid Alfisol. *Communications in Soil Science and Plant Analysis*. 45 (7): 953–967, DOI:10.1080/00103624.2013.874025.
8. Choudhary, A.K., Thakur, S.K. and Suri, V.K. 2013. Technology transfer model on integrated nutrient management technology for sustainable crop production in high value cash crops and vegetables in North-Western Himalayas. *Communications in Soil Science and Plant Analysis* 44 (11): 1684-1699. [DOI:10.1080 /00103624.2013.783058].
9. Choudhary, A.K. and Suri, V.K. 2013. ‘On-Farm’ participatory technology development on resource conservation technologies in rainfed upland paddy in Himachal Pradesh, India. *Communications in Soil Science and Plant Analysis* 44 (17): 2605-2617. [DOI:10.1080/00103624.2013.811521].
10. Choudhary AK and Suri, V.K. 2014. Integrated nutrient management technology for direct seeded upland rice (*Oryza sativa*) in north-western Himalayas. *Communications in Soil Science and Plant Analysis* 45:6, 777-784. DOI: 10.1080/00103624.2013.861914.
11. Choudhary, A.K. and Suri, V.K. 2014. ‘On farm’ participatory technology development on forage cutting and nitrogen management in dual purpose wheat (*Triticum aestivum*) in north-western Himalayas. *Communications in Soil Science and Plant Analysis*. 45:6, 741-750. DOI: 10.1080/00103624.2013.858727.
12. Das, T.K., Bhattacharyya, R., Sudhishri, S., Sharma, A.R., Saharawat, Y.S., Bandyopadhyay, K.K., Sepat, S., Bana, R.S., Aggarwal, P., Sharma, R.K., Bhatia, A., Singh, G., Datta, S.P., Kar, A. Singh, B., Singh, P., Pathak, H., Vyas, A.K., Jat, M.L. 2014. Conservation agriculture in an irrigated cotton–wheat system of the western Indo-Gangetic Plains: Crop and water productivity and economic profitability. *Field Crops Research* 158: 24–33.



Practical manuals

1. Sepat, Seema, Bana, R.S., Kumar, Dinesh and Rana, K.S. (2013). A practical manual on principles and practices of managing soil and field crops. Division of Agronomy, IARI, New Delhi. pp. 90. ISBN: 978-81-88708-95-6.
2. Dass, A., Kaur, R., Bana, R.S., Rana, K.S., Choudhary, A.K., Pooniya, V., Vyas, A.K., Idnani, L.K. and Rana, D.S. 2013. Irrigation Water Management- A Practical Manual. IARI, New Delhi pp. 104 ISBN: 978-93-83168-02-6
3. Bana, R.S., Rana, K.S., Dass, A., Choudhary, A.K., Pooniya, V., Vyas, A.K., Kaur, R., Sepat, S. and Rana, D.S. 2013. A Manual on Dryland Farming and Watershed Management. IARI, New Delhi pp. 104 ISBN: 978-93-83168-03-3
4. Choudhary, A.K., Pooniya, V., Rana, D.S., Bana, R.S., Dass, A., Rana, K.S. and Vyas, A.K. 2013. Crop Ecology and Agro-meteorology – A Practical Manual IARI, New Delhi pp.116 ISBN: 978-93-83168-04-0

Edited Books

1. Rana, K.S., Choudhary, Anil K., Sepat, S. and Bana, R.S. 2014. Advances in Field Crop Production. [ISBN 978-93-83168-08-8]. Post Graduate School, IARI, New Delhi, India. pp 475
2. Rana, K.S., Choudhary, Anil K., Sepat, S., Bana, R.S. and Dass, A. 2014. Methodological and Analytical Agronomy. [ISBN 978-93-83168-07-1]. Post Graduate School, IARI, New Delhi, India. pp 276
3. Rana, K.S., Choudhary, Anil K., Bana, R.S. and Sepat, S. 2014. Natural Resource Management for Sustainable Agriculture. [ISBN 978-93-83168-06-4]. Post Graduate School, IARI, New Delhi, India. pp 342
4. Choudhary, A.K., Rana, K.S., Dass, A., Srivastav, M. 2014. Advances in Vegetable Agronomy. [ISBN: 978-93-83168-17-0]. Post Graduate School, IARI, New Delhi & ICAR, DARE, New Delhi, India. pp 358 + ii.
5. Dass, A., Rana, K.S., Choudhary, A.K., Bana, R.S. 2014. Climate Resilient Dryland Farming and Watershed Management [ISBN: 978-93-83168-18-7]. Post Graduate School, IARI, New Delhi & ICAR, DARE, New Delhi, India. pp 235.
6. Srivastav, M., Choudhary, A.K., Rana, K.S., Dass, A. 2014. Agronomy of Horticultural Crops [ISBN: 978-93-83168-19-4]. Post Graduate School, IARI, New Delhi & ICAR, DARE, New Delhi, India. pp 210.

23. Details of patents and income generated

- Revenue of Rs. 22.22 Lakh was generated through sale of farm produce through Pusa Produce Sale Centre.
- Revenue of Rs. 2,05679 Lakh was generated through sale of FYM/Composts through Biomass Utilisation Unit (BUU)

24. Areas of consultancy and income generated:

None

25. Faculty selected nationally/internationally to visit other laboratories / institutions / industries in India and abroad:

During last 4 years 5 faculty members visited foreign countries

Dr Dinesh Kumar	Availed Commonwealth Fellowship in U.K.
Dr Shivadhar	Availed Commonwealth Fellowship in U.K.
Dr U.K. Behera	Visited Germany
Dr Seema Sepat	Visited Canada
Dr Y.S. Shivay	Visited Sri Lanka

**26. Faculty serving in****a) National committees b) International committees c) Editorial Boards d) any other (please specify):**

Name	Editorial Board	Any other
Dr K.S. Rana	Indian Journal of Agronomy Annals of Agricultural Research Research on Crops	Former Treasurer, Indian Society of Agronomy
Dr D.S. Rana	Indian Journal of Agronomy Annals of Agricultural Research	Former Secretary, Indian Society of Agronomy
Dr. U.K. Behera	Indian Journal of Agronomy	
Dr. Y.S. Shivay	Indian Journal of Agronomy	Secretary, Indian Society of Agronomy
Dr. Ashok Kumar	Indian Journal of Agronomy	Former Treasurer, Indian Society of Agronomy
Dr. T.K. Das	Indian Journal of Agronomy	
Dr. Dinesh Kumar	Indian Journal of Agronomy	
Dr. A.K. Singh	Indian Journal of Agronomy	Treasurer, Indian Society of Agronomy
Dr. Shiva Dhar	Annals of Agricultural Research	Secretary, Annals of Agricultural Research
Anil K. Choudhary	Indian Journal of Agronomy	
Dr. Anchal Dass	Indian Journal of Agronomy	Councilor, Indian Journal of Agronomy
Dr. Ramanjit Kaur	Indian Journal of Agronomy	
Dr. C.M. Parihar	Indian Journal of Agronomy	Councilor, Indian Journal of Agronomy
Dr. R.S. Bana	Indian Journal of Agronomy Annals of Agricultural Research	

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).**28. Student projects percentage of students who have done in-house projects including interdepartmental projects:**

100%

Percentage of students doing projects in collaboration with other universities / industry / institute:

None

29. Awards / recognitions received at the national and international level by Faculty:

Name	Name of the award
Dr. K.S. Rana Dr. D.S. Rana Dr. T.K. Das Dr. Ashok Kumar Dr. Y.S. Shivay Dr. Dinesh Kumar Dr U.K. Behera	ISA, Fellow award
Dr. T.K. Das	ISWS, Fellow award
Dr. K. S Rana	Best poster award (International conference)



Dr. K. S Rana	IARI Best Hindi Article Award
Dr Dinesh Kumar	Pusa Vishisht Hindi Pravakta Puruskaar
Dr R.S. Bana	First Prize for the Best Hindi Presentation
Drs D.S. Rana and S. Sepat	Best FAI [Hindi article
Drs T.K. Das and S. Sepat	Best DWR [Hindi article
Dr. Y.S. Shivay	FAI, Shriram Khad Patrika Award for Best Hindi Article FAI, Golden Jubilee Award for excellence on "Nutrient Management in Rice"
Dr. T.K.Das	Best Poster Award by ISAS and ISA
Dr Anil K Choudhary	Best Poster Award in International Conference

Doctoral / post doctoral fellows:

None

Students:

Dr. M.D. Tuti	Best Ph. D. Thesis award by ISWS
Dr. Vijay Pooniya	Best Ph. D. Thesis award by ISA
Dr. M.A. Ansari	Best Poster Award by ISA
Ms. Ekta Joshi	IPNI Scholar Award
Mr. Paramesh V.	ICAR-SRF
Ms. Ekta Joshi	DST Inspire Fellowship
Mr. Bipin Kumar	Rajeev Gandhi Fellowship
Mr. Jitesh Baghel	Rajeev Gandhi Fellowship
Ms. Sobhana V.	Rajeev Gandhi Fellowship
Mr. Khare Tushar R.	Best poster award (International conference)
Dr. Amarpreet Singh	Mosaic Best Ph. D. Thesis Award
Dr. Amarpreet Singh	FAI Best Ph. D. Thesis Award
Dr. Amarpreet Singh	IARI Student Merit Award
Dr. Asha Ram	FAI Best Paper Award
Mr. R. K. Meena	ISA Best M. Sc. Thesis Award

30. Seminars/ Conferences/ Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any.

- Organized one day Farmers Training in Mewat on 23.03.2013 on Preservation of green fodder through Silage and hay making" under NAIP Project at Pinangua (Mewat).
- Organization of Parthenium Awareness Week 16–22 August 2012 at IARI, New Delhi.
- Third International Agronomy Congress on "Agriculture diversification, Climate Change management and Livelihoods" organised by Indian Society of Agronomy, ICAR and IARI, New Delhi, India from 26–30 November, 2012 at IARI, New Delhi.

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standards

**32. Student profile programme-wise (2014-15):**

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	11	-	-	-
Ph.D.	134	8	-	5.97	-

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students from other countries
M.Sc.	Nil	Nil	85	15
Ph.D.	85	Nil	15	10

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

All the students are selected after clearing All India Competitive Examinations and will be getting fellowship. All the students have cleared NET.

3 Indian Administrative Services

2 Indian Police Service

3 students in Nationalized Banks

All others are selected as ARS Scientist or Assistant Professor.

No student passed out from the Division is jobless.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	None
PG to M.Phil.	None
PG to Ph.D.	95%
Ph.D. to Post-Doctoral	None
Employed Campus selection Other than campus recruitment	100% students are in job/employed
Entrepreneurs	None

36. Diversity of staff

Percentage of faculty who are graduates: 100%	
Of the same university	70
From other universities within the state	None
From universities from other States from	30
Universities outside the country	None



37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All are Ph.D.

38. Present details of departmental infrastructural facilities with regard to

- Library: one
- Internet facilities for staff and students: 100%
- Total number of class rooms: Two
- Class rooms with ICT facility: one
- Student's laboratories: three
- Research laboratories: Two

39. List of doctoral, post-doctoral students and Research Associates

S.No.	Name	From host/other universities
Ph.D.		
1.	Ms. Sobhna V	Other university
2.	Jitesh K. Baghel	Other university
3.	Shahane Amit Anil	IARI
4.	Chaitanya P. Nath	Other university
5.	Parkash C. Ghasal	Other university
6.	Amit Kumar	IARI
7.	Khare Tushar R.	IARI
8.	Rajesh K. Meena	IARI
9.	Tarun Paul	Other university
10.	Mukesh Choudhary	Other university
11.	Ms. Heba M. Noman	Other university
12.	O. Anthony Imoudu	Other university
13.	Renjith, P.S.	IARI
14.	Ramesh K. Singh	Other university
15.	Adarsh Kumar	IARI
16.	Sudhir K. Rajpoot	IARI
17.	Rakesh K. Verma	Other university
18.	Swarna Ronaki	Other university
19.	Raghavendra Madar	Other university
20.	Praveen Jakhar	Other university
21.	K. S. Singh	Other university
22.	H.N. Meena	Other university
23.	Ms. F.E. Mergya	Other university
24.	D.D. Yadav	IARI
25.	Vijay Kumar S.	IARI
26.	Dinesh Jinger	IARI
27.	Rohtash Bajiya	Other university
28.	H.S. Meena	Other university
29.	Arup Layek	Other university
30.	Ms. Bhargavi, B.	Other university



M.Sc.		
1	Arkaprabha Gosh	Other university
2	V.P. Verma	Other university
3	M.R. Yadav	Other university
4	Amir Jan	Other university
5	Ashis Ghosh	Other university
6	Ms. Kavita Kumari	Other university
7	Ms. S.D. Bomboria	Other university
8	Ms. Anita Kumawat	Other university
9	B.R. Meena	Other university
10	Rohullah	Other university

40. Number of post graduate students getting financial assistance from the university.

All students getting fellowship either from IARI, ICAR, UGC and other funding agencies

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Not applicable

42. Does the department obtain feedback from

Yes

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from faculty and students is taken for designing and revising courses as well as for improving teaching-learning evaluation.

b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Students' feedback is taken into consideration for further improvement in faculty in their teaching methodology.

c. alumni and employers on the programmes offered and how does the department utilize the feedback?

The suggestions of alumni are welcome and are always well taken.

43. List the distinguished alumni of the department (maximum 10):

S.No.	Name and Address	Passing Year
1.	Dr. B.G. Bathkal Vice Chancellor , PKV, Akola	1965
2.	Dr. S. Sankaran Vice Chancellor, TNAU, Coimbatore	1970
3.	Dr. R.P. Roy Sharma Vice Chancellor, BAU, Ranchi	1967
4.	Dr. S.R.V. Reddy Vice Chancellor, ANGRAU, Hyderabad	1976
5.	Dr. Masood Ali Director, IIPR, Kanpur	1971



6.	Dr. D.M. Hegde Director DOR, Hyderabad	1977
7.	Dr. R.K. Rajput Director, DWM, Rahuri	1965
8.	Dr. K.A. Singh Director, IGFRI, Jhansi	1986
9.	Dr. S.K. Agarwal Director (Extension), CCSHAU, Hissar	1974
10.	Dr. B.B. Patil Director of Research, Mau Parbhani	1974

44. Give details of student enrichment programmes (special lectures / workshops / Seminar) involving external experts.

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes.

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director (Education) monitor at the Institute level.

47. Highlight the participation of students and faculty in extension activities.

1. On farm demonstration/ trials are being conducted in villages of NCR
2. Radio and TV talk : 92
3. Participated in Kisan mela and other extension activities

Faculty and students participate in extension activities especially during Pusa krishi vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department.

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

Organized two International Training for Afgan Students and also conducted two summer Schools and one winter school of twenty one and fifteen days each for the faculty/Scientist of ICAR and SAUs.

A. Significant achievements in the last 5 years

- Phospho-gypsum-enriched urea up to 7.5% had significant effect on the productivity of aromatic rice.
- Aromatic rice responded well to the application of 40 kg sulphur through 20% neem cake and neem oil conditioned sulphur and recorded significantly higher productivity.



- Inoculation of rice seeds with different plant growth promoting rhizobacteria (PGPR) (*Azospirillumbrasilense* and *Bacillus subtilis*) proved beneficial over no-inoculation, especially with respect to growth and yield of rice hybrids grown by SRI method.
- Foliar application of 2.0 kg ZnSO₄/ha at boot and after anthesis was found equally effective as soil applied 25 kg ZnSO₄/ha + 2 foliar spray at boot and after anthesis with respect to yield, Zn and Fe concentration in grain of wheat.
- Under limited irrigation conditions higher grain and straw yields of wheat were obtained from FIRBS in comparison with conventional tillage. Application of 75% NPK + 5 t FYM/ha produced comparable grain and straw yields as obtained from 100% NPK. Under assured irrigation conditions, higher values of yield attributes, grain yield and straw yields were obtained from wheat grown on FIRBS with 100% recommended dose of nutrients + 5 t FYM/ha in comparison with minimum tillage with same dose of nutrients.
- Grain and straw yields obtained from the application of 75% NPK + 5 t FYM/ha were similar to the application of 100% recommended dose of NPK. Thus, saving of 25% recommended dose of NPK is possible with the application of 5 t FYM/ha.
- In pigeonpea-wheat/sunflower sequence, pigeonpea-sunflower recorded 13.3 and 39.3% higher pigeonpea equivalent yield and net returns along with saving of 1 irrigation and nutrient than pigeonpea-wheat system.
- In *Rabi* maize, intercropping of spinach, potato, radish, coriander and fenugreek was found feasible in improving the resource use efficiency and productivity than sole maize.
- In sweet sorghum based system, sweet sorghum-wheat system was found more productive and remunerative than sweet sorghum-mustard/chickpea system. In wheat based system, wheat-groundnut was found more efficient than wheat-soybean/maize system.
- In Cotton-wheat cropping system, Bt cotton-wheat system was found more productive than non Bt-cotton system, however there was decline in yield of wheat grown after Bt cotton as compared to non-Bt cotton. The productivity of this system can be improved further by intercropping mungbean/groundnut with the cotton.
- Recycling of sunflower stover in pigeonpea-sunflower system, mungbean in mungbean-mustard-sunflower system and soybean/groundnut stover in wheat based system reduced nutrient requirement of succeeding crop by 25 to 50%, reduced unit cost of production, improved productivity by 10 to 15 % and caused favourable changes in soil health parameters. The microbial properties like microbial biomass, dehydrogenase activity, FDA activity and water holding capacity recorded improvement due to recycling of crop residue.
- In mustard, ridge and furrow sowing with two rows in each furrow made efficient use of available moisture and highest seed yield (16.1 q/ha) and water use efficiency (11.7 kg/ha-mm).
- Application of starch polymer (*Jalshakti*) @ 5 kg/ha + 1% seed coating helped in augmenting the yield and water use efficiency of dryland mustard.
- In dryland wheat crop, application of 60 kg N/ha with 30,000 litres of water/ha through aquafertilization proved superior over the other placement method.
- Intercropping of pearl millet paired rows (30/70 cm) + one row of mothbean, the application of 80 kg N + 40 kg P₂O₅/ha gave highest net returns and benefit:cost ratio.
- Application of FYM @ 5 t/ha + dust mulch + straw mulch was found promising moisture conservation practice in pearl millet / maize + mothbean intercropping systems.
- In dryland lentil, the application of 10 kg N + 25 kg P₂O₅/ha + PSB + VAM with 20,000 litres of water per hectare through aquafertilization proved superior in comparison to other placement method of fertilizers.
- Mustard + chickpea intercropping system gave significantly higher equivalent yield over sole mustard and sole chickpea. Application of FYM @ 5 t/ha + organic mulch + kaolin spray (6%) proved superior over the



- control. Among the fertility levels, 60 kg P₂O₅ + 30 kg S/ha gave significantly higher yield over the control and 30 kg P₂O₅.
- Potato planting on raised-bed and irrigation in furrows at 60 mm CPE found promising in potato. Irrigation at 60 mm CPE applied as conventional furrow irrigation (CFI) with an application of 150 kg N/ha (urea) was the most appropriate for potato and succeeding maize crop.
 - Irrigation at 30 mm CPE and an application of 25 kg N/ha (urea) + *Azotobacter* + 5 t/ha FYM recorded significantly the highest marketable yield of cauliflower curd and the highest WUE favouring its quality.
 - Three irrigations at branching, pre-flowering and pod filling stages applied through furrow planting and irrigation method with *ArbuscularMycorrhizae* inoculation were the most beneficial for productivity and water economy in summer greengram. Water economization in summer greengram could also be achieved by irrigating at 120 mm CPE and sowing in FIRBS.
 - Among potato-based intercropping systems, potato + radish intercropping was found promising when irrigated at 1.2 IW/CPE ratio in each furrow.
 - Tillage and stand establishment techniques were perfected in diversified cropping systems for improved productivity and resource-use efficiency.
 - Zero tillage technology was found beneficial for *rabi* crops, resulting in similar yield as with conventional tillage but with less resources, and thus proved to be more economical.
 - Furrow-irrigated raised-bed system (FIRBS) was developed for improved nutrient and water-use efficiency in crops like maize, cotton, pigeonpea, wheat and mustard.
 - Residue application on soil surface was found essential for success of zero-till sown crops, and the benefits started accruing from the second cropping cycle onwards. However, perennial weed infestation increased under double-zero conditions.
 - Integrated weed management using skipping one row after every four rows supplemented with fenoxaprop-ethyl + isoproturon (80 g/ha + 0.40 kg/ha) was developed for better weed control in wheat.
 - *Phalaris minor*'s cross-resistance to clodinafop-propargyl was confirmed. Herbicide rotation greatly reduced resistance development.
 - Economic threshold density of *Chenopodiumalbum* (6-7 plants/m²) in wheat, *Cyperusrotundus* (27-30 plants/m²) in soybean and *Trianthemaportulacastrum*(4-5 plants/m²) in soybean was determined.
 - Tank-mix of pendimethalin and imazethapyr was optimized for complete weed control in soybean.
 - New herbicides such as bispyribac-Na, pyrazosulfuron-ethyl was found very effective in controlling broad-spectrum weeds in rice.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths:

- Scientists with
- Dynamic Scientific team mostly young.
- Infrastructure: Laboratories, Instruments, Library, online resources, smart class rooms
- Highly placed alumni

Weaknesses:

- Lack of expertise in certain areas like carbon sequestration qualification & modeling
- International and national linkages with well defined collaborative research programmes and with industries



- Young scientist for capacity building and advance training in frontline area is required.
- Centre for advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

Opportunities:

- Centrally located for national/ International collaborations
- Training in Frontier areas
- Guest/visiting scientist lecture

Challenges:

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower

52. Future plans of the department.

Education:

Enhancement of the quality of human resources:

- Efforts will be made to enable the scientists through up gradation of knowledge and skill specifically in the area of crop physiology, crop modeling, molecular physiology and systems biology.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes especially ANASTU, Afghanistan
- Young Scientist will be encourages to go for 6-12 months training at world leading Institues through ICAR/ DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientist
- Trimester Seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
- To enhance the research quality and output, Ph.D. students who have completed 2 Years will be encouraged to present research progress once in six months.

Research:

• **Arresting deterioration of soil health:**

Conventional agricultural systems involving intensive cropping with fixed rotations, imbalanced use of fertilizers and cultivation of high-yielding varieties have led to decline in soil health. To overcome this problem, research work on balanced use of fertilizers, conservation agriculture with crop residue management and summer legumes will be undertaken and popularized among farmers.

• **Long-term impact of zero tillage:**

There are observations that compaction of soil, weeds, pests and other associated problems increase in areas after few years of continuous zero tillage. Investigations will be undertaken to record long-term impact of zero tillage in combination with nutrient, water and weed management practices on various crops. Further, impact of conservation agriculture and approaches for minimizing emission of GHGs, and ways to obviate and mitigate the adverse effect of such gases will be studied.

• **Aerobic rice cultivation:**

Water is the most critical input in agriculture and its judicious use is the need of the hour to avoid future shortage of water and environmental degradation. There is a need to develop package of practices for aerobic rice which can give equivalent yield compared to transplanted rice.



- **Efficient use of poor quality waters:**

Disposal of sewage and waste waters is a challenging issue in urban areas. There is a need to develop strategies for efficient use of such waters through either pre-treatment and/or conjunctive use with good quality waters.

- **Water-saving technologies:**

Water table decline is a major issue in north-western plain zone of India. *In situ* water conservation through watershed management and artificial groundwater recharge need to be undertaken. Further, water-saving technologies including fertigation schedules for specific crops as well as low-cost soluble fertilizers will be undertaken.

- **Integrated Crop Management:**

The concept of ICM is an innovative crop management technology of holistic management practices imbedded with tillage, integrated nutrient management, integrated nutrient and water management, integrated weed and pest management strategies as well as the energy management strategies to enhance food production, resource-use efficiency, food quality and overall agricultural sustainability. The attempts would be made on alternate strategies for sustainable farm incomes under emerging issues of changing global climate, biotic and abiotic stresses.

- **Precision farming:**

Cost of inputs is increasing while the input availability is still a problem in many areas. There is a need to reduce the cost of cultivation, improve resource-use efficiency and net returns of the farmers. For achieving this, precise use of inputs in right quantity, at right place and right time will be undertaken under the precision farming programme.

- **Integrated nutrient management:**

The concept of integrated nutrient management is not new, but challenge to translate it into a practical recipe for the farmers in different regions and cropping systems compatible with their socio-economic conditions is a great concern. The attempts would be made to complement the use of organic sources of plant nutrients with chemical fertilizers and other nutrients sources to generate useful information on the complementary and synergistic effects of these materials on the yield of crops and cropping systems. The alternate strategies should address the sustainable income of the farmers along with sustainable crop production environment under emerging issues of changing global climate, biotic and abiotic stresses.

- **Crop Diversification:**

Development of new cropping systems and crop diversification models consistent with sustainable use of land, water and other natural and purchased production resources.

- **Basic and applied research:**

Basic and applied research in nutrient management, soil-water relation, tillage and weed management, precision farming, bio-energy leading to development of integrated soil-plant-water-weed management systems.



viii) Division of Biochemistry

1. Name of the Department:

Division of Biochemistry

2. Year of establishment:

1966

3. Is the Department part of a School/Faculty of the university?

School of Basic Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Plant Physiology, Microbiology, Post-Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Division of Plant Physiology, Microbiology, Post-Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	2	2	0	4
Senior Scientist (Associate Professor)	3	1	2	2
Scientist (Assistant Professor)	9	8	1	5



Besides above there are two permanent faculties in the discipline who are posted at sister department or sister institute as follows:

1. Dr. Shelly Praveen, Principal Scientist, Division of Plant Pathology, IARI, New Delhi-12 Faculty in the Discipline of Biochemistry from other Department

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. R. D. Rai	Ph.D.	Head of the Division	Biochemistry	39	1	0
Dr. Archana Sachdev	Ph.D.	Professor	Biochemistry	29	6	8
Dr. Aruna Tyagi	Ph.D.	Principal Scientist	Biochemistry	25	7	3
Dr. Suresh Kumar	Ph.D.	Principal Scientist	Plant Molecular Biology & Biotechnology	16	5	0
Dr. Anil Dahuja	Ph.D.	Senior Scientist	Biochemistry	18	7	0
Dr. Archana Singh	Ph.D.	Senior Scientist	Biochemistry	5	2	0
Dr. R. R. Kumar	Ph.D.	Scientist	Biochemistry	7	0	0
Dr. Suneha Goswami	Ph.D.	Scientist	Biochemistry	5	0	0
Dr. Vinutha T.	Ph.D.	Scientist	Biochemistry	4	0	0
Ms. Veda Krishnan	M. Sc.	Scientist	Biochemistry	4	0	0
Dr. Sweta Kumari	Ph.D.	Scientist	Biochemistry	3	0	0

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S.No.	Name of the Faculty	Status
1.	Prof. S.L. Mehta, Former Head, Division of Biochemistry, Former D.D.G. (Education), ICAR, New Delhi	Adjunct Faculty

13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M. Sc. = 1.1:1 and Ph.D.= 3:1

15. Number of academic support staff (technical) and administrative staff:

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	14	9	9
2.	Administrative	8	6	6
3.	Supportive	18	12	12

16. Research thrust areas as recognized by major funding agencies:

Abiotic stress tolerance and Nutritional quality improvement.



17 Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Dr. Archana Sachdev	Improvement of soyoil quality increased shelf life by recombinant DNA technology (NATP-ICAR)	Nil	19
	Use of RNAi technology in developing low phytatesoy bean and rice (NFBSFARA-ICAR)		249
Dr. Aruna Tyagi	Elucidating the role of novel regulatory genes from rice in response to water deficit stress and their functional validation (DST)	Nil	37.34
Dr. Anil Dahuja	Metabolic engineering for the development of <i>high-isoflavone</i> soybeans with improved nutritional and flavor quality (DBT)	Nil	45.174
Dr. Archana Singh	Biochemical and molecular characterization of salinity induced responses in pigeon pea (<i>Cajanus cajan</i> L.) - towards the salinity tolerance (DBT)	Nil	36.50
Dr. R. R. Kumar	Exploring Heat-stable Rubisco activase from cereals for augmenting the activity of Rubisco in wheat (<i>Triticum aestivum</i> L.) under the heat stress. (DST-SERC)	Nil	48
Dr. Suneha Goswami	Identification and characterisation of heat responsive novel transcription factors in wheat (<i>Triticum aestivum</i> L.) (DST)	Nil	23.5
Dr. Vinutha T.	Screening soybean germplasm for α -tocopherol content and assessing the expression of γ -tocopherol methyl transferase (γ -TMT) gene in contrast (DST)	Nil	22.0

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

Project: Use of RNAi technology in developing low phytate soybean and rice (NFBSFARA-ICAR)

Institutes: Department of Botany, University of Calcutta, NRC Indore

Total budget for IARI: 249 lakhs

b) International collaboration

None

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

None

20. Research facility / centre with

State recognition

None

National recognition

None

International recognition

None



21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable

22. Publications:

	Rai R.D.	Sachdev A.	Tyagi A.	Kumar S.	Dahuja A.	Singh A.	Kumar R.R.	Goswami S.	Vinutha T.	Krishnan V.	Kumari S.
Number of papers published in peer reviewed journals (national /international)	92	48	32	32	31	25	22	21	9	12	6
Monographs	0	10								1	
Chapters in Books	37	2	2	14	1	1	2	2	1	1	0
Edited Books	5	1									
Books with ISBN with details of publishers	0						1(ISBN: 978-93-84337-10-0) Narendra Publishing House	1(ISBN: 978-93-84337-10-0) Narendra Publishing House			
Number listed in International Database	0										
Citation Index – range / average		0-97		0-78/6.53	0-32/4.60	0-228/ 30.12			0-5/	0-13	0-4
SNIP range / average											
SJR range / average											
Impact Factor– range / average				0-2.28		0-42.351				0-1.74	0-3.1
h-index		5		7	7	11	5	4	2	2	2

Selected publication from 2010-2015

Publication: NAAS Rating above 8

S.No.	Publications	NAAS Rating
9.	Archana Singh as a one of the member of Consortium- Indian Initiative on Tomato Genome Sequencing Project (IITGSP).The tomato genome sequence provides insights into fleshy fruit evolution.Nature 485:635–641(2012)	20
10	Himabindu Kudapa, Arvind K. Bharti, Steven B. Cannon, Andrew D. Farmer, Benjamin Mulaosmanovic, Robin Kramer, Abhishek Bohra, Nathan T. Weeks, John A. Crow, Reetu Tuteja, Trushar Shah, Sutapa Dutta, Deepak K. Gupta, Archana Singh, Kishor Gaikwad, Tilak R. Sharma, Gregory D. May, Nagendra K. Singh and Rajeev K. Varshney. A Comprehensive Transcriptome Assembly of Pigeonpea (Cajanus cajan L.) using Sanger and Second-Generation Sequencing Platforms: Molecular Plant1-9 (2012)	12.61
11.	Swarup K. Parida, S. Kaul, S.K. Kalia, V. Dalal, G. Hemaprabha, A. Selvi, A. Pandit, A. Singh, K. Gaikwad, T.R. Sharma, P.S. Srivastava, N.K. Singh and T. Mohapatra. Informative genomic microsatellite markers for efficient genotyping applications in sugarcane. Theor. App. Genet. 118:327 - 338(2009)	9.51
12.	Sweta Kumari, Anil Dahuja, T. Vinutha, Sanjay Kumar Lal, Abhijit Kar and Raj D Rai (2015). Changes in the levels of off-flavour generation in soybean through biotic elicitors treatments. J. Agric. Food Chem. 63, 700-706, DOI: 10.1021/jf505199a 9.1	9.11



13.	Kumar, R.R., Pathak, H., Sharma, S.K., Kala, Y.K., Nirjal, M.K., Singh, G.P., Goswami, S., Rai, R.D. (2014) Novel and conserved heat-responsive microRNAs in wheat (<i>Triticum aestivum</i> L.). <i>Funct. Integr. Genomics</i> . DOI 10.1007/s10142-014-0421-0	8.69
14.	Chandra Bhan Yadav, Anuj, Suresh Kumar, M. G. Gupta and Vishnu Bhat. (2012) Genetic linkage maps of the chromosomal regions associated with apomictic and sexual modes of reproduction in <i>Cenchrus ciliaris</i> . <i>Mol. Breeding</i> . 30: 239-250.	8.28

Publication: NAAS Rating 6-8

S.No.	Publications	NAAS Rating
109.	Kalpna Tewari, Sweta Kumari, Vinutha T., Bhupinder Singh and Anil Dahuja (2014) Gamma radiation induces reduction in the off-flavour generation in soybean through enhancement of its antioxidant potential, <i>J. Radioanal. Nucl. Chem</i> . DOI: 10.1007/s10967-014-3803-9	7.42
110.	Sweta Kumari, Veda Krishnan and Archana Sachdev (2014). Impact of soaking and germination durations on antioxidants and anti-nutrients of black and yellow soybean (<i>Glycine max.</i> L) Varieties. <i>J. Plant Biochem. Biotechnol.</i> DOI 10.1007/s13562-014-0282-6.	6.81
111.	Mawlong I., Kurup D., Ali K., Yadav S. and Tyagi A. (2014) Isolation and characterization of an AP2/ ERF-type drought stress inducible transcription factor encoding gene from rice. <i>J. Plant Biochem. Biotechnol.</i> 23(1): 42-51	6.81
112.	Anil Sharma, Suresh Kumar and Raj K. Bhatnagar (2011) <i>Bacillus thuringiensis</i> protein Cry6B (BGSC ID 4D8) is toxic to larvae of <i>Hypera postica</i> . <i>Curr. Microbiol.</i> 62: 597-605.	7.36
113.	Kumar S.M.S., Dahuja A., Rai R. D., Walia S. and Tyagi A. (2014) Role of γ -oryzanol in drought tolerant and susceptible cultivars of rice (<i>Oryza sativa</i> L). <i>Ind. J. Biochem. Biophys.</i> 51: 75-80.	7.08
114.	Meena N.L., Ali K., Deshmukh P.R. and Tyagi A. (2014) Effect of heat stress on physio-biochemical characteristics of chickpea (<i>Cicer arietinum</i> L) genotypes. <i>Ind. J. Agri. Sci.</i> 84(3): 401-406.	6
115.	Meena N.L., Ali K., Deshmukh P.R. and Tyagi A. (2014) Effect of heat stress on physio-biochemical characteristics of chickpea (<i>Cicer arietinum</i> L) genotypes. <i>Ind. J. Agri. Sci.</i> 84(3): 401-406. <i>Khelaram. Soren, Ali K and Tyagi A (2012) Cloning and Characterization of gene encoding novel zinc finger protein transcription factor from rice Accepted in Ind. J. Biochem. Biophys.</i> 49:36-41	7.08
116.	Swati Saxena, Archana Singh, Sunil Archak, Tushar K. Behera, K. Tusha, K. John Joseph., Sudhir U. Meshram, Ambika B. Gaikwad (2015) Development of Novel Simple Sequence Repeat Markers in Bitter Gourd (<i>Momordica charantia</i> L.) Through Enriched Genomic Libraries and Their Utilization in Analysis of Genetic Diversity and Cross-Species Transferability. <i>Appl. Biochem. Biotechnol.</i> 175:93-118.	7.69
117.	Suresh Kumar, Neha Sahu, Archana Singh (2015) High- frequency in vitro plant regeneration via callus induction in a rare sexual plant of <i>Cenchrus ciliaris</i> L. <i>In Vitro Cell Dev. Biol.</i> 51:28-34.	7.14
118.	Archana Singh, Bharat Bhushan, O.P. Yadav, Suresh Kumar, R.D. Rai (2015) Induced defence responses of contrasting bread wheat genotypes under differential salt stress imposition. <i>Ind. J. Biochem. Biophys.</i> 52:75-85.	7.08
119.	Lall R., Thomas G., Singh S., Singh A., Gulshan Wadhwa G. Comparative genome analysis of <i>Solanum lycopersicum</i> and <i>Solanum tuberosum</i> . <i>Bioinformation</i> 9 (18): 923-928 (2013)	7.0
120.	Danekar P., Tyagi A., Mahato A., Krishnan K. G., Singh A., Raje R.S., Gaikwad K., Singh N.K. Genomewide characterization of Hsp 100 family genes from pigeon pea. <i>Ind. J. Genet. Plant Breed.</i> 74(3):325-334(2014)	6.19
121.	Bharat Bhushan, Ajay Pal, Satish Kumar, Rajesh, Archana Singh (2015) Evaluation of post-germinative lipid peroxidation and enzymatic antioxidant potential in lead absorbing oat (<i>Avena sativa</i>) seedlings. <i>J. Environ. Biol.</i> 36: 279-288.	6.55
122.	B. K. Singh, Archana Singh, K. Gaikwad and N. K. Singh .Cloning and Characterization of full-length triticum cDNA and genes from wheat varieties K-68 and Chinese spring. <i>J Plant Biochem. Biotechnol.</i> 18: 21-28(2009)	6.81
123.	V. Jyothilakshmi, A. Singh, K. Gaikwad, K. Vinod, N. K. Singh and S.M.S. Tomar RNA Editing in CMS wheat: Influence of nuclear background leads to differential editing on orf256. <i>Ind. J. Genet. Plant Breed.</i> 68(4):353 – 359 (2008).	6.19
124.	Nagendra K. Singh, Deepak K. Gupta, Pawan K. Jayaswal, Ajay K. Mahato, Sutapa Dutta, Sangeeta Singh, Shefali Bhutani, Vivek Dogra, Bikram P. Singh, Giriraj Kumawat, Jitendra K. Pal, Awadhesh Pandit, Archana Singh, Hukum Rawal, Akhilesh Kumar, G. Rama Prashat, Ambika Khare, Rekha Yadav, Ranjit S. Raje, Mahendra N. Singh, Subhojit Datta, Bashasab Fakrudin, Keshav B. Wanjari, Rekha Kansal, Prasanta K. Dash, Pradeep K. Jain, Ramcharan Bhattacharya, Kishor Gaikwad, Trilochan Mohapatra, R. Srinivasan & Tilak R. Sharma. The first draft of the pigeonpea genome sequence. <i>J Plant Biochem. Biotechnol.</i> 21(1): 98-112(2012)	6.81



125.	Kumar, R.R., Rai, R.D. (2014) Can wheat beat the heat: understanding the mechanism of thermotolerance in wheat (<i>Triticum aestivum</i>). Cereal Res. Commun. 42: 1-18.	6.62
126.	Kumar, R.R., Goswami, S., Sharma, S.K., Singh, K., Gadpayle, K.A., Singh, S.D., Pathak, H., Rai, R.D. (2013) Differential expression of heat shock protein and alteration in osmolyte accumulation under heat stress in wheat, <i>J. Plant Biochem. Biotech.</i> 22:16-26	6.81
127.	Kumar, R.R., Sharma, S.K., Goswami, S., Singh, R., Pathak, H., Rai, R. D (2013) Characterization of differentially expressed stress-associated proteins in starch granule development under heat stress in wheat (<i>Triticum aestivum</i> L.). <i>Indian J. Biochem. Biophys.</i> 50:126-138.	7.08
128.	Rai, G.K., Kumar, R., Kumar, R.R., Dogra, S (2014) Free radicals scavenging -antioxidant phytochemicals in cherry tomato (<i>Solanum lycopersiconvar. Ceresiforme</i> (dunal) a. Gray). <i>Bangladesh J. Bot.</i> 43(3): 255-260	6.38
129.	Kumar, R.R., Goswami, S., Singh, K., Gadpayle, K.A., Sharma, S.K., Singh, G.P., Pathak, H., Rai, R.D. (2014) Ascorbic acid at pre-anthesis modulate the thermotolerance level of wheat (<i>Triticum aestivum</i>) pollen under heat stress. <i>J. Plant Biochem. Biotech</i> 23(3):293–306	6.81
130.	Kumar, R.R., Sharma, S.K., Rai G.K., Singh, K., Chaudhary, M., Dhawan, G., Singh, G.P., Goswami, S., Pathak, H, Rai, R.D (2014) Putrescine at pre-anthesis enhances the thermotolerance of wheat (<i>Triticum aestivum</i> L.) by modifying transcript levels and activity of antioxidant enzymes. <i>Indian J. Biochem Biophys.</i> 51: 396-406	7.08
131.	Goswami, S., Kumar, R.R., Sharma, S.K., Kala, Y.K., Singh, K., Gupta, R., Dhawan, G., Rai, G.K., Singh, G.P., Pathak, H., Rai, R.D. (2014) Calcium trigger protein kinases induced signal transduction for augmenting the thermotolerance of developing wheat grain under heat stress. <i>J. Plant Biochem. Biotech</i> DOI: 10.1007/s13562-014-0295-1	6.81
132.	Veda Krishnan and Sahida Siddiqui. (2013). Rapid decolourisation of acid red 10b by fungal strains. <i>Journal of Applied Technology in Environmental Sanitation</i> , 3(1): 21-26.	6.74
133.	Krishnan Veda, Mageshwaran V and Siddiqui Sahida (2013). Efficient bio-decolorisation of Reactive Orange 4 by fungal strains. <i>Journal of Applied Technology in Environmental Sanitation</i> , 3(4): 165-170.	6.74
134.	Vinutha T, Chirag Maheswari, Navita Bansal, Rama Prashat G, Veda Krishnan, Sweta Kumari, Anil Dahuja, Archana Sachdev and R.D. Rai. (2014). Expression analysis of γ -tocopherol methyl transferase genes and alpha-tocopherol content in developing seeds of soybean (<i>Glycine max</i>). <i>Indian Journal of Biochemistry & Biophysics</i> (Accepted)	7.08
135.	Veda Krishnan, Priyanka Jain, Vinutha T, Alkesh Hada, Manickavasagam M, Ganapathi A, R.D. Rai and Archana Sachdev. (2014). Molecular modeling and in-silico characterization of Glycine max, Inositol (1, 3, 4) tris 5/6 kinase: A potential candidate gene for developing low phytate transgenics. <i>Plant Omics Journal</i> (Accepted)	6.77
136.	Koundal V, Vinutha T, Haq QMR and Praveen S (2010) Modulation of Plant Development and MYB Down Regulation: both during in planta expression of miR159a and in Natural ToLCV infection. <i>J. Plant Biochem. Biotechnol.</i> 19: 171-175.	6.81
137.	Singh, P., Jolly, M., Punjabi, M., Rai, R. D. and Sachdev, A. (2013). Characterization and expression of codon optimized soybean phytase gene in <i>E. coli</i> , <i>Indian Journal of Biochemistry & Biophysics.</i> 50: 537-547	7.08
138.	Kumar, A., Kumar, V., Lal, S. K., Jolly, M., and Sachdev, A. (2014). Influence of gamma rays and ethyl methane sulphonate (EMS) on the levels of phytic acid, raffinose family oligosaccharides and antioxidants in soybean seeds of different genotypes, <i>Journal Plant Biochem. Biotechnol.</i> (DOI 10.1007/s13562-014-0282-6	7.81
139.	Krishnan, V., Singh, A., Vinutha, T., Singh, B., Dahuja, A., Rai, R. D. and Sachdev, A. (2014). Irradiation effects on protein profile, solubility, oxidation, scavenger ability and bioavailability of essential minerals in black and yellow Indian soybean (<i>Glycine max. L</i>) varieties, <i>Journal of Radioanalytical and Nuclear Chemistry.</i>	7.40
140.	Gaurav Kumar, Dahuja Anil and Santha IM (2014) Effect of gamma radiation and storage on total antioxidant capacity and parameters responsible for generation of off-flavour in soybean seeds varying in seed coat color. <i>Legume Res.</i> 37: 500-507.	6.14
141.	Mahesh Kumar., Ahuja S., Dahuja Anil, Kumar R., and Singh B. (2014) Gamma radiation protects fruit quality in tomato by inhibiting the production of reactive oxygen species (ROS) and ethylene. <i>J. Radioanal. Nucl. Chem.</i> 301: 871-880.	7.42



142.	Mahesh Kumar., Singh B., Ahuja S., Dahuja Anil and Anand A. (2014) Gamma radiation and magnetic field mediated delay in effect of accelerated ageing of soybean. J. Food Sci. Technol. DOI 10.1007/s13197-014-1590-5.	7.12
143.	Suresh Kumar (2014) RNAi (RNA interference) vectors for functional genomics study in plants. Natl. Acad. Sci. Lett. 37: 289–294.	6.24
144.	Amaresh Chandra, K. K. Tiwari, D. Nagaich, N. Dubey, Suresh Kumar, R. K. Bhatt and A. K. Roy (2011) Development and characterization of microsatellite markers from tropical forage <i>Stylosanthes</i> species, analysis of genetic variability and cross-species transferability. Genome 54: 1016-1028.	7.56
145.	Suresh Kumar and Vishnu Bhat (2012) High-frequency direct plant regeneration via multiple shoot induction in the apomictic forage grass <i>Cenchrus ciliaris</i> L. In Vitro Cell Dev Biol. 48: 241-248.	7.16
146.	Suresh Kumar, Reshu Tiwari, Amaresh Chandra, Anil Sharma and Raj K. Bhatnagar (2013) <i>In vitro</i> direct plant regeneration and <i>Agrobacterium</i> -mediated transformation of lucerne (<i>Medicago sativa</i> L.) Grass and Forage Science 68: 459–468.	7.93
147.	Suresh Kumar (2011) Biotechnological advancements in alfalfa improvement. J. Appl. Genet. 52: 111-124.	7.90
148.	K.K. Dwivedi, A. Radhakishna, Suresh Kumar, M.K. Srivastava, M.G. Gupta and P. Kaushal (2015) Development of an ISSR - derived SCAR marker linked to apospory in buffel grass (<i>Cenchrus ciliaris</i> L.). Ind. J. Gen. Plant Breeding (In Press)	6.19
149.	Amaresh Chandra, A.K. Roy and Suresh Kumar (2010) Molecular techniques for improvement of forage crops. Range Mgmt. & Agroforestry. 31: 87-96.	6.04
150.	Suresh Kumar and Amaresh Chandra (2010) <i>In vitro</i> plantlet regeneration in <i>Stylosanthes</i> spp. via callus induction from cotyledonary and hypocotyl explants. Natl. Acad. Sci. Lett. 33: 289 – 297.	6.24
151.	Suresh Kumar, L. Arul and Deepti Talwar (2010) Generation of marker-free Bt transgenic indica rice and evaluation of its yellow stem borer resistance. J. Appl. Genet. 51: 243-257.	7.90
152.	Suresh Kumar, Amaresh Chandra, M. G. Gupta and G. P. Shukla (2010) Molecular and embryological analyses of rare sexual plant in buffelgrass (<i>Cenchrus ciliaris</i> L.). Range Mgmt. & Agroforestry. 31: 36-40.	6.04

23. Details of patents and income generated:

None

24. Areas of consultancy and income generated:

Nil

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Name	Institutions and Industries Visited
Dr. Archana Sachdev	Max Planck Institute for Biochemistry, Munchen, Germany (1992) University of Western Australia Perth, Australia (2003) Hebrew University of Jerusalem, Faculty of Agriculture, Food and Environmental Quality Sciences, Israel (2001)
Dr. Aruna Tyagi	Ohio State niversity Columbus, USA (2010) Texas Tech University Lubbock, USA (1997)
Dr. Suresh Kumar	University of Missouri, USA (2009) University of California, USA (2010) Purdue University, USA (2011) International Centre for Genetic Engineering and Biotechnology, New Delhi (2006)



26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. R.D. Rai	Member, International Top-level Forum on Engineering, Science & Technology. Executive Member International Society on Medicinal Mushrooms, Beijing, China.		
Dr. Archana Sachdev	Executive Committee Member, Society of Plant Biochemistry and Biotechnology, New Delhi, India.		Reviewer and content writer for an MHRD Project under National Mission on Education through ICT (NME-ICT) – “e pathshala” in the field Biochemistry and Molecular biology Member, Core Scientific Support Team of School of Basic Sciences at IARI, 2011 Fellow of Indian Society of Agricultural Biochemists Kanpur, India
Dr. Suresh Kumar		Member, Editorial Board, Biofertilizers and Biopesticides Member, Editorial Board, Biosafety Member, Editorial Board, Recent Advances in DNA and Gene Sequence	
Dr. Anil Dahuja		Member, Editorial Board, Frontiers in Nutrition- Nutrition and Environmental Sustainability (Published from Switzerland).	
Dr. Vinutha T.			Member and content writer for an MHRD Project under National Mission on Education through ICT (NME-ICT) – “e pathshala” In the field Biochemistry and molecular biology. Project reviewer – DBT-BIRAC Scheme. Govt. of India.
Dr. Sweta Kumari		Editor, Journal of Plant Science and Research	Nil

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute: None

**29. Awards/recognitions received at the national and international level by:****a) Faculty:**

Name	Awards/Recognitions
Dr. R.D. Rai	Two Gold Medal in B.Sc. Gold Medal for first position in M.Sc. (Biochemistry) Member, Expert Committee on Medicinal Plants, National Biodiversity Authority K.U. Patel Award, All India Food Preserves Association, Delhi (2000) Chairman, Session on Cordyceps, International Medicinal Mushroom Conference, Nantong, China (2009) Executive Member International Society on Medicinal Mushrooms, Beijing, China (2014)
Dr. Archana Sachdev	DAAD Fellowship (1992-93) FAO funded ICAR-AHRD fellowship(2000-2001) Deputation under research component of NATP/HRD(2003-2004) Best Teacher Award IARI(2014) Fellow of the Indian Society of Agricultural Biochemists (1998)
Dr. Suresh Kumar	Three Gold Medals for outstanding performance in B.Sc. (Ag. & A.H.) examinations (1994) Norman E. Borlaug Fellowship (2008) Indo-US Research Fellowship (2009) Special Achievement Award (2012) INSA-Visiting Fellowship (2013) Award for Excellence in Research (2015)
Dr. Anil Dahuja	Best Teacher Award, IARI (2012). Young Scientist Award (2013). Fellow of the Indian Society of Agricultural Biochemists (2014).
Dr. Archana Singh	Young Scientist Award (1994). International Technology Award (2003). Best Poster Award (2004). Letter of Appreciation by Indian Prime Minister- Shri Atal Bihari Vajpayee to Consortium members of IIRGSP (2005). Letter of appreciation for being First Indian scientists' group to sequence Arhar Genome by Ministry of Agriculture, Govt. of India (2012). Academic Brilliance Award (2015)
Dr. R.R. Kumar	Young Scientist Award in (2011) Young Scientist Award (2014)
Dr. Vinutha T	Gold Medal for PhD research (2013)
Dr. Sweta Kumari	Young Scientist Award (2014)
Ms. Veda Krishnan	Young Scientist Award (2014) Certificate of excellence for outstanding young faculty - 2015

c) Students:

PM Fellowship Awarded to One Ph.D. student in 2014

ICAR-SRF(PGS) Awarded to three Ph.D.students in 2013

DST Inspire Fellowship to five Ph.D. students

CSIR Fellowship to one Ph.D. student

Three students received IARI Gold Medal.

Three students have got best poster presentation award in different seminars and conferences.



30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Seminar/Conference/Workshops	Source of Funding	Details of participants
Every year one/two 21-day trainings for Scientists/ Teachers of NARS under the Center for Advance Faculty Training, Division of Biochemistry, IARI.	Indian Council of Agricultural Research	25 participants (Scientist/Assistant Professors and above rank) from all over India
Short course on "Hands-on-Training on RNAi: Concepts and its Applications in Plant Science", 4-13 March, 2014	Indian Council of Agricultural Research	15 participants (Scientist/Assistant Professors and above rank) from all over India

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	2	2	-	-
Ph.D.	52	1	-	1.92	-

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	10
Ph.D.	81.42	NIL	18.58	NIL

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

- All students have been selected for M. Sc. and Ph.D. after clearing All India Competitive Examinations and have got fellowships.
- Indian Police Service – One
- Indian Revenue Service – One
- Many continuing career as researchers abroad: (as Post Doctoral Fellows)
- No student of the discipline is without a job.
- All ARS seats for three consecutive years have been bagged by the students of Biochemistry discipline, IARI.
- Students in Civil Services - Three

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. are holding jobs mainly in the research and teaching fields. A few (20%) have gone abroad as Post Doctoral Fellows.
Employed Campus selection Other than campus recruitment	All our students are holding a Class I job and many have more than two options in jobs even before the completion of their degrees.
Entrepreneurs	None

**36. Diversity of staff:**

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	40
From universities from other States from	60
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All faculty are Ph.D except one.

38. Present details of departmental infrastructural facilities with regard to:

- Library: one
- Internet facilities for staff and students: Every room/laboratory/classroom/lecture room has computer with internet connection and WiFi.
- Total number of class rooms: Two
- Class rooms with ICT facility: Two
- Student's laboratories: Two
- Research laboratories: Ten

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S.No.	Name of the M.Sc. student	University of Graduation
1.	Mr. Jyoti Prakash Singh	BHU, Varanasi, UP
2.	Mr. Mahesh Kumar	Ruhelkhand University, Barely
3.	Mr. Salih Mir Khostie	Afghanistan
4.	Mr. Ashok Kumar	U S Bangalore, Karnataka
5.	Mr. Sachidanand Tiwari	MPUAT, Udaipur, Rajasthan
6.	Mr. Sandeep Kumar	PAU Ludhiana
7.	Mr. Vijay Panduranga Kapale	Navsari Agril University, Navsari, Gujarat
8.	Ms. Beena A.S.	Kerala Agriculture University, Kerala
9.	Mr. Rahul Devidas Damale	V. N. Marathwada Agri. University, Maharashtra

S.No.	Name of the Ph.D. student	Host/other institute/ university
1	Ms. Nabaneeta Basak (Ph.D.)	Other University
2	Ms. Vanita Pandey (Ph.D.)	IARI
3	Mr. Gaurav Kumar (Ph.D.)	IARI
4	Mr. Ajeet Singh (Ph.D.)	Other University
5	Ms. Kalpana Tiwari (Ph.D.)	IARI
6	Ms. Pooja Verma (Ph.D.)	Other University
7	Mr. Ashish Marathe (Ph.D.)	Other University
8	Mr. Vaibhav Kumar (Ph.D.)	IARI
9	Mr. Manoj Kumar (Ph.D.)	IARI



10	Mr. Maharish Tomar. (Ph.D.)	IARI
11	Mr. Sushil S. Changan (Ph.D.)	IARI
12	Mr. Om Prakash Gupta (Ph.D.)	IARI
13	Mr. Muzaffar Hasan (Ph.D.)	IARI
14	Mr. Chirag Maheshwari (Ph.D.)	IARI
15	Mr. Nitin Kumar Garg (Ph.D.)	IARI

S.No.	Name	Designation	Qualification	Host/other institute/ university
1.	Divya	JRF	M.Sc.	Other University
2.	Rajiv Tripathi	SRF	PhD	Other University
3.	Amandeep Kaur	JRF	M.Sc.	Other University
4.	Kavita Dubey	JRF	M.Sc.	Other University
5.	Alkesh Handa	SRF	M.Sc.	Other University
6.	Mansi Panjabi	SRF	M.Sc.	Other University
7.	Monika Awana	JRF	M.Sc.	Other University
8.	Kushboo Singh	SRF	M.Sc.	Other University
9.	Nandita	SRF	M.Sc.	Other University
10.	Shweta Singh	SRF	M.Sc.	Other University
11.	Sadhana	SRF	M.Sc.	Other University

*Four JRF/SRF are registered for their Ph.D. in various other universities.

40. Number of post graduate students getting financial assistance from the university:

All the students are and have been getting fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from:

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty undergoes refresher courses, trainings in the national and international laboratories to improve/update with the innovative techniques. Students' suggestions are taken into consideration for further need-based improvement.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

Gathering of the alumni and the present faculty on specific occasions provides the opportunities for one to one discussions. We try to incorporate suggestions given by the esteemed alumnis.

**43. List the distinguished alumni of the department (maximum 10):**

S.No.	Name and address	Passing Year
1.	Dr. S. L. Mehta Former Dean & Jt. Director (Education) IARI, Former Deputy Director General (Education) ICAR, Former Vice-Chancellor, Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan	1967
2.	Dr. M. L. Lodha Former Head, Division of Biochemistry, IARI	1970
3.	Dr. K. R. Koundal Former Joint Director (Research), IARI	1972

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Educational tools, scientific discussions, quizzes, crosswords, black board, white board, OHPs, LCDs and smart class room, assignments, term papers, quizzes, practical class and trainings.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level the Professor monitors the academic activities and at the Institute level the Dean and Joint Director (Edn.) monitors the academic progress.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa Krishi Vigyan Mela and also have interactions with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for research exposure are regularly conducted for the students. They participate in sports held at the intra and inter Institute levels and also show active participation in cultural and literary activities. Some are content writers in MHRD project – E-pathshala programme.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:**Abiotic Stress Tolerance****Genomics:**

- On Next-Generation Sequencing for identification of heat-responsive stress associated genes in *Triticum aestivum*, Indian Agricultural Research Institute is first institute to submit raw data on Whole Transcriptome Analysis of wheat for heat stress tolerance in the Sequence Read Archive (SRA) of NCBI with accession no PRAJNA172054. More than 23000 unigenes were identified in HD2985 and 22000 unigenes in HD2329 which were predicted to be stress-associated transcripts. Gene Ontology analysis of DEGs showed cellular process to be most altered followed by metabolic process in thermotolerant cultivar. RNA-Seq elucidated the mechanism of miRNAs ion heat stress tolerance. More than 12000 conserved miRNAs and 37 novel heat-responsive miRNAs in wheat under HS. The identified miRNAs were used for the target prediction using



psRNATarget tool. Maximum targets were observed for the tae-miR159a (36 targets) followed by tae-miR156 (30 targets).

- A novel Rubisco activase (RCA) gene was cloned from HD2985 cultivar of wheat and the gene sequence was submitted in NCBI Gen Bank with accession no KC776912. Positive correlation between the Rubisco activity and RCA expression was observed. Real time expression profiling of starch biosynthesis pathway associated genes showed abundance of granule bound starch synthase, starch synthase-II and sucrose phosphate synthase in HD2985 (thermotolerant) cultivar of wheat compared to HD2329 (thermosusceptible).

Proteomics:

- Diurnal change in SSS activity was carried out in HD2985, HD2329, NIAW, PBW343 and C-306 and very high activity of SSS in HD2985 compared to other cultivars was observed. Seeds of HD2985 showed maximum starch content compared to NIAW, C-306, HD2329, PBW343, PBW321, HUW510, HDR77 and HD2932.
- Screening of wheat germplasm exposed to differential heat stress (30°, 35° and 40°C for 2 h) showed the overall best performance by Kanchan and HD2985 with respect to biochemical and physiological traits. Exogenous application of hydrogen peroxide (20 mM) to HD2985 and HD2329 cultivars showed 1.75 fold increases in the expression of AGPase and SSS involved in starch biosynthesis pathway. We could observe increase in the starch content in H₂O₂ treated sample compared to control. A novel signaling molecule *i.e.* Calcium Dependent Protein Kinase (CDPK) gene of 1613 bp was cloned from C-306 cultivar of wheat under differential heat stress. The sequence was submitted in NCBI Gen Bank with accession no JX878360.
- Protein profiling of wheat germplasm was carried out using 2D-PAGE and expression of many new protein spots was observed in the germplasm. Selected protein spots were identified to be HSP17, RCA, CDPK, HSP26, oxygen evolving enhancer protein etc. using MALDI-TOFF. Soluble starch synthase activity was carried out in 9 wheat lines (HDR77, WR544, PBW621, NW40, RAJ3765, C306, HD2733, PBW343 and HUW510) grown under net-house and glass house condition and a marked variation in the SSS activity was observed with RAJ3765 and C306 performed better compared to other cultivars in samples collected from glasshouse compared to net-house.
- Variations in proline accumulation among different wheat cultivars (C306, HDR77, HD2687 and HD2985) were studied at milky dough stage and we could observe maximum accumulation of proline in C-306 cultivar. Starch content was estimated in the wheat lines grown under net-house and glass house condition and RAJ3765 showed maximum accumulation of starch compared to other cultivars. Scanning electron microscopy of starch granules collected from HDR77 and HD2329 grown under elevated temperature was carried out. We could observe small and disintegrated granules with flat structure in case of HD2329 compared to HDR77. Scanning electron microscopy of starch granules in C-306 (thermotolerant) showed very bold and well defined granules with intact aleuronic compartments compared to HD2329 where, defragmented, flattened and less numbers of endospermic cells were observed under heat stress.
- The pollen collected from control and HS-treated HD2985 cultivar of wheat were used for the SEM in order to understand the textural changes in the pollen under HS. We observed clogging of pores in the exine layer of pollen under HS; most of the pollens were flaccid and deflated because of HS. The stigmatic layer exposed to HS showed drying of upper surface with unclasped structure which doesn't support the growth of pollen and ultimately causes defunct pollen. Similarly, SEM of starch granule collected from HS treated HD2985 showed defragmented and small granules which ultimately causes empty pockets in endospermic tissues and the quality of the grain drastically decreases.

Molecular Biology:

- Using specific primers designed for ABA responsive transcription factor gene from WRKY family, a drought inducible as well as ABA responsive 280 bp gene encoding WRKY transcription factor was amplified, cloned and sequenced. The gene sequence was submitted to GenBank (Acc # 395809). RT-PCR analysis revealed an upregulated expression of gene in ABA treated plants as compared to control. A 732 bp cDNA for SHN



clade of AP2/ERF transcription factor family associated with WDS was isolated from leaves of rice *cv.* N22 and submitted to GenBank (Acc # GQ 369789).

- Differential patterns of expression of bzip transcription factor encoding genes were observed for different stress levels and developmental stages. Expression was also correlated with ABA. Differential patterns of expression of genes encoding phytosterol acyltransferase and HMG-CoA reductase were observed for different stress levels and developmental stages. Expression was also correlated with ABA. ABA concentration decreased with the maturity of leaves and was more in leaves that were exposed to WDS as compared to control at different developmental stages. A 964 genomic sequence of AP2/ERF transcription factor family was PCR amplified using gene specific primers from genomic DNA of *Oryza sativa* L *cv.* N22. Homology search revealed a full length genomic insert identical to the *Oryza sativa* L. genomic region (chromosome 6) LOC_Os06g40150. The conserved domain analysis of deduced protein revealed the presence of AP2 domain from 5-69 amino acid. This is the DNA binding domain, which binds to CRT/DRE cis-elements present in promoter region of stress responsive genes. Predicted protein was found to be nuclear localized protein and basic amino acid residues (from 5-9 amino acid) code for nuclear localization signal at the N-terminus while the 62 amino acids (from 139-201) act as transcription regulation domain. It belonged to group V along with SHN clade of *Arabidopsis* responsible for wax biosynthesis.
- pBI121::NosAP2CaMV35S carrying AP2/ERF-N22 driven under a constitutive promoter was transformed into *Agrobacterium* and then into *Arabidopsis* by floral dip method. 30 *Arabidopsis* plants were transformed and 12 transformants were selected on kanamycin. Screening and molecular analysis of *Arabidopsis* transformants was continued through T0, T1 and T2. T2 plants showed improved turgor and less wilting compared to wild type after 8 days of withholding water. However some phenotypic aberrations such as stunted growth, smaller siliques size, less number of seeds and branches, delayed flowering and bolting were observed. Southern blot analysis indicated similar pattern with single copy integration of gene in all the 7 T2 lines. PCR analysis confirmed the integration of the gene and kan^r marker. Quantitative RT PCR showed increased gene expression in the transgenic plants (1.49 fold) as compared to wild type after 8 days of withholding water. Physio-biochemical analysis of T2 plants revealed higher wax content, MSI, proline, capacity to scavenge ROS, carotenoids and ABA content under water deficit stress. Higher ABA content influences closing of stomata, thereby reducing the stomatal conductance and transpiration rate. The chlorophyll content was found to be reduced, which in turn decreased photosynthetic rate and efficiency to some extent. These factors could be responsible for the observed phenotypic aberrations.
- To overcome negative phenotypic effects, the dehusked mature seeds of Pusa Sugandh 2 were transformed using gold particle bombardment with pC1200;nos.AP2.rd29A. Constructs were designed for rice transformation in pCAMBIA under an inducible promoter containing AP2/ERF transcription factor. Rice calli were transformed using biolistic method and screened on hygromycin. Positive transformants were regenerated. Molecular analysis of transformants was done using specific primers for hygromycin, inducible promoter and AP2/ERF transcription factor encoding gene. Southern analysis confirmed the integration of three copies of gene. Overexpression studies have shown 1.4 and 2 fold more expression than wild type under control and water deficit stress respectively. Transformation efficiency was found to be 0.95% for overstored seeds, 2.9% for fresh seeds and overall transformation efficiency of 1.93%. Survival rate of plants was 87%. About 90% of the plants reached maturity and showed no phenotypic aberrations. Physio-biochemical analysis of T1 plants revealed higher wax content, MSI, proline, antioxidant potential, carotenoids and ABA content under water deficit stress.
- Another 1017 bp gene sequence encoding AP2/ERF transcription factor and a 461 bp gene sequence encoding bZIP transcription factor were identified and sequenced from rice *cv.* N22. AP2/ERF transcription factor sequence was submitted to GenBank under accession # KC 988330. It encoded a protein of 338 amino acid residues with a MW of 36.5 KDa and pI of 4.75. The gene sequence with a bipartite NLS sequence and a single AP2 domain belonged to group VII according to Nakano's classification. Blast P suggested its role in cytokinin response. Semi-quantitative RTPCR was done to confirm the induction of gene under water deficit stress. Higher expression was observed in drought tolerant *cv.* N22 as compared to drought susceptible IR 64.



High-affinity Potassium Transporter (*HKT*) gene isolation and characterization

- Spatial distribution of HKTs (*HKT2;1*, *HKT2;3*, *HKT1;4*) in contrasting wheat genotypes [WH542 (salt-susceptible) and KRL210 (salt-tolerant)] revealed that *HKT2;1* and *HKT2;3* were expressed in both root and shoot regions, while *HKT1;4* is expressed in root region only. These transporters (*HKT2;1*, *HKT2;3*, *HKT1;4*) from the root and shoot region of salt-tolerant wheat genotype (KRL-210) were isolated, cloned sequenced and submitted to EMBL Gen Bank with accessions HG934157, HG934158, HG934159, HG934160 and HG934161. Expression analysis (RT-qPCR) of two candidate HKT genes (*HKT2;1* and *HKT2;3*) were found to be up-regulated in root and down regulated in shoot due to induced salt stress. Expressions were significantly high in salt-tolerant wheat genotypes (KRL210) than the salt-susceptible one (WH542). Differential expressions were more prominent in root as compared to shoot. *HKT2;1* transporter was more expressive as compared to *HKT2;3* in both the tissues. *In silico* analysis of sequenced *HKT2;1.1* gene showed wide range significant homology with wheat, rice, barley, rye and oat. The *HKT2;3.1* gene was found to be a new candidate gene in wheat which revealed 94% and 89% sequence homology with barley and grass family respectively. Isolation of full-length HKT genes (*HKT2;3.1* and *HKT1;4.1*) was also accomplished.

Biochemical studies:

- ABA was isolated and quantified from mature seeds of rice *cv.* N22. ABA concentration in seeds at 20 DAF and 30 DAF was 7.42 µg/g and 13.77 µg/g respectively. It was observed that ABA content increased with maturity of seeds and increased as much as twice in the seeds at 30 DAF as compared to seeds at 20 DAF. ABA content was more in stressed leaves as compared to control at three different developmental stages of vegetative growth. ABA concentration in leaves under control and WDS at 10 DAP was 2.63 and 4.67 µg/g, at 25 DAP, 1.44 and 4.19 µg/g and at 40 DAP, 1.32 and 1.97 µg/g respectively. There was a marginal decrease in the concentration of ABA during the growth from 10 DAP to 25 DAP but a drastic decrease in ABA concentration was observed when the plants reached 40 DAP growth stage.
- The level of gamma oryzanol was compared among five different cultivars viz-P1401, PB-1, N22, APO and PNR 381. P1401 and PB1 are known to be drought sensitive cultivars while N22 and APO are drought tolerant cultivars. PNR 381 is suitable for both irrigated and upland cultivation. The higher levels of oryzanol in drought tolerant cultivars and lower levels in drought sensitive cultivars show its role in drought tolerance as it may be involved in free radical scavenging and membrane stabilization which is manifestations associated with drought. The major component of oryzanol is 24-methylenecycloartanyl ferulate followed by cycloartanyl ferulate, campesteryl ferulate and sitosteryl ferulate. These three account for 80% of gamma oryzanol. The variation in the levels of individual components of oryzanol was compared and the effect of their variation on the total antioxidant capacity was studied. The drought tolerant cultivars showed higher antioxidant capacity compared to the drought sensitive cultivars indicating its role as an antioxidant in combating the oxidative stress. 24-methylene cycloartanyl ferulate was the principal component and is thought to be the major source of antioxidant activity as it was found to be the principal component in all the cultivars.
- The effect of NaCl concentration was studied in terms of antioxidant enzymes, their isozymic pattern, and SDS - PAGE protein - profiling in two Indian cultivars of hexaploid wheat (*Triticum aestivum* L.), HD 2329 (salt-sensitive) and Kharchia65 (salt-tolerant) under laboratory conditions. Antioxidant enzyme activities of super oxide dismutase (SOD), glutathione reductase (GR), catalase (CAT), ascorbate peroxidase (APX) and peroxidase (POX) were found to be higher in the tolerant than in the susceptible and were induced in both the genotypes with increase in salt stress levels. Differential variation in the antioxidant enzyme activities was initially more pronounced in 3 days and 6 days after treatment (DAT) but declined thereafter. The isozymic pattern of POX showed quantitative variation, as three forms were observed in susceptible variety while only two in the tolerant one. Rest of the four antioxidant enzymes i.e. SOD, CAT GR and APX showed only quantitative differences in the expressions of the existing bands. Significant quantitative variations were observed in the soluble protein profiles of the tolerant variety at different levels of salt treatment and duration.
- The experiments were executed in controlled conditions in the Phytotron facilities and results were reproducible as Antioxidant enzyme activities varies from susceptible to resistant genotype as well as at variable salt



treatments and duration of treatments and Protein profiles of susceptible and tolerant varieties at different levels of treatment and duration was not able to indicate much variation but intensity of band expression was observed and an absence of a protein band in tolerant variety (K-65) was found. Total RNA was isolated from salt susceptible (HD2329) and salt- tolerant (Kharchia-65) varieties of wheat at salt stress level of 150mM NaCl from 3, 6, 9 and 12days after treatment (DAT). Total RNA was quantified and cDNA synthesis was done to store templates for further characterization of HKT- gene specific sequences in wheat cultivars. Five set of HKT-gene specific primers (F/R) were designed on the basis of wheat and barley EST sequences that were closely related to rice HKT genes using software tools.

- The impact of salt stress on root and shoot under different salinity levels (0, 150 and 300 mM NaCl) and durations (3,7,14,21, & 30 days) on three varieties of wheat viz., WH542 (susceptible), KRL 1- 4(moderate tolerant), KRL210 (tolerant) revealed that levels of salinity significantly affected the growth which attributes phenotypic variations among the genotypes by reducing root and shoot length with due course of salt treatment and that too more in susceptible than tolerant genotype.
- The biochemical measurements of protein content and protease activity indicated that tolerant genotype (KRL 210) is better adapted to tolerate salt stress. Although the protein contents were decreased in the physiologically active leaves along with the levels and duration of salt- treatments for all the genotypes of wheat but constitutively tolerant genotypes were having more protein contents to combat the stress efficiently.
- Molecular studies on HKT gene(s) specific semi-quantitative differential expressions conducted in wheat genotypes- HD2329 (salt-sensitive) and Kharchia65 (salt-tolerant) revealed that HKT₂ subfamily of high affinity potassium ion transporters are key players in maintaining ion homeostasis in the plant and sodium/ potassium symport system is active during salt stress conditions. Up regulation as well as down regulation of expressions indicated that high affinity potassium ion transporters are constitutive as well as inducible in these genotypes. These findings further may help towards deciphering the mechanism of salt - tolerance and evolving wheat varieties with higher salinity tolerance levels.
- Expression studies in were planned in salt- susceptible (HD-2329, WH542) moderate salt-tolerant (KRL 1-4) and salt-tolerant (Kharchia-65, KRL 210) varieties of wheat at differential salt stress levels and durations of salt treatment under controlled phytotron conditions. Total three cell-wall degrading enzymes named xylanase, cellulase, polygalacturonase and two sugar metabolizing enzymes named- invertase and sucrose-phosphate synthase (SPS) were taken into account. Differential variation in the spatial and temporal enzymatic activities as well as membrane stability index (MSI) were observed. Differential and spatial protein profiling of these wheat genotypes at different levels of treatment and duration were also observed. A set of five high affinity potassium transporter genes 19 (HKTs) from both the HKT1 and HKT2 sub-families were taken into account for molecular expression studies. Harvested and frozen tissues were further used to biochemical and molecular studies.
- The impact of salt stress on root and shoot regions under differential salinity levels (0, 150 and 300 mM NaCl) and durations (7, 14 and 21 days) on varieties of wheat viz., WH 542 (salt-susceptible), KRL 1- 4(moderate salt- tolerant), KRL 210 (salt-tolerant) was carried out and revealed that sugar metabolizing enzymes-Invertase and Sucrose Phosphate Synthase(SPS)) and cell- wall degrading enzymes (CWDE)- xylanase, cellulase, polygalacturonase are crucial biochemical markers for resistance against salt stress under controlled conditions. Activities of these enzymes were found to be more pronounced in shoot region than root and activities were significantly high in salt-susceptible genotype due to salt stress. Membrane stability index (MSI) revealed that roots are more severely injured than shoots due to stress imposition. Differential expressions of soluble protein in these contrasting wheat genotypes revealed their spatial (root and shoot region) and temporal partitioning during salt stress under controlled conditions.
- Differential expression studies of *HKT* gene specific transporters were also carried out in root and shoot regions of these wheat genotypes and *HKT1;4* transporter was found to be root specific while *HKT2;1* and *HKT2;3* are genotype specific. Quantitative expressions (Real time qPCR) of two candidate HKT genes (*HKT2;1.1* and *HKT2;3.1*) were found to be ~1.5 and ~3.0 folds down regulated respectively due to salt stress in shoot region of salt- tolerant wheat genotype. These two candidate HKT genes of HKT2 subfamily were isolated,



sequenced and submitted (Acc # HF 937363 and HF 937364). The *HKT2;3.1* transporter is a new candidate gene reported in wheat which revealed 94% sequence homology with barley. *In silico* analysis of sequenced *HKT2;1.1* transporter showed wide range significant homology of 89-98% with wheat, barley, rye and oat.

Effect of biotic elicitors on mitigation of salt stress

- A comprehensive biochemical and molecular expression analysis of salt-tolerance and understanding of mechanism that how seed priming with biotic elicitors mitigate the effect of salt-stress responses in wheat genotypes were carried out. Salt- stress induces production of Reactive Oxygen Species (ROS) and for the scavenging, plant induces defence responses in the form of anti- oxidatant system, osmolyte accumulation, and gene regulations. The experiments were carried out on both root and shoot regions of two contrasting wheat genotypes- salt- susceptible (WH 542) and salt- tolerant (KRL 210), to study the effect of salt- stress on seed priming with two different biotic elicitors- salicylic acid (SA) and methyl jasmonate (MJ). The study was mainly centred around; (i) biochemical parameter such as total phenolic content (TPC), lipid peroxidation (LP) and antioxidant (AO) activity., and (ii) molecular parameter that included semi-quantitative and quantitative expression analysis of high affinity potassium transporter (*HKT*) genes. Primed seeds were germinated in petriplates for initial standardization of the strength of priming reagents to be used and were further sown in pots under controlled conditions in phytotron facility. After 14 days of sowing/germination, plants were exposed to 150 mM NaCl salt stress. Differential expression analysis of *HKT* genes was done only at 14 Days after salt-stress imposition in both root and shoot of primed and unprimed as well as salt- stressed and salt-unstressed i.e. control tissues.
- Morphological expressions of both the contrasting wheat genotypes were influenced by seed priming with biotic elicitors – MJ and SA. Primed seeds of both the contrasting wheat genotypes showed healthier growth parameters as compared to the unprimed seeds. The comparison of unprimed control seeds i.e. without salt- stress and with salt- stress indicated reduction in the growth. The effect of seed priming with respect to improved morphological growth of salt-susceptible wheat genotypes than that to salt- tolerant one indicated that this technology can be used in combating salt- stress and improving salt- tolerance capacity of crop plants. High total phenolic content (TPC) was found in primed salt treated samples with respect to both biotic elicitors- Sa and MJ. Tolerant wheat genotype (KRL 210) primed with methyl jasmonate (PKMJ) showed significantly higher TPC in both root and shoot regions. Root showed higher levels of TPC than that of shoot region whether primed with SA or MJ. Comparative analysis showed that the TPC was more accumulated in primed samples.
- Seeds primed with biotic elicitors (SA and MJ) revealed that lipid peroxidation (LP) was differentially expressed among contrasting wheat genotypes. Unprimed salt- susceptible wheat genotype exhibited higher level of LP under salt- stressed condition than the control one. In the unprimed salt- tolerant wheat genotype reverse pattern was observed. Priming with both the elicitors lowered LP levels in salt- susceptible wheat genotype. In the case of salt-tolerant wheat genotype SA- priming reduced the levels of lipid peroxidation by 50% and MJ- primed seeds of salt-tolerant genotype showed around 10 folds increase in the shoot region.
- Salt- susceptible wheat genotype showed higher antioxidant (AO) activity as compared to the salt- tolerant genotype. The biotic elicitor- MJ showed increase in AO activity and imparted more influence than that to SA to combat salt- stress. Roots exhibited more AO activity than that to shoot in both the contrasting wheat genotype. *HKT* genes-specific semi-quantitative (RT-PCR) analysis showed that the two *HKT* genes were differentially expressed in contrasting wheat genotypes. The *HKT1* and *HKT3* genes showed contrasting expression patterns in the bread wheat genotypes at 150 mM NaCl salt- stress. There was a differential variation in their expressions in root as well as shoot regions of contrasting wheat genotypes with reference to the induced effects of biotic elicitors (SA and MJ). The difference in expression level was found to be more prominent in root than in shoot regions after 14 days of salt treatment. Semi-quantitative difference in expression level of *HKT* genes in shoot and root was further validated by Real- time/Quantitative PCR (RT-qPCR). The expression of both *HKT1* and *HKT3* genes was found to be up- regulated in the shoot samples of salt- susceptible and salt- tolerant wheat genotypes. Seed priming with SA was found to induce the up-regulation of both the *HKT* genes while MJ was about 1.5 folds down regulated. *HKT3* gene was about 1.5 folds more down-regulated as that of



HKT1. Down regulation of *HKT* genes in root region of salt-tolerant wheat genotype provided tolerance to salt-stress imposition and MJ-induced seed priming showed more influence in the down regulation of *HKT* gene expressions than that of SA-induced ones in the roots of both contrasting wheat genotypes.

- Biochemical and molecular expression in shoot and root regions of primed and unprimed samples from contrasting wheat genotypes (WH542 & KRI210) revealed that biotic elicitors -Salicylic Acid (SA) and Methyl Jasmonate (MJ) mitigate the effect of salt stress in both root and shoot regions. MJ showed better responses than that of SA, and can be utilized to improve defence responses of crop plant against salt stress. The regulation of gene expressions and signaling cascades that regulate Na⁺ transporters remain to be elucidated and these studies will help in understanding the mechanism of ion homeostasis during salt stress to improve crop yield.

Epigenomics:

- Expression analysis of *HKT* genes under salt stress in salt-tolerant (Kharchia-65, KRL-10) and salt-sensitive (HD-2329, WH-542) bread wheat (*Triticum aestivum* L.) genotypes showed their differential expression. To understand molecular mechanisms of gene regulation, involvement of epigenetic mechanism was investigated. As a pilot survey, the effect of epigenetic regulation in differential expression of the *HKT* genes was studied using methylation-sensitive restriction enzymes (*DpnII* and *ScrFI*) in Chop-PCR analysis of the *HKT* genes in the salt-sensitive and salt-tolerant genotypes. Preliminary studies on methylation status of cytosine residues at CG sites of the *HKT2;3* and *HKT1;4* genes in KRL-210 (salt-tolerant) and WH-542 (salt-sensitive) genotypes of wheat using Chop-PCR clearly indicated differential methylation of these genes at CG sites.
- Global methylation status of contrasting wheat genotypes (Kharchia65 and HD2329) under salt stress in shoot as well as root tissues was estimated to assess salt stress induced variation in cytosine methylation. Global methylation was estimated using ELISA based colorimetric method. The estimation of global methylation status of cytosine in genomic DNA revealed that stress increases methylation in both shoot and root in both the genotypes. Methylation is 30-40% more in shoot as compared to root in both control and treated. Site-specific and quantitative analyses of cytosine methylation in these genotypes and its role in differential expression of the genes are being pursued using bisulfite-sequencing of the *HKT* genes.

Nutritional Quality Enhancement

Reduction of phytate content in soybean

Phytic acid was detected early in embryogenesis (i.e. at about 24 days after flowering) and accumulated in a linear fashion throughout most of the seed development reaching its maximum (27.16 mg/g) until physiological maturity constituting 2.7% of the total seed wt. The similarity in the pattern of accumulation of phytic acid and dry weight confirmed a linear relation between the two parameters in developing seeds. Nearly all of the P translocated to developing seeds was incorporated into phytic acid from the third week after flowering until physiological maturity and the rate of phytic acid P accumulation was high during the initial stages of seed development and decreased with the increase in seed size on attainment of maturity. The phytase activity increased gradually till it reached its maximum level at 11 days after germination, after which a decline was observed till the 21st day after germination.

Analysis of oligosaccharides (raffinose, stachyose etc.) was done in mature seeds of three varieties of soybean i.e. Pusa 16, PK 416 and DS 9702 and low raffinose series oligosaccharide content in Pusa 16 coincided with the relatively low phytic acid content in its seeds. Phytic acid, RFO and antioxidant contents were determined in 134 plants (generated by gamma radiation and EMS treatments) picked up randomly, four from each of the 34 lines representing 21 genotypes in the M10 generation to elucidate a relationship between them. Only four plants showed low phytate and low RFO contents with moderate antioxidant activity.

A full length genomic sequence encoding phytase was amplified using gene specific primers, cloned and characterized. Its computational analysis predicted a 547aa long protein of metallophos family. Expression analysis by Northern hybridization and RT-PCR confirmed maximum expression of phytase gene around 11 days after germination. Southern analysis predicted the presence of a single copy of phytase gene in the soybean genome. A full length



cDNA encoding phytase was isolated from germinating cotyledons of *Glycine max* (Pusa 16) by splicing using over-lap extension methods by polymerase chain reaction and the sequence analysis confirmed an open reading frame of 1644 bp encoding a 547 amino acid protein, with a deduced molecular mass of 62 kDa. The N-terminal signal peptide of 28 amino acids suggested its secretory status. The deduced phytase amino acid sequence showed 81.9% identity to the phytase of *Lupinus albus*. Belonging to the purple acid phosphatase family the soybean phytase exhibited the conserved motifs and signature metallophosphoesterase domains. For expression of the isolated phytase gene in a prokaryotic vector to check its functionality the codon usage frequency for *E. coli* was deduced from GenBank database and 35 codons of 5' end of core phytase (without signal peptide) were optimized according to *E. coli* codon usage. To nullify the effects of rare codons at the 52 end of phytase gene, targeted codons were changed to their commonly-used counterparts in *E. coli* by PCR-based mutagenesis using the oligonucleotide primers. The gene was mutated without changing the amino acids, using the overlap polymerase chain reaction the modified phytase gene was cloned into a prokaryotic expression vector pET-28a(+) and its expression in *E. coli* was confirmed by SDS-PAGE and Western blot analysis. Bioassay using the crude expression product in *E. coli* confirmed its functionality. Temporal regulation of phytase (*GmPhy*) transcripts in soybean cotyledons and vegetative tissues was indicated by RT PCR with highest steady state RNA levels of *Gmphy* detected in 10 day old cotyledons and vegetative tissues. MIPS transcripts attained maximal expression level upto 6-8 mm of seed size. A single band indicated no alternative splicing. Amongst vegetative tissues MIPS expression was observed only in leaves. Detection of MIPS transcripts and presence of substantial phytate in the leaves indicated the expression of a specific MIPS isoform.

To control the level of phytate in seeds, the expression profile of four members of the MIPS gene family in developing seeds and vegetative tissues of soybean (*Glycine max*) cv. Pusa-16 was monitored by quantitative real-time PCR (Q-PCR). Transcript levels were measured relative to the endogenous reference gene eEF-1 α . The Q-PCR analysis indicated both temporal and spatial variations in the expression patterns with maximum MIPS1 expression in early developing cotyledons compared to the other vegetative tissues. MIPS3 and MIPS4 showed poor expression in developing seeds but their transcript levels were relatively higher in vegetative tissues compared to MIPS1 and MIPS2. Full length MIPS1 cDNA was amplified from the seed stage (4-6mm) showing maximum expression, using gene specific primers. Computational analysis of the sequence revealed an open reading frame of 1533 nucleotides encoding 510 amino acids with a molecular mass 52 kDa (HM461969). The non-secretory nature of protein was predicted by the SignalP program. The amplicon was cloned in the prokaryotic expression vector pET28a. The insoluble fraction of *E. coli* BL21 culture supernatant harboring the recombinant plasmid pET-28a -MIPS on induction with 1 mM IPTG for 3 h at 37°C expressed a 52 kD fusion protein on SDS-PAGE further confirmed by Western analysis using Anti His antibody.

For over expression of phytase gene in developing seeds of soybean, a sense construct (pAKVS-Gmphy) was prepared by cloning the full length (1.6kb) phytase gene in sense orientation with respect to the developmentally regulated - vicilin promoter. The Gmphy expression cassette was further subcloned into the binary vector pAKVS containing bar gene for plant selection. Gene silencing constructs (ihp, AS) for down regulating the expression of MIPS gene in developing seeds of soybean were prepared for transformation into soybean. The 14 kb, intron spliced hairpin construct (pBIN-MIPShp) was designed containing a MIPS ihp cassette (~1800bp) driven under the control of vicilin promoter and a bar gene under 35S constitutive promoter for plant selection. An antisense construct (pBIN-MIPS- AS) of ~13.9kb was also prepared using the isolated and characterized 1.5kb coding fragment of MIPS (full length), cloned in an antisense orientation under a seed specific- vicilin promoter, for targeting the expression in developing seeds and using bar gene expression for plant selection. The three constructs were mobilized into *Agrobacterium* and screened for putative positives by PCR using bar gene specific primers before transformation into soybean by cotyledonary node method.

Transformation and regeneration of soybean with *Agrobacterium* mediated cotyledonary node method was conducted and the confirmation of *Gmphy* T₀ putative transformants was done by PCR using bar specific and *phytase* gene specific primers. Southern blot analysis of the transformed soybeans (T₀ generation) with gene specific (*phytase*) and *bar* specific probes was also conducted. Real Time PCR (RT-qPCR) of developing seeds (T₁) of the putative transformants was done to check the *phytase* expression. Molecular screening of the putative transformants (T₀ and T₁) harbouring MIPS gene constructs (RNAi and antisense) was conducted using gene specific and *bar* primers and



is under progress for subsequent generations. We also targeted the genes encoding the late phytic acid pathway enzymes for which a full length *GmIPK2* cDNA with an open reading frame of 840 bp and encoding 279aa with a predicted MW of 30.91 kDa was isolated, cloned and characterized (KF297702) from the developing soy seeds by RT-PCR. The sense and the antisense fragments (355bp each) were cloned spanning the intron (400bp) at the respective sticky ends to construct a 1.1 kb - intron spliced hairpin (*ihp*) cassette. The *ihp* cassette was successfully sub cloned into the binary vector pCWAK harboring the seed specific *vicilin* promoter and terminator as well as *bar* gene as plant selection marker, to generate an *RNAi* vector for *GmIpk2* suppression. The transformation of soybean with *Agrobacterium* mobilized with *IPK2* RNAi vector, was conducted using the rapid and reliable method for *Agrobacterium* mediated (cot node) transformation of soybean, standardized by the our group. Molecular screening of the transformants by PCR using *bar* specific primers showed amplification of the 500bps of *bar* gene, whereas no amplification was observed in the non-transgenic control. Southern hybridization using *bar* specific and *IPK2* specific probes to check for the putative transformants to confirm stable integration of transgenes into the genomes of soybean plants. The putative transformants are being proceeded further to the next generation. For designing a gene silencing cassette for down regulating the *MRPABCC5* transporter gene expression in soybean, a 521 bp sequence, specific to the *MRPABCC5* transporter gene, was isolated, cloned and characterized using sequence information from GenBank database. The sense and the antisense fragments (521bp) were cloned spanning the *Glycine max* intronic fragment (400bp) to generate a 1.4 kb intron spliced hairpin loop (*ihp*) cassette. The *ihp* cassette is being subcloned into the pORE vector under the control of conglycinin (seed specific) promoter.

Molecular screening of soybean transformants harbouring the *MIPS* gene (*ihp*, antisense) and *phytase* co-suppression vectors revealed positive transformants (T1-T3) showing a distinct down-regulation in the expression of *MIPS* and up regulation in the expression of *phytase* genes with respect to non-transgenic control seeds. Temporal pattern of differentially expressed genes of PA biosynthesis pathway was studied thorough microarray based gene expression profiling. Eight genes of PA pathway showed significant DE profiles between the stages of seed development clearly suggesting a different and sequential time of action of the enzymatic activities encoded by them.

Reduction of off-flavour generation in soybean

Analysis of off-flavour causing volatiles: The volatile compounds generated via lipoxygenase mediated reaction was determined using GC-MS analysis in three selected substrate combination signifying high, medium and low PUFA ratio mimicking the naturally found variation. A total of eleven compounds, predominantly a collection of short chain aldehydes & ketones and their alcoholic counterparts were identified by comparing their retention time and mass spectra with those reported in NIST library of known compounds. In-depth analysis of these volatiles revealed that hexanal is the major volatile for linoleic acid whereas oxidation of linolenic acid releases trans-2-hexenal. A reciprocal relationship was present between PUFA ratios with relative amount of hexanal to trans-2-hexenal ratio. The enzyme lipoxygenase was isolated and purified from defatted soybean seeds to 107 fold and purified enzyme on SDS-PAGE exhibited single band of about 98 kDa. The purified fraction was then run on IEF and on improved SDS-PAGE for the separation of three isozymes of Lox, which were then characterized by MALDI-TOF. Inhibitor studies using the purified enzyme were carried out using natural antioxidants (Ascorbic acid, alpha tocopherol, diazein, genistein and glycitin) present in soybean seeds, which showed tocopherol to be the most potent inhibitor of lipoxygenase.

Role of hydroperoxide lyase in off-flavour generation in soybean: Fourteen lines of soybean seeds varying in germination potential (7 lines each of good and poor storers) were analysed for two major enzymes in the oxidative pathway namely LOX and HPL along with their total antioxidant capacity, level of related antioxidant enzyme activities and parameters involved to measure lipid peroxidation. It was observed that LOX-2 and hydroperoxide lyase enzyme activities are negatively correlated with germination potential of soybean seeds. Hydroperoxidelyase from soybean seed was purified to 16.5 fold by ammonium sulphate precipitation followed by ion exchange chromatography. The SDS PAGE analysis of purified enzyme revealed that it is about 53kDa protein. Kinetic studies using purified hydroperoxidelyase showed the V_{max} and K_m values to be $275.48 \times 10^{-3} \Delta A/min.$ and $25 \mu M$ respectively. The effect of natural antioxidant molecules like α -tocopherol, genistein, glycitein, daidzein and ascorbic acid on the HPL activity showed them all to inhibit the enzyme activity.

Determination of antioxidant capacity of soybean mutants: Various soybean mutants, produced through chemical mutagenesis were analyzed for parameters taken as indices of off-flavour as well as the parameters known to inhibit



the levels of off-flavour producing compounds for the identification of soybean lines with least off-flavour generating potential. The total antioxidant capacity of 14 selected soybean mutants was determined using CUPRAC method and it ranged from 4.55 to 13.88 μmol trolox equivalents/g seeds (Trolox is a water soluble form of the vitamin E). Also levels of two antioxidant molecules viz. ascorbic acid and tocopherols and activities of antioxidant enzymes such as superoxide dismutase (SOD) and peroxidase (POD) were determined in these soybean mutant lines. The ascorbate content was found to vary from 3.4 to 10.6 mg/100 g seeds in these cultivars while vitamin E content ranged from 10 to 20 mg/100 g seeds. Significant variations were also observed amongst the mutant lines with respect to their SOD and POD activities.

Role of protein oxidation and hydrolysis in off-flavour generation in soybean: We determined the levels of Trypsin Inhibitor (TI) and extent of protein oxidation in fourteen commonly grown cultivars of soybean. The two parameters were found to be negatively correlated. It seems that low TI activity in soybeans make the soy proteins prone to hydrolysis by proteases and hydrolyzed proteins in turn become more vulnerable to oxidation by lipid hydroperoxides. We further determined the concentrations of free and bound phenols in these cultivars to study their preventive role in protein oxidation owing to their antioxidative properties. The levels of free phenolics were found to be less as compared to bound phenolics in all the soybean cultivars. However, our results showed that the higher concentration of bound phenolics is more effective in preventing the oxidation of proteins and hence the off-flavour generation as indicated by the significant negative correlation between these two parameters. The extent of off-flavour generation was determined by estimations of various parameters taken as indices of off-flavour viz. LOX activity, TBA number (a measure of malondialdehyde [MDA] generated because of the breakdown of lipid hydroperoxides).

Gene expression analysis of γ -TMT isoforms and tocopherol profiling during seed development in contrasting genotypes of soybean: To understand the molecular basis of differential accumulation of γ -tocopherol in these two genotypes, the expression analysis of genes encoding three isoforms of γ -tocopherol methyl transferase (γ -TMT1, γ -TMT2 and γ -TMT3; the isozymes involved in catalyzing the conversion of γ -tocopherol to γ -tocopherol) was carried out at three stages (30 DAF, 40 DAF, and 50 DAF) of soybean seed development in BRAGG and DS2706. RT-PCR analysis showed that the levels of the transcripts of all the three isoforms of γ -TMT were more in BRAGG as compared to DS2706. Furthermore, the levels of these transcripts increased towards seed maturation and reached to the maximum levels at 50 DAF; the enhancement in γ -TMT3 expression being the highest. Quantitative Real time-PCR data further corroborated these findings. At 50 DAF the expression of γ -TMT3 was found to be significantly higher in BRAGG as compared to DS2706, suggesting a predominant role of this γ -TMT isoform in γ -tocopherol accumulation. The γ -tocopherol content was also found to be significantly higher in BRAGG than in DS2706 at all the seed development stages analyzed. The partial CDS, distinguishing the three isoforms of the γ -TMT, were also amplified from the two contrasting genotypes, cloned into pGEM-T vector, sequenced, and their *in-silico* characterization carried out. The results obtained in the present study could be further utilized in various metabolic engineering experiments aiming for the nutritional and flavour quality improvement of soybean.

The α -tocopherol content in the Bragg was significantly higher than that of the DS2706 at all seed developmental stages; the difference being the greatest at 50 DAF. The expression levels of three different isoforms of γ -TMT i.e. γ -TMT1, γ -TMT2, and γ -TMT3 could affect γ -tocopherol content and concentration in the soybean genotypes and were, therefore, investigated at three same stages of seed development selected above for studying the accumulation of tocopherols. Both semi-quantitative (using Reverse Transcription-PCR) and quantitative (using Real-time PCR) gene expression analysis was carried out in contrasting soybean genotypes. The expression level was normalized based on the expression of a reference gene, EF1 γ which was given as a proper reference gene in a gene expression analysis. The expression of all three γ -TMT genes reached the highest level at 50 DAF, when seed size reached the maximum. γ -TMT 1 and γ -TMT 2 did not show any significant difference ($P < 0.05$) in the expression level between the DS2706 and the BRAGG. γ -TMT 3 showed significant differences ($P < 0.05$) in expression between the DS2706 and the Bragg at both 40 and 50 DAF. The expression level of γ -TMT 3 in the BRAGG was 1.5 to 3 times that of the DS2706 at 40 and 50 DAF ($P < 0.05$). The γ -TMT3 expression levels further correlated well with the pattern of γ -tocopherol accumulation observed in BRAGG and DS 2706.

The tocopherol profiling was also done in the developing soybean seeds at three different seed stages viz. 30 DAF, 40 DAF, and 50 DAF. The γ -tocopherol concentration increased toward seed maturation. At all developmental stages, the γ -tocopherol concentration was significantly higher in the Bragg lines than in the DS2706 ($P < 0.05$). In 30-DAF



seeds, γ -tocopherol concentration in the Bragg was 2x that of the DS2706. The difference between the Bragg and the DS2706 was greater toward seed maturation. At 50 DAF, the γ -tocopherol concentration of Bragg was up 3.5 times that of the DS2706. There was no significant difference ($P < 0.05$) in $\beta + \gamma$ -tocopherol concentration between the DS2706 and Bragg at 40DAF and 50DAF. Compared to other tocopherol forms, δ - tocopherol concentration in the DS2706 was significantly lower ($P < 0.05$) than in the Bragg at 40 DAF.

Biotic elicitors' treatment of soybean seeds as a strategy for reduction/elimination of off-flavour generation in soybean: Continuing with our previous efforts of enhancing inherent antioxidant capacity of soybean seeds to control off-flavour generation, the use of biotic elicitors was explored for this purpose. The inherent levels of antioxidant molecules (total bound and unbound phenols and tocopherols) and off-flavour determining parameters (LOX activity, TBA number and amount of oxidized proteins, trypsin inhibitor activity) were analyzed in fourteen genotypes of soybean seeds varying with respect to their seed coat colour. The study revealed that out of these fourteen varieties, two varieties namely SL 525 (Yellow seed coat colour), EC 109514 (black seed coat colour) had the least and the highest off flavor generating capacity respectively. These were selected for treatment with 3 different concentrations of 3 biotic elicitors viz. Chitosan (2, 4, and 8 mg/ml), Jasmonic acid (1, 3, and 5 μ M), Salicylic acid (0.1, 0.5, and 1.0 mM) for a duration of 8 and 16 days. The treatment of soybean seeds with biological elicitors could alter its inherent antioxidant system, which comprises of non-enzymatic antioxidant molecules (vitamins A, C, E; glutathione, carotenoids, phenolics) and antioxidant enzymes (SOD, Peroxidase and Catalase).

A significant increase in bound and unbound phenols, trypsin inhibitor activity and total tocopherol content and a decrease in Lipoygenase activity, Thiobarbituric acid (TBA) number and amount of oxidized proteins were observed in seeds treated by all the three elicitors. Both the SL 525 and EC 109514 responded favourably to the elicitors' treatment with respect to different off-flavor controlling parameters at 16 days after treatment than at 8 days after treatment. A much better response was observed at higher concentration of elicitors at 16 days of treatment than at 8 days of treatment. EC 109514 responded much better to the elicitors than SL 525 as far as increase in antioxidant potential was concerned and there was a greater decrease in LOX (Lipoygenase) activity and TBA (Thiobarbituric acid) number and oxidized proteins in SL525 than in EC109514. The effect of JA treatment was found to be maximum, which could be due to the fact the enzyme lipoygenase is involved in JA biosynthesis, so treatment of soybean seeds with JA might initiate a kind of feedback inhibition of lipoygenase leading to lesser formation of medium chain aldehydes and ketones responsible for off-flavour generation in soybean.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths:

- Scientists of the Division are well trained having expertise in the diverse area of research, self-motivated and dedicated to the research work.
- The Division has all the necessary infrastructure including laboratories, instruments, library, online resources etc.
- The Division has been recognized as the Center for Advance Faculty Training in biochemistry.
- The Division under take dynamic course curricula of International standard for the M.Sc. and Ph.D. students.

Weaknesses:

- Limited expertise in certain areas like protein biochemistry
- International linkages on collaborative research programs
- Training of scientists in the frontier areas of research is required.
- Reducing technical support, working hands and supporting staff are some of the major concerns.

Opportunities:

- Location of the Institute/Division fetch collaborative supports with other Research Institutes, Universities
- Many of the renowned National/International research/training institutions are easily accessible



- Most of the funding agencies being in Delhi can be approached easily for liberal funding.

Challenges:

- Competitive research environment limits the scope of collaboration with other institutes and Universities
- Linkages with International research organizations and the industries
- Keeping the scientists updated to the technological innovations
- Development of sandwich program for research scholars with foreign Universities.
- Maintaining and utilizing the technical knowhow of the laboratories due to depleting technical and supporting staff.

52. Future plans of the department

Research

Basic and strategic research in the area of abiotic stress tolerance and nutritional quality improvement will be given emphasis. The focus will be on deciphering biochemical, molecular and epigenetic mechanisms of abiotic stress tolerance and nutritional quality improvement of crop plants in a multidisciplinary mode of collaborative research with National and International Institutions. The main areas of the current research program are:

1. *Identification of mechanisms and component traits for tolerance to drought and heat stress in rice and wheat*

Biochemical and molecular approaches will be used to decipher component traits for tolerance to moisture deficit stress and high temperature stresses in rice and wheat. Emphasis will be given to develop sensors, stress-responsive candidate gene based-molecular markers developed will be useful in mapping QTLs for heat stress-tolerance in wheat. 2) The novel heat stress-responsive genes identified by transcriptome data analysis, will be useful for understanding of stem reserve mobilization, photosynthetic heat tolerance and heat tolerance in grain development. Enhanced knowledge of gene—regulatory—network, and pathways involved in heat-tolerance of wheat. Efforts will also be made to unravel epigenetic basis of abiotic stress tolerance in crop plants.

2. *Genomics for identifications of promoters and genes for enhancing abiotic stress tolerance in wheat and rice*

Biochemical and molecular analysis of candidate gene transgenics and genome editing will be used to identify novel genes involved in abiotic stress tolerance of plants. Genome-wide DNA methylation analysis will be employed to understand short term and long term stress memory, acclimation and trans-generational stress memory in rice, role of biotic elicitors in improving abiotic stress tolerance in crop plants. Efforts will be made to identify and design strategies to overcome kinetic and metabolic bottlenecks in physiological processes for yield improvement. Efforts will be made to integrate cell biology, plant and crop physiology with computational biology for prediction gain in plant trait from modification of genes/processes.

3. *Development of transgenic rice and wheat with enhanced abiotic stress tolerance*

Genes for ABA signaling and stress responsive transcription factors will be used to engineer drought tolerance in rice. Efforts will be made to engineer physiological pathways of carbon fixation, photosynthesis, photorespiration and nutrient use efficiency in rice. Cytokinin metabolism will be engineering for improving drought tolerance in wheat.

4. *Development of soybean transgenic for enriched nutritional quality*

Alpha-tocopherol profiling of soybean core germplasm for identification of α -tocopherol enriched genotypes. Anthocyanin finger printing in soybean germplasm, with differentially colored seed coats for the identification of cyanidin-3-glucoside (Cy3G) dense genotypes. Identification of, nutraceutically important, “high isoflavone” containing soybean genotypes. Screening of soybean germplasm for off-flavor associated phospholipids and oil body associated proteins. Identification, cloning and characterization of the potential candidate genes by comparing/combining their temporal and spatial metabolite and transcript profiles. Designing of recombinant



transgene cassettes for expression under tissue specific promoter for transformation into soybean. Functional validation of the promising genes encoding the desired traits through a transient expression system. Soybean transformation with the overexpressing / silencing vectors harboring the targeted genes to develop nutritionally enriched stable transgenics. Molecular and biochemical analysis of the stable transgenics.

Education

Enhancement of the quality of human resources:

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of biological chemistry and systems biology.
- Efforts will be made to initiate sandwich programs for Ph.D. students with International Institutions.
- Scientists will be encouraged to undergo 6-12 months training at world's leading Institutions.
- Efforts will be made to get more DST Inspire Fellowship, DBT Ramalinga Swamy Fellows, DBT BioCare women scientists, etc.
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.



ix) Division of Entomology

1. Name of the Department

Division of Entomology

2. Year of establishment

1905

3. Is the Department part of a School/Faculty of the university?

Yes, School of Plant Protection

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. & Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Agricultural Chemicals, Plant Pathology, Nematology, Vegetable Crops, Floriculture and Landscaping, Agronomy, Post-Harvest Technology, Environmental Science, Molecular Biology and Biotechnology, Microbiology, Plant Physiology, Genetics, Seed Science and Technology, Agricultural Extension etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester system

9. Participation of the department in the courses offered by other departments

The faculty deliver lectures and guide students in the sister departments of Division of Agricultural Chemicals, Plant Pathology, Nematology, Horticulture, Post-Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Molecular Biology and Biotechnology, Genetics, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned	Filled	Vacant	Actual (including CAS & MPS)
Professor/ Principal Scientist	3	8	0	8
Associate Professors/Senior Scientist	8	5	3	5
Asst. Professors/Scientist	21	5	16	5
Others/Technical	51	13	38	13

* Faculty members from other Institute/division/Regional station



Besides above there are four permanent faculties in the discipline who are posted at sister department or sister institute as follows:

	Sanctioned	Filled	Vacant	Actual (including CAS & MPS)
Professor/ Principal Scientist	3	8	0	8
Associate Professors/Senior Scientist	8	5	3	5
Asst. Professors/Scientist	21	5	16	5
Others/Technical	51	13	38	13

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of M.Sc. students guided	No. of Ph.D. Students guided
Dr. (Mrs.) Chitra Srivastava	Ph.D.	Head of the Division	Insect Toxicology	29	3	11
Dr. Subhash Chander	Ph.D.	Professor	Insect Ecology (IPM)	24	5	10
Dr. R.K. Thakur	Ph.D.	Project Coordinator	Apiculture	26	3	1
Dr. R. K. Sharma	Ph.D.	Principal Scientist	IPM	28	3	8
Dr. (Mrs.) Debjani Dey	Ph.D.	Principal Scientist	Systematics	24	2	11
Dr. Pradyumn Kumar*	Ph.D.	Principal Scientist	IPM	32		
Dr. D. B. Ahuja*	Ph.D.	Principal Scientist	IPM	30	0	0
Dr. S. Subramanian	Ph.D.	Principal Scientist	Insect Physiology	19	4	0
Dr. Gagan K. Mahapatro	Ph.D.	Principal Scientist-Nat. Fellow	Insect Toxicology	16	3	2
Dr. Surender Kumar Singh*	Ph.D.	Principal Scientist	Biological Control (IPM)	20	0	0
Dr. (Ms) Vinay Kumari Kalia	Ph.D.	Principal Scientist	Insect Physiology	15	3	0
Dr. (Mrs.) Kirti Sharma	Ph.D.	Principal Scientist	Insect Physiology	22	2	5
Dr. Bishwajeet Paul	Ph.D.	Senior Scientist	Biological Control	22	2	1
Dr. M. K. Dhillon	Ph.D.	Senior Scientist	Insect Physiology	10	1	0
Dr. J. P. Singh	Ph.D.	Senior Scientist	Insect Toxicology	15	0	0
Dr. Sachin Suroshe	Ph.D.	Senior Scientist	Biological Control	12	0	0
Dr. (Mrs.) Kolla Sreedevi	Ph.D.	Senior Scientist	Systematics	8	6	0
Dr. S. Chakraborty*	Ph.D.	Senior Scientist	IPM	10	0	0
Dr. K. Shankarganesh	Ph.D.	Scientist	Biological Control	6	1	0
Dr. Meshram Naresh M	Ph.D.	Scientist	Systematics	5	2	0
Dr.Nebapure Suresh M	Ph.D.	Scientist	Insect Toxicology	3	0	0
Dr. Prasanna Kumar N.*	Ph.D.	Scientist	IPM	3	0	0
Dr.Shashank P.R	Ph.D.	Scientist	Systematics	3	0	0
Dr. Sagar D	Ph.D.	Scientist	Insect Physiology	2	0	0

* Faculty members from other Institute/division



12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S. No.	Name of the Visiting Fellow	Status
1.	Ms. Elizabeth Bandason from Malawi, CV Raman International Fellowship for African Researcher, Oct. 2013-Jan. 2014 (5 months)	Visiting Fellow
2.	Mr. Moses from Tanzania under CV Raman International Fellowship for African Researcher Sept. 2014-Jan. 2015	Visiting Fellow

13. Percentage of classes taken by temporary faculty – programme-wise information

Nil

14. Programme-wise Student: Teacher Ratio:

M.Sc. student: 1.33: 1

Ph.D. student: 3.83: 1

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	51	13	13
2.	Administrative	15	6	6
3.	Supportive	45	22	22

16. Research thrust areas as recognized by major funding agencies

Insect pest management, Insect Biosystematics, Host-plant resistance, Bio-pesticides, Insect-microbe interactions, Climate change impact on insects, Pest informatics

17. Number of faculty with ongoing projects from a) National b) International funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

Name	National	International	Total Grants Received (Lakh Rupees)
Dr. G.T. Gujar	Cry1Ac resistance inheritance and assessment of fitness costs in Pink bollworm, <i>Pectinophora gossypiella</i> (Lepidoptera: Gelechiidae) (Contract Research)	Nil	9.92319/
	Evaluation of Bt transgenic cabbage events against three important insect pests, <i>Plutella xylostella</i> , <i>Spodoptera litura</i> and <i>Helicoverpa armigera</i> (Contract Research)	Nil	9.89 965/
	Diversity analysis of Bacillus and other predominant genera in extreme environments and its utilization in Agriculture (NAIP)	Nil	Rs. 25.38,655/-
Dr. G.T. Gujar Dr. (Ms) Vinay Kalia	Nil	Crop Plants which remove their own major biotic constraints (DST)	72.846/
Dr. (Ms) Vinay Kalia	Characterization of native <i>Bacillus thuringiensis</i> (Bt) isolates and their evaluation for insecticidal activity towards agriculturally important insect pests for development of biopesticides (DBT)	Nil	24.0
	National facility for insect rearing and xenobiotics-cum- transgenic bioassay (ICAR)	Nil	



Dr. V.V. Ramamurthy	"To understand the nature of diversity in lac insects of <i>Kerria</i> spp. in India and nature of Insect x host interaction (NAIP) - Rs. 32.08 lakhs	Nil	Rs. 32.08/
	Studies on the ecology and taxonomy of whitefly <i>Bemisia tabaci</i> in India, its symbiosis with various obligate and facultative bacterial symbionts (NAIP)	Nil	Rs.24.4214
Dr. (Ms) Chitra Srivastava	Nil	"Ensuring food security; harnessing science to project our grain harvest from insect threats (DST)	Rs.68.41 lakhs
Dr. G.K. Mahapatro	National Fellow Project- "Environmentally sustainable termite control" integrative and inclusive approach of frontier and indigenous technologies" -	Nil	Rs.62.39,916/-
Dr. S. Subramanian	The role of bacterial endosymbionts in shaping the insect-virus relationship in <i>Bemisia tabaci</i> (NFBSFARA)	Nil	Rs. 37.8789
	Project Common basis of defense induction in rice and mustard against sucking and gall insects pests (NFBSFARA)	Nil	Rs.13.4396
	"Molecular approaches in characterization and utilization of gut microflora from Muga silkworm, <i>Antheraea assamensis</i> for enhancing productivity of muga culture in North Eastern India (DBT)	Nil	Rs. 26.55 lakhs
Dr. Subhash Chander	National Initiative on Climate Resilient Agriculture (NICRA: ICAR) Sub-project 3 'Simulation modeling for vulnerability assessment and adaptation.	Nil	Rs. 36. 88 lakh (IARI Centre)
Dr. M.K. Dhillon	Genetic diversity of <i>Chilo partellus</i> populations in relation to augmentative biocontrol with <i>Trichogramma chilonis</i> (DBT)	Nil	Rs. 40.19 lakhs
	Mechanism and genetics of diapause regulation in spotted stem borer (DST)	Nil	Rs.30.58 lakhs
Dr. (Ms) K. Sreedevi	Taxonomy of Coleopterans (Bruchidae, Coccinellidae, Cucujoidae, Curculionidae and Scarabaeoidea" (MOEF)	Nil	Rs. 20. 75720/
Dr. N.M. Meshram	"Network Project on Insect Biosystematics' (ICAR)	Nil	Rs. 64.0
	The relationships of phytoplasma with its host plants and insect vectors (NFBSFARA)	Nil	Rs.9.03790/
Dr. K. Shankarganesh,	Entitled "Development of insecticide and temperature tolerant strains of <i>Aenasius bambawalei</i> (Encyrtidae: Hymenoptera) for the management of cotton mealybug, <i>Phenacoccus solenopsis</i> (DST)	Nil	Rs.22.22 lakhs
Dr. (Ms) M. Sujithra	Development of forewarning model using regression and simulation approach for management of rice leaf folder <i>Cnaphalocrosis medinalis</i> Guenee (Lepidoptera:Pyralidae) (DST)	Nil	Rs. 22.50 lakhs



18. Inter-institutional collaborative projects and associated grants received

a) National collaboration b) International collaboration

National collaboration

- **DBT funded project** “Molecular approaches in characterization and utilization of gut microflora from Muga silkworm *Antheraea assamensis* for enhancing productivity of muga culture in North eastern India” **Collaboration** with Central Muga Eri Research and Training Institute, Jorhat, Assam
- **Project:** ‘Common basis of defense induction in rice and mustard against sucking and gall insects – National Fund for Basic and Strategic areas of Research in Agriculture (NFBSFARA)
Collaboration with DRR, NRCPB and ICGEB.
- **Project:** ‘The role of bacterial endosymbionts in shaping the insect- virus relationship on *Bemisia tabaci* - National Fund for Basic and Strategic areas of Research in Agriculture(NFBSFARA)
Collaboration with Delhi University
- **Multi-institutional project** “Strategies to enhance adaptive capacity to climate change in vulnerable regions” funded by World Bank and Global Environment facility (GEF) under the auspices of NAIP (2009-2013);
Consortia partners: CMFRI, Mumbai; CRRI, Cuttack; OUAT, Bhubaneswar.
- **Climate change project** “National initiative on climate resilient agriculture (NICRA)’ (2010-2012, 2012-2017).
Collaboration: IARI, NCIPM, CRIDA, DRR, IIHR and other institutes.
- **ICAR Network project** “Impact, adaptation and vulnerability of agriculture to climate change” (2007-12).
Collaboration: The project was executed through IARI, CRIDA, CMFRI and IIHR and other institutes.
- **All India Coordinated Rice Improvement Project (AICRIP)** since 2006 and participated in Annual Group Meetings and discussions
- **‘National Extension Programme (NEP)** for disseminating improved cultivars and other technologies.
Collaboration: Scientist acts as a Nodal Officer for liaisoning with CSKHPKV, Palampur (HP)
- **Inter-institutional project**, “Expert System on wheat crop management”
Collaboration: Indian Agricultural Statistical Research Instt. (IASRI), New Delhi

International collaboration

- **Project** “Ensuring food security; harnessing science to project our grain harvest from insect threats”
Collaboration: Grand Challenge programme in Australia-India Strategic Research Fund (2012-15).
- **Project** “Crop Plants which remove their own major biotic constraints”-
Collaboration: Grand Challenge programme in Australia-India Strategic Research Fund (2012-15).

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

Nil

20. Research facility/centre with

State recognition

National Pusa Insect Collection

**National recognition**

- National Pusa Insect Collection
- Network Project on Insect Biosystematics (ICAR)
- National facility for insect rearing and xenobiotics-cum-transgenic bioassay (ICAR)

International recognition

Grand Challenge programme in Australia-India Strategic Research Fund (2012-15)

21. Special research laboratories sponsored by/created by industry or corporate bodies

Nil

22. Publications

	No. papers in peer reviewed journals (Nat./Internat.)	Mono-graphs	Book Chapters	Edited Books	Books with ISBN with details of publishers	Number listed in International Database	Citation Index – range/average	SNIP range / average	SJR range / average	Impact Factor–range/average	h-index
Chitra Srivastava	102	-	17	2	-	85	0-14 Total citations= 152			0-3.5	7.0
Subhash Chander	105	-	32	-	1 IARI, New Delhi, ISBN 81-88708-01-1	80	0-161/9.182 Total citations = 507	0-1.791	0-2.559	0-4.62/0.878	9.0
R.K. Sharma	72	-	10	1							
S. Subramanian	35	-	10	2							
D. Dey	70	-	15	1	ISBN 81-901384-1-3, Jyoti publishers New Delhi 12	80	Total citations=274	0-0.967	0-0.34	0-1.5	8
G.K. Mahapatro	55	-	7	3							
Kirti Sharma	70	-	9								
Bishwajeet Paul	23	-	8								
Vinay Kalia	56	-	8			25	231	0.436-1.337	0.27-1.1	0.67-2.743	8.0
K. Sreedevi	49	-	5	1	1 VDM Publishers Mauritius						
Sachin Suroshe	27	-	5	1	1, LAP, Germany		Total citation= 68			5.74	6



M.K. Dhillon	50	2	31	4	1	56	0-112/ 8.76 Total citation = 490	0.125 - 1.607	Q4- Q1	0.0-1.93	11.0
J.P. Singh	58	-	24	8							
Meshram Naresh	9	-	2				Total citation = 3				1
K. Shankarganesh	23	-	3	2			Total citation=5				
Nebapure Suresh M	4	-									
Shashank P.R.	7	-	1								2
Sagar D.	7	-									

Some of the important publication from 2009-2014

S.No.	Publications
NAAS Rating Above 9	
1.	Sujithra M., Chander S. 2013. Simulation of rice brown planthopper, Nilaparvatalugens population and crop-pest interactions to assess climate change impact. <i>Climatic Change</i> 121: 331-347, DOI 10.1007/s 10584-013-0878-1. (NAAS score = 10.62)
2.	Selvaraj, K. and Chander, S. 2015. Simulation of climatic change impact on crop-pest interactions: a case study of rice pink stem borer <i>Sesamia inferens</i> (Walker). <i>Climatic Change</i> 129 (1-2), DOI 10.1007/s 10584-015-1385-3. (IF = 10.62)
3.	Boomiraj K., Chakrabarti B., Aggarwal, P.K., Choudhary, R., Chander, S. 2010. Assessing the vulnerability of Indian mustard to climate change. <i>Agriculture, Ecosystems & Environment</i> 138: 265-273. (NAAS score = 9.20)
4.	Aggarwal N., Rajesh Kumar, Srivastava C., Dureja P. and. Khurana M.2010. Synthesis of nalidixic Acid based hydrazones as novel pesticides. <i>Journal of Agricultural and Food Chemistry</i> 58(5): 3056–3061. (NAAS score = 9.11)
Publication: NAAS Rating: 8-9	
5	Ashraf O. Abd El-Latif, B., Subrahmanyam B. 2010. Pyrethroid resistance and esterase activity in three strains of the cotton bollworm, <i>Helicoverpa armigera</i> (Hübner). <i>Pesticide Biochemistry and Physiology</i> 96 : 155–159. (NAAS score = 8.01)
6	Ashraf O. Abd El-Latif, B., Subrahmanyam B. 2010. Pyrethroid resistance and esterase activity in three strains of the cotton bollworm, <i>Helicoverpa armigera</i> (Hübner). <i>Pesticide Biochemistry and Physiology</i> 96 : 155–159. (NAAS score = 8.01)
7	Das T.K., Bhattacharyya R., Sudhishri S., A.R. Sharma, Y.S. Saharawat, K.K. Bandyopadhyay, S. Sepat, R.S. Bana, P. Aggarwal, R.K. Sharma, A. Bhatia, G. Singh, S.P. Datta, A. Kar, B. Singh, P. Singh, H. Pathak, A.K. Vyas and M.L. Jat. 2014. Conservation Agriculture in an irrigated cotton- wheat system of the western Indo- Gangetic Plains: Crop and water productivity and economic profitability. <i>Field Crops Research</i> . 158: 24-33. (NAAS score = 8.71)
8	Dhurua S., Gujar G.T. 2011. Field-evolved resistance to Bt toxin Cry1Ac in Pink bollworm, <i>Pectinophora gossypiella</i> (Saunders) (Lepidoptera: Gelechiidae) from India. <i>Pest Management Science</i> 67: 898-903. (NAAS=8.74)
9	Jacob S.R., Arunkumar M.B., Madhuban Gopal, Srivastava C., Sinha S.N. 2009. An analysis of the persistence and potency of film-coated seed protectant as influenced by various storage parameters. <i>Pest Management Science</i> 65(7): 817-822. (NAAS Score = 8.74)
10	Kumari P., Sashi Kant, Zaman Shazmira, Banerjee Nirupama Mahapatro GK, Neera Bhalla Sarin (2013). A novel insecticidal GroEL protein from <i>Xenorhabdus nematophila</i> confers insect resistance in tobacco, <i>Transgenic Research</i> , (DOI: 10.1007/s11248-013-9734-3). (NAAS score = 8.28)
11	Nair R., Kalia V., Aggarwal K.K. and Gujar, G.T. 2010. Inheritance of Cry1Ac resistance and associated biological traits in the cotton bollworm, <i>Helicoverpa armigera</i> (Lepidoptera: Noctuidae). <i>Journal of Invertebrate Pathology</i> 104:31-38. (NAAS Score = 8.60)
Publications > 6-8	
12	Abbaszadeh G, Srivastava C., Walia S. 2012. Insect growth inhibitory activity of clerodanoid terpenoids isolated from <i>Clerodendron infortunatum</i> L. on the cotton bollworm, <i>Helicoverpa armigera</i> (Hubner) <i>National. Academy of Science Letters</i> Volume 35 (5): 457-464 DOI 10.1007/s40009-012-0077-z (6.07)



13	Adak, T., Kumar, J., Dey, D., Shakil, N.A. and Walia, S. 2012. Residue and bio- efficacy evaluation of controlled release formulations of imidacloprid against pests in soybean (<i>Glycine max</i>). <i>Journal of Environmental Science and Health, Part B</i> 47(3): 226-231(NAAS Score = 7.21)
14	Akhtar M.S., Ramamurthy V.V. 2011. A new species of <i>Habrobracon</i> Ashmead (Hymenoptera: Braconidae) with notes on Indian species. <i>Oriental Insects</i> 45 (2-3): 194-201(NAAS score =6.17)
15	Akhtar M. S. Khan F. R., Ramamurthy, V. V. 2011. Description of new species of the genus <i>Ephedrus</i> (Hymenoptera: Braconidae: Aphidiinae) from India with an up to date checklist. <i>Pan Pacific Entomologist</i> 87 (2): 98-105. (NAAS score =6.39)
16	Asokan R., Rebijith K.B., Singh S. K. , Sidhu, A.S., Karanth, Siddharthan, S. 2011. Praveen K. Ellango, R and Ramamurthy, V.V. Molecular identification and phylogeny of <i>Bactrocera species</i> (Diptera: Tephritidae). <i>Florida Entomologist</i> 94 (4): 1026-1035. (NAAS score =7.16)
17	Andrew J.P., Ramamurthy V.V. 2010. A checklist of weevils of the tribe Mecysolobini (Coleoptera: Curculionidae: Molytinae). <i>Oriental Insects</i> , 271-336. (NAAS score =6.17)
18	Chamarthi S.K., Sharma, H.C., Sahrawat, K.L., Narasu, L.M.,Dhillon, M.K. 2011.Physico-chemical basis of resistance to shoot fly, <i>Atherigonasocatain</i> sorghum, <i>Sorghum bicolor</i> . <i>Journal of Applied Entomology</i> 135(6): 446-455. (NAAS Rating: 7.56)
19	Dhillon M.K., Davis, R., Sharma, H.C. 2013. Expression of <i>cry</i> genes from <i>Bacillus thuringiensis</i> : Influence on biochemical composition of transgenic cotton. <i>Indian Journal of Agricultural Sciences</i> 83: 1388-1391. (NAAS : 6.00)
20	Dhillon, M.K., Pampapathy, G., Wadaskar, R., Sharma, H.C. 2012. Impact of <i>Bt</i> -transgenic cottons and insecticides on target and nontarget insect pests, natural enemies and seed cotton yield in India. <i>Indian Journal of Agricultural Sciences</i> 82(3): 248-254. (NAAS Rating: 6.00)
21	Dhillon M.K., Sandeep Kumar, Gujar, G.T 2014. A common HPLC-PDA method for aminoacid analysis in insects and plants. <i>Indian Journal of Experimental Biology</i> 52:73-79. (NAAS : 7.20)
22	Dhillon, M.K., Sharma, H.C. 2010. Chickpea mediated effects of <i>Bacillus thuringiensis</i> on <i>Helicoverpa armigera</i> and its larval parasitoid, <i>Campoletischloridae</i> . <i>Journal of Applied Entomology</i> 134: 682-693. (NAAS Rating: 7.56)
23	Dhillon M.K., Sharma, H.C. 2011. Effect of mating and parasitism regimes on certain biological parameters of <i>Campoletischloridae</i> . <i>Indian Journal of Experimental Biology</i> 49: 786-790. (NAAS Rating: 7.2)
24	Dhillon M.K., Sharma, H.C. 2013. Comparative studies on the effects of <i>Bt</i> -transgenic and non-transgenic cotton on arthropod diversity, seed cotton yield and bollworms control. <i>Journal of Environmental Biology</i> 34: 67-73. (NAAS: 6.68)
25	Fand B.B., Gautam R.D, Suroshe S. 2010. Suitability of various stages of mealybug, <i>Phenacoccusolenopsis</i> (Homoptera: Pseudococcidae) for development and survival of the solitary endoparasitoid, <i>Aenasiusbambawalei</i> (Hymenoptera: Encyrtidae). <i>Biocontrol Science and Technology</i> 21 (1): 51-55(NAAS Score = 6.71)
26	Gautam R.D., Suroshe S. and Mahapatro G.K. 2009.Unique record of chloropid pest in rice (<i>Oryza sativa</i>). <i>Indian Journal of Agricultural Sciences</i> 79 (10): 841-843. (NAAS score = 6.00)
27	Gorashi, N.E., Tripathi, M., Kalia, V. and Gujar, G.T. 2014. Identification and characterization of the Sudanese <i>Bacillus thuringiensis</i> and related bacterial strains for their efficacy against <i>Helicoverpa armigera</i> (Lepidoptera: Noctuidae) and <i>Triboliumcastaneum</i> (Coleoptera: Tenebrionidae). <i>Indian J. Exp. Biol.</i> 52: 637-649. (NAAS score = 7.20)
28	Gotyal B.S.,Srivastava C., Suresh Walia, S K Jain and D S Reddy 2010. Efficacy of wild sage <i>Lantana camara</i> extracts against <i>Cadacauteilla</i> in stored wheat seeds <i>Indian Journal of Agricultural Sciences</i> 80 (5): 433-36. (NAAS score = 6.00)
29	Gupta S., V.T. Gajbhiye, R.K. Sharma and R.K. Gupta 2010. Dissipation of cypermethrin, chlorpyrifos and profenophos in tomato fruits and soil following application of pre- mix formulations. <i>Environment Monitoring Assessment</i> DOI 10.1007/s 10661-010-1461-0. (NAAS score = 7.59)
30	Halder J., Srivastava C., Prem Dureja 2010.Effect of methanolicextracts of sadabahar, <i>Vincarosea</i> and bottlebrush, <i>Callistemonla nceolatus</i> alone and their mixtures against neonate larvae of gram pod borer (<i>Helicoverpa armigera</i>). <i>Indian Journal of Agricultural Sciences</i> 80 (9):820-823. (NAAS score = 6.18)
31	Halder J.,Srivastava C., Swaran Dhingra, Premdureja 2012 Effect of essential oils on feeding, survival, growth and development of third instar larvae of <i>Helicoverpa armigera</i> Hubner <i>National Academy of Science. Letters</i> , 2012,DOI: 10.1007/s40009-012-0043-9(NAAS=6.07)
32	Jha, A.N. Srivastava, C., Naresh Chandra 2011. Screening of greengram (<i>Vignaradiata</i>) cultivars to three species of pulse beetle (<i>Callosobruchussp</i>) <i>Indian J Agri. Sci.</i> (3):87-90. (NAAS = 6.00)
33	Kalaisekar A. Ramamurthy, V. V., Patil, J. V., Dhandapani, A., Azad Thakur N. S. 2012. Multivariate morphometrics of elytralcolour polymorphism in seven-spotted ladybird beetle, <i>Coccinellaseptempunctata</i> L. (Coleoptera: Coccinellidae). <i>Current Science</i> . 102, No.10, 25: 1418-1425. (NAAS =6.91)
34	Kalia V., Sharma G., Shapiro-Ilan D. I., Ganguly S. 2014. Biocontrol potential of <i>Steinernemathermophilum</i> and its symbiont <i>Xenorhabdusindica</i> against lepidopteran pests: virulence to egg and larval stages. <i>Journal of Nematology</i> 46:18-26. (NAAS score=6.0)



35	Krishna Reddy P, Sharma K., Singh S. 2014. Attractancy potential of culturable bacteria from the gut of peach fruit fly, <i>Bactrocera zonata</i> (Saunders). <i>Phytoparasitica</i> 42:691–698 (NAAS = 6.72)
36	Kumar, J., Nisar, K, Dey, D., Shakil, N.A, Pankaj, Walia, S. 2010. Field appraisal of slow release formulations of acephate against the mustard aphid, <i>Lipaphis erysimi</i> . <i>Indian J. Agric. Sciences</i> .80(7): 636-639.(NAAS score = 6.18)
37	Kumar, J., Shakil, N.A., Chander, S., Walia, S., Shukla, L. and Parmar, B.S. 2010. Field appraisal of controlled release formulations of cartap hydrochloride against rice leaf folder (<i>Cnaphalocrocis medinalis</i>). <i>Indian Journal of Agricultural Sciences</i> 80(5):405-408. (NAAS score = 6.18)
38	Kumar M.K., Srivastava C. 2010. Interaction of gamma radiation and deltamethrin on resistant and susceptible strain of <i>Trogoderma granarium</i> . <i>Indian Journal of Agricultural Sciences</i> 80 (12):60-63 (NAAS score = 6.18)
39	Kumar P., Singh, S. Dutta, D., Singh, N. Sharma, G., Ganguly, S., Kalia, V., Nain, L. 2013. Extracellular novel metalloprotease from <i>Xenorhabdus indica</i> and its potential as an insecticidal agent. <i>Journal of Microbiology and Biotechnology</i> pp. 1-20, http://DOI: 10.4014/jmb.1306.06062 (NAAS score= 7.4]
40	Kumelachew M. L., Najam A. Shakil, Jitendra Kumar , Manish K. Singh, Chitra Srivastava 2012. Bio-efficacy evaluation of nanoformulations of β -cyfluthrin against <i>Callosobruchus maculatus</i> (Coleoptera: Bruchidae) <i>Journal of Environmental Science and Health, Part B</i> (2012) 47, 687–691 (NAAS =7.21)
41	Lodha ML, Choudhary NL, Mahapatro GK, Singh B, Gupta GP. 2011. Purification and evaluation of antiviral proteins from <i>Bougainvillea xbutiana</i> , against <i>Helicoverpa armigera</i> (Hübner). <i>Indian J. agric. Sci.</i> 81(1): 74-78. (NAAS score = 6.18)
42	Mahapatro GK, Panigrahi M. 2013. The case for banning endosulfan. <i>Current Science</i> , 104 (11): 1476-1479. (NAAS score: 6.91]
43	Mahapatro GK, Panigrahi M. 2014. Endosulfan issue: science versus conscience. <i>Current Science</i> , 106 (2): 152-155. (NAAS score: 6.91]
44	Mahapatro GK, Kumar S. 2013. Reporting first time <i>Heterotermes indicola</i> (Isoptera: Rhinotermitidae) from Delhi. <i>Indian J. agric. Sci.</i> 83(4): 459-462.(NAAS score:6.18)
45	Menon P., R. Ocha G. Bauchan, Joshi S., Ramamurthy V.V. 2011. A new genus and species <i>Mangalauzbekapus</i> (Acari: Eriophyidae) from India. <i>International Journal of Acarology</i> 37 (2): 131-142. (NAAS score = 6.55)
46	Menon P., Joshi S., Mohammad Hussain, V. V. Ramamurthy V.V. 2011. A new species of <i>emipteroeseius</i> (Acari: Otopheidomenidae) on <i>Dysdercus</i> from India. <i>Zootaxa</i> 2800: 53-63. (NAAS score = 6.97)
47	Meshram N.M. 2014. Three new species of the genus <i>Scaphoideus</i> (Hemiptera: Cicadellidae) with notes on the female of <i>Scaphoideus varna</i> from India. <i>Zootaxa</i> , 3754 (2): 185–194. (NAAS score = 6.97)
48	Meshram N.M., Ramamurthy V.V. 2012. A new deltocephaline species of genus <i>Scaphoideus</i> (Hemiptera: Cicadellidae: Athysanini) with redescription of <i>Scaphoideus harlanif</i> from India. <i>Oriental Insects</i> 46 (2): 153-162.(NAAS score = 7.16)
49	Meshram N.M., Ramamurthy, V.V. 2012. Description of new species of the genus <i>Krisna</i> (Hemiptera: Cicadellidae: Iassinae) from India. <i>Florida Entomologist</i> . 95(2): 374-380.(NAAS score = 7.16)
50	Meshram N. M., Ramamurthy V. V. 2013. Description of a new evacanthine leafhopper species <i>Sophonia chandrai</i> sp. nov., with new record of <i>Chudania axona</i> (Hemiptera: Cicadellidae) from India. <i>Zootaxa</i> , 3717 (2): 224–230. (NAAS score= 6.97)
51	Mittal A, Kansal, R, Kalia, V. Tripathi, M., Gupta, V.K. 2013. A kidney bean trypsin inhibitor with an insecticidal potential against <i>Helicoverpa armigera</i> and <i>Spodoptera litura</i> . <i>Acta Physiologiae Plantarum</i> .(Nov 15, 2013) pp. 1-17, http://DOI 10.1007/s11738-013-1433-4 . (NAAS score = 7.21)
52	Nair R., Kalia V., Aggarwal K.K., Gujar G.T. 2013. Variation in the cadherin gene sequence of Cry1Ac susceptible and resistant <i>Helicoverpa armigera</i> (Lepidoptera: Noctuidae) and the identification of mutant alleles in resistant strains. <i>Current Science</i> 104(2): 215-223. (NAAS score = 6.91)
53	Parveen, S., Khokhar, S., Usmani, M. K., Ramamurthy, V.V. 2010. Bionomics of <i>Scutelleraperplexa</i> (Hemiptera: Scutelleridae) a sucking pest of <i>Jatropha</i> with description of immature stages. <i>Entomological News</i> 121 (5): 401-408. (NAAS score = 6.0)
54	Paul B., Paul S., Khan S.A. 2011. A potential economical substrate for large-scale production of <i>Bacillus thuringiensis</i> var. <i>kurstaki</i> for caterpillar control. <i>Biocontrol Sci. Tech.</i> 21(11): 1363-1368. (NAAS score = 6.71)
55	Paul S., Paul B., Khan M. A., Aggarwal C., Thakur J.K., and Rathi M.S. 2013. Effects of lindane on lindane-degrading <i>Azotobacter chroococcum</i> ; evaluation of toxicity of possible degradation product(s) on plant and insect. <i>Bull. Environ. Contam. Toxicol.</i> 90(3): 351-356. (NAAS score = 7.11)
56	Prasannakumar N.R., Chander S. 2014. Weather-based brown planthopper prediction model at Mandya, Karnataka. <i>J. Agrometeorology</i> 16 (1): 126-129. (NAAS score = 6.15)
57	Prasannakumar, N.R., Chander, S., Pal, M. 2012. Assessment of impact of climate change with reference to elevated CO ₂ on rice brown planthopper, <i>Nilaparvatalugens</i> (Stal.) and crop yield. <i>Current Science</i> 103 (10): 1201-1205. (NAAS score = 6.91)



58	Prasannakumar, N.R., Chander, S., Sahoo, R.N. 2013. Characterization of brown planthopper damage on rice crop through hyper spectral remote sensing under field condition. <i>Phytoparasitica</i> 42: 387-395, DOI 10.1007/s12600-013-0375-0. (NAAS rating = 6.72)
59	Prasannakumar, N.R., Chander, S., Sahoo, R.N. and Gupta, V.K. 2013. Assessment of brown planthopper (<i>Nilaparvatalugens</i>) damage in rice using hyper-spectral remote sensing. <i>International J. Pest Management</i> 59 (3): 180-188, DOI: 10.1080/09670874.2013.808780. (NAAS score = 6.72)
60	Ramesha B. and V.V. Ramamurthy 2011. A study on the <i>Baris</i> from India (Coleoptera: Curculionidae). <i>Oriental Insects</i> 45(4): 304-392. (NAAS score = 6.17)
61	Ramesha B., Ramamurthy V.V. 2012. The genus <i>Mecobaris</i> Marshall (Coleoptera: Curculionidae: Baridinae) from India with description of one new species. <i>Pan Pacific Entomologist</i> 88(1):22-34. (NAAS= 6.39)
62	Ramesha B., Subrahmanyam B., Srinivasan, IM Santha. 2012. In vivo and in vitro effect of <i>Acacia nilotica</i> seed proteinase inhibitors on <i>Helicoverpa armigera</i> (Hübner) larvae. <i>Journal of Biosciences</i> 37 (2): 269-276 (NAAS = 7.76)
63	Reji G., Chander S., Kamble K. 2014. Predictive zoning of rice stem borer damage in southern India through spatial interpolation of weather-based models. <i>J. Environmental Biology</i> 35: 923-928. (NAAS score = 6.68)
64	Shahnawazul I., S. Kundu, Jag Shoran, N. Sabir, Sharma, Kirti, Farooqi, Samir, Singh, R., Agarwal, H.O., Chaturvedi, K.K., Sharma, R.K. and Sharma, A.K. (2012) Selection of wheat (<i>Triticum aestivum</i>) variety through expert system. <i>Indian J Agri. Sci</i> 82 (1): 39-43. (NAAS score = 6.18)
65	Shakil N.A., Pandey A., Singh M.K., Jitendra Kumar, Awasthi S.K., Pankaj, Srivastava C., Singh M.K., Pandey R.P. > 2010. Synthesis and bioefficacy of new 3-substituted-3,4-dihydro-1,3-benzoxazines <i>Journal of Environmental Science and Health, Part B</i> , 45: (2) 108-115. (NAAS score = 7.21)
66	Shanas S., Ramamurthy V.V. 2009. A Study on the Oriental weevil genus <i>Episomus</i> (Coleoptera: Curculionidae). <i>Oriental Insects, USA</i> 43: 77-154. (NAAS= 6.17)
67	Shanika J, Thomas A., Kar A., Ramamurthy V.V. 2010. Host correlated morphometric variations in the populations of <i>Bemisia tabaci</i> (Gennadius) (Hemiptera: Aleyrodidae). <i>Oriental Insects, USA</i> 44: 193-204. (NAAS= 6.17)
68	Shelton A. M., Gujar G.T., Chen M., Rauf A. Srinivasan R, Kalia V., A. Mittal, Russell, D., Wu, Y., and Uijtewaal, B. 2009. Assessing the susceptibility of cruciferous lepidoptera to cry1ba2 and cry1ca4 for future transgenic cruciferous vegetables. <i>J. Econ. Entomol.</i> 102(6): 2217-2223 (NAAS score = 7.6)
69	Singh S.K., Ramamurthy V.V. 2010. Chorionic microsculpturing as a diagnostic character for species identification of fruit flies (Diptera: Tephritidae). <i>Entomological News</i> 121(1): 91-94. (NAAS score = 6.00)
70	Selvaraj K., Chander S., Prasannakumar N.R. 2014. Determination of thermal constant and development threshold of pink borer, <i>Sesamia inferens</i> Walker. <i>Proceedings National Academy Sciences, India Section B: Biological Sciences</i> : DOI 10.1007/s40011-014-0348-1. (NAAS score = 6.0)
71	Selvaraj, K., Chander, S., Sujithra, M. 2012. Determination of multi-species economic injury levels for rice insect pests. <i>Crop Protection</i> 32: 150-160. (NAAS score = 7.3)
72	Shankarganesh K, Paul B., Gautam, R.D, 2013. Studies on ecological safety of insecticides to egg parasitoids, <i>Trichogramma chilonis</i> Ishii and <i>Trichogramma brasiliensis</i> (Ashmead), <i>National Academy Science Letters – India</i> , 36(6):581–585. (NAAS score: 6.07)
73	Sridhar J, Sharma K. 2013. Effect of different combinations of antimicrobial agents on biological fitness and fecundity of tobacco caterpillar (<i>Spodopteralitura</i>) (Lepidoptera: Noctuidae) reared on meridic diet. <i>Indian Journal of Agricultural Sciences</i> : 83: 708-716. (NAAS score = 6.18)
74	Srivastava, C., Chander, S., Sinha, S.R., Palta, R.K. 2009. Toxicity of various insecticides against Delhi and Palla populations of brown plant hopper (<i>Nilaparvatalugens</i>). <i>Indian Journal of Agricultural Sciences</i> 79(12): 1003-1006. (NAAS score = 6.18)
75	Sujithra, M., Chander, S., Selvaraj K. 2011. Simulation of rice brown planthopper (<i>Nilaparvatalugens</i> (Stal)) damage for determining economic injury levels. <i>J. Sci. Ind. Res.</i> 70(5): 338-345. (NAAS rating = 6.51)
76	Upadhyay A., Madhuban Gopal, Srivastava C., Pandey N.D. 2010. Isoxazole derivatives as a potential insecticide for managing <i>Callosobruchus maculatus</i> . <i>Journal of Pesticide Sciences</i> 35(4): 464-469. (NAAS rating = 6.69)
77	Yadav D.S., Chander, S. 2010. Simulation of rice planthopper damage for developing decision support tools. <i>Crop Protection</i> 29: 267-276. (NAAS score = 7.3)
78	Yadav D.S., Chander, S., Selvaraj, K. 2010. Agro-ecological zoning of brown planthopper (<i>Nilaparvatalugens</i>) incidence on rice (<i>Oryza sativa</i>). <i>J. Sci. Ind. Res.</i> 69: 818-822. (NAAS score= 6.51)
79	Verghese A., Kamala Jayanthi P.D., Sreedevi K. Sudha Devi K., Pinto, V. 2013. A quick and non-destructive population estimate for the weaver ant, <i>Oecophylla smaragdina</i> Fab. (Hymenoptera :Formicidae). <i>Current Science</i> , 104(5):641-646. (NAAS rating = 6.91)
80	Verghese A., Shivananda T. N., Kamala Jayanthi P.D., Sreedevi K. 2013. Frank Milburn Howlett (1877-1920) : discoverer of the Pied Piper's lure for the fruit flies (Tephritidae : Diptera). <i>Current Science</i> , 105 (2): 260-262. (NAAS score = 6.91)



23. Details of patents and income generated

Patents Filed/granted

1	Novel naphthyridine based hydrazines as patent agrochemicals. Rajesh Kumar. N aggrawal, Chitra Srivastava, J M Khurana and P Dureja (2010). Patent application No 2964/DEL/2005. Filed 13.12.2010
2	Samfungin: A novel fungicide and the process for the making same. Madhuban Gopal, S C Roy, M Ghose, R Dasgupta, C Devakumar, B Subrahmanyam, Chitra Srivastava, R Gogoi, Rajesh Kumar and A Goswami (2010). Patent application No. 1599/DEL/2011.
3	Nanoencapsulated hexaconazole: A novel fungicide and the process for making the same. Madhuban Gopal, S C Roy, I Roy, S Pradhan, Chitra Srivastava, R Gogoi, Rajesh Kumar and A Goswami (2010). Patent submitted to ITMU, IARI, New Delhi vide letter No. AC/2010/705 dated 08/10/2010

24. Areas of consultancy and income generated (Contract Research)

Consultancy Area	Income generated
CryIAc resistance inheritance and assessment of fitness costs in Pink bollworm, <i>Pectinophora gossypiella</i> (Lepidoptera: Gelechiidae)	Rs. 9. 92319 Lakh
Evaluation of <i>Bt</i> transgenic cabbage events against three important insect pests, <i>Plutella xylostella</i> , <i>Spodoptera litura</i> and <i>Helicoverpa armigera</i> "	Rs.9. 89965 Lakh
Consultancy project funded by NATCOM Impact Assessment of climate change on major crops and integrated vulnerability assessment of agriculture in India, 2010	Rs. 20.2248 lakh

25. Faculty selected nationally/internationally to visit other laboratories/institutions /industries in India and abroad

Name	Institutions and Industries Visited
Dr. G.T. Gujar	Germany to attend 'Annual meeting of Society of Invertebrate Pathology, 2013 Australia under Indo-Australian Project 2013. China, 9th International Colloquium on Invertebrate pathology and Control (ICIIPMC), 27. Aug.- 1 Sept. 2006
Dr. Chitra Srivastava	Joint workshop under Australia-India Strategic Research Fund (AISRF), University of Queensland and Dept. Agriculture Australia, 26 April 2014 to 04 May 2014
Dr. Subhash Chander	Great Plains Systems Research Unit (USDA), Fort Collins, Colorado, USA from 15th April-14th July 2003 (3 months) for training on' under NATP ToE sub-project 'Crop Modelling'. 'Centre de Cooperation Internationale en Recherche Agronomique pour le Development (CIRAD)', France from December 13-30, 2000 for training.
Dr. S. Subramanian	Dr. S. Subramanian attended Joint workshop under Australia-India Strategic Research Fund (AISRF), University of Queensland and Dept. Agriculture Australia, 26 April 2014 to 04 May 2014
Dr. Vinay Kalia	Australia under Indo-Australian Project, 2013.
Dr. M.K. Dhillon	Environmental Risk Assessment Workshop on 'Non-target Organism Testing', Iowa, USA, 23-27 June 2014
Dr. R.D. Gautam	Ethiopia through USAID IMPM CRSP Project, 3 Sept. – 2 Oct. 2006

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. G.T. Gujar	Research Advisory & Monitoring Committee (RAMC) for BSI & ZSI, 2007 Member of Academic Council of Marathwada Agric. Univ., Parbhani	Chief Editor of Indian Journal of Entomology 2008 Editor , J. Entomology & Nematology 2008	
Dr. V.V. Ramamurthy	-	Chief Editor of Indian Journal of Entomology	Joint Secretary, Entomological Society of India, 2009-2014



Dr. Subhash Chander	Member of Doctoral Committee of the Life Sciences, IGNOU, New Delhi , 2012, 2013, 2014 Selection Committee for Scientists, FRI, Dehradun, 2014	Member Editorial Board of India Journal of Horticulture 2014	Joint Secretary, Entomological Society of India, 2014-2019
Dr. Chitra Srivastava	Vice- President, Society of Pesticide Science, New Delhi, 2013		
Dr. G.K. Mahapatro		Editorial Core Committee of Indian Journal of Entomology	
Dr. J.P. Singh		Editorial Core Committee of Indian Journal of Entomology	
Dr. Prem Kishore	Panel Member and Hindi consultant of Commission for Scientific & Technical Terminology, HRD, Govt. of India, 2004		

27. Faculty recharging strategies (UGC, ASC, Refresher/orientation programs, workshops, training programs and similar programs).

- Faculty members attend training programmes such as Summer Schools, Winter Schools, Workshops, Seminar, Symposia etc.
- During last 15 years Faculty members have attended about 127 Seminars/symposia, 62 Scientific meetings, 37 Workshops and 20 training programmes.
- Organized 3rd K.M. Singh Memorial Award on 13.3.09 in which Dr. L.K. Hazarika, Dean, Agriculture, AAU, Jorhat delivered an award lecture.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

100%

All the students do their dissertation in the department. In M. Sc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities /industry/ institute

Nil

29. Awards/recognitions received at the national and international level by

a) Faculty:

Name	Awards/Recognitions
Dr. B. Subramanyam	Bharatratna Dr. C. Subramanyam award for outstanding teachers' award" of the ICAR for the biennium 2002-2003 for his contribution to post-graduate teaching IARI Best Teacher Award Elected Fellow of Entomological Society of India, New Delhi, 2008
Dr. Prem Kishore	Dr. Rajendra Prasad Award for Technical Book in Hindi in the Field of Agriculture 1999-2000, ICAR Panel Member and Hindi consultant of Commission for Scientific & Technical Terminology, HRD, Govt. of India, 2004 Ist Prize and Certificate for Best article in Hindi, IARI, New Delhi, 2004
Dr. Chitra Srivastava	IARI Best Teacher Award 2007 Elected SPPS Fellow of SPPS, New Delhi



Dr. Subhash Chander	Sukumar Basu Memorial Award, 2011, IARI, New Delhi IARI Best Teacher Award 2007 Meritorious Scientists Award of SPPS, New Delhi, 1997 Nominated Doctoral Committee Member, School of Sciences, IGNOU, New Delhi, 2012, 2013, 2014 Elected Fellow of Entomological Society of India, New Delhi, 2008 Elected Fellow SPPS, New Delhi
DR. R.D. Gautam	IARI Best Teacher Award 2009 Dr. R.P. Srivastava Memorial National Award 2007
Dr. G.T. Gujar	Delivered Dr. D. Saharia Memorial lecture, Assam Agric. Univ., Jorhat Prof. K.P. Kushwaha Memorial Medal, Awarded by MPUAT, Udaipur, 2009
Dr. V.V. Ramamurthy	IARI Best Teacher Award Elected Fellow of Entomological Society of India, New Delhi, 2008
Dr. A.V.N. Paul	National Fellow Project for two terms during 2000-2005 and 2005 - 2010).
Dr. G.K. Mahapatro	National Fellow Project, ICAR, 2011 Bharat Jyoti Award, 2011, India International Friendship Society (IIFS), New Delhi Best Poster Award 2012, 2nd International Science Congress ISCA-2012 Fellow of Entomological Society of India, New Delhi, 2008
Dr. N. Ramakrishnan	National Fellow project, 1985
Dr. K. Sreedevi	Jagdiswari Rao Women Scientist Award, 2013, AZRA, CRRI, Cuttack
Dr. Kirti Sharma	Team Award -'The Manthan Award for South Asia 2009' for "Expert System on wheat crop management in e-learning category
Dr. Vishwa Nath	Elected Fellow SPPS, New Delhi
Dr. Debjani Dey	Elected Fellow of Entomological Society of India, New Delhi, 2008
Dr. M.K. Dhillon	Fellow, The Academy of Environmental Biology, Lucknow, 2014
Dr. Sachin Suroshe	Best poster Award Nat. Seminar on "Pomegranate, ICAR-NRC on Pomegranate, Solapur, 2014
Dr. Naresh Meshram	Best poster award Nat. Symposium on Entomology, COHF Pasighat, Arunachal Pradesh, 2014
Dr. K. Shankarganesh	Fellow Society for Biocontrol Advancement, Bengaluru , 2014

Doctoral / post-doctoral fellows

Nil

Students

Name	Awards/Recognitions
Dr. Joseph Rajkumar	Jawahar Lal Nehru Award (ICAR) for outstanding Ph.D. research 2007
Dr. Baba Sahab Fand	Jawahar Lal Nehru Award (ICAR) for outstanding Ph.D. research 2012
Dr. Berin Pathrose	IARI Merit Medal in Ph.D., 2008
Dr. G. Abbaszadeh	IARI merit medal in Ph.D., 2012
Achntya Pramanik	IARI merit medal in M.Sc., 2012
Dr. Prasannakumar N.R.	Guru Pradhan Memorial Medal in Ph.D. (Entomology), 2013
Guru Pirasanna Pandi	Best Poster Award, National Symposium on IPM for sustainable crop protection, 24-25 Feb. 2015



30. Seminars/Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Seminar/Conference/Workshops	Source of Funding	Details of participants
National symposium on Frontier Areas of Entomological Research, ESI and Entomology Division, 5-7 Nov. 2003	Entomological Society of India	200 Entomologists from all over India
National symposium on “Integrated Pest Management for Sustainable crop Protection”, 24-25 February 2015.	Sponsored by Association of Biotech Led Enterprises (ABLE)	100 scientists and students
National Training Course on ‘Integrated Pest Management for Sustainable Agricultural Development’ held during March 6-17, 1999	Directorate of Extension, DAC, GOI, New Delhi	25 participants (Assistant Professors and Subject Matter Specialists)
National Training Course on ‘Modern Trends in Insect Pest Management’ held during February 28- March 6, 2000	Directorate of Extension, DAC, GOI, New Delhi	22 participants (Assistant Professors and Subject Matter Specialists)
ICAR-IARI Summer School on ‘Alternate strategies for insect pest management in major crops’ held during June 11-July 2, 2001	ICAR	24 participants (Assistant Professors, Scientists, Senior Scientists)
ICAR-IARI Winter School on ‘New vistas in biological control of insect pests and weeds’ held during 4-24 September, 2001\	ICAR	24 participants (Assistant Professors, Scientists, Senior Scientists)
NATP sponsored training “Microbial Control of Insect Pests: Constraints, Current Developments and Perspectives in Integrated Pest Management” January 19 to February 8, 2004.	ICAR	24 participants (Assistant Professors, Scientists, Subject matter specialists)
Short Term Certificate Course on “Biological Software and Rural Technologies” from 1 st November to 31 st December, 2004 sponsored by Post Graduate School, Indian Agricultural Research Institute, New Delhi – 110012.	IARI	20 participants
NATP sponsored Short Term Course on “Entrepreneurship development in mass production and use of biological control agents in agriculture systems” from 16 th November to 15 th December, 2004.	ICAR	20 participants
Training on “Mass production technologies for natural enemies of crop pests” for 20 participants, 24 Nov. - 01 Dec., 2014	Sponsored by Directorate of Extension, DAC, Ministry of Agriculture, GOI,	20 Scientists and Subject matter specialists
Training of delegation from Sri Lanka to IARI under ICAR-CARP Srilanka work plan for the year 2003-04	ICAR-CARP	4 Scientists from Sri Lanka
Individual training to Ms. Elizabeth Bandason from Malawi, CV Raman International Fellowship for African Researcher, Oct. 2013-Jan. 2014 (5 months)	CV Raman Fellowship	One Scientist from Malawi
Individual training to Mr. Moses from Tanzania under CV Raman International Fellowship for African Researcher Sept. 2014-Jan. 2015	CV Raman Fellowship	One Scientist from Tanzania
Subject matter training on ‘Crop Protection’ for 4 scientists from Islamic Republic of Afghanistan, Dec. 2013-Jan. 2014	ICAR	4 scientists from Islamic Republic of Afghanistan

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standard

Emphasis is on undertaking of original research after thorough review of literature.

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	2	-	-
Ph.D.	127	6	2	4.72	1.57



33. Diversity of students

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	2	-	-
Ph.D.	127	6	2	4.72	1.57

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise. (last 5 years)

Civil Services	:	1
NET	:	All the student qualify ICAR-NET
ARS	:	30
SAUs	:	2

Almost all M.Sc. qualify All India competitive examination for Ph.D. with fellowship.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG programme in the Division
PG to M.Phil.	No M.Phil programme in the Division
PG to Ph.D.	75%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few also go abroad for post doc.
Employed	Nil 100%
Campus selection	
Other than campus recruitment	
Entrepreneurs	Nil

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	Nil
From other universities within the state	5%
From universities from other States from	95%
Universities outside the country	Nil

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

Nil

38. Present details of departmental infrastructure facilities with regard to

- Library:
One Divisional library, besides Central Library
- Internet facilities for staff and students:
Every laboratory/class room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: One
- Student's laboratories: One
- Research laboratories: 15

39. List of doctoral, post-doctoral students and Research Associates

a) from the host institution/university

Ph.D. students (M.Sc. from IARI, New Delhi)

Pratap Divekar

Soumia P.S.

Guru Pirasanna

Shah Vivek

Shivaji Thube

Asish Kumar Rout

Mohd. Muzeruddin Baig

Yogesh Yele

Namita Poddar

Veeranna D.

b) from other institutions/universities

S.No.	Name of the M. Sc. student	University of Graduation
1.	Dileep Kumar	UAS Bengaluru
2.	Mandla Rajsekhar	ANGRAU Hyderabad
3.	Srinivasan N.	UAS Bengaluru
4.	Archana Anokhe	ANGRAU Tirupati
5.	Ramya N.	UAS Bengaluru
6.	Laneesha M.	Kerala Ag. Univ, Vellayani
7.	Vinod Kumar P.	ANGRAU Hyderabad
8.	Sourav Sarkar	BCKV, Mohanpur, West Bengal

S.No.	Name of the Ph.D. student	University of Master Degree
1.	Kennedy N.	TNAU, Coimbatore
2.	Mahendran B.	GBPUAT Pantnagar
3.	Ramya R.S.	TNAU, Coimbatore
4.	Kailash C. Naga	SKRAU, Bikaner
5.	Jilu V.Sajan	AAU Anand
6.	Lokesh Kumar Meena	BHU, Varanasi
7.	Sunil Kumar Yadav	GBPUAT, Pantnagar
8.	Rakesh Kumar	CSAUAT, Kanpur
9.	Joni Kumar	GBPUAT, Pantnagar
10.	Mohammad Mustafa	CSKHPKV, Palampur
11.	Golive Prasanthi	UAS, Bengaluru
12.	Gugulotu Laxman	ANGRAU, Hyderabad



RAs/SRFs

S.No.	Name	Designation	Qualification	Host/other institute/ university
1.	Mazhar Husain	SRF	M.Sc.	Other University
2.	Vishwapal	SRF	M.Sc.	Other University
3.	Dr. Sachin Kumar	RA	Ph.D.	Other University
4.	K.S. Roni	SRF	M.Sc.	Other University
5.	Shama Parveen	SRF	M.Sc.	Other University
6.	Ms. Sakshi Tyagi	SRF	M.Sc.	Other University
7.	Ms. Salam Rita Devi	SRF	M.Sc.	Other University
8.	Tahseen Raya Hashmi	SRF	M.Sc.	Other University
9.	N. Subash Chander Bose	SRF	M.Sc.	Other University
10.	Ms. Nidhi Sanwal	SRF	M.Sc.	Other University
11.	Tarun Kumar	SRF	M.Sc.	Other University
12.	Ms. Monika Singh	SRF	M.Sc.	Other University
13.	S. Kulanthaivel	SRF	M.Sc.	Other University
14.	Shan Thomas	SRF	M.Sc.	Other University
15.	Naveen	SRF	M.Sc.	Other University
16.	Rahul Chandel	SRF	M.Sc.	Other University
17.	Vimal Kumar Dwivedi	SRF	M.Sc.	Other University
18.	Aditya Kumar Tanwar	SRF	M.Sc.	Other University
19.	Ms. Alka Panwar	SRF	M.Sc.	Other University
20.	Ms. Tanu sethi	SRF	M.Sc.	Other University
21.	Praful	SRF	M.Sc.	Other University
22.	Mrs. Surabhi Gupta	SRF	M.Sc.	Other University
23.	Ms. Neha Paliwal	SRF	M.Sc.	Other University
24.	Ms. Swati	SRF	M.Sc.	Other University
25.	Amar Pal Singh	SRF	M.Sc.	Other University

Post-doctoral Fellow:

Dr Mala Misra, Post-Doctoral Fellow, UGC, PDFWM-2013-14, Microbiology & Entomology, 2014-19

40. Number of post graduate students getting financial assistance from the university. 17 (57%) from IARI

Other students get fellowship either from ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

No

42. Does the department obtain feedback from

- a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?



Yes, Feedback from students taken into consideration to improve teaching –learning evaluation. For course curriculum revision, exercise first at divisional level, school level and then at Institute level is undertaken, besides taking expert advice from renowned resource persons.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

It is utilized by undertaking necessary changes in curriculum and conveying to faculty.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

Opinion of alumni is taken for improvement in different programmes. Alumni meet is also held during the convocation where alumni offers their suggestions.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and Position held
1.	Dr. B.R. Subbarao Entomologist, Commonwealth Institute of Entomology, London, UK
2.	Dr. Pritam Singh, Specialist of Insect Artificial Diets, New Zealand
3.	Dr. Ulagaraj Eminent Entomologist, Florida, USA
4.	Dr. S.N. Puri Former Vice-Chancellor Central University, Imphal
5.	Dr. H.C. Sharma Senior Entomologist, ICRISAT, Hyderabad
6.	Dr. Z.R. Khan Senior Entomologist, ICIPE, Kenya
7.	Dr. V.M. Pawar Former Vice- Chancellor, Marathwada Agricultural Univ., Parbhani
8.	Dr. T.P. Rajendran Former ADG Plant Protection, ICAR
9.	Dr. K.R. Kranti Director, Central Instt. of Cotton Res., Nagpur
10.	Dr. S.V. Sarode Ex-Director of Research (Dr. PDKV, Akola)

44. Give details of student enrichment programmes (special lectures/workshops /seminar) involving external experts.

Special Lectures/ Important Visitors

S.No.	Name and Position held
1.	Twists and Turns of Weed Biological Control by Dr. Robert N. Wiedenmann, Arkansas Univ., 2014
2.	Why are Public Sector Organizations failing on Pro-Poor GMOs? By Prof. Derek Russel, Melbourne Univ., Australia, 2014
3.	Smart bees by Dr. Kasper Bienefeld, Lander Institut fur Bienenkunder, Hohen, Germany, 2015
4.	Transgenic crops and IPM by Prof. K. Mita, Southwest University, Chongqing, China, 2013
5.	Dr. Chad Boeckman, USA, 2013
6.	Prof. Parvinder Grewal, Ohio State University, Wooster, USA, 2011
7.	Prof. S. Dhara, University of California, USA, 2011



8.	Prof. Dan Suiter, University of Georgia, USA, 2011
9.	Dr. Dakshina R. Seal, Scientist, University of Florida, 2008
10.	Dr. Bhadriraju Subrahmanyam, Professor, Department of Grain Science and Industry, Kansas State University, Manhattan, 2005
11.	Dr. Graham Head, IRM Lead, Monsanto, USA, 2005
12.	Dr. John Heraty, Associate Professor, Nov., University of California, Riverside, USA, 2003
13.	Dr. Stonehouse, Professor, Imperial College, London, 2003

Guest Lectures and award lectures are held regularly and students and faculty attend seminars, workshops and conferences. Students are also present compulsory Course Seminars.

45. List the teaching methods adopted by the faculty for different programmes.

Black board teaching, Power point presentations, OHP, Field demonstrations, Term paper presentations by students are undertaken.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Students' feedback is obtained at the end of the Course by the Professor at Division level, while PG School obtains students at the Institute level.

47. Highlight the participation of students and faculty in extension activities.

- Faculty participates in Extension activities through Pusa Krishi Vigyan Mela, Field visits, Field days, Institute Production Unit, National Extension Programme (NEP).
- Students also participate Pusa Krishi Vigyan Mela and also undertake field visits.

48. Give details of “beyond syllabus scholarly activities” of the department.

- Lectures by eminent visitors
- Faculty Seminar
- Study tours
- Sports and cultural programmes at institute, region, all India and Universities level
- Faculty and students celebrate “Teacher Day”
- Organizes Freshers' Welcome function and Valedictory function for Degree Recipients during convocation week

49. State whether the programme/department is accredited/graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The Division of Entomology established in 1905 as one of the five major Divisions of the then Imperial Agricultural Research Institute located at Pusa, Bihar was shifted to its present premises in 1936. Eminent entomologists like H.M. Lefroy, T. B. Fletcher, H.S. Pruthi, S. Pradhan and K.N. Mehrotra laid strong foundation for basic and applied research in Insect Science. Their pioneering contributions resulted in the publication of a monumental reference work *viz.*, Indian Insect Life in 1906 by Lefroy and Text Book of Agricultural Entomology by Pruthi. Since then identification of the insecticidal principles of neem, the concept of Integrated Pest Management (IPM), periodicity of locusts, mode of action of DDT and development of 'Pusa Bin' stand out prominently in the annals of entomological research of our country. The Division has pioneered in investigations in insect biosystematics and economic entomology.



Insect Diagnostics

National Pusa Collections (NPC) with over five lakh specimen serves as a national repository for insect pests of crops. Currently, CD-ROM based diagnostics are being developed for various crop pests. Over the last 50 years, 1500 new species of insects have been described from NPC. As a national service for pest diagnostics, every year, over 4000 specimens are identified by the taxonomists of this Division. Several taxonomic treatises on agriculturally important insects belonging to orders Lepidoptera, Coleoptera, Hemiptera, Orthoptera and Hymenoptera and class Acarina have been made from this Division.

Insecticides: Mode of action and resistance

Insect toxicology studies brought out relative toxicity of insecticides against major crop pests and development of their formulation technology. Besides, studies were also carried out on persistence of toxicity, residue limits, safer waiting periods etc. Besides elucidating the mode of action of azadirachtin, the antifeedant principle of neem seeds, a number of indigenous floras have been investigated for identification of insect growth regulatory properties (IGR).

The Division was the first to report insecticide resistance (IR) in Singhara beetle, *Galerucella birmanica* and has played important role in monitoring IR management in *Helicoverpa armigera*. Biochemical basis of insecticide resistance was extensively investigated. Carboxyl esterases were found to impart an ability to degrade pyrethroids in the resistant strains of *H. armigera*. Studies on baseline susceptibility of the diamondback moth and the American bollworm to *Bacillus thuringiensis* have led to the understanding of genetics of *Bt* resistance in crop pests.

Biological pest suppression

The Division has established a strong unit of biological control. *Apanteles flavipes* was exported to Barbados for the control of sugarcane borer, *Diatrea saccharalis* in the 1970s. Presently more than two-dozen parasitoids, predators and microbial pathogen species are reared for investigations. Predators viz., *Crypolaemus montrouzieri* and *Scymnus coccivora* were introduced in Caribbean countries for the control of mealy bug in 1996. Predators viz., *Crypolaemus montrouzieri* and *Scymnus coccivora* were introduced in Caribbean countries for the control of mealy bug in 1996. A major attempt is being made to develop temperature insensitive strains of *Trichogramma* for our climatic conditions. Studies on tritrophic interactions to enhance parasitoid activity are one of the current thrusts of this Division.

The discovery of a nucleopolyhedrovirus (NPV) of tobacco caterpillar in 1969 led to intensive research on insect pathogenic viruses, bacteria and fungi. Genomic mapping of baculoviruses of insect pests during 1980s laid strong foundation for insect molecular biological research in the Division.

Insect Pest Management

Studies on the the biology and bionomics of major insect pests laid the foundation for adoption of eco-friendly IPM approaches. Significant contributions were made to understand the biology and host plant resistance of major insect pests. Significant work is being done on development of insect forewarning and monitoring tools for timely decision making, pest risk analysis, crop-pest simulation models and climate change impact assessment on crop pests. Effect of habitat management practices such as inter- and trap-crops on conservation of natural enemies of pests has also been evaluated.

Recently, this Division has established a National facility for insect rearing for developing standalone technologies for rearing insect pests for analytical studies and for developing novel artificial diets for several crop pests.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

- Specialized faculty covering all major research areas of Entomology
- Meritorious students (toppers of State Agric. Univ.)
- Well-equipped labs/Climate control chambers/National Facility for insect rearing



- National Pusa Collection harbouring 5 lakh specimens
- Inter-disciplinary collaboration with other Divisions

Weaknesses

- Reduced faculty strength
- Inadequate expertise in emerging areas
- Inadequate number of specialized personnel in biosystematics/Insect Genetics/Chemical Ecology
- Less number of patents
- Need to promote International linkages

Opportunities

- Young faculty (50%); can be trained in emerging areas
- Excellent research grant opportunities for quality research
- Scope to excel in Basic and Strategic research
- Opportunity to develop technologies and products, and increased dissemination of IPM among farmers
- Scope for increased inter-disciplinary linkages within School of Plant protection and other Divisions

Challenges

- Competition from other Instt./SAUs
- Poor adoption of IPM by farmers
- Increased threat of pest problems including invasive species and climate change
- Environmental contamination and health hazards due to indiscriminate pesticide use
- To infuse Entomology discipline with rapid developments in science and technology

52. Future plans of the department

Human Resource Development

- Strengthening scientific manpower with training in molecular biology, geo-spatial techniques, chemical ecology
- Pedagogical training for faculty
- Faculty and student exposure to advanced laboratories in the country and abroad
- Revision of course curricula, introduction of new interdisciplinary courses such as 'Bio-security and Invasive Species'; 'Molecular Taxonomy', and 'Climate Change and Pest Management' and development of e-courses
- Establishment of 'Centre of Advanced Studies in Entomology'

Research and Extension

Molecular diagnostics with emphasis on intraspecific variability

Owing to cultivation of monogenic resistance cultivars, indiscriminate pesticide use, climate change and increased frequency of extreme climatic events, probability of development of insect biotypes or ecotypes has greatly increased. This calls for an efficient detection of intraspecific variability in insect populations.

Host-plant resistance involving novel sources resistance including transgenics

Emphasis is required on exploration of thermo-tolerant sources of host-plant resistance that could be utilized under changing environmental conditions. Proteinase inhibitors and lectins also need to be exploited in pest suppression. Environmental impacts of transgenic crops are also required to be thoroughly investigated.



Emphasis on studies on invasive species including efficient monitoring

Invasive species need to be detected no sooner than their accidental entry to prevent their spread and huge economic losses that could be inflicted. This requires strong quarantine measures and inter-institutional linkages.

Insecticide safety to friendly fauna, non-target organisms and environment

There is a need to promote use of bio-rational components in pest management to ensure sustainable pest suppression with least environmental disruption.

Development of climate resilient IPM technology

Pest management packages are required to be adapted to changing pest scenario in crops in different crops utilizing more of bio-rational components, ecological engineering and less of chemical pesticides. Exploration of novel microbial bio-control agents and thermo-tolerant predators/parasitoids is also needed.

Strengthening of inter-disciplinary collaboration in research among Plant Protection disciplines

Holistic pest management solutions are needed for management of insect, disease nematode and weed pests of different crops to ensure an effect plant health management.

Emphasis on dissemination of IPM technology to end-users

Adoption of IPM technology needs to be enhanced by collaborative efforts of government agencies, private organizations including pesticide/input supply companies, consumers and farmers.



x) Environmental Sciences

1. Name of the Department:

Centre for Environment Science and Climate Resilient Agriculture (CESCRA), formerly known as Division of Environmental Sciences

2. Year of establishment:

1993

3. Is the Department part of a School/Faculty of the university?

School of Natural Resource Management

4. Names of programmes offered (UG, PG, M. Phil., Ph.D., Integrated Masters, Integrated Ph.D., D.Sc. D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Agronomy, Agricultural Physics, Agricultural Engineering, Biochemistry, Microbiology, Post Harvest Technology, Soil Science and Agricultural Chemistry, Genetics, Water Technology and Plant Physiology.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertation in the sister departments like Agronomy, Biochemistry, Microbiology, Post Harvest Technology, Soil Science and Agricultural Chemistry, Genetics, Agricultural Engineering, Agricultural Physics Water Technology, Physiology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others): 18

Post	Sanctioned	Filled	Actual (including CAS & MPS)
Principal Scientist	9	9	8 and 1
Senior Scientist	6	5	5
Scientist	4	4	4
Others	-	-	-

**11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance**

Name	Qualification	Designation	Specialization	No. of Ph.D./M.Phil students guided for the last 4 years	
				M.Sc.	Ph.D.
1. Dr. S.D. Singh	Ph.D.	Principal Scientist & In-Charge	Plant Physiology	2	4
2. Dr. H. Pathak	Ph.D.	Principal Scientist & Professor	Soil Science	1	3
3. Dr. S.K. Bandyopadhyay	Ph.D.	Principal Scientist	Agronomy	1	0
4. Dr. Anita Chaudhary	Ph.D.	Principal Scientist	Microbiology		1
5. Dr. Navindu Gupta	Ph.D.	Principal Scientist	Organic Chemistry	2	1
6. Dr. S. Naresh Kumar	Ph.D.	Principal Scientist	Plant Physiology	2	2
7. Dr. Shiv Prasad	Ph.D.	Principal Scientist	Environmental Sciences		2
8. Dr. D.K. Sharma	Ph.D.	Principal Scientist	Economic Botany	2	1
9. Dr. Arti Bhatia	Ph.D.	Principal Scientist	Organic Chemistry	4	4
10. Dr. Niveta Jain	Ph.D.	Senior Scientist	Organic Chemistry	3	1
11. Dr. Manoj Srivastava	Ph.D.	Senior Scientist	Soil Science		0
12. Dr. Shakeel A. Khan	Ph.D.	Senior Scientist	Environmental Sciences	2	2
13. Dr. Bidisha Chakrabarti	Ph.D.	Senior Scientist	Environmental Sciences	1	0
14. Dr. Usha Mina	Ph.D.	Senior Scientist	Environmental Sciences	2	0
15. Dr. Renu Singh	Ph.D.	Senior Scientist	Environmental Sciences	2	0
16. Mr. Achchhelal Yadav	M.Sc.	Scientist	Physics	0	0
17. Dr. Pragati Pramanik	Ph.D.	Scientist	Soil Physics	0	0
18. Dr. Namita Das Saha	Ph.D.	Scientist	Environmental Sciences	0	0

12. List of senior visiting fellows, adjunct faculty, and emeritus professors:

S. No.	Name of the Faculty	Status
1	Dr. Viridi, Professor, Delhi University	Guest faculty
2	Dr. M.C. Jain, Former Head, CESCRA	Guest Faculty

13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all the programmes but in few specific courses only 5% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M.Sc.: 1:1.6 and Ph.D.: 1:1.2

15. Number of academic support staff (technical) and administrative staff:

S. No.	Category	Sanctioned	Filled	Actual
1	Technical	18	8	8
2	Administrative	5	5	5
3	Supportive	10	8	8

16. Research thrust areas as recognized by major funding agencies:

Climate change and environmental pollution



17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

Name of faculty	Title of project & funding agency (National)	Budget (Rs. in lakhs)
Dr. S.K. Bandyopadhyay	Strategies to enhance adaptive capacity to climate change in vulnerable regions	1158.00
Dr. H. Pathak	National Initiative on Climate Resilient Agriculture (NICRA)	3688.80
	Adaptation of Indian agriculture to climate change	88.80
Dr. S.D Singh	NPCC-Network project on Climate Change	229.00
Dr. Arti Bhatia	Reducing loss of nitrogen and emission of greenhouse gases with urea stabilizer in maize and wheat	11.36
Dr. Navindu Gupta	Bio-conversion technology for biodegradable organic waste for energy & value added products	12.10
Dr. S. Naresh Kumar	NPCC-Network project on Climate Change	40.00
	NFBSRA project: Decision Support System for Enhancing Productivity of Grapes under Moisture and Temperature Stress Conditions	38.21
Dr. Niveta Jain	Emission of greenhouse gases and particulate matter due to burning of crop residues in northwest India	50.00
Dr. Manoj Shrivastava	Dynamic of engineered nano-particles (ENPs) in soil and phytotoxicity assessment on food crops	29.38
Dr. Renu Singh	Development of economically viable conversion technology for ethanol production from rice straw	22.00
Dr. Bidisha Chakrabarti	Assessing water, carbon and nitrogen footprints of major crops in some selected sites of the Indo-Gangetic plains	29.45

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

1. Project: National Initiative on Climate Resilient Agriculture (NICRA)

Institutes: CRIDA, Hyderabad and other ICAR Institutes

Total Budget: 3688.80 lakhs

2. Project: NPCC-Network project on Climate Change

Institutes: CRIDA, Hyderabad and other ICAR Institutes

Total Budget: 229.00 lakhs

b) International collaboration:

1. Project: Strategies to enhance adaptive capacity to climate change in vulnerable regions

Institutes: OUAT, Bhubaneswar; CMFRI, Cochin

Total Budget: 1158.00 Lacs

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

Nil

20. Research facility/centre with State of the art facilities:

State-of-the-art facilities for climate change and environmental pollution research such Free Air Carbon Dioxide Enrichment (FACE), Temperature Gradient Tunnel (TGT), Open Top Chamber (OTC), Gas Chromatography, HPLC, AAS, Eddy flux tower have been established.



- **State recognition**

This Centre has been recognized for climate change studies all over India

- **National recognition**

It is well recognized Centre for environmental science and climate change studies. Scientists of this centre have contributed in the INCCA, National Reports on GHGs and India's National communication o UBNFCCC

- **International recognition:**

Scientists of this centre are well reputed and recognized in the field of climate change studies. They have contributed in the IPCC 5th Assessment Report and also in the UNFCCC.

21. Special research laboratories sponsored by/created by industry or corporate bodies:

Nil

	S D S	H. Pathak	S K B	S.N.K.	N. Gup- ta	Shiv Pras- ad	DKS	Arti Bhatia	A. Chaud- hary	N. Jain	MS	SA K	B. Chakrabar- ty	U. Mina	R. Singh	A Y	P. Pra- manik	N.D. Saha
Num- ber of papers pub- lished in peer reviewed journals (national /inter- national)		150		31	8	11	12	18	-	16	9	6	11	15	10	6	10	2
Mono- graphs		2	-	Nil	-	-	-	25	-	-		-		-	9	-		-
Chapters in Books		30	-	18	-	10	5	2	-	17	1	-	9	7	IK Inter Pvt Ltd	-	5	-
Edited Books	1	4	-	3	-	-	1	4	-		-	-		1		-		-
Books with ISBN with de- tails of publish- ers		4 CBS Publica- tion & IARI	-	Nil	-	2 DPH, Delhi	-	2 DPH, Delhi & IARI	-	2 Divya Pub- lishing House	-	-		5	1	-		-
Citation index- range/ average		1-362	-	1-156	-	1-318	-	1-162	-	1-139	1-68	-	1-47	1-11		1-3		
Impact Factor- range / average	-	3.00- 11.02	-	3-15.5	-	2-11	-	3-9.2	-	3.90- 9.50	3-10.5	-	3.1-8.9	3-8	3-11.63	3 -7.47	3-8.51	5- 6.11
h-index	-	41	-	10	-	9	-		-	13	6	-	6	4	-	1	-	-



22. Publications: During last four years (2010-2014)

List of some important publications

Publication	NAAS score
Asseng, S., F. Ewert, C. Rosenzweig, J.W. Jones, J. L. Hatfield, A. Ruane, K. J. Boote, P. Thorburn, R. P. Rötter, D. Cammarano, N. Brisson, B. Basso, P. Martre, P. K. Aggarwa, C. Angulo, P. Bertuzzi, C. Biernath, A. J. Challinor, J. Doltra, S. Gayler, R. Goldberg, R. Grant, L. Heng, J. Hooker, L. A. Hunt, J. Ingwersen, R. C. Izaurralde, K. C. Kersebaum, C. Müller, S. Naresh Kumar, C. Nendel, G. O'Leary, J. E. Olesen, T. M. Osborne, T. Palosuo, E. Priesack, D. Ripoche, M. A. Semenov, I. Shcherbak, P. Steduto, C. Stöckle, P. Stratonovitch, T. Streck, I. Supit, F. Tao, M. Travasso, K. Waha, D. Wallach, J.W. White, J. R. Williams and J. Wolf (2013). Uncertainty in simulating wheat yields under climate change. <i>Nature Climate Change</i> doi:10.1038/nclimate 1916; <i>Nature Climate Change</i> 3: 827-832	20.0
S. Asseng, F. Ewert, P. Martre, R.P. Rötter, D.B. Lobell, D. Cammarano, B.A. Kimball, M.J. Ottman, G.W. Wall, J.W. White, M.P. Reynolds, P.D. Alderman, P.V.V. Prasad, P.K. Aggarwal, J. Anothai, B. Basso, C. Biernath, A.J. Challinor, G. De Sanctis, J. Doltra, E. Fereres, M. Garcia-Vila, S. Gayler, G. Hoogenboom, L.A. Hunt, R.C. Izaurralde, M. Jabloun, C.D. Jones, K.C. Kersebaum, A.-K. Koehler, C. Müller, S. Naresh Kumar, C. Nendel, G. O'Leary, J.E. Olesen, T. Palosuo, E. Priesack, E. EyshiRezaei, A.C. Ruane, M.A. Semenov, I. Shcherbak, C. Stöckle, P. Stratonovitch, T. Streck, I. Supit, F. Tao, P. Thorburn, K. Waha, E. Wang, D. Wallach, J. Wolf, Z. Zhao, and Y. Zhu. 2014. Rising temperatures reduce global wheat production. <i>Nature Climate change</i> . http://dx.doi.org/10.1038/nclimate2470	20.0
Martre, Pierre, Daniel Wallach, Senthold Asseng, Frank Ewert, James W. Jones, Reimund P. Rötter, Kenneth J. Boote, Alex C. Ruane, Peter J. Thorburn, Davide Cammarano, Jerry L. Hatfield, Cynthia Rosenzweig, Pramod k. Aggarwal, Carlos Angulo, Bruno Basso, Patrick Bertuzzi, Christian Biernath, Nadine Brisson, Andrew J. Challinor, Jordi Doltra, Sebastian Gayler, Richie Goldberg, Robert F. Grant, Lee Heng, Josh Hooker, Leslie A Hunt, Joachim Ingwersen, Roberto C Izaurralde, Kurt Christian Kersebaum, Christoph Müller, Soora Naresh Kumar, Claas Nendel, Garry o'Leary, Jørgen E. Olesen, Tom M. Osborne, Taru Palosuo, Eckart Priesack, Dominique Ripoche, Mikhail A. Semenov, Iurii Shcherbak, Pasquale Steduto, Claudio O. Stöckle, Pierre Stratonovitch, Thilo Streck, Iwan Supit, Fulu Tao, Maria Travasso, Katharina Waha, Jeffrey W. White and Joost Wolf . 2014 Multimodel ensembles of wheat growth: Many models are better than one. <i>Global Change Biology</i> . DOI: 10.1111/gcb.12768.	14.22
Simona Bassu, Nadine Brisson, Jean-Louis Durand, Kenneth Boote, Jon Lizaso, James W. Jones, Cynthia Rosenzweig, Alex C. Ruane, Myriam Adam, Christian Baron, Bruno Basso, Christian Biernath, Hendrik Boogaard, Sjaak Conijn, Marc Corbeels, Delphine Deryng, Giacomo De Sanctis, Sebastian Gayler, Patricio Grassini, Jerry Hatfield, Steven Hoek, Cesar Izaurralde, Raymond Jongschaap, Armen R. Kemanian, Christian K. Kersebaum, Naresh S. Kumar, David Makowski, Christoph Müller, Claas Nendel, Eckart Priesack, Maria Virginia Pravia, Soo-Hyung Kim, Federico Sau, Iurii Shcherbak, Fulu Tao, Edmar Teixeira, Dennis Timlin and Katharina Waha (2014). How do various maize crop models vary in their responses to climate change factors? <i>Global Change Biology</i> DOI: 10.1111/gcb.12520.	14.22
Gupta PK, Gupta V, Sharma C, Das SN, Purkait N, Adhya TK, Pathak H, Ramesh R, Baruah KK, Venkatratnam L, Singh G and Iyer CSP (2009) Development of methane emission factors for Indian paddy fields and estimation of national methane budget. <i>Chemosphere</i> 74:590-598.	9.5
Khan SA, Rashmi, Hussain MZ, Prasad S and Banerjee UC (2009) Prospects of biodiesel production from microalgae in India. <i>Renew. Sustainable Energy Reviews</i> 13:2361–2372.	11.51
Naresh Kumar S, Aggarwal PK, Saxena R, Rani S, Jain S and Chauhan N (2013) An assessment of regional vulnerability of rice to climate change in India. <i>Climatic Change</i> . 118:683-699.	10.62
Pathak H and Wassmann R (2009) Quantitative evaluation of climatic variability and risks for wheat yield in north-west India. <i>Climatic Change</i> 93:157-175.	10.62
Singh A, Pant D, Korres N, Nizami EAS, Prasad S and Jerry D (2010) Key issues in life cycle assessment of ethanol production from lignocellulosic biomass: Challenges and perspectives. <i>Bioresource Technology</i> , 101:5003–5012.	11.04
Singh R and Shukla A (2014) A review on methods of flue gas cleaning from combustion of biomass. <i>Renewable Sustainable Energy Reviews</i> , 29: 854-863	11.51
Singh R, Shukla A, Tiwari S and Srivastava M (2014) A review on delignification of lignocellulosic biomass for enhancement of ethanol production potential. <i>Renewable and Sustainable Energy Reviews</i> 32:713-728.	11.51
Wassmann R, Jagadish SVK, Heuer S, Ismail A, Redona E, Serraj R, Singh RK, Howell G, Pathak H, Sumfleth K (2009) Climate Change Affecting Rice Production: The Physiological and Agronomic Basis for Possible Adaptation Strategies. <i>Adv Agron</i> 101:59-122.	11.02
Wassmann R, Jagadish SVK, Sumfleth K, Pathak H, Howell G, Ismail A, Serraj R, Redona E, Singh RK, Heuer S (2009) Regional vulnerability of climate change impacts on Asian rice production and scope for adaptation. <i>Adv Agron</i> 102: 91-133.	11.02



Bhatia A, Ghosh A, Kumar V, Tomer R, Singh SD, Pathak H (2011) Effect of elevated tropospheric ozone on methane and nitrous oxide emission from rice soil in north India. <i>Agricult Ecosys and Environ.</i> 144: 21– 28.	9.20
Bhatia A, Sasmal S, Jain N, Pathak H, Kumar V and Singh A (2010) Mitigating nitrous oxide emission from soil under conventional and no-tillage in wheat using nitrification inhibitors. <i>Agric Ecosyst Environ</i> 136: 247–253.	9.20
Chattara S, Chakraborti D, Sehgal VK, Paul RK, Singh SD, Daripa A and Pathak H (2014) Predicting the impact of climate change on water requirement of wheat in the semi-arid Indo-Gangetic Plains of India. <i>Agriculture. Ecosys and Environ</i> 197:174–183.	9.20
Pathak H, Jain N, Bhatia A, Patel J, Aggarwal PK (2010) Carbon footprints of Indian food items. <i>Agric Ecosyst. Environ</i> 139: 66–73.	9.20
Saud T, Singh DP, Mandal TK, Gadi R, Pathak H, Saxena M, Sharma SK, Gautam R, Mukherjee A, Bhatnagar RP (2010) Spatial distribution of biomass consumption as energy in rural areas of the Indo-Gangetic plain. <i>Biomass and Bioenergy</i> 35:932-941	9.41
Srivastava A, Naresh Kumar S and Aggarwal PK (2010) Assessment on vulnerability of sorghum to climate change in India. <i>Agric. Ecosyst. Environ.</i> 138:160-169.	9.20

Publications with NAAS Score 8.0-9.0

Publications	NAAS score
Aggarwal P, Mittal R.B, Maity P, and Sharma A R (2009) Modification of hydrothermal regimes under bed planted wheat. <i>Geoderma</i> , 153 (3-4): 312- 317.	8.51
Bhatia A, Agarwal PK, Jain N, Pathak H (2012) Greenhouse gas emission from rice and wheat-growing areas in India: Spatial analysis and upscaling. <i>Greenhouse Gas Sci Technol.</i> 2:115–125.	8.92
Bhatia A, Jain N, Pathak H (2013) Methane and nitrous oxide emissions from Indian rice paddies, agricultural soils and crop residue burning. <i>Greenhouse Gas Sci Tech</i> 3:196–211.	8.92
Das TK, Bhattacharyya R, Sharma AR, Das S, Saad AA and Pathak H (2013) Indian Impacts of conservation agriculture on total soil organic carbon retention potential under an irrigated agro-ecosystem of the western Indo-Gangetic Plains. <i>Europ J Agronomy</i> 51:34-42.	8.92
Das TK, Bhattacharyya R, Sudhishri S, Sharma AR, Saharawat YS, Bandyopadhyay KK, Sepat S, Bana RS, Aggarwal P, Sharma RK, Bhatia A, Singh G, Datta SP, Kar A, Singh B, Singh P, Pathak H, Vyas AK and Jat ML (2014) Conservation agriculture in an irrigated cotton-wheat system of the western Indo-Gangetic Plains: Crop and water productivity and economic profitability. <i>Field Crops Res</i> 158:24–33.	8.61
Jain N, Bhatia A, Pathak H (2014) Emission of Air Pollutants from Crop Residue Burning in India. <i>Aerosol and Air Quality Res</i> 14: 422–430.	8.87
Naresh Kumar S, P. K. Aggarwal, D. N. Swarooparani, Rani Saxena, Nitin Chauhan, Surabhi Jain (2014). Vulnerability of wheat production to climate change in India. <i>Climate Research.</i> doi: 10.3354/cr01212	8.45
Naresh Kumar, S. and P.K. Aggarwal. 2013. Climate change and coconut plantations in India: Impacts and potential adaptation gains. <i>Agril. Syst.</i> http://dx.doi.org/10.1016/j.agry.2013.01.001 .	8.71
Pathak H, Byjesh K, Chakrabarti B, Aggarwal P.K (2011) Potential and cost of carbon sequestration in Indian agriculture: Estimates from long-term field experiments. <i>Field Crops Res.</i> 120:102–111.	8.45
Pathak H, Saharawat YS, Gathala M, Ladha JK (2011) Impact of resource-conserving technologies on productivity and greenhouse gas emission in rice-wheat system. <i>Greenhouse Gas Sci Tech</i> 1:261–277.	8.92
Tomer R, Bhatia A, Kumar V, Kumar A, Singh R, Singh B and Singh SD (2014) Impact of Elevated Ozone on Growth, Yield and Nutritional Quality of Two Wheat Species in Northern India. <i>Aerosol and Air Quality Research</i> , 14: 1392-1401.	8.87
Byjesh K, Naresh Kumar S and Aggarwal PK (2010) Simulating impacts, potential adaptation and vulnerability of maize to climate change in India. <i>Mitigation Adaptation Strategies Global Change.</i> 15:413-431.	8.0
Kumari M, Chakraborty D, Gathala MK, Pathak H, Dwivedi BS, Tomar RK, Garg RN, Singh R, Ladha JK (2011) Soil aggregation and associated organic carbon fractions as affected by tillage in a rice-wheat rotation in north India. <i>Soil Sci Soc Am J</i> 75:560-567.	8.0
Boomiraj, K., Chakrabarti, B., Aggarwal, P.K., Choudhary, R. and Chander, S. (2010) Assessing the vulnerability of Indian mustard to climate change. <i>Ag. Ecos.& Env.</i> 138:265-273.	8.86



Publications with NAAS Score 6-8

Bhatia A, Pathak H, Aggarwal PK and Jain N (2010) Trade-off between productivity enhancement and global warming potential of rice and wheat in India. <i>Nutr. Cycl. Agroecosyst</i> 86:413-424.	7.73
Bhatia A, Pathak H, Jain N, Singh PK and Tomer R (2012) Greenhouse gas mitigation in rice–wheat system with leaf color chart-based urea application. <i>Environ Monit Assess</i> 184:3095–3107.	7.68
Bhatia A, Tomer R, Kumar V, Singh S D and Pathak H (2012) Impact of tropospheric ozone on crop growth and productivity – a review. <i>Journal of Scientific & Industrial Research</i> , 71: 97-112.	6.5
Chakrabarti B, Aggarwal PK, Singh SD, Nagarajan S and Pathak H (2010) Impact of high temperature on pollen germination and spikelet sterility in rice: comparison between basmati and non-basmati varieties. <i>Crop Pasture Sci</i> 61:363-368.	7.28
Chakrabarti B, Singh R, Bhatia A, Singh SD and Singh B (2014) Impact of aerial deposition from thermal power plant on growth and yield of rice and wheat. <i>Indian J Agric Sci</i> 84(5): 233-240.	6.0
Chakravarti B, Singh SD, Kumar NK, Aggarwal PK, Pathak H and Nagarajan S (2012) Low cost facility for assessing the impact of carbon dioxide on crops. <i>Curr. Sci</i> 102 (6):1035-1040.	6.83
Daripa A, Bhatia A ,Tomer R, Singh SD, Jain N and Pathak H (2014) Nitrous oxide and carbon dioxide emission from maize (zea mays l.) under fertiliser application and elevated carbon dioxide in Northwest India. <i>Experimental Agricult</i> doi:10.1017/S0014479714000118	7.07
Das DK Maiti D and Pathak H (2009) Site-specific nutrient management in rice in Eastern India using a modeling approach. <i>Nutr. Cycling Agroecosys</i> 83:85-94.	7.73
Epimaque Nsanzabaganwa, Tapas K Das, Dhian S Rana and S Naresh Kumar 2014. Nitrogen and phosphorus effects on winter maize in an irrigated agroecosystem in western Indo-Gangetic plains of India. <i>Maydica</i> , 59:152-160.	6.0
Gathala MK, Ladha JK, Kumar V, Saharawat YS, Kumar V, Sharma PK, Sharma S and Pathak H (2011) Tillage and crop establishment affects sustainability of south Asia's rice-wheat system. <i>Agron J</i> 103:1-11.	7.54
Jain N, Dubey R, Dubey D S, Singh J, Khanna M, Pathak H, and Bhatia A (2013) Mitigation of greenhouse gas emission with system of rice intensification in the Indo-Gangetic Plains. <i>Paddy Water and Environ</i> DOI 10.1007/s10333-013-0390-2.	7.25
Maity P and Aggarwal P (2012) Variation of thermal properties of sandy loam soil under different management practices. <i>Ind J of Agricult Sci</i> 82 (2): 181–5.	6.0
Manju Zacharias, S. Naresh Kumar, S.D. Singh, D.N. Swaroopa Rani and P.K. Aggarwal. 2014. Assessment of impacts of climate change on rice and wheat in the Indo-Gangetic plains <i>Journal of Agrometeorology</i> 16 (1) : 9-17	6.16
Mina U, BhatiaA, Kumar U(2012)Response of maize and its pest Chiloptartellusto ozone and carbon dioxide exposure. <i>Maydica</i> , 57, 183-187.	6.0
Mina Usha and Choudhary Anita. (2012) Impact of Transgenic Cotton Varieties on Activity of Enzymes in their Rhizosphere. <i>Indian Journal of Biochemistry and Biophysics</i> 49: 195-20.	7.08
Mina Usha and Dubey, S.C. (2009) Effect of environmental variable on development of Fusariumwlt in chickpea cultivars. <i>Ind J of Agricult Sci</i> , 80(3); 231-234.	6.0
Mina Usha, Mall A, Ruckminee, Naik Gaurav, and Kumar Sarad (2013). Purification and characterization of athermostable soluble peroxidase from Citrus medica leaf. <i>Preparative Biochemistry Biotechnology</i> 43(2): 137-15.	6.70
Naresh Kumar S., P.M. Govindakrishnan, D.N. Swarooparani, Ch. Nitin, J. Surabhi, P.K. Aggarwal 2015. Assessment of impact of climate change on potato and potential adaptation gains in the Indo-Gangetic Plains of India. <i>International Journal of Plant Production</i> 9 (1), 151-170.	7.03
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Pathak H, Mohanty S, Jain N, Bhatia A, (2010) Nitrogen, phosphorus, and potassium budgets in Indian agriculture. <i>Nutrient Cycling in Agroecosystems</i> 86: 287-299.	7.73



Pathak H, Pramanik P, Khanna M and Kumar A (2014) Climate change and water availability in Indian agriculture: Impacts and adaptation. Indian J of Agricult Sci, 84 (6): 671–9.	6.0
Pathak H, Sankhyan S, Dubey DS, Bhatia A and Jain N (2013) Dry direct-seeding of rice for mitigating greenhouse gas emission: Field experimentation and simulation. Paddy Water Environ. 11:593–601	7.25
Pathak, H, Jain N, Bhatia A, Mohanty S, Gupta Navindu Global warming mitigation potential of biogas plants in India. Environ Monit Assess, 2009, 157:407–418.	7.68
Pramanik P, Aggarwal P, and Dey P (2013) Model for calculation of penetration resistance from easily measurable soil physical properties. Ind J of Agricult Sci 83(3): 294-299.	6.0
Prasad S, Kumar A, Muralikrishna KS (2013) Assessment of ethanol yield associated character in sorghum biomass. Maydica, 58: 299-303.	6.0
Priyanka, Suryavanshi YV, Singh, R, Prasanna, Bhatia Arti and Shivay YS (2012) Paddy Water and Environ, DOI 10.1007/s10333-012-0323-5.	7.25
Raghuvanshi SP, Singh R, Raghav A K and Chandra A (2010) Carbon dioxide reduction options in Power Generation. Asian J Chem, 22(3): 1675-1683.	6.3
Rani Saxena and S. Naresh Kumar (2014). Simulating the impact of projected climate change on rice (<i>Oryza sativa</i> L.) yield and adaptation strategies in major rice growing regions of India. J Agromet. 16 (1) : 18-25	6.0
Sahoo, R.N., Dipanwita Dutta, M. Khanna, N. Kumar, S. K. Bandyopadhyay, 2015. Drought assessment in the Dhar and Mewar Districts of India using meteorological, hydrological and remote-sensing derived indices. Nat Hazards DOI 10.1007/s11069-015-1623-z.	8.0
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Satyavan Singh, Bhatia A, Tomer R, Kumar V, Singh B. & Singh SD (2013). Synergistic action of tropospheric ozone and carbon dioxide on yield and nutritional quality of Indian mustard (<i>Brassica juncea</i> (L.) Czern.) Environ. Monit. Assess. 185:6517–6529	7.68
Singh Abhai, Pratap Singh Rashmi, Mina Usha, Singh M.P. and Varshney CK (2010) Effects of different doses of nitrogen treatments on isoprene emission from <i>Ficus glomerata</i> . J of App and Nat Sci 2(1): 17-21	8.42
Singh R, Lataand Joshi HC (2012) Saccharification potential of Indian maize cultivars for biofuel production. Vegetos. 25(1): 121-126.	6.04
Singh SD, Chakrabarti B, Muralikrishna, KS, Chaturvedi AK, Kumar V., Mishra S and Harit R (2013) Yield response of important field crops to elevated air temperature and CO ₂ levels. Ind J. Agri. Sci. 83(10):1009-12.	6.0
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39. Salaskar, D.; Shrivastava, M. and Kale, S.P. (2011) Bioremediation potential of spinach (<i>Spinacia oleracea</i> L.) for decontamination of cadmium in soil. Current Science 101: 1359-1363.	6.91
Srivastava, P.C., Dwivedi, R.; Srivastava, A.; Kumar, S.; Shrivastava, M. (2011) Relationships of labile pool of Mn with some general soil properties and extractable soil Mn contents. Journal of Radioanalytical and Nuclear Chemistry 290:149–151.	7.47
Srivastava, P.C.; Singh, A. P.; Kumar, Surendra; Ramachandran, V.; Shrivastava, M and S.F. D'souza (2013) Evaluation of phosphorus enriched post-methanation biosludges as phosphorus sources: chemical speciation and field study. Journal of Plant Nutrition, 36:617–632.	6.53
Yadav A, Hussain GFS and Nachane R P. (2012). Comparative studies on the physical properties of fibres of <i>Bt</i> and non- <i>Bt</i> cottons at various stages of growth. Indian Journal of Agricultural Sciences 82 (11): 957–960.	6.0
Yadav A and Chattopadhyay SK. (2012). Structure- property relationship of DREF-3000 friction spun yarns. J. Polym. Mater. Vol.29 No.1, 115-126.	6.28
Sumedha Ahuja, Mahesh Kumar, Pankaj Kumar, V.K. Gupta, R.K. Singhal, Achchhelal Yadav Bhupinder Singh (2014). Metabolic and biochemical changes caused by gamma irradiation in plants. Journal of Radio Analytical and Nuclear Chemistry.	7.47

23. Details of patents and income generated:

Nil

24. Areas of consultancy and income generated: Consultancy projects on greenhouse gas mitigation, climate



change, pollution):

Rs. 43 lakhs

25. Faculty selected nationally/internationally to visit other laboratories/institutions /Industries in India and abroad:

Name	Nationally/internationally to visit other laboratories/institutions/ industries in India and abroad
Dr. H. Pathak	Potsdam University, Germany to formulate a project on climate change and water management in rice. Changwan City, South Korea to attend the IPCC lead authors meeting. Amsterdam, Netherlands to attend workshop on Nitrogen and Climate. Durban, South Africa to attend the Climate Change Talks of UNFCCC. Bonn, Germany to attend United Nations Framework Convention on Climate Change Talks (UNFCCC). Bangkok, Thailand to attend United Nations Framework Convention on Climate Change Talks (UNFCCC). Vigo, Spain for the IPCC 5 th Assessment Report. Deputed to the United Nations Framework Convention on Climate Change Talks (UNFCCC) at Doha, Qatar Review Workshop of an ACIAR Project in Dhaka, Bangladesh Warsaw, Poland to attend United Nations Framework Convention on Climate Change (UNFCCC) Bonn, Germany to attend SBSTA Meeting of the United Nations Framework Convention on Climate Change (UNFCCC) Lima, Peru to attend the United Nations Framework Convention on Climate Change (UNFCCC)
Dr. A Bhatia	Paris, France, workshop on model inter-comparison on agricultural greenhouse gas emissions Manhattan, Kansas, USANAIP HRD training in the area of Eddy covariance measurements at Kansas State University Tsukuba, Japan to present paper and round table discussion on greenhouse gas emissions at Marco symposium
Dr. S. Naresh Kumar	16 th International Post Graduate Course on Crop-Weather Modelling at World Meteorological Organization, Regional Meteorological Training Centre – Bet Dagan, Tel Aviv, Israel CRI, Sri Lanka Zekerman Climate Research Unit, University of East Anglia, Norwich, UK, Meteorological Research Institute–Japan Meteorological Agency, National Institute for Environmental Studies, Tsukuba, Japan. IRRI and CERECA, Los Banos, Laguna, Philippines. International Water Management Institute, Colombo, Sri Lanka. FAO, Rome CIMMYT, El Batan, Mexico INRA-National Institute for Agricultural Research, Clermont-Ferrand, France AgMIP (Agricultural Model Intercomparison and Improvement) workshop at Long Beach, California, USA AgMIP (Agricultural Model Intercomparison and Improvement) workshop at San Antonio, Texas, USA University of Saskatchewan, Saskatoon, Canada.

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. H. Pathak	IPCC	Editor-in-Chief , Current Advances in Agricultural Sciences Editor , Greenhouse Gases: Science and Technology, John Wiley Editor , Indian Journal of Agronomy, Indian Society of Agronomy	--
Dr. A. Bhatia	NATCOM, MoEF		
Dr S. Naresh Kumar	AgMIP (model developers group member) INCCA NATCOM IPCC (Expert reviewer)	Editor, Indian Journal of Plant Physiology	
Dr. N. Jain	NATCOM, MoEF		

27. Faculty recharging strategies (UGC, ASC, Refresher/orientation programs, workshops, training programs

**and similar programs)**

Faculty regularly attends international and national conferences, symposia seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

- Percentage of students who have done in-house projects including interdepartmental projects **100%**
- Percentage of students doing projects in collaboration with other universities/industry/institute **Nil**

29. Awards/recognitions received at the national and international level by**Faculty**

Name of Faculty	Awards/Recognitions
Dr. S.D. Singh	Aryabhata Samman (Vigyan Bharati Dilli), 2013, IARI Best Teacher Award, 2010
Dr. H. Pathak	Fellow, Indian National Science Academy, New Delhi in 2014. Fellow, West Bengal Academy for Science and Technology (FWAST) in 2013. Best paper award of the Third International Agronomy Congress in 2012. Lead Author, Inter-Governmental Panel on Climate Change (IPCC) 5 th Assessment Report, 2011-14. Coordinator of Department of Agriculture Research and Education (DARE)/Indian Council of Agricultural Research (ICAR), Govt. of India for the climate negotiations in the United Nation Framework Convention on Climate Change (UNFCCC), 2011 onwards. Prof. S.K. Mukherjee Memorial Award Lecture, Indian Society of Soil Science, New Delhi, 2012. National Academy of Agricultural Sciences (NAAS) Recognition Award (Natural Resource Management), 2011. Prof. S.K. Mukherjee Commemoration Award of the Indian Science Congress Association (ISCA), 2011. Gold Medal of the Society of Agricultural Professional, CSA University of Agric. and Technology, Kanpur, 2010. President, Agriculture and Forestry Sciences Section, Indian Science Congress Association for 2007-2008. Fellow, National Academy of Agricultural Sciences (FNAAS) in 2007. Head, Division of Environmental Soil Science, Indian Institute of Soil Science, Bhopal in 2007 (Declined). Co-Facilitator, Rice-Wheat Consortium for the Indo-Gangetic Plains (RWC), IRRI during 2007-2009. Alexander von Humboldt Fellowship of Germany in 2004-2005. Member of the Panel on mitigating greenhouse gas emission from agriculture, Environmental Protection Agency (EPA)-USA in 2002. Dr. B.C. Deb Memorial Award by the Indian Science Congress Association in 2001. Consultant, International Rice Research Institute, the Philippines in 2000 and 2001. Visiting scientist, University of Essex, United Kingdom in 1997. Best paper award of the Indian Science Congress Association in 2001. Golden Jubilee Commemoration Young Scientist Award by the Indian Society of Soil Science in 1998. BOYSCAST Fellowship by the Department of Science and Technology, Govt. of India in 1997. Young Scientist Award by the Indian Science Congress Association in 1994.
Dr. S. Naresh Kumar	RL Narasimha Swamy Memorial Award 2002 CV Venkatram Memorial Award 2004 Best Research Paper Award in Indian Journal of Horticulture award 2009. Fellow of Indian Society for Plant Physiology, 2011 CPCRI -Young Scientist Award 2002-2003 Fellow of Indian Society of Plantation Crops, 2012 JC Bose Gold Medal of Indian Society for Plant Physiology, 2013 Member, Model improvement group in AgMIP (Columbia University, USA) Expert Reviewer for IPCC AR 5, Ministry of Environment and Forests, Govt of India, BHU Gold Medal, 1988
Dr. Manoj Srivastava	Endeavour Research Award 2011 (Government of Australia)

b) Students



30. Seminars/Conferences/Workshops organized and the source of funding (national/international) with details of outstanding participants, if any:

Seminar/Conference/Workshops	Source of Funding	Details of participants
MTC on Natural Resource Management for Sustainable Agriculture” from 15-22 December, 2014	Directorate of Extension, Ministry of agriculture Govt. of India	23
Eddy covariance System, and Soil CO2 Flux during 15-16th Nov 2013	NICRA/Elcome India	35
Workshop on Eddy Covariance measurements during 28-30th Nov 2013	NICRA,ICAR, Govt. of India	25
Workshop on Development of Greenhouse Gas Emission Inventory for Agriculture during 6-7 May, 2014	MoEF, Govt. of India	36
MTC on Environmental Resources Management for Sustainable Agriculture from (23-30 th October, 2013)	Directorate of Extension, Ministry of agriculture Govt. of India	20

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	4	1	-	-
Ph.D.	88	3	2	3.2	2.27

33. Diversity of students

Name of the programme (refer to question No. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students From other countries
MSc	-	-	100	10
PhD	75%	0	100	10

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

Student progression	Percentage against enrolled
UG to PG	NA
PG to M.Phil.	NA
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	NA
Employed	Rakesh Sepat (Ph.D.), Indian Forest Service Gundu Singh (M.Sc.), Regional Forest Officer Karnataka
Campus selection	Mr. Mohan (M.Sc.) Regional forest Officer Karnataka
Other than campus recruitment	Mr. Satyavan Singh (Ph.D.) Environment Officer SPCB, Rajasthan Mr. Bhanudas Pingle (Ph.D.) Indian Forest Services (IFS) Mr. Sugnaram Jat (Ph.D.) Indian Forest Service Mr. Gaurav Kumar (M.Sc.) ADO in Punjab Mr. Dinesh Kumar (M.Sc.) Agricultural Officer in Nationalized Bank Mr. Nishant Kumar (M.Sc.) Environment Officer Central warehousing Corporation Mr. Ram Kishore Fagodia (Ph.D.) ARS –Scientist in ICAR Mr. Deepak Kumar (Ph.D.) ARS –Scientist in ICAR Ms. Rachana Dubey (Ph.D.) ARS –Scientist in ICAR



	Ms.Amrita Daripa (Ph.D.) ARS –Scientist in ICAR Ms.Namita Das (Ph.D.) ARS –Scientist in ICAR Ms.Sheetal Radhakrishnan (Ph.D.) ARS –Scientist in ICAR Mr. Gulshan Kumar (M.Sc.) ARS –Scientist in ICAR Mr. Sandeep Kumar (M.Sc.) ARS –Scientist in ICAR Ms. M.S. Dhanya (Ph.D.) Assitt. Professor, Central University, Bhatinda, Punjab.
Entrepreneurs	Nil

36. Diversity of staff:**Percentage of faculty who are graduates**

Of the same university	30%
From other universities within the state	30%
From universities from other States	40%
Universities outside the country	Nil

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D. Litt. during the assessment period:

All were awarded Ph.D. before assessment period except one

38. Present details of departmental infrastructural facilities with regard to

a) Library	One
b) Internet facilities for staff and students	For everyone with LAN and wifi
c) Total number of class rooms	Three
d) Class rooms with ICT facility	Three
e) Student's laboratories	Four
f) Research laboratories	Seven

39. List of doctoral, post-doctoral students and Research Associates

Name of the M. Sc. student	University of Graduation
1. Ms. Maya Prajapati	ANGAU, Hyderabad
2. Mr. Ram Kumar	Banaras Hindu University, Varanasi, UP
3. Mr. Sumit Kumar Dey	UBKV, WB
4. Mr. Renti Ogunslukin	University of Florin
5. Mr. Prakash Kumar Jha	Banaras Hindu University, Varanasi, UP
6. Mr. Jayant Thokdar Milan Kumar Lal	UBKV, WB
7. Mr. Ranjeet Kumar Chaurasia	CSAUAT, Kanpur
8. Mr. SaumenBhar Rajeev Kumar	UBKV, WB
9. Mr. Ravan Kumar	Banaras Hindu University, Varanasi, UP

Name of the Ph.D. student	Host/other institute/ university
1. Ms. Sheetal K Radhakrishanan	IARI
2. Mr. Shweta Amrita Lakra	IARI
3. Mr. Anket Kumar Singh	IARI
4. Ms. Sudha Kannojiya	Bundelkhand University, Uttar Pradesh
5. Mr. Sandeep Kumar	IARI
6. Ms. Amita Raj	IARI
7. Mr. Lal Chand Malav	IARI
8. Mr. Mahesh Malav	IARI



9. Mr. Tyaz Malla	IARI
10. Mr. Paritosh Kumar	IARI
11. Mr. Gulshan Kumar	IARI
12. Mr. Larry	University of Zimbabwe

40. Number of post graduate students getting financial assistance from the university

100%

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Not applicable

42. Does the department obtain feedback from?

Yes

- Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**
Yes. Feedbacks are assessed and used for improvement
- Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**
Yes. Feedbacks are assessed and used for improvement
- Alumni and employers on the programmes offered and how does the department utilize the feedback?**
Yes. Feedbacks are assessed and used for improvement

43. List the distinguished alumni of the department (maximum 10)

Name and address

- Dr. Shalini Singh, National Environmental Engineering Research Institute, Mumbai
- Dr. Deepanjan Majumdar, Scientist-D, National Environmental Engineering Research Institute, Kolkata
- Dr. Sudip Mitra, Associate Professor, Tezpur University, Assam
- Dr. Khoiyangbam Raju, Associate Professor, Assam University, Assam
- Dr. P. Ramesh Kumar, Indian Forest Service, Karnataka
- Dr. K. Boomiraj, Associate Professor, TNAU, Coimbatore
- Dr. Manish Kumar, Scientist-D, RRL Bhubaneswar, CSIR
- Dr. Dhanya M.S., Associate Professor, Central University, Bhatinda
- Dr. Somen Acharya, Scientist, DRDO, Ladakh
- Dr. Satyavan Singh, Scientist-C, CPCB, Kota, Rajasthan

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Special Workshops were conducted on statistical methods; soil, water and air analysis; greenhouse gas emission and climate change. Lectures of reputed scientists were arranged. A few examples are given below.

- Dr. Mark Sutton, Professor, School of Ecology and Hydrology and Chairperson, International Nitrogen Initiative, United Kingdom on Challenges for Managing the Global Nitrogen Cycle
- Dr. Jun Furuya and Dr. Shintaro Kobayashi, JIRCAS, Japan on Climate Change and Agriculture: Economic Implications
- Dr. Chris Atkinson, Professor of Sustainable Agriculture and Climate Change at Natural Resources Institute, University of Greenwich, United Kingdom on Climate Change and Sustainable Agriculture



45. List the teaching methods adopted by the faculty for different programmes

Teaching using traditional tools such as black board as well as with modern audio-visual aids such as projector, power point, on-line analysis are followed.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Performance of our student in various examinations and performance of faculties are periodically monitored and evaluated.

47. Highlight the participation of students and faculty in extension activities:

Faculties of CESCRA participate regularly in demonstrating various technologies in the climate resilient villages in Gurgaon, Haryana.

48. Give details of “beyond syllabus scholarly activities” of the department:

Organize quiz competition, extempore, creative writing, etc. Special programmes are organized on the Environment Day (June 5) every year.

49. State whether the programme/department is accredited/graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

- **Greenhouse gas emission and mitigation in Indian agriculture:** Research on GHG emission from Indian agriculture started in 1990s when, based on very limited measurements done elsewhere, it was reported that Indian rice fields emit 37.5 million ton (Mt) methane per year. With sustained and systematic indigenous research the methane emission estimates have been rationalized. The current estimate shows that Indian rice fields covering an area of 43.86 million ha emitted 3.3 million tons of methane. The nitrous oxide emission from Indian agricultural soils is 0.14 million tons. Technologies such as intermittent flooding, dry direct-seeded rice (DSR), site-specific nutrient management, system of rice intensification (SRI) and use of nitrification inhibitors were found effective in mitigating GHG emission from agriculture. The DSR and SRI reduced global warming potential by 50-70% and saved 25-30% irrigation water compared to the conventional transplanted rice without any yield loss. The potential and cost of C sequestration in different agro-climatic zones of India were also assessed.
- **Impact of climate change on Indian agriculture:** The impacts of increase in atmospheric carbon dioxide and temperature on major crops were evaluated under controlled environment conditions (Free air CO₂ enrichment, Open Top Chambers) and using simulation models for the first time. Spatial and temporal changes in key climatic parameters of agricultural importance were also characterized. The Divisional scientists have been representing the IPCC in the 4th and 5th Assessment Reports. The spatial impacts, adaptation gains and vulnerability of major crops such as wheat, rice, maize, sorghum, mustard, etc are quantified and these findings are reported in IPCC AR5 as well as being used in policy briefs and support. The centre has expertise in developing the crop simulation models and InfoCrop version 2 is released in 2014. The first version of InfoCrop was released in 2004.
- **Use of industrial and urban waste in agriculture:** Developed protocol for use of post-methanation distillery effluent as source of plant nutrients. The Central Pollution Control Board (CPCB) adopted this protocol to be implemented in all the distilleries as one of the options for water pollution control.
- **Water pollution control:** Developed a sub-surface wetland plant for treating 1429 L day⁻¹ of municipal wastewaters of IARI. The plant has extremely low maintenance and operational costs and is currently being researched for its further up-scaling to entire IARI watershed and Ujjina village in Mewat District, Haryana.



- **Solid waste management for energy and manure:** Optimized the process conditions for maximizing the biogas production from agricultural wastes. Developed dry fermentation technology for the production of energy and manure from agricultural and kitchen wastes.
- **Impact of air pollution on crop:** Evaluated air pollution impacts on vegetables and suggested remedial measures. Quantified the impact of increased tropospheric ozone on crop growth and productivity.
- **Decision support for sustainable land-use systems:** Developed Decision Support Systems such as InfoCrop, IMPASSE, ResourCeS, USAR, Img2Info, Ref2Info, DROP, InfoSoil, InfoRCT, and InfoNitro to assist in environmental impact assessment, optimization of resource use and sustainable land-use management. The models are extensively used in various ICAR Institutes and State Agricultural Universities for predicting the impact of climate change and nitrogen and water management on crop yield.
- **Environmental indicators for assessing soil health:** A composite soil quality index based on the physicochemical and microbiological parameters was used to assess the impact of resource conserving technologies (RCTs) on soil quality in rice-wheat cropping systems.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

- Multi-disciplinary, integrated faculty and capable
- Highly competitive, capable students in ICAR system
- High teacher : student ratio
- No financial constraints

Weaknesses

- Limited job opportunities for students
- Inadequate exposure to new science of climate change and environmental degradation
- Inadequate experience with the grass-root environmental problems
- Lack of quick output solutions
- Inadequate practical exposure

Opportunities

- New opportunities for students in ARS and other services
- Increasing interest of foreign students
- Scope of linkages with national and international advanced organizations
- Increasing funding

Challenges

- Changing aspirations and mindset of students
- Competition from other Institutes/Universities
- Diluted focus of Staff and Students
- Limited No. of motivated teacher

52. Future plans of the department

- Upgrade the Discipline into an International Center for Environment and Agriculture Climate Smart.
- Produce globally competitive students with high employability and commitment for Environment.
- Provide advanced training to all stakeholders for promoting environment and climate literacy.
- Foster local as well as global outlook in academic programme.
- Introduction of new courses such as Environment and Society, International Environment Policies and Disaster Management.
- Enhancing skills of faculties with training in advanced laboratories.



xi) Division of Genetics

1. Name of the Department:

Division of Genetics

2. Year of establishment:

1968 (Earlier Division of Botany from 1945)

3. Is the Department part of a School/Faculty of the university?

School of Crop Improvement

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Divisions of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Horticulture, Molecular Biology and Biotechnology, Plant Physiology, Plant Genetic Resources, Seed Science and Technology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments: Divisions of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Horticulture, Molecular Biology and Biotechnology, Plant Physiology, Plant Genetic Resources, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	8	4	4	22
Senior Scientist (Associate Professor)	28	17	11	11
Scientist (Assistant Professor)	33	24	9	9



Besides above there are thirteen permanent faculties in the discipline who are posted at sister department or sister institute and in the regional stations as follows:

1	Dr. (Ms.) Jyoti Kumari	Sr. Scientist	Genetics & P. Breeding
2	Dr. Avinash Singode	Scientist	Genetics & P. Breeding
3	Dr. Chikkappa G. Karjagi	Scientist	Genetics & P. Breeding
4	Dr. Nirupma Singh	Scientist	Genetics & P. Breeding
5	Dr. Bhupender Kumar	Scientist	Genetics & P. Breeding
6	Dr. Ganapati Mukri	Scientist	Genetics & P. Breeding
7	Dr. K.K. Vinod	Sr. Scientist	Genetics & P. Breeding
8	Dr. Jayanta Bhat	Sr. Scientist	Genetics & P. Breeding
9	Dr. Dharam Pal	Pr. Scientist	Genetics & P. Breeding
10	Dr. Madhu Patial	Scientist	Genetics & P. Breeding
11	Dr. Sai Prasad	Pr. Scientist	Genetics & P. Breeding
12	Dr. P. Jayaprakash	Sr. Scientist	Genetics & P. Breeding
13	Dr. B. S. Patil	Sr. Scientist	Genetics & P. Breeding

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. H. S. Gupta	PhD	Ex. Director	Genetics & P. Breeding	5	-	1
Dr. K.V. Prabhu	PhD	JDR	Genetics & P. Breeding	21	-	3
Dr. Ashok Kumar Singh	PhD	Head	Genetics & P. Breeding	20	-	4
Dr. Ram Kumar Sharma	PhD	Pr. Scientist	Genetics & P. Breeding	11	3	-
Dr. Vinod	PhD	Professor	Genetics & P. Breeding	17	1	3
Dr. J. Kumar	PhD	Pr. Scientist	Genetics & P. Breeding	-	-	2
Dr. Sanjay Kumar	PhD	Pr. Scientist	Genetics & P. Breeding	21	-	-
Dr. Rajbir Yadav	PhD	Pr. Scientist	Genetics & P. Breeding	8	2	-
Dr. C. Tara Satyavathi	PhD	Pr. Scientist	Genetics & P. Breeding	9	1	-
Dr. Chellapilla Bharadwaj	PhD	Pr. Scientist	Genetics & P. Breeding	8	2	-
Dr. Sujata	PhD	Pr. Scientist	Genetics & P. Breeding	9	-	-
Dr. (Ms.) Anju Mahendru	PhD	Pr. Scientist	Biochemistry	20	-	3
Dr. Sanjay Kumar Lal	PhD	Pr. Scientist	Genetics & P. Breeding	17	3	-
Dr. D.K. Yadava	PhD	Pr. Scientist	Genetics & P. Breeding	12	2	-
Dr. R.N. Gadag	PhD	Pr. Scientist	Genetics & P. Breeding	19	-	5
Dr. G.P. Singh	PhD	Pr. Scientist	Genetics & P. Breeding	13	3	1
Dr. J. B. Sharma	PhD	Pr. Scientist	Genetics & P. Breeding	09	1	-
Dr. H.K. Dikshit	PhD	Pr. Scientist	Genetics & P. Breeding	12	3	-
Dr. Akshay Talukdar	PhD	Pr. Scientist	Genetics & P. Breeding	09	-	6
Dr. R. S. Raje	PhD	Pr. Scientist	Genetics & P. Breeding	09	-	3
Dr. Gopala Krishnan S.	PhD	Sr. Scientist	Genetics & P. Breeding	06	-	-
Dr. Naveen Singh	PhD	Sr. Scientist	Genetics & P. Breeding	06	1	-
Dr. Shailesh Tripathi	PhD	Sr. Scientist	Genetics & P. Breeding	06	-	-
Dr. T. Nepolean	PhD	Sr. Scientist	Genetics & P. Breeding	06	-	-
Dr. Pradeep Kumar Singh	PhD	Sr. Scientist	Genetics & P. Breeding	06	-	-
Dr. Sumer Pal Singh	PhD	Sr. Scientist	Genetics & P. Breeding	06	1	-
Dr. Dharmendra Singh	PhD	Sr. Scientist	Genetics & P. Breeding	06	-	-



Dr. Firoz Hossain	PhD	Sr. Scientist	Genetics &P. Breeding	09	2	-
Dr. Neelu Jain	PhD	Sr. Scientist	Biotechnology	09	-	-
Dr. Prolay Kr. Bhowmick	PhD	Scientist	Genetics &P. Breeding	03	-	-
Dr. Ramya P.	PhD	Scientist	Genetics &P. Breeding	03	-	-
Dr. Kiran Gaikwad	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. Niharika Mallick	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. Vignesh M.	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. Shallendra Kumar Jha	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. Venkatraman Hedge	PhD	Pr. Scientist	Genetics &P. Breeding	17	-	-
Dr. Navinder Saini	PhD	Sr. Scientist	Biotechnology	02	-	-
Dr. Muraleedhar Aski	PhD	Scientist	Genetics &P. Breeding	01	-	-
Dr. Naresh Kumar	PhD	Scientist	Genetics &P. Breeding	01	-	-
Dr. Vijendra Singh	PhD	Sr. Scientist	Genetics &P. Breeding	19	-	-
Dr. Sanjay Singh	PhD	Pr. Scientist	Genetics &P. Breeding	06	-	-
Dr. (Ms.) Jyoti Kumari	PhD	Sr. Scientist	Genetics &P. Breeding	07	-	-
Dr. Avinash Singode	PhD	Scientist	Genetics &P. Breeding	05	-	-
Dr. Chikkappa G. Karjagi	PhD	Scientist	Genetics &P. Breeding	05	-	-
Dr. Nirupma Singh	PhD	Scientist	Genetics &P. Breeding	06	-	-
Dr. Bhupender Kumar	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. Ganapati Mukri	PhD	Scientist	Genetics &P. Breeding	02	-	-
Dr. K.K. Vinod	PhD	Sr. Scientist	Genetics &P. Breeding	05	-	-
Dr. Jayanta Bhat	PhD	Sr. Scientist	Genetics &P. Breeding	05	-	-
Dr. Dharam Pal	PhD	Pr. Scientist	Genetics &P. Breeding	06	-	-
Dr. Madhu Patial	PhD	Scientist	Genetics &P. Breeding	04	-	-
Dr. Sai Prasad	PhD	Pr. Scientist	Genetics &P. Breeding	13	-	-
Dr. P. Jayaprakash	PhD	Sr. Scientist	Genetics &P. Breeding	01	-	-
Dr. B. S. Patil	PhD	Sr. Scientist	Genetics &P. Breeding	03	-	-
Mr. Rama Prashat G	MSc	Scientist	Genetics	01	-	-

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S.No.	Name of the Faculty	Status
1.	Dr. S K VasaI, Distinguished Maize Scientist from CIMMYT and the World Food Prize laureate	Adjunct Professor
2.	Dr. V P Singh	Adjunct Faculty member
3.	Dr. A Bandopadhyay	Adjunct Faculty member

13. Percentage of classes taken by temporary faculty – programme-wise information:

Nil

14. Programme-wise Student Teacher Ratio:

M. Sc. = 1:4.58 and Ph.D.= 1:1.44

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	NA	46	46
2.	Administrative	15	11	11
3.	Supportive	213	107	107



16. Research thrust areas as recognized by major funding agencies:

Biofortification and quality enhancement of crops, marker assisted breeding, molecular mapping of QTLs/genes for biotic and abiotic stress tolerance, enhancement of genetic potential of field crops through, germplasm evaluation and utilization, pre-breeding, including distant hybridization for transfer of agronomically important traits in field crops, molecular breeding for biotic and abiotic stress resistance, crop quality and effective utilization of molecular marker technologies for crop improvement

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Total Grants Received
Dr. Vinod	Network project on “Transgenics in Crops”		118.49 lakhs
Dr. K. V. Prabhu Dr. G. P. Singh		Molecular breeding selection strategies to combine and validate QTLs for WUE and Heat tolerance in wheat	1,65000 US dollars
Dr. Vinod Dr.K.V.Prabhu Dr.J.B.Sharma	Molecular marker assisted development of biotic stress resistant wheat varieties		70.37 lakhs
Dr. Neelu jain	Cloning and characterisation of genes expressed in response to leaf rust resistance in wheat		Total Rs 11680000 (Rs 4997900 at IARI centre)
Dr. Anju Mahendru Singh	Biofortification of wheat for micronutrients through conventional and molecular approaches		83 lakhs
Dr. Anju Mahendru Singh	Biofortified wheat for improved human nutrition		20.1 lakhs
Dr. Anju Mahendru Singh	Identification and characterization of peptides in selected wheat cultivars which are less immunogenic to patients with Celiac disease		3.73 lakhs
Dr. Anju Mahendru Singh	ICAR-ACIAR network project on Wheat Grain Quality		26.19 lakhs
Dr. Anju Mahendru Singh	CRP-Wheat Biofortification		6.5 lakhs
Dr. Anju Mahendru Singh	Wheat quality – NPTC		26 lakhs
Dr. A. K. Singh	Allele Mining and Expression Profiling of Resistance- and Avirulence- genes in Rice-Blast Pathosystem for development of Race non-specific disease resistance		Rs. 495.32 Lakhs
Dr. A. K. Singh Dr. Gopala Krishnan	ICAR Network project on Transgenic and functional genomics-Understanding genes involved in expression of Basmati quality traits in rice		Rs. 325.00 Lakhs
Dr. A. K. Singh Dr. K. V. Prabhu Dr. Gopala Krishnan Dr. M. Nagarajan	Development of biotic stress resistant rice through MAS		Rs. 95.37 Lakhs
Dr. A. K. Singh Dr. K. V. Prabhu Dr. K. K. Vinod	Development of abiotic stress resistant rice through MAS		Rs. 23.72 Lakhs
Dr. A. K. Singh Dr. Gopala Krishnan	Analysis of diversity in yield components (seed size and weight) at transcriptome and epi-genome level for association or genetic mapping of selected loci in rice and chickpea		Rs. 55.04 Lakhs



Dr. A. K. Singh Dr. Gopala Krishnan Dr. P. K. Bhowmik	CRP on Biofortification		Rs. 370.20 Lakhs
Dr. A. K. Singh Dr. Gopala Krishnan Dr. P. K. Bhowmik	Molecular Genetic analysis of resistance/tolerance to different stresses		Rs. 851.39 Lakhs
Dr. Gopala Krishnan Dr. A. K. Singh	Metabolic and Molecular profiling of aromatic rice germplasm of India for gaining insights about aroma		Rs. 25.624 Lakhs
Dr. A. K. Singh Dr. Gopala Krishnan	Improvement of aroma in the high yielding Basmati Rice varieties using conventional and marker assisted selection		Rs. 51.52 Lakhs
Dr. K. K. Vinod Dr. Gopala Krishnan Dr. P. K. Bhowmik Dr. M. Nagarajan	Marker Assisted Improvement of Rice Variety Pusa44 for Phosphorus Use Efficiency		Rs. 45.03 Lakhs
Dr. T. Nepolean Dr. Firoz Hossain	Bioprospecting and Allele Mining for Abiotic Stress Tolerance		4,29,61,600
Dr. H. S. Gupta Dr. Firoz Hossain Dr. T. Nepolean	ICAR network project on transgenics in crop plants (Functional Genomics Component)		1,32,17,295
Dr. H. S. Gupta Dr. Firoz Hossain Dr. T. Nepolean	Rapid conversion of normal maize inbreds to quality protein maize and further enhancement of limiting amino acids in elite inbreds through marker-assisted selection		79.99 lakhs (sanctioned)
Dr. H. S. Gupta Dr. Firoz Hossain Dr. M. Vignesh Dr. T. Nepolean	Development of micronutrient enriched maize through molecular breeding		112.88 lakhs (sanctioned)
Dr. C. Tara Satyavathi Dr. S. P. Singh	Generation of mapping populations and identification of QTL(s) for downy mildew resistance in Pearl millet [<i>Pennisetum glaucum</i> (L.) R. Br]		60 lakhs
Dr. C. Tara Satyavathi Dr. S. P. Singh	Biofortification platform		40 lakhs
Dr. C. Bharadwaj Dr. Shailesh Tripathi	Functional genomics in chickpea for drought tolerance		40 lakhs
Dr. C. Bharadwaj Dr. Shailesh Tripathi	Genomic approaches for stress tolerant chickpea (DST-AISRF)-		4700080
Dr. C. Bharadwaj Dr. V. S. Hegde	Identification of QTLs for seed weight and seed number in chickpea		25 lakhs
Dr. C. Bharadwaj Dr. Shailesh Tripathi Dr. V. S. Hegde		DAC funded "Pre-breeding and genetic enhancement in breaking yield barriers in <i>kabuli</i> chickpea and lentil through ICAR – ICARDA collaboration"	5.25 lakhs received so far in year 1
Dr. Shailesh Tripathi Dr. C. Bharadwaj	Centre of excellence for high-throughput allele determination for molecular breeding		38.57 lakhs



Dr. Shailesh Tripathi Dr. C. Bharadwaj Dr. V. S. Hegde	Developing chickpea cultivars suited to mechanical harvesting and tolerant to herbicides		74.21 lakhs
Dr. R. S. Raje	Development of mapping population and identification of QTLs for seed yield components in pigeon pea (<i>Cajanus cajan</i>).		29,97,323
Dr. R. S. Raje	Selection and utilization of water logging tolerant cultivars in pigeonpea		7,73,921
Dr. R. S. Raje	Evaluation and production of CGMS based hybrids for enhancement of productivity and stability of yield in pigeonpea (<i>Cajanus cajan</i> L. Millspaugh)		14,76,841
Dr. R. S. Raje	Construction of linkage map and identification of molecular markers for wilt resistance in pigeonpea [<i>Cajanus cajan</i> (L.) Millspaugh]		18,66,299
Dr. H. K. Dikshit		ICARDA Lentil biofortification - Harvest plus project	10.75 lakhs
Dr. H. K. Dikshit Dr. Dharmendra Singh	Generation advancement and development of new genotypes through pre breeding in lentil		5.9 lakhs
Dr. D. K. Yadava Dr. Sujata Dr. Naveen Singh	Development of double low (Canola Type) Indian Mustard (<i>Brassica juncea</i> (L.) Czern. & Coss) through marker assisted selection		84.15 lakhs
Dr. Akshay Talukdar	Marker assisted selection for development of Kunitz trypsin inhibitor free soybean varieties.		32.70 lakhs
Dr. Akshay Talukdar	Molecular mapping and construction of linkage map for YMV resistance in soybean		29.96 lakhs
Dr. Jagmail Singh	Identification of consistent QTLs for fibre quality traits in cotton based on two mapping populations and four environments		35 lakhs

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

Sl. No	Project title	Collaborative institutes	Total grants received
1.	Rapid conversion of normal maize inbreds to quality protein maize and further enhancement of limiting amino acids in elite inbreds through marker-assisted selection -DBT	IARI, New Delhi; VPKAS, Almora; ICAR-RC-NEH, Barapani; CSK-HPKV, Palampur; JNKVV, Jabalpur and ANGRAU, Hyderabad	392.41 (sanctioned for all centres)
2.	Development of micronutrient enriched maize through molecular breeding -DBT	IARI, New Delhi; VPKAS, Almora; CSK-HPKV, Bajaura and ANGRAU, Hyderabad	297.60 lakhs (sanctioned for all centres)
3	Analysis of diversity in yield components (seed size and weight) at transcriptome and epi-genome level for association or genetic mapping of selected loci in rice and chickpea	NIPGR, New Delhi 5 years (05.08.2013 – 04.08.2018)	Rs. 55.04 Lakhs
4	CRP on Biofortification	DRR, Hyderabad 3 years (29.11.2014 – 31.03.2017)	Rs. 370.20 Lakhs
5	Molecular Genetic analysis of resistance/tolerance to different stresses	DRR, CRRI, NRCPB, TNAU, PAU, CSKHPKV 3 years (26.11.2014 – 31.03.2017)	Rs. 851.39 Lakhs
6	Metabolic and Molecular profiling of aromatic rice germplasm of India for gaining insights about aroma	DRR, Hyderabad 3 years (22.08.2012 – 21.08.2015)	Rs. 25.624 Lakhs



7	Marker assisted selection for development of Kunitz trypsin inhibitor free soybean varieties.	Directorate of Soybean Research, Indore; Agharkar Research Institute, Pune	113.01 lakhs
8	Molecular mapping and construction of linkage map for YMV resistance in soybean	BN College of Agriculture, AAU, Biswanath Chariali, Assam	69.97 lakhs
9	Genomic approaches for stress tolerant chickpea (DST-AISRF)	NIPGR, New Delhi	4700080
10	Centre of excellence for high-throughput allele determination for molecular breeding	IIPR, Kanpur	38.57 lakhs
11	Pre-breeding and genetic enhancement in breaking yield barriers in <i>kabuli</i> chickpea and lentil	IIPR, Kanpur PAU, Ludhiana	5.25 lakhs received so far in year 1
12	Developing chickpea cultivars suited to mechanical harvesting and tolerant to herbicides	PAU, Ludhiana IIPR, Kanpur RVSKVV, Gwalior UAS, Dharwad ANGRAU, Hyderabad	74.21 lakhs
13	Generation advancement and development of new genotypes through pre breeding in lentil	IIPR, HPKV, RVSKVV	5.9 lakhs
14	Development of mapping population and identification of QTLs for seed yield components in pigeon pea (<i>Cajanus cajan</i>).	NRCPB	29,97,323
15	Selection and utilization of water logging tolerant cultivars in pigeonpea	HAU, IIPR, BHU, PAU, JNKVV	7,73,921
16	Evaluation and production of CGMS based hybrids for enhancement of productivity and stability of yield in pigeonpea (<i>Cajanus cajan</i> L. Millspaugh)	UAS - Bangalore, IIPR, PDKV, PAU, JNKVV, SK Nagar Agricultural University	14,76,841
17	Construction of linkage map and identification of molecular markers for wilt resistance in pigeonpea [<i>Cajanus cajan</i> (L.) Millspaugh]	UAS - Dharwad	18,66,299

b) International collaboration

Sl. No	Project title	Collaborative institutes	Total grants received
1.	Generation of mapping populations and identification of QTL(s) for downy mildew resistance in Pearl millet [<i>Pennisetum glaucum</i> (L.) R. Br]	ICRISAT, Patancheru, Telangana	60 lakhs
2	Genomic approaches for stress tolerant chickpea (DST-AISRF)	ICRISAT, Patancheru University of Western Australia, Perth	4700080
3	Centre of excellence for high-throughput allele determination for molecular breeding	ICRISAT, Patancheru	38.57 lakhs
4	Pre-breeding and genetic enhancement in breaking yield barriers in <i>kabuli</i> chickpea and lentil	ICARDA	5.25 lakhs received so far in year 1
5	Developing chickpea cultivars suited to mechanical harvesting and tolerant to herbicides	ICRISAT, Patancheru	74.21 lakhs
6	ICARDA Lentil biofortification - Harvest plus project	Nepal, Bangladesh, ICARDA (Morocco)	10.75 lakhs
7	Selection and utilization of water logging tolerant cultivars in pigeonpea	ICRISAT	7,73,921



19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

None under these programmes.

20. Research facility / centre with State recognition

None

National recognition

None

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable



22. Publications:

	Number of papers published in peer reviewed journals (national / international)	Monographs	Chapters in Books	Edited Books	Books with ISBN with details of publishers	Number listed in International Database	Citation Index – range / average	SNIP range / average	SJR range / average	Impact Factor– range / average	h-index
Dr. H. S. Gupta	21	-	1	-	-	-	0 to 13 (4.04)	0 to 1.15 (0.56)	0 to 3.62 (0.72)	0 to 4.04 (1.09)	7
Dr. K.V. Prabhu	58	--	20	5	--			0.372 to 1.86 (0.720)	0.207 to 1.937 (0.530)		
Dr. Ashok Kumar Singh	57	-	8	-	-					0.18-4.04/1.40	20
Dr. Vinod	23	-	-	-	-	-	2.26	0.425	0.305	0.138-1.746	4
Dr. C. Tara Satyavathi	21	----	8	1	New Vishal Publishers			0.049 to 0.69 (0.324)	0.118 to 0.276(0.174)	3.02 to 6.88 NAAS rating	
Dr. Chellapilla Bharadwaj								0.049 to 3.941 (1.0816)	0.111 to 3.001(0.766)		
Dr. Sujata	25	--	8	2	--		43	8.005	4.326		4.0
Dr. (Ms.) Anju Mahendru	19	--	6	1	--			0.087 to 2.023 (0.644)	0.118 to 1.559(0.442)		
Dr. Sanjay Kumar Lal	23	0	1	0	0						
Dr. D.K. Yadava	38	--	21	5	--		125	11.498	6.758		5.0
Dr. J. B. Sharma	12	-	02	02	-	-	0-5	0.001-1.162	0.108-1.084	0.138-2.281	3
Dr. Akshay Talukdar	19	0	4	0	0	0	85	0.351-1.062	0.111-1.400	0.042-2.924	6
Dr. Gopala Krishnan S.	39	-	10	-	-					0.19-5.68/1.11	9
Dr. N Singh	12	--	16	--	--		50	9.909	5.836		4.0



Dr. Shailesh Tripathi	16							1								0.177-8.905 Ave – 3.137	0.276-3.001 Ave – 1.291	0.53-3.941 Ave – 1.374										
Dr. T. Nepal	35	-						3			-						0.223 to 4.3 (1.3)	0.169 to 2.4 (0.64)	0.3 to 1.148 (0.6)									
Dr. Sumer Pal Singh	7							3									2.5-6.37											
Dr. Firoz Hossain	37	-						3			-						0 to 4.04 (0.67)	0 to 3.62 (0.47)	0 to 1.15 (0.46)	0 to 13 (3.73)								
Dr. Prolay Kr. Bhowmick	7	-						-			-						0.19-3.51/1.39	0.169-1.773	0.351-1.53									
Dr. Kiran Gaikwad	11	-						-			-						(0.052-3.53) 0.76	(0.108-2.591) 1.185	(0.103-1.210) 0.69	4								
Dr. Niharika Mallick	02	-						-			-						0.138-1.338	0.188-0.626	0.222-0.895	1								
Dr. Vignesh M.	17	-						3			-						0 to 3.53 (0.45)	0 to 3.62 (0.38)	0 to 1.1 (0.42)	0 to 10 (2.59)								
Dr. Shallendra Kumar Jha	9	-						1			-						0 to 2.57 (0.46)	0 to 1.18 (0.30)	0 to 1.19 (0.50)	0 to 5 (0.89)								
Dr. Navinder Saini	14							2									17.29			282								
											D. ISBN 978-81-322-2171-5 ii). ISBN 9781466 585256																	
Dr. Naresh Kumar	9	1						0			0						7.15	(0.111-1.932) 0.589	(0.049-1.418) 0.806	57								
Dr. Sanjay Singh	21							03									0.2-1.0			4810								

**Some of the important publication from 2010-2014**

List of Publications NASS Rating >8-9)	NAAS Journal ID	NAAS rating
Narpinder Singh, S Singh, N Isono, T Noda, Anju M Singh . (2009). Diversity in amylopectin structure, thermal and pasting properties from wheat varieties/lines. <i>International Journal of Biological Macromolecules</i> : 45: 298–304.	I119	8.60
Pandit, A., Vandna, R., Subhashish, B., Shikha, S., Vinod, K., chauhan, M., Gautam, R.K., Singh, R., Sharma, P.C., Singh, A.K., Gaikwad, K., Sharma, T.R., Mohapatra, T., Singh, N.K.2010. Combining QTL mapping and transcriptome profiling of bulked RILs for identification of functional polymorphism for salt tolerance genes in rice (<i>Oryza sativa</i> L.). <i>Molecular Genetics and Genomics</i> . 284: 121-136	M053	8.88
Giriraj Kumawat, Ranjeet S. Raje, ShefaliBhutani, Jitendra K Pal, Amitha SVCR Mithra, KishorGaikwad, Tilak R Sharma and Nagendra K Singh. (2012).Molecular mapping of QTLs for plant type and earliness traits in pigeonpea (<i>Cajanuscajan</i> L. Millsp.). <i>BMC Genetics</i> . 13:84	B010	8.81
Singh VK, Singh A, Singh SP, Ellur RK, Choudhary V, Sarkel S, Singh D, Gopala Krishnan S, Nagarajan M, Vinod KK, Singh UD, Rathore R, Prashanthi SK, Aggrawal PK, Bhatt JC, Mohapatra T, Prabhu KV and Singh AK. 2012. Incorporation of blast resistance into “PRR78”, an elite Basmati rice restorer line, through marker assisted backcross breeding. <i>Field Crops Research</i> , 128: 8-16.	F010	8.47
List of Publications NASS Rating >9)	NAAS Journal ID	NAAS rating
Swarup Kumar Parida, Vivek Dalal, Ashok Kumar Singh, Nagendra Kumar Singh and Trilochan Mohapatra. 2009. Genic non-coding microsatellites in the rice genome: characterization, marker design and use in assessing genetic and evolutionary relationships among domesticated groups. <i>BMC Genomics</i> , 10:140.	B011	10.40
Basavaraj, S.H., Singh, V.K., Singh, A., Singh, A., Singh, Singh, A., Yadav, S., Ellur, R. K., Singh, D., Gopala Krishnan, S., Nagarajan, M., Mohapatra, T., Prabhu, K.V. and Singh, A. K. 2010. Marker-assisted improvement of bacterial blight resistance in parental lines of Pusa RH10, a superfine grain aromatic rice hybrid. <i>Molecular Breeding</i> DOI 10.1007/s11032-010-9407-3.	M047	9.25
Singh, A., Singh, P. K., Singh, R., Pandit, A., Mahato, A. K., Gupta, D. K., Tyagi, K., Singh, A. K., Singh, N. K. and Sharma, T. R. 2010. SNP haplotypes of the BADH1 gene and their association with aroma in rice (<i>Oryza sativa</i> L.). <i>Molecular Breeding</i> DOI: 10.1007/s11032-010-9425-1	M047	9.25
Ngangkham, U., Parida, S. K., De, S. K., Anand, R. K., Singh, A. K., Singh, N. K. and Mohapatra, T. 2010. Genic markers for wild abortive (WA) cytoplasm based male sterility and its fertility restoration in rice. <i>Molecular Breeding</i> DOI: 10.1007/s11032-010-9397-1.	M047	9.25
Singh, H., Deshmukh, R. K., Singh, A., Singh, A. K., Gaikwad, K., Sharma, T. R., Mohapatra, T. and Singh, N. K. 2010. Highly variable SSR markers suitable for rice genotyping using agarose gels. <i>Molecular Breeding</i> 25(2): 359-364.	M047	9.25
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Vignesh Muthusamy, Firoz Hossain, Nepolean Thirunavukkarasu, Mukesh Choudhary, Supradip Saha, Jayant S. Bhat, Boddupalli M. Prasanna, Hari S. Gupta. 2014. Development of β -Carotene Rich Maize Hybrids through Marker-Assisted Introgression of β -carotene hydroxylase Allele. <i>Plos One</i> (DOI: 10.1371/journal.pone.0113583)		9.53

**Publication: NAAS Rating 6-8**

Sl. No.	List of Publications (NAAS Rating >6-8)	NAAS Journal ID	NAAS rating
1.	Basavaraj, S.H., Singh, V.K., Singh, Atul, Singh, Devinder Singh, Nagarajan, M., Mohapatra, T., Prabhu, K.V. and Singh, A.K. (2009). Marker aided improvement of Pusa 6B, the maintainer parent of Pusa RH 10, for resistance to bacterial blight. <i>Ind. J. Genet.</i> , 69:10-16.	I047	6.20
2.	Chakraborti M., Prasanna B.M., Hossain F, Singh A.M. and Guleria. (2009) Genetic evaluation of kernel Fe and Zn concentrations and yield performance of selected Maize (<i>Zea mays L.</i>) genotypes. <i>Range Mgmt. & Agroforestry</i> 30(2): 109-114.	R007	6.17
3.	Hettiarachchi, K., Prasanna, B.M., Rajan, A., Singh, O.N., Gowda, K.T.P., Pant, S.K. and Sangit Kumar (2009). Generation mean analysis of Turicum leaf blight resistance in maize. <i>Ind. J. Genet.</i> 69(2): 102-108.	I047	6.20
4.	Kumar Durgesh, Shailendra K. Jha, SMS Tomar, Vinod, B Singh and P. Dureja (2009). Genetical and biochemical analysis of glaucousness in wheat (<i>Triticumaestivum L.</i>) <i>Ind. J. Genet.</i> , 69(2): 93-98	I047	6.20
5.	Sivasamy M., Vinod, Sushma Tiwari, R. S. Tomar, Bhanwar Singh, J. B. Sharma, S. M. S. Tomar and Suresh Chand (2009). Introgression of useful linked genes for resistance to stem rust, leaf rust and powdery mildew and their molecular validation in wheat (<i>Triticumaestivum L.</i>). <i>Ind. J. Genet.</i> 69(1): 17-27	I047	6.20
6.	Tiwari Sushma, Bhanwar Singh, Vinod, S. M. S. Tomar, N.K.Singh and Suresh Chand(2009).Molecular validation and screening of <i>Triticumdicoccoides</i> Korn.accessions for stripe rust resistance gene Yr15 with SSR marker (2009). <i>Ind. J. Genet.</i> 69(1): 66-68	I047	6.20
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8.	Ghazi, I., Srivastava, P., Dalal, V., Gaikwad, K., Singh, A. K., Sharma, T. R., Singh, N. K. and Mohapatra, T. 2009. Physical mapping, expression analysis and polymorphism survey of resistance gene analogues on chromosome 11 of rice. <i>Journal of Bioscience. Proceedings of Indian Academy of Sciences.</i> 34(2): 251–261.	J085	7.76
9.	Singode, A., Sekhar, J.C., Kalyani Srinivasan and Prasanna, B.M. (2009). Evaluation of yield performance of selected North East Himalayan (NEH) maize landrace accessions of India outside their original habitat. <i>Ind. J. Genet.</i> 69(3): 191-198.	I047	6.20
10.	Tara Satyavathi, C. Sakkira Begum, Singh, B.B, Unnikrishnan, K.V. and Bharadwaj,C. 2009. Analysis of diversity among cytoplasmic male sterile sources and their utilization in developing F1 hybrids in Pearl millet [<i>Pennisetumglaucum (R.) Br.</i>] <i>Ind. J. Genet.</i> 69 (4):126-133	I047	6.20
11.	Vignesh, M., Yadava, D.K. Sujata. V., Mohapatra T., Jain Neelu, Yadav Anil Kumar, Malik Divya, Yadav M. S. and Prabhu K. V. 2009. Genetics of white rust resistance in <i>Brassica juncea</i> . and allelic relationship between interspecific sources of resistance. <i>Ind. J. of Genet.</i> 69(3): 205-208.	I047	6.20
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14.	Ammar, MHM, Pandit, A., Singh, RK, Sameena, S, Chauhan, MS, Singh, AK, Sharma, PC, Gaikwad, K. Sharma, TR, Mohapatra, T, Singh, NK. 2009. Mapping of QTL controlling Na ⁺ , K ⁺ , Cl ⁻ ion concentration in salt tolerant indica variety CSR 27. <i>J. Plant Biochemistry and Biotechnology.</i> 18:139-150.	J324	6.41
15.	Irfan Ghazi, Prem Srivastava, Vivek Dalal, Kishor Gaikwad, Ashok K. Singh, Tilak R. Sharma, Nagendra K. Singh and Trilochan Mohapatra. 2009. Physical mapping, expression analysis and polymorphism survey of resistance gene analogues on chromosome 11 of rice. <i>J. Biosci.</i> 34(2): 251–261.	J085	7.76
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20.	Chakraborti Mridul and Chandrashekar Shanti 2010. Multiple roles of a PLC β regulator in olfaction, pupal development and synaptic vesicle recycling in <i>Drosophila melanogaster</i> . <i>Ind. J. Genet.</i> 70(3): 215-221.	I047	6.20
21.	Chakraborti M., Prasanna B.M., Singh A. and Hossain F. (2010). Generation mean analysis of kernel iron and zinc concentrations in maize (<i>Zea mays</i> L.). <i>Ind. J. Agril. Sci.</i> 80(11): 956-959.	I023	6.18
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32.	Prasanna B.M., Mazumdar S., Chakraborti M., Hossain F, Manjaiah K.M., Agrawal P.K. Guleria S.K. and Gupta H.S. (2011). Genetic variability and genotype x year interactions for kernel iron and zinc concentration in maize (<i>Zea mays</i> L.). <i>Ind. J. Agril Sci.</i> 81(8): 704-711.	I023	6.18
33.	Kailash B. Bhawar, Vinod, J. B. Sharma, A. K. Singh, M. Sivasamy, Mona Singh, K. V. Prabhu, S. M. S. Tomar, T. R. Sharma and B. Singh (2011), Molecular marker assisted pyramiding of leaf rust resistance genes Lr19 and Lr28 in wheat variety HD2687, <i>Ind. J. Genet.</i> 71(4) 304-311.	I047	6.20
34.	Kumar Durgesh, S. Kumarsamy, Vinod, Gaurav Kumar and S. M. S. Tomar, (2011), Genetics of rust resistance and cytogenetic studies in a derivative of wheat (<i>Triticum aestivum</i> L.) x <i>Aegilops speltoides</i> . <i>Ind. J. Genet.</i> (71)151-157	I047	6.20
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37.	Khanduri A., Hossain F., Lakhera P.C. and Prasanna B.M. (2011). Effect of harvest time on kernel sugar concentration in sweet corn. <i>Ind. J. Genet.</i> 71(3): 231-234.	I047	6.20
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43.	Singh, N.K., Gupta, D.K. Jayaswal, P.K., Mahato, A.K., Dutta, S., Singh, S., Bhutani, S., Dogra, V., Singh, B.P., Kumawat, G., Pal, J.K., Pandit, A., Singh, A., HukumRawal, Akhilesh Kumar, Rama Prashat, G., Khare, A., Yadav, R., Raje, R. S., Singh, M. N., Datta, S., BashasabFakrudin, Wanjari, K.B., RekhaKansal, Dash, P. K., Jain, P.K., Bhattacharya, R., Gaikwad, K., Mohapatra, K., Srinivasan, R. and Sharma, T.R. (2011). The first draft of the pigeonpea genome sequence. <i>J. Plant Biochemistry and Biotechnology.</i> 21: 98-112.	J324	6.41
44.	Gopala Krishnan S, Singh JP and Dwivedi NK. 2011. Primitive weedy forms of guar, adak guar: possible missing link in the domestication of guar [<i>Cyamopsis tetragonoloba</i> (L.) Taub.]. <i>Genetic Resources and Crop Evolution</i> , 58(7): 961-966.	G010	7.59
45.	Singh AK, Gopala Krishnan S, Singh VP, Mohapatra T, Prabhu KV, Singh NK, Sharma TR, Nagarajan M, Vinod KK, Singh D, Singh UD, Chander S, Atwal SS, Seth R, Singh VK, Ellur RK, Singh A, Anand D, Khanna A, Yadav S, Goel N, Singh A, Shikari AB, Singh A and Marathi B. 2011. Marker assisted selection: a paradigm shift in Basmati breeding. <i>Ind. J. Genet.</i> , 71(2): 1-9.	I047	6.20
46.	Balram Marathi, Smriti Guleria, N. K. Singh, T. Mohapatra, K. V. Prabhu and A. K. Singh. 2011. Molecular diversity and segregation distortion measured by SSR markers in a new plant type based recombinant inbred line population of rice. <i>Ind. J. Genet.</i> , 71(4): 296-302.	I047	6.20
47.	Singh, Rakesh, Singh, A.K., Sharma, T.R., Singh, A. and Singh, N.K. 2011 Fine mapping of grain length QTLs on chromosomes 1 and 7 in Basmati rice (<i>Oryza sativa</i> L.). <i>J. Plant Biochem. Biotechnol.</i> DOI 10.1007/s13562-011-0080-3.	G010	7.59
48.	G. K. Chikkappa, N. K. Tyagi, K. Venkatesh, M. Ashish, K. V. Prabhu, T. Mohapatra and A. K. Singh. 2011. Analysis of transgene(s) (<i>psy+crtI</i>) inheritance and its stability over generations in the genetic background of indica rice cultivar Swarna. <i>J. Plant Biochem. Biotechnolgy.</i> DOI 10.1007/s13562-010-0021-6.	G010	7.59
49.	Santosh, H. B., Sekhar, J. C., Rakshit, S., Gadag, R. N. and Dass, S. (2012) Detection of epistatic interaction for susceptibility towards pink borer (<i>Sesamia inferens</i> Walker) in maize (<i>Zea mays</i> L.) <i>Ind. J. Genet.</i> 72(3) 284-289.	I047	6.20
50.	Vignesh M., Hossain F., Nepolean T., Saha S., Agrawal P.K., Guleria S.K., Prasanna B.M. and Gupta H.S. (2012) Genetic variability for kernel b-carotene and utilization of <i>crtRB1 3'TE</i> gene for biofortification in maize (<i>Zea mays</i> L.). <i>Ind. J. Genet.</i> 72(2) 189-194.	I047	6.20
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54.	Mithlesh Kumar, S. K. Lal*, R. L. Sapra, K. V. Prabhu, Akshay Talukdar, Madanpal Singh, K. P. Singh, Deepti Nagaich and K. V. Bhat. (2012) Assessment of genotypic variation in soybean for water use efficiency (WUE) using Carbon Isotope Discrimination (CID) technique. <i>Ind. J. Genet.</i> 72(2) 241-247	I047	6.20
55.	R. Sakkira Begum, R.N. Gadag, Firoz Hossain, Jayant S Bhat, R.T. Maruti, Hanumanth Naik and S K Jha. (2012) Genetic diversity analysis in some inbred lines of Maize for baby corn traits <i>Indian J. Hort.</i> (Accepted)	I050	6.13
56.	Kallesh DT, G P Singh, Anju M Singh, Arvind Ahlawat and R K Sharma (2012) Genetic diversity analysis for moisture stress adaptive and quality traits in bread wheat (<i>Triticum aestivum</i> L.). <i>Ind. J. Agril. Sci.</i> 82(11) 978-984	I023	6.18
57.	Agrawal P.K., Jaiswal S.K., Prasanna B.M., Hossain F., Saha S., Guleria S.K. and Gupta H.S. (2012). Genetic variability and stability for kernel iron and zinc concentration in maize (<i>Zea mays</i> L.) genotypes. <i>Ind. J. Genet.</i> 72(4): 421-428.	I047	6.20
58.	Vignesh M., Hossain F., Nepolean T., Saha S., Agrawal P.K., Guleria S.K., Prasanna B.M. and Gupta H.S. (2012). Genetic variability for kernel b-carotene and utilization of crtRB1 3'TE gene for biofortification in maize (<i>Zea mays</i> L.). <i>Ind. J. Genet.</i> 72(2): 189-194.	I047	6.20
59.	Tiwari A., Prasanna B.M., Hossain F. and Guruprasad K.N. (2012). Analysis of genetic variability for kernel carotenoid concentration in selected maize inbred lines. <i>Ind. J. Genet.</i> 72(1): 1-6.	I047	6.20
60.	Nepolean, T., Gupta, S. K., Dwivedi, S. L., Bhattacharjee, R., Rai, K. N. and Hash, C. T. (2012) Genetic diversity in maintainer and restorer lines of pearl millet. <i>Crop Science</i> , 52: 2555-2563.	C118	7.51
61.	Nepolean. T., Ishwar Singh, Hossain, F. and Neha Pandey, Gupta, H. S. (2012) Molecular characterization and assessment of genetic diversity of inbred lines showing variability for drought tolerance in maize. <i>J. Plant Biochemistry and Biotechnology</i> . DOI 10.1007/s13562-012-0112-7.	J324	6.41
62.	Singh, Anju-Mahendru, Singh, S.K., Ahlawat, A.K., Jain, N, Singh, G.P., Ravi, I, Yadav, M and Misra, P.C. (2012). Distribution of alleles of grain quality genes in Indian bread wheat varieties. <i>Ind. J. Genet.</i> 72(2) 208-216.	I047	6.20
63.	Singh, S K, Singh, A.M, Jain, N., Singh, G.P., Ahlawat, A.K. and Ravi, I. (2012). Molecular characterization of vernalization and photo period genes in wheat varieties from different agroclimatic zones of India. <i>Cereal Research Communication</i> . (accepted in October, 2012).	C042	6.55
64.	Henry RJ, Edwards M, Waters DLE, Gopala Krishnan S, Bundock P, Sexton TR, Masouleh AK, Nock .CJ and Pattemore J. 2012. Molecular markers for plants derived from large scale sequencing. <i>J. of Biosciences</i> 37(5): 829-841.	J085	7.76
65.	Guleria S, Sharma V, Marathi B, Anand S, Singh NK, Gopala Krishnan S, Mohapatra T, Prabhu KV and Singh AK. 2012. Molecular mapping of grain physico-chemical and cooking quality traits using recombinant inbred lines in rice (<i>Oryza sativa</i> L.). <i>J. Plant Biochemistry and Biotechnology</i> , 21(1): 1-10.	J324	6.41
66.	Dixit, P. Dokku, S. V. Amitha Mithra, S. K. Parida, A. K. Singh, N. K. Singh, T. Mohapatra. 2012. Haplotype structure in grain weight gene GW2 and its association with grain characteristics in rice. <i>Euphytica</i> , DOI 10.1007/s10681-012-0852-4.	E081	7.64
67.	Rakesh K. Srivastava, Shashi K. Mishra, Ashok K. Singh and Trilochan Mohapatra. 2012. Development of a coupling-phase SCAR marker linked to the powdery mildew resistance gene 'er1' in pea (<i>Pisum sativum</i> L.) <i>Euphytica</i> DOI 10.1007/s10681-012-0650-z.	E081	7.64
68.	Sonah H., R.K. Deshmukh, S. Chand, M. Srinivas Prasad, G.J.N. Rao, H.C. Upreti, A.K. Singh, N.K. Singh and T.R. Sharma. 2012. Molecular Mapping of Quantitative Trait Loci for Flag Leaf Length and Other Agronomic Traits in Rice (<i>Oryza sativa</i>). <i>Cereal Research Communications</i> 40(3), pp. 362–372.	C042	6.55
69.	Anand D, Baunthiyal M, Gopala Krishnan S, Singh NK, Prabhu KV and AK Singh. 2013. Novel InDel variation in GS3 locus and development of InDel based marker for marker assisted breeding of short grain aromatic rices. <i>J. Plant Biochemistry and Biotechnology</i> DOI 10.1007/s13562-013-0243-5.	J324	6.41
70.	Singh VK, Singh A, Singh SP, Ellur RK, Singh D, Gopala Krishnan S, Bhowmick PK, Nagarajan M, Vinod KK, Singh UD, Mohapatra T, Prabhu KV, Singh AK. 2013. Marker-assisted simultaneous but stepwise backcross breeding for pyramiding blast resistance genes Piz5 and Pi54 into an elite Basmati rice restorer line 'PRR78'. <i>Plant Breeding</i> 132 (5): 489-495.	P069	7.18



71.	Shikari AB, Khanna A, Gopala Krishnan S, Singh UD, Rathour R, Tonapi V, Sharma TR, Nagarajan M, Prabhu KV and Singh AK. 2013. Molecular analysis and phenotypic validation of blast resistance genes Pita and Pita2 in landraces of rice (<i>Oryza sativa</i> L.). <i>Ind. J. Genet.</i> 73(2): 131-141.	I047	6.20
72.	John KJ, Scariah S, Nissar VAM, Latha M, Gopala Krishnan S, Yadav SR and Bhat KV 2013. On the occurrence, distribution, taxonomy and genepool relationship of <i>Cucumis callosus</i> (Rottler) Cogn., the wild progenitor of <i>Cucumis melo</i> L. from India. <i>Genetic Resources and Crop Evolution</i> , 60(3): 1037-1046.	G010	7.59
73.	Anand D, Baunthiyal M, Singh A, Gopala Krishnan S, Singh NK, Prabhu KV and Singh AK. 2013. Validation of gene based marker-QTL association for grain dimension traits in rice. <i>J. Plant Biochemistry and Biotechnology</i> , 22(4): 467-473.	J324	6.41
74.	Yadav Sheel, Singh Ashutosh, Goel Nitika, Singh A. K. 2013. Identification of Indian rice germplasm lines with bacterial leaf blight (BLB) resistance genes. 2013. <i>Ind. J. Genet.</i> , 73(3): 310-313.	I047	6.20
75.	Thakur S, P K Singh , Rajeev Rathour , M Variar , S K Prashanthi , A K Singh , U D Singh , D Chand , N K Singh , Tilak Raj Sharma 2013. Positive Selection Pressure on Rice Blast Resistance Allele Piz-t makes it Divergent in Indian land races. <i>Journal of Plant Interactions</i>	J329	6.90
76.	Vijayan J., Jain S., Jain N., Devanna B.N., Rathour R., Variar M., Prashanthi S., Singh A. K., Singh U. D., Singh N. K., Sharma T. R. 2013. Identification of differentially expressed genes in rice during its early phases of interaction with <i>Magnaporthe oryzae</i> . <i>Ind. J. Genet.</i> , 73(3):233-243.	I047	6.20
77.	Nagaraja N.R., Singh Anupam, Pallavi J.K., Sharma J.B., Singh G.P., Jain Neelu and Prabhu K.V. (2013) Validation of molecular markers linked to the stem rust resistance genes effective in India. <i>Ind. J. Genet.</i> , 73(3) 314-319	I047	6.20
78.	Harish GD, TalukdarAkshay*, Shivakumar M, Kumar B, Verma K, Lal SK, Sapra RL, Singh KP (2013) Genetics of yellow mosaic virus (YMV) resistance in cultivated soybean [<i>Glycine max</i> (L) Merr.]. <i>Legume Research</i> 36 (3): 263-267	L008	6.09
79.	TalukdarAkshay, Shivakumar M (2013) Pollination without emasculation, an efficient method of hybridization in soybean. <i>Current Science</i> 103(6): 628-630	C141	6.91
80.	Kumar, H., Dikshit, H. K., Singh, A. M., Singh, D., Kumari, J., Singh, A., & Kumar, D. Characterization of elite lentil genotypes for seed iron and zinc concentration and genotype x environment interaction studies. <i>Ind. J. Genet.</i> 73(2) :169-176	I047	6.20
81.	Kumar Bhupender, AkshayTalukdar*, Verma K, Vanishree G, InduBala, Lal SK, SinghKP, Sapra RL Screening of soybean [<i>Glycine max</i> (L.) Merr.] genotypes for yellow mosaic virus (YMV) disease and their molecular characterization using RGA and SSRs markers <i>Australian J. Crop Sci.</i> 8 (1)	A233	6.00
82.	Sinha Pallavi, S M S Tomar, Vinod, Vikas Kumar Singh and H. S. Balyan (2013). Genetic analysis and molecular mapping of a new fertility restorer gene Rf8 for <i>Triticum timopheevi</i> cytoplasm in wheat (<i>Triticum aestivum</i> L.) using SSR markers. <i>Genetica</i> :141:431-441	G011	7.68
83.	Shikari Asif Bashir, Khanna Apurva, Gopal Krishnan S., Singh U.D., Rathour R. Tonapi V., Sharma T.R., Nagarajan M. Prabhu K.V. and Singh A.K. (2013) Molecular analysis and phenotypic validation of blast resistance genes Pita and Pita2 in landraces of rice (<i>Oryza sativa</i> L.). <i>Ind. J. Genet.</i> , 73(2) :131-141	(I047)	6.20
84.	Chandu Singh P.R., Singh N.K., Prabhu K.V., Vinod K.K. and Singh A.K. (2013) Molecular mapping of quantitative trait loci for grain chalkiness in rice (<i>Oryza sativa</i> L.). <i>Ind. J. Genet.</i> 73(3):244-251	I047	6.20
85.	Nepolean T., Senthilvel S., Hossain F., Namratha P.M. and Gupta H.S. (2013). Combating abiotic stresses in maize (<i>Zea mays</i>): Genomics approaches and in-silico tools available for the breeders. <i>Review. Ind. J. agric. Sci.</i> , 83: 1115-21.	I023	6.18
86.	Guleria S.K., Chahota R.K., Kumar P., Kumar A. Prasanna B.M., Hossain F., Agrawal P.K. and Gupta H.S. (2013). Analysis of genetic variability and genotype x year interactions on kernel zinc concentration in selected Indian and exotic maize (<i>Zea mays</i> L.) genotypes. <i>Ind. J. Agric. Sci.</i> , 83(8): 836-841.	I023	6.18
87.	Sivaranjani R. Prasanna B.M. Hossain F. and Santha I.M. (2013). Genetic variability for total carotenoid concentration in selected maize inbred lines. <i>Ind. J. Agric. Sci.</i> , 83(4): 431-436.	I023	6.18
88.	Gupta H. S., Raman B., Agrawal P. K., Mahajan V., Hossain F. and Nepolean T. (2013). Accelerated development of quality protein maize hybrid through marker-assisted introgression of opaque-2 allele. <i>Plant Breeding</i> . 132: 77-82.	P069	7.18



89.	Nepolean T., Singh I., Hossain F., Pandey N. and Gupta H.S. (2013). Molecular characterization and assessment of genetic diversity of inbred lines showing variability for drought tolerance in maize. <i>J. J. Plant Biochemistry and Biotechnology</i> . DOI: 10.1007/s13562-012-0112-7. 22(1): 71-79.	J324	6.41
90.	Vignesh M., Nepolean T., Hossain F., Singh A. K. and Gupta H. S. (2013). Sequence variation in 3'UTR region of crtRB1 gene and its effect on β -carotene accumulation in maize kernel. <i>J. Plant Biochem. and Biotech.</i> DOI 10.1007/s13562-012-0168-4. 22(4): 401-408.	J324	6.41
91.	Firoz Hossain, T. Nepolean, A. K. Vishwakarma, N. Pandey, B. M. Prasanna, H. S. Gupta. 2013. Mapping and validation of microsatellite markers linked to sugary1 and shrunken2 genes in maize (<i>Zea mays</i> L.). <i>J. Plant Biochem. And Biotechnol.</i> DOI 10.1007/s13562-013-0245-3.	J324	6.41
92.	RamanaKumari B, M Kolesnikova-Allen, S Senthilvel, T Nepolean, PB KaviKishor, JR Witcombe, Oscar Riera-Lizarazu, Rakesh Sand CT Hash. 2013. Development of a set of chromosome segment substitution lines in pearl millet [<i>Pennisetumglaucum</i> (L.) R. Br.]. <i>Crop Science</i> . Accepted.	C118	7.51
93.	Sharma Rajiv K., Pawan K. Singh, , Vinod, Arun K. Joshi, Subhash C. Bhardwaj, Navtej S. Bains and Sukhwinder Singh (2013). Protecting south Asian wheat production from stem rust (Ug99) epidemic. <i>J. Phytopathol.</i> 161(5): 299-307	J321	7.00
94.	Sarkar, S., Anju M. Singh, Arvind K Ahlawat, MridulChakrabotiand Santosh K Singh. 2013. Genetic diversity of bread wheat genotypes based on High Molecular Weight Glutenin Subunit profiling and its relation to bread making quality. <i>J. Plant Biochemistry and Biotechnology</i> .DOI 10.1007/s13562-014-0261-y.	J324	6.41
95.	Sarkar, S., Anju M Singh, Arvind K Ahlawat, MridulChakraborti, Santosh K Singh and G P Singh.2013 Generation mean analysis of gluten strength in bread wheat (<i>Triticumaestivum</i>): An effective utilization of micro-sedimentation test in early generation progenies. <i>Ind. J. Agric. Sci.</i> 84 (3): 323–327,.	I023	6.18
96.	Kallesh, D T, G P Singh, Anju M Singh, R K Sharma, A Arora, and AK Ahlawat. 2013 Association of physiological and morphological traits with grain yield under moisture stress conditions in bread wheat (<i>Triticumaestivum</i>). <i>Ind. J agric. Sci.</i> , 83(11): 1257-60.	I023	6.18
97.	Mallikarjuna M.G., Nepolean T., Hossain F., Manjaiah K.M., Singh A.M., Gupta H.S. (2014). Genetic variability and correlation of kernel micronutrient among exotic quality protein maize inbreds and their utility in breeding programme. <i>Ind.J. Genet.</i> 74(2): 166-173.	I047	6.20
98.	Sivaranjani R., Santha I. M., Pandey N., Vishwakarma A.K., NepoleanT. and Hossain F. (2014). Microsatellite-based genetic diversity in selected exotic and indigenous maize (<i>Zea mays</i> L.) inbred lines differing in total kernel carotenoids. <i>Indian J. Genet.</i> 74(1): 34-41.	I047	6.20
99.	Tomar S.M.S, Sanjay K. Singh, M. Sivasamy and Vinod (2014).Wheat rusts in India: Resistance breeding and gene deployment – A review. <i>Ind. J. Genet.</i> , 74(2): 129-156	I047	6.20
100.	Gireesh C, Vinod, JB Sharma and K.V.Prabhu (2014). Inheritance and molecular mapping of leaf rust resistance in <i>Triticumturgidum</i> var. durum cv. Trinakria. <i>Ind.J. Genet.</i> 74: 10-15	I047	6.20
101.	Tomar R.S., Rupesh K. Deshmukh, BhojarajaNaik K., S.M.S.Tomar and Vinod (2014). Development of chloroplast specific microsatellite markers for molecular characterization of alloplasmic lines and phylogenetic analysis in wheat. <i>Plant Breeding</i> , 133: 12–18	P069	7.18
102.	Gireesh C., Vinod, J.B.Sharma and K.V.Prabhu (2014). Genetics and molecular mapping of stem rust resistance in bread wheat genotype WR95. <i>Euphytica</i> (accepted)	E081	7.64
103.	MallickNiharika, Vinod, J.B.Sharma, R.S.Tomar, M. Sivasamy and K. V. Prabhu (2014). Marker assisted backcross breeding to transfer multiple rust resistance in wheat. <i>Plant Breeding</i> (accepted)	(P069)	7.18
104.	Singh AK, Singh VK, Singh A, Ellur RK, Pandian RTP, Gopala Krishnan S, Singh UD, Nagarajan M, Vinod KK, and Prabhu KV (2014) Introgression of multiple disease resistance into a maintainer of Basmati rice CMS line by marker assisted backcross breeding. <i>Euphytica</i> , DOI 10.1007/s10681-014-1267-1.	E081	7.64
105.	Shikari AB, Rajashekara H, Khanna A, Gopala Krishnan S, Rathour R, Singh UD, Sharma TR, Prabhu KV and Singh AK. 2014. Identification and validation of rice blast resistance genes in Indian rice germplasm. <i>Ind. J. Genet.</i> 74(3): 286-299. (NAAS ID – I047; NAAS Score – 6.2	I047	6.20
106.	Naresh BN, Vinod KK, Gopalakrishnan S, Bhowmick PK, Vanaja T, Krishnamurthy SL, Nagarajan M, Singh NK, Prabhu KV and Singh AK (2014) Marker based haplotype diversity of Saltol QTL in relation to seedling stage salinity tolerance in selected genotypes of rice. <i>Ind. J. Genet.</i> 74(1): 16-25.	I047	6.20



23. Details of patents and income generated:

Large numbers of varieties are developed by the Division. However, seed is produced and sold by SPU and IARI Regional Station, Karnal.

24. Areas of consultancy and income generated:

Same as above

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Name of Faculty Member	Name of the Training/Topic	Country	Period of deputation
Dr. K.V. Prabhu	“Review on Biosafety Requirements and Handling GMOs in Asia Pacific”	FAO Bangkok	Nov. 30- Dec. 4, 2009
Dr. G.P. Singh	CSISA workshop (Wheat Breeding)	CSISA, Kathmandu, Nepal	September 10-13, 2009
Dr. K.V. Prabhu	GCP project on drought and heat tolerance in wheat through molecular approaches	Mali, Africa	September 20-23, 2009
Dr. A. K. Singh	Rice Genetics Conference	IRRI, Manila Phillipines	Nov. 14-20, 2009
Dr. Vinod	Wheat improvement and pathology training	CIMMYT, El Batan and Toluca, Mexico	August 2 - October, 2010
Dr. S. Gopala Krishnan	Boyscott Fellowship	Centre for Plant Conservation Genetics, Southern Cross University PO Box 157, Lismore NSW 2480, Australia	Nov.1, 2010-Oct. 30, 2011
J.B.Sharma	Wheat improvement and pathology training	Bhairahwa, Nepal	Nov.29-Dec 12, 2010
Dr. K.V. Prabhu	Member of steering Committee of the Molecular Wheat Breeding Programme	Sydney and Adelaide, Australia	October 30- November 9, 2010
Dr. S. Gopala Krishnan	Boyscott Fellowship	Centre for Plant Conservation Genetics, Southern Cross University PO Box 157, Lismore NSW 2480, Australia	Nov.1, 2010-Oct. 30, 2011
Dr. A.K. Singh Dr. J. Kumar	To prepare a detailed Project Report (DPR) for establishment of Advance Centre for Agricultural Research and Education (ACARE) in Myanmar	Yezin Agricultural University, Yezin, Myanmar	Sept.11-17, 2011
Dr. K.V. Prabhu Dr. Rajbir Yadav Dr. Neelu Jain	International Conservation Agriculture Congress on Research Links between Indian and Australia. Meeting of ICAR-ACIAR programme on marker assisted wheat breeding	Brisbane, Australia	Sept 27-30., 2011
Dr. Firoz Hossain Dr. T Nepolean Vignesh	11th Asian Maize Conference on climate change effects and meeting maize demands for Asia’	CIMMYT, CAAS, GxAAS & GMRI, Nanning, China	Nov. 7-11, 2011
Dr. Akshay Talukdar	NAIP training on Allele Mining and TILLING	Purdue University USA	March 18 to June 21, 2012
Dr. A.K. Singh	Consultancy to prepare a detailed Project Report (DPR) for establishment of Advance Centre for Agricultural Research and Education (ACARE) in Myanmar.	Yezin Agricultural University, Yezin, Yangon	Sept. 11-17, 2011
Dr. J. Kumar	Preparing DPR for establishing ACARE at Yezin, Myanmar	Myanmar	Sept. 12-16 2011



Dr. GP Singh	To attend 4 th Technical Workshop Borlaug Global Rust Initiative	Beijing, China	September 1-4, 2012
	To attend 4 th Annual Review Meeting of CSISA Project	CIMMYT South Asia, Kathmandu, Nepal	December 16-20, 2012
Dr. A.K. Singh	Yezin Agricultural University, Yezin (Feb 17-20, 2013): To assess progress of the Advance Centre for Agricultural Research and Education (ACARE) in Myanmar.	Myanmar	Feb. 17-20, 2013
	Visit to Ministry of Science and Technology, Socialist Republic of Vietnam, for working out bilateral collaboration in the area of biotechnology.	Vietnam	Feb. 26-March 2, 2013
Dr. K. V. Prabhu	Annual project meeting of GCP integrated breeding platform	France	18- 20 th June, 2013

26. Faculty serving in

a) National committees

Name of the scientist	Committees
Dr. K. V. Prabhu	Member DBT task Force Member DST task force Member Genetic Engineering Approval Committee
Dr. G. P. Singh	Elected Secretary, Indian Society of Genetics & Plant breeding Joint secretary, Society for advancement of wheat research
Dr. Rajbir Yadav	Member AICRP wheat monitoring team for NWPZ
Dr. A. K. Singh	Member DBT task force on Crop Biotechnology Member DBT task force on Grand Challenge Programme
Dr. C. Tara Satyavathi	Elected member, Executive committee, Indian Society of Agricultural Sciences, New Delhi
Dr. C. Bharadwaj	Councillor for north zone for Indian Society of Pulses Research and Development
Dr. D. K. Yadava	Member, Central Varietal Release Committee for Brassica
Dr. S. K. Lal	Team Leader of AICRP on Soybean monitoring team, Southern zone II

b) International Committees

Name of the scientist	Committees
Dr. A. K. Singh	Member Indian delegation of Centre on Integrated Rural Development for Asia and the Pacific (CIRDAP).

c) Editorial Boards

Name of the scientist	Editorial Board
Dr. Dharmendra Singh	Consulting editor of Biotech Today
Dr. Akshay Talukdar	Associate Editor of Indian Journal of Genetics and Plant Breeding
Dr. R. S. Raje	Indian Journal of Genetics and Plant Breeding
Dr. D. K. Yadava	Journal of oilseed Brassica
Dr. Naveen Singh	Journal of Crop Improvement

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attends international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

No. of Faculties undergone trainings	2009-10	2010-11	2011-12	2012-13	2013-14
National	4	2	3	18	12
International	1	-	-	2	2

**28. Student projects****Percentage of students who have done in-house projects including interdepartmental projects:**

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two disciplines is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:**a) Faculty:**

Faculty Recognitions	Year	Awardees
Rafi Ahmed Kidwai Award (ICAR)	2013	Dr. K.V.Prabhu
	2014	Dr. A.K.Singh
Borlaug Award	2012	Dr. K.V. Prabhu
	2012	Dr. A.K. Singh
Bharat Ratna Dr.C. Subramaniam Award for Outstanding Teacher	2014	Dr. A.K. Singh
Dr. B. P. Pal Memorial Award (IARI)	2009	Dr. Vinod
	2013	Dr. D.K. Yadava
V.S. Mathur Memorial Award (ISGPB)	2011	Dr. Vinod
NAAS Fellowship	2011	Dr. A.K.Singh
	2015	Dr. D.K. Yadava
	2015	Dr. G.P.Singh
Other Recognitions/Awards	2009-2014	Total 31

b) Students:

Students' Recognitions	Year	Name of the Student
Jawaharlal Nehru Award (ICAR)	2009	Balram Marathi
	2010	Chikkappa G. Karjagi.
IARI Merit Medals		
Best Ph.D. student award	2009	Mridul Chakraborti
	2011	Shallendra K.Jha
	2013	Vignesh M.
Best M.Sc. student award	2009	H.B.Santosh
	2010	Prashant Kumar K.C.
	2012	Harish Kumar
Outstanding Doctoral Thesis Award (ICAR)	2012	Vignesh M.
Other Awards (Best Poster etc.)-04 No.	2011-12	A.B.Shikari, Mukesh Shankar (2), Sekhar Babu Geddam,

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:**a) National funding**

Name of summer Institute/Workshop/Seminar	Dates/ on which held	No. of Trainees
Mid-Year Group Meet for year 2011 of ICAR NFSM Funded Project entitled " Selection and utilization of water logging tolerant cultivars in pigeonpea"	Dec., 12 – 13, 2011	15
Molecular approaches for allele mining and crop improvement	Jan. 5-25, 2012	25

b) International funding: Nil



31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	7	2	-	-
Ph.D.	188	9	-	4.78	-

33. Diversity of students

Name of the Programme	% of students from the same university	% of students from other universities within the same state	% of students from universities outside the state	% of students from other countries
MSc	0	0	83.33	16.66
PhD	42.1	0	52.6	5.3

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

Category	Number and percentage of students
Agricultural Research service	43 (86%)
UPSC	4 (8%)
Agricultural Universities and Research Organizations	3 (6%)

35. Student progression:

Student Progression	Percentage against enrolled
PG to PhD	100
Employed	NIL
a) Campus selection	Nil
b) Other than campus selection	100
Entrepreneurs	0

36. Diversity of staff:

Category	Percentage of faculty who are graduates
Of the same university	25.5
From other universities within the state	0.0
From universities from other states	70.87
From universities outside the country	3.63

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D. Litt. during the assessment period:

Nil

38. Present details of departmental infrastructural facilities with regard to:

Quality Laboratory

- **Gas Chromatograph:** Used for Fatty acid analysis of Brassica seed and oil samples from the project as well as of students, scientist of this and other sister divisions of the Institute along with the partners in public-private partnership. The number of samples analysed in one season is in the range of 7000-10000.



- **Elisa reader:** Mainly used as spectrophotometer for study of total glucosinolates in seed meal of Brassica. The number of samples analysed in one season exceeds 7000.
- **UPLC** system is used for estimation of carotenoids and amino acid profiles of maize inbreds.
- **Brix meter** helps in estimating kernel sweetness in sweet corn genotypes.
- **GCMS:** For estimation of 2AP, the major volatile compound responsible for development of rice aroma.
- **FTNIR:** For non-destructive and high-throughput estimation of amylase from rice grain
- **SATAKE Huller and Miller:** For the purpose of hulling and milling for small sample
- **Spectrophotometer:** Estimation of amylase
- **Hot Water Bath:** For cooking and other quality related activity
- **Low Temperature Water Bath:** For Gel Consistency (GC) estimation
- **Photo enlarger:** For the purpose of grain dimension measurement
- **Annadarpan:** For the purpose of grain dimension measurement
- Till 1970s, **Wheat Quality laboratory** of Division of Genetics was a part of the All India Wheat Coordinating Unit and was considered the best lab in Asia for wheat quality analysis. However, the laboratory suffered a setback when the Coordinating Unit was transferred to Karnal as part of Directorate of wheat Research. The laboratory got a facelift after Dr S Nagarajan, the then Director, decided to modernize the laboratory and within a period of five years (2001-2006), the laboratory had about 20 instruments needed for quality testing of wheat. Today, this laboratory can boast of a 50 odd instruments sufficient to carry out most wheat quality analysis using conventional as well as molecular methods. The laboratory has the instruments ranging from those required for testing of grain texture, flour and dough strength, molecular markers for important quality genes to those for grain micronutrients evaluation under one roof.

Laboratory Facilities

Besides “Quality Assessment Laboratories” for cereals and oilseeds, the Division has well-equipped laboratories for undertaking molecular breeding. The equipment include Ultracentrifuges, High speed refrigerated centrifuges, PCR machines, Spectrophotometers, Densitometer, Ice-Flaking Machines, Deep Freezers (-80°C and -20°C) etc. The Division also has Light and Fluorescent Microscopes with photographic facilities, Stereozoom Microscope, Micromanipulator, and a Dark Room for microphotograph development and printing. Generator and UPS facilities are also available for back-up of equipment.

- **Drosophila Lab:** The Division of Genetics is having a well equipped *Drosophila* laboratory for basic research as well as teaching.
- **Plant Phenomics Facility:** Recent developments in digital imaging allow comprehensive and quantitative non-destructive analysis of plants. The high-throughput phenotyping platform (LemnaTec Scanalyzer) achieves an automatic, highly efficient, quantitative assessment of plant growth through non-destructive analysis of different crops or model plants under high-throughput conditions, an unprecedented number of reproducible and significant data points on plant development, data recorded in one snapshot per run routinely producing 15 or more types of images, imaging in multiple runs throughout their entire life cycle during their growth phase to quantify growth and development of important traits in time, comprehensive quantitative representation of plants in datasets generating special data for physiological traits to identify and quantify the concealed parameters that are difficult to phenotype but really control plant development. The Scanalyzer consists of a conveyor system and an image acquisition unit to make images from all angles. Plant imaging is done in closed imaging boxes and therefore reproducible conditions are maintained and comparable images are obtained. High-resolution colour images taken from the top and several sides under reproducible illumination conditions provide the best basis for comprehensive phenotyping. The image types attained could be of various types viz. RGB image, grey image, binary image, image object list, region of interest, skeleton, bounding box, area, convex hull, calliper length and centre of mass.



Various parameters can be estimated based on image analysis for stress tolerance phenotyping. These parameters can be highly correlated to biological traits such as: leaf area, chlorophyll content, stem diameter, plant height/width, growth rate, stress pigment concentration, tip burn, biomass, internodal length, color, leaf rolling, plant architecture etc. Plant images can be taken in several wavelengths including infrared, near infrared, fluorescent and visible range. Infrared light scanning measurements depict plant temperature/ water use whereas near infrared light assesses the tissue water content. Visible range scanning provides the estimation of plant growth rates/ growth curves, dynamic measurement of leaf area, estimate of biomass, structure/development and senescence, lesions/cell death. Fluorescent and root imaging depicts plant health status and its water use/ soil water content respectively.

Since the non-destructive assessment systems for controlled chambers and glass houses have become available now, there is a realization to use these imaging methods in the field as well. Keeping in view, the first of its kind field phenomics in India has been established at IARI by LemnaTec scanalyzer platform. The camera system is mounted on stationary portable frames and plants grow at ground. The cameras move on the frame at a height of 3 to 6 meters over the field area with high precision and reproducibility to various positions. It has one visible camera that captures top view and side view and another laser based camera to capture plant height. The image processing is carried out through the lemnaTec software.

- **Computer Cell** : Computers with internet connectivity and multimedia facilities that cater to the needs of scientists, administrative staff and students.
- **Divisional Library** : Has a valuable collection of more than 2000 books in genetics, cytogenetics, plant breeding, molecular biology and biotechnology, besides journals, Annual Reviews, Newsletters and reprints of publications by scientists of the Division.
- **Divisional Museum** : A Museum highlighting the research and teaching achievements of the Division of Genetics since its inception in 1960.
- **Seminar Hall** : Air-conditioned Seminar Hall with modern audio-visual facilities such as LCD Projector and electronic OHP.
- **Lecture Hall /Practical Lab** : A Lecture Hall equipped with audio-visual tools with smart board a Practical Laboratory are available for PG teaching.

Common Facilities: Photostat , electronic duplication facilities and internet facilities available for meeting the requirements of the divisional staff and students

39. List of doctoral, post-doctoral students and Research Associates:

a) from the host institution/university:

S. No.	Name of the Student	Date of joining	PhD
1	V.Hanumanth Nayak	06.08.2009	6 th Year
2	Prasant Kumar K.C	06.08.2010	4 th Year
3	Jai singh	06.08.2010	4 th Year
4	Ranjith Kumar Ellur	04.08.2011	4 th Year
5	Amasiddha Bellundagi	04.08.2011	4 th Year
6	Todkar Leena Prakash (Ms.)	04.08.2011	4 th Year
7	Ms. Huyhn Ngoc Hai	23.08.2011	4 th Year
8	Chandana Behera	24.08.2011	4 th Year
9	Vinu V	03.08.2012	3 rd Year
10	Rajkumar Uttamrao Zunjare	03.08.2012	3 rd Year
11	Harish Kumar	03.08.2012	3 rd Year



12	Niranjana M.	03.08.2012	3 rd Year
13	H. Shivakumara	03.08.2012	3 rd Year
14	Abdul Fiyaz R.	27.08.2012	3 rd Year
15	Yashpal	03.08.2012	3 rd Year
16	Deepika Cheruku	09.08.2012	3 rd Year
17	Ananda. M	30.08.2012	3 rd Year
18	Vidya Sagar	02.08.2013	2nd Year
19	Konsam Sarika	02.08.2013	2 nd Year
20	Rahul Gajghate	02.08.2013	2 nd Year
21	Vennampally Natraj	02.08.2013	2 nd Year
22	Amit Kumar	02.08.2013	2 nd Year
23	A. Anuradha	02.08.2013	2 nd Year
24	Suman Parre	02.08.2013	2 nd Year
25	Jitendra Kumar Meena	02.08.2013	2 nd Year
26	Darasing Ramsing Rathod	02.08.2013	2 nd Year
27	Sreenivasa V.	02.08.2013	2 nd Year
28	Subhash Chandra	01.08.2014	Ist Year
29	Kirti Rani	01.08.2014	Ist Year
30	Mukesh Choudhary	01.08.2014	Ist Year
31	Amit Kumar Singh	01.08.2014	Ist Year
32	Soma Gupta	01.08.2014	Ist Year
33	Manu B.	01.08.2014	Ist Year
34	Abhijit Kumar Das	01.08.2014	Ist Year
35	Raghunandan K.	01.08.2014	Ist Year
36	KM. Shanti Kumari	01.08.2014	Ist Year
37	Philanim WS.	01.08.2014	Ist Year
38	Rumesh Ranjan	03.12.2014	Ist Year

b) from other institutions/universities: Nil

40. Number of post graduate students getting financial assistance from the university:

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Need assessment exercise is a continuing process. All the programmes are regularly monitored and assessed and any changing scenario and emerging issues are incorporated in the research programmes. Similarly, latest developments in the disciplines of genetics and plant breeding are incorporated in the syllabus so that students are aware of the latest developments, tools and techniques.

42. Does the department obtain feedback from:

Yes



a) **Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**

Feedback from students and faculty is taken into consideration for revising course curricula as well as improving teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) **Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

c) **Alumni and employers on the programmes offered and how does the department utilize the feedback?**

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

S.No.	Name and address	Year of passing
1.	Dr. M.S. Swaminathan, Chief Mentor, MSSRF, Chennai and Former DG ICAR, New Delhi , Former DG,IRRI, Manila	1949
2.	Dr. H.K. Jain, Former Director, IARI, New Delhi	1951
3.	Dr. V.L .Chopra, Former Member, Planning Commission and Former DG ICAR, New Delhi	1957
4.	Dr. Sanjay Rajaram, Former Director, Global wheat programme, CIMMYT and the World Food Prize laureate	1964
5.	Dr. S. K. Vasal Former Global Director, Maize Research, CIMMYT and the World Food Prize laureate	1966
6.	Dr. R.S. Paroda, Chairman, Haryana Farmers' Commission and Former DG, ICAR, New Delhi	1968
7.	E. A. Siddiq, Former DDG (Crop Sciences), ICAR, New Delhi and Padma Shree Awardee	1968
8.	Dr. B.S. Dhillon, Vice- Chancellor, Punjab Agricultural University, Ludhiana	1973
9.	Dr. P. L. Gautam, Former DDG (Crop Sciences), ICAR, New Delhi	1974
10.	Dr. B. M. Prasanna, Global Director, Maize Research, CIMMYT	1990

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Students of this prestigious division are always exposed to frequent visits by eminent personalities such as Prof. M. S. Swaminathan, Prof. V. L. Chopra, Dr. S. K. Vasal, Dr. G.S. Khush, Dr. Ravi P. Singh, etc. The distinguished visitors often give special seminars and also interact with staff and students in labs and fields.

45. List the teaching methods adopted by the faculty for different programmes:

Division of Genetics is well equipped for teaching with respect to infrastructure. The class rooms and seminar hall are equipped with internet and computer facilities with smart boards. The methodology used for teaching includes, power point presentations, laboratory experiments, frequent field visits, visits to the laboratories outside the department, etc. Students are trained well individually for carrying out the research works on their own. Students are asked to prepare and execute the research works allotted to them on their own with able guidance from the faculty. Student seminars are compulsory for all the students. Students are often given frequent assignments in most of the courses to develop their grasping and comprehensive abilities. Overall, students are nurtured and trained to become good researchers, who would be able to take research and teaching responsibilities in different national and international institutes and universities.



46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The Division has the mandate for both research and teaching. Research programmes are formulated every five years taking into account the needs of the country and inputs from RAC. There is a well established system for formulation and approval of research projects. All research projects are monitored regularly in the form of IRC1 and IRCII where all the projects and results are discussed thoroughly. In these review meetings external resource persons from outside of institute are invited to give their critical inputs. If necessary, mid-term course corrections are undertaken.

All M.Sc. and Ph.D students have research work as part of their programme. Each student is guided by an advisory committee with chairman of the committee as major guide. There is regular review of the progress of the students' research work by the advisory committee. The research problem of the students is as per the mandate of the Division.

47. Highlight the participation of students and faculty in extension activities:

The Pusa *Krishi VigyanMela* (Agriculture Science Fair) is organized at IARI Main campus, New Delhi every year. The *Mela*, conceived and initiated in the year 1972 continues to be an important annual event of the Institute for creating awareness about the latest agricultural technological developments and for receiving feedback from the farming community, which helps in deciding the Institute's future research strategy. Every year this *Mela* is organized with a specific theme on a priority area of agricultural research and technology transfer. Both the students and faculty of this institute actively participate in the *Mela* and creates awareness among the farmers about the latest and useful technologies.

48. Give details of “beyond syllabus scholarly activities” of the department:

Besides the well crafted curriculum of the department, students are encouraged to actively participate in different International and National seminars and conferences. They are encouraged to interact with distinguished personalities who frequently visit our institution. Many lectures and seminars are organized by our institution for remembering many auspicious occasions and students are asked to participate in those events. Study tours, visit to various institutes and laboratories for exposure. Students participate in sports held at institute, region, all India and Universities levels. Students have an elected students' union which has cultural and sports secretary.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

Varietal Development

Genetics Division of Indian Agricultural Research Institute is famous as the Seat of Green Revolution worldwide. This division has established many special dimensions in the crop improvement programmes. Since 1960, the division has developed 285 crop varieties which include 165 of cereals, 75 of pulses, 33 of oilseeds, 8 of forage sorghum and four of cotton. All these varieties have been very popular in the areas of their recommendation during their life span. Details of varieties developed during last 5 years and popular among the farmers, are given in this chapter.

Wheat

HD-3118:Wheat variety released during 2014 for late to very late sown conditions of North Eastern Plain Zone. Average seed yield of this variety is 41.7 q/ha. HD 3118 is most amenable to late and very late sowing as it has shown minimum reduction in yield in very late sown conditions. It has the best HMW sub-units combination for bread making with *Glu-1* score, 8/10.



HI-8737: The durum wheat variety was released during 2014 for timely sown irrigated conditions of Central Zone. Average seed yield of this variety is 53.0 q/ha. It has shown resistance to all leaf rust pathotypes indicating presence of unique resistance genes, hence, can contribute to wheat rust diversification of leaf rust resistance base. It can serve as a 'dual' purpose variety suitable both for making chapati and pasta preparation.

HD-3086 (Pusa Gautami): Released in 2013 for timely sown irrigated conditions of Punjab, Haryana, Delhi, Rajasthan (except Kota and daipur Divisions), U.P. (except Jhansi Division), Parts of J&K (Kathua district), Parts of HP (Una district & Paonta Valley) and Uttarakhand (Tarai region). Average seed yield of this variety is 54.56 q/ha. It is a semi dwarf variety (93 cm) which matures in 143 days. It possesses a high level of resistance against leaf and stripe rust and also shows high degree of resistance against loose smut and flag smut. It has better chapatti and bread quality score, hence it may find favour with industry.

HD-3090 (Pusa Amulya): Released in 2013 for late sown irrigated conditions of Maharashtra, Karnataka, A.P., Goa and plains of Tamil Nadu. Average yield is 42.1 q/ha. It is an early maturing (101 days) and semi-dwarf (80 cm) variety. It showed high degree of resistance to leaf and stem rusts under artificial rust epiphytotic conditions. It possesses good quality parameters for most of the quality traits and end-use for bread and *chapatti* purposes

HD-3059 (Pusa Pachheti): Released in 2012 for late sown irrigated conditions of Punjab, Haryana, Delhi, Rajasthan (except Kota and Udaipur Divisions), U.P. (except Jhansi Division), Parts of J&K (Kathua district), Parts of HP (Una district & Paonta Valley) and Uttarakhand (Tarai region). Average yield is 42.5 q/ha. It is an early maturing (121 days) and semi-dwarf (93 cm) variety. It possesses high degree of resistance to all the three rusts under artificial and natural epiphytotic conditions and shown resistance to stem rust race Ug99 and its variants. It possesses superior quality parameters for end-use as bread and *chapatti* purposes.

HD-3043: Released in 2011 for restricted irrigated conditions of Punjab, Haryana, Delhi, Rajasthan (except Kota and Udaipur Divisions), U.P. (except Jhansi Division), Parts of J&K (Kathua district), Parts of HP (Una district & Paonta Valley) and Uttarakhand (Tarai region). Average yield is 42.8 q/ha. It is a semi-dwarf variety which matures 143 days. It possesses a high level of resistance against stripe rusts and leaf rust. It has better bread making quality score.

HD 2967: Released in 2011 for timely sown irrigated conditions of Punjab, Haryana, Delhi, Rajasthan (except Kota and daipur Divisions), U.P. (except Jhansi Division), Parts of J&K (Kathua district), Parts of HP (Una district & Paonta Valley) and Uttarakhand (Tarai region). Average seed yield is 50.4 q/ha. It matures in 143 days. It carries diversified genes other than 1B/1R. Possesses very high adult plant resistance against most prevalent leaf rust and yellow rust diseases. It has also better degree of resistance against leaf blight.

HD 2985 (Pusa Basant): Released in 2010 for irrigated late sown conditions of North Eastern Plains Zone. Average seed yield is 35-40 q/ha. It has the lowest reduction in the 1000-grain weight under very late sown conditions. The variety possesses the usable and most practical type of disease resistance viz., the adult plant resistance (APR) because of *Lr13*.

HD 2987 (Pusa Bahar): Released in 2010 for restricted irrigated and rainfed conditions of Peninsular Zone. Average seed yield is: Rainfed: 20-22 q/ha; Restricted irrigation: 30-32 q/ha. It has all the desirable HMW sub-units for best bread making ability as the *Glu-1* score is perfect 10/10 indicating a very good bread quality.

Rice

Pusa 1609: Released during 2014 for irrigated conditions of Basmati growing regions of the Uttar Pradesh, NCR Delhi, Uttarakhand and Punjab. Average seed yield of this variety is 46.0 q/ha. It is the first Basmati rice variety developed by pyramiding blast resistance genes *Piz5* and *Pi54* through MAS and showed resistance to neck blast and moderate resistance to leaf blast. Seed to seed maturity is only 120 days.

Pusa 1592: Identified during 2014 for irrigated conditions of Basmati growing areas Punjab, Haryana, Delhi and Jammu & Kashmir. Average seed yield of this variety is 47.3 q/ha. It has extra-long slender translucent grain. It is strongly aromatic. It is a MAS derived bacterial blight resistant NIL of Pusa Sugandh 5 developed by pyramiding of bacterial blight resistance genes, *xa13* and *Xa21* with yield and quality on par to the recurrent parent Pusa Sugandh 5.



Pusa Basmati 1509: Released during 2013 for irrigated and transplanted conditions of Basmati growing regions of Western Uttar Pradesh and Delhi. Average seed yield is 41.4 q/ha. It has semi-dwarf plant stature with tolerant to lodging and shattering at maturity. It has seed to seed maturity of 115 days which is 30 days early as compared to Pusa Basmati 1121. It can be planted upto end of July thus saving 4-5 irrigations. It has strong aroma and grain and cooking quality superior to Pusa Basmati 1121.

Pusa 1612: Released during 2013 for irrigated and transplanted conditions of Punjab, Haryana, Delhi and J&K. Average seed yield is 51.0 q/ha. An improved version of Pusa Sugandh 5 with on par yield, resistance to blast disease and 120 days seed to seed maturity. It possesses leaf blast resistance gene *Piz5* and *Pi54*. It is significantly superior in yield to Pusa Basmati-1, Taraori Basmati and Pusa Basmati 1121.

Chickpea

Pusa 3022: Kabuli chickpea variety was released during 2014 for irrigated normal sown conditions of North Western Plain zone. Average seed yield of this variety is 18-20 q/ha. Developed through desi x kabuli introgression. Extra large seeded kabuli (36g/100 seed weight) variety with attractive beige coloured seeds with 24% protein. Moderately resistant to dry root rot, *Ascochyta* blight and stunt.

Pusa 2085: Kabuli chickpea variety was released during 2013 for irrigated conditions of National Capital Region of Delhi. Average seed yield is 20.0 q/ha. It is a large seeded kabuli chickpea variety with 100 seed weight of 36 g. It has multiple disease resistance against dry root rot and stunt; moderately resistant to wilt and botrytis gray mold and tolerant to collar rot. The seeds are beige coloured, uniform, attractive and shining.

Pusa Green 112: Green seeded chickpea variety was released during 2013 for irrigated conditions of National Capital Region of Delhi. Average seed yield is 23.0 q/ha. Seeds are dark green, uniform and excellent for cooking and culinary purpose. It possesses high resistance to *Fusarium* wilt and drought. It has multiple stress resistance.

Pusa-5023: Kabuli chickpea variety was released during 2011 for irrigated conditions of National Capital Region of Delhi. Average seed yield is 25.0 q/ha. It is an extra bold seeded variety (50g/ 100 seeds) and is moderately resistant to wilt.

Pusa-5028 : Desi chickpea variety was released during 2011 for irrigated conditions of National Capital Region of Delhi. Average seed yield is 27.0 q/ha. It is an extra bold seeded variety (41g/ 100 seeds) and is moderately resistant to wilt.

Mungbean

Pusa 0672: Released in 2010 for *Kharif* season of North Hill Zone. Average seed yield is 9.5-10.0 q/ha. It is tolerant to major diseases like MYMV and CLS. Its seeds are shining green and attractive and are of medium size (3.8-5.3 g/100 seed). Its maturity range is from 52-103 days

Indian mustard

Pusa Mustard 30 (LES-43): Released in 2013 for timely sown irrigated conditions of Uttar Pradesh, Uttarakhand, Madhya Pradesh and eastern Rajasthan. Average seed yield is 18.24 q/ha. This is the first bold seeded (1000 seed weight 5.38 g) low erucic acid (<2%) variety of Indian mustard which has 37.7% oil content. It matures in 137 days.

Pusa Mustard 29 (LET-36): Released in 2013 for timely sown irrigated conditions of Delhi, Haryana, Jammu, Punjab and northern Rajasthan. Average seed yield is 21.69 q/ha

It is a low erucic acid variety (<2%) of Indian mustard. 1000-seed weight of this variety is about 4.0 g with 37.2% oil content. It matures in 143 days.

Pusa Mustard 28 (NPJ-124): Released in 2012 for early sown (First week of September) conditions of Rajasthan, Haryana, Punjab, Delhi, Plains of J&K and HP, Western UP. Average seed yield is 19.93 q/ha. Seeds contain 41.5% oil. Average maturity of this variety is 107 days. It has very high per day productivity of 18.63 kg/day/ha. Suitable for multiple cropping system between September (after harvest of *Kharif* crops) to Mid December (upto



sowing of *Rabi* crops particularly wheat and vegetables) to have an additional crop and is a very potential substitute of *B. rapa* cv. Toria (in toria's traditional belt)

Pusa Mustard 27 (EJ-17): Released in 2010 for early sown (September sowing) conditions of U.P., M.P., Uttarakhand and Kota region of Rajasthan. Average seed yield of this variety is 15.35 q/ha with 41.7% oil content in seeds. This variety matures in 118 days and is moderately tolerant to high temperatures at seedling as well as at maturity stage. It is suitable for multiple cropping system can be successfully grown after harvest of *Kharif* crops (September) upto sowing of wheat, vegetables and Sugarcane (December-January) when fields generally remain vacant and is good substitute of toria.

Pusa Mustard 26 (NPJ-113): Released in 2010 for late sown (November sowing) conditions of Rajasthan, Haryana, Punjab, Delhi, Plains of J&K, HP and Western UP. Average seed yield of this variety is 16.04 q/ha with 37.6% oil content in seeds. This variety matures in 126 days and possesses terminal heat tolerance. It is suitable for multiple cropping systems particularly in rice and cotton belts where the fields are generally vacated in November; farmers prefer to raise late sown mustard which performs well in one to two irrigations. It also suits well in areas where long duration guar varieties are grown and fields are vacated in November.

Pusa Mustard 25 (NPJ-112): Released in 2010 for early sown (First week of September) conditions of Rajasthan, Haryana, Punjab, Delhi, Plains of J&K and HP, Western UP. Average seed yield is 14.7 q/ha. Suitable for multiple cropping system between September (after harvest of *Kharif* crops) to Mid December (upto sowing of *Rabi* crops particularly wheat and vegetables) to have an additional crop and is a very potential substitute of *B. rapa* cv. Toria (in toria's traditional belt). Average maturity in of this variety is 107 days.

Pusa Tarak (EJ-13): Released in 2009 for early (September) sowing of National Capital Region of Delhi. Average seed yield is 19.24 q/ha. Mean oil content in this variety is 40%. This variety is useful in the multiple cropping system particularly during the period of September – December. It gives good results where onion, other vegetables and sugarcane are planted in the month of January.

Soybean

Pusa 5 (DS-12-5): Soybean variety was identified during 2014 for irrigated normal sown conditions of North plain zone. Average seed yield of this variety is 26 q/ ha. Determinate growth habit with average plant height of 76 cm. Tawny pubescence, white flower, resistant to yellow mosaic virus (YMV), *Rhizoctonia* Aerial blight (RAB) and Bacterial Pustule (BP). It matures in 125 days (113-128). Oil content is 20.8%.

Pusa Soybean 12 (DS 12-13): Released in 2014 for normal sown irrigated conditions of Delhi, Haryana, Punjab, Uttarakhand, U.P. and Bihar. Average seed yield is 22.86 q/ha. A bold seeded variety having 100-seed weight of 10.53 grams with good seed longevity and high oil content (19.60%). It also possesses resistance against yellow mosaic virus (YMV), *Rhizoctonia* Aerial blight (RAB) and Bacterial Pustule (BP). It is having excellent germination and field emergence.

Pusa Soybean 14 (DS 2614): Released in 2013 for normal sown irrigated conditions of National Capital Region of Delhi. Average seed yield is 22.12 q/ha. Its seeds are of medium size (9.93 g/100 seeds) which contain high oil content (20.26%). It is resistant to a number of serious diseases of soybean viz., Yellow Mosaic Virus (YMV), *Rhizoctonia* Aerial Blight (RAB), and Bacterial Pustule (BP). Germination and field emergence is very good.

Basic Research

Discovery of genes and marker development

- Besides, applied research, the division is also involved in basic research which has resulted in the discovery of new genes e.g. *apd₁* and *apd₂* for apical lethality, *Rf8* for fertility restoration in wheat and identification and development of markers for several genes for rust resistance such as *Lr9, Lr19, Lr24, Lr32, Lr45* and a few unknown genes such as *srWR* and *SrWR* in bread wheat line WR95. These markers are used by researchers all over the world.
- Markers linked to genes/ QTLs in rice**
Important genes mapped in rice include *Rf4* for fertility restoration, which has been widely utilized across the world for marker assisted improvement of restorers. Besides this, it has also been utilized for testing the



genetic purity of hybrid seed lots which not only saves time but also economizes the process of genetic purity testing in rice hybrids. Besides this, QTLs for grain number, grain length and cooked kernel elongation have been mapped in Basmati rice, which are being utilized in MAS.

- **Superior alleles for grain length in short grain aromatic rice**

A 342 bp InDel (*aksGS3-12*) in *GS3* locus specific to aromatic short grain rices of India have been identified and validated, which can be utilized in marker assisted breeding of short grain aromatic rice varieties.

- **Validated gene linked/ gene based markers in rice**

Besides this a large number of markers linked to various important traits such as resistance to bacterial blight, blast, tolerance to salinity and restoration of fertility have been validated in Indian germplasm which will help in improving these traits in rice.

- **Biofortification and quality enhancement of Crops**

Malnutrition caused by inadequate intake of micronutrients has emerged as one of the most important health-challenge. Micronutrient deficiencies are particularly prevalent in the rural population where many do not have access to balanced diets. With the ever increasing price of nutrient-rich vegetables, eggs and meat, poor people are compelled to consume the relatively cheaper staple grains. Though, they provide enough calories but fail to deliver sufficient quantities of essential micronutrients required for proper growth and development. Though various interventions like 'nutritional -supplementation' and 'industrial-food fortification' have been tried to alleviate micronutrient deficiencies, none of these approaches has been found viable in the long run. Development of micronutrient-enriched crop plants through breeding approaches, a process popularly known as 'biofortification', holds promise as it is sustainable and cost-effective.

Among various micronutrients, deficiency caused by iron (Fe), zinc (Zn) and provitamin A have prominent effects. Fe and Zn are required in humans for proper functioning of the body, and deficiency of which affect growth, development, reproductive performance and work productivity. Due to Fe-deficiency anemia is the most common nutritional disorder. Zn deficiency leads to depression, gastro-intestinal problems and impaired immunity. Provitamin A plays important role in vision, and inadequate intake leads to night blindness and in extreme cases loss of eye sight. Indian Agricultural Research Institute, New Delhi, in addition to productivity enhancement is also pursuing research on quality improvement of different crops as a result of which new dimensions have been established by developing high quality varieties/genetic stocks in different crops. World's first superfine grain scented rice hybrid Pusa RH-10, development of Improved Pusa Basmati-1 through MAS, development of basmati rice varieties Pusa basmati-1121, Pusa Basmati-1509, Fe rich lentil variety, L-4147, six low erucic acid varieties of mustard, green seeded chickpea variety, Fe and Zn rich genotypes in wheat, Fe rich genetic stocks in pearl millet, β -carotene, lysine and tryptophan rich maize, QPM etc. are some successful steps towards quality enhancement in different crops. Institute's research teams are in the process of identification of genes/QTLs responsible for higher various quality traits in different crops, which would further help in developing mineral-rich varieties through MAS.

Development of high throughput screening protocol and identification of donors for resistance to Bakanae disease of rice

A rapid, reliable and high-throughput seed inoculation assay for screening against bakanae disease of rice caused by *Fusarium fujikuroi* was developed. Based on the high throughput screening protocol, rice genotypes such as Athad apunnu, C101A51, Chandana, IR 58025B, Panchami, PAU 201, Pusa 1342 and Varun Dhan were found to be highly resistant, while BPT 5204, Himju, Peeli badam and Suphala were resistant. Rasi and TKM 6 were found to be highly susceptible exhibiting cent per cent mortality with elongation and mortality symptoms as early as on 8th day after inoculation.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths

A strong faculty of scientists, well equipped laboratories with facilities for molecular work and quality analysis, plant phenotyping facilities which are among the best in the world, classrooms with modern audio-



visual aids and field facilities, large number of externally funded programmes with national and international collaborations..

Weaknesses

There are certain areas such as doubled haploid production, high throughput genotyping and phenotyping facilities, use of bioinformatics and biometrics which need to be strengthened.

Opportunities

A large number of varieties developed by the division are popular all over the country. There is a huge scope for commercialization the technologies developed. With sufficiency in food production, emphasis is shifting towards bio-fortification and nutritional enhancement through genetic means using latest technologies. There are ample opportunities in collaboration with private sector.

Challenges

With rapid development of technologies and emerging new knowledge, there is a need to assimilate and constantly upgrade the tools and infrastructure and to keep pace with new knowledge.

52. Future plans of the department

Education

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of advances in Genetics and Plant Breeding
- Young scientists will be encouraged to go for post doctoral research at leading laboratories in the world.
- Efforts will also be made to expose the young scientists to different laboratories and institutes within country.
- Regular seminars will be arranged by inviting eminent scientists in the field of Genetics, Plant Breeding and Molecular Biology

Research

- Emphasis will be given to the use of modern tools for precision breeding for developing high yielding varieties with improved biotic and abiotic stress tolerance, improved grain quality and nutritional enhancement
- Efforts will be made to identify novel genes/alleles for various useful traits and developing robust markers for them.
- Efforts will be enhanced in the area of pre-breeding. Emphasis will be given on wild relatives of crops for identification of novel genes and their introgression in cultivated varieties.



xii) Division of Floriculture and Landscaping

1. Name of the Department:

Division of Floriculture and Landscaping

2. Year of establishment:

1983

3. Is the Department part of a School/Faculty of the university?

Yes, It is a part of School of Horticultural Sciences.

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Sc., Ph.D. (Horticulture specialization in Floriculture and Landscaping)

5. Interdisciplinary programmes and departments involved:

Programme : All MSc, M Tech. and PhD programmes are interdisciplinary

Departments : 22

Units : 8

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

- National Research Centre on Plant Biotechnology, New Delhi
- National Bureau of Plant Genetic Resources, New Delhi
- Indian Agricultural Statistical Research Institute, New Delhi

7. Details of programmes discontinued, if any, with reasons

Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester examination system

9. Participation of the department in the courses offered by other departments

Division of Fruits and Horticultural Technology

Division of Vegetable Science

Division of Food Science and Post Harvest Technology

Division of Seed Science and Technology

Centre for Protected Cultivation Technology



10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned	Filled	Actual (including CAS & MPS)
Head	1	1	1
Principal Scientist	4	5	4
Senior Scientist	4	3	4
Scientist	8	5	5

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./ M.Phil. students guided for the last 4 years
Dr. S S Sindhu	PhD	Head & Principal Scientist	Production management, Landscaping and protected cultivation	25 years	MSc: 1 PhD: 2
Dr. K V Prasad	PhD	Professor	Ornamental Crop improvement and Biotechnology	20 years	MSc: 1 PhD: 1
Dr. Kanwar Pal Singh	PhD	Principal Scientist	Ornamental Crop improvement	26 years	MSc: Nil PhD: 2
Dr. Kishan Swaroop	PhD	Principal Scientist	Ornamental Crop improvement	18 years	MSc: 2 PhD: Nil
Dr. Gunjeet Kumar	PhD	Principal Scientist	Ornamental Crop improvement	17 years	MSc: Nil PhD: Nil
Dr. Prabhat Kumar	PhD	Senior Scientist	Ornamental Crop improvement and production management	12 years	MSc: 2 PhD: 1
Dr. Markandey Singh	PhD	Senior Scientist	Production management and protected cultivation	13 years	MSc: Nil PhD: Nil
Dr. D V S Raju	PhD	Senior Scientist	Ornamental Crop improvement	12 years	MSc: 3 PhD: Nil
Dr. Ritu Jain	PhD	Scientist, Senior Scale	Post Harvest and production management	7 years	MSc: Nil PhD: Nil
Dr. Namita	PhD	Scientist, Senior Scale	Ornamental Crop improvement	5 years	MSc: Nil PhD: Nil
Dr. Babita Singh	PhD	Scientist	Landscaping, Post Harvest and production management	3 years	Yet to become research guide
Dr. Sapna Panwar	PhD	Scientist	Ornamental Crop improvement	2 years	Yet to become research guide
Dr. Vanlalruati	PhD	Scientist	Ornamental Crop improvement	1 year	Yet to become research guide

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

Adjunct faculty: Dr. R L Misra, Dr. V. A. Parthasarthy, Dr. K.L. Chadha

Guest Faculty: Mr. Ravindra Kumar

13. Percentage of classes taken by temporary faculty – programme-wise information

No temporary faculty. All faculty in the division are permanent employees of the IARI.

**14. Programme-wise Student Teacher Ratio**

MSc: 3: 13

PhD: 5: 13

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Staff	Sanctioned	Filled	Actual
Technical	12	12 +2 (OHLU)	12 +2 (OHLU)
Administrative	6	4	5

16. Research thrust areas as recognized by major funding agencies

- Basic and applied research for crop improvement in commercial flower crops (Rose, Gladiolus, Chrysanthemum, marigold, Bougainvillea) through conventional and non conventional approaches.
- Development of production technology in commercial flower crops (Lilium, gladiolus, tuberose)
- Turfgrass management
- Nutraceutical pigments from flower crops
- Research on DUS test guidelines in rose, chrysanthemum, marigold and bougainvillea.
- Micropropagation of flower crops
- Value addition in flowers
- Research on cut greens, dwarfism in bougainvillea
- Dissemination of information and transfer of technology through outreach programmes.
- Post graduate teaching and training programme for human resource development

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

- Number of faculty with ongoing projects from National funding agencies: 13
- Number of faculty with ongoing projects from international funding agencies: Nil
- Total grants received: —

Project Title	Funding Agencies	Grants Received Project-Wise
Improvement for biotic stress resistance in Rose	ICAR	
Development of varieties/ hybrids for desirable horticultural traits in marigold		
Development of varieties/ hybrids for desirable horticultural traits in rose, gladiolus, chrysanthemum, Lilium, Iris and Eustoma		
Standardization of the package of practices in lilium		
Standardization of integrated nutrient management and integrated weed management practices in gladiolus		
Development of cost effective production technology for ornamental potted plants		
Turfgrass management		
Development of post harvest/value added ornamental adaptations		
Nutraceuticals from flower crops		
Development of National Repository for Chrysanthemum Varieties	PPV&FR Authority	10,00,000/-
Entrepreneurship development and financial empowerment of rural Women through value addition in ornamentals	Department of Science and Technology	29,51,604/-
Genetic Divergence Analysis and DNA Fingerprinting of Indian Bred Roses	Department of Biotechnology	Rs. 34,80,000/-



18. Inter-institutional collaborative projects and associated grants received

a) National collaboration b) International collaboration

Validation of DUS testing guidelines for marigold Collaboration (IARI-IIHR)	PPV&FR Authority	Rs. 26,02,000/-
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19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR,

AICTE, etc.; total grants received.

NATP - 2

NHB - 1

DBT/DST - 1

20. Research facility / centre with

- State recognition** : Nil
- National recognition** : National Cultivar Registration Authority for Roses FLS, IARI, New Delhi.
- International recognition** : International cultivar registration Authority (ICRA) for Bougainvillea, FLS, IARI, New Delhi.

21. Special research laboratories sponsored by / created by industry or corporate bodies

NIL

22. Publications:

Number of papers published in peer reviewed journals (national /international) in the last 5 years (Range:3.5-7.4 NAAS rating)

- National : 28
- International : 7
- Monographs : Nil
- Chapters in Books : 75
- Edited Books : 4 Nos.

Books with ISBN with details of publishers:

- Plant variety protection in ornamental crops. ISBN: 978-81-88708-78-9. Published by Head, Division of Floriculture and Landscaping, ICAR-IARI, New Delhi-12
- Sajawati fasalon main paudha kisamon ka sanrankshan. ISBN: 978-81-88708-70-3. Published by Head, Division of Floriculture and Landscaping, ICAR-IARI, New Delhi-12
- Horticulture for Health and Wealth. ISBN: 978-93-83168-20-0. Published by Head, Division of Floriculture and Landscaping, ICAR-IARI, New Delhi-12
- A training manual on teaching of post graduate courses in Horticulture-Floriculture & Landscape Architecture. ISBN: 978-93-83168-11-8. Published by Joint Director (Education) and Dean, Postgraduate School, IARI on behalf of the Director, ICAR-IARI, New Delhi-12
- Turfgrasses: Practical Manual. TB-ICN: 115/2013. Published by Head, Division of Floriculture and Landscaping, ICAR-IARI, New Delhi-12
- Avenues in Floriculture for livelihood. TB-ICN: 141/2014. Published by Head, Division of Floriculture and Landscaping, ICAR-IARI, New Delhi-12



Number listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete, Dare Database - International Social Sciences Directory, EBSCO host, etc.)

Submission of sequence data to GenBank (NCBI) related to mycoplasma like organisms in rose (In collaboration with Division of Plant pathology)

Accession numbers for nucleotide sequences provided by GenBank

roseSeq1 KP096312

roseSeq2 KP096313

roseSeq3 KP096314

roseSeq4 KP096315

rose Seq5 KP096316

Citation Index – range / average

Range: 2-69

Average: 16.3

SNIP: Nil

SJR : Nil

Impact Factor – range / average

h-index

23. Details of patents and income generated:

Patents: Chrysanthemum varieties namely Pusa Centenary and Pusa Anmol were filed for patent with PPV&FR Authority.

Income generated: Rs 2.70 lakh through commercialization of seven varieties of chrysanthemum and 2 varieties of gladiolus.

24. Areas of consultancy and income generated: Nil

25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

India

1. Dr. K.V. Prasad: Professor & Principal Scientist

Visited Central Food Technological Research Institute(CFTRI), Mysore to get exposure on nutraceutical aspects in flower crops.

2. Dr. D. V. S. Raju, Senior Scientist

Visited Kerala Agricultural University to attend winter school on Floriculture in the changing global scenario: Issues and strategies.

3. Dr. Ritu Jain, Scientist

Visited National Botanical Research Institute (NBRI), Lucknow to attend training on Value addition in flower crops.

4. Dr. Namita, Scientist

Visited National Botanical Research Institute (NBRI), Lucknow to attend training on Value addition in flower crops.

Visited Headquarter of The Board of Control for Cricket in India, Mumbai to attend workshop for curators on “Grass management in cricket pitch and outfield”.



Abroad

1. Dr. K V Prasad

Visited Vienna, Austria to present two papers during the International Symposium on Induced mutation in crop plants at Vienna, Austria, 12-15th Aug 2008

2. Dr. P. Naveen Kumar

Visited Israel for Post Doc. Fellowship, under BOYSCAST fellowship, DST during 2010.

3. Dr. Ritu Jain, Scientist

Attended SLCARP International Agricultural Research Symposium, 2014 and presented a paper on dwarfing in Bougainvillea.

26. Faculty serving in

- a) **National committees** : Dr. K.V. Prasad, Member Secretary of subgroup on Floriculture, Medicinal and Aromatic crops at Planning commission GOI for the finalization of XI five year plan.
Dr. K.V. Prasad, Member Secretary, Task Force for the finalization of DUS test guidelines of Rose and Chrysanthemum by PPV&FR Authority, GOI, New Delhi.
- b) **International committees** : Nil
- c) **Editorial Boards** : ISOH (Indian Society of Ornamental Horticulture)
: Dr. Kanwar Pal Singh
: Dr. D V S Raju
: Dr. Ritu Jain
: Dr. Namita
: Dr. Sapna Panwar
- d) **Any other (please specify)** : Dr. K V Prasad, Executive Councilors, HSI (The Horticultural Society of India)

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

Training Program attended

Dr. K V Prasad: 1 (CFTRI)

Dr. D V S Raju: 1 (KAU)

Dr. Ritu Jain: 1 (NBRI)

Dr. Namita: 1 (NBRI)

Dr. Sapna Panwar: 1 (TNAU)

Dr. Vanlalruati: 1 (NRCPB)

Training Program conducted:

Faculty up-gradation training programme on “Computer Aided Design Technology” held at Division of Floriculture and Landscaping, IARI, New Delhi, 2010.

One day dialogue on ‘Turfgrass research and Management’, 2013 organized by Division of Floriculture and Landscaping.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects

100%



Percentage of students doing projects in collaboration with other universities/industry/ institute
Nil

29. Awards/recognitions received at the national and international level by Faculty Doctoral / post doctoral fellows students

Faculty

Awards

1. Dr. S. S. Sindhu, Head, Division of Floriculture and Landscaping honoured with Gold Medal by DAHS, Dr. H. B. Singh award, National Leaders memorial award and Bharat Jyoti Award for his meritorious work in the field of floriculture and landscaping.
2. Dr. S. S. Sindhu is a recipient of INSA fellowship of Japan under *International Exchange Programme*.
3. Dr. S. S. Sindhu was conferred the Fellow of the Horticulture society of India during 2014 for his contribution and leadership in the field of horticulture.
4. Dr. S.S. Sindhu was conferred JSIL Fellowship 2015 of Confederation of Horticultural Associations of India (CHAI) in the field of floriculture.
5. Dr. Kanwar Pal Singh, Principal Scientist was awarded with DAHS Merit Medal and HSI Gold Medal for outstanding contributions in the field of Floriculture.
6. Dr. Kanwar Pal Singh, Principal Scientist was nominated Fellow of the Indian Society of Ornamental Horticulture (ISOH) for outstanding contributions in the field of horticulture especially floriculture.
7. Dr. Kanwar Pal Singh, Principal Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI)
8. Dr. K. V. Prasad, professor & Principal Scientist was awarded with Horticultural Society of India (HSI) Gold Medal and DAHS Merit Award in Floriculture for outstanding contributions in the field of floriculture.
9. Dr. K. V. Prasad, professor & Principal Scientist was awarded with Prestigious Dr. B.P. Pal Gold Medal for the year 2009 by the PG School, IARI.
10. Dr. K. V. Prasad, professor & Principal Scientist was conferred the Fellowship of the Horticultural Society of India during 2009, Fellow of the Indian Society of Ornamental Horticulture during 2010 in the field of Floriculture.
11. Dr. K. V. Prasad, professor & Principal Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI) for outstanding contributions in the field of floriculture.
12. Dr. Kishan Swaroop, Principal Scientist received DAHS – Merit Award for the year 2011 conferred by Delhi Agri - Horticultural Society, New Delhi for outstanding contribution towards dissemination of technologies in the field of floriculture.
13. Dr. Kishan Swaroop, Principal Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI) for outstanding contributions in the field of floriculture.
14. Dr. Gunjeet Kumar, Senior Scientist received Gold Medal conferred by the Hi-tech Horticulture Society for the year 2011.
15. Dr. Markandey Singh, Senior Scientist received community Service Award presented by Rotary Club, Palampur, H.P. for the year 2006 and award for excellent research achievements popularized among the beneficiaries in Hindi presented by IHBT, Palampur (2005)
16. Dr. Prabhat Kumar, Senior Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI), fellow of Indian Society of Horticulture Research & Development and fellow of Indian Society of Ornamental Horticulture for outstanding contributions in the field of floriculture.



17. Dr. Prabhat Kumar, Senior Scientist was awarded with Dr. Ambedkar young fellow award for the year 2010 and Himadri Young Scientist Award for the year 2012.
18. Dr D. V. S. Raju, Senior Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI)
19. Dr. Ritu Jain, Scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI) and awarded with Pusa Vishisht Pravakta Puraskar for the year 2011.
20. Dr. Namita, scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI).
21. Dr. Sapna Panwar, scientist was conferred the Fellow of the Confederation of Horticultural Associations of India (CHAI).

Students

Name of the student	MSc/PhD	Name of the award	Year for which given
MSc students			
Ms Shyama Kumari	MSc	IARI Merit Gold Medal	2011
Ms. Prativa Lakhota	MSc	IARI Merit Gold Medal	2012
Mr. Soobedar Yadav	MSc	IARI Merit Gold Medal	2013
Ms. Henuka Rai	MSc	IARI Merit Gold Medal	2014
Mr. Abhay K. Gaurav	MSc	IARI Merit Gold Medal	2015

Honours to the Division

- The Division got the Second prize for Sarvadhik Hindi Patra Vyahvar for the year 2012.
- Best Divisional stall award during Pusa Krishi Vigyan Mela 2012.
- Best Divisional live demonstration award during Pusa Krishi Vigyan Mela 2013.
- Outstanding Division for the year 2013.
- Innovative farmer award during Pusa Krishi Vigyan Mela 2014.

30. Seminars/ Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any.

Nil

31. Code of ethics for research followed by the departments

- Authenticated research on flower crops
- Published research papers based on authenticated research
- Check plagiarism in manuscripts

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	1	2	-	-
Ph.D.	58	6	6	10.34	10.34

**33. Diversity of students**

Name of the programme (refer to question no.4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students from other countries
MSc	-----	-----	100%	----
PhD	100%	-----	-----	-----

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise

- Civil Services and Defense Services examinations : 2
- NET, SET, GATE, etc. : 11
- ARS Examination : 7
- Other competitive examinations : 1

35. Student progression

Student progression	Percentage against enrolled
UG to PG	----
PG to M.Phil.	----
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	----
Employed	
Campus selection	NA
Other than campus recruitment	90%
Entrepreneurs	10%

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	NA
From other universities within the state	Nil
From universities from other States	100 %
Universities outside the country	Nil

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

Nil

38. Present details of departmental infrastructural facilities with regard to

- a) Library : 1 (Divisional library which is having related books on Floriculture and Landscaping)
- b) Internet facilities for staff and students : All the faculty and students have internet facilities
- c) Total number of class rooms : 1
- d) Class rooms with ICT facility : 1
- e) Student's laboratories : 1
- f) Research laboratories : 1

39. List of doctoral, post-doctoral students and Research Associates

- a) from the host institution/university

**Doctoral Students:**

1. Abhay Kumar Gaurav
2. Meenu
3. Asmita
4. Aido
5. K. Ravindra Kumar
6. Henuka Rai
7. Poonam Kumari
8. Omem
9. Lakshmydurga
10. Palmsey Sangama
11. M. Lakshmypathy
12. Soobedar Yadav

On relief

1. Aparna
2. Bharat Singh Hada
3. Shyama Kumari

Senior Research Fellow

1. Pavnesh Kumar Kumar
 2. Vaishali Singh
 3. Rohit Pinder
- b) from other institutions/universities
Nil

40. Number of post graduate students getting financial assistance from the university.

- **Fellowship from IARI**
MSc: 7 (Seven)
PhD: 6 (Six)
- **Fellowship DST (Inspire)**
PhD: 3 (Two)
- **Fellowship RGNF (UGC)**
PhD: 2 (Two)
- **Selected for NF for OBC (UGC)**
PhD: 3 (Three)

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

The need assessment for new programmes is based on the inputs received from different stakeholders including students, farmers, industry in seminar/symposia organized by the institute.

42. Does the department obtain feedback from

- a. **faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**
Institute takes feedback through forms and utilizes the information for further improvement
- b. **students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**



Yes. The feedback obtained is utilized to improve the contents of the course in terms of theory and practical classes.

c. Alumni and employers on the programmes offered and how does the department utilize the feedback?

No

43. List the distinguished alumni of the department (maximum 10)

The Division of Floriculture and Landscaping is just one year old as a teaching discipline. Prior to separation it was part of the Horticulture Discipline with a number of distinguished alumni have passed out. Which are highlighted in the Horticulture discipline.

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

- Special Lecture on Rose “The Science and Art of Rose Breeding” by Sh. M. S. Viraraghavan on 21-12-2012 for post graduate students of the Division.
- ‘Ikebana Floral Arrangement’ on 06 February, 2012 in the premises of the Library, IARI, New Delhi.
- Special lecture on “Estimate preparation of Horticulture Development as per DSR” and “Landscaping of archaeological monuments” by Mr. Ravindra Kumar, Deputy Director (Hort.), Archaeological Survey of India, Humayun Tomb, New Delhi

45. List the teaching methods adopted by the faculty for different programmes.

- Chalk and talk method of teaching
- Explaining and demonstration
- Collaboration and interaction
- Walk and learn method for identification of planting material
- Hands on experience
- Teaching aids such as audio and video aids
- Use of e-sources during teaching
- Experiential learning

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

By constant review and obtaining the feedback from students and peers from other organizations.

47. Highlight the participation of students and faculty in extension activities.

The students and the faculty take part in various extension activities such as field days on different aspects, Pusa Horticulture Shows, demonstration of technologies on farmers field, Pusa Krishi Mela, time to time interaction with farmers/growers/landscapers, etc. organized by the institute/Division. An exclusive crop cafeteria is developed every year in a specified area of the Pusa Krishi Mela Ground to showcase the latest technologies for the benefit of farmers. The students and faculty actively participate in outreach programmes in the IARI adopted villages.

48. Give details of “beyond syllabus scholarly activities” of the department.

Participation in

- Sports at institute, state and national level
- Various cultural activities
- Social services
- Educational visits



49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

- Various protocols on micropropagation of ornamental crops such as rose, chrysanthemum, gladiolus, tuberose, gerbera, marigold, liliium, orchids, *etc.*
- **Varieties in commercial flowers (Last five years)**
 Marigold: Pusa Arpita
 Chrysanthemum: Pusa Anmol, Pusa Centenary, Pusa Chiraksha, Pusa Sona, Pusa Aditya, Pusa Kesari, *etc.*
 Rose: Pusa Mahak
 Gladiolus: Pusa Kiran, Pusa Shubam, Pusa Srijana, Pusa Unnati, Pusa Manmohak, Pusa Red Valentine, Pusa Vidushi,
- *In vitro* mutagenesis protocols and mutants
- *In vitro* protocols for nutraceutical pigments
- Screened turfgrasses for Delhi condition
- Developed marigold Inbred lines having high carotenoid pigments
- Developed DNA fingerprints for rose, marigold, chrysanthemum, bougainvillea, *etc.*
- Dwarfing of bougainvillea
- Drying technology for chrysanthemum, marigold and rose
- DUS test guidelines for rose, chrysanthemum, marigold, bougainvillea have been developed.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

Well trained human resources

Adequate infrastructure

A pioneer in rose research in the Country

Has the largest collection of germplasm in rose, gladiolus, bougainvillea.

Has the largest collection of wild species in roses (25)

Developed the highest number of varieties in roses (>250), gladiolus (>45) marigold (5)

Developed the highest number of fragrant varieties in roses

Developed the DUS test guidelines for rose and chrysanthemum which are notified. Developed the guidelines in marigold and bougainvillea

A pioneer in post graduate education in Floriculture and Landscaping

A pioneer in developing the protocols for in vitro regeneration from different crops

Established the first Value Addition Laboratory

Commercialised the technology to private entrepreneur

The Division is the International Registration Authority of Bougainvillea.

Has the largest collection of varieties in the repository

Pioneer in developing technology for in vitro induction of anthocyanins from rose and petunia and carotenoids from calendula and betalains from bougainvillea.

A pioneer in initiating the work on lawn grasses

Initiated collaboration with BCCI for cricket grounds



Weaknesses

Ageing infrastructure not commensurating with the modern times

Depleting manpower

Depleting employment avenues in public sector

Extracurricular facilities, including appropriate sports and recreational facilities, are rather inadequate

Opportunities

Develop trained manpower in frontier areas through new courses and disciplines

New 'breed' of human resources needed to deal with IPR, bio-safety, uncommon opportunities arise from biotechnological and information system revolutions.

To cater to the HRD of the world through M.Sc. and Ph.D. programmes in international agriculture

Threats

Today, the country has 41 State Agricultural Universities, 1 Central Agricultural University and 4 Deemed Universities to cater to the needs of trained manpower. These offer a healthy competition to IARI.

However, Early bird catches the worm, IARI's Leadership role is indomitable

52. Future plans of the department.

The Division proposes to foray into new emerging areas of research in Floricultural crops. That include

- Pre breeding to identify potential sources for biotic and abiotic stresses
- Isolation, characterization of nutraceutical pigments from rose marigold and bougainvillea and their potential use in food and beverages.
- Turfgrass management
- Pot plant production and management
- Improved and novel flower varieties with desirable traits.



xiii) Division of Fruits & Horticultural Technology

1. Name of the Department:

Fruits & Horticultural Technology

2. Year of establishment:

1970

3. Is the Department part of a School/Faculty of the university?

Yes, School of Horticultural Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc. D.Litt., etc.)

Both M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

None

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester System

9. Participation of the department in the courses offered by other departments

Yes, Collaboration with Divisions of Plant Physiology, Post Harvest Technology and currently with Floriculture and Landscaping and Vegetable Science

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

Staff	Sanctioned	Filled	Actual (including CAS & MPS)
Professor + Head	2	1	2
Principal scientist	6	6	6
Associate Professor/ Sr. Scientist	6	3	6
Asst. Professor/ Scientist	6	5	6
Others	-	-	-



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./ M.Phil. Students guided for the last 4 years	
					M.Sc.	Ph.D.
Dr. Anand K. Singh	Ph.D.	Ex. Head & Prin. Sci.	Mango breeding, biotechnology of fruit crops	14	1	3
Dr. (Mrs) K. Usha	Ph.D.	Prin. Sci. and Acting Head	Mango malformation and Guava wilt management	19	1	2
Dr. Sanjay K. Singh	Ph.D.	Professor & Principal Scientist	Grape improvement, Plant physiology and Tissue culture of fruit crops	17	1	2
Dr. O.P. Awasthi	Ph.D.	Prin. Sci.	Citrus improvement, Stress management and cropping system of fruit crops	11	1+1 guiding	0
Dr. Anil Kumar Dubey	Ph.D.	Principal Scientist	Mango & Citrus improvement, Root stocks and Salinity	13	5	0
Dr. M.K. Verma	Ph.D.	Principal Scientist	Grape & Citrus improvement and nutrient management of	6	2 guiding	0
Dr. Radha Mohan Sharma	Ph.D.	Principal Scientist	Citrus Improvement & Production Technologies	12	1	
Dr. Manish Srivastav	Ph.D.	Sr. Scientist	Mango and citrus improvement, molecular characterization of fruit crops	12	1	1
Dr. Jai Prakash	Ph.D.	Sr. Scientist	Papaya and Grape improvement	6	2 guiding	0
Dr. A. Nagaraja	Ph.D.	Scientist (SS)	Guava improvement & wilt management, Management of Mango malformation	6	1+1	0
Dr. Awtar Singh	Ph.D.	Principal Scientist	Crop Improvement in Citrus	3	0	0
Dr. Kanhaiya Singh	Ph.D.	Principal Scientist	Papaya Breeding	14	0	0
Dr. (Mrs.)Rama S. Tulluri	Ph.D.	Principal Scientist	Plant breeding and Molecular cyto-genetics	3	0	0
Dr. Sunil Kumar Sharma	Ph.D.	Principal Scientist (Pune)	-	-	0	0
Dr. K.K. Pramanick IARI RSShimla	Ph.D.	Sr. Scientist	-	4	0	0
Dr. Amit Kumar Goswami	Ph.D.	Scientist	Guava and Papaya improvement	4	0	0
Dr. (Ms.) Nimisha Sharma	Ph.D.	Scientist	Molecular characterization of fruit crops	3	0	0
Dr. (Ms.) Madubala Thakre	Ph.D.	Scientist	Improvement in Guava	3	0	0



12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S.No.	Name of the Faculty	Status
1.	Dr. K. L. Chadha, Former DDG (Hort), ICAR and National Professor, Division of Fruits & Horticultural Technology, IARI, New Delhi	Adjunct Professor
2.	Dr. A.M. Goswami, Former Head, Division of Fruits & Horticultural Technology, IARI, New Delhi	Adjunct Faculty
3.	Dr. Deep Kishore, Former Principal Scientist, Division of Fruits & Horticultural Technology, IARI, New Delhi	Guest Faculty
4.	Dr I.S.E. Bailey, Queensland Horticulture Institute, Australia (28.10.2013)	Foreign Visiting Faculty

13. Percentage of classes taken by temporary faculty-programme-wise information

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M. Sc. = 1.0: 2.6 and Ph.D.= 1.0 : 1.2 .

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Sl. No.	Category	Sanctioned	Filled	Actual
1.	Technical	10	7	3
2.	Administrative	3	2	1
3.	Supportive	47	15	15

16. Research thrust areas as recognized by major funding agencies

Some of the current thrust areas in research are;

Phenotyping of mango hybrids and germplasm for different parameters attributing yield and quality, Sex expression studies on papaya, Evaluation and characterization of guava genotypes for wilt tolerance, soft seed and pulp colour. Mutagenesis in grape and morphological and molecular characterization of mutant population; Induction of parthenogenesis in commercial cultivars of citrus; Mechanical behavior of seed hardness and fruit firmness in grapes grown under subtropical conditions; Unraveling the physiological and molecular basis of mango malformation to develop effective management methods; Induction of parthenocarpy using Plant Growth Regulators and pollinicide in Kinnow mandarin.

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

Name	National	International	Total Grants Received (Lakh Rupees)
Dr A.K. Singh Dr S.K. Singh Dr K. Usha Dr Manish Srivastav Dr Nimisha S Sharma Dr Jai Prakash	AMAAS on HAM in bio-fertilization of horticultural crops- upto 2014 (ICAR)	Nil	6.5 lakhs
Dr S.K. Singh Dr V.B. Patel	ICAR-NPTC on Functional Genomics in Mango (2015-2017)	Nil	1.60 crores
Dr S.K. Singh Dr V.B. Patel	NATP Biological hardening of tissue culture raised grape plantlets using VAM Fungi (2000-2005)	World bank aided	18.5 Lakhs
Dr A.K. Singh	NATP on DNA Fingerprinting of ber (Zizyphus mauritiana) (2001-2005)	World bank aided	23.0 Lakhs



18. Inter-institutional collaborative projects and associated grants received

b) International collaboration:

Project: Indo-Australian research collaborative project on Mango (University of Queensland, Australia & ICAR, New Delhi)

Institutes: IARI, New Delhi, Australia

Total Budget (for IARI):Rs. 9.0 Crores (Approx.)

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, ICAR etc.; total grants received.

One by ICAR under these programmes.

20. Research facility /Centre with

State recognition: None

National recognition: Tissue Nutrient Analysis Laboratory - National Professor (ICAR)

International recognition: None

21. Special research laboratories sponsored by / created by industry or corporate bodies: Not Applicable



22. Publications (2010-2014)

Particulars	Dr. A. K. Singh	Dr. K. Usha	Dr. S. K. Singh	Dr. O.P. Awasthi	Dr. A. Kumar Dubey	Dr. A. Singh	Dr. M.K. Verma	Dr. R. M. Sharma	Dr. M. Srivastav	Dr. Jai Prakash	Dr. A. Nagraja	Dr. K. Singh	Rama S. Tuluri	Dr. S. K. Sharma	Dr. K.K. Pramanick	Dr. Dr. A. K. Goswami	Ms. N. Sharma	Dr. M. Thakre V
Number of papers published in peer reviewed journals (national / international)	52	25	75	70	57	30	33	50	50	20	11	22	35	32	59	15	7	2
Monographs	1	-	1	4	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Chapters in Books	25	12	35	40	20	6	69	14	30	15	8	10	18	29	45	12	2	1
Edited Books	1	-	4	6	2	2	-	-	-	-	-	-	-	-	-	-	-	-
Books with ISBN with details of publishers				1	1	1		1	ISBN 81-8180-035-31		ISBN-978-81-88708-79-8							
Number listed in International Database	1	-	1													1		
Citation Index – range / average	0-24.0 / 2.50	0-42.0 / 2.56	0-76 / 4.50	0-24 / 2.80	0-14 / 1.85	0-18 / 1.25	0-23 / 2.10	0-12 / 1.15	0-24 / 3.22	0-16 / 3.25	0-12 / 1.15	0-14 / 1.85	0-35 / 3.15	0-13 / 2.45	0-24 / 3.38	0-4 / 1.12	0-16 / 2.58	0-3 / 1.50
SNIP range / average																		
SJR range / average																		
Impact Factor – range / average	0.16 – 3.80	0.16- 1.76	0.16 to 2.17	0.16- 2.058	0.11- 2.54	0.16- 1.56	0.11- 2.10	0.0- 2.024	0.1- 2.058	0.1-1.8	0.16- 0.54	0.11- 0.25	0.16- 3.50	0.16- 2.01	0.11-1.76	0.16- 0.45	0.5- 1.90	0.1-0.45
h-index																		

**Some of the important publications from 2010-2014****Publication: NAAS Rating Above 8.00**

S. No.	Publication	NAAS rating
1.	Alizadeh, Mahdi, Singh, S.K., Patel, V.B., Bhattacharya, R.C. and Yadav, B.P. (2010). <i>In vitro</i> responses of grape rootstocks to NaCl. <i>Biologia Plantarum</i> , 54(2): 381-385.	8.10
2.	Singh, S.K., Sharma, H.C., Goswami, A. M., Datta, S. P. and Singh, S. P. (2000). In vitro growth and leaf mineral composition of grapevine cultivars as affected by sodium chloride. <i>Biologia Plant.</i> 43 (2): 283-286.	8.10
3.	Sharma, Dew Kumari, Dubey, A.K., Srivastav, Manish, Singh, A.K. Sairam, R.K., Pandey, R.N., Dahuja, Anil and Kaur, Charanjeet. (2011). Effect of putrescine and PBZ on growth, physiochemical parameters and nutrient acquisition on salt sensitive citrus rootstock <i>Karna khatta</i> (<i>Citrus karna</i> Raf.) under NaCl stress. <i>J. Plant Growth Regulation</i> ; 344 (11): 9192-97.	8.27

Publication: NAAS Rating: 7.0-8.0

S. No.	Publication	NAAS rating
1.	Alizadeh, M., Singh, S.K. and Patel, V.B. (2010). Comparative performance of in vitro multiplication in four grape (<i>Vitis</i> spp.) rootstock genotypes. <i>Int. J. Plant Production</i> , 4(1): 41-50.	7.20
2.	Singh, Sanjay Kumar, Singh, S.K., and Sharma. R.R. (2010).. Effects of pruning intensity on the biochemical status of shoot buds in three mango (<i>Mangifera indica</i> L.) cultivars planted at high density, <i>Journal of Horticultural Science and Biotechnology UK</i> , 85 (6): 483-490.	7.60
3.	Srivastav, Manish, Kishor, Arun, Dahuja, Anil and Sharma, R.R. (2010). Interactive influence of PBZ and salinity on onion leakage, proline and activities of antioxidant enzymes in mango. <i>Scientia Hort.</i> 125: 785-88.	7.60
4.	Jha, S.K., Sethi, S., Srivastav, Manish, Dubey, A.K., Sharma, R.R., Samuel, D.V.K. and Singh, A.K. (2010). Firmness characteristics of mango hybrids under ambient storage. <i>J. Food Engg.</i> 97 : 208-12.	7.70
5.	Patel, S.K. Dubey, A.K. Srivastav, M., Singh, A.K., Dahuja, A. and Pandey, R.N. (2011). Effect of NaCl concentrations in irrigation water on growth, antioxidant enzymes and nutrient acquisition in different citrus rootstocks. <i>J. Horticultural Science and Biotechnology UK</i> 86(2): 189-195.	7.30
6.	Rymabi, H., Srivastav, Manish, Sharma, R.R. and Singh, S.K. (2011). Review: Lenticels on mango fruit: Origin, development, discoloration and prevention. <i>Scientia Horticulturae</i> , 135: 164-176.	7.50
7.	Saboki, Ebrahim, Usha, K. and Singh, Bhupinder (2011). Pathogenesis-Related (PR)- proteins: Chitinase and β -1, 3-glucanase in defense mechanism against malformation in mango (<i>Mangifera indica</i> L.). <i>Scientia Horticulturae</i> , 130: 847-852.	7.50
8.	Singh N.V., Singh S.K. and Singh A.K. (2011). Standardization of embryo rescue technique and bio-hardening of grape hybrids (<i>Vitis vinifera</i> L.) using Arbuscular mycorrhizal fungi (AMF) under sub-tropical conditions. <i>Vitis Germany</i> , 50 (3): 115-1189	7.80
9.	Nripendra V. Singh, Sanjay K. Singh, Anand K. Singh, Deodas T. Meshram, Sachin S. Suroshe, Dwijesh C. Mishra. (2012). Arbuscular mycorrhizal fungi (AMF) induced hardening of micropropagated pomegranate (<i>Punica granatum</i> L.) plantlets. <i>Scientia Horticulturae</i> 136:122-127.	7.80
10.	Singh, O.P., Usha, K., Saboki, E., Srivastav, Manish, Dahuja, Anil and Singh, Bhupinder. Enzymatic reactive oxygen species scavenging system in mango varieties resistant and susceptible to malformation. <i>Scientia Horticulturae</i> , 138: 81-89.	7.60
11.	Sharma, S., Sharma, R.R., Pal, R.K., Jhalegar, M.J., Singh, J. and Srivastav, Manish (2012). Ethylene absorbents influences fruit firmness and activity of enzymes involved in fruit softening of Japanese plum (<i>Prunus salicina</i> Lindell) cv. Santa Rosa. <i>Fruits</i> , 67: 257-266.	7.60
12.	Rymbai, H., Srivastav, Manish, Sharma, R. R. and Singh, S.K. (2012). Review: Lenticels on mango fruit: Origin, development, discoloration and prevention. <i>Scientia Horticulturae</i> , 135: 164-170.	7.20
13.	Dutta, S.K., Srivastav, Manish, Chaudhary, Rekha, Lal, Krishan, Patil, Praveen and Singh, S.K. (2013). Low temperature storage of mango (<i>Mangifera indica</i> L.) pollen. <i>Scientia Horticulturae</i> 161: 193-197.	7.60
14.	Dutta, S.K., Srivastav, Manish, Rymbai, H., Chaudhary, Rekha, Dubey, A.K., Singh, A.K. and Lal, Krishan. (2013). Pollen-pistil interaction studies in mango (<i>Mangifera indica</i> L.) cultivars. <i>Scientia Horticulturae</i> 160: 213-221	7.60



15.	Khan Hanif, Sivalingam, P.N., Chauhan Sarita., Awasthi, O.P. and More, T.A. (2013). Improved crossing technique and identification of true F ₁ hybrids of <i>Ziziphus mauritiana</i> Lam. by molecular markers. <i>Scientia Horticulturae</i> , 150:164-171.	7.60
16.	Nimisha, S., Kherwar, D., Ajay, K.M. Singh, B. and Usha, K. (2013). Molecular breeding to improve guava (<i>Psidium guajava</i> L.): Current status and future prospective. <i>Scientia Horticulturae</i> , 164: 578-588.	7.60
17.	Ram, Mohan, Prasad, K.V., Singh, S.K., Hada, B.S. and Kumar, S. (2013): Influence of salicylic acid and methyl jasmonate elicitation on anthocyanin production in callus cultures of rose. <i>Plant Cell Tissue Organ Culture</i> 113: 459-467.	7.40
18.	Rymbai, H., Srivastav, Manish, Sharma, R.R., Patel, C.R. and Singh, A.K. (2013). Bio-active compounds in mango (<i>Mangifera indica</i> L.) and their roles in human health and plant defence - A review, <i>J. Hort. Sci. Biotech.</i> 88(4): 269-379	7.90
19.	Salari, A., Sharma, A., Muthusamy, S.K., Singh, S.K., Chinnusamy, V. and Bansal, K.C. (2013). An improved protocol for high frequency plant regeneration from mature embryos of wheat. <i>Proc. Indian Natl. Sci. Acad.</i> 79(2): 159-166.	7.10
20.	Sharma, D.K., Dubey, A.K., Srivastav, M., Singh, A.K., Randey, R.N. and Dahuja, A. (2013). Effect of Paclbutrazol and putrescine on antioxidant enzymes activity and nutrients content in salt tolerant citrus rootstock sour orange under sodium chloride stress. <i>J. Plant Nutrition</i> , 36: 1765-1779.	7.76
21.	Sharma, D.K., Dubey, A.K., Srivastav, Manish, Singh, A.K., Pandey, R.N. and Dhauja, Anil. (2013). Effect of paclbutrazol and putrescine on antioxidant enzymes activity and nutrients content in salt tolerant citrus rootstock sour orange under sodium chloride stress. <i>J. Plant Nutr.</i> , 36: 175-79	7.10
22.	Spooner, David, Rojas, P., Bonierbale, M., Mueller, L.A., Srivastav, Manish, Senalik, D. and Philipp, S. (2013). Molecular phylogeny of <i>Daucus</i> (Apiaceae). <i>Systematic Bot.</i> 38(3): pp. 850-857.	7.10
23.	Kundu, M., Dubey A.K., Srivastav, M., Malik S., Singh, B. (2014). Effect of gamma ray irradiation and cryopreservation on pollen stainability, in vitro germination and fruit set in citrus. <i>Turkish J. Biology</i> , 38:1-9.	7.40
24.	Sharma, Radha Mohan, Kour, Kiran, Singh, Brijeshwar, Yadav, Sangita, Kotwa, Neeraj; Rana, Jai Chand and Anand, Rajneesh. (2014). Selection and characterization of elite walnut (<i>Juglans regia</i> L.) clone from seedling origin trees in North Western Himalayan region of India. <i>Australian J. Crop Sci.</i> , 8(2):257-262	7.40

Publication: NAAS Rating 6.0-7.0

S. No.	Publication	NAAS rating
1.	Kashyap, Poonam, Singh, A.K., Singh, Sanjay K. and Deshmukh, Rupesh (2010). Genetic diversity analysis of indigenous and exotic apple genotypes using inter simple sequence repeat markers. <i>Indian Journal of Horticulture</i> , 67 (Spl Issue):16-20.	6.16
2.	Samant, Deepa, Singh, A.K., Srivastav, Manish and Singh, N.K. (2010). Assessment of genetic diversity in mango using inter-simple sequence repeat markers. <i>Indian J. Horticulture</i> , 67 (Spl Issue):1-8.	6.16
3.	Singh, Sanjay Kumar and Singh, S.K. (2010). Effect of pruning intensities on leaf tissue micronutrient status in three mango (<i>Mangifera indica</i> L.) cultivars planted under high density. <i>J. Hort. Sci.</i> 5(2): 37-41.	6.16
4.	Singh, Nripendra V., Singh, S.K., Patel, Singh,, Ashutosh and Singh, A.K. (2010). Standardization of embryo rescue technique for grape hybrids under sub-tropical conditions. <i>Indian Journal of Horticulture</i> 67: 37-42.	6.16
5.	Singh, Sanjay Kumar, Singh, S.K., Sharma, R.R., Srivastav, Manish and Patel, V.B. (2010). Influence of pruning intensities on leaf nutrient composition in some mango cultivars planted under high density. <i>Indian Journal of Horticulture</i> 67(1):16-20.	6.16
6.	Singh, Sanjay Kumar, Singh, S.K., Sharma, R.R., Srivastav, Manish and Patel, V.B. 2010. Influence of pruning intensity on flowering, fruit yields and floral malformation in three mango cultivars planted under high density. <i>Indian Journal of Horticulture</i> 67(1): 84-89.	6.16
7.	Sethi, Shruti, Srivastav, Manish, Samuel, D.V.K., Singh, A.K., Dubey, A.K. and Singh, G. (2011). Evaluation of newly developed mango hybrids for their storage behaviour and peel colour. <i>Indian J. Agric. Sci.</i> 81: 56-61.	6.16
8.	Abirami, K., Singh, Room and Baskaran, V. (2011). Studies on the influence of seedling physiological parameters with vigour in some polyembryonic and monoembryonic mango genotypes. <i>Indian Journal of Horticulture</i> 68(1): 18-23.	6.16
9.	Nagaraja, A., Usha, K., Singh, Bhupinder, Singh, S.K. and Umamaheswari C. (2011). Effect of temperature and relative humidity on growth and sporulation of <i>Fusarium mangiferae</i> under in vitro conditions. <i>Indian Journal of Horticulture</i> 68(1) : 36-38.	6.16
10.	Singh, A.K. and Singh, Rakesh. (2011). Analysis of genetic relationships of Indian grape genotypes using RAPD markers. <i>Indian J. Hort.</i> 68(3): 287-292.	6.16
11.	Singh, A.K., Sinha, Pallavi, Dubey, A.K. and Srivastav, Manish (2011). Characterization of citrus germplasm using simple sequence repeat markers, <i>Indian Journal of Genetics and Plant Breeding</i> , 71(4): 349-355	6.16



12.	Singh, Anshuman, Singh, A.K. and Singh, S.K. (2012). SSR markers reveal genetic diversity in closely related mango hybrids. <i>Indian J. Horticulture</i> 69(1): 299-305.	6.16
13.	Verma, Santosh, Singh, S.K., Krishna, Hare and Patel, V.B. (2012). Comparative performance of grafting techniques in grape cv. Pusa Urvashi. <i>Indian Journal of Horticulture</i> 69(1):13-19.	6.16
14.	Rymbai, H., Srivastav, Manish, Sharma, R.R., Patel, C.R. and Singh, A.K. (2012). Bio-active compounds in mango (<i>Mangifera indica</i> L.) and their roles in human health and plant defence - a review. <i>The Journal of Horticultural Sciences and Biotechnology</i> 88: 369-79.	6.80
15.	Verma M.K., Singh, S.K., Prakash J., Singh A.K. and Jha S.K. (2013). Mechanical behaviour of seed hardness in relation to physico-chemical composition of grape (<i>Vitis vinifera</i> L.). <i>Indian J. Hort.</i>	6.16
16.	Dubey, A.K., Srivastav, M and Kaur, C. (2013). Fruit quality, antioxidant enzymes activity and yield of six cultivars of grapefruit (<i>Citrus paradisi</i>) grown under subtropical conditions. <i>Indian J. Agric. Sci.</i> , 83(8):842-846.	6.16
17.	Kumar Dinesh, Nazeer A., Verma M.K. and Dar T.A. (2013). Growth, yield, quality and leaf nutrient status as influenced by planting densities and varieties of apricot (<i>Prunus armeniaca</i> L.). <i>Indian J. Hort.</i> 70(2): 195-199.	6.16
18.	Kumar, Rakesh; Savanan, S; Bakshi, P. and Sharma, R M. (2013). Influence of GA ₃ and blossom removal on quality of strawberry cv. Belrubi. <i>Vegetos</i> , 26 (1):107-110.	6.20
19.	Lal, Shiv, Ahmed, N. and Verma, M.K. 2013. Fruit size contributing traits in pomegranate (<i>P. granatum</i> L.) cv. Dholka under temperate condition. <i>Indian J. Agric. Sci.</i> , 83(5): 535-41.	6.16
20.	Nayak, D., Singh, A.K. and Srivastav, Manish. (2013). Estimation of genetic parameters of fruit quality traits in mango hybrids population. <i>Indian Journal of Horticulture</i> 70(1): 13-17.	6.16
21.	Patel, V.B., Barman, Kalyan, Chand, Girish and Singh, S.K. (2013). Stem-end blackening: A new physiological disorder in mango from Bihar. <i>Indian J. Hort.</i> 70(2): 223-29.	6.16
22.	Prakash, J. and Singh, A.K. (2013). Screening of papaya genotypes against the viral diseases. <i>Indian J. Hort.</i> 70(3): 437-438.	6.16
23.	Pratibha, Lal, S. and Goswami, A.K. (2013). Effect of pruning and planting systems on growth, flowering, fruiting and yield of guava cv. Sardar. <i>Indian J. Hort.</i> 70(4): 496-500.	6.16
24.	Ramajayam, D., Singh, S.K., Patel, V.B. and Alizadeh, M. (2013). Mycorrhization alleviates salt stress in grape rootstocks during in vitro acclimatization. <i>Indian J. Horticulture</i> 70(1): 26-32.	6.16
25.	Saboki Ebrahim, Sharma, T.R., Usha, K. and BhupinderSingh (2013). Resistance gene analogues in mango against mangomalformation. <i>Acta Phytopathologica et Entomologica Hungarica</i> . 48:39-52.	6.22
26.	Thakre, M., Lal, S., Goswami, A.K. and Pratibha. (2013). Effect of various methods of crop regulation in guava under double-hedge row system of planting. <i>Indian J. Hort.</i> 70(2): 211-216.	6.16
27.	<i>Thakre, M., Lal, S., Goswami, A.K. and Pratibha. (2013). Effect of various methods of crop regulation in guava under double-hedge row system of planting. Indian J. Hort. 70(2):211-216.</i>	6.16
28.	Ramajayam, D., Singh, S.K., Patel, V.B. and Alizadeh, M. (2013). Mycorrhization alleviates salt stress in grape. . <i>Indian J. Hort.</i> 71(2): 270-276.	6.16
29.	Dubey, A.K. Manish Srivastav and Charanjit Kaur (2014). Variation of sweet orange (<i>Citrus sinensis</i> L. Osbeck) accessions in India and identification of high yielding types. <i>Indian J. Hort.</i> 71(3): 321-325	6.20
30.	Anshuman Singh, Jai Prakash, Manish Srivastav, S.K. Singh, O.P. Awasthi, A.K. Singh, S.K. Chaudhari and D.K. Sharma (2014). Physiological and biochemical responses of citrus rootstocks under salinity stress. <i>Indian J. Hort.</i> 71(2): 162-167	6.16
31.	Manish Srivastav, Singh, A.K., Dubey, A.K. and Bhagat, S.K. (2014). Effect of self-, open- and cross-pollination with Sensation on fruit set in mango cultivar Amrapali. <i>Indian J. Hort.</i> 71(3): 412-414	6.16
32.	Nagaraja, A., Sahoo R.N., Usha, K., Singh, S.K., Sivaramanae N. and Gupta V.K. (2014). Spectral discrimination of healthy and malformed mango (<i>Mangifera indica</i> L.) panicles using spectro-radiometer. <i>Indian J. Hort.</i> 71(1): 40-44	6.16
33.	Nimisha Sharma, A.K. Singh, Manish Srivastav, B.P. Singh, A.K. Mahto and N.K. Singh. (2014). Comparison of mango genomic DNA isolation methods for next generation sequencing. <i>Indian J. Hort.</i> 71(2), June 2014: 260-263.	6.16
34.	Palanichamy V., Singh Room, Singh S.K. and Srivastav Manish. (2014). Changes in the reducing and non-reducing sugars during fruit bud differentiation in mango hybrids. <i>Indian J. Hort.</i> 71(2): 277- 280.	6.16
35.	Pandey, P., Singh, A. K., Dubey, A. K. And Dahuja, A. (2014). Biochemical and salt ion uptake responses of seven mango (<i>Mangifera indica</i> L.) rootstocks to NaCl stress. <i>J. Hortic. Sci. Biotechnol.</i> , 89: 367-372.	6.80
36.	Pandey, P., Singh, A. K., Dubey, A. K. and Awasthi, O.P. (2014). Effect of salinity stress on growth and nutrient uptake in polyembryonic mango rootstocks. <i>Indian J. Hort.</i> 71: 28-34.	6.16

Monographs: IPGRI Descriptor on (*Mangifera Indica* L.); Dr Room Singh and S.K. Singh, Bioersivity International, Italy.



*Chapters in Books

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- Dubey, A K. (2011) Role and deficiency /toxicity symptoms of micro-nutrients in mango <http://agropedialabs.iitk.ac.in/agrilore>. 15 p.
- Dubey, A K. (2011) Role and deficiency symptoms of secondary nutrients in Grapes <http://agropedialabs.iitk.ac.in/agrilore> 10 p.
- Dubey, A K. (2011) Role and deficiency symptoms of secondary nutrients in Mango <http://agropedialabs.iitk.ac.in/agrilore> 10 p.
- Dubey, A K. (2011) Role and deficiency symptoms of Potassium in Grapes <http://agropedialabs.iitk.ac.in/agrilore> 7 p.
- Dubey, A K. (2011) Role and deficiency symptoms of Potassium in Mango <http://agropedialabs.iitk.ac.in/agrilore> 10 p.
- Dubey, A K. (2011) Role and deficiency symptoms of Phosphorous in Grapes <http://agropedialabs.iitk.ac.in/agrilore> 11 p.
- Dubey, A K. (2011) Role and deficiency symptoms of Phosphorous in Mango <http://agropedialabs.iitk.ac.in/agrilore> 6 p.
- Dubey, A K. (2011) Role and deficiency symptoms of Nitrogen in Grapes <http://agropedialabs.iitk.ac.in/agrilore> 9 p.

23. Details of patents and income generated: Rs. 18.0 Lakhs from sale of farm produce during five years

24. Areas of consultancy and income generated: Nil

25. Faculty selected nationally/ internationally to visit other laboratories/ institutions/ industries in India and abroad:

Name	Institutions and Industries Visited
Dr. Manish Srivastav, Sr. Scientist	NAIP (HRD) ICAR training on MAS in Horticultural crops , University of Wisconsin, USA (25.03.2011 to 24.06.2011)
Dr. A.K. Singh, PS & Former Head	Deputation Horticulture Research & Development showcase organized by National Horticulture Research Network (NHRN), Horticulture Australia Ltd., Australia (18-25 th August, 2013)
Dr A.K. Singh	DBT Overseas Associateship on Genchp in mangamenet of citrus virusesUniversity of California-Riverside, USA, 2007-2008
Dr S.K. Singh	DBT Overseas Associateship on Tropical Fruit Biotechnology, University of Florida, TREC, Homestead, USA, 2008-2009

**26. Faculty serving in**

Name	National/International Committees	Editorial Board of	Any other
Dr A.K. Singh	Member of IMC/RAC of CISH, Lucknow, NRC Grapes, Pune & NRC Citrus, Nagpur, IIHR Bengaluru. Member of the American Society of Plant Sciences.	Editor, Indian Journal of Plant Physiology Journal -Progressive Horticulture	Member Board of Studies Banaras Hindu University, Varanasi
Dr S.K. Singh	Committee to monitor NHM implementation in Himalayan states by Ministry of Agriculture, GoI	Indian Journal of Horticulture Indian Horticulture, Journal of Horticultural Sciences	Member Board of Studies BHU, Varanasi Sikkim University, Gangtok North Eastern Hill University, Tura Campus
Dr A.K. Dubey	Member Expert Committee on formulation of Horticulture courses/ textbooks of IGNOU	Turkish Journal of Biology	-
Dr M.K. Verma	IMC member CITH, Srinagar	Indian Journal of Horticulture	-
Dr. Manish Srivastav	Member of the American Society of Plant Sciences	Indian Journal of Horticulture	-

27. Faculty recharging strategies (UGC, ASC, Refresher/ Orientation programmes, workshops, training programmes and similar programmes):

Scientist (6), Sr. Scientist (4) and Principal Scientist (2) have undergone different 21 days training programmes organized by the ICAR, DBT, CSIR, UGC etc. and also faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

percentage of students who have done in-house projects including inter-departmental projects: 100%
percentage of students doing projects in collaboration with other universities/ industry / institute: 0%

29. Awards / recognitions received at the national and international level by

Name of the faculty member	Name of the award/recognition
Dr. A.K. Singh, PS & Former Head	Fourth Indian Horticulture Congress-2010 on Horticulture, Horti-Business and Economic Prosperity at NPL, New Delhi from 18-21, November, 2010 as Organizing Secretary (2010) Fellow of the Horticultural Society of India, New Delhi 2011 Gold medal from Delhi Agri-Horticultural Society, New Delhi 2009 Secretary, the Horticultural Society of India, New Delhi -2012 Best Poster Paper 1st Prize on "Conservation & Management of Genetic Diversity for Protected Cultivation" in National Seminar on Protected Cultivation of Vegetables and Value Addition on 29-30 Nov., 2013 at Allahabad School of Agriculture, Sam Higginbottom, Institute of Agriculture, Technology & Sciences, Allahabad (2013) Honorary Membership of the Botanical Society of America-2014
Dr. K. Usha, Principal Scientist	3 rd Prize" on Hindi presentation competition ("Jalvaau Parivartan aiv Bhartiya Krishi"-2014
Dr S.K. Singh	Distinguished Scientist Award-2009 of the Hi-Tech Horticultural Society, Meerut-2009 Distinguished Scientist of the Year Award Society for Recent Initiatives in Horticulture, Meerut (2010) Best Poster Paper Award at the XXIII Annual Conference of National Environmental Science Academy 27-29 th Dec. 2010 held at New Delhi (2010) Member - Board of Studies, Banaras Hindu University, Varanasi (2011)



	<p>Best paper award- 5th Indian Horticultural Congress-2012, PAU, Ludhiana. (2012)</p> <p>Editor in Chief, Indian Journal of Horticulture (2012)</p> <p>Member, Board of Studies at Sikkim University, Gangtok, Sikkim (2013-2015)</p> <p>Member, Board of Studies at NEHU, Tura, Meghalaya (2014-2016)</p> <p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Nominated member of Board of Studies, Sikkim University</p> <p>Joint Secretary, Society for Promotion of Horticulture, IIHR, Bangalore (2013)</p>
Dr. M.K. Verma, Sr. Scientist	<p>Young Scientist Award, Bioved Research Society, Allahabad (2011)</p> <p>Nominated Editor of Indian Journal of Horticulture (2012)</p> <p>Nominated Editor of Indian Journal of Horticulture (2013)</p> <p>Award of Fellow of the Horticultural Society of India (2013)</p>
Dr. V.B. Patel, Scientist	<p>Young Scientist Award of the National Academy of Agricultural Sciences, New Delhi-2009</p> <p>Best Poster Paper Award at the XXIII Annual Conference of National Environmental Science Academy 27-29th Dec. 2010 held at New Delhi (2010).</p> <p>Fourth Indian Horticulture Congress-2010 on Horticulture, Horti-Business and Economic Prosperity at NPL, New Delhi from 18-21, November, 2010 as Co-Organizing Secretary (2010)</p> <p>Best poster paper award, seminar on Physiological and Molecular Interventions for Yield and Quality Improvement in Crop Plant organized by SVPVA&T, Meerut, ISPP, New Delhi. (2011).</p>
Dr. O.P. Awasthi, Pr. Sci.	<p>Fellow of the Horticultural Society of India (2012)</p> <p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p>
Dr. A.K. Dubey, Pr. Sci.	<p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Fellow of the Horticultural Society of India (2014)</p>
Dr. Manish Srivastav, Sr. Scientist,	<p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Best Teacher Award, PG School IARI 2014</p> <p>Best Poster Paper Award at 6th Indian Horticultural Congress-2014 held at TNAU, Coimbatore on 06-09 Nov., 2014</p> <p>Fellowship of the Horticultural Society of India-2014</p> <p>Honorary Membership of the Botanical Society of America-2014</p>
Dr. Kanhaiya Singh, Sr. Scientist	<p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Best Poster Paper Ist Prize on “Conservation & Management of Genetic Diversity for Protected Cultivation” in National Seminar on Protected Cultivation of Vegetables and Value Addition on 29-30 Nov., 2013 at Allahabad School of Agriculture, Sam Higginbottom, Institute of Agriculture, Technology & Sciences, Allahabad (2013)</p>
Dr. Jai Prakash, Sr. Scientist	<p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Best Poster Paper Ist Prize on “Conservation & Management of Genetic Diversity for Protected Cultivation” in National Seminar on Protected Cultivation of Vegetables and Value Addition on 29-30 Nov., 2013 at Allahabad School of Agriculture, Sam Higginbottom, Institute of Agriculture, Technology & Sciences, Allahabad (2013)</p>
Dr. Amit K. Goswami, Scientist	<p>Best Poster Paper Award at 5th Indian Horticultural Congress-2012 held at PAU, Ludhiana on 06-09 Nov., 2012</p> <p>Best Poster Paper Ist Prize on “Conservation & Management of Genetic Diversity for Protected Cultivation” in National Seminar on Protected Cultivation of Vegetables and Value Addition on 29-30 Nov., 2013 at Allahabad School of Agriculture, Sam Higginbottom, Institute of Agriculture, Technology & Sciences, Allahabad (2013)</p>

b) Doctoral / post-doctoral fellows: 3

c) Students:

ICAR Jawaharlal Nehru Awards: 2

Best Poster Paper Six students.

One student got best Young Scientist presentation award in 6th Indian Hort. Congress -2014 at TNAU, Coimbatore (2014)

Six students got Best Paper Award at different symposia/conferences.

**Summary of Awards and Honours (Faculty)**

Name of the award	
Borlaug Award	1
B.P. Pal Memorial Award of NAAS	1
Omprakash Bhasin Award	1
Fellow of NAAS	2
Associate Fellow of NAAS	3
Fellow of HSI	8
Jawahar Lal Nehru Award of ICAR for Doctoral Research	2
Best Research Paper Award	22
VASVIK award in Agricultural Sciences and Technology	1
Eco-Friendly Award OF Urivi Vikram Trust	2
Young Scientist Award of NAAS	1
Best Teacher Award for excellence in Post-Graduate teaching	2
Hari Om Award Trust Award of ICAR	3
Dr. Rajendra Prasad Award of ICAR	2
Best Horticulturist Award	1
Dr. Rafi Ahmad Kidwai Award	2

Degree Awarded to M.Sc.

National= 14 International= 2

Degree awarded to Ph.D.

National = 13 International= 1

30. Seminars/ Conferences/ Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any.

Seminar/Conference/Workshops	Source of Funding	Details of participants
Winter School on Advances in rootstocks for overcoming biotic and abiotic stresses in fruit crops- (17 th Nov. to 07 th Dec., 2011)	Indian Council of Agricultural Research	25 Scientists and Asstt. Prof.
Model Training Course (MTC) on “Good Agricultural Practices (GAP) in Horticultural Crops” (11-18 March, 2013)	Ministry of Agri., Deptt. of Agril. Extension, GoI	20 State Govt. Agri./Hort. officers
Organization of Model Training Course (MTC) on “Recent Advances in Planting Material Production of Fruit Crops” (21-28 February, 2014)	Ministry of Agri.& Cooperation, GoI and Krishi Vistar Bhawan, Pusa Campus, New Delhi	17 State Govt. Agri./Hort. officers
Six months training programme for scientists from Afghanistan in Horticulture discipline conducted by Dr. R.K. Jain, Convener, Dr. A.D. Munshi, Prof. of Horticulture as Course Coordinator and Dr. S.K. Singh, Co-Convener and Professor, Div. of FHT (29.08.2013 to 28.02.2014)	Afghanistan	6 Agriculture scientists
Organization of Model Training Course (MTC) on “Management of Production Problems of Horticultural Crops for Enhancing Productivity and Quality” (January 27 – 3 February, 2015)	Directorate of Extension, Department of Agriculture & Cooperation, Ministry of Agriculture Government of India, New Delhi	18 State Govt. Agri./Hort. officers



31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard.

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	-	-	-
Ph.D.	95	5	1	5.26	1.05

33. Diversity of students

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise. (Five years)

All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships. All others are selected as ARS scientist or Assistant Professor

ICAR JRF	:	22
DST INSPIRE Fellowship	:	05
CSIR/UGC JRF & NET	:	03
ICAR SRF & NET	:	18
ARS	:	16
Assistant Professor in SAU	:	08
Assistant Professor in CAU	:	03
Post Doc Fellowship	:	03
Indian Administrative Service	:	05
Indian Police service	:	04
Indian Forest Service	:	10
Indian Foreign Service	:	02

Students are in Food Corporation of India and PO/ ADO in several Nationalized Banks.

35. Student progression

Student progression (%)	
UG to PG:	NA
PG to M.Phil.	NA
PG to Ph.D.	92%
Ph.D. to Post-Doctoral:	5%
Employed	
• Campus selection	-
• Other than campus recruitment:	95%
Entrepreneurs: Nil	

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	: 20%
From other universities within the state	: 0%
From universities from other States from	: 70%
Universities outside the country	: 10%

**37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period**

Ph.D. : One

38. Present details of departmental infrastructural facilities with regard to

- a) Library: One Divisional Library with 1500 Text and Reference books + 225 M.Sc. + Ph.D. theses
- b) Internet facilities for staff and students: Every room/ laboratory/class room/lecture room has computer with internet connection and WiFi facilities for all students and staff in office, laboratories and hostels.
- c) Total number of class rooms : Two
- d) Class rooms with ICT facility : One
- e) Student's laboratories : Two
- f) Research laboratories : Two
(PG Laboratory, Physiology Laboratory, Tissue Nutrient Laboratory, Central Tissue Culture Laboratory)

39. List of doctoral, post-doctoral students and Research Associates**a. from the host institution/university**

Sl. No.	Name of the M. Sc. student	University of Graduation
1.	Mr. Sachin Kumar Patel	B.Sc.CSAUA &T, Kanpur M.Sc. (Hort.)- IARI, New Delhi
2	Mr. Om Prakash Singh	B.Sc.CSAUA&T, Kanpur M.Sc. (Hort.)- IARI, New Delhi
3	Mr. Soyimchten	B.Sc. CAU, Pasighat, Arunachal Pradesh M.Sc. (Hort.)- IARI, New Delhi
4	Mr. Kakade Vijaysinha Dhanasingrao	B.Sc. (Hort)—MPKV, Rahuri M.Sc. (Hort.) – IARI, New Delhi-110012
5	Mr. Chandrakant Awachare	B.Sc. (Hort.) – Dr. P.D.K.V., Akola M.Sc. (Fruit Science)- IARI, New Delhi-110012
6	Ms. Uwisize Marie Grace (Foreign Student from Rwanda)	B.Sc. (Ag.) – AAU, Allahabad M.Sc. (Hort.)- IARI, New Delhi
7	Mr. Ankit Sigh	B.Sc. (Agri.) – NDU&T, Faizabad, U.P. M.Sc. (Hort.)- IARI, New Delhi
8	Mr. Vishambhar Dayal	B.Sc. (Ag.) – CSAUA&T, Kanpur M.Sc.(Fruit Science) – IARI, New Delhi-110012
9	Ms. Suman Beniwal	B.Sc. (Agri.) – MPUAT, Udaipur M.Sc. (Hort.)- IARI, New Delhi
10	Mr. Darshan Manikrao Kadam	B.Sc. (Hort.) – Dr. P.D.K.V., Akola M.Sc. (Fruit Science)- IARI, New Delhi-110012
11	Mr. Farahad Anees (Student from Afghanistan))	B.Sc. (Hort.) – Kabul University, Afghanistan M.Sc. (Hort.) – IARI, New Delhi-110012
12	Ms. Madhumitta Mallick	B.Sc. (Ag.) – OUA&T, Bhubanaeswar M.Sc. (Fruit Science) – IARI, New Delhi-110012
13	Mr. Banoth Shiva	B.Sc. (Hort.) – Dr. YSR Horticultural University, AP. M.Sc. (Fruit Science) – IARI, New Delhi-10012
14	Ms. Tanushree Debnath	B.Sc. (Agri.) – Central Agril. Univ., Imphal, Manipur M.Sc. (Fruit Science) – IARI, New Delhi-10012
Sl. no.	Name of the Ph.D. student	Host/other institute/ university
1	Mr. Dipak Nayak	M.Sc. (Hort.) – IARI, New Delhi-110012 Ph.D. (Pomology) - IARI, New Delhi-110012



2	Mr. D. Ramajayam	M.Sc. -Other university Ph.D. (Pomology) - IARI, New Delhi-110012
3	Mr. Ebrahim Saboki (Foreign Student from Iran)	M.Sc. -Iran University. Ph.D. (Pomology) - IARI, New Delhi-110012
4	Mr. Anshuman Singh	M.Sc. - Other university Ph.D. (Pomology) - IARI, New Delhi-110012
5	Mr. Sudip Kumar Dutta	M.Sc. (Hort.) – IARI, New Delhi-110012 Ph.D. (Pomology) - IARI, New Delhi-110012
6	Mr. Sant Ram	M.Sc. - Other university Ph.D. (Pomology) - IARI, New Delhi-110012
7	Mr. Wasim Hassan Raja	M.Sc. - Other university Ph.D. (Pomology) - IARI, New Delhi-110012
8	Mr. Arun Kishor	M.Sc. (Hort.) – IARI, New Delhi-110012 Ph.D. (Pomology) - IARI, New Delhi-110012
9	Mr. Pranathan Barman	M.Sc. - Other university Ph.D. (Fruit Science) - IARI, New Delhi-110012
10	Mr. Heiplanmi Rymbai	M.Sc. - Other university Ph.D. (Fruit Science) - IARI, New Delhi-110012
11	Mr. Panava Pandey	B.Sc. (Agri.) – NDUAI Faizabad, U.P. M.Sc. (Hort.)- BHU, Varanasi, U.P. Ph.D. (Fruit Science) - IARI, New Delhi-110012
12	Mr. Evening Stone Marboh	B.Sc. (Agri.)- Central Agril. University, Imphal, Manipur M.Sc. (Hort.)- G.B.P.U.A &T, Pantnagar Ph.D. (Fruit Science) - IARI, New Delhi-110012
13	Mr. Rahul Dev	B.Sc. (Agri.) – C.S.J.M. Univ. Kanpur M.Sc. (Agril.)- G.B.P.U.A &T, Pantnagar Ph.D. (Fruit Science) - IARI, New Delhi-110012

b. From other institutions/universities: 1 PDF (2011-2012)

Sl. No.	Name	Designation	Qualification	Host/other institute/ university
1.	Dr. (Mrs.) M. Saxena	PDF	Ph.D.	GBPUA&T, Pantnagar
2.	Dr Deepmala Pathak	SRF	M.Sc.	Jeewaji Univeersity. Gwalior
3.	Ms. Shikha Verma	SRF	M.Sc.	Kurukshetra University, Haryana
4	Ms. Simranjit Kaur	SRF	M.Sc.	Punjab Agricultural University, Ludhiana

40. Number of post graduate students getting financial assistance from the university:

14, all the students got fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Revision of 16 + 4 courses, formulation 2 new courses in light of Revised Course curricula in Horticulture (Fruit Science) approved by ICAR recommended by 4th Deans' Committee and notified by UGC. This exercise is repeated every 5- 6 years

42. Does the department obtain feedback from?

a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Yes by taking the suggestions from the teaching faculty, Adjunct Professors, experts and resource persons from the particular field from renounced Universities and Institutes. Feedback from students and faculty is taken



into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done

b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

After every course the feedback form is collected every registered students to be considered for revision/ modification if any. Faculty is advised to improve.

c. alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department

Sl. No.	Name	Year	Position held
1	Dr H.C. Dass	1965	Director, NRC on Citrus, Nagpur
2	Dr C.B.S. Rajput	1965	Director, Institute of Agricultural Sciences, BHU, Varanasi
3	Dr S.P. Ghosh	1963	Deputy Director General (Horticulture), ICAR, New Delhi
4	Dr B.S. Chundawat	1968	Vice Chancellor, Sardarkrushinagar Dantiwada Agril. Univ., Gujarat
5	Dr G.B. Raturi	1974	Director, CIAH, Bikaner, Rajasthan
6	Dr K.L. Chadha	1964	Deputy Director General (Horticulture), ICAR, New Delhi
7	Dr O.P. Pareek	1965	Director, CIAH, Bikaner, Rajasthan
8	Dr G.L. Kaul	1965	Vice Chancellor, Assam Agricultural University, Jorhat
9	Dr , D.G. Dhandar	1968	Director, CIAH, Bikaner, Rajasthan
10	Dr K.K. Jindal	1972	A.D.G. (Hort.), ICAR , New Delhi
11	Dr S.N. Pandey	1968	A.D.G. (Hort.), ICAR , New Delhi
12	Dr Ram Kripal Patha	1970	Director, CISH, Lucknow, Uttar Pradesh
13	Dr P. G. Adsule	1977	Director, NRC on Grapes, Pune , Maharashtra
14	Dr K. Arulmozhi	1986	Director of Agriculture, Govt. of Tamil nadu
15	Dr A.K. Singh	1990	Managing Director, NHB, Gurgaon
16	Dr R.K. Pal	1990	Director, NRC on Pomegranate. Pune, Maharashtra
17	Dr (Ms).Elizabeth Saipari	1992	Joint Director, Mizoram Govt., Aizawal
18	Dr D.P. Waskar	1990	Joint Director Research, VMMPKV, Parbhani
19	Dr Sajan Kurien	1990	Dean, Kerala Agricultural University, Trissur
20	Dr P.K. Pramanick	2001	Director, Horticulture (PHM), West Bengal Govt.
21	Dr A.R. Midani	2001	Director, Seed & Plant Improvement Centre, Varmin, Tehran, Iran
22	Dr Bidyut Chandan Deka	2001	Joint Director (Res.), ICAR Res Complex, Nagaland Centre
23	Dr M. Angamuthu	2002	Additional Chief Secretary, Guwahati, Govt. of Assam

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

Sl. No.	Topic	Speaker/ Expert
1	Mango breeding in Australia	Dr I. Bally, Mareeba, Queensland, Australia (2014)
2	Fruit crop research in India	Dr K.L. Chadha, Adjunct Professor (2013)



3	Alternate bearing and its management in fruit crops	-do-
4	Micronutrients in fruit production	-do-
5	Fruit breeding in India: Historical perspectives	Dr K.L. Chadha, Adjunct Professor (2012)
6	Introduction of genetic resources in fruit crops	Dr K.L. Chadha, Adjunct Professor (2011)
7	Long term nutrient trials in fruit crops	Dr K.L. Chadha, Adjunct Professor (2011)
8	Leaf Tissue nutrient diagnostics in perennial fruit trees	Dr K.L. Chadha, Adjunct Professor (2010)

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes.

Classroom teaching using white marker board and pen, black board, power point slides, class seminars, group discussion and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

A series of small quiz exams and feedback from students. At Divisional level, professor monitor's academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities.

All faculty and student take part in the extension activities of the Division. The faculty takes part in Krishi Vigyan Melas, Pusa Horticulture Show, Mango show, Agri-Expo at Pragati Miadan etc.

48. Give details of "beyond syllabus scholarly activities" of the department.

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The Division is leader in developing improved varieties of mango which occupy a substantial area in the country. Amrapali and Mallika have spread to tribal and marginal areas of Odisha, Jharkhand, Gujarat, Uttarakhand, Madhya Pradesh, Chhattisgarh etc. Improved technologies like High density orcharding, use of PGRs, etc. have been initiated from Division. The Division has also contributed in the development of Whole Genome map of mango through transcriptome analysis of three commercial varieties.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

- Dedicated faculty and staff
- Meritorious students –Toppers of JRF (ICAR) exam in M.Sc. and IARI for Ph.D.
- Well-equipped Post graduate and specialized labs.
- Smart class room facilities
- 100% placement of students to different jobs in R&D and also administrative services



Weaknesses

- Vacant positions in Technical and supporting staff
- Delay in approval of Master Plan for building new hostels and facilities of permanent (civil) nature

Opportunities

- Establishment as Centre of Excellence in Frontier areas of Horticultural Sciences, like CESCRA, WTC, FS&PHT
- Establishment of two new IARIs in Assam and Jharkhand
- Initiating e-courses with different govt. agencies like UGC, IGNOU, NCERT, NIOS etc.
- Initiating training programmes for faculty CAS and CAFTs
- Dissemination of research through network of Regional Stations and several ICAR institutes & SAUs.
- Setting up of Smart Class Rooms, Media lab, online examination systems

Challenges

- Space constraints for expansion of Office building, hostels, international hostels to enhance student intake capacity
- Lack of enough resources for modernization of facilities and amenities for students and staff.
- Administrative delays in procurement of new equipment and facilities

52. Future plans of the department.

- Aim to set up a Centre of Excellence in Hi-tech Horticulture
- Capacity building of faculty in advanced centres (international and national) for research and Education
- Conduct regular training courses/ training programmes for students and staff.
- Foraging collaborations with foreign universities and institutes under exchange programme for both student and staff.

53. Other important information

- a. The Division has awarded **115** M.Sc. and **136** Ph.D. so far
- b. **Training received by the Faculty:** The faculty has received training both at National and International level on different emerging areas in Horticulture.

a. National	=	10
b. International	=	04
Total	=	14

- c. The Division also house The Horticultural Society of India



xiv) Division of Microbiology

1. Name of the Department

Division of Microbiology

2. Year of establishment

1961

3. Is the Department part of a School/Faculty of the university?

School of Resource Management & Technology

4. Names of programmes offered

(UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.): M.Sc. and Ph. D.

5. Interdisciplinary programmes and departments involved:

Interdisciplinary programmes	Departments	Faculty
<p>Development of benignant microbial consortium for growth promotion of some important crops (DBT Project), project was sanctioned for two centers</p> <p>Strategy for developing recombinant Environmental libraries for antibiotics (DBT Project) project was sanctioned for two centres</p> <p>Allele Mining and bioprospecting of genes for abiotic stress tolerance PI (ICAR- NAIP (2009– 2014)</p> <p>Harnessing and engineering the genetic diversity of rice endophytic diazotrophs and its application to improve rice growth. CCPI. (ICAR-Incentivizing Research In Agriculture) 2014-2017</p>	<p>IARI, New Delhi and Delhi University, South Delhi Campus</p> <p>IARI, New Delhi and NRCPB, New Delhi</p> <p>8 centres for microbes</p> <p>10 centres: IARI, New Delhi; NRCPB; DRR, Hyderabad; CRRI, Cuttack; CIMAP, Lucknow; NBAIM, Mau; DMR, New Delhi; PAU, Ludhiana; DWR; CU, Kolkata</p>	Dr. K. Annapurna
<p>Allele Mining and bioprospecting of genes for abiotic stress tolerance, Co PI (ICAR- NAIP (2009– 2014)</p> <p>Value Chain on Production of food-grade nutraceuticals for use as natural antioxidants and food colorants (NAIP, ICAR, Co PI, Inter-divisional and Inter- Institutional) Department of Forest Products, Dr. Y. S Parmar University of Horticulture & Forestry, Solan, 173230, HP, Co-PI</p> <p>Recycling of animal and farm waste and application of their value added products in sustainable crop production and animal husbandry; Collaborating Institutes IVRI, CARI, IIT Roorkee and IARI, 2007-2012; Co-PI</p> <p>High Rate Algal Biomass Production for Food, Biochemicals and Biofuels (PI, Indo-Danish project funded by DBT, Inter-Institutional with IIT, Kharagpur, Antenna group, Madurai, International collaboration with DTU, Lyngby, Denmark), PI</p>	<p>8 centres for microbes</p> <p>4 centres</p> <p>5 centres</p> <p>3 centres from India, including one private company</p>	Dr. Dolly Wattal Dhar



Increasing the efficiency of microbial production of bioethanol from agricultural biomass	ICAR-NFBSFARA	Dr. Lata
Value Chain on Production of food-grade nutraceuticals for use as natural antioxidants and food colorants (NAIP, ICAR, Co PI, Inter-divisional and Inter- Institutional)	4 centres	Dr. Sunil Pabbi
High Rate Algal Biomass Production for Food, Biochemicals and Biofuels (PI, Indo-Danish project funded by DBT, Inter-Institutional with IIT, Kharagpur)	3 centres from India, including one private company	
Development of Transgenic <i>Rhizobium</i> for pulse crops (DBT Project), project was sanctioned for three centers	(3 centres; IARI, M.S. University, Baroda, University of Hyderabad, Hyderabad).	Dr. A K Saxena
NAIP project on 'Diversity analysis of <i>Bacillus</i> and other predominant genera in extreme environments and its utilization in agriculture'.	(5 centres; IARI, NBAIM, Mau; CPRI, Kasargod, DGR, Junagadh; NRCPB, New Delhi).	
Allele Mining and bioprospecting of genes for abiotic stress tolerance CCPI and Group Leader (Microbes). ICAR- NAIP (2009– 2014)	(8 centres for microbes)	
Role of Archaeobacteria in Alleviation of Salinity and Moisture Stress. (CPI) NFBSFARA (2012-2015)	(2 Centres; IARI, New Delhi and DGR, Junagadh)	
Selection of broad spectrum <i>Rhizobium</i> spp. for different pulses; Co-PI	Division of Microbiology, IARI, N Delhi	Dr. Archana Suman
Isolation and characterization of plant growth promoting rhizobacteria for increasing sugarcane crop productivity; PI	Divisions of Crop Production, Plant Physiology and Biochemistry, IISR, Lucknow	
Cellular and molecular interaction of the bacterial isolates with pathogen causing major disease (red-rot) of sugarcane; PI	Divisions of Crop Production, Pathology, Plant Physiology and Biochemistry, IISR, Lucknow	
Effect of bio-manuring on sugarcane productivity and soil properties under continuous rationing; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, Entomology, Agril Engineering, IISR, Lucknow	
Improving productivity & quality of ratoon cane through integration of organics, bio-agents & inorganic fertilizers; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, Entomology, Agril Engineering, IISR, Lucknow	
Biological methods for improving productivity of ratoon cane in subtropical India; Co-PI	Divisions of Crop Production, , Entomology, Agril Engineering, IISR, Lucknow	
Study of allelopathic effects of black gram on sugarcane yield and quality; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, IISR, Lucknow	
Studies on direct and indirect effects of allelochemicals in sugarcane; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, IISR, Lucknow	
IISR: Studies on rhizospheric environment of plant and ratoon crop of sugarcane; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, Agril Engineering, IISR, Lucknow	
IISR:Long term effect of conventional (non-organic) and organic cultivation of sugarcane on soil properties and cane yield; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, IISR, Lucknow	
Identification of inhibitors in sugarcane biomass hydrolyzates and their effect on ethanol yields; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, Agril Eng., IISR, Lucknow	
Investigations on vacuum and nitrogen packaging in storage of jiggery; Co-PI	Divisions of Crop Production, Plant Physiology & Biochemistry, Agril Eng., IISR, Lucknow	



AICRP-Optimizing standards for sugarcane seed production through micro propagation; Co-PI	Divisions of Crop Production, Crop Improvement, IISR, Lucknow	
Intellectual Property Management and Transfer/Commercialization of Agricultural Technologies as Institute Technology Management Unit (ITMU); PI	Divisions of Microbiology, Genetics and Agril Economics	
Intellectual Property Management and Transfer/Commercialization of Agricultural Technologies as Zonal Technology Management Unit (ZTMU); PI	Divisions of Microbiology, Genetics and Agril Economics	
Zonal Technology Management and Business Planning and Development (ZTM&BPD); Co-PI and PI	Divisions of Microbiology, Genetics and Agril Economics	
Course on "Microbial Ecology"	Interdisciplinary with Environmental Science	Dr. Geeta Singh
DST sponsored research project	Division of Soil Science and Agricultural Chemistry, ICAR-IARI	Dr. B. Ramakrishnan
Interdisciplinary programmes between Center of Environmental Science and Climate Resilient Agriculture for carrying out research on role of microbes in alleviating effect of climate change		Dr. Rajeev Kaushik
Research projects	Agronomy and Genetics	Dr. Swarnalakshmi

6. Courses in collaboration with other universities, industries, foreign institutions, etc.: NA

7. Details of programmes discontinued, if any, with reasons : Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester system (Total three trimesters in a year)

9. Participation of the department in the courses offered by other departments:

Interdisciplinary course : Nanotechnology in crop protection (MB 512/AC512) (L +1P)

Dr. Dolly Wattal Dhar and Dr. A. K. Saxena

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others):

	Sanctioned	Filled	Actual (including CAS \$ MPS)
Professor	03	03	03
Associate Professors	08	08	08
Asst. Professors	15	09	09
Others	-	-	-

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

NAME	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./M. Phil students guided (Last 4 years)
1.	2.	3.	4.	5.	6.
Dr. (Mrs.) K. Annapurna	Ph.D.	Head & Principal Scientist	Plant Microbe interactions	27 years	Two Ph.D.
Dr. (Mrs.) Dolly Wattal Dhar	Ph.D.	Professor & Principal Scientist	Microalgae and cyanobacteria	30 years	Two Ph.D.



Dr. (Mrs.) Lata	Ph.D.	Principal Scientist	Applied Microbiology	27 years	Two Ph.D.
Dr. Sunil Pabbi	M.Sc. (Honours), Ph.D.	Principal Scientist	Applied Microbiology, Algology	28 years	Two Ph.D.
Dr. A.K. Saxena	Ph.D.	Principal Scientist	Plant- Microbial Interaction and Microbial diversity	25 years	Three Ph.D.
Dr. (Mrs.) Archana Suman	Ph.D.	Principal Scientist	Plant microbe interactions	25	Nil
Geeta Singh	Ph.D.	Principal Scientist	Soil Microbiology	24 years	Nil
Dr. G. Abraham	Ph.D.	Principal Scientist	Algology	15 years	Nil
Dr. B. Ramakrishnan	Ph.D.	Principal Scientist	Agricultural Bacteriology	23 years	Nil
Sangeeta Paul	Ph.D.	Principal Scientist	Soil Microbiology	22 years	One Ph.D.
Livleen Shukla	Ph.D.	Principal Scientist	Applied Microbiology	21 years	Two Ph.D.
Radha Prasanna	Ph.D.	Principal Scientist	Plant Microbe Interactions; Applied Microbiology; Biofertilizers and control agents	18 years	One Ph.D.
Dr. Rajeev Kaushik	Ph.D.	Principal Scientist	Microbial Ecology and Agrowaste management	17 years	Nil
Sunita Gaind	Ph.D.	Senior Scientist	Soil Microbiology	5 years	Nil
Dr. (Ms) K. Swarnalakshmi	Ph.D.	Senior Scientist	Legume Microbe interactions	11 years	Nil
Ms Anju Arora	M.Sc.	Senior Scientist	Applied and industrial microbiology	17 years	Nil
Dr. Surender Singh	Ph.D.	Scientist (Sr. Scale)	Applied Microbiology	7 years	Nil

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

Dr. Y. D. Gaur

Contact No. 9810077105 & 011-26123845

D 3/3565, Vasant Kunj, New Delhi-110070

Email ID: ydgaur@gmail.com

Course 501 & 608 w.e.f. Nov. 2010 till date

Tenure from Nov. 3, 2010 to Nov. 24, 2015

13. Percentage of classes taken by temporary faculty – programme-wise information

Total: 19 classes for Course MB 501, Microbiology-I (11 classes) & Immunology – Immunodiagnostics in Agriculture, Mb 608 (8 classes)

14. Programme-wise Student Teacher Ratio No. of students /No. of faculty

Total number of Faculty : 17

Total No. of students : 26

Ratio: 1.5



15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

	Sanctioned	Filled	Actual
Academic support staff (technical)	28	11	11
Administrative staff	08	05	05

16. Research thrust areas as recognized by major funding agencies:

Major thrust areas :

- To carry out research on biological nitrogen fixation, organic matter decomposition & recycling of farm wastes, phosphate solubilization and pesticide degradation.
- Human resource development
- Extension & dissemination of research achievements and the technologies developed

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

K Annapurna

- Harnessing and engineering the genetic diversity of rice endophytic diazotrophs and its application to improve rice growth; 2014-2017; 300.00 Lakhs; PI, ICAR-Incentivizing Research In Agriculture
- Genetic diversity and Potential of ACC Deaminase producing rhizobia of soybean and their role in drought stress; 2013-16; 59.80 Lakhs; PI; DBT
- Molecular diversity of soybean and chickpea rhizobia based on their antagonistic potential; 2011-2016; 23.75 Lakhs, PI; DBT

Dolly Wattal Dhar

- Indo-Denmark Collaboration Project entitled “High Rate Algal Biomass Production for Food, Feed, Biochemicals and Biofuels” funded by Department of Biotechnology, Govt. of India Rs. 100.68 lakhs Approx. for IARI, PI, Till Sept. 2015

Lata

- Increasing the efficiency of microbial production of bioethanol from agricultural biomass ICAR-NFBSFARA; 2011-2015; Rs. 219.23 lakhs; Total = CCPI
- Synthetic biology and metabolic engineering opportunities for enhanced production of biofuels through microbes as CO-PI; ICAR-AMAAS; 2014-2017; Rs. 65.00 Lakhs

Sunil Pabbi

- Indo-Denmark Collaboration Project entitled “High Rate Algal Biomass Production for Food, Feed, Biochemicals and Biofuels” funded by Department of Biotechnology, Govt. of India, Rs. 100.68 lakhs Approx. for IARI,PI

Anil Kumar Saxena

- Draft Genome Sequencing of P-solubilizing *Pseudomonas striata* PS27 and functional validation of MSP Genes; 2014-2017; 44.73 lakhs ; PI
- Biomolecules and industrially important enzymes from extremophilic bacteria; 2014-17, 62.73 lakhs; Co-PI
- Metagenomic and cultural approaches for identification of novel microbial genes/alleles and microbes for bioconversion of lignocellulosic biomass at extreme physiological conditions of low temperature; 2014-2017; 90.00 lakhs; Co-PI



- Genome wide mining of salt tolerant genes from halophilic archaea; 2014-17; 41.50 lakhs; CPI
- Role of Archaeobacteria in Alleviation of Salinity and Moisture Stress; 2012-2015; 205.32 lakhs; PI

G. Abraham

- Assessment of the Influence of Environmental Factors in Relation to Sporulation in *Azolla microphylla*, CSIR, New Delhi, 1-7-2012 to 30-06-2015, Rs.16,00200, PI
- Proteomics of Salinity stress in *Azolla* DST, New Delhi, 1-7-2012 to 30-06-2015, Rs.34,95000, PI

Archna Suman

- Setting of Food Testing Laboratory MOFPI, New Delhi Co- PI, Rs. 1049.8 Lakhs

Radha Prasanna

- Prospecting the potential of cyanobacteria based formulation as plant growth promoting and biocontrol agents in cereal-legume cropping system and selected vegetables; ICAR Network Project on “Applications of Microorganisms in Agriculture and Allied Sectors” (AMAAS); Rs. 40 lakhs approx. (2014-2017)

B Ramakrishnan

- Archaeal- and anaerobic ammonia oxidative processes of nitrogen cycling in oxic and anoxic soils funded by Department of Science and Technology, GOI; Total grant: Rs. 38,58,000.00

Rajeev Kaushik

- Genome-wide mining of novel genes/alleles for salinity tolerance from halophilic Archaeobacteria funded by DBT; Grant: 41.50 lakhs
- Metagenomics and cultural approaches for identification of novel microbial genes/alleles and microbes for bioconversion of lignocellulosic biomass at extreme physiological conditions of low temperature funded by ICAR under AMAAS; Grant: 80 Lakhs

Anju Arora

- Synthetic biology and metabolic engineering opportunities for enhanced production of biofuels through microbes as PI; ICAR-AMAAS; 2014-2017; Rs. 65.00 Lakhs

Swarnalakshmi

- Assessment of symbiotic nitrogen fixing potential and phosphorus use efficiency in chickpea lines/genotypes funded by CGIAR under international project; Total Grants: Rs. 17,19,900

18. Inter-institutional collaborative projects and associated grants received

- a) National collaboration b) International collaboration

K Annapurna

- Development of benignant microbial consortium for growth promotion of some important crops (DBT Project), project was sanctioned for two centers (IARI, New Delhi and Delhi University, South Delhi Campus).
- Strategy for developing recombinant Environmental libraries for antibiotics (DBT Project) project was sanctioned for two centres (IARI, New Delhi and NRCPB, New Delhi)
- Allele Mining and bioprospecting of genes for abiotic stress tolerance PI (ICAR- NAIP (2009– 2014) (8 centres for microbes).
- Harnessing and engineering the genetic diversity of rice endophytic diazotrophs and its application to improve rice growth. CCPI. (ICAR-Incentivizing Research In Agriculture) 2014-2017 (10 centres: IARI, New Delhi; NRCPB; DRR, Hyderabad; CRRI, Cuttak; CIMAP, Lucknow; NBAIM, Mau; DMR, New Delhi; PAU, Ludhiana; DWR; CU, Kolkotta)



Dolly Wattal Dhar

- Value Chain on Production of food-grade nutraceuticals for use as natural antioxidants and food colorants (NAIP, ICAR, Co PI, Inter-divisional and Inter- Institutional) Department of Forest Products, Dr. Y. S Parmar University of Horticulture & Forestry, Solan, 173230, HP, Co-PI
- Indo-Denmark Collaboration Project entitled “High Rate Algal Biomass Production for Food, Feed, Biochemicals and Biofuels” funded by Department of Biotechnology, Govt. of India, Rs. 100.68 lakhs Approx. for IARI, PI

Lata

- Increasing the efficiency of microbial production of bioethanol from agricultural biomass ICAR-NFBSFARA, Grant received Rs. 219.23 Lakhs, 2011-2015

Anil Kumar Saxena

- Development of Transgenic *Rhizobium* for pulse crops (DBT Project), project was sanctioned for three centers (3 centres; IARI, M.S. University, Baroda, University of Hyderabad, Hyderabad). Rs. 20.02 Lacs BT/ PR2420?AGR/21/118/2001, PI
- NAIP project on ‘Diversity analysis of *Bacillus* and other predominant genera in extreme environments and its utilization in agriculture’. (5 centres; IARI, NBAIM, Mau; CPRI, Kasargod, DGR, Junagadh; NRCPB, New Delhi). Rs. 202.00 Lacs
- Allele Mining and bioprospecting of genes for abiotic stress tolerance CCPI and Group Leader (Microbes). ICAR- NAIP (2009– 2014) (8 centres for microbes). Rs. 101.531; Lacs
- Role of Archaeobacteria in Alleviation of Salinity and Moisture Stress. (CPI) NFBSFARA (2012-2015) (2 Centres; IARI, New Delhi and DGR, Junagadh) Rs. 205.32 Lacs

Swarnalakshmi

- DBT National collaboration Project on Efficacy and Risk Assessment of Bioinoculants in *Cajanus cajan*: Impact on plant growth, rhizospheric microbial diversity, and genes involved in N turnover (Rs. 5 lakhs during Jan1, 2014 to Dec 31, 2014); IIT, New Delhi
- CGIAR - International collaboration Project on Assessment of symbiotic nitrogen fixing potential and phosphorus use efficiency in chickpea lines/genotypes (30,000 USD from Oct 1, 2014 to June 30, 2015); IIPR, Kanpur and ICRISAT, Hyderabad

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

S.No.	Title of Project (s)	Funding Agency/ Period (From-To)	Amount/Budget (in lakhs)
1.	K. Annapurna Harnessing and engineering the genetic diversity of rice endophytic diazotrophs and its application to improve rice growth, ICAR, PI	2014-2017	300.00
2.	Genetic diversity and Potential of ACC Deaminase producing rhizobia of soybean and their role in drought stress, DBT, PI	2013-16	59.80
3.	Molecular diversity of soybean and chickpea rhizobia based on their antagonistic potential.	2011-2016	23.75
4.	Allele Mining and bioprospecting of genes for abiotic stress tolerance	2009-2014	101.531
5.	Strategy for developing recombinant environmental libraries for antibiotic production	2009-2013	40.18



6.	Development of a benignant microbial consortium for growth promotion of cereals	2008-2012	38.27
7.	Phosphate solubilizing bacterial biofertilizers – liquid formulations	2008-2010	15.00
8.	Studies on Plant-Microbe interactions in explosive contaminated soils-	2008-2009	2.00
9.	Developing liquid formulation for <i>Azospirillum</i>	2006-2009	8.40
10.	Correlating the Commensal attributes of Rhizobacteria to plant growth promotion	2005-2008	18.72
11.	Development of Transgenic Biofertilizer cyanobacterium <i>Nostoc muscorum</i> with cloned mps genes of <i>P. cepacia</i>	2003-2007	22.23
12.	Biofertilisers-HRD F.No. 26(36)/97-NATP	1999-2004	129.12
13.	Integrated nutrient management on rice-wheat-mungbean cropping system.BT/PR1241/AGR/02/067/98	1999-2002	16.12
14.	Inventory of Microbial Resources in India	2002-2005	4.27
15.	Studies on growth promoting bradyrhizobia of mungbean	1997-2000	11.50
16.	Mission mode project of Technology development and Demonstration of biofertilizers- <i>Rhizobium</i> .	1993-1997	59.89
17.	Technology development and demonstration of biofertilizers- <i>Rhizobium</i>	1991-1996	31.41
18.	National facility for <i>Rhizobium</i> Germplasm collection	1990-1995	63.71
1.	Dolly Wattal Dhar National Facility for Blue Green Algal Collections, DBT, GOI, Associate	1986-1992	194 lakhs
2.	Strengthening of the National Facility for Blue Green Algal Collections at IARI, New Delhi, Renamed as NCCUBGA, DBT, GOI, Associate	1990-1995	Rs. 20 lakhs/annum, approx.
3.	Mission Mode Project on Technology Development and Demonstration Project on biofertilizer BGA including <i>Azolla</i> , DBT, GOI, Associate	1995-1998	Rs. 30 Lakhs
4.	Human Resource Development in Biofertilizers-under TOE (Team of Excellence Mode) NATP, ICAR, Associate	Nov. 1999-March 2005	Rs. 146.45 lakhs
5.	Bio-prospecting and allele mining for abiotic stress tolerance” (NAIP project) NAIP, ICAR, Associate	2009-2014	Rs. 101.531 Lakhs
6.	Role of Biofertilizers in Integrated Nutrient Management of Rice Based Cropping System (DBT), GOI, Co-PI	July 1999-2002	Rs. 21.72 lakhs
7.	National Centre for Conservation and Utilisation of Blue Green Algae (IARI, DBT), CoPI	1996-2003	~ Rs. 20 lakhs/annum
8.	Analysis of genetic diversity among <i>Anabaena</i> strains in Indian Soils, Co PI AP Cess fund project, ICAR	2004-2007	13.25 Lakhs
9.	Human Resource Development in BGA and <i>Azolla</i> Biofertilizers and Promotion in agriculture, Co PI	Nov. 2007-Oct. 2010	Rs. 24.32 lakhs
10.	Value chain on production of food – grade nutraceuticals for use as natural antioxidants and food colorants, (NAIP: Component 2, Project Code: 5056; CPI: Dr. Suresh Walia) NAIP, ICAR;	Feb. 2009-Dec. 2012	Rs. 629.69 lakhs.
11.	Molecular Biodiversity Analysis of Cyanobacterial Germplasm DBT, PI	April 2004- March 2007	46 lakhs
12.	Indo Danish Project on “ High rate algal biomass production for food, feed, biochemicals and biofuels” with Prof. Debabrata Das, Project Coordinator (India) and Prof. Irini Angelidaki, Project Coordinator (Denmark), PI, GOI	2010-2015	Rs. 100.68 lakhs



1.	Lata Bioremediation of Polycyclic Aromatic hydrocarbons (PAHs) through microbial consortia as PI	ICAR (Under AMAAS Scheme); 2014 (Completed)	71.13
2.	Nature of interactions among the entomopathogenic nematodes, their bacterial endosymbionts and the insect hosts as CCPI	NAIP; 2014 (Completed)	301.3
3.	Developing PGPR Consortia for Enhanced Crop and Soil Productivity of Rice -Wheat Cropping System as PI	ICAR (Under AMAAS Scheme); 2014 (Completed)	88.83
4.	Development of Microbial consortium for rapid bioconversion of high silica content crop residue (Paddy straw), PI	NATP-CGP; 2005 (Completed)	15.67
1.	Sunil Pabbi National Facility for Blue Green Algal Collections/ National Centre for Conservation and Utilisation of Blue Green Algae; Associated	Department of Biotechnology, Govt. of India; 1986-2002	194 lakhs
2.	Technology Development and Demonstration Project on Biofertilizers (BGA and <i>Azolla</i>); Associated	Department of Biotechnology, Govt. of India; 1995-1998	Rs. 30 Lakhs
3.	Human Resource Development in Biofertilizers-under TOE (Team of Excellence Mode-NATP, ICAR; Co-PI and PI	NATP/ICAR; Nov. 1999-March 2005	Rs. 146.45 lakhs
4.	Role of Biofertilizers in Integrated Nutrient Management of Rice Based Cropping System (DBT); Co-PI	Department of Biotechnology, Govt. of India; July 1999-2002	Rs. 21.72 lakhs
5.	Molecular Biodiversity Analysis of Cyanobacterial Germplasm DBT; Co-PI	Department of Biotechnology, Govt. of India; April 2004-March 2007	46 lakhs
6.	Human Resource Development in BGA and <i>Azolla</i> Biofertilizers and Promotion in agriculture; PI	Department of Science and Technology, Govt. of India; Nov. 2007-March, 2010	Rs. 24.32 lakhs
7.	Value chain on production of food – grade nutraceuticals for use as natural antioxidants and food colorants, (Component 2, PCS); Co-PI	NAIP, ICAR; Feb. 2009-Dec. 2012	Rs. 629.69 lakhs.
8.	Indo Danish Project on “High rate algal biomass production for food, feed, biochemicals and biofuels” with Prof. Debabrata Das, Project Coordinator (India) and Prof. Irini Angelidaki, Project Coordinator (Denmark); PI	Department of Biotechnology, Govt. of India; September, 2010-2014	Rs. 100.68 lakhs
1.	A.K. Saxena Draft Genome Sequencing of P-solubilizing <i>Pseudomonas striata</i> PS27 and functional validation of MSP Genes, PI	2014-2017	44.73
2.	Biomolecules and industrially important enzymes from extremophilic bacteria, PI	2014-17	62.73
3.	Metagenomic and cultural approaches for identification of novel microbial genes/alleles and microbes for bioconversion of lignocellulosic biomass at extreme physiological conditions of low temperature Co-PI	2014-2017	90.00
4.	Genome wide mining of salt tolerant genes from halophilic archaea Co-PI	2014-17	41.50
5.	Role of Archaeobacteria in Alleviation of Salinity and Moisture Stress CPI	2012-2015	205.32
6.	Allele Mining and bioprospecting of genes for abiotic stress toleranc, CCPI and Group Leader (Microbes)	2009-2014	101.531
7.	Diversity analysis of <i>Bacillus</i> and other predominant genera in extreme environments and its utilization in agriculture. CPI (2009), CCPI (May 2009 – 2013)	2009-2013	202.00



8.	Microbial Management of Abiotic stress. Network Project on Application of Microorganisms in Agriculture and Allied Sectors (AMAAS) F.No.: 3-17/2005/iA.III PI	2006-2009	52.73
9.	Complete genome sequencing of <i>Mesorhizobium ciceri</i> Ca181 F.No.: 3-17/2005/iA.III, PI	2006-2009	154.94
10.	Assessing the impact of industrial effluent application on shifts in soil structural and functional microbial diversity, Co-PI	2006-2009	45.72
11.	Diversity of Microorganisms in exotic/extreme, Indo Gangetic Plains and development of diagnostic kits for select fungal pathogens and soil microbes Sub- Project: Diagnostic kits for soil microbes (<i>Bacillus</i> and fluorescent <i>Pseudomonas</i>). F.No.: 3-17/2005/iA.III, Co-PI	2006-2009	196.46
12.	Development of transgenic <i>Rhizobium</i> for pulse crops BT/PR2420?AGR/ 21/118/2001, PI	2002-2005	20.02
13.	Network on Biofertilizers F.No.12-9/21002-I.A.II (pt), (Discontinued following transfer to NBAIM, Mau in National interest) Awarded again in 2012, PI	2002-2005 2012- onwards	1.4 per annum 4.6 per annum
	Biofertilisers-HRD F.No. 26 (36)/97-NATP Co-PI	1999-2004	129.12
14.	Integrated nutrient management on rice-wheat-mungbean cropping system, BT/PR1241/AGR/02/067/98, PI	1999-2002	16.12
15.	Selection and evaluation of <i>Bradyrhizobium</i> and vesicular arbuscular mycorrhizal (VAM) and mycorrhizal colonization of red gram, FNo. 4-17/96. SW&DF dated 29.10.96, PI	1997-2000	3.93
16.	Studies on growth promoting bradyrhizobia of mungbean, Co-PI	1997-2000	11.50
17.	Mission mode project of Technology development and Demonstration of biofertilizers- <i>Rhizobium</i> . Associate	1993-1997	59.89
18.	Technology development and demonstration of biofertilizers- <i>Rhizobium</i> Associate	1991-1996	31.41
19.	National facility for <i>Rhizobium</i> Germplasm collection Associate	1990-1995	63.71
1.	Geeta Singh Phosphate solubilizing bacterial biofertilizers-Liquid formulation, DBT, GOI	2007-2010	32 Lakhs
1.	Archna Suman Intellectual Property Management and Transfer/ Commercialization of Agricultural Technologies as Institute Technology Management Unit (ITMU) (), PI: ICAR, IARI, New Delhi;	2009-2012	Rs. 37.50 Lakhs
1.	Radha Prasanna Prospecting the potential of cyanobacteria based formulation as plant growth promoting and biocontrol agents in cereal-legume cropping system and selected vegetables	ICAR Network Project on "Applications of Microorganisms in Agriculture and Allied Sectors" (AMAAS); 2014-2017	Rs. 40 lakhs approx.
2.	Integrated Use of Biofertilizers in Rice-Wheat-Mungbean Cropping System" [as Co-PI]	Dept. of Biotechnology (DBT), Govt. of India; 1999-2002	12
3.	Team of Excellence in Biofertilizers" [as Co-PI]	National Agricultural Technology Project (NATP)-HRD of ICAR1999-2002	130
4.	Analysis of genetic diversity among <i>Anabaena</i> strains in Indian soils"	ICAR AP Cess Fund 2004 -2007	13.25



5.	Assessment of the establishment and proliferation of inoculated cyanobacteria in rice based cropping systems by molecular methods”	All India Network Project on Biofertilizers 2007- 2012	13
6.	Mining for genes involved in production of fungicidal compounds in <i>Anabaena</i> strains” (Theme – Microbial Genomics)	ICAR Network Project on “Applications of Microorganisms in Agriculture and Allied Sectors” (AMAAS); 2006-2014	87
7.	Developing PGPR Consortia for Enhanced Crop and Soil Productivity of Rice-Wheat Cropping System” (Theme – Nutrient Management, PGPR and Biocontrol)- [as Co-PI]	ICAR Network Project on “Applications of Microorganisms in Agriculture and Allied Sectors” (AMAAS); 2006-2014	70
8.	Prospecting natural cyanobacterial biofilms and associated bacterial diversity for their potential as inoculants in rice wheat cropping system”	Dept. of Biotechnology (DBT), Govt. of India, 2010-2013	35
1.	Sangeeta Paul Evaluation of modified <i>Azotobacter</i> strains for their performance as biofertilizer in wheat Grants received	Dept. of Biotechnology (DBT), Govt. of India, From 2003-2005.	15.45 lakhs
2.	Bioprospecting for chitinolytic micro-organisms and their potential in insect biocontrol.	Dept. of Biotechnology (DBT), Govt. of India From 2010-2014	37.84 lakhs
3.	Development of low cost effective formulation of <i>Bacillus thuringiensis</i> for integrated pest management purposes.	Dept. of Biotechnology (DBT), Govt. of India From 2007-2011	39.45 lakhs
1.	Livleen Shukla Biotechnological production of xylitol from xylose rich lignocellulosic materials PI	MOFPI, New Delhi	16.3Lakhs
1.	Anju Arora Bioremediation of Polycyclic Aromatic hydrocarbons (PAHs) through microbial consortia as Co- PI	ICAR (Under AMAAS Scheme); 2011-2014	71.13 Lakhs
2.	Increasing the efficiency of microbial production of bioethanol from agricultural biomass (Co-PI)	NFBSFARA (ICAR) 2011-16	219.23 Lakhs
3.	Synthetic biology and metabolic engineering opportunities for enhanced production of biofuels through microbes as PI	ICAR-AMAAS2014-2017	65.00 Lakhs
1.	K. Swarnalakshmi Efficacy and Risk Assessment of Bioinoculants in <i>Cajanus cajan</i> : Impact on plant growth, rhizospheric microbial diversity, and genes involved in N turnover	DBT National collaboration Project IIT, New Delhi Jan1, 2014 to Dec 31, 2014	Rs. 5 lakhs
2.	CGIAR - International collaboration Project on Assessment of symbiotic nitrogen fixing potential and phosphorus use efficiency in chickpea lines/genotypes	Oct 1, 2014 to June 30, 2015); IIPR, Kanpur and ICRISAT, Hyderabad	30,000 USD

20. Research facility / centre with:

- state recognition
- national recognition

National recognition

- CCUBGA functions as a service as well as repository in the country for the BGA isolates. It is recognized by National Biodiversity Authority of India as Designated National Repository under Biodiversity Act 2002 (Ref. No. N.2/23/2006/Admn., NBA/3736 dated: 28.12.2007).



21. Special research laboratories sponsored by / created by industry or corporate bodies:

Archna Suman

- i. Zonal Technology and Business Planning and Development Unit containing a tissue culture lab, Microbiology, Molecular Biology Lab and a Transgenic Green House funded by World bank through NAIP, ICAR
- ii. A Biofertilizer Microbiology Lab funded by Biotechnological Industry Research Assistance Council (BIRAC), DBT

22. Publications:

- Number of papers published in peer reviewed journals (national /international) : 879 (approx.)
- Chapters in Books : 225
- Edited Books: 38
- Books with ISBN with details of publishers: 13
- Number listed in International Database (For e.g. Web of Science, Scopus) :NA
- Humanities International (Complete, Dare Database - International Social, Sciences Directory, EBSCO host, etc.): NA
- Citation Index – range / average: Varying
- SNIP
- SJR
- Impact Factor – range / average: Varying
- h-index: Varying

Details Below in a Table form

Details	KA	DW D	LA TA	SP	AKS	Arch na	Gee ta	Abra ham	Ra ma	San geeta	Liv leen	Ra dha	Raj eev	Sunita	Swar na	Anju	Suren der
Number of papers published in peer reviewed journals (<i>national/international</i>)	60	70	130	36	116	57	25	32	16	33	35	125	31	42	11	35	25
Chapters in Books	15	28	29	22	15	5	12	15		07	08	36	04	14	06	4	05
Edited Books/Mono-graphs	03	13	-	3	02	1	05			01		10					
Books with ISBN with details of publishers	02	02	-	01	02			02		01	01	02					
Number listed in International Database (For e.g. Web of Science, Scopus, Humanities International Complete, Dare Database - International Social Sciences Directory, EBSCO host, etc.)																	
Citation Index – range / average		1103	1203		1080	467				85		1542		478 Since 2010 307	57		
SNIP																	
SJR																	
Impact Factor – range / average						2.2- 9.91								5.0 – 11.0	4-8		
h-index		16	20	07	17			9				21	09	13	04		07



K Annapurna

Books Authored

1. K. Annapurna & Kornelia Smalla; 2014; Microbial Ecology and Application of Inoculants in Biocontrol; Indian Agricultural Research Institute, New Delhi; 100
2. K. Annapurna; 2009; Training for SAARC countries; Training Manual on Rhizobium Biofertilizer Technology for Sustainable Agriculture; ISBN No. 978 – 81- 88708 – 44 – 4; Indian Agricultural Research Institute, New Delhi; 60

Books Edited

1. Shiv Dhar Misra, K.M. Manjaya, K. Annapurna and R.K. Rai; 2008; Rhizosphere: Strategies for augmenting soil fertility and productivity p- 618; Division of Agronomy, IARI, New Delhi. Pp. 670; ISBN No. 978-81-88708-32-1; Indian Agricultural Research Institute, New Delhi; 670

Dolly Wattal Dhar

Books Edited

1. P K Singh, Dolly Wattal Dhar, Sunil Pabbi, Radha Prasanna, Anju Arora (Eds.) (2000) Biofertilizers : Blue green algae and Azolla, National Centre for Conservation and Utilisation of Blue green Algae, Indian Agricultural Research Institute, New Delhi Venus Printers and Publishers, New Delhi, p 141
2. P K Singh, Dolly Wattal Dhar, Sunil Pabbi, Radha Prasanna, Anju Arora (Eds.) (2001) Recent Advances in the exploitation of blue green algae and Azolla, National Centre for Conservation and Utilisation of Blue green Algae, Indian Agricultural Research Institute, New Delhi Venus Printers and Publishers, New Delhi, p137

Manuals

1. Singh P K, Dhar Wattal Dolly, Pabbi Sunil, Prasanna Radha and Arora Anju (2000) Training Manual on blue green algae, NCCUBGA, IARI, New Delhi. Venus Printers and Publishers, New Delhi, p67
2. Singh P K, Dhar Wattal Dolly, Pabbi Sunil, Prasanna Radha and Arora Anju (2000) Manual on Blue Green Algae and Azolla Biofertilizers; NCCUBGA, IARI, New Delhi, Venus Printers and Publishers, New Delhi, p36
3. Singh P K, Dolly Wattal Dhar, Sunil Pabbi, Radha Prasanna and Anju Aror. (2002) BGA-Azolla Biofertilizers, A Manual for their Production, Evaluation and Utilization National Centre for Conservation and Utilisation of Blue green Algae, Indian Agricultural Research Institute, New Delhi, p. 1-137. Venus Printers and Publishers, New Delhi.
4. Singh P K, Dolly Wattal Dhar, Sunil Pabbi, Radha Prasanna and Anju Arora (2003) Cyanobiotech- A training Manual, NCCUBGA, 95p.
5. Pabbi, Sunil and Dhar Wattal Dolly (2008) Blue Green Algae and Azolla Biofertilizers: A Training Manual. CCUBGA, IARI, New Delhi -12, p48.
6. Abraham G, Pabbi Sunil, Dhar Wattal Dolly (2009) Blue Green Algae: A practical Manual CCUBGA, IARI, New Delhi, p76
7. Paul, Sangeeta, Radha Prasanna, Lata and Dolly Wattal Dhar (2009) Microbiotech – A manual for agricultural Microbiologists, Division of Microbiology and CCUBGA, IARI, New Delhi.
8. Abraham G, Pabbi S and Dhar Wattal Dolly (2010) Blue Green Algae, A practical manual, CCUBGA, IARI, New Delhi-12, p87



9. Pabbi Sunil and Dhar Wattal Dolly (2010) Blue Green Algae: Applications in Agriculture and Industry (Practical Manual) CCUBGA, IARI, New Delhi-12, p 67
10. Prasanna Radha, Lata, Anil Kumar Saxena and Dolly Wattal Dhar (2010) Bioprospecting microbes for agriculture, Indian Council of Agricultural Research, Division of Microbiology, IARI, New Delhi, 304 p. **ISBN: 978-81-88708-52-9.**
11. Livleen Shukla, Sunil Pabbi and Dolly Wattal Dhar Microbiology (2010) Tools and Techniques, A Practical approach, Division of Microbiology, IARI, New Delhi-110012, Post Graduate School, M/s Royal Offset Printers, P108 **ISBN: 978-81-88708-26-0**

Sunil Pabbi

Books Edited

1. Singh, P.K. and Pabbi, S. (eds). 1998. Mass production of Blue-green Algal Biofertilizer. . NCCUBGA, IARI, New Delhi, India. p 67.
2. Singh, P.K. Dhar, D.W, **Pabbi, S.**, Prasanna, R. and Arora, A. (eds.) 2000. Biofertilizers: Blue Green Algae and *Azolla*. NCCUBGA, IARI, New Delhi, India. p 141.
3. Singh, P.K. Dhar, D.W, **Pabbi, S.**, Prasanna, R. and Arora, A. (eds.) 2001. Recent advances in exploitation of blue green algae and *Azolla*. NCCUBGA, IARI, New Delhi, India. p 129.
4. Shukla, L., Pabbi, S. and Dhar, D.W. 2009. Microbiology- Tools and Techniques: A Practical Approach. Division of Microbiology, IARI, New Delhi (**ISBN: 978-81-88708-26-0**). p108.

A.K. Saxena

Books Authored

1. Kaushik, B.D., Saxena, A.K. and Prasanna, R. (2004) Techniques in Microbiology: A practical manual for post graduate students. IARI, New Delhi. **ISBN: 81-88708-02-X** Indian Agricultural Research Institute, New Delhi, 152

Books Edited

1. Prasanna, R., Lata, Saxena, A.K. and Dhar, D.W. (2009) Bioprospecting Microbes for Agriculture. **ISBN: 978-81-88708-52-9.** Indian Agricultural Research Institute, New Delhi. 304

Archna Suman

Books edited

1. Pramod Kumar, Archna Suman & J.P. Saxena (2010) Current Scenario on Vegetable Seed Production-Eds. pp.42.

Sangeeta Paul

1. Paul, Sangeeta, Radha Prasanna, Lata and Dolly Wattal Dhar (2009) Microbiotech – A manual for agricultural Microbiologists, Division of Microbiology and CCUBGA, IARI, New Delhi. ISBN: 978-81-88708-34-5

Radha Prasanna

Books edited/ Authored

1. Radha Prasanna, Lata, Saxena, A.K., Dhar, D.W. (2009) *Bioprospecting microbes for agriculture*. Division of Microbiology, IARI, New Delhi, 304p.
2. Paul, S., Dhar, D.W., Prasanna R. (2009) *Microbiotech- A manual for Agricultural Microbiologists*, Division of Microbiology, IARI, New Delhi, 69p.



3. Kaushik, B.D., Saxena, A.K., Radha Prasanna (2004) *Techniques in Microbiology: A Laboratory Manual for Post Graduate Students*, IARI, New Delhi, India. 152p.
4. Dhar, D.W., Pabbi, S., Radha Prasanna (2003) *Cyanobiotech – A Training Manual*. NCCUBGA, IARI, New Delhi, India. 95p.
5. Singh, P.K., Dhar, D.W., Pabbi, S., Radha Prasanna and Arora, A. (2002) *Blue-Green Algae: A Manual for their Production, Evaluation and Utilization*. NCCUBGA, IARI, New Delhi, India. 74p.
6. Singh, P.K., Dhar, D.W., Pabbi, S., Radha Prasanna, Arora, A. (2001) *Recent Advances in the Exploitation of Blue-Green Algae and Azolla*. NCCUBGA, IARI, New Delhi, India, 137p.
7. Tilak, K.V.B.R., Saxena, A.K., Annapurna, K., Radha Prasanna (2000) *Training Manual on Molecular Tagging of Inoculant strains for Ecological Studies*. Division of Microbiology, IARI, New Delhi, 22p
8. Singh, P.K., Dolly Wattal Dhar, Sunil Pabbi, Radha Prasanna, Anju Arora. (2000) *Biofertilizers: Blue green algae and Azolla*. National Centre for Conservation and Utilization of Blue green Algae, Indian Agricultural Research Institute, New Delhi. 141p. Venus Printers and Publishers, New Delhi. 141p.
9. Singh, P.K., Dhar, D.W., Pabbi, S., Radha Prasanna, Arora, A. (2000) *Manual on Blue-Green Algae and Azolla Biofertilizers*. NCCUBGA, IARI, New Delhi, India, 36p.

23. Details of patents and income generated

LATA

- Process Patent for developing “Pusa Process for production and storage of Frozen Ginger Slices” asco-investigator” (Jointly by Dr. R. K. Pal, Mr. Wangdup Bhutia and Dr. Lata) 1744/DEL/2006 dated 31.7.2006
- Patent filed “ A novel formulation of plant growth promoting rhizobacteria with enhanced shelf life and the method of its preparation” as co-investigator Reference No.6680/RQ-DEL/2009, dated 27/08/2009 Dr. Lata and Dr. Anupama

SUNIL PABBI

- An Indian patent entitled “Process for obtaining high purity phycocyanin from cyanobacteria” has been filed (Application No. 3981/DEL/2014 dated 29/12/2014) – Recently filed, no income

ARCHNA SUMAN

- As a Nodal Person (PI, Incharge, IARI-Institute Technology Management Unit) during 2010-2014, 19 Patents and 2 copyrights applications of scientists have been filed to Indian Patent Office. 8 patents and 2 copy rights have been granted and previous granted 21 patents have been protected further. 41 new and extant varieties applications of wheat, rice, vegetables and flowers have been filed for protecting under the Protection of Plant Varieties and Farmers Right Act 2001 (PPV&FRA).
- The strengthening of Public Private Partnership (PPP) during 2010-2014 was done by tech licensing, contract and consultancy activities.

SANGEETA PAUL

- **Patent filed:** “Liquid bioinoculant of *Azotobacter chroococcum* and the process thereof” has been filed on 25-02-2011. Inventors: Sangeeta Paul, Bishwajeet Paul, M.S. Rathi and B.D. Kaushik Filed one patent; Technology commercialized Total income generated Rs. 1 lakh

24. Areas of consultancy and income generated :

K. ANNAPURNA

- VAM technologies licensed to :



SAI Bioorganics, Moga, Punjab
Bharat Agro Molecules Ltd.
Prathishtha Industries Ltd
Vaishnavi Biotech Ltd
Eco Inputs, Ludhiana
Patanjali Group, Haridwar
Sowbhagya Biotech Ltd. Hyderabad
Prabhat Fertilizers and Chemical Works, Haridwar

SANGEETA PAUL

Technology developed and commercialized: Liquid bioinoculant of *Azotobacter*

This technology has been licensed to:

M/s Sai Bio Organics, Moga, Punjab.
M/s Eco Inputs, Ludhiana, Punjab.

SUNIL PABBI

- BGA Biofertilizer technology has been licensed under Institute's Public-Private Partnership Programme by signing MOU.

M/s Sai Bio Organics, Moga,
M/s Ecological Products Industries, New Delhi,
M/s Eco Inputs, Punjab and Forex Fastners (P) Ltd., Punjab

ARCHNA SUMAN

- 83 IARI technologies have been transferred to 111 private companies for revenue of Rs 3,07,94,360. 54 contract/consultancy project assignments were under taken for revenue of Rs 4,67,87,089. In all a total revenue of Rs 7,75,81,449 (Seven crores seventy five lakhs eighty one thousand four hundred forty nine only) has been generated. In addition collaborating projects of Advanta India Ltd and Chromous Biotech under DBT-BIRAC and Bejosheetal seeds Pvt Ltd under SIBRI, based on IARI technologies were processed as licensee partner and were sanctioned, that include grant-in-aid for the concerned scientist and soft loan for the respective industry.

LIVLEEN SHUKLA

- Composting technology and every year more than Rs. 20,000 are being generated by selling compost inoculum.

25. Faculty selected nationally / internationally to visit other laboratories / institutions/industries in India and abroad : Nationally : Given under Faculty recharging column *

K ANNAPURNA

- FAO fellowship on Molecular studies with *Bradyrhizobium japonicum* in University of Tennessee, Knoxville, USA from Jan-July, 1997 for 3 months funded by UNDP
- ICAR –NATP Fellowship in University of Missouri, Missouri, USA from Sept 2002- Feb, 2003 for 4 months funded by ICAR –NATP fellowship



DOLLY WATTAL DHAR

- Training on Technical knowhow development on Pharmacia LKB 4151 (Alpha Plus Amino Acid Analyser) 29.10.1990-3.11.1990 (6 days) at Pharmacia LKB Biochrom Ltd., Cambridge, England, UK
- Biotechnology Applied to Agriculture and Bio-Industry, 14.4.1998-17.7.1998 (3 months) Bio-Industry Unit, Faculty of Agricultural Sciences, Walloon Centre of Industrial Biology, Gembloux, Belgium Standing Committee for University Cooperation towards Development (CUD) of the kingdom of Belgium
- Advanced Molecular Studies in Cyanobacteria, 25.08.2004-20.11.2004, (2 months, 25 days) NATP, ICAR under HRD in biofertilizers, Darrin Fresh Water Institute, Rensselaer Polytechnic Inst., Bolton Landing (Troy), NY, USA, Under Prof. Sandara nierzswickibauerr
- International Training on “Micro-algal Technology for Natural Food Colorants”, December 7, 2009-February 4, 2010, (2 months) “National Agricultural Innovation Project” on “Value Chain on Food Grade Nutraceuticals for Use as Natural Anti-Oxidants and Food Colorants” (Component-2, PCS-50-56) at the Institute for Sustainable Energy and the Environment, Ohio University, Athens, Ohio (USA) under the leadership of Prof. David Bayless, Director, Ohio Coal Research Centre and Robe Leadership Institute at Ohio University, Athens
- Invited to attend Review Meeting of Indo Denmark Collaboration Project on “ High rate algal biomass production for food, feed, biochemicals and biofuels” as Coordinating Centre PI at Technical University of Denmark (DTU), Lyngby, Denmark. 13.6.2011- 19. 6.2011, Seven days and 26.8.2014, one day, Funded by Department of Biotechnology, Govt. of India

LATA

- Three month International deputation to the Department of Biology, University of Waterloo, Ontario, Canada for three months (May 27th - August 25th 2003) to study the “Molecular mechanism of plant growth promotion by PGPR

SUNIL PABBI

- Provided Financial grant to attend and present paper at International Congress of Microbiology and Applied Bacteriology held at Manchester, England. UNITED KINGDOM International Union of Microbiological Societies (7 days)
- Provided Financial grant to attend and present paper at 8th International Congress of Bacteriology and Applied Microbiology Division, ‘IUMS CONGRESS’ 96, held at Jerusalem, Israel. ISRAEL August 18-23, 1996 (7 days) International Union of Microbiological Societies
- Selected and provided scholarship to attend course on ‘Biotechnology Applied to Agriculture and Bioindustry’ at Faculte Universitaire des Sciences Agronomiques at Gembloux, BELGIUM, April 15 to July 15, 1999 (3 months) Standing Committee for University Cooperation towards Development (CUD) of the kingdom of Belgium
- On deputation to gain expertise on ‘Molecular Techniques for Identification and Improvement of BGA/ *Azolla* Biofertilizer Strains’ at Department of Biology, Texas A & M University, College Station, TEXAS, USA October 28 to December 27, 2003 (2 months) NATP, ICAR
- Invited to attend 1st Tropical and Subtropical Cyanoprokaryota Workshop held at **University of Las Palmas de GC, Gran Canaria, Spain** and present a paper (**ORAL**) on “Conservation and Analysis of Cyanobacterial Biodiversity” from 11-15 July, 2005, (5 days) University of Las Palmas de GC, Gran Canaria, Spain
- Invited to attend Review Meeting of Indo Denmark Collaboration Project on “ High rate algal biomass production for food, feed, biochemicals and biofuels” as Coordinating Centre PI at Technical University of Denmark (DTU), Lyngby, Denmark. 13.6.2011- 19. 6.2011, Seven days Department of Biotechnology, Govt. of India



- Invited to attend Review Meeting of Indo Denmark Collaboration Project on “ High rate algal biomass production for food, feed, biochemicals and biofuels” as Coordinating Centre PI at Technical University of Denmark (DTU), Lyngby, Denmark. 04.11.2013 TO 10.11.2013 Seven days, Department of Biotechnology, Govt. of India

A K SAXENA

- FAO fellowship for training on ‘Establishment of phytotron facility at IARI’ from Jan-July, 1997 for 6 months in Wageningen Agricultural University, Wageningen, The Netherlands funded by UNDP
- ICAR AHRD-FAO fellowship for attending 3rd International course on Biotechnology in Agriculture: Plants and Microorganisms’ from Dec. 2000- Feb, 2001 for 45 days in the Hebrew University of Jerusalem, Rehovot, Israel funded by ICAR AHRD-FAO fellowship
- ICAR-NATP fellowship to work on Rhizobium competitiveness from Nov1- Dec 15, 2004 for 45 days in Department of Biology, Faculty of Science University of Calgary, Calgary, Canada funded by ICAR-NATP fellowship

ARCHNA SUMAN

- **Member of ICAR delegation of Business Incubators of India** for EMRC Agribusiness forum - 2011 South Africa Johannesburg October 16- 20, 2011 Furntech incubator at Johannesburg – For South Africa Johannesburg October 18, 2011, Timbali Incubator at Timbali- For Gerbera Flower October 20 **NAIP (World Bank)**
- ISSCT Agronomy Workshop, Miami, Florida, Dec 2-6, 2000.
- 24th ISSCT Congress, Brisbane, Australia September 16-21, 2001.
- Technology commercialization detailing for delegation from West Africa Agricultural Productivity Program (WAAPP), Agricultural Council of Nigeria.

GEETA

- Fulbright Indo-American Environment leadership programme (IAELP) Fellowship offered by United States Educational Foundation in India. (2007-2008). CORNELL UNIVERSITY, Department of crop and soil sciences (2007)

B. RAMAKRISHNAN

- Centre for Environmental Risk Assessment and Remediation (CERAR) University of South Australia, Adelaide, Australia

RADHA PRASANNA

- Visiting Scientist in Dr. Mary Ann Bruns’s Lab, Penn State University, State College, Pennsylvania, USA (September 14 – December 14, 2010), funded by ICAR-NAIP
- “Molecular Marker Technologies and Genetic Transformation in Cyanobacteria” at Prof. Susan Golden’s Lab, Texas A & M University, College Station, Texas USA (May 25- July 24, 2000), funded by ICAR-NATP (HRD Program)
- *Keynote Lecture on “Cyanobacteria as novel plant growth promoting and biocontrol options - metabolites, genes and “cross talk” with plants”* at the 2nd Asian PGPR Conference at Beijing [21st-24th August 2011].
- Invited oral presentation at the 2nd *International Conference on Algae, Biomass and Biofuels, at San Diego, California, USA on “ Metabolic engineering of Chlorella strains for improving lipid quality and productivity for use as sources of biodiesel and essential fatty acids”* [10th-13th June 2012].



LIVLEEN SHUKLA

- Training under NAIP, ICAR: Bioremediation at Centre for Environmental Risk Assessment and Remediation (CERAR), UNISA, SOUTH Australia, Adelaide; July 01 - September 28, 2010 under the supervision of Professor Nanthi Bolan

ANJU ARORA

- Advanced research training in the area of “Fermentation technology and Biofuels” at department of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, Arkansas, USA from 7th Nov, 2010 to 1st Feb 2011 under NAIP, HRD program.

RAJEEV KAUSHIK

- Visited Department of Bacterial Genetics, Institute for Biology, Humboldt University, Berlin, Germany for three months training on “Gene mining from Bacillus” from 16th November 2009 to 13th February, 2010

K. SWARNALAKSHMI

- Training on “ Microbial molecular taxonomy”, at Austrian Institute of Technology, Vienna during Sep 1 –Nov. 30, 2013 under NAIP, HRD programme

SURENDER SINGH

- Post Doctoral Researcher for six months at University of South Australia (UniSA), Adelaide, 6th June 2011- 3rd December, 2011 under Dr. Ravi Naidu

26. Faculty serving in

- a) National committees b) International committees c) Editorial Boards d) any other (please specify)

K. Annapurna

- Editor: Indian Journal of Microbiology (2001-2006)
- Editor in Chief: Indian Society of Agricultural Sciences (2006-2012)
- Faculty Representative, Academic Council, PG School, IARI, New Delhi (2010-2012)
- Member-UGC SAP Committee, Kaktiya University (2009-till date)
- Member-UGC SAP Committee, Pondicherry University (2009-till date)
- Fellow; Society for Applied Biotechnology (2012)
- Member, Scientific Advisory Committee (SAC) of FARMER (2012-till date)
- Nomination as member for Review Committee on Genetic Manipulation (RCGM)
- Advisory member; National workshop on Polyphasic Approach to Bacterial identification (2012)
- Advisory Member; Expert Committee on Soil, Sediment & Microbial Diversity, National Biodiversity Authority, GOI, Chennai, India.(2007)
- Member; Advisory Council, Ayurveda Vishwa Parishad (AVP), India.(2007)
- Advisory Member; DBT Advisory Board, Annamali University, Annamalai Nagar, Chidambaram, India (2007)
- Nominated as Editorial Member; Open Journal of Microbiology, Europe (2008)
- Member; Varietal Release Committee (AICRP on Soybean), India (2000- till date)
- Member; AICRP on Soybean monitoring team, India (2004-2005)
- Member; Advisory Board, Door Darshan, Govt. Of India, India (2005-2010)



- Member; Association of Microbiologists of India (1998)
- Member; Society for Biochemistry and Biotechnology, India (2002)
- Asian PGPR Society – International Advisory Board Member (2012)

Dolly Wattal Dhar

- **Member of the following Professional Societies**
 - Association of Microbiologists of India
 - Phycological Society of India
 - Biotechnological Society of India
 - Indian Science Congress
 - Annals of Agricultural Research
 - Society for Plant Research
 - Life Membership Agricultural Research Service Scientist Forum (Regd.) ARSS Forum, 24-26, March 2006, No. 94, 22/3/2006
 - Reviewer of journals under Springer and others
- **Editorial Board:Vegetos** : An International Journal of Plant Research from Society of Plant Research
- **Consulting Editor: Journal of Environmental Biology**, by Triveni Enterprises, Lucknow, India
- Member, Specialized Products Sectional Committee (FAD 24) of Bureau of Indian Standards, Govt. of India since Nov. 2007 and continuing till date.
- **Organizing Secretary** : International Conference on Biotechnology: A rendezvous with basic sciences for global prosperity, December 26-2012, (BTBS, 2012), Organized by Society for Plant Research at NASC, ICAR
- **Member**: National Scientific Committee for **International Conference on Algal Biorefinery**: A potential source of food, feed, biochemicals, biofuels and biofertilizers, 10-12th January, 2013, Department of Biotechnology,
- **Member: Academic Council of IARI as Professor, Division of Microbiology**, New Delhi
- **Member:Standing Committee on Faculty and Discipline**, Post Graduate School, IARI, New Delhi
- **Member: Equipment Purchase Committee**, IARI, New Delhi
- **Member: Management Committee for the Staff Welfare Fund** (IARI, New Delhi)
- **Member**: Member **Task Force** for cleanliness of the campus
- **Chairperson**: Standing committee of student's problems, discipline, welfare board and residences

Lata

- **Member**, Editorial Advisory board, Journal of Advanced Mass Spectrometry
- **AMI-Prof.J.V.Bhat Award** for the best paper published in Indian Journal of Microbiology in 2013
- **Member, International electronic working group** on discussion paper on the review of the Code of Practice for Prevention and Reduction of Mycotoxin Contamination in Cereals, 2013-14
- **Best poster award during** 54th Annual conference of Association of Microbiologist of India for paper entitled "Augmentation of paddy straw with efficient microorganism consortium for rapid composting" authored by Sharma A., Pranaw K., Shah R., Arora A., and Lata at MDU, Rohtak.



- **Nominated as advisory member of NFBSFARA project “Development of Gossypol-free Lysine-rich Cottonseed Cake by Solid State Fermentation”.**
- Nominated as External Expert in Departmental Research Committee (DRC) of Department of Microbiology, MDU, Rohtak.
- Served as member of the scientific panel on “**Contaminants in the food chain**” of **Food Safety Standards Authority of India** under the Food safety Standards Act, 2006.
- Member, Project Review Committee of DST, DRDO and DNES.
- **Member, Standing Committee on Scholarships, Financial assistance and Academic Progress for the year 2009**
- **Executive council member** of Association of Microbiologists of India (2010-2013)
- **Editor**, Indian Society of Soil Science (2011-till date)
- Incharge, Biofertilizer Production Unit, Division of Microbiology, IARI, New Delhi.
- Associate Editor of the Indian Journal of Microbiology published by Association of Microbiologists of India (2006-2011)
- Secretary cum treasurer, Association of Microbiologists of India, Delhi Chapter
- Member, Organising committee of DST sponsored National workshop on “Emerging Horizons of Biofuel Research and Applications” held at RBS College, Agra from 25-27th July, 2009.
- Served as **Convener** in Technical session ‘Agricultural Microbiology’ during International Symposium on “Microbial Biotechnology: Diversity, Genomics and Metagenomics,” 49th Annual conference of Association of Microbiology India at University of Delhi from 18-20th Mar 2008.
- Member, Organising committee of International Symposium on “Microbial Biotechnology: Diversity, Genomics and Metagenomics,” 49th Annual conference of Association of Microbiology India at University of Delhi from 18-20th Mar 2008.
- Received **Best Poster award during 59th Annual Conference of Indian Phytopathological Society** for paper titled “Microbial consortium for Bio-conversion of diversified agro residues”, authored by Middha, S., Dadhich, S.K., Kaushik, B.D., **Lata**. at RD University, Jabalpur on January 16th-18th, 2007.
- Grover, M., Matta, N.K., **Lata**, Tyagi, S.P. and Saxena, A.K. (2007). Commendation certificate for **Prof. M.J. Narsimhan Academic Merit Award-2006** for presentation of Paper titled “Exploitation of Plant Growth Promoting Rhizobacteria for Agricultural benefits” during 59th Annual Conference of Indian Phytopathological Society, held at RD University, Jabalpur on January 16th, 2007.
- **Editor** of the Indian Journal of Microbiology published by Association of Microbiologists of India (1999-2005)
- Received **Best Teacher Award** of I.A.R.I., New Delhi for Excellence in teaching in Discipline of Microbiology for the year 2004.
- Received a letter of appreciation from Dean and Joint Director (Edn) for excellent teaching in the discipline of Microbiology in the year 2000.
- Nominated as member of Professional Women Advisory Board 2000 by American Biographical Institute Inc., North Carolina, and USA
- Member of the scientific panel on “Contaminants in the food chain” of Food Safety Standards Authority of India under the Food safety Standards Act, 2006.
- Member, International electronic working group on discussion paper on the review of the Code of Practice for Prevention and Reduction of Mycotoxin Contamination in Cereals, 2013-14



- **Membership of professional societies**

Life member of Association of Microbiologists of India.

Life member of International Federation of Women in Agriculture.

Life member of Indian Society of Agronomy.

Life member of Indian Society of Agricultural Science.

Life member of Biotechnology Society of India.

Life member of Indian Society Of Soil Science

Member of National Geographic Society, USA

Member of Indian Society of Mycology and Plant Pathology

Sunil Pabbi

- Member (Central Executive Council) 2014-2016, Association of Microbiologists of India.
- Member, Editorial Board, VEGETOS
- Member, Specialized Products Sectional Committee (FAD 24) of Bureau of Indian Standards, Govt. of India since Nov. 2007 and continuing till date.

Anil Kumar Saxena

- **Member** Soil Quality and Fertilizers Sectional Committee of BIS (2009 till date).
- Editor: Indian Journal of Microbiology (2001-2004)
- Chief Editor: Pusa AgriScience

Archana Suman

- African-Network on Incubators, International
- EMRC, South Africa, International
- ICRISAT-Agribusiness Incubator, International
- Indian Institute of Management, Lucknow, National
- Indian Chambers of Commerce (ICC), Kolkata, National
- The Federation of Andhra Pradesh Chambers of Commerce and Industry (FAPCII), National
- The Associated Chambers of Commerce and Industry of India (Assocham), National
- Agribusiness Community of Practices (CoPI), Info Dev, International
- National Research Development Cooperation (NRDC), New Delhi, National
- Twenty ICAR institutes of North Zone – For Hand holding in their Technology commercialization and IP protection, National
- Sugar Industry- By training sugar industry personals, National
- Universities – Allahabad Agric Univ., Lucknow Univ., Bundelkhand University- Jhansi, Chatrapati Shahuji Maharaj University-Kanpur, Integral Univ.-Lucknow, JNU-New Delhi etc – Training students, National
- Molecular Biology Group, South Campus, Delhi University – For collaborative research work on sugarcane genome, National
- UP Council of Science & Technology – As subject matter specialist for their extension programmes, National, (UP State)



- CSSRI –Regional station at Lucknow – For collaborative research on long term trials and effect on soil physical and chemical properties, National
- Peer Group of Microbiology, Soil Science, Biotechnology and Sugarcane workers – Life member of professional societies and personal communications, National
- As a reviewer for national and international journals, National and International
- Women Scientist Group, Bangalore, National
- Reviewer for National/International Journals (2006-2015)
World J. Microbiol. & Biotechnology
Letters in Applied Microbiology
Current Microbiology
Soil and Tillage Research
African J Agronomy
Indian J Agric Sciences
Indian J Sugarcane Technology
- Sugar Tech, Consulting Editor, 2010, for Sugar Tech Journal (Springer Verlag)
- Advisory Board Member Recognition, 2011, “beejIndia Producer Company Ltd.” under Company Act 1956-
DIN allotted
- Member 2009, **National Academy of Sciences of India (NASI)**-2009
- Member 2008, Executive Council, Indian Society of Soil Sc., Lucknow Chapter
- Member, 2003-06 Management Committee, IISR, Lucknow
- Key-Speaker 2009-2011; 2001-2009 Business Meetings organized by NRDC, ICC, FAPCII at Hyderabad, Calcutta, New Delhi > 20 lectures in symposium/summer schools and other meetings
- Invitee for Brain Storming Sessions/ Meetings in the areas of Microbiology & Business Development
2006, Role of Agriculturally Important Microorganisms in Sustainable Food and Agriculture Production at NBAIM, Mau
2006, Sugarcane mechanization at PDCSR Modipuram
2006, Red Rot Management in Sugarcane at IISR, Lko
2006, Environment Metagenomicsat DBT-NIIT meeting, New Delhi
2009-2011 Business Development meetings by NAIP, World bank, NRDC
June 2 and July 14, 2010, Central Technology Management Committee,
Oct 29-30, 2010, ABI-ICRISAT meet for business incubation
- Dec 1-2, 2010; National Conference on Food Inflation, Security, Price outlook
- National Conference on Food Inflation, Security, Price outlook

Geeta Singh

- Reviewer for Current Microbiology, Physiology and Molecular Biology of Plants

Radha Prasanna

- Member, Core Scientific Support Team and Think Tank, IARI and key member of School of Natural Research Management (2013-14)



- Editor, Annual Report of the Division of Microbiology, (ICAR-DARE and IARI)
- Executive Editor, Pusa Agri Science
- Member, Review Editorial Board of Frontiers in Environmental Toxicology (a section of Frontiers in Environmental Science)
- Life Member, Indian Science Congress Association (ISCA), Association of Microbiologists of India (AMI), Asian PGPR Society and Indian Society of Agronomy
- Member, American Society of Microbiology (ASM)
- Serving as a Reviewer for several reputed international journals, including: Algal Research, Agriculture, Ecosystems and Environment, Applied and Environmental Microbiology, Applied Biochemistry and Microbiology, Applied Microbiology and Biotechnology, Biology and Fertility of Soils, Bioresource Technology, Current Science, European Journal of Agronomy, European Journal of Plant Pathology, Journal of Basic Microbiology, Journal of Proteomics, Letters in Applied Microbiology, Microbiological Research, Paddy and Water Environment, Plant Methods, Soil and Tillage Research.
- Several research publications (as first-author author or as co-author) placed under Elsevier Science Direct Top 25 articles, identified as most accessed/downloaded articles of the journal and cited in Rice Abstracts.

Ramakrishnan

- Member, Fulbright-Nehru Fellowship (Indo-US Fellowship) Selection Committee (2013, 2014)
- Editorial Board Member (2012-), Journal of Bioremediation & Biodegradation
- Expert member under the DBT online ePromIS System
- Award of “International Journal of Molecular Sciences” Best Paper-2013 (Third prize for article; doi:10.3390/ijms10030889)
- Editorial Board Member (2012-), Journal of Bioremediation & Biodegradation

K.Swarnalakshmi

- Editor in Annals of Agricultural Research since 2014:
- Consulting Editor of “Biotech today

Surender Singh

- Editor of Electronic Journal of Biotechnology published by Elsevier

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs: In India only

Title	Name of the faculty	Institution	Year/ Duration
Training on 'Methods for inoculant quality assurance and <i>Rhizobium</i> characterization'	K. Annapurna	Centre for Biotechnology, SPIC Science Foundation, Madras	December 12 - 15, 1994/ 4 days
ICAR- Repatriation of <i>Rhizobium</i> Germplasm Collection	K. Annapurna	ICRISAT, Patancheru, Hyderabad, India from funded by ICRISAT, Hyderabad	Oct 1990 – Jan 1991 for 4 months
Training on 'Gene isolation, cloning and plant transformation'	K. Annapurna	Division of Biochemistry, IARI, New Delhi-110012	May 10-30, 1994/ 21 days
Training on 'Techniques in plant genetic engineering and molecular breeding'	K. Annapurna	NRCPB, New Delhi-110012	1997/ 21 days



Advanced Plant Molecular Biology Techniques: -	K. Annapurna	Division of Biochemistry, IARI, New Delhi- 12	2003/ 21 days
Training program on Science and Technology for Rural Societies. Sponsored by DST, GOI.	K. Annapurna	IIPA, New Delhi	2013/ 3 days
Site Directed Mutagenesis, Cloning and Isolation of Fusion Proteins by Affinity Chromatography	Dolly Wattal Dhar	Division of Biochemistry, Indian Agricultural Research Institute, New Delhi-110012	30.11.1989-13.12.1989 (14 Days)
E.mail under different Environments/ Platforms	Dolly Wattal Dhar	Computer Centre, Library Service (BIC), IARI, New Delhi	18.5.1999-20.5.1999 (3 Days)
XXVI course on the Use of computer in Agricultural Research,	Dolly Wattal Dhar	Indian Agricultural Statistics Research Institute, New Delhi-110012	16.3.1995- 30.3.1995, (15 Days)
Training Programme on “Knowledge Management and Knowledge Sharing in Organization for Scientists and Technologists”	Dolly Wattal Dhar	Sponsored by Department of Science and Technology, Govt. of India, Conducted by Indian Institute of Public Administration	September 9 th till 13 th 2013 (5 days)
Attended brain storming session on “Agricultural Sustainability through Microbial Biotechnology: Novel and Innovative concept”	Lata	NASC complex organized by NBAIM Mau.	11 th Nov 2008
Brain storming session on “Alternative Fuels- Looking Ahead”	Lata	NAAS complex organized by Barwale Foundation	March 16, 2007.
Attended Intellectual Property Awareness Programme	Lata	IARI organized by Business Development Cell, IARI, New Delhi	August 29, 2006
Training course on Recent Techniques in Plant Genetic Engineering and Molecular Breeding	Lata	NRC on Plant Biotechnology, I.A.R.I., New Delhi	October, 18 to November 7, 2004
Training course on Advanced Techniques in Biochemistry and Molecular Biology	Lata	ICAR center for advanced studies in Biochemistry, Division of Biochemistry, IARI, New Delhi	3 – 17 th October, 2000.
Training programme in Computer Basics with Application in Information Technology	Lata	Computer Centre of BIC, IARI, New Delhi.	August 19 to September 8, 1999
Training course in Advanced Plant Molecular Biology	Lata	Division of Biochemistry and Biotechnology Centre, IARI, New Delhi	6-21 st November, 1986.
Summer Institute in ‘Microbial Enterotoxins and their impact on animal and human health	Lata	College of veterinary Sciences, GB Pant University, Pantnagar	June 7-30, 1982
Training on ‘Methods for inoculant quality assurance and <i>Rhizobium</i> characterization’	Anil Kumar Saxena	Centre for Biotechnology, SPIC Science Foundation, Madras	December 12-15, 1994/ 4 days
Training on ‘Gene isolation, cloning and plant transformation’	Anil Kumar Saxena	Division of Biochemistry, IARI, New Delhi-110012	May 10-30, 1994 / 21 days
Training on ‘Techniques in plant genetic engineering and molecular breeding’	Anil Kumar Saxena	NRCPB, New Delhi-110012	(January 11-31, 2002) / 21 days
Management Development Program	Anil Kumar Saxena	NAARM, Hyderabad	Dec 2-7, 2010 / 6 days
Research project Development Workshop	Anil Kumar Saxena	NAARM, Hyderabad	Feb. 20-23, 2012/3 days
Research project Development Workshop	Anil Kumar Saxena	NAARM, Hyderabad	March 20-22, 2014/3 days



Training Workshop on 'Computer Networking and Information Processing in Agriculture'	Sunil Pabbi	Centre of Advanced Studies in Agricultural statistics and Computer Application, Indian Agricultural Statistics Research Institute, New Delhi	1996, 15 days
Training course on 'Plant Genetic Engineering'	Sunil Pabbi	National Research Centre on Plant Biotechnology, IARI, New Delhi	1998, 22 days
Short course on 'Orientation for Plant Genetic Resources (PGR) Policy and Emerging Intellectual Property Rights (IPR) Issues'	Sunil Pabbi	National Bureau of Plant Genetic Resources, New Delhi	1999, 10 days
Training programme on 'Multimedia as an Educational Tool'	Sunil Pabbi	Department of Computer Science and Engineering, Maharana Pratap University of Agriculture & Technology, Udaipur (Raj.)	2003, 11 days
Training course on 'Emerging Trends in Agriinformatics'	Sunil Pabbi	Unit of Simulation and Informatics, IARI, New Delhi	21 days, 2007
Winter school on "Immunological and Molecular Marker Techniques for Ecological Studies of Soil Microorganisms" sponsored by the Indian Council of Agricultural Research	Geeta Singh	Division of Microbiology, Indian Agricultural Research Institute, New Delhi	20 th December 1999 to 9 th of January 2000
"Trouble Shooting in Computer Software & Hardware"	Geeta Singh	Bio-Informatics Centre	29-10-2001 to 30-10-2001
Biochemistry and Molecular Biology organized by the ICAR Centre of Advanced Studies of Biochemistry	Geeta Singh	Division of Biochemistry, Indian Agricultural Research Institute, New Delhi	November 1-21, 2003
DBT – CAMS. Training workshop – Molecular taxonomy of the symbiotic fungi.	Geeta Singh	SLS JNU, New Delhi, India	Dec 1-24, 2003
Advances in Designing and Analysis of Agricultural Experiments under Centre of Advanced Studies	Geeta Singh	Indian Agricultural Statistics Research Institute	3-23 February, 2005
Orientation Program on "Radioisotopes Use and Safety"	Geeta Singh	Indian Agricultural Research Institute, New Delhi	7 th August 2006
Participated in the Post Graduate School Golden Jubilee and Nuclear Research Laboratory Foundation Day commemoration Seminar on Nuclear Technology for Ecological Sustenance and Food Security Research and Human Resource Development"	Geeta Singh	NRL Auditorium, IARI	December 2008
Conventional, chromatographic and Spectral analysis of oils and fats	Radha Prasanna	CSIR-Indian Institute of Chemical Technology, Hyderabad	March 14-16, 2012
Metagenomics	Radha Prasanna	School of Biological Sciences, Madurai Kamaraj University, Madurai	March 2-16, 2009
Biosafety Issues and Web Resources in GMOs	Radha Prasanna	NRCPB, IARI, New Delhi	June 7-9, 2007
Advances in Design and Analysis of Agricultural Experiments	Radha Prasanna	Centre for Advanced Studies, IASRI, New Delhi	Feb 19 – March 8, 2005
Gene Cloning and Sequencing	Radha Prasanna	Centre for Advanced Studies, Division of Biochemistry, IARI, New Delhi	March 19 – April 8, 2004



Statistical Methods in Computational Analysis	Radha Prasanna	Bioinformatics Centre, IARI, New Delhi	Dec 1999
Solid Waste Processing and Disposal	Radha Prasanna	Indian Institute of Technology (IIT), New Delhi	Feb 3-4, 1997
Mushroom Production Technology	Livleen Shukla	Institute of Agricultural Technology, Training and Education, CCS Haryana Agri. University, Hisar	January 27-January 29, 1994
Training in Use of Computer in Agricultural Research	Livleen Shukla	IASRI (ICAR)	September 1-September 15, 1995.
National workshop cum Training on Application of phytotronics in Agricultural Research	Livleen Shukla	UNDP/FAO/ICAR/IARI	November 16-21, 1998
Summer school on Graphic and Multimedia Production	Livleen Shukla	ICAR	June 26-July 16, 2002
Organic Farming course on Soil as a living system	Livleen Shukla	Bija Vidyapeeth, Uttaranchal, India	February 7 – February 11, 2005
Training on Biochemical and Molecular Biology Advanced Techniques	Livleen Shukla	ICAR	November 18-December 08, 2008
Brain storming session on “NEW GENERATION BIOFUELS	Livleen Shukla	NAIP	28 th August, 2009
Attended training on “Molecular Techniques for Gene Characterization and Genome Analysis”	Rajeev Kaushik	National Bureau of Animal Genetic Resources, Karnal, Haryana	17 th to 26 th November 2005.
Attended training on “Microbial Diversity Analysis of Agriculturally Important Microorganisms”	Rajeev Kaushik	National Bureau of Agriculturally Important Microorganisms, Mau, UP	13 rd to 25 th January, 2006
Attended training on “Project Proposal Development”	Rajeev Kaushik	NAARM, Hyderabad	20-23 rd February 2012
Received advanced training on ‘Gene isolation and characterisation’	Anju Arora	CAS, Division of Biochemistry, IARI, N. Delhi.	2003
Advanced research training in the area of “Fermentation technology and Biofuels”	Anju Arora	Department of Biological and Agricultural Engineering, University of Arkansas, Fayetteville, Arkansas, USA under NAIP, HRD program.	7 th Nov, 2010 to 1 st Feb 2011
Participated in Theoretical and practical course on “Molecular Techniques in Bioenergy”	Anju Arora	International Centre for Genetic Engineering and Biotechnology, New Delhi	8 th October – 17 th October, 2012
Participated in the ICAR sponsored winter school “Recent advances in molecular identification and characterization of agriculturally important microorganisms”	Surender Singh	National Bureau of Agriculturally Important Microorganisms (NBAIM), Mau Nath Bhanjan, U.P.	1 st -21 st September 2009
Attended workshop on “Fundamentals of mass spectrometry-based proteomics for beginners”	Surender Singh	Institute of Bioinformatics, Whitefield, Bengaluru (Karnataka)	06 th to 08 th March, 2014/ 3 days

28. Student projects: From faculty

- percentage of students who have done in-house projects including interdepartmental projects; 100%
- percentage of students doing projects in collaboration with other universities / industry / institute: Nil



29. Awards / recognitions received at the national and international level by Faculty

K Annapurna

1. Awarded IAR Best Teacher Award for Excellence in Teaching (2006)
2. Y.P.Memorial Young Scientist Award conferred by Society of Basic and Applied Mycology (2006)
3. Asian PGPR Society – International Advisory Board Member
4. Editor, Indian Journal of Microbiology, 2000-2006
5. Editor-In-Chief; Indian Society of Agricultural Sciences (2006-2012)
6. Indian Coordinator: Indo-German Workshop, Indo-German Science Technology Centre (IGSTC) / BMBF (Germany) (2014)
7. Indian Coordinator: International Training Program for SAARC countries (2009)
8. Best poster paper presentation award National Conference on Emerging Trends in Microbiology and Biotechnology. 29-30 January, 2007.
9. Best poster paper presentation award in Agricultural Microbiology section at the 49th Annual meeting of Association of Microbiologist of India held in Delhi (2008)
10. Best poster paper presentation award in Indian Phyto-Pathological Society, India (2006)
11. In Charge : Institute Placement Cell (2011-till date)
12. Warden, Girls Hostel; PG School, IARI, New Delhi-12 (2005-2011)
13. Advisor; Lady Student : PG School, IARI, New Delhi-12 (2009-till date)
14. Member: Inter Zonal- ICAR Staff Sports-IARI (2000-2009)
15. Member: IARI Sports Committee, India, (2005-2012)
16. Chairperson, Convocation Cultural Committee, PG School, IARI (2010-till date)
17. Co-Convener: Session on Plant-Microbe Interactions, 49ththe 49th Annual meeting of Association of Microbiologist of India held in New Delhi-(2008)
18. Presenter Quinquennial Review Team (QRT) for AICRP Soybean, Institute group , 2011
19. Expert at the Brainstorming workshop for :establishment of a National Genomics Resources Repository, Dec. 27, 2007
20. Member; Varietal Release Committee (AICRP on Soybean), India (2000-till date)
21. Member; Indian Society of Soybean Research and Development, India (2004)
22. Reviewer for DBT, DST, CSIR, ICAR projects, 1998— till date
23. Expert for First and Second Expert Committee meeting on Soil, Sediment and Microbial Diversity” at NBA, Chennai, 2008-09
24. Best Poster Award: In Afro-Asian Congress on Microbes for Human & Environmental Health. MICRO-BIOTECH 29th Sept-1st Oct. Amity University (2014).
25. Woman Leadership Award: Asian PGPR Society (2014)
26. Reviewer on panels of Annals of Microbiology, Antony van Leeuwenhoek, Biocontrol, Biology and Fertility of Soils, Canadian Journal of Microbiology, Current Microbiology, J of Basic Microbiology, Plant Soil, SpringerPlus, Current Science, Physiology & Molecular Biology of Plants, Indian Journal of Biotechnology, Journal of Plant Biochemistry and Biotechnology, Indian J. Microbiology, Indian Journal of Experimental Biology.
27. Head, Division of Microbiology, Feb. 27, 2015 till date



Dolly Wattal Dhar

1. Awarded BEST TEACHER AWARD, , PG School, IARI, PUSA, New Delhi, 2008-09 for excellence in teaching in the discipline of MICROBIOLOGY
2. Appreciation Prize for Division of Microbiology in Krishi Mela for the Division of Microbiology (Feb. 2009), during my tenure as Head
3. Presented QRT report, SRC etc. for CCUBGA, IARI
4. Technical Expert for Formulation of Standards for biofertilizers; BIS, New Delhi
5. Professor K S Bilgrami Award; Society for Plant Research, 2010-2011
6. Chairperson: Woman Cell of Indian Agricultural Research Institute, New Delhi
7. Chief Guest; July 5-7, 2008 Three days training on 'Production and Use of BGA and *Azolla* Biofertilizers' for farmers from at village Aterna, Distt. Sonapat, Haryana, India under the project '*Development of Human Resource in Blue Green Algae and Azolla and their promotion in Agriculture*' (DST funding, GOI)
8. Actively involved in Krishi Mela for Thematic and Divisional Pandals, farm Woman trainings and lectures on biofertilizers, Invited to be the Guest of Honour, during the workshop on "Empowerment of Women Farmers and Urban Horticulture" on February- 27, 2014 for capacity building of farm women and their interaction with agro-industry personnel and scientists (Annual *Pusa Krishi Mela*, IARI, New Delhi, Feb. 26-28, 2014)
9. Compiled Significant Research Achievements of PG Students (2011-2012) by the Professors as Convener, received **Appreciation letter** from the Director.
10. Supervised Ms Lauren Beth Stadler, Swarthmore College, Pennsylvania, USA under Fulbright- Nehru Grant for a period of nine months (Exploring Applications of Waste Grown Algae" from 17th August, 2009 till 20th May, 2010).
11. Co-Coordinator; March 16-March 30, 2009, Fifteen days; International training for the participants of SAARC countries on "*Rhizobium* biofertilizer technology for sustainable agriculture"
12. Felicitation: For dedication and support towards Environmental Management Awareness 28-29 May, 2010 In: National Conference on "Woman, Environmental Education and Climate Change by All India Foundation for peace and Disaster Management, supported by The American Centre, New Delhi
13. Participated in review meeting under Indo-Denmark Collaborative Project : High Rate algal biomass production for food, feed, biochemicals and biofuels" at Environment technical University of Denmark, Denmark June 15, 2011 to June 18, 2011; 26 August, 2015
14. Coauthor for best poster awards for National and International conferences
15. Editorial Board: *Vegetos: An International Journal of Plant Research* from Society of Plant Research
16. Consulting Editor: *Journal of Environmental Biology*, by Triveni Enterprises, Lucknow, India
17. Organizing Secretary: International Conference on Biotechnology: A rendezvous with basic sciences for global prosperity, December 26-2012, (BTBS, 2012), Organized by Society for Plant Research at NASC, ICAR
18. Member: National Scientific Committee for International Conference on Algal Biorefinery: A potential source of food, feed, biochemicals, biofuels and biofertilizers, 10-12th January, 2013, Department of Biotechnology, IIT, Kharagpur; Chairperson: Technical Session II, Phycoremediation
19. Member: Academic Council of IARI as Professor, Division of Microbiology, New Delhi
20. Member: Standing Committee on Faculty and Discipline, Post Graduate School, IARI, New Delhi (Ref. No. PGS/1-11/St.Comm./08, dated June 20, 2008)
21. Chairperson : Standing Committee on Student's Problems, Discipline, Welfare Board and Residences
22. Member: Equipment Purchase Committee, IARI, New Delhi (Ref. No. 9-4/98-99/ST, Dated 3.12.2003)



23. Member: Management Committee for the Staff Welfare Fund (IARI, New Delhi, ref. No. SWF/2005-2006 (I)/E&P, Dated 10.10.2007)
24. Member: Member Task Force for cleanliness of the campus, 2001
25. Member of Specialized Products Sectional Committee, FAD Formulation of Indian Standards, Bureau of Indian Standards, Manak Bhavan, 9, Bahadur Shah Zafar Marg, New Delhi-110002
26. High Rate Algal Biomass Production for Food, Biochemicals and Biofuels (PI, Indo-Danish project funded by DBT, Inter- Institutional with IIT, Kharagpur), Danish partners: Department of Environmental Engineering, DTU, Technical University of Denmark, Lyngby, DK, Multidisciplinary and interaction with private partner; Spirulina production research and training centre (SPRTC), Total allocation for IARI Delhi: 100.68 Lakhs (September 2010-2014)
27. CCUBGA Recognized by National Biodiversity Authority, Chennai as Designated National Repository under Biodiversity Act, 2002. Ref. No.N.2/23/2006/Admn., NBA/3736, Dated 28.12.2007., Incharge “Germplasm”
28. Co-ordinator New Generation Biofuels” Brain storming session; National Academy of Agricultural Sciences, ICAR; 28 August, 2009
29. Professor: Division of Microbiology: 18.06.07 till 04.08.08; 08.06.09; continuing;
30. Invited for Oral Presentation: Assessing cyanobacterial biodiversity through polyphasic approaches. Presented in 4th Congress of the International Society for Applied Phycology, Scaling –up for new opportunities in applied phycology, Halifax, Canada, June 19-24, 2011
31. Guest of Honour : Workshop on “Empowerment of Women Farmers and Urban Horticulture” for capacity building of farm women and their interaction with agro-industry personnel and scientists (Annual *Pusa Krishi Mela*, IARI, New Delhi, Feb. 26-28, 2014; February, 27, 2014

Lata

1. Member, Editorial Advisory board, Journal of Advanced Mass Spectrometry
2. AMI-Prof. J.V. Bhat Award for the best paper published in Indian Journal of Microbiology in 2013
3. Member, International electronic working group on discussion paper on the review of the Code of Practice for Prevention and Reduction of Mycotoxin Contamination in Cereals, 2013-14
4. Best poster award during 54th Annual conference of Association of Microbiologist of India for paper entitled “Augmentation of paddy straw with efficient microorganism consortium for rapid composting” authored by Sharma A., Pranaw K., Shah R., Arora A., and Lata at MDU, Rohtak.
5. Nominated as advisory member of NFBSFARA project “Development of Gossypol-free Lysine-rich Cottonseed Cake by Solid State Fermentation”.
6. Nominated as External Expert in Departmental Research Committee (DRC) of Department of Microbiology, MDU, Rohtak.
7. Served as member of the scientific panel on “Contaminants in the food chain” of Food Safety Standards Authority of India under the Food safety Standards Act, 2006.
8. Member, Project Review Committee of DST, DRDO and DNES.
9. Member, Standing Committee on Scholarships, Financial assistance and Academic Progress for the year 2009
10. Executive council member of Association of Microbiologists of India (2010-2013)
11. Editor, Indian Society of Soil Science (2011-124)
12. Incharge, Biofertilizer Production Unit, Division of Microbiology, IARI, New Delhi.



13. Associate Editor of the Indian Journal of Microbiology published by Association of Microbiologists of India (2006-2011)
14. Secretary cum treasurer, Association of Microbiologists of India, Delhi Chapter
15. Member, Organising committee of DST sponsored National workshop on “Emerging Horizons of Biofuel Research and Applications” held at RBS College, Agra from 25-27th July, 2009.
16. Served as Convener in Technical session ‘Agricultural Microbiology’ during International Symposium on “Microbial Biotechnology: Diversity, Genomics and Metagenomics,” 49th Annual conference of Association of Microbiology India at University of Delhi from 18-20th Mar 2008.
17. Member, Organising committee of International Symposium on “Microbial Biotechnology: Diversity, Genomics and Metagenomics,” 49th Annual conference of Association of Microbiology India at University of Delhi from 18-20th Mar 2008.
18. Received Best Poster award during 59th Annual Conference of Indian Phytopathological Society for paper titled “Microbial consortium for Bio-conversion of diversified agro residues”, authored by Middha, S., Dadhich, S.K., Kaushik, B.D., Lata. at RD University, Jabalpur on January 16th-18th, 2007.
19. Grover, M., Matta, N.K., Lata, Tyagi, S.P. and Saxena, A.K. (2007). Commendation certificate for Prof. M.J. Narsimhan Academic Merit Award-2006 for presentation of Paper titled “Exploitation of Plant Growth Promoting Rhizobacteria for Agricultural benefits” during 59th Annual Conference of Indian Phytopathological Society, held at RD University, Jabalpur on January 16th, 2007.
20. Editor of the Indian Journal of Microbiology published by Association of Microbiologists of India(1999-2005)
21. Received Best Teacher Award of I.A.R.I., New Delhi for Excellence in teaching in Discipline of Microbiology for the year 2004.
22. Received a letter of appreciation from Dean and Joint Director (Edn) for excellent teaching in the discipline of Microbiology in the year 2000.
23. Nominated as member of Professional Women Advisory Board 2000 by American Biographical Institute Inc., North Carolina, and USA

Sunil Pabbi

1. Best Teacher award from Post Graduate school, IARI, New Delhi; 2007-08
2. Awarded PROF Y S R K SARMA MEMORIAL AWARD-2014 by the Society for Plant Research.
3. Executive Council Member, Association of Microbiologists of India, 2013-2014

Anil Kumar Saxena

1. Best poster paper presentation award in Agricultural Microbiology section at the 39th Annual meeting of Association of Microbiologist of India held at Manglore, 1998.
2. Best Teacher Award, IARI, 2002
3. Best poster paper presentation award in Agricultural Microbiology section at the 40th Annual meeting of Association of Microbiologist of India held at Bhubaneswar, 2000
4. Editor, Indian Journal of Microbiology, 2000-2005
5. Treasurer, AMI (Delhi Chapter), 1998-2002
6. Secretary AMI (Delhi Chapter), 2002-2005
7. Member, Institute Placement Cell, 2002-2005



8. Best Research Paper award for the paper entitled “Mycorrhizae induced hardening of tissue culture raised grape (*Vitis vinifera* L.) plantlets”, Horticulture Society of India, 2004.
9. Member Secretary, IRC (NBAIM), 2007-2009
10. Member Secretary, RAC (NBAIM), 2007-09
11. Secretary, Society of Agriculturally Important Microbial Genetic Resources (SAIMGR), 2007-2009
12. Editor, Annual Report and Newsletter (NBAIM), 2006-2009
13. Convenor, Institute Training Committee (HRD Cell), NBAIM, 2006-2009
14. Convenor, Institute Technical Committee (NBAIM). 2006-2009
15. Co- Convenor, Session on Plant – Microbe Interactions at 47th AMI held at Bhopal, 2006
16. Expert to evaluate Programme on NBC defence technologies, September 2007.
17. Facilitator/ Member Secretary –Quinquennial Review Team (QRT), 2008
18. Expert at the Brainstorming workshop for establishment of a National Genomics Resources Repository, Dec. 27, 2007.
19. Reviewer for DBT, DST, ICAR projects, 2001- till date
20. Expert for First and Second Expert Committee meeting on Soil, Sediment and Microbial Diversity” at NBA, Chennai, 2008-09
21. Organising Secretary for Brainstorming session on ‘Agricultural Sustainability through Microbial Biotechnology: Novel and Innovative Concept’, Nov. 11, 2008
22. Head, Division of Microbiology, IARI, May, 2009- 26 Feb. 2015
23. Member Soil Quality and Fertilizers Sectional Committee of BIS, 2009- till date.
24. Member, Research Development Committee, CCS Univeristy, Meerut, 2009- till date.
25. Group leader for the Microbe group in NAIP project Bioprospecting of genes and allele mining for abiotic stress tolerance, 2009- 2014
26. Executive Editor, Journal Pusa AgriScience, 2009- 2013
27. Chief Editor, Journal Pusa AgriScience, 2013- till date
28. Co-organiser with Grow Diesel for the “Second Summit on Biofuel”, 2009
29. Elected as fellow of NAAS, 2011
30. Convener, Annual Review of INSPIRE fellowship, DST, 2012
31. Best Poster Award at National Symposium on Microbes in Health and Agriculture” held at School of Life Sciences, Jawaharlal Nehru University New Delhi. March 12-13, 2012
32. Best Poster Award -Swaran Jayanti Award at 83rd Annual Session and Symposium on space for human welfare of NASI held at Goa University, Goa, India, Dec 5-7, 2013
33. Convener, 51st Convocation Significant Research Achievements of Post-Graduate Students, IARI, 2013
34. Review panel of Biology and Fertility of Soils, Current microbiology, J of Basic Microbiology, Indian J. Microbiology
35. XIV Hari Krishan Shastri Memorial Award, IARI, 2013
36. Distinguished Scientist Award, PGPR Society, 2014
37. Elected as fellow of Indian Academy of Microbiological Sciences, India, 2014



Archana Suman

1. Best Agribusiness Incubator Award, at the 2nd Global Agribusiness Incubation Conference NIABI, by Dr APJ Abdul Kalam, Former President of India -2012 for year 2011
2. NASI Swaran Jayanti Award for Best Poster at the 83rd Annual Session and Symposium on “Space for Human Welfare” Dec.5-7, 2013 at Goa University, Goa, India.
3. Award for “NAIP technology commercialization at highest value” during Agri-Tech Investors Meet, July 18-19, 2013.
4. Consulting Editor: for SugarTech Journal (Springer Verlag), 2010
5. Advisory Board Member: 2011: Recognition “beejIndia Producer Company Ltd.” under Company Act 1956-DIN allotted
6. Member 2008; Executive Council, Indian Society of Soil Sc., Lucknow Chapter
7. Member: 2009; National Academy of Sciences of India, (NASI)-2009
8. Management Committee, 2003-06; IISR, Lucknow
9. Member-Secretary: Institute Technology Management Committee (ITMC)
10. Member, Important Institute Management Committees like Purchase, Contract Research Consultancy, Sports committees Grievance and Woman Cell, IISR, Lucknow
11. Member-Secretary: Standing Advisory Committee (SAC); 2010-2014

Geeta

1. National Award: “Shri Ram” award by Fertilizer Association of India (FAI) 2005.
2. Fulbright Indo-American Environment leadership programme (IAELP) Fellowship offered by United States Educational Foundation in India. (2007-2008).

B. Ramakrishnan

1. Member, Fulbright-Nehru Fellowship (Indo-US Fellowship) Selection Committee (2013, 2014)
2. Award of “International Journal of Molecular Sciences” Best Paper-2013 (Third prize for article; doi:10.3390/ijms10030889)
3. Endeavour Research Fellow, Centre for Environmental Risk Assessment and Remediation (CERAR), University of South Australia, Adelaide, Australia
4. Editorial Board Member (2012-), Journal of Bioremediation & Biodegradation

Radha Prasanna

1. ICAR Panjabrao Deshmukh Outstanding Woman Scientist Award (2012)
2. IARI Best Teacher Award (2008)
3. Associateship of the National Academy of Agricultural Sciences (NAAS), India in 2005
4. Co-Author of several Best Poster Awards at National and International Conferences

Anju Arora

1. Awarded three years fellowship by University of Edinburgh to work on Role of Integrated Constructed wetlands in improvement in quality of domestic wastewaters 2008 Supervisor Dr. Miklas Scholz . (Could not avail due to personal reasons)

**Surender Singh**

1. Awarded Endeavour Postdoctoral award, 2011 by Department of Education, Employment and Workplace Relations (DEEWR), Australia to work as Post Doctoral Researcher for six months at University of South Australia (UniSA), Adelaide
2. Surender- Course Co-Coordinator of Training on Microbe mediated crop residue management and their utilization for sustainable crop production”. Held from August 2- 13 (2009), Division of Microbiology, IARI, New Delhi, India funded by PG school, IARI, New Delhi

Doctoral / post doctoral fellows :**Students**

Saritha M.	Ph.D.	J.V. Bhat Award for Best paper published in Indian Journal of Microbiology.	Nov 2013
Saritha, M.	M.Sc.	IARI, Merit Medal	2012
Hillol chakdar	Ph.D.	IARI Merit Medal	2013
Vijaya Rani	M.Sc.	IARI Merit Medal	2015
Chetan Kumar G	Ph.D.	Best Poster Award “Modulation of astaxanthin synthesis in green alga <i>Haematococcus</i> through cultural manipulations	In “ 2 nd International Conference on Algal Biorefinery: A potential source of food, feed, biochemicals, biofuels and biofertilizers from 27 th August till 29 th August, 2014 (ICAB: 2014)
Student’s Thesis work	M.Sc.	Best poster awards in large number of Seminars and Conferences	
Chethan Kumar G; Hillol Chakdar; Pandiyan K; Borase D. Namdev; Bagul Samadhan Yuvraj Arjun Singh; Kumar M. Ramanand Bhakar; Krishnashish; Ajinath Dukare; Bandeppa G S; Kiran Kumar Reddy	ARS		2011-12; 2012-13;2013-142014-15
Dr. V. Govindasamy	Ph.D. from IARI	Awarded AMI (Association of Microbiologists of India) Young Scientist	2011-2012
Dr. V. Govindasamy	Ph.D. from IARI	Awarded Endeavour Fellowship for Post Doctoral Studies by Govt. of Australia	2011-2012

30. Seminars/ Conferences/ Workshops organized and the source of funding (national / international) with details of outstanding participants, if any**Dolly Wattal Dhar**

- Organizing Secretary : International Conference on Biotechnology: A rendezvous with basic sciences for global prosperity, December 26-2012, (BTBS, 2012), Organized by Society for Plant Research at NASC, ICAR;

Sunil Pabbi

- Organising Secretary, Interactive Workshop on Biofertilizers organized at IARI, New Delhi from November 5-6, 2004 inaugurated by Dr. Mangala Rai, the then Secretary DARE and DG, ICAR. Attended by 90 participants.



Archna Suman

- Organizing Secretary: Awareness building workshop for National Agricultural Innovation Project (NAIP) 2008; IISR, Lucknow
- Organizing Secretary: Zonal Technology Management & Business Planning & Development (ZTM-BPD) North Zone-I Meeting–cum-Workshop–2009-10; IARI, New Delhi
- Organizing Secretary: Zonal Technology Management & Business Planning & Development (ZTM-BPD) North Zone-I Meeting–cum-Workshop–2010-11; IARI, New Delhi
- Organizing Secretary: Institute-Industry Meet; June 14, 2010; IARI, New Delhi
- Organizing Secretary: IARI Field Days for Industry Sept 21, 2010; IARI, New Delhi
- Organizing Secretary: “*Utpadak se Udhami*”- A workshop of Entrepreneurs Nov 9, 2010, IARI, New Delhi

31. Code of ethics for research followed by the departments:

Students are given research problems based on In house as well as externally funded projects. Department follows code of ethics very honestly for the conduct and completion of research by students both at Master's and Ph.D. level

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	1	3	-	-
Ph.D.	95	3	2	3.15	2.10

33. Diversity of students:

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students from other countries
M.Sc.	NA	NA	NA	NA
Ph. D.	90-100%	NA	5-10%	NA

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

Civil Services: (5 students) Poonam Singh; Sudhir Mishra; Radha Krishnan, Sarvanan; Jaikumar

NET qualified: 90- 100% students enrolled are NET qualified

35. Student progression

Student progression	Percentage against enrolled
UG to PG	NA
PG to M.Phil.	NA
PG to Ph.D.	90-100%
Ph.D. to Post-Doctoral	NA
Employed • Campus selection • Other than campus recruitment	NA Other than campus, ARS, State Govt., Pvt. Jobs, other services, International assignments
Entrepreneurs	10% approx.



36. Diversity of staff:

Percentage of faculty who are graduates, M.Sc.

Of the same university	35
From other universities within the state	10
From universities from other States	55
Universities outside the country	NA

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period :

1. Dr. Sunil Pabbi
2. Dr. Rajeev Kaushik
3. Dr. Surender Singh

38. Present details of departmental infrastructural facilities with regard to

- a) Library: Divisional library with books on Microbiology and other related areas
- b) Internet facilities for staff and students: Available
- c) Total number of class rooms: Lecture hall, Library, Computer room, Lab for PG students
- d) Class rooms with ICT facility: NA
- e) Student's laboratories: One main laboratory for students as well as Laboratories available with individual faculty to conduct practicals of PG students
- f) Research laboratories: Twelve Laboratories including PG Lab.

39. List of doctoral, post-doctoral students and Research Associates

- a) from the host institution/university (Ph.D. students)
 - b) from other institutions/universities (Ph.D. students)
- a) From the host institution/university (Ph.D. students)**
- **Dr. K. Annapurna**
 1. Kiran Kr. Reddy, Roll No.10147
 2. Ekta Narwal, Roll No.10310
 - **Dr. Dolly Wattal Dhar**
 1. Vasana Ram, Roll No.10148
 2. Himani Priya, Roll No. 10492
 - **Dr. Lata**
 1. Saritha M., Roll No. 10006
 2. Jairam Choudhary, Roll No. 10308
 - **Dr. A.K. Saxena**
 1. Sh Krishnashis Das, Roll No. 10146;
 2. Devendra Kumar, Roll No. 10307 &
 3. K Velmourougane, Roll No. 10542



- **Dr. G. Abraham**

1. Sh. Y.P. Reddy, Roll No. 10309

- **Dr. Sangeeta Paul**

1. Ajinath Dukare, Roll No. 9856 &
2. Manjunath B.S., Roll No.10493

- **Dr. Livleen Shukla**

1. Dolamani Amat, Roll No. 10149;
2. Dharmendra Kumar, Roll No. 10311 &
3. Hemant Singh Maheshwari, Roll No. 10490

- **Dr. Radha Prasanna**

1. Shobit Thapa, Roll No. 10312 &
2. Himanshu Mahawar Ravi, Roll No.10494

- **Dr. Rajeev Kaushik**

1. Vijaya Rani, Roll No. 10491

b) From other institutions/universities

- **Dr. K. Annapurna**

1. Annu Kumari, DBT Project, Registered with Amiity University, NOIDA, U.P.

- **Dr. Lata**

1. Rameshwar Tiwari, NFBS-FARA project, Registered with M.D. University, Rohtak, Haryana

- **Dr. A. K.Saxena**

1. Mahendra Vikram Singh Rajawat, ICAR, AMAAS Project, Registered with Amiity University, NOIDA, U.P.

- **Dr. Rajeev Kaushik**

1. Sonam Gaba, ICAR, AMAAS Project, Registered with Amiity University, NOIDA, U.P.

- **Ms Anju Arora**

1. Ms Shalley Sharma ICAR, AMAAS Project, Registered with Amiity University, NOIDA, U.P.

40. Number of post graduate students getting financial assistance from the university.

Fellowship available to 100% students, both M.Sc. and Ph. D.

- | | |
|--------------------|----|
| 1. IARI fellowship | 5 |
| 2. DST inspire | 4 |
| 3. Rajiv Gandhi | 2 |
| 4. CSIR | 4 |
| 5. ICAR | 11 |

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Need assessment exercise was undertaken before the revision of course curricula for the discipline of Agricultural Microbiology. Courses were revised and updated based upon the student's feedback and advancement in the subject.



Developed Post Graduate School Calender (2010-11) for the discipline of Microbiology, under Post Graduate School, IARI, New Delhi-110012. Revised and modified New Courses (Unit wise) based upon Education Division of ICAR's Revised PG Course Curricula and Syllabus for Microbiology. The course curricula was developed based upon the suggestions given by the faculty and updated information available.

42. Does the department obtain feedback from

- a. **faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**

Yes, the suggestions are regularly incorporated. New topics are added and courses are made more practical oriented.

- b. **students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**

Feedbacks from the students are used for better development of course curricula.

- c. **alumni and employers on the programmes offered and how does the department utilize the feedback?**

Regular interactions with the alumni of Division of Microbiology and adjunct faculty helps in the development of quality course curricula for the students of Division of Microbiology. This also includes the advancement in the theory as well as practical, inclusion of new chapters and advance methods of teaching for the students.

43. List the distinguished alumni of the department (maximum 10)

1. Dr. M A Sattar, Ph. D. Microbiology, IARI, Director General, Bangladesh Institute of nuclear Agriculture, BAU Campus, Mymensingh-2202, Bangladesh
2. Prof. Sudhir U. Meshram, Ph. D. Microbiology, IARI, VC, North Maharashtra University, Jalgaon (M.S.), India
3. *Dr. Kayo Devi Yami*: PhD, Microbiology, IARI, Chairman of Public Service Commission of Nepal.
4. Dr. Sudhir Mishra, IPS Officer, Ph. D. Microbiology, IARI, Addl. Commissioner of Police-I, Kolkata in the rank of IG.
5. Dr. Ajai Vyas: Asst. Professor, School of Biological Sciences, Nanyang Technological University, Singapore
6. Dr. Bidyut Mohanty: Research Asst. Professor, Medical University of South Carolina, USA
7. Dr. Jeevan Kumar, R.P: Manager at Pepsi Co, Asia Middle East, Africa
8. Dr. Sarita Chauhan, Chief Operating Officer, Coral Springs, Florida, USA

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

- Prof. Danielle Julie Carrier, Department of Biological & Agricultural Engineering, University of Arkansas, USA delivered a lecture on Biomass Deconstruction and Sugar Recovery for Biofuel Production on 2nd February 2013.
- Dr. Nikhat Parveen, Associate Professor, Microbiology & Molecular Genetics, Rutgers – New Jersey Medical School, Newark, USA delivered a lecture on *Treponema pallidum* and *Borrelia burgdorferi* : beautiful spirochetes that cause important human diseases on 12th November 2013.
- Prof. Ravi Tiwari, Murdoch University delivered a lecture on A journey to understand the language of DNA Australia on 7th December 2013.
- Mr. Reginal Peter Walters, Managing Director, SQC Pvt. Ltd., Adelaide, Australia delivered a lecture on Algal biofuel research in Australia on 18 October 2011



- Dr. Sanjay Swarup, Associate Professor, Department of Biological Sciences and Director, NUS Environmental Research Institute delivered a lecture on Multidisciplinary approaches to understand microbial ecology from rhizobacteria to freshwater ecology and climate biology on September 9, 2011

45. List the teaching methods adopted by the faculty for different programmes.: Class room teaching, Power point presentation, Interaction and discussion

Faculty uses Blackboard/Whiteboards, Transparencies using overhead projector, Power point presentations, Research paper discussion on specific topics for class room teaching, They also use Web based lectures, Interactive discussion on special topics, Case studies appearing in Annual Reviews, Controversial issues of innovators in the history of microbiology and biotechnology, Short and surprise quiz, small presentation and assignments of students on selected topics

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Departments ensures that programme objectives are constantly met and learning outcomes are monitored through regular meetings, assessments and mid course corrections

47. Highlight the participation of students and faculty in extension activities

Students of the discipline of Microbiology are involved in the Extension activities through Krishi Mela, interactions with farmers and other Institute's Village Linked programmes, Programs on DD Doordarshan by faculty participation

48. Give details of "beyond syllabus scholarly activities" of the department

Visits to Biodiversity parks, Biotech Parks, National institutes of importance and laboratories, Mother Diary, Fermentation laboratories and companies, Visits to various institutes outside Delhi, student's trips, Polluted sites, Land fill locations etc.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

The Division of Microbiology was established in 1961 by merging the units of Soil Microbiology of the Division of Soil Science & Agricultural Chemistry and Algology of then Botany Division. The focus of the Division is on basic, applied and strategic research on microorganisms of agricultural importance. Since its inception, the Division has contributed extensively on the isolation and selection of nitrogen fixing- and plant-growth promoting microorganisms for legumes, cereals, millets and oilseed crops. The standard protocols for mass production of bacterial (*Rhizobium*, *Azotobacter*, *Azospirillum* and phosphate solubilisers), cyanobacterial (blue-green algal bio-fertilizer for rice) and arbuscular mycorrhizal inoculants for various crops have been developed. Effective microorganisms for composting and their quality control parameters for their mass production are available. Mass production of *Rhizobium* inoculants for pulse crops was initiated in the late 1960s. The Division continues to be the prime centre for production and distribution of microbial inoculants of high quality, and for formulation of standards by the Bureau of Indian Standards (BIS) for testing microbial cultures for efficiency and purity of manufactured inoculants. The department has provided basic and applied knowledge regarding the application and production of biofertilizers and maintaining their quality. The Division of Microbiology is the national lead centre for advancing knowledge and understanding of the microbial domains for agricultural application. Microbial consortia for rapid decomposition of agri-waste has been developed and promoted. Genetic characterization and molecular identification of bacteria have been done and more than 2000 16S rDNA sequences have been submitted to NCBI Microbes have been resourced for isolating genes coding for abiotic and biotic stress tolerance (salt, temperature, antibiotic production etc.) A large culture collection of archaea bacteria has been initiated.



The blue sky research of the Division includes utilization of microbial gene- and metabolite pool for plant growth promotion as well as protection, natural resource management and value addition of biomass through microbial means. More importantly, the Division contributes to the human resource development. The faculty of the Division offers teaching and research guidance for both national and international students for their master's and doctoral degrees. The Centre for Conservation and Utilization of Blue Green Algae (CCUBGA) is affiliated to this Division. The CCUBGA, the National Facility for *Rhizobium* Germplasm Collection and the *Azolla* germplasm collection within the Division are the major provider and storehouse of the national microbial wealth.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths: Competent Human Resource is the major strength of the Department having committed and responsible staff; Skilled and experienced personnel for bioinoculant Technologies, Zeal to learn, keeping abreast of the information globally, Teachers are well updated regarding the knowledge and latest information in the area of Agricultural Microbiology. Laboratories are well equipped for the students to undertake research for their Master's and Doctoral programmes. Teachers are passionate about the teaching.

Weaknesses: Less knowhow and exposure to advanced tools and techniques, Prefer to be working in comfort zones, In-depth knowledge of metabolomics, Bioinformatics, Limited funds and shortage of man power particularly as the technical and supporting staff are the weaknesses

Opportunities: Developing new technologies/products/strains, with interactive collaborations, we can develop multi-institutional programs where expertise shall be pooled

Challenges: Re-orienting existing research: promotion through extramural projects for generation of additional funds, Regular invited talks from experts from within IARI and outside for promoting collaborative and interdisciplinary projects, Promotion of international/national workshops once a year to showcase in house research and learn from others, Farmers-interaction events at selected sites/villages for every 3-6 months, Teachers expressed that the Motivation is low as no incentives are given to teachers for putting efforts for conducting practicals or adding new topics/ recent advances. Many students show poor interest and are casual.

52. Future plans of the department

General Initiatives

- Secondary agriculture
- Plant microbe interactions
- School mode programs
- Human Resource Development
 - Trainings in taxonomy/ metabolite purifications
 - Formulations
- Commercialization of existing management technologies
- Developing new technologies/products/strains
- Metamicrobiome

Infrastructure

- Cryopreservation facilities-intensify
- Contained net house construction
- Maintenance and proper utilization of glasshouse/ net houses
- Common facilities –incubator shakers, centrifuges, PCR machines, cool chambers, microscopes, deep freezers etc
- Quality testing lab for biofertilizer



xv) Molecular Biology and Biotechnology

1. Name of the Department:

Division of National Research Centre on Plant Biotechnology (Molecular Biology and Biotechnology)

2. Year of establishment:

1985

3. Is the Department part of a School/Faculty of the university? Yes

School of Basic Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Biochemistry, Microbiology, Genetics, Plant Genetic Resources, Plant Pathology & Entomology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister Divisions such as Biochemistry, Microbiology, Horticulture, Genetics, Plant Genetic Resources, Plant Pathology & Entomology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	04	04+1	01 Excess	-
Senior Scientist (Associate Professor)	10	07	03 Adjusted	-
Scientist (Assistant Professor)	19	20	01 Excess	-



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. T.R Sharma	Ph.D.	Project Director	Genomics, Bioinformatics and Plant Disease Resistance			
Dr. N.K. Singh	Ph.D.	National Professor	Biotechnology, Genomics and Molecular Markers			
Dr. S.R. Bhat,	Ph.D.	Principal Scientist	Genetics and Cytogenetics	36 Years	05	2
Dr. (Mrs.) Sarvjeet Kaur	Ph.D.	Principal Scientist	Plant Biochemistry	28 Years	06	0
Dr. (Mrs.) Anita Grover	Ph.D.	Principal Scientist	Biochemistry			
Dr. R.C. Bhattacharya,	Ph.D.	Principal Scientist	Biotechnology (Plant Sciences) Transgenics for resistance to biotic stresses			
Dr. Debasis Pattanayak	Ph.D.	Principal Scientist	Biochemistry and Biotechnology (Transgenics and RNA)			
Dr. Pranab Kumar Mandal	Ph.D.	Principal Scientist	Biochemistry (Plant Science)			
Dr. (Mrs.) Rekha Kansal	Ph.D.	Principal Scientist	Biochemistry and Plant Molecular Biology	30 Years	03	0
Dr. Jasdeep C. Padaria	Ph.D.	Principal Scientist	Biotechnology (Plant Sciences); Prospecting of genes from plant and microbes; development of transgenic plants	11.5 years as faculty 14.5 years as research guide 22 years : research experience	3	3 (registered at present with PG school, IARI) 6 (registered at present with universities other than with PG school, IARI)
Dr. Pradeep Kumar Jain	Ph.D.	Principal Scientist	Plant Biotechnology, Molecular Biology, RNAi, Genomics			
Dr. Rohini Sreevathsa	Ph.D.	Senior Scientist	Agril. Biotechnology			
Dr. Sharmistha Barthakur	Ph.D. Post Doctorate	Senior Scientist	Plant biotechnology and Molecular Biology	17 years	1	-
Dr. K.S. Gaikwad	Ph.D.	Senior Scientist	Biotechnology (Plant Science)	17 Years	3	-
Dr. Monika Dalal	Ph.D.	Senior Scientist	Biochemistry (Molecular Biology and Biotechnology)	15 Years	1	-
Dr. (Mrs.) Kanika	Ph.D.	Senior Scientist	Biotechnology (Plant Science)	15 years	3	2
Dr. Subodh Kumar Sinha	Ph.D.	Senior Scientist	Biochemistry Plant Molecular Biology	8 years	-	-
Dr. B.L. Patil	Ph.D.	Senior Scientist	Plant Virology and Molecular Biology	08 years	-	-
Dr. Prasantha K. Dash		Senior Scientist	Biotechnology, Plant hormone modulation for yield enhancement in crops			
Dr. Rhitu Rai	Ph. D.	Senior Scientist	Biotechnology, Plant-microbe/pathogen Interaction	14	-	-



Dr. Rhitu Rai		Scientist	Genetics and Plant Molecular Biology			
Dr. S.V.A.C.R. Mithra		Scientist	Genetics & Plant Breeding			
Dr. Navin Chandra Gupta		Scientist	Plant Biotechnology			
Denabandhu Behra		Scientist	Biotechnology and Genomics			
Dr. Vandana Rai		Sr. Scientist	Biotechnology (abiotic stress)			

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S. No.	Name of the Faculty	Status
1.	Prof. V.L. Chopra, Former Professor, Division of National Research Centre on Plant Biotechnology, IARI, New Delhi	Adjunct Faculty

13. Percentage of classes taken by temporary faculty – programme-wise information:

Nil

14. Programme-wise Student Teacher Ratio:

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	14	11	03
2.	Administrative	18	09	09
3.	Supportive	04	01	03

16. Research thrust areas as recognized by major funding agencies:

17 Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Total Grants Received (Lakh Rupees)
1. Dr. N.K Singh	From QTL to variety: Marker assisted breeding of abiotic stress tolerant rice varieties with major QTLs for drought submergence and salt tolerance. (DBT)	Nil	588.98
2. Dr. N.K Singh	Physical mapping and sample sequencing of wheat chromosome 2A-International Wheat Sequencing Consortium (India) (DBT)	Nil	871.92
3. Dr. N.K Singh	Genomics for augmenting fibre quality improvement in jute. (ICAR)	Nil	49.04
4. Dr. N.K Singh	Establishment of National Rice Resource Database (DBT)	Nil	92.708
5. Dr. N.K Singh	Nil	Molecular breeding selection strategies to combine and validate QTLs for improving WUE and heat tolerance in wheat (CIMMYT)	USD154560



6. Dr. N.K Singh	Allele mining for agronomically important genes in wild rice germplasm and stress tolerant landraces of rice growing in the hot spots (ICAR)	Nil	250
7. Dr. N.K Singh	Identification and functional analysis related to yield and biotic stresses (DBT)	Nil	93.1
8. Dr. N.K Singh	Bioprospecting of genes and allele mining for abiotic stress tolerance (DBT)	Nil	2356.17
9. Dr. N.K Singh	Generation, characterization and use of EMS induced mutants of upland variety Nagina 22 for functional genomics in rice	Nil	177.76
10. Dr. T.R. Sharma	<i>Puccinia triticina</i> genomics network on <i>De Nova</i> genome sequencing, fitness, variation and pathogenicity	Nil	571.47
11. Dr. T.R. Sharma	Development of rice and tomato varieties resistant to <i>Rhizoctonia solani</i> , the causal agent of rice sheath blight and tomato root and crown rot diseases (Indo-Australia) (DBT)	Nil	86.39
12. Dr. T.R. Sharma	Molecular cloning and functional characterization of rice blast resistance genes-second phase (DBT)	Nil	80.41
13. Dr. T.R. Sharma	Allele mining and expression profiling of resistance and avirulence genes in rice-blast pathosystem for development of race non-specific disease resistance (NAIP)	Nil	1300.1
14. Dr. T.R. Sharma	Bioinformatics and comparative genomics (ICAR)	Nil	167.00
15. Dr. Srinivasan	Fusarium wilt resistance and drought tolerance in chickpea (ICAR-NPTC)	Nil	180
16. Dr. S.R. Bhat	Molecular and genetic analyses of guggul for the identification of genes governing adventives embryony (NFBSFARA) (ICAR)	Nil	240.9
17. Dr. S.R. Bhat	Development of haploid-inducer lines of <i>Brassica juncea</i> through genetic engineering of centromere histone protein	Nil	64.1
18. Dr. S.R. Bhat	Unraveling molecular processes involved in adventives polyembryony towards genetic engineering for fixation of heterosis	Nil	772.1
19. Dr. S.R. Bhat	Functional genomics of Alternaria blight & drought tolerance in Brassica	Nil	232.96
20. Dr. Rekha Kansal	NPTC Project-Development of aphid resistant transgenic Brassica	Nil	110.76
21. Dr. J.C. Padaria	Design and construction of a strong promoter for constitutive overexpression of a <i>nifA</i> gene in <i>Azotobacter vinelandii</i> (DBT)	Nil	24.472
22. Dr. J.C. Padaria	National initiative for climate resilient agriculture (ICAR)	Nil	1770.05862
23. Dr. P.K. Mandal	Phenomics of moisture deficit and low temperature tolerance in rice	Nil	405.60
24. Dr. P.K. Mandal	Improving productivity of wheat through enhanced	Nil	26.60
25. Dr. D. Pattanayak	Development of transgenic rice tolerant to drought and resistant to yellow stem borer	Nil	140



26. Dr. R.C. Bhattacharya	Crop plants which remove their own major biotic constraints (Indo-Australia Grant Challenge Programme)	Nil	140.72
27. Dr. R.C. Bhattacharya	Common basis of defense induction in rice and mustard against sucking and gall insect pests	Nil	63.55
28. Dr. R.C. Bhattacharya	Establishment of Referral Laboratory for conducting special test	Nil	73.33
29. Dr. P.K. Jain	Understanding plant nematode interactions using RNAi	Nil	167
30. Dr. P.K. Jain	Understanding plant nematode interaction: Identification of plant and nematode genes involved in disease development	Nil	50
31. Dr. S. Barthakur	Molecular cloning and functional characterization of annexing multigene family from <i>Pennisetum glaucum</i>	Nil	45
32. Dr. S. Barthakur	NPTC-Wheat transgenics for Terminal heat stress	Nil	New Grant, 2015
Dr. K. Gaikwad	Modeling network of gene response to abiotic stress in rice	Nil	71.082
33. Dr. Kanika	Genomics and Phenomics of Ragi (DBT)	Nil	107.34
34. Dr. Kanika	Prospecting of RNA chaperon in microbes and development of osmotolerant rice	Nil	24.17
35. Dr. Rohini Sreevathsa	Resistance to pod borer in pigeon pea	Nil	124.17
36. Dr. Rohini Sreevathsa	Development of pod borer resistant transgenic pigeon pea and chickpea	Nil	88.93
37. Dr. Amolkumar U. Solanke	Translational research on root knot nematode tolerant RNAi transgenic based on vital parasite gene targets from validation to proof-of-concept to selection of event(s) in the field under confined conditions	Nil	10.92
38. Dr. Amolkumar U. Solanke	Genomics of cotton boll and fibre development	Nil	250.81
Dr. B. L. Patil	Virus resistant transgenic papaya, by ICAR-NPTC	Nil	
39. Dr. Rhitu Rai	DBT Cloning and characterization of effectors from xa13 compatible strains of <i>Xanthomonas oryzae</i> pv <i>oryzae</i> Sequencing of Xoo pathotypes for better management of bacterial leaf blight		34.5 lakhs 68 lakhs

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

- Project:** Marker assisted breeding of abiotic stress tolerant rice varieties with major QTLS for drought submergence and salt tolerance. (Funded by DBT Govt. of India)

Institutes: IARI, New Delhi; IASRI, New Delhi; UDSC, Delhi; CRRI, Cuttack;

Total Budget (for IARI): Rs. 588.98 lakhs

- Project:** National initiative for climate resilient agriculture (Funded by ICAR,)

Institutes: IARI, New Delhi;

Total Budget (for IARI): Rs. 1046.00 lakhs



b) International collaboration

1. **Project:** Molecular breeding selection strategies to combine and validate QTLs for improving WUE and heat tolerance in wheat (Funded by CIMMYT)

Institutes: IARI, New Delhi;

Total Budget: Rs. USD154560 lakhs

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

None under these programmes.

20. Research facility / centre with

State recognition

None

National recognition

Phenotyping facility is being developed

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable



22. Publications:

	T.R. Sharma	N.K. Singh	S.R. Bhat	S. Kaur	Anita Grover	R.C. Bhat.	D. Patt.	P.K. Mandal	Kanika	Sharmistha Barthakur	Subodh K. Sinha	P. K. JAIN	Kishor Gaikwad	Rekha Kansal
Number of papers published in peer reviewed journals (national / international)	54	160	85	17	14	10	39	8	10	15	15	15	30	30
Monographs									2	-	-	-	-	-
Chapters in Books	2	2	4		3	2	20	7	6	4	4	3	1	4
Edited Books			2						E-book:1	-	-	-	-	-
Books with ISBN with details of publishers										1				
Number listed in International Database					5	6	23							
Citation Index – range / average	4441	7500						30-1/15						
SNIP range / average														
SJR range / average														
Impact Factor– range / average								5.88-7.94/6.91						4.08-7.5
h-index	32	37						3	6	3	11			

	Jasdeep Padaria	Monika Dalal	Vandana Rai	P. K. Dash	Rhitu Rai	Amol Solanke	S.V.A.C. R. Mithra	R. Nagar	N.C. Gupta	A. Dinabandhu	Rohini Sri.	Mahesh Rao	B.L. Patil	Sanjay Singh
Number of papers published in peer reviewed journals (national / international)	27	15	20	15							47		19	21
Monographs				4										
Chapters in Books	10	6	4	4							11		9	3



Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

S. No.	Publications	NAAS Rating
1.	Basavaraj, S. H., Singh, V. K., Singh, A., Anand, D., Yadav, S., Ellur, R. K., Singh, D., Gopalakrishnan, S., Nagarajan, M., Mohapatra, T., Prabhu, K. V. and Singh, A. K. 2010. Marker-assisted improvement of bacterial blight resistance in parental lines of Pusa RH10, a superfine grain aromatic rice hybrid. <i>Mol. Breed.</i> 26:293-305.	9.25
2.	Bhati, J., Sonah, H., Jhang, T., Singh, N. K., Sharma, T. R. 2010. Comparative Analysis and EST Mining Reveals High Degree of Conservation among Five <i>Brassicaceae</i> Species. <i>Comp. Funct. Genomics.</i>	9.01
3.	Bhatia, Varnika., Uniyal, Prem L. and Bhattacharya, Ramcharan (2011) Aphid resistance in <i>Brassica</i> crops: Challenges, biotechnological progress and emerging possibilities, <i>Biotechnology Advances</i> 29: 879-888	15.60
4.	Channamallikarjuna, V., Sonah, H., Prasad, M., Rao, G.J.N., Chand, S., Upreti, H.C., Singh, N.K. and Sharma, T. R. (2010). Identification of major quantitative trait loci qSBR11-1 for sheath blight resistance in rice. <i>Mol Breeding</i> 25:155-166.	9.25
5.	Das Alok, D. Soubam , P. K. Singh, S. Thakur, N. K. Singh and T. R. Sharma (2012). A novel blast resistance gene, Pi54rh cloned from wild species of rice, <i>Oryza rhizomatis</i> confers broad spectrum resistance to <i>Magnaporthe oryzae</i> . <i>Funct Integr Genomics</i> 12:215–228	9.29
6.	Deka, S. And Barthakur, S. (2010). Overview on current status of biotechnological interventions on yellow stem borer <i>Scirpophaga incertulas</i> (Lepidoptera: Crambidae) resistance in rice. <i>Biotechnology Advances</i> , 28:70-81.	15.60
7.	Deokar, A A., Kondawar, V., Kohli, D., Aslam, M., Jain, P K., Karuppayil, S M, Varshney, R K and Srinivasan, R. (2014) The CarERF genes in chickpea (<i>Cicer arietinum</i> L.) and the identification of CarERF116 as abiotic stress responsive. <i>Functional and Integrative Genomics</i> (DOI10.1007/s10142-014-0399-7)	9.29
8.	Deokar, A. A., Kondawar, V., Jain, P.K., Karuppayil, S.M., Raju, N. L., Vadez, V., Varshney, R.K. and Srinivasan, R. (2011) Comparative analysis of expressed sequence tags (ESTs) between drought-tolerant and -susceptible genotypes of chickpea under terminal drought stress. <i>BMC Plant Biol.</i> 11:70.	10.35
9.	Deshmukh, R., Singh, A., Jain, N., Anand, S., Gacche, R., Singh, A., Gaikwad, K., Sharma, T. R., Mohapatra, T. and Singh, N. K. 2010. Identification of candidate genes for grain number in rice (<i>Oryza sativa</i> L.). <i>Funct. Integr. Genomics.</i> Aug; 10(3):339-47.	9.29
10.	Dutta, S., Kumawat, G., Singh, B. P., Gupta, D. K., Singh, S., Dogra, V., Gaikwad, K., Sharma, T. R., Raje, R. S., Bandhopadhyaya, T. K., Datta, S., Singh, M. N., Bashasab, F., Kulwal, P., Wanjari, K., Varshney, R., Cook, D. R. and Singh, N. K. 2011. Development of genic-SSR markers by deep transcriptome sequencing in pigeonpea [<i>Cajanus cajan</i> (L.) Millspaugh]. <i>BMC Plant Biol.</i> 11:17.	10.35
11.	Gorthy S, Mayandi K., Faldu D. DalalM. (2013) Molecular characterization of allelic variation in spontaneous brown midrib mutants of sorghum (<i>Sorghum bicolor</i> L Moench). <i>Molecular Breeding</i> , 31:795–803	9.25
12.	Gupta S.K, A.K. Rai, S.S. Kanwar, D. Chand, N.K. Singh, T.R Sharma (2012). The single blast resistance gene <i>Pi54</i> activates complex defense mechanism in rice. <i>J Exp. Bot.</i> 63 (2)757-772.	11.24
13.	Gupta S.K, A.K. Rai, S.S. Kanwar, T.R Sharma (2012). Comparative Analysis of Zinc Finger Proteins Involved in Plant Disease Resistance. <i>PLoS One</i> 7(8):e42578	9.73
14.	Hiremath, P J., , Srinivasan, R.,..... and Varshney, R.K. (2011) Large-scale transcriptome analysis in chickpea (<i>Cicerarietinum</i> L.), an orphan legume crop of the semi-arid tropics of Asia and Africa. <i>Plant Biotechnology Journal</i> , 9: 922–93.	12.28
15.	Jain Ajay, Sinilal Bhaskran, Dhandapani Gurusamy, Meagher, Richard B., and Sahi, Shivendra V. (2013) Effects of Defency and Excess of Zinc on Macronutrients. <i>Environmental Science and Technology</i> , 47:5327-53335.	11.26
16.	Kadam, S., Singh, K., Shukla, S., Goel, S., Vikram, P., Pawar, V., Gaikwad, K., Khanna-Chopra. R. and Singh, N. (2012). Genomic associations for drought tolerance on the short arm of wheat chromosome 4B. <i>Funct Integr Genomics.</i> 2012 Apr 5	9.29
17.	Kohli D., Joshi G., Deokar A A., Bhardwaj A R., Agarwal M., Agarwal S K., Srinivasan R., Jain P K (2014) Identification and characterization of wilt and salt stress-responsive microRNAs from chickpea by high-throughput sequencing. <i>PLOS ONE</i>	9.73
18.	Koramutla MK, Kaur A, Negi M, Venkatachalam P & Bhattacharya RC. 2014. Elicitation of jasmonate mediated host defense in <i>Brassica juncea</i> (L.) attenuates population growth of mustard aphid <i>Lipaphis erysimi</i> (Kalt.). <i>Planta</i> (DOI 10.1007/s00425-014-2073-7).	9.35



19.	Kudapa H. A.K. Bharti, S. Datta., T.R. Sharma.,N.K. Singh., R. K. Varshney (2012). A Comprehensive Transcriptome Assembly of Pigeonpea (<i>Cajanus cajan</i> L.) using Sanger and Second-Generation Sequencing Platforms. <i>Mol Plant</i> 5:1020-8.	11
20.	Kumar PP, Prasad NG, Kamaraju D, Banakar P, Rohini Sreevathsa A & Rao U. 2013. Utility of host delivered RNAi of two FMRF amide like peptides, <i>flp-14</i> and <i>flp-18</i> , for the management of root knot nematode, <i>Meloidogyne incognita</i> . <i>PLOS ONE</i> 8: e80603.	9.73
21.	Kumar, M., Basha, P. O., Puri, A., Rajpurohit, D., Randhawa, G. S., Sharma, T. R. and H.S. Dhaliwal 2010. A candidate gene <i>OsAPC6</i> of anaphase-promoting complex of rice identified through T-DNA insertion. <i>Funct. Integr. Genomics</i> . 10:349–358	9.01
22.	Kumar, P., Vasupalli, N., Srinivasan, R. and Bhat, S.R. (2012) An evolutionarily conserved mitochondrial <i>orf108</i> is associated with cytoplasmic male sterility in different alloplasmic lines of <i>Brassica juncea</i> and induces male sterility in transgenic <i>Arabidopsis thaliana</i> . <i>J. Expt. Botany</i> , 63 , doi:10.1093/jxb/err459)	11.24
23.	Leelavathi, S., Bhardwaj, A., Kumar, S., Dass, A., Pathak, R., Pandey, S. S., Tripathy, B. C., Padmalatha, K. V., Dhandapani, G., Kanakachari, M., Solanke, A. U., Kumar, P. A., Cella, R. and Reddy, V. S. 2011. Genome-wide transcriptome and proteome analyses of tobacco <i>psaA</i> and <i>psbA</i> deletion mutants. <i>Plant Mol. Biol.</i> DOI 10.1007/s11103-011-9731-y.	9.52
24.	Mayer, K.F.X., Singh, N. K., Praud, S.(2014) A chromosome-based draft sequence of the hexaploid bread wheat (<i>Triticum aestivum</i>) genome . <i>Science</i> 345: (6194).	20
25.	Nadella, K.D., Marla, Soma S., and Kumar, P. A. (2012). “Metabolomics in Agriculture” <i>OMICS: A Journal of Integrative Biology</i> . April 2012, Vol. 16, No. 4: 149-159	9.75
26.	Nagarajan, V.K., Jain, Ajay., Poling, M.D., Lewis A.J., Raghothama, K.G. and Smith, A.P. (2011) <i>Arabidopsis</i> Pht1;5 mobilizes phosphate between source and sink organs and influences the interaction between phosphate homeostasis and ethylene signaling. <i>Plant Physiology</i> 156: 1149-1163.	12.56
27.	Nandeshwar, S. B., Moghe S., Chakrabarty, P. K., Deshattiwar, M. K., Kranthi, K., Kumar, P. A., Mayee, C. D. and Khadi, B. M. (2009). <i>Agrobacterium</i> transformation of <i>cryIAC</i> gene in diploid cotton <i>Gossypium arboreum</i> cv. RG 8 and regeneration of transgenic plants. <i>Plant Molecular Biology Reporter</i> 27: 549-557.	11.32
28.	Nepolean T, Hossain F, Shiriga K, Mittal S, ... Amitha Mithra SV, Mohapatra T & Gupta HS. 2013. Unraveling the genetic architecture of subtropical maize (<i>Zea mays</i> L.) lines to assess their utility in breeding programs. <i>BMC Genomics</i> 14: 877 (doi: 10.1186/1471-2164-14-877).	10.40
29.	Ngangkham, U., Parida, S. K., Dey, S. K., Raj Kumar, K. A., Singh, A. K., Singh, N. K. and Mohapatra, T. 2010. Genic markers for WA cytoplasm based male sterility and its fertility restoration in rice. <i>Mol. Breed.</i> 26:275-292	9.25
30.	Padmalatha K. V., Patil, D. P., Kumar, K., Dhandapani, D., Kanakachari, M., Phanindra, M. L. V., Kumar, K., Mohan, T. C., Prakash, A. H., Vamadevaiah, H. M., Katageri, I. S., Leelavathi, S., Kumar, P. A. and Reddy, V. S. 2012. Functional genomics of fuzzless-lintless mutant of <i>Gossypium hirsutum</i> cv. MCU5 reveal key genes and pathways involved in cotton fibre initiation and elongation. <i>BMC Genomics</i> 13:624 doi:10.1186/1471-2164-13-62.	10.40
31.	Padmalatha, K.V., Dhandapani, G., Kanakachari, M., Kumar, S., Dass, A., Patil, D.P., Rajamani, V., Kumar, K., Pathak, R., Rawat, B., Leelavathi, S., Reddy, P.S., Jain, N., Powar, K.N., Hiremath, V., Katageri, I.S., Reddy, M.K., Solanke, A.U., Reddy, V.S. and Kumar, P.A. (2012) Genome-wide transcriptomic analysis of cotton under drought stress reveal significant down-regulation of genes and pathways involved in fibre elongation and up-regulation of defense responsive genes. <i>Plant Molecular Biology</i> , 78(3):223-46.	12.56
32.	Pandit, A., Rai, V., Bal, S., Sinha, S., Kumar, V., Chauhan, M., Gautam, R. K., Singh, R., Sharma, P. C., Singh, A. K., Gaikwad, K., Sharma, T. R., Mohapatra, T. and Singh, N. K. 2010. Combining QTL mapping and transcriptome profiling of bulked RILs for identification of functional polymorphism for salt tolerance genes in rice (<i>Oryza sativa</i> L.). <i>Mol. Genet. Genomics</i> . 284(2):121-36.	9.01
33.	Parida, S. K., Pandit, A., Gaikwad, K., Sharma, T. R., Srivastava, P. S., Singh, N. K. and Mohapatra, T. 2010. Functionally relevant microsatellites in sugarcane unigenes. <i>BMC Plant Biol.</i> 10:251.	10.35
34.	Parida, S.K., Dalal, V., Singh, A.K., Singh, N.K. and Mohapatra, T. (2009). Genic non-coding microsatellites in the rice genome: characterization, marker design and use in assessing genetic and evolutionary relationship among domestic groups. <i>BMC Genomics</i> 10:40.	10.40
35.	Pattanayak D, Solanke AKU & Kumar PA. 2013. Plant RNA interference pathways: diversity in function, similarity in action. <i>Plant Mol Biol Rep</i> 31: 493-506.	11.32
36.	Pearce, G., Bhattacharya, R.C., Chen, Y., Barona, G., Yamaguchi, Y. And Ryan, C. A. (2009). Isolation and characterization of hydroxyproline-rich glycopeptides signals in black nightshade leaves <i>Plant physiology</i> 150:1422-1433.	12.56



37.	Poul, Priyanka, A Awasthi, AK. Rai, SK Gupta, R. Prasad, TR Sharma & HS Dhaliwal (2012). Reduced tillering in Basmati rice T-DNA insertional mutant <i>OsTEF1</i> associates with differential expression of stress related genes and transcription factors. <i>Funct. Integr Genomics</i> . DOI 10.1007/s10142-012-0264-5.	9.29
38.	Raju, N. L., Gnanesh, B. N., Lekha, P., Jayashree, B., Pande, S., Hiremath, P. J., Byregowda, M., Singh, N. K. and Varshney, R. K. 2010. The first set of EST resource for gene discovery and marker development in pigeonpea (<i>Cajanus cajan</i> L.). <i>BMC Plant Biol.</i> 10:45.	10.35
39.	Ramaiah, M., Jain, Ajay., Baldwin J.C., Karthikeyan, A.S. and Raghothama, K.G. (2011) Characterization of the phosphate starvation-induced glycerol-3-phosphate permease gene family in Arabidopsis. <i>Plant Physiology</i> 157: 279-291.	12.56
40.	Saha, D., Kumar, V., Bhat, S. R. and Srinivasan, R. (2011) Characterization of Upstream Sequences of the LOJ Gene Leads to Identification of a Novel Enhancer Element Conferring Lateral Organ Junction-Specific Expression in Arabidopsis thaliana. <i>Plant Mol. Biol. Rep.</i> 29, 265–277.	11.32
41.	Sangram, K.L., Lohia, B. Kumar, A. Viswanathan, C. And Basnal, K.C. (2009). Genome-wide targeted prediction of ABA responsive genes in rice based on over-represented cis-motif in co-expressed genes. <i>Plant Molecular Biology</i> . DOI 10.1007/s11103-008-9423-4.	9.52
42.	Sarkar, D., Tiwari, J.K., Sharma, S., Sharma, Poonam S., Gopal, J., Singh, B.P., Luthra, S.K., Pandey, S.K. and Pattanayak, D. (2011). Somatic hybrids between <i>Solanum tuberosum</i> L. and <i>S. pinnatisectum</i> Dun.: Molecular, phenotypic and late blight resistance characterization. <i>Plant Cell and Tissue Organ Culture</i> 107: 427-440.	9.63
43.	Sato S, Tabata, A.K. Tyagi... J.P. Khurana.....T.R. Sharma.. N.K. Singh...R. Wing... (The Tomato Genome Consortium)... (2012) The tomato genome sequence provides insights into fleshy fruit evolution. <i>Nature</i> . 485:635-641.	20.0
44.	Sharma R, Arya S, Patil SD, Sharma A, Jain PK, Navani, NK & Pathania R. 2014. Identification of novel regulatory small RNAs in <i>Acinetobacter baumannii</i> . <i>PLoS ONE</i> 9: e93833 (doi:10.1371/journal.pone.0093833).	9.73
45.	Sharma, P., Nain, V., Lakhanpal, S. and Kumar, P. A. 2010 Synergistic activity between <i>Bacillus thuringiensis</i> Cry1Ab and Cry1Ac toxins against maize stem borer (<i>Chilo partellus</i> Swinhoe). <i>Letters Applied Microb.</i> 51: 42-47.	9.69
46.	Sharma, R.K., Bhardwaj, P., Negi, R. Mohapaaatra, T. And Ahuja, P.S. (2009). Identification, characterization and utilization of unigene derived microsatellite markers in tea (<i>Camellia sinensis</i> L.) <i>BMC Plant Biology</i> . 9:53.	10.35
47.	Singh, A., Singh, Pradeep K., Singh, Deepak, K., Tyagi, Kuldeep., Singh, Ashok, K., Singh, Nagendra, K. And Sharma, Tilak, R., (2010). SNP haplotypes of the BADH1 gene and their association with aroma in rice (<i>Oryza sativa</i> L.) <i>Molecular Breeding</i> - 10.1007/s11032-010-9425-1.	9.25
48.	Singh, H., Deshmukh, R.K., Singh, A., Singh, A.K., Gaikwad, K., Sharma, T.R., Mohaptra, T. And Singh, N.K. (2010). Highly variable SSR markers suitable for rice genotyping using agarose gels. <i>Molecular Breeding</i> , 25: 359-364.	9.25
49.	Sonah, H., Deshmukh, Rupesh K., Singh, Vinay P., Gupta, Deepak K., Singh, Nagendra K. and Sharma, T.R. (2011). Genomics Resources in Horticultural crops: Status, Utility and Challenges. <i>Biotechnology Advances</i> 29: 199-211.	15.60
50.	Srivastava, D., Nain, V., Sahi, S., Verma, A., Sharma, P., Sharma, P. C. and Kumar, P. A. 2011. Modeling and molecular dynamic simulation studies of pathogen resistance (R) protein from brinjal (<i>Solanum melongena</i> L.). <i>Bioinformatics</i> 5: 326-330.	11.32
51.	Thakur S, Singh PK, Rathour R, Variar M, Prashanthi SK, Singh AK, Singh UD, Chand D, Singh NK & Sharma TR. 2013. Positive selection pressure on rice blast resistance allele <i>Piz-t</i> makes it divergent in Indian land races. <i>J Plant Interact</i> 8: 34-44.	9.29
52.	Varshney, R.K.,, Sharma, T. R.,Singh, N.K. and Cook, D. R. 2010. Pigeonpea genomics initiative (PGI): an international effort to improve crop productivity of pigeonpea (<i>Cajanus cajan</i> L.). <i>Mol. Breed.</i> 26(3):393-408.	9.25
53.	Varshney, R.K.,, Deokar, A.A., Srinivasan, R.,, and Hoisington, D. A. (2009). A comprehensive resource of drought and salinity-responsive ESTs for gene discovery and marker development in chickpea (<i>Cicer arietinum</i> L.) <i>BMC genomics</i> , 10:523-541.	10.40
54.	Vijay, D., Dadlani, M., Kumar, P.A. and Panguluri, S.K. (2009) . Molecular marker analysis of differently aged seeds of soybean and safflower. <i>Plant Molecular Biology Reporter</i> . 27:282-291	11.32
55.	Wang Z, Hobson N, Galindo L.....Dash PK, Kumar PA.....Deyholos M. (2012). The genome of flax assembled <i>de novo</i> from short shotgun sequence reads. <i>Plant J.</i> 72.461-473.	12.58



56.	R. W. Briddon, B. L. Patil, B. Bagewadi, M. S. Nawazul-Rehman and C. M. Fauquet. (2010) Distinct evolutionary histories of the DNA-A and DNA-B components of bipartite begomoviruses. <i>BMC Evolutionary Biology</i> . 10(1): 97.	9.41
57.	B.L. Patil and C. M. Fauquet. (2010) Differential interaction between cassava infecting gemini viruses and gemini virus satellites. <i>Journal of General Virology</i> . 91:1871-1882.	9.53
58.	D.R. Mbanzibwa, Y.P. Tian, A.K. Tugume, B.L. Patil, J.S. Yadav,....., C.M. Fauquet, and J.P.T. Valkonen. (2011) Evolution of cassava brown streak disease-associated viruses. <i>Journal of General Virology</i> . 92: 974-987.	9.53
59.	J.S. Yadav, E. Ogwok, H. Wagaba, B.L. Patil, B. Bagewadi, T. Alicai, E. Gaitan-Solis, N.J. Taylor, and C.M. Fauquet. (2011) RNAi mediated resistance to Cassava brown streak Uganda virus in transgenic cassava. <i>Molecular Plant Pathology</i> . 12(7):677-687.	10.49
60.	B.L. Patil, E. Ogwok, H. Wagaba, I.U. Mohammed, J.S. Yadav, B. Bagewadi, N.J. Taylor, T. Alicai, J.F. Kreuze, M.N. Gowda and C.M. Fauquet. (2011) RNAi mediated resistance to diverse isolates belonging to two virus species involved in Cassava brown streak disease. <i>Molecular Plant Pathology</i> .	10.49
61.	M. Hema, P. Sreenivasulu, B.L. Patil, P. Lava Kumar and D. V. R. Reddy. (2014) Tropical Food Legumes: Virus Diseases of Economic Importance and their Control. In: Control of Plant Virus Diseases: Seed-Propagated Crops. Eds. G. Loebenstein & N. Katis. <i>Advances in Virus Research</i> . 90(9):431-505.	9.59
62.	B.L. Patil* and C.M. Fauquet (2015) Light intensity and temperature affect systemic spread of silencing signal in transient agro-infiltration studies. <i>Molecular Plant Pathology</i> . doi: 10.1111/mpp.12205. (*Corresponding author)	10.49
63.	B.L. Patil*, J. Legg, E. Kanju and C. M. Fauquet* (2015) <i>Cassava brown streak disease: A threat to food security in Africa.</i> <i>Journal of General Virology</i> . doi:10.1099/jgv.0.000014. (*Corresponding author)	9.53
64.	B.L. Patil* and P. Lava Kumar (2015) Pigeonpea sterility mosaic virus: a legume-infecting Emaravirus from South Asia. <i>Molecular Plant Pathology</i> . doi: 10.1111/mpp.12238. (*Corresponding author)	10.49

Publication: NAAS Rating 8-9

S. No.	Publications	NAAS Rating
1.	Gupta V, Natarajan C, Kumar K, Prasanna R. 2011. Identification and characterization of endoglucanases for fungicidal activity in <i>Anabaena laxa</i> . <i>J Applied Phycology</i> , 23(1): 73-81.	(8.49)
2.	Acharjee, S., Sarmah, B., Kumar, P. A., Olsen, K., Mahon, R., Moar, M. J., Moore, A. and Higgins, T. J. V. (2010). Expression of a sequence-modified <i>cry2Aa</i> gene for resistance to <i>Helicoverpa armigera</i> in chickpea (<i>Cicer arietinum</i> L.). <i>Plant Science</i> : 178: 333-339.	8.92
3.	Arvinth, S., Arun, S., Selvakesavan, R.K., Srikanth, J., Mukunthan, J., Kumar, P.A., Premachandran M. N. and Subramonian, N. (2010). Genetic transformation and pyramiding of aprotinin-expressing sugarcane with <i>cry1Ab</i> for shoot borer (<i>Chilo infuscatellus</i>) resistance. <i>Plant Cell Reports</i> . 29: 383-395.	8.51
4.	Bhattacharya R, Koramutla MK, Negi M, Pearce G & Ryan CA. 2013. Hydroxyproline-rich glycopeptide signals in potato elicit signalling associated with defense against insects and pathogens. <i>Plant Sci</i> 207: 88-97.	8.92
5.	Garg B, Lata C and Prasad M (2012) A study of the role of gene <i>TaMYB2</i> and an associated SNP in dehydration tolerance in common wheat. <i>Molecular Biology Reports</i> DOI: 10.1007/s11033-012-1983-3	8.51
6.	Giriraj Kumawat, Ranjeet S Raje, Sefali Bhutani, Jitendra K Pal, Amitha SVCR Mithra, Kishor Gaikwad, Tilak R Sharma and Nagendra K Singh. Molecular mapping of QTLs for plant type and earliness traits in pigeonpea (<i>Cajanus cajan</i> L. Millsp.) <i>BMC Genetics</i> 2012, 13:84 doi:10.1186/1471-2156-13-84	8.81
7.	Grover, Anita, (2012), Plant chitinases: Genetic Diversity and Physiological roles. <i>Critical reviews in Plant Sciences</i> , 31:57-73	8.92
8.	Gupta, N. C., Jain, P. K., Bhat, S. R. and Srinivasan, R. (2012). Upstream sequence of fatty acyl-CoA reductase (FAR6) of <i>Arabidopsis thaliana</i> drives wound-inducible and stem-specific expression. <i>Plant Cell Rep</i> . DOI 10.1007/s00299-011-1205-9.	8.51
9.	Jain Ajay, Nagarajan, V.K. Raghobama, K.G. (2012) Transcriptional regulation of phosphate acquisition by high plants. <i>Cellular and Molecular Life Sciences</i> . 69: 3207-3224.	8.56
10.	Karmakar, R., Bhattacharya, R.C. and Kulshrestha, G. (2009). Comparative metabolism of thiamethoxam in tomato cell suspension culture and field conditions <i>J. Agric. & Food Chem</i> . 57:6369-6374.	8.91
11.	Karthikeyan AS, Jain A, Nagarajan VK, Sinilal B, Sahi SV & Raghobama KG. 2014. <i>Arabidopsis thaliana</i> mutant <i>lpsi</i> reveals impairment in the root responses to local phosphate availability. <i>Plant Physiol Biochem</i> 77: 60-72.	8.78



12.	Khanna, S M., Taxak, P C., Jain P K., Saini, R. and Srinivasan, R. (2014) Glycolytic enzyme activities and gene expression in <i>Cicer arietinum</i> exposed to water deficit stress. <i>Appl. Biochem. Biotechnol.</i> 173(8):2241-53.	8.78
13.	Kohli D., Joshi G., Deokar A A., Bhardwaj A R., Agarwal M., Agarwal S K., Srinivasan R., Jain P K (2014) Identification and characterization of wilt and salt stress-responsive microRNAs from chickpea by high-throughput sequencing. <i>PLOS ONE</i>	8.51
14.	Kuhar K, Gupta V K, Kansal R and Gupta VK (2012) Isolation and <i>in silico</i> characterization of cDNA encoding cyclophilin from etiolated <i>Vigna mungo</i> seedlings. <i>Braz. J. Plant Physiol.</i> , 24(1): 69-73.	8.7
15.	Kumar S, Malik SK, Uchoi A, Chaudhury R & Bhat S R. 2014. A new wild type of Citron (<i>Citrus medica</i> L., Rutaceae) identified through morphology and <i>psbM-trnD</i> spacer region of chloroplast DNA. <i>Trees (Accepted)</i> .	8.4
16.	Kumar V, Malik SK, Pal D, Srinivasan R & Bhat SR. 2014. Comparative transcriptome analysis of ovules reveals stress related genes associated with nucellar polyembryony in citrus. <i>Tree Genet Genom</i> 10: DOI 10.1007/s11295-013-0690-0.	8.4
17.	Kumawat G., R.S. Raj, S. Bhutani, JK Pal, AS Mithra, K Gaikwad, TR Sharma, NK Singh (2012). Molecular mapping of QTLs for plant type and earliness traits in pigeonpea (<i>Cajanus cajan</i> L. Millsp.), <i>BMC Genetics</i> 2012, 13:84 doi:10.1186/1471-2156-13-84.	8.81
18.	Majumder, K., Sairam, R.K. and Bhattacharya, R.C. (2012) Differential expression of salt overly sensitive pathway genes salinity determines stress tolerance in Brassica genotypes. <i>Plant Physiology and Biochemistry</i> 51: 90- 101	8.78
19.	Manjulatha M, Rohini Sreevathsa A. Manoj K, Sudhakar C, Prasad TG, Tuteja N & Udayakumar M. 2013. Overexpression of a pea DNA helicase (PDH45) in peanut (<i>Arachis hypogaea</i> L.) confers improvement of cellular level tolerance and productivity under drought stress. <i>Mol Biotechnol</i> (DOI 10.1007/s12033-013-9687-z).	8.26
20.	Patil, G., Deokar, A.A., Jain, P.K., Thengane, R.J. and Srinivasan, R. (2009). Development of a phosphomannose isomerase-based <i>Agrobacterium</i> -mediated transformation system for chickpea (<i>Cicer arietinum</i> L.) <i>Plant Cell Reports</i> 28:1669-1676.	8.51
21.	Pratibha P, Singh SK, Sharma I, Kumar R, Srinivasan R, Bhat SR, Ahuja PS & Sreenivasulu Y. 2013. Characterization of a T-DNA promoter trap line of <i>Arabidopsis thaliana</i> uncovers a cryptic bi-directional promoter. <i>Gene</i> 524: 22-27.	8.20
22.	Sateesh, V., Jagannadham, P T K., Chidambaranathan, P., Jain P K. and Srinivasan, R. (2014) NAC transcription factor genes: genomewide identification, phylogenetic, motif and cis-regulatory element analysis in pigeonpea (<i>Cajanus cajan</i> (L.) Millsp.). <i>Mol. Biol. Rep.</i> (DOI 10.1007/s11033-014-3669-5)	8.78
23.	Sharma, P., Nain, V., Paul, S. L. and Kumar, P. A. 2011. Binding of <i>Bacillus thuringiensis</i> Cry1A toxins with brush border membrane vesicles of maize stem borer (<i>Chilo partellus</i> Swinhoe). <i>Journal of Invert. Path.</i> 106: 333-335.	8.67
24.	E.Ogwok, B.L. Patil, T. Alicai and C.M. Fauquet. (2010) Transmission studies with Cassava brownstreak Uganda virus (Potyviridae: Ipomovirus) and its interaction with abiotic and biotic factors in <i>Nicotiana benthamiana</i> . <i>Journal of Virological Methods.</i> 169:296-304.	7.88
25.	I. Amin, B. L. Patil, R.W.Bridson, S.Mansoor and C.M. Fauquet. (2011) A common set of developmental miRNAs are upregulated in <i>Nicotiana benthamiana</i> by diverse begomoviruses. <i>Virology Journal.</i> 8:143.	8.09
26.	I. Amin, B.L. Patil, R. W. Bridson, S.Mansoor and C.M. Fauquet. (2011) Comparison of phenotypes produced in response to transient expression of genes encoded by four distinct begomoviruses in <i>Nicotiana benthamiana</i> and their correlation with the levels of developmental miRNAs.	8.09
27.	B.L. Patil* and C. M. Fauquet (2015) Differential behaviour of the genomic components of cassava mosaic geminiviruses and the diversity of their small RNA profiles. <i>Virus Genes.</i> (DOI: 10.1007/s11262-015-1184-y) (*Corresponding author)	7.84

Publication: NAAS Rating 6-8

S.No.	Publications	NAAS Rating
1.	Dogra T, Priyadarshini A, -Kanika, Kumar A, and Singh, NK. 2013. Identification of genes involved in salt tolerance and symbiotic nitrogen fixation in chickpea rhizobium <i>Mesorhizobium ciceri</i> Ca 181. <i>Symbiosis</i> 61:135-143. 7.0	7.0
2.	Goyal E, Singh RS, Kumar K. 2013. Isolation and functional characterization of Salt overly sensitive 1 (SOS1) gene promoter from <i>Salicornia brachiata</i> Roxb. <i>Biol Plant</i> 57(3): 465-473. (7.74)	7.74



3.	Natarajan C, Gupta V, Kumar K, Prasanna R. 2013. Molecular characterization of a fungicidal endoglucanase from the cyanobacterium <i>Calothrix elenkinii</i> . <i>Biochem Genet.</i> , 51 : 766-779. (6.82)	6.82
4.	Rana A, Saharan B, Joshi M, Prasanna R, Kumar K, Nain L. 2011. Identification of multitrait PGPR isolates and evaluating their potential as inoculants for wheat. <i>Ann. Microbiol.</i> 61: 893-900 (7.04)	7.04
5.	Singh A, Singh DP, Tiwari R, Kumar K, Singh RV, Singh S, Prassana R, Saxena AK and Nain L. 2015. Taxonomic and functional annotation of gut bacterial communities of <i>Eisenia foetida</i> and <i>Perionyx excavates</i> . <i>Microbiol. Res.</i> Doi: 10.1016/j.micres.2015.03.003. (7.94)	7.94
6.	Aggarwal, R., Singh V. B., Shukla, R., Gurjar, M. S., Gupta, S. and Sharma, T.R. 2010. URP-based DNA Fingerprinting of <i>Bipolaris sorokiniana</i> Isolates Causing Spot Blotch of Wheat. <i>J Phytopathology.</i> 158:210-216.	7.00
7.	Ahmed I, Solanke AU, Deshmukh DP, Kanakachari M, Sreevathsa R, Pattanayak D, Sharma TR & Kumar PA. 2014. Isolation and characterization of ethylene responsive factor (ERF) genes from brinjal. <i>Indian J Hort</i> 71: 49-54.	6.13
8.	Ammar, M.H.M., Pandit, A., Singh, R.K., Sameena, S., Chauhan, M.S., Singh, A.K., Sharma, P.C., Gaikwad, K., Sharma, T.R., Mohapatra, T. and Singh, N.K. (2009). Mapping of QTLs controlling Na ⁺ , K ⁺ and Cl ⁻ ion concentration in salt tolerance indica rice variety CSR27. <i>Journal of Plant Biochemistry and Biotechnology</i> 18: 139-150.	6.41
9.	Bhat, S. R. (2011). Rationalizing investment and effort in whole genome sequencing for harvesting applied benefits. <i>Current Sci.</i> 100: 1633-1637.	6.91
10.	Bhat, S. R. 2011. Genetic engineering of apomixis in plants: closer to reality. <i>J Plant Bioch. Biotech.</i> 20: 1-4.	6.41
11.	Bhat, S.R. (2010). Transgenics for increasing productivity. <i>Journal of Plant Biochemistry and Biotechnology.</i> 19:1-7.	6.41
12.	Bhatia, R., Singh, K.P., Jhang, T. and Sharma, T.R. (2009). Assessment of clonal fidelity of micropropagated gerbera plants by ISSR markers. <i>Scientia Hort.</i> 119: 208–211.	7.40
13.	Chamola, R., Balyan, h.S. and bhat, S.R. (2013) Effect of alen cytoplasm and fertility restorer gene on agronomic and physiological traits in cytoplasmic male sterile and fertility restored lines of Brassica juncea (L.) Czern. <i>Plant Breeding.</i> Accepted.	7.18
14.	Chelliah, A., Gupta G.P., Karuppaiah, S. and Kumar, P. A. 2012. Antagonistic effect of Cry1Ac and Cry1Jb on cotton bollworm (<i>Helicoverpa armigera</i>). <i>Indian Journal of Agricultural Sciences</i> 82:	6.18
15.	Chitra N, Gupta V, Kumar K & Prasanna R. 2013. Molecular Characterization of a fungicidal endoglucanase from the cyanobacterium <i>Calothrix elenkinii</i> . <i>Biochem Genet</i> 51: 766-779.	6.94
16.	Choudhary P, Khanna SM, Jain PK, Bharadwaj C, Kumar J, Lakhera PC & Srinivasan R. 2013. Molecular characterization of primary gene pool of chickpea based on ISSR markers. <i>Biochem Genet</i> 51: 306-322.	6.94
17.	Choudhary P, Khanna SM, Jain PK, Chellapilla-Bharadwaj, Kumar J, Lakhera PC, Srinivasan R (2012) Genetic structure and diversity analysis of primary gene pool of chickpea using SSR markers. <i>Genet Mol. Res.</i> 11:891-905.	6.99
18.	Choudhary, P., Khanna, S.M., Jain, P.K., Bharadwaj, C., Kumar, J., Lakhera, P.C. and Srinivasan, R. (2012) Genetic structure and diversity analysis of primary gene pool of chickpea using SSR markers. <i>Genet. Molecular Research.</i> 11: 891-905.	6.99
19.	Dalal M., Sandeep Kumar G., Mayandi K. (2013) Identification and expression analysis of group 3 LEA family genes in sorghum [<i>Sorghum bicolor</i> L. Moench]. <i>Acta Physiologia Plantarum</i> , 35:979–984	7.31
20.	Danekar P, Tyagi A, Mahto A, Singh A, Raje RS, Gaikwad K & Singh NK. 2014. Genomewide characterization of Hsp 100 family genes from pigeon pea. <i>Indian J Genet Plant Breed.</i>	6.2
21.	Dash PK. 2013. High quality RNA isolation from polyphenol-, polysaccharide- and protein-rich tissues of lenti (<i>Lens culinaris</i>). <i>3 Biotech.</i> 3:109-114.	7.85
22.	Dikshit, H.K., Sharma, T.R., Singh, B.B. and Kumari Jyoti (2009). Molecular and morphological characterization of fixed lines from diverse cross in Mung bean (<i>Vigna radiata</i>). <i>Journal of Genetics</i> , 88:141-144.	6.88
23.	Dixit NN, Prasad Dokku, Amitha Mithra SV, Parida SK, Singh AK, Trilochan Mohapatra (2013). Haplotype structure in grain weight gene GW2 locus and its association with grain characteristics in rice. <i>Euphytica</i> DOI 10.1007/s10681-012-0852-4	7.64
24.	Dixit, Rekha, Bhargava, A., Dalal, V., Plaha, P., Singh, N K. and Sharma, T. R. (2009). Accumulation of Defence Response-related and Unique Expressed Sequence Tags during the Incompatible Interaction in the <i>Oryza sativa</i> – <i>Magnaporthe oryzae</i> Pathosystem. <i>J Phytopathology.</i> 157: 483-489.	7.00



25.	Dutta S, Mehto AK, Sharma P, Rajee RS, Sharma TR & Singh NK. 2013. Highly variable 'Arhar' simple sequence repeat markers for molecular diversity and phylogenetic studies in pigeonpea <i>Cajanus cajan</i> (L.). <i>Plant Breeding</i> 132: 191-196.	7.18
26.	Gahlloth, D., Shukla, U., Birah, A., Gupta, G.P., Kumar, P.A., Dhaliwal, H.S. and Sharma, A.K. (2011) Bioinsecticidal activity of <i>Murraya koenigii</i> miraculin-like protein against <i>Helicoverpa armigera</i> and <i>Spodoptera litura</i> . <i>Archives of Insect Biochemistry and Physiology</i> , Vol. 78(3):132-144.	7.52
27.	Geetha KA, Kawane A, Bishoyi AK, Phurailatpam A, Ankita C, Malik SK, Srinivasan R & Bhat SR. 2014. Characterization of mode of reproduction in <i>Commiphora wightii</i> [(Arnot) Bhandari] reveals novel pollen-pistil interaction and occurrence of obligate sexual female plants. <i>Trees Struct Func</i> 27.	7.93
28.	Ghazi, I.A., Srivastava, P.S., Dalal, V., Gaikwad, K., Singh, A.K., Sharma, T.R., Singh, N.K. and Mohapatra, T. (2009). Physical mapping, expression analysis and polymorphism survey of resistance gene analogues on chromosome 11 of rice. <i>Journal of Bioscience</i> 34: 251-261.	7.76
29.	Jayakumar S & Kaur S. 2013. Occurrence of cry genes in <i>Bacillus thuringiensis</i> (Bt) isolates recovered from phylloplanes of crops growing in the New Delhi region of India and toxicity towards Diamond-back moth (<i>Plutella xylostella</i>). <i>J Biol Sci</i> 13: 463-473 (DOI: 10.3923/jbs. 2013.463.473).	7.74
30.	Kanika Dogra, T. And Nain L. (2010). Biochemical and molecular characterization of a rhizobitoxine producing <i>Bradyrhizobium</i> from pigeon pea growing under arid conditions. <i>Folia Microbiologica</i> , 55(3): 233-238.	7.22
31.	Kanika, Dogra, T. and Nain, L. (2010). Biochemical and molecular characterization of <i>Mesorhizobium ciceri</i> containing <i>acdS</i> gene. <i>J. Plant Biochemistry. & Biotechnology</i> . 19(1): 107-110.	6.41
32.	Katara J, Deshmukh R, Singh NK & Kaur S. 2013. Diversity analysis of <i>Bacillus thuringiensis</i> isolates recovered from diverse habitats in India using random amplified polymorphic DNA (RAPD) markers. <i>J Biol Sci</i> 13: 514-520 (DOI: 10.3923/jbs. 2013.514.520).	7. 74
33.	Katara, J., Deshmukh, R., Singh, N.K. and Kaur, S. 2013. Diversity analysis of <i>Bacillus thuringiensis</i> isolates recovered from diverse habitats in India using random amplified polymorphic DNA (RAPD) markers. <i>Pak. J. Biol. Sci.</i> DOI: 10.3923/pjbs. 2013.	6.87
34.	Katara, J.L., Deshmukh, R., Singh, N.K. and Kaur, S. 2012. Molecular typing of native <i>Bacillus thuringiensis</i> isolates from diverse habitats in India using REP-PCR and ERIC-PCR analysis. <i>Journal of General and Applied Microbiology</i> 58 (2): 83-94.	6.74
35.	Khanna SM, Choudhary P, Saini R, Jain, PK & Saini R. 2014. Specific activities and transcript levels of glycolytic enzymes under dehydration in chickpea (<i>Cicer arietinum</i> L.) seedlings. <i>Legume Res.</i>	6.09
36.	Khanna, S M., Taxak, P C., Jain P K., Saini, R. and Srinivasan, R. (2014) Glycolytic enzyme activities and gene expression in <i>Cicer arietinum</i> exposed to water deficit stress. <i>Appl. Biochem. Biotechnol.</i> 173(8):2241-53.	7.89
37.	Kuhar K, Kansal R, Subrahmanyam B, Koundal KR, Miglani K & Gupta VK. 2013. A Bowman-Birk protease inhibitor with antifeedant and antifungal activity from <i>Dolichos biflorus</i> . <i>Acta Physiologia Plantarum</i> 35: 1887-1903.	7.31
38.	Kumar M, Kansal R, Kumar V, Srivastava PS and Koundal K R (2012) Isolation and Characterization of Protease Inhibitor Protein from Pigeonpea (<i>Cajanuscajan</i> L.) <i>Vegetos</i> 25 (2): 158-164	6.02
39.	Kumar, Narender., Jhang, T., Satyavir and Sharma, T.R. (2011). Molecular and Pathological Characterization of <i>Colletotrichum falcatum</i> Infecting Subtropical Indian Sugarcane. <i>J. Phytopath.</i> 159:260-267.	7.0
40.	Kumar, P.A., Mohapatra, T., Sharma, T.R., Bhattacharya, R.C., Dash, Gupta, P.K., and Solanke, A.K. (2011) <i>Biotechnology and crop improvement. Indian Journal of Agricultural Sciences</i> 81(9): 787-800	6.18
41.	Kumari A, Das A, Devanna BN, Thakur S, Singh PK, Singh NK & Sharma TR. 2013. Mining of rice blast resistance gene <i>Pi54</i> shows effect of single nucleotide polymorphisms on phenotypic expression of the alleles. <i>Eur J Plant Pathol</i> 137: 55-65.	7.61
42.	Madhav, M.S., Plaha, P. Singh, N.K. and Sharma, T.R. (2009). Molecular characterization of genomic fragment containing <i>Pi-k^h</i> gene from the genomic library of indica rice line, Tetep. <i>J Phytopathology</i> . 157: 322-324.	7.0
43.	Malhotra, B., Huddone, S., Verma, A., Chamail, A., Sanju, S., Thakur, A., Sindhu, R., Singh, Y., Patil, V.U., Siddappa, S., Gupta, R. and Pattanayak, D. 2012. Indian entrepreneurship in biotechnology comes of age. <i>Journal of Plant Biochemistry and Biotechnology</i> 21(S1): S90-S99.	6.41
44.	Natrajan, C, Gupta, V., K, Kanika. and Prasanna, R.. 2013. Molecular characterization of a fungicidal endoglucanase from cyanobacterium <i>Calothrix elenkii</i> . <i>Biochem Genet</i> (DOI 10.1007/s10528-013-9605-x)	6.94



45.	Padaria Jasdeep Chatrath, Bhatt Deepesh, Koushik Biswas, Singh Gangandeeep and Raipuria Rajkumar (2013) In-silico prediction of uncharacterized protein generated from heat responsive SSH library in wheat (<i>Triticum aestivum</i> L.) <i>Plant Omics Journal</i> , 6: 150-156.	6.35
46.	Padaria JC, Choudhary M & Tarafdar A. 2013. An efficient protocol for genomic DNA isolation from field grown mature leaves of <i>Pennisetum glaucum</i> [(L) R. Br.]. <i>Res J Biotechnol</i> 8: 30-34.	6.29
47.	Padaria, J. C. and Kapoor, Vikram (2011). Plasmid borne gene of <i>Bacillus pumillus</i> MTCC7615 responsible for fungal antagonism towards <i>Rhizoctonia solani</i> . <i>Indian Journal of Biotechnology</i> , Vol 10,316-320	7.0
48.	Pandey, A. K., Chaudhary, P., Singh, S. B., Arora, A., Kanika, Chaudhry, S. and Nain, L.. (2012). Deciphering the traits associated with PAH degradation by a novel <i>Serratia marcescens</i> L11 strain <i>J. Env. Sci. and Health (Part A-Toxic/Hazardous Substance & Environmental Engineering)</i> 47: 755-765	7.25
49.	Pandit, A., Rai, V., Sharma, T.R., Sharma, P.C. and Singh N.K. . (2011). Differentially expressed genes in sensitive and tolerant rice varieties in response to salt stress. <i>J. Plant Biochem. Biotechnol.</i> 20 (2):149-154.	6.4
50.	Parida, S. K., Yadava, D. K. and Mohapatra, T. 2010. Microsatellites in <i>Brassica unigenes</i> : Relative abundance, marker design and use in comparative physical mapping and genome analysis. <i>Genome</i> 53:55-67	7.67
51.	Pathania, N., Kanwar, S. S., Jhang, T., Koundal, K. R. and Sharma, T. R. 2010. Application of different molecular techniques for deciphering genetic diversity among yeast isolates of traditional fermented food products of Western Himalayas. <i>World J. Microbiol. Biotechnol.</i> 26:1539-1547	7.40
52.	Patil M, Ramu SV, Jathish P, Rohini Sreevathsa A, Reddy PC, Prasad TG, Udayakumar M. 2013. Overexpression of <i>AtNAC2</i> (ANAC092) in groundnut (<i>Arachis hypogaea</i> L.) improves abiotic stress tolerance. <i>Plant Biotechnol Rep</i> (DOI 10.1007/s11816-013-0305-0)	7.05
53.	Patil, G., Patel, R., Jaat, R., Pattanayak, A., Jain, P.K. and Srinivasan, R. (2009). Glutamine improves shoot morphogenesis in chickpea (<i>Cicer arietinum</i> L.) <i>Acta Physiol. Plant.</i> 31:1077-1084.	7.31
54.	Pradhan A, Shahi VK & Sinha SK. 2013. Evaluation of genetic diversity in Faba bean (<i>Vicia faba</i> L.) genotypes using seed protein and isozymes electrophoresis. <i>Natl Acad Sci Lett</i> : (Accepted)	6.07
55.	Prakash, S., Wu, X-M. and Bhat, S. R. (2011). History, evolution, and domestication of Brassica Crops. <i>Plant Breeding Rev.</i> 35: 19-84.	7.18
56.	Raghavendra, K. P., Phanindra, M. L. V., Kumar, B. K., Dhandapani, G. and Kumar, P. A. 2011. Identification of differentially expressed genes during bud stage of cotton boll development using suppression subtractive hybridization and cDNA microarray. <i>Journal of Plant Biochem. Biotech.</i> 20: 12-19.	6.41
57.	Rai R, Dash PK, Mohapatra T and Singh A (2012) Phenotypic and molecular characterization of indigenous rhizobia nodulating chickpea in India. <i>Ind. J. Exptl. Biol.</i> 50(5):340-350	7.2
58.	Rai, A.K., Kumar, S.P., Gupta, S.K., Gautam, N., Singh, N.K. and Sharma., T.R. (2011). Functional complementation of rice blast resistance gene <i>Pi-kh</i> (<i>Pi54</i>) conferring resistance to diverse strains of <i>Magnaporthe oryzae</i> . <i>J. Plant Biochem. Biotechnol.</i> 20 (1) :55-65	6.41
59.	Rakshit, A., Rakshit, S., Santhy, V., Gotmare, V. P., Mohan, P., Singh, V.V., Singh, S., Singh, J., Balyan, H.S., Gupta, P.K. and Bhat, S.R. (2010). Evaluation of SSR Markers for the assessment of genetic diversity and fingerprinting of <i>Gossypium hirsutum</i> accessions. <i>Journal of Plant Biotechnology and biotechnology</i> . (In Press).	6.41
60.	Rakshit, a., Rakshit, S., Santhy, V., Gotmare, V.P., Mohan, P. Singh, V.V., Singh, S., Singh, J., Balyan, H.S., Gupta, P.K. and Bhat, S.R. (2010). Association of AFLP and SSR markers with agronomic and fiber quality traits in <i>Gossypium hirsutum</i> L. <i>Journal of Genetics</i> .	6.88
61.	Ram K, Padaria JC & Singh A. 2013. Isolation and characterization of symbiotically defective pyrimidine and amino acid auxotrophs of <i>Mesorhizobium ciceri</i> in chickpea. <i>J Environ Biol</i> 34: 793-797.	6.68
62.	Ramadasappa, S., Rai, A.K., Jaat, R.S., Singh, A. and Rai, R. (2012) Isolation and screening of <i>phlD</i> plant growth promoting rhizobacteria antagonistic to <i>Ralstonia solanacearum</i> . <i>World J of Microbiol. and Biotech.</i> 28:1681-90.	7.26
63.	Ramu, S.V., Rohini, S., Keshavareddy, G., Gowri., neelima M., Shanmugam, N.B., Kumar, A.R.V., Sarangi, S.K., Kumar, P.A. and Udayakumar, M. (2011). Expression of a synthetic <i>cry1Ac-F</i> gene in transgenic Pigeonpea confers resistance to <i>Helicoverpa armigera</i> . <i>Journal of Applied Entomology</i> . DOI: 10.1111/j.1439-0418.2011.01703.x	7.56
64.	Rana, A., Saharan, B., Joshi, M., Prasanna, R., Kanika and Nain, L. 2011. Identification of multi-trait PGPR isolates and evaluating their potential as inoculants for wheat. <i>Annals Microbiol.</i> (DOI: 0.1007/s13213-011-0211-z)	7.55



65.	Ravishanker KV,R. Goel. N. K. Singh. TR Sharma(2012). Development of SSR markers based on a survey of genomic sequences and their molecular analysis in banana (<i>Musa spp.</i>). <i>J Hort Sci. Biotechnol.</i> 87 :8-88.	6.51
66.	Sah P, Kalia P, Sonah H & Sharma TR. 2013. Molecular mapping of black rot resistance locus Xca1bo on chromosome 3 in Indian cauliflower (<i>Brassica oleracea var. botrytis L.</i>). <i>Plant Breeding</i> doi:10.1111/pbr.12152.	7.18
67.	Sateesh, V., Chidambaranathan, P., Jagannadham, P T K., Kohli, D., Jain P K., Bhat, S R. and Srinivasan, R. (2014) A Polyketide cyclase / dehydrase and lipid transport superfamily gene of <i>Arabidopsis</i> and its orthologue of chickpea exhibit rapid response to wounding. <i>Ind J Genetics Plant Breeding</i> .	7.20
68.	Shanmugavadivel PS, Amitha Mithra SV, Prasad D, Anand RKK, Rao GJN, Singh VP, Singh AK, Singh NK & Mohapatra T. 2013. Mapping quantitative trait loci (QTL) for grain size in rice using a RIL population from basmati x indica cross showing high segregation distortion. <i>Euphytica</i> 194: 401-416.	7.64
69.	Sharma RP. 2013. Wingless to Wnt: discovery of conserved cell signaling gene family in the animal kingdom. <i>Curr Sci</i> 104: 1140-1141.	6.91
	Sharma, A. Sonah, H., Deshmukh, R.K., Gupta, N.K., Singh, N.K. and Sharma, T. R. 2011. Analysis of genetic diversity in earthworms using DNA markers. <i>Zoolog. Sci.</i> 1:25-31.	7.3
70.	Sharma, Anshul., Sonah, H., Gupta, N. K., Singh, N. K. and Sharma, T. R. (2011). Analysis of Genetic Relationship among Earthworm Species using Morphological and Molecular Markers. <i>Zoological Sciences</i> ,28:25-31	7.08
71.	Sharma, M. K., Kumar, R., Solanke, A. U., Sharma, R., Tyagi, A. K. and Sharma, A. K. 2010. Identification, phylogeny, and transcript profiling of ERF family genes during development and abiotic stress treatments in tomato. <i>Mol. Genet. Genomics</i> , 284:455–475.	8.88
72.	Sharma, T. R. Rai, A. K. Gupta, S. K. and Singh, N. K. 2010. Broad spectrum blast resistance gen Pikh cloned from rice line Tetep designated as Pi54. <i>J. Plant Biochem. Biotech.</i> 19: 87-89.	6.41
73.	Shikari AB, Khanna A, Gopala Krishnan S, Singh UD, Rathour R, Tonapi V, Sharma TR, Nagarajan M, Prabhu KV & Singh AK. 2013. Molecular analysis and phenotypic validation of blast resistance genes Pita and Pita2 in landraces of rice (<i>Oryza sativa L.</i>). <i>Ind J Genet</i> 73: 131-141.	6.20
74.	Singh A, Chand D & Pattanayak D. 2013. Purification and characterization of potato ribonuclease P. <i>J Plant Biochem Biotechnol</i> 22: 425-433.	6.41
75.	Singh R, Tiwari I M, Jagdeesh HM, Kansal R, Gupta RN, Koundal KR and Saini R (2012) Isolation of lectin gene and development of resistant <i>Nicotiana tabacum L.</i> against <i>Spodopteralitura</i> <i>Indian J. Biotech.</i> 11: 134-141.	6.48
76.	Singh S, Sharma SR, Kalia P, Sharma P, Kumar V, Kumar R, Meena BL, Kumar S & Sharma TR. 2013. Screening of cauliflower germplasm for resistance to downy mildew and designing appropriate multiple resistance breeding strategies <i>J Hort Sci Biotech</i> 88: 103-109.	6.51
77.	Singh, A., Chamail, A., Chand, D., Chakrabarti, S.K. and Pattanayak, D. (2011). pUC-IVT, a modified pUC19 based in vitro transcription vector. <i>Journal of Plant Biochemistry and Biotechnology</i> 21: 60-65.	6.41
78.	Singh, A., Chand, D. and Pattanayak, D. 2012. Purification and characterization of potato Ribonuclease P. <i>Journal of Plant Biochemistry and Biotechnology</i> DOI 10.1007/s13562-012-0171-9.	6.41
79.	Singh, A.K., Gopalakrishnan, S., Singh, V. P., Prabhu, K. V., Mohapatra, T., Singh, N. K., Sharma, T. R., Nagarajan, M. and Vinod K. K. (2011). Marker assisted selection: a paradigm shift in Basmati breeding. <i>Indian J. Genet</i> :71:1-9	6.20
80.	Singh, N. K., Gupta, D. K., Jayaswal, P.K., Mahato, M. K., Dutta, S., Singh, S. Bhutani, Dogra, S., Singh, V., Kumawat, B. P., Pal, G., Pit, J. K., Singh, A., Rawal, A., Kumar, H., Prashat, A., Khare, G. R., Yadav, A., Raje, R., Singh, R. S., Datta, M. N., Fakrudin, S., Wanjari, B., Kansal, K. B., Dash, R., Jain P. K., Bhattacharya, P. K., Gaikwad, K., Mohapatra, T., Srinivasan, R. and Sharma, T. R. (2011). The first draft of the <i>Pigeonpea</i> genome sequence. <i>J of Plant Biochem and Biotechnology</i> . 21:98-112.	6.41
81.	Singh, R. K., Bhatia, V. S., Bhat, K. V., Mohapatra, T., Singh, N. K., Bansal, K. C. and Koundal, K. R. 2010. SSR and AFLP based genetic diversity of soybean germplasm differing in photoperiod sensitivity. <i>Genet. Mol. Biol.</i> 33:319-324	6.74



82.	Sinha SK, Kumar M, Kumar A, Bharti S & Shahi VK. 2013. Antioxidant activities of different tissue extract of Faba bean (<i>Vicia faba</i> L.) containing phenolic compounds. <i>Legume Res</i> 36(6):496-504.	6.09
83.	Sonah, H, R.K. Deshmukh, S. Chand, M Srinivasprasad, GJN Rao, H.C. Upreti, A.K. Singh, N.K. Singh, T. R. Sharma (2012). Molecular mapping of Quantitative Trait Loci for Flag leaf length and other agronomic traits in rice (<i>Oryza sativa</i>). <i>Cereal Res Comm.</i> 40:362-372.	6.55
84.	Tiwari JK, Poonam, Chakrabarti SK, Kumar V, Gopal J, Singh BP, Pandey SK & Pattanayak D. 2013. Identification of host gene conferring resistance to Potato virus Y using Rygene-based molecular markers. <i>Indian J Hort</i> 70: 373-377.	6.13
85.	Tula S, Ansari MW, Prasad Babu A, Pushpalatha G, Sreenu K, Sarla N, Tuteja N & Rai V. 2013. Physiological assessment and allele mining in rice cultivars for salinity and drought stress tolerance. <i>Vegetos</i> 26: 219-228.	6.02
86.	Vajinder Kumar V, Thakare DR, Saha DN Jajoo A, Jain PK, Bhat SR and Srinivasan R. (2012) Characterization of upstream sequences of the peroxidase gene, Atrpx18 of <i>Arabidopsis thaliana</i> . <i>J. Plant Biochem. Biotech.</i> 21(1):121-127.	6.41
87.	Vijayan J, Jain S, Jain N, Devanna BN, Rathour R, Variar M, Prashanthi SK, Singh AK, Singh UD, Singh NK & Sharma TR. 2013. Identification of differentially expressed genes in rice. <i>Indian J Genet</i> 73: 233-243.	6.20
88.	Yadava, D. K., Giri, S. C., Vasudev, S., Yadav, A. K., Dass, B., Raje, R. S., Vignesh, M., Singh, R., Mohapatra, T. and Prabhu, K. V. 2010. Stability analysis in Indian mustard (<i>Brassica juncea</i>) varieties. <i>Ind. J. Agric. Sci.</i> 80:761-765	6.18
89.	Yamagishi H & Bhat SR. 2014. Cytoplasmic male sterility and mitochondrial genes in Brassicaceae crops. <i>Breeding Science</i> (Accepted).	7.04
90.	Amresh Kumar, Nidhi, N. Prasad and Subodh K. Sinha (2015) Nutritional and antinutritional attributes of Faba bean (<i>Vicia faba</i> L.) growing in Bihar, India. <i>Physiol. Mol. Biol. Plants.</i> 21:159-162.	4.36
91.	Atul Pradhan, V. K. Shahi and Subodh K. Sinha (2014) Evaluation of Genetic Diversity in Faba bean (<i>Vicia faba</i> L.) Genotypes using Seed Protein and Isozymes Electrophoresis	6.07
92.	Suchi Smita, Subodh K. Sinha, V.K. Sharma and V.K. Shahi (2011) Phenotypic and physiological characterization of rhizobia strains isolated from different areas of Bihar. <i>Bioscience Discovery</i> 2: 281-287.	6.09
93.	Subodh Kumar Sinha, Mukesh Kumar, Amresh Kumar, Sharda Bharti and V.K. Shahi (2013) Antioxidant activities of different tissue extract of Faba bean (<i>Vicia faba</i> L.) containing phenolic compounds. <i>Legume Res.</i> 36(6):496-504.	-
94.	Subodh Kumar Sinha (2010) RNAi induced gene silencing in crop improvement. <i>Physiol. Mol. Biol Plants.</i> 16:321-332.	4.36
95.	Suchi Smita, Subodh K. Sinha, Dayaram, V.K. Shahi (2010) Molecular diversity of rhizobia strains isolated from different areas of Bihar. <i>RAU J. Res.</i> 20 (1&2) 1-5.	-
96.	N.C. Gupta, S.K. Sinha, M. Jolly, N. Dubey and A. Sachdev (2009) Antisense RNA-Mediated Inhibition of <i>GmFAD2-1</i> Encoding Omega-6-Desaturase. <i>Indian J. Plant Physiol.</i> 14: 336-343.	4.66
97.	Sinha Subodh Kumar, Dubey Nirupama and Sachdev Archana (2008) Gene silencing constructs for alteration of seed fatty acid composition by RNAi induced transgene silencing. <i>New Botanist</i> 35: 23-32.	-
98.	K Kishore, SK Sinha, R Kumar, NC Gupta, N Dubay & A Sachdev (2007) Isolation and characterization of microsomal ω -6 desaturase gene (<i>fad2-1</i>) from soybean. <i>Indian J. Expt. Biol.</i> 45: 390-397.	7.20
99.	R Kumar, K Kishore, SK Sinha NC Gupta, N. Dubey & A Sachdev (2007) Isolation and characterization of <i>fad2-1</i> cDNA sequence from <i>Glycine max</i> L. <i>Indian J. Plant Physiol.</i> 12: 6-12.	4.66
100.	Sinha Subodh Kumar, Dubey Nirupama and Sachdev Archana (2006) Intron-spliced gene silencing construct for alteration of seed fatty acid composition by RNAi induced transgene silencing. <i>New Botanist</i> 33: 181-191.	-
101.	Subodh K. Sinha, Arupratan Dasgupta, Anita Baranwal and Shelly Praveen. (2004) Molecular Variability in the replicase gene of viruses causing tomato leaf curl disease in India. <i>J Plant Biochem. Biotechnol.</i> 13: 43-46.	6.41
102.	Arupratan Dasgupta, Subodh K. Sinha and Shelly Praveen (2004) Structure of replication initiator protein unites diverse viruses causing tomato leaf curl disease (ToLCD). <i>Plant Sci.</i> 166: 1063-67.	8.92
103.	Shelly Praveen, M.S. Kulkarni, Subodh K. Sinha & Y.S. Ahlawat (2004) Diagnosis of Tomato leaf curl virus (ToLCV) by Polymerase Chain Reaction (PCR). <i>Indian Phytopathology.</i> 57: 117-120.	4.59
104.	Shelly Praveen, Arupratan Dasgupta, Subodh K. Sinha and Anupam Varma (2003) Structure of a replication initiator protein of Tomato leaf curl virus. <i>Indian Phytopathology.</i> 56: 504.	4.59



23. Details of patents and income generated:

S.No.	Title	Application No./ Patent Number	Date of filing/Granting (YY-MM-DD)	Name of the Inventor/ Scientist
1.	Polynucleotide fragment for generating blast tolerant plants, methods and uses thereof.	782/DEL/2014 complete	2015-02-20	Sharma Tilak Raj, Devanna Basavantraya Navadagi
2.	Pathogen inducible promoter from rice and uses thereof.	783/DEL/2014complete	2015-02-20	Sharma Tilak Raj, Vijayan Joshitha
3.	Design and validation of a single-copy gene based 50K SNP rice chip for association mapping and molecular breeding in rice.	2280/DEL/2014 provisional	2014-08-11	Singh Nisha, Jayaswal Kumar Pawan, Sharma Tilak Raj and Singh Nagendra Kumar

24. Areas of consultancy and income generated:

Nil

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Name	Institutions and Industries Visited
Dr. N.K. Singh	Participated the 7 th International Rice Genetics Symposium on 05-07 November, 2013 held in Philippines Attended IWGSC workshop meeting on 11-15 th January, 2015 at San Diego, USA Attended "Physical Mapping & Sample sequencing of wheat Chromosome 2A-international Wh25eat Genome Sequencing Consortium (India)" on 16-20 January, 2014 at CIMMYT, Mexico
Dr. Vandana Rai	Visited Meijo University, Nagoya, Japan for study/training programme in International Centre for Green Biotechnology Program by Research Centre of Meijo University on 10 th Sept., 2013 to 9 th October, 2013
Dr. Rhitu Rai	Visited USA to participate in the Plant & Animal Genome (PAG)XXII Conference on 11-15 th January, 2014 at San Diego California, USA
Dr. Ajay Jain	Visited USA to participate in National Science Foundation meeting on 6 th August, 2013 to 30 th October, 2013 at West Kentucky, University, USA

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Kanika		Universal Journal of Microbiology Research, Horizon Research Publishing, 506 N Garfield Ave #210, Alhambra CA 91801 USA	Nil
Dr. Sharmistha Barthakur	Indian Science Congress, member of sectional committee Agriculture and Forestry Sciences, 2012		Councilor, Northern Zone, Indian Society of Agricultural Sciences, New Delhi (2013)
Dr. T. R. Sharma	DBT Task Force		
Dr. T. R. Sharma	BIRAC - DBT		
Dr. S. R. Bhat	DBT Task Force on Agricultural Biotechnology		
Dr. S. R. Bhat	DBT – Member RCGM		

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

**28. Student projects****Percentage of students who have done in-house projects including interdepartmental projects:**

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:**a) Faculty:**

Name	Awards/Recognitions
Dr. T. R. Sharma, Project Director	Fellow of Indian National Science Academy, New Delhi DST GoI J.C. Bose National Fellowship Award NASI Reliance Platinum Jubilee Award (2013) Chief Editor, Journal of Plant Biochemistry and Biotechnology, (2009)
Dr. P.K. Mandal	Awarded the Fellowship of the Indian Society of Agricultural Biochemists
Dr. Kanika	Second best paper award in National Conference on Changing Scenario of Agriculture in M.P. (2013) Fellow Society of Applied Biotechnology, India Member of Editorial Board of Universal Journal of Microbiological Research Invited as a panelist at the Plant Genomics Congress Asia, Kuala Lumpur Malaysia (2014)
Dr. Rhitu Rai	Best Poster Award in National Seminar in Plant Biotechnology, Jamia Hamdard, New Delhi (2014)
Dr. Amolkumar U. Solanke	C.V Award Society for Biotechnologists, India (2013) Best original research paper presentation in plant biotechnology
Dr. Sharmistha Barthakur	Commonwealth Academic staff fellowship of United Kingdom, 2012
Dr. B. L. Patil	IVS Fellow (Plant Virology) Award in 2014, by Indian Virological Society

b) Students:

- Four students got Jawaharlal Nehru Award
- Seven students got IARI Gold Medal
- Nine students got IARI Merit Medal.
- One student got Best student of IARI

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Seminar/Conference/Workshops	Source of Funding	Details of participants
'Frontier technology in the area of Biotechnology on gene isolation, characterization and breeding with reference to abiotic stress related genes held during 10-30 December 2013.	Indian Council of Agricultural Research	21 participants (Assistant Professors and above rank)
Model Training Course on 'Transgenic Technology for adaptation to Climate Change' (19 th to 26 th August 2014) Sponsored By Directorate of Extension, Ministry of Agriculture, Government of India	Directorate of Extn.Min. of Agriculture	20 participants (Assistant Professors and above rank)
'Biotechnological approaches for adaptation to climate change' held during 4-24 December 2012	Indian Council of Agricultural Research	23 participants (Assistant Professors and above rank)
21 days Summer School on "RNA-interference as a Tool for Plant Functional Genomics and Crop Improvement", at ICAR-NRCPB, during 6-26 May, 2015.	ICAR	25 participants



31. Code of ethics for research followed by the departments: As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Application received	Selected		Pass percentage	
		Male	Female		
Male	Female				
M.Sc.	Admissions are made through ICAR	4	2	-	-
Ph.D.	391	4	3	1.02	0.76

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	-
Ph.D.	85.00	15%	-	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

All students are selected for M.Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.

17 students has joined ARS last year

No student of the discipline is Jobless.

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Entrepreneurs	Nil

36. Diversity of staff:

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	14.29
From universities from other States from	85.71
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All are Ph.D.

**38. Present details of departmental infrastructural facilities with regard to:**

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ class room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with LCD facility: two
- Student's laboratories: 1
- Research laboratories: 14

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S.No.	Name of the Post doctoral student	University of Graduation
1.	Dr. Sikha Deka, UGC, Post doc fellow	Guwahati University,, Guwahati, Assam
2.	Dr. Sushma KhomdramDBT-RA	Manipur University, Canchipur , Manipur

S.No.	Name of the Ph.D. student	Host/other institute/ university
1	Mr. Devanna (Ph.D.)	NRCPB
2	Mr. V. Satheesh (Ph.D.)	NRCPB

40. Number of post graduate students getting financial assistance from the university:

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from:

Yes

- Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?**

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

- Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?**

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.



c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

NA

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

**xvi) Division of Nematology****1. Name of the Department**

Nematology

2. Year of establishment

1966

3. Is the Department part of a School/Faculty of the university?

School of Plant Protection

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved

Plant Pathology, Entomology, Agricultural Chemicals, Division of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Vegetable Science, Soil Science and Agricultural Chemistry, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester

9. Participation of the department in the courses offered by other departments

The faculty deliver lectures or guide dissertations in the sister departments Division of Plant Pathology; Entomology and Agricultural Chemicals

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	2	1	1	9
Senior Scientist (Associate Professor)	4	2	2	2
Scientist (Assistant Professor)	13	3	2	3



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. Uma Rao	Ph.D.	Head of the Division	Molecular Nematology	26	2	1
Dr. Anil Sirohi	Ph.D.	Professor	Molecular Nematology	24	4	3
Dr. H K Sharma	Ph.D.	Principal Scientist	Nematode Management	24	2	0
Dr. A K Singh	Ph.D.	Principal Scientist	Nematode Management	24	0	0
Dr. Anju Kamra	Ph.D.	Principal Scientist	Nematode Ecology	23	1	2
Dr. Pankaj	Ph.D.	Principal Scientist	Nematode Management	22	3	1
Dr. Gautam Chawla	Ph.D.	Principal Scientist	Nematode Taxonomy	22	3	1
Dr. Sharad Mohan	Ph.D.	Principal Scientist	Entomopathogenic Nematodes	22	3	1
Dr. Archana U Singh	Ph.D.	Principal Scientist	Nematode Management	22	3	0
Dr. Mahendra Singh	Ph.D.	Senior Scientist	Nematode Genetics	15	2	0
Dr. Vishal Somvanshi	Ph.D.	Senior Scientist	Nematode biosystematics & Entomopathogenic nematode	3	0	0
Mr. Vikas Bamel	Ph.D.	Senior Scientist	Nematode Management	11	0	0
Dr. Tushar K Dutta	Ph.D.	Scientist	Molecular Nematology	5	0	0
Dr. Waghmare Chandramani Dattatraya	Ph.D.	Scientist	Nematode biosystematics	3	0	0

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S. No.	Name of the Faculty	Status
1.	Mohammad Shamim Jairajpuri	Adjunct Professor

13. Percentage of classes taken by temporary faculty – programme-wise information

Nil

14. Programme-wise Student Teacher Ratio

M. Sc. = 1:1.75 and Ph.D.= 1:1.16

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	19	7	7
2.	Administrative	5	3	3
3.	Supportive	20	9	9

**16. Research thrust areas as recognized by major funding agencies**

Nematode biosystematics; Nematode plant interaction; Basic Molecular Nematology; Nematode Biocontrol; Nematode Genomics; Biological control of insect pests by entomopathogenic nematodes; Nematode Ecology; Integrated Nematode Management

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Dr. Uma Rao		Translation of plant resistance to nematodes to commercial practice - The Indo-Australian Biotechnology Fund (IABF)	
Dr. Uma Rao	Translational research on root knot Nematode tolerant RNAi transgenics based on vital parasite gene targets from validation to proof-of-concept to selection of event(s) in the field under confined conditions - DBT		Rs 109.28 lacs
Dr. Uma Rao	Plant parasitic nematode genome informatics - <i>insilico</i> resource development - DBT		Rs 36.596
Dr. Sharad Mohan		Understanding <i>Pasteuria</i> spore attachment for exploitation as a natural control agent of root-knot and cyst nematode crop pests DST-British Council	23.5.Lakhs
Dr. Sharad Mohan	Demonstration of effective and affordable biological agents (Entomopathogenic Nematodes and other Bio-agents) for the Management of White grub menace on sugarcane crop in western U.P - DST Consultancy Project		17.8Lakhs
Dr. Anil Sirohi	Understanding Plant Nematode Interactions using RNAi		188.0541
Dr. Anil Sirohi	Understanding plant-nematode interaction: Identification of plant and nematode genes involved in disease development		42.4263
Dr. Vishal	Determination of factors governing host specificity in nematode-bacteria symbiotic relationship - DST		20.00

18. Inter-institutional collaborative projects and associated grants received**a) National:**

1. Translational research on root knot Nematode tolerant RNAi transgenics based on vital parasite gene targets from validation to proof-of-concept to selection of event(s) in the field under confined conditions.

Collaboration with : NRCPB

IARI Grant :

2. Understanding Plant Nematode Interactions using RNAi

Collaboration with: NRCPB; IIT Kanpur and IIPR, Kanpur

IARI Grant : Rs. 188.0541 Lakhs



3. Understanding plant-nematode interaction: Identification of plant and nematode genes involved in disease development.

Collaboration with : IIT, Kanpur, Delhi University, IHBT, Palampur;

b) International collaboration

1. Translation of plant resistance to nematodes to commercial practice” under The Indo-Australian Biotechnology Fund (IABF) platform for bilateral collaboration in science jointly managed and funded by the governments of India and Australia
2. Understanding *Pasteuria* spore attachment for exploitation as a natural control agent of root-knot and cyst nematode crop pests DST-British Council

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

None under these programmes.

20. Research facility / centre with

state recognition

national recognition

National Nematode Collection of India

international recognition

National Nematode Collection of India

21. Special research laboratories sponsored by / created by industry or corporate bodies

None

22. Publications:

	Vishal	Sharad	Uma	Vikas	TK Dutta	Anil Sirohi	A K Singh	Anju Kamra	H.K. Sharma	Pankaj	Gautam
Number of papers published in peer reviewed journals (national / international)	22	8	40	4	8	14	6	10	32	102	32
Monographs	0							1			
Chapters in Books	1	1	1	2	3	1	1	10	15	28	12
Edited Books							1	0			
Books with ISBN with details of publishers	0				LAP Lambert Academic Publishing, Saarbrucken, Germany. ISBN 978-3-659-26485-6		LAP Lambert Academic Publishing, Saarbrucken, Germany. ISBN 978-3-659-26485-6				
Number listed in International Database											
Citation Index – range / average					0-40						



SNIP range / average	0-8.22/ 1.405										
SJR range / average											
Impact Factor– range / average NAAS	4.6 - 20	3.5 to 8.0		1-4.5	15.8	3.65 – 9.9	1-5.8	3.65-7.8	3-4.56	3.65 – 10.47	
h-index					3		3				

23. Details of patents and income generated

Filed two patents

(i) **2012:** Filed an **Indian Patent: Method for the control of nematodes in plants**-Application No: 3876/DEL/2012; Date of filing: 14/12/2012 **CBR Number: 13059**. (Uma Rao)

(ii) **2014: International patent filed (Patent treaty co operation that provides protection in 148 countries):** Method for the control of nematodes in plants. Application No: PCT/IB2013/060946 Date of filing: 14/12/2013; Submission no:060946 (Uma Rao)

(iii) **Nema Gel** Indian Patent Application Reference No. 8115/RQ-DL/2006

Patent Filed

24. Areas of consultancy and income generated

i. Management of white grubs in sugarcane crop by entomopathogenic nematodes, Consultancy project: 17.5 lakhs

ii. Nema Gel

Pusa Nema Gel technology was licensed to Rallis India Limited for Rs. 7 Lakh in 2013.

Earlier Pusa NemaGel was licensed to Huntin Organics for 2 lakh rupees.

25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

Dr. Uma Rao - North Carolina, USA

Dr. Anil Sirohi - University of California, USA

Dr. Pankaj, Rothamsted Research, UK

Dr. Sharad Mohan - Visited Rothamsted Research, UK

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Uma Rao	IMC - CPRI; DBT-Member Task Force on Biological Control agents;		Chairman, Women Cell-IARI, EPC and IPAC of IARI.
Dr. Anil Sirohi	IMC of NRCPB; Academic Council IARI, Examination committee IARI, Selection/ Promotion committees of Universities; RAC of SVBPUA&T, Modipuram	Editor, Pusa AgriScience	MOHR, PG Hostels, IARI International Students Advisor
Dr. Pankaj	Chief Editor, Indian Journal of Nematology		
Dr. Sharad Mohan	Country Representative for the European Society of Nematologist		



27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

percentage of students who have done in-house projects including interdepartmental projects

100%

percentage of students doing projects in collaboration with other universities/ industry / institute

10%

Students carrying part of their thesis objective at Rothamsted Research, UK and the University of Hertfordshire, UK.

29. Awards / recognitions received at the national and international level by

a) Faculty

Name	Awards/Recognitions
Dr. Pankaj	Prof. HM Shah Memorial Award; Fellow of SPPS; Best Paper Presentation Award; Meritorious Scientist Award - SPPS; Fellow of NSI
Dr. Anil Sirohi	IARI Gold Medal (M.Sc); Fellow NSI
Dr. Anju Kamra	Meritorious Scientist, SPPS; Ghuman Devi Women Scientist Award, ISPP
Dr. Sharad Mohan	Best Teacher Award, Post Graduate School, IARI 2013
Dr. Tushar K Dutta	Jawaharlal Nehru award, Crop Protection Young Scientist Award, IARI merit medal

Doctoral / post doctoral fellows - none

b) Students

- ICAR Jawaharlal Nehru Award, for Best Thesis
- DJ Raski Gold Medal Award - several students
- Several students have got best poster presentation award in different seminars and conferences.

30. Seminars/ Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Seminar/Conference/Workshops	Source of Funding	Details of participants
Faculty Training	Indian Council of Agricultural Research	21 participants (Assistant Professors and above rank)
Faculty Training	Indian Council of Agricultural Research	20 participants (Assistant Professors and above rank)
Faculty Training	Indian Council of Agricultural Research	23 participants (Assistant Professors and above rank)
Faculty Training	Indian Council of Agricultural Research	25 participants (Assistant Professors and above rank)

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standard

**32. Student profile programme-wise (2014-15):**

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female		
M.Sc.	Admissions are made through ICAR	3	1	-	-
Ph.D.	13	5	1	38.46	7.69

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	-
Ph.D.	92	NIL	8	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

ARS Exam :

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	85%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Entrepreneurs	Nil

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	37
From universities from other States from	63
Universities outside the country	None

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

None

38. Present details of departmental infrastructural facilities with regard to

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: one



- d) Class rooms with ICT facility: one
 - e) Student's laboratories: one
 - f) Research laboratories: 10
39. List of doctoral, post-doctoral students and Research Associates
- a) from the host institution/university : None
 - b) from other institutions/universities : None

40. Number of post graduate students getting financial assistance from the university.

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Not applicable

42. Does the department obtain feedback from

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10)

- i) Dr. H S Gaur, Vice Chancellor, SVBPU&T, Modipuram
- ii) Dr. Shashi Sharma, Professor and Chair, Centre for Biosecurity and Food Security at Murdoch University, Australia
- iii) Dr. Prem Warrior, Chief Business Development Officer Valagro SpA, Italy
- iv) Dr. K.S. Varaprasad, Director, ICAR-Institute of Oilseed Research, Hyderabad

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures by eminent subject matter specialists, lectures by adjunct professor/faculty, and award lectures are held regularly. Students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

White board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.



46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Division level professor monitors the academic activities and at Institute level, Dean and Joint Director (Edn.) monitors the student progress.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa Krishi Vigyan Mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department.

Educational tours for students to various institutes and laboratories for exposure, Quiz contests, seminars conference participation, help add to the academic exposure.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

Nematode Taxonomy and Biosystematics

- Identified and documented most of the genera and species of soil, insect and plant nematodes occurring in India.
- Highlighted the emerging nematode problems in vegetables, cereals, pulses and oilseed based cropping systems.
- Differentiated races of root-knot, reniform and cyst nematodes using host differentials and DNA polymorphism. Identified genes of several plant and entomopathogenic nematodes and their sequences deposited in gene bank.
- Proposed novel classification schemes and developed diagnostic keys to nematode taxa.
- Established the National Nematode Collection of India (NNCI)
- Digitization of NNCI in progress

Biochemical and Molecular Nematology

- Identified the role of hydrolases from plant parasitic nematodes and their role in physio-pathogenesis.
- Developed foliar application technology of synthetic elicitor molecules like salicylic acid, jasmonic acid and beta amino butyric acid against root-knot nematode on tomato, cowpea, rice and wheat to induce resistance and delay the growth of juveniles.
- Identified nematode specific genes of *M. incognita* and *M. graminicola* through proteomics approach.
- RNAi based resistant transgenics of brinjal and tomato against root-knot nematode generated
- Root-knot nematode, *Meloidogyne incognita* responsive promoters have been identified.
- Cloned and sequenced a new putative resistance *cre* gene against cereal cyst nematode, *Heterodera avenae* from Indian wheat cv. Raj MR1.

Management

- Established the nematicidal potential of neem and other botanicals against root-knot, reniform and pigeon pea cyst nematodes in vegetables and pulses.
- Developed protocols for seed treatment with neem products and nematicides in direct seeded cereal, vegetable, flower, pulse and oilseed crops for the control of root-knot, reniform and cyst nematodes.



- Identified a large number of sources of resistance in vegetables, pulses and oil-seeds against root-knot and reniform nematodes and in cereals against cyst nematodes
- The biology, population dynamics and integrated management package for *M. graminicola* worked out for both rice and wheat.
- Developed integrated nematode management packages utilizing combinations of cultural and chemical control methods and their efficacy demonstrated in multi-location trials in cereal, vegetable, pulse, and oilseed crops

Entomopathogenic Nematodes

- The Division has taken a lead by describing first new heat tolerant species of entomopathogenic nematode, *Steinernema*
- Application technology developed and field validated for managing grub of sugarcane

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths:

- Specialised faculty in different subject sub-disciplines .
- Dynamic course curricula of International standard with continuous up gradation
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni

Weaknesses:

- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline areas (Nanotechnology) is required.
- Centre for Advanced Studies (CAS)
- Shortage of technical and supporting staff.

Opportunities:

- Best suited for imparting subject matter training in Nematology for developing nations
- Upgrade country's human resource in nematology
- Basic research in biology

Challenges:

- Basic Competition from ICAR and other institutes/SAUs and other Universities
- Develop Linkages with International research Organizations and compete internationally
- Updating research and teaching with latest technology and human resource manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department.

The Division plans to develop environmentally safe nematode management technologies which are economical and easily adaptable by the farmer.



xvii) Plant Genetic Resources (PGR)

1. Name of the Department

Plant Genetic Resources (PGR)

2. Year of establishment

1997

3. Is the Department part of a School/Faculty of the university?

The Department is a part of the Postgraduate School, IARI (a deemed-to- be a University)

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Sc. and Ph.D. in Plant Genetic Resources (PGR)

5. Interdisciplinary programmes and departments involved

PGR is a complex discipline and the course curriculum is mix of basic science, management and policy issues. Departments involved of IARI viz. Seed Science & Technology; Molecular Biology and Biotechnology; Bioinformatics; Biochemistry, etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons.

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester system

9. Participation of the department in the courses offered by other departments

The faculty of PGR are involved in teaching activities of other sister departments/disciplines of IARI viz. Seed Science & Technology; Molecular Biology and Biotechnology; Bioinformatics; Biochemistry, etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professors/Asst. Professors/others)

	Sanctioned (Cadre strength)	In position (Actual)	Actual (As teaching faculty)
Professor (Principal Scientists)	10	52	34
Associate Professors (Senior Scientists)	47	36	17
Asst. Professors (Scientists)	95	25	4



11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Quali- fication	Designation	Specialization	Number of years of experience	Number of Ph.D. or M.Sc. students guided for the last 4 years
Anuradha Agrawal	M.Sc., Ph.D.	Principal Scientist	Eco. Botany, PGR	21	Ph.D.: 1M.Sc.: 2
Sunil Archak	M.Sc., Ph.D.	National Fellow	PGR, Biotechnology	17	M.Sc. : 2
Shashi Bhalla	M.Sc., Ph.D.	Principal Scientist & OIC	Entomology, PGR	29	M.Sc.: 3 Ph.D.: 2
K.C. Bhatt	M.Sc., Ph.D.	Principal Scientist	PGR; Eco. Bot.	22	M.Sc.: 1
K.V. Bhat	M.Sc., Ph.D.	Principal Scientist & Head	Plant Breeding & Genetics, PGR	28	Ph.D.: 4
I.S. Bisht	M.Sc., Ph.D.	Principal Scientist & Professor (till 31.3.2015)	PGR, Pl. Pathology	34	Ph.D.: 4
Pratibha Brahmi	M.Sc., Ph.D.	Principal Scientist	PGR, IPR on PGRFA	28	-
V. Celia Chalam	M.Sc., Ph.D.	Principal Scientist	Pl. Pathology, PGR	22	-
Rekha Chaudhury	M.Sc., Ph.D.	Principal Scientist & OIC; Professor (w.e.f. 1.4.2015)	PGR, Eco. Bot., Cryobiology	30	M.Sc.: 2 Ph.D.: 1
K.K. Gangopadhyay	M.Sc., Ph.D.	Principal Scientist	PGR, Veg. Sci.	22	-
Kavita Gupta	M.Sc., Ph.D.	Principal Scientist	Entomology, PGR	20	-
Sandhya Gupta	M.Sc., Ph.D.	Principal Scientist	PGR Conservation	22	-
Veena Gupta	M.Sc., Ph.D.	Principal Scientist	Eco. Bot., PGR	27	Ph.D.: 3
Anjali Kak	M.Sc., Ph.D.	Principal Scientist	Eco. Bot., PGR	21	-
Ashok Kumar	M.Sc., Ph.D.	Principal Scientist	PGR, Plant Breeding	29	-
S.K. Malik	M.Sc., Ph.D.	Principal Scientist	Eco. Bot., PGR	19	Ph.D.: 3
Soma S. Marla	M.Sc., Ph.D.	Principal Scientist	Crop Genomics	29	Ph.D.: 2
Anjula Pandey	M.Sc., Ph.D.	Principal Scientist	PGR, Systematic Bot.	28	M.Sc.: 2 Ph.D.: 1
Ruchira Pandey	M.Sc., Ph.D.	Principal Scientist	PGR, Eco. Bot.	28	-
D.B. Parakh	M.Sc., Ph.D.	Principal Scientist	Pl. Pathology, PGR	28	-
J. Radhamani	M.Sc., Ph.D.	Principal Scientist	PGR, Seed Physiology	28	-
Archana P. Raina	M.Sc., Ph.D.	Principal Scientist	Biochemistry, PGR	20	-
Mukesh K. Rana	M.Sc., Ph.D.	Principal Scientist	Pl. Breeding, PGR	17	M.Sc.:1
G J Randhawa	M.Sc., M.Phil, Ph.D.	Principal Scientist	Pl. Physiology, PGR	29	M.Sc.: 2
Neelam Sharma	M.Sc., Ph.D.	Principal Scientist	Eco. Bot, PGR	29	-
Baleshwar Singh	M.Sc., Ph.D.	Principal Scientist	Pl. Pathology, PGR	36	-
Mool Chand Singh	M.Sc., Ph.D.	Principal Scientist	Agronomy, PGR	26	-
Neeta Singh	M.Sc., Ph.D.	Principal Scientist	Pl. Physiology, PGR	29	-
Kalyani Srinivasan	M.Sc., Ph.D.	Principal Scientist	Pl. Physiology, PGR	29	-
R.K. Tyagi	M.Sc., Ph.D.	Principal Scientist & Head	Eco. Bot., PGR	30	Ph.D.: 2
Vandana Tyagi	M.Sc., Ph.D.	Principal Scientist	Eco. Bot., PGR	22	-
Nidhi Verma	M.Sc., Ph.D.	Principal Scientist	Eco. Bot., PGR	18	-
M.C. Yadav	M.Sc., Ph.D.	Principal Scientist	Molecular Genetics & Biotechnology, PGR	19	M.Sc.: 2 Ph.D.: 1
S.K. Yadav	M.Sc., Ph.D.	Principal Scientist	PGR, Veg. Sci.	18	-



Jameel Akhtar	M.Sc., Ph.D.	Senior Scientist	Pl. Pathology, PGR	11	-
Lalit Arya	M.Sc., Ph.D.	Senior Scientist	Pl. Biochemistry, Biotechnology, PGR	17	-
Ambika Baldev	M.Sc., Ph.D.	Senior Scientist	Molecular Biology, PGR	17	M.Sc.:1
Rakesh Bhardwaj	M.Sc., Ph.D.	Senior Scientist	Biochemistry, PGR	12	-
Sherry R. Jacob	M.Sc., Ph.D.	Senior Scientist	Seed Technology, PGR	12	-
A. Kandan	M.Sc., Ph.D.	Senior Scientist	Pl. Pathology, PGR	11	-
Zakaullah Khan	M.Sc., Ph.D.	Senior Scientist	Nematology, PGR	16	-
Sundeeep Kumar	M.Sc., Ph.D.	Senior Scientist	Molecular Breeding, PGR	12	-
Rajesh Kumar	M.Sc., Ph.D.	Senior Scientist	Pl. Biotechnology, PGR	15	-
Hanuman Lal	M.Sc., Ph.D.	Senior Scientist	Ag. Stat., PGR	17	-
T.K. Mondal	M.Sc., Ph.D.	Senior Scientist	Pl. Biotechnology, PGR	16	-
T.P. Prasad	M.Sc., Ph.D.	Senior Scientist	Entomology, PGR	15	-
S. Rajkumar	M.Sc., Ph.D.	Senior Scientist	Pl. Biotechnology, PGR	15	-
Dinesh P. Semwal	M.Sc., Ph.D.	Senior Scientist	Eco. Bot, PGR	15	-
Rakesh Singh	M.Sc., Ph.D.	Senior Scientist	Pl. Biotechnology, PGR	17	-
T.P. Singh	M.Sc., Ph.D.	Senior Scientist	Pl. Physiology, PGR	10	-
Manjusha Verma	M.Sc., Ph.D.	Senior Scientist	Biochemistry, PGR	12	-
Yasin Jeshima	M.Sc., Ph.D.	Scientist	Molecular Genetics, PGR	6	-
Vikender Kaur	M.Sc., Ph.D.	Scientist	Eco. Bot., PGR	2	-
Amit Kumar	M.Sc., Ph.D.	Scientist	Mol. Biol. & Biotechnology, PGR	5	-
R. Parimalan	M.Sc., Ph.D.	Scientist	PL. Breeding, Biotechnology, PGR	6	-

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

Nil

13. Percentage of classes taken by temporary faculty – programme-wise information

Nil

14. Programme-wise Student Teacher Ratio

1:3

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Nil

16. Research thrust areas as recognized by major funding agencies

PGR augmentation, characterization, quarantine, molecular biology, bioinformatics and low and ultra low temperature conservation

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

On-going (in-house) project:



- National: 85
- International: Nil
- Total grants (research grant per annum): Rs. ~ 700 lakhs

18. Inter-institutional collaborative projects and associated grants received

- National collaboration: Nil
- International collaboration: Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

- National (DST, DBT, NOVOD Board, MoEF &CC, etc.): 30
- International: 2
- Total grants: Rs. 1566 lakhs

20. Research facility / centre with

- State recognition: ISO 9001-2008 standard
- National recognition:
- International recognition: ICAR-Bioversity International Centre of Excellence on in vitro conservation and cryopreservation

21. Special research laboratories sponsored by / created by industry or corporate bodies

Nil

22. Publications:

Number of papers published in peer reviewed journals (national/international):

About 2,000 (average 50 per faculty)

The best five publications of each faculty member of PGR discipline are listed below:

S. No.	Name	Best 5 publications
Principal Scientists		
1.	Anuradha Agrawal	<p>Agrawal A, R Sanayaima, R Tandon and RK Tyagi (2010) Cost-effective <i>in vitro</i> conservation of banana using alternatives of gelling agent (isabgol) and carbon source (market sugar). <i>Acta Physiologia Plantarum</i>, 32: 703-711.</p> <p>Sholi NJY, A Chaurasia, A Agrawal and NB Sarin (2009) ABA enhances plant regeneration of somatic embryos derived from cell suspension cultures of plantain cv. Spambia (<i>Musa sp.</i>). <i>Plant Cell Tissue Organ and Culture</i>, 99: 133-140.</p> <p>Agrawal A, C Mahalakhsmi and RK Tyagi (2008) Use of commercial sugar, isabgol and ordinary water in culture medium for conservation of <i>Curcuma longa</i> L. <i>Journal of Plant Biochemistry and Biotechnology</i>, 17: 85-89.</p> <p>Agrawal A, RK Tyagi and R Goswami (2008) Cryopreservation of subgroup Monthan (ABB) of Indian cooking bananas (<i>Musa spp.</i>) <i>Current Science</i>, 94: 1125-1128.</p> <p>Tyagi RK, A Agrawal and A Yusuf (2006) Conservation of <i>Zingiber</i> germplasm through in vitro rhizome formation. <i>Scientia Horticulturae</i>, 108: 210-219.</p>
2.	Sunil Archak	<p>Archak S and Kumar V (2013) Portable search engine for registered crop germplasm: a new concept for enhancing access to information on plant genetic resources. <i>Plant Genetic Resources: Characterization and Utilization</i> 11: 62-67.</p>



		<p>Archak S, AB Gaikwad, KR Swamy and JL Karihaloo (2009) Genetic analysis and historical perspective of cashew (<i>Anacardium occidentale</i> L.) introduction into India. <i>Genome</i>, 52:222-30.</p> <p>Archak S, V Lakshminarayana Reddy and J Nagaraju (2007) High-throughput multiplex microsatellite marker assay for detection and quantification of adulteration in Basmati rice (<i>Oryza sativa</i>). <i>Electrophoresis</i>, 28:2396-405.</p> <p>Archak S, Eshwar Meduri, P Sravana Kumar and J Nagaraju (2007) InSatDb: A microsatellite database of fully sequenced insect genomes. <i>Nucleic Acids Research</i>, 35: D36-D39.</p> <p>Archak S and Nagaraju J (2007) Computational prediction of rice (<i>Oryza sativa</i>) miRNA targets. <i>Genomics, Proteomics and Bioinformatics</i> 5: 196-206.</p>
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Scientists		
52.	Yasin Jeshima	<p>Pandey S, Devi C, Kak A, JK Yasin and V Gupta (2013) Breaking seed dormancy in sweet gourd (<i>Momordica cochinchinensis</i>). <i>Seed Sci. & Technol.</i> 41 (1): 133-136</p> <p>Yasin JK, K Bhat, MA Nizar, S Rajkumar, M Verma, J Radhamani, N Verma and S Pandey (2013) Alternate antioxidant defence system in moisture stress responsive accessions of horse gram. <i>Legume Research</i>. (in Press)</p> <p>Ramya KT, RA Fiyaz and Yasin JK (2013) "SMART" agriculture for nutritional security. <i>Current Science</i>. 105 (11):1458</p> <p>Verma N, SS Ranga, Yasin JK, S Kumar and AK Singh (2013) Chickpea genetic resources to enhance production in changing climatic scenario. <i>Legume Research (in Press)</i></p> <p>Yasin JK, S Srivignesh, PT Prathima, J Nanjundan and M Arumugam Pillai (Eds.) (2012) Merging Plant Breeding with crop biotechnology. <i>New India publishing Ltd.</i> 348.</p>
53.	Vikender Kaur	<p>V Kaur, RK Behl, S Singh and S Madaan (2011) Endosperm and pericarp size in wheat (<i>Triticum aestivum</i> L.) grains developed under high temperature and drought stress conditions. <i>Cereal Research Communications</i>, 39(4): 515-524</p> <p>V Kaur and RK Behl (2010) Grain yield in wheat as affected by short periods of high temperature, drought and their interaction during pre- and post- anthesis stages. <i>Cereal research communications</i>, 38(4): 514-520.</p> <p>V Kaur, RK Behl, T Shinano and M Osaki (2008) Interacting effects of high temperature and drought stresses in wheat genotypes under semiarid tropics- an appraisal. <i>Tropics</i>, 17(3): 225-235.</p> <p>Bhasker P, S Singh, Mathiyazhagan, V Kaur, R Bala and S Kumar (2010) Rice improvement strategy in relation to climate change. In: National Conference on Environment degradation: Effects, challenges and remedies organised by JCD Vidyapeeth, Sirsa, Haryana on dated Feb. 25-28, 2010.</p>



54.	Amit Kumar	<p>Singh R, D Narzary, J Kumari, AK Singh, S Kumar, A Kumar (2013) Molecular diversity and SSR transferability in Vetiver grass (<i>Vetiveria zizanioides</i>). <i>Industrial crops and products</i>.</p> <p>Singh N, DR Choudhury, AK Singh, S Kumar, K Srinivasan, RK Tyagi, NK Singh, R Singh (2013) Comparison of SSR and SNP markers in estimation of genetic diversity and population structure of Indian rice varieties. <i>PLOS ONE</i> 10.1371 /journal. pone .0084136</p> <p>Singh AK, MK Rana, S Singh, S Kumar, R Kumar (2013) CAAT box derived polymorphism (CBDP): a novel promoter targeted molecular marker for plants. <i>Journal of Plant Biochemistry and Biotechnology</i> DOI 10.1007/s13562-013-0199-5.</p> <p>Rana MK, A Kashika, S Singh and AK Singh (2012) Multi-locus DNA fingerprinting and genetic diversity in Jute (<i>Corchorus spp.</i>) based on sequence related amplified polymorphism (SRAP). <i>Journal of Plant Biochemistry and Biotechnology</i>. DOI:10.1007/s13562-012-0104-7.</p> <p>Singh AK, MK Rana, S Singh, S Kumar and R Singh (2012) Isolation and expression analysis of a CAS15 gene from white clover. <i>Vegetos</i> 25 (1): 354-361.</p>
55.	R. Parimalan	<p>Parimalan R, G Mahendranath, and P Giridhar (2013) Analysis of water soluble polysaccharides as a potential chemotaxonomic marker for landraces in <i>Bixaorellana</i>. <i>Indian J. Biochem. Biophys.</i> (Accepted).</p> <p>Parimalan R, P Giridhar and GA Ravishankar (2011) Enhanced shoot organogenesis in <i>Bixaorellana</i> L. in the presence of putrescine and silver nitrate. <i>Plant Cell Tiss. Organ Cult.</i>, 105(3): 285-290.</p> <p>Parimalan R, A Venugopalan, P Giridhar and GA Ravishankar, (2011) Somatic embryogenesis and <i>Agrobacterium</i>-mediated transformation in <i>Bixaorellana</i> L. <i>Plant Cell Tiss. Organ Cult.</i>, 105(3): 317-328.</p> <p>Mahendranath G, A Venugopalan, R Parimalan, P Giridhar and GA Ravishankar (2011) Annatto pigment production in root cultures of <i>Achiote</i> 106(3): 517-522.</p> <p>Narasimha Prasad, BC Gururaj, HB Vinod Kumar, P Giridhar, R Parimalan, A Sharma and GA Ravishankar (2006) Influence of 8-Methyl-nonenoic Acid on Capsaicin Biosynthesis in In-Vivo and In-Vitro Cell Cultures of <i>Capsicum</i> Spp. <i>J. Agr. Food Chem.</i> 54 1854 - 1859.</p>

23. Details of patents and income generated

Patents:

1. Patent No/Application No: 245749 Title : Process enabling simultaneous detection of two transgenes namely 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS or CP4EPSPS) gene and cauliflower
2. Patent No/Application No: 254341 Title : Process enabling simultaneous detection of two transgenes namely human serum albumin (HAS) and bar genes using a multiplex polymerase chain reaction
3. Patent No/Application No: 258165 Title : Diagnostic kit based on polymerase chain reaction for detection of cry1Ac gene

Copyrights

1. 30267/2008 Software "IINDUS" (Indian Information System as per DUS Guidelines).
2. 5760/2006 Development of Crop DNA Fingerprinting Database Software Package
3. 32399/2009 Development of Band size-Binary Program
4. 2666/2013 Molecular Binary Data Analysis Software

Technology transferred:

1. PCR based detection assays and protocols for ten Genetically Modified (GM) crops
Amar Immunodiagnosics Pvt Ltd., Hyderabad (1.5 lakh)
Basmati Export Development Foundation, Modipuram (4 lakh)
Punjab Biotechnology Incubator, Mohali (4 lakh)



2. Application of DNA-based markers to differentiate citrus root stocks
MSSC Ltd Akola and K.V.K., Durgapur (2 lakh)

24. Areas of consultancy and income generated

-

25. Faculty selected nationally / internationally to visit other laboratories / institutions/industries in India and abroad

-

26. Faculty serving in

- a) National committees b) International committees c) Editorial Boards d) any other (please specify)

-

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

-

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/ industry/institute

None

29. Awards/ recognitions received by students at the national and international level

List of the IARI Merit Medals Students

S.No.	Name of Student	Roll No.	Year of submission / Award of degree	Any Medal of Award received for thesis
1.	M. Selvendran	3966	2000	IARI Merit Medal
2.	Y. Amarawathi	4049	2001	IARI Merit Medal
3.	D. Kumutha	4217	2003	IARI Merit Medal
4.	H. Mohan	4298	2004	IARI Merit Medal
5.	Sunaina Singh	4382	2005	Award of Best Student of the year
6.	Ramya, P.	4538	2007	IARI Merit Medal
7.	Gore Padmavati Ganpat	20328	2014	IARI Merit Medal

30. Seminars/Conferences/Workshops organized and the source of funding national/international) with details of outstanding participants, if any.



S. No.	Seminar/ Conference/ Workshops	Source of Funding	Details of participants
1.	<i>In vitro</i> and Cryopreservation Techniques for Conservation of Plant Genetic Resources.	Based on training fee from each of the participants	Different countries of the World including from India.
2.	National Orientation Course on Biosafety Considerations for Evaluation of Transgenic Crops.	DBT, Funded Training Programme	24, participants
3.	Seed Health Testing and Quality Production.	G.B. Pant Nagar Training Programme	10, participants
4.	Germplasm Exchange: Policies and Procedures in India.	ICAR, Training	24, participants NARS and Pvt. Corp.
5.	Winter school on Biosecurity and Biosafety: Policies, Procedures and Issues.	ICAR , Training	22, participants
6.	Current Regulations and Policies for Access to Genetic Resources''	ICAR, Training	25 participants NARS
8.	Crop Gene Expression Data Analysis and Structural Bioinformatics	NAIP, funded Training	
9.	Diagnostic Methods for detection and Identification of Pests of seed and other Planting Material and their Management.	NBPGR, Training Prog.	
11.	Molecular Diagnostics for Risk Assessment and management of Genetically Modified crops.	NAIP, Funded training Programme	
12.	Role of under-utilized and Neglected Plant Genetic Resources in Health and Nutritional Security	DAC,	23

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 standard

32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	1	-	-
Ph.D.	15	3	-	20.0	-

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the State	% of students from universities outside the State	% of students from other countries
Ph.D.	50%	-	50%	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.

Civil Service: 5



Indian Forest Services:	5
State Departments:	10
ARS:	16
Others:	8

35. Student progression

Student progression	Percentage against enrolled
UG to PG	Not applicable
PG to M.Phil.	Not applicable
PG to Ph.D.	70%
Ph.D. to Post-Doctoral	Nil
Employed Campus selection Other than campus recruitment	Nil 100%
Entrepreneurs	Nil

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	5%
From other universities within the state	15%
From universities from other States from	80%
Universities outside the country	-

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

-

38. Present details of departmental infrastructural facilities with regard to

- Library: Available
- Internet facilities for staff and students: Available
- Total number of class rooms: Two
- Class rooms with ICT facility: Nil
- Student's laboratories: Nil
- Research laboratories: 6 (Specific PGR management activities)

39. List of doctoral, post-doctoral students and Research Associates

- from the host institution/university: Nil
- from other institutions/universities: Nil

40. Number of post graduate students getting financial assistance from the university

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Nil



42. Does the department obtain feedback from

- a. Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?
- b. Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?
- c. Alumni and employers on the programmes offered and how does the department utilize the feedback?

43. List the distinguished alumni of the department (maximum 10)

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

45. List the teaching methods adopted by the faculty for different programmes.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

47. Highlight the participation of students and faculty in extension activities.

48. Give details of “beyond syllabus scholarly activities” of the department.

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in activities of PGR club are compulsorily done by all students.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

- Extent of diversity present in crop species and populations
- Appropriate conservation strategies for diversity available in different crops
- Safe germplasm exchange
- Capacity building and awareness on agrobiodiversity conservation and use

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strengths

- Committed and competent faculty
- State-of-the-art laboratory facilities for quality research

Weaknesses

- Reluctance of faculty and students to undertake field-based research problems
- Limited research on PGR policy issues

Opportunities

- PGR has to branch out to a broader range of thematic areas, to open up more career opportunities for its graduates, such as, Bio-diplomacy, Law, Environmental accounting, Economics and Entrepreneurship studies



- It may also be worth looking at having short/ diploma courses beside 2-year research-based M.Sc. courses and Ph.D. programmes on
 - ”Agrobiodiversity for Climate Change” for policy managers
 - ”Health, Nutrition and Agrobiodiversity”

Challenges

- Limited job and career opportunities for PGR graduates
- Lack of systems approach in agrobiodiversity related education, extension and research
- Weak multidisciplinary collaboration

52. Future plans of the department.

The future plans of the department with regard to Postgraduate research include:

- Assessment of diversity loss over time and space and approaches to measuring genetic erosion on-farm.
- Identification of genetically important crop populations, and farming systems that are priorities for conservation in traditional production systems and investigating different options for “adding value” to these populations in a given social, economic and ecological context.
- Study of functional polymorphism in plant genetic resources of important crops.
- Characterization of germplasm for enhanced utilization using tools of comparative genomics.
- Providing scientific basis for seed conservation strategies and for devising effective seed conservation protocols.
- Investigating molecular aspects of seed longevity.
- Investigating seed storage behaviour as a prerequisite for storage strategy and factors responsible for recalcitrance in seeds.
- Development of cost-effective *in vitro* conservation and cryopreservation protocols.
- *Developing DNA based diagnostics to check unauthorized GM events and to monitor unintentional presence of transgenes in germplasm collections.*



xviii) Division of Plant Pathology

1. Name of the Department:

Division of Plant Pathology earlier named as Division of Mycology and Plant Pathology

2. Year of establishment:

It was a section of Mycology established in 1905

3. Is the Department part of a School/Faculty of the university?

School of Crop Protection

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc. D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Divisions of Entomology, Nematology, Agricultural chemicals, Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Soil Science and Agricultural Chemistry, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Divisions of Entomology, Nematology, Agricultural chemicals, Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Soil Science and Agricultural Chemistry, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)				13
Senior Scientist (Associate Professor)				5
Scientist (Assistant Professor)				8



Besides above there are two permanent faculties in the discipline who are posted at sister department or sister institute as follows:

1.	Dr. Atul Kumar, Division of Seed Science and Technology, IARI, New Delhi-12	Permanent faculty in the discipline of Plant Pathology from other Department
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11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance:

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
R.K. Jain	Ph.D.	Dean and Joint Director (Education)	Plant Pathology (Virology)	36	2	6
Rashmi Aggarwal	Ph.D.	Head of the Division	Plant Pathology (Fungal Pathology)	30	4	9
Pratibha Sharma	Ph.D.	Professor	Plant Pathology (Fungal Pathology)	39	4	14
V.K. Baranwal	Ph.D.	Principal Scientist	Plant Pathology (Virology)	30	3	5
R. Gogoi	Ph.D.	Principal Scientist	Plant Pathology (Fungal Pathology)	25	4	1
A. Kumar	Ph.D.	Principal Scientist	Plant Pathology (Bacteriology)	18	2	-
G. P. Rao	Ph.D.	Principal Scientist	Plant Pathology (Virology)	26	2	14
T. Prameela Devi	Ph.D.	Principal Scientist	Plant Pathology (Mycology)	25	2	2
Parimal Sinha	Ph.D.	Principal Scientist	Plant Pathology (Fungal Pathology)	22	4	2
Dinesh Singh	Ph.D.	Principal Scientist	Plant Pathology (Bacteriology)	25	1	-
Bikash Mandal	Ph.D.	Principal Scientist	Plant Pathology (Virology)	21	2	2
K. K. Biswas	Ph.D.	Principal Scientist	Plant Pathology (Virology)			
Krishna Kumar		Principal Scientist	Plant Pathology (Fungal Pathology)	16	1	-
K.K. Mondal	Ph.D.	Principal Scientist	Plant Pathology (Bacteriology)	15	2	3
R. K. Sharma	Ph.D.	Senior Scientist	Plant Pathology (Mycology)	18	3	-
Anirban Roy		Senior Scientist	Plant Pathology (Virology)	12	1	2
V. Sahnmugam	Ph.D.	Senior Scientist	Plant Pathology (Fungal Pathology)	15	1	2
D. Bahukhandi	Ph.D.	Senior Scientist	Plant Pathology (Mycology)	15	2	



Lakshman Prasad	Ph.D.	Senior Scientist	Plant Pathology (Mycology)	11	5	
Deeba Kamil	Ph.D.	Scientist Senior Scale	Plant Pathology (Mycology)	6	1	-
Bishnu Maya Bashyal	Ph.D.	Scientist	Plant Pathology (Fungal Pathology)	6	1	-
R.K. Saritha	Ph.D.	Scientist	Plant Pathology (Virology)	8	-	-
Vaibhav K. Singh	Ph.D.	Scientist	Plant Pathology (Fungal Pathology)	6	-	-
G. Prakash	Ph.D.	Scientist	Plant Pathology (Fungal Pathology)	2	-	-
N. Srinivasa	Ph.D.	Scientist	Plant Pathology (Fungal Pathology)	1	-	-
Basavaraj	M.Sc.	Scientist	Plant Pathology (Virology)	2	-	-
Timmanna	M.Sc.	Scientist	Entomology (Virology)	1	-	-

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S. No.	Name of the Faculty	Status
1.	Dr. C.D. Mayee, Former chairman, ASRB, New Delhi	Adjunct Professor
2.	Dr. Anupam Verma, Former Dean, IARI, New Delhi	Adjunct Professor
3.	Dr. P. Usha Sarma, Ex- Scientist, CSIR Centre for Biochemical Technology, New Delhi	Emeritus Scientist, CSIR
4.	Dr. Dillip Laxman, Research Plant Pathologist, Floral and Nursery Plants Research Unit, United States Department of Agriculture, USA.	Visiting Scientist, USDA
5.	Prof. N. K. B.Adhikaram, Department of Botany, Faculty of Science, University of Peradeniya, Peradeniya, Sri Lanka.	Visiting Scientist, Sri Lanka

13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M. Sc. = 1:2.1 and Ph.D. = 1.15:1

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled
1.	Technical	45	17
2.	Administrative	10	8
3.	Supportive	75	29

16. Research thrust areas as recognized by major funding agencies:

Diagnostics, Genomics, Transgenics, Biocontrol, Host Pathogen Interaction



17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Inter-institutional collaboration	Total Grants Received (Lakh Rupees)
Dr. V.K. Baranwal	Referral Centre for Virus Testing of Tissue Culture Raised Plants (DBT)	Nil		69.97 lakhs (2015-2018)
	Outreach project – “Diagnosis and Management Strategies for virus and virus like diseases in crops” (ICAR)			Allocated by Institute (Rs. 13 lakh) (2013-2014)
	Validation of serological diagnostic reagents and kits for plant viruses affecting horticultural crops (BIRAC)			61.20 lakhs (2014-2017)
	ICAR Networking Transgenic papaya (ICAR)			7.07 lakhs (2013-2014)
	ICAR Networking Transgenic Banana (ICAR)			7.07 lakhs (2013-14)
Dr. Shelly Praveen	RNAi and other cutting edge technological interventions to develop insect-pest, diseases and viruses tolerant tomato hybrids for Indian and international markets (DBT-BIPP)	Nil		52.00 lakh (2011-2015)
	Functional significance of “Potyviral HCPro interactions with host and vector factors” (DST)			36.74 lakhs (2010-2013)
	Developing of Dual Resistance in Tomato against virus infection and insect damage (Phase I) (DBT)			40.74 lakhs (2011-2014)
Dr. Rashmi Aggarwal	Development of suitable formulation using indigenous strains of NE India for crop improvement: a combined holistic approach (DBT)	Nil		51.656 lakh (2012-2015)
	Pathogenomics genome sequencing of <i>Puccinia striiformis</i> (ICAR)			50.00 lakhs (2014-2017)
Dr. P.Sinha	<i>Phytophthora</i> , <i>Fusarium</i> and <i>Ralstonia</i> diseases of horticultural and field crops (Sub Project: <i>Fusarium</i> wilt of chickpea) (ICAR)	Nil		34.52 lakh (2008-2014)
Dr. A. Kumar	Genome Mining of Plant associated endophytic bacteria for natural projects (DBT)	Nil		85.60 Lakhs (2011-2015)
	Understanding the mechanisms of non host resistance in rice and wheat against rust and blast (NFBSFARA)			228.11 lakhs (2013-2016)
	Integrated approaches to eradicate pomegranate bacterial blight (ICAR-Flagship)			23.16 lakhs (2014-2017)



Dr. G.P. Rao	Molecular Characterization of phytoplasmas associated with sugarcane in India (DST)	Nil		32.44 lakhs 2012-Continuing
	Identification and characterization of sesame phyllody disease and its secondary spread in nature (DBT)			19.80 lakhs 2012 -Continuing
	Cataloguing of Phytoplasma diseases of major crops of North East Region of India and molecular characterization (DBT)			25.04 lakhs (2015-2018)
Dr. Pratibha Sharma	Outreach Programme on “Diagnosis and Management of Leaf sport diseases of field and horticultural crops in vegetables”. (ICAR) – network)	Nil		17.56 lakhs (2009-2017)
	Contract Research project on “High Density CFU Microbial Formulation” (Contractual – International Panacea Limited, New Delhi)			7.0 lakhs (per annum) (2011-continuing)
	Niche area of Excellence’s project entitled “Exploration and Exploitation of <i>Trichoderma</i> as antagonist ((ICAR) – network)			40.0 lakhs (2012-2016)
	Stress Tolerant Rice for Africa and South Asia (STRASA) (BMGF Fund, IRRI)	With IRRI.		6.00 lakhs (2011-1014)
Dr. Bishnu Maya Bashyal	Relationship between <i>Sclerotium rolfsii</i> , <i>Rhizoctonia solani</i> , the soil and climatic variables in three major cropping system in the country and identification of markers for resistance to <i>Sclerotium rolfsii</i> (ICAR NFBSFARA)	Nil		75.36 lakhs (2013-2018)
	Unraveling the role of different <i>Fusarium</i> spp. Associated with complex etiology of bakanae disease of rice (DST)			29.58 lakhs (2014-2017)
Dr. Dinesh Singh	Outreach project on Phytophthora, <i>Fusarium</i> and <i>Ralstonia</i> diseases of horticultural and field crops (ICAR)	Nil		Yet to be decided
Dr. K.K. Mondal	Development of spectroscopy methods for detection and quantification of and contaminants in fruit and juices and milk (NFBSRFA)	Nil		47.06 2012-2015
	Deciphering the role of Xop -T3SS effectors of <i>Xanthomonas axonopodis</i> pv. <i>punicae</i> in the modulation of PAMP-triggered immune response in pomegranate (DBT)			Rs. 42.698 (2015-2018)
	Characterization of <i>Xanthomonas oxyzae</i> pv. <i>oxyzae</i> strain from north-west and eastern regions for screening of Xop-like effectors to investigate its role as virulence determinants to induce blight. (DBT)			12.6 lakhs (2014-2015)



Dr. Bikash Mandal	Novel strategies for molecular diagnosis of plant viruses (NAIP, ICAR)	Nil		37.36 lakhs (2013-2014)
	Development of genetically engineered vaccines against economically important poultry viral diseases (NFBSRFA, ICAR)			26.9 lakhs (2013-2014)
Dr. T. Prameela Devi	Development of Molecular markers for identification of <i>Trichoderma</i> isolates (DBT)			70.33 lakhs (2009-2013)
Dr. K. K. Biswas	Development of citrus tristeza virus resistant citrus plant (DBT)	Nil		26.92 lakhs (2012-2015)
	Multiplexed fast-per based detection kit for a group of viruses affecting potato in India (DBT/BIRAC)			14.00 lakhs (2013-2014)

18. Inter-institutional collaborative projects and associated grants received:

a). National collaboration

Please refer above table

b). International collaboration

With IRRI- STRASA project

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

Referral Centre for Virus Testing of Tissue Culture Raised Plants (DBT)

20. Research facility / centre with

State recognition

Clearance Certification of export/import materials-Directorate of Plant Protection, Quarantine & Storage, Faridabad

National recognition

- Transmission Electron Microscopy
- Confocal Microscopy
- Containment facility
- Referral Centre for Virus Testing of Tissue Culture Raised Plants
- Indian Type Culture Collection (ITCC)
- Herbarium Cryptogamme Indae Orientalis (HCIO)

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable



22. Publications:

Name of Scientist	No. of papers published in peer reviewed journals	Mono-graphs	Chapters in Books	Edited Books	Number listed in International Database	Citation Index – range / average	SNIP range / average	SJR range / average	Impact Factor– range / average	h-index
R.K. Jain	27	-	9	3	-				7.9-9.1	-
Rashmi Aggarwal	139	-	35	2	-	300	-	-	-	8
Pratibha Sharma	102	-	39	9	-	-	-	-	-	-
V. K. Baranwal	73	-	11	2	-	465	-	346 – 3492	7.3 (6.0 -11.04)	11
R. Gogoi	56	-	16	5	-	78	-	-	4.0-8.59	5
A. Kumar	60	-	10	1	-	-	-	-		-
G. P. Rao	24	-	6	1	-	766	-	-	3.7/8.74 Av 6.22	15
T. Prameela Devi	35	-	5	3	-	19	-	-	3.17-7.55	3
Parimal Sinha	25	-	9	1	-	-	-	-	-	5
Dinesh Singh	74	-	32	2	-	-	-	-	-	-
Bikash Mandal	74		8	2	-	447	-	-	-	11
K. K. Biswas										
Krishna Kumar										
K.K. Mondal	37	-	7	1	-	135	54	0.78-1.05	-	7
R. K. Sharma	16	-	10	5	-	-	-	-	-	-
Anirban Roy	43	-	6	-	-	305	-	-	0-8.827	10
V. Sahn mugam	64	-	3	-	-	1-56	-	-	6.1-10.81	11
D. Bahukhandi	22	-	10	2	-	61	-	-	-	5
Lakshman Prasad	22	-	-	1	-	14	-	-	-	2
Deeba Kamil	26	-	8	4	-	19	-	-	3.17-7.04	3
Bishnu Maya Bashyal	21	-	9	1	-	32	-	-	3.11-7.35	3
R.K. Saritha	1	-	1		-	-	-	-	0-8.28	-
Vaibhav K. Singh	23	-	7	3	-	-	-	-	-	-
G. Prakash	2	-	-	-	-	-	-	-	4.59-9.51	-
N. Srinivasa	6	-	2	-	-	-	-	-		-
Basavaraj	2	-	-	-	-	-	-	-	6.36-9.73	-
Timmanna	-	-	-	-	-	-	-	-	-	-



Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

S. No.	Publications	NAAS Rating
1.	Aundy Kumar, Munder A, Aravind R, Eapen SJ, Tümmler B, and Raaijmakers JM (2012) Friend or foe: genetic and functional characterization of plant endophytic <i>Pseudomonas aeruginosa</i> . <i>Environmental Microbiology</i> , DOI: 10.1111/1462-2920.12031	12.24
2.	Prabha K and Baranwal VK (2012). The Genome Sequence of an Isolate of Indian Citrus Ringspot Virus infecting the Sweet Orange in India. <i>J. Virol.</i> 86(22):12446.	10.65
3.	Fátima TenaFernández, Inmaculada González, Paula Doblás, César Rodríguez, NanditaSahana, HarpreetKaur, ÓscarLlorca, Shelly Praveen and Tomas Canto (2013). The influence of cis-acting P1 protein and translational elements on the expression of Potato virus Y HCPro in heterologous systems and its suppression of silencing activity. <i>Molecular Plant Pathology</i> DOI: 10.1111/mpp.12025.	10.49
4.	Jyothsna P, Haq QMI, Priyanka Singh, Sumiya KV, Shelly Praveen, Ramaveer Rawat, Rob W Briddon and Malathi VG (2012). Infection of Tomato leaf curl New Delhi virus (ToLCNDV), a bipartite begomovirus with betasatellites results in enhanced level of helper virus components and antagonistic interaction between DNA B and betasatellites. <i>Applied Microbiology and Biotechnology</i> DOI 10.1007/s00253-012-4685-9.	9.81
5.	Sahana Nandita, Kaur Harpreet, Jain RK, Palukaitis Peter, Canto Tomas and Praveen Shelly (2014). The asparagine residue in the FRNK box of potyviral helper-component protease is critical for template function and subcellular localization. <i>Journal of General Virology</i> vir.0.060269-0.	9.53
6.	Sahana Nandita, Kaur Harpreet, Basavaraj, Tena Fatima, Jain Rakesh Kumar, Palukaitis Peter, Canto Tomas and Praveen Shelly (2012). Inhibition of the host proteasome facilitates Papaya ringspot virus accumulation and proteosomal catalytic activity is modulated by viral factor HcPro. <i>PLOS ONE</i> 7(12): e52546. doi:10.1371/journal.pone.0052546.	9.53
7.	Khanna A, Sharma V, Ellur RK, Shikari AB, Gopala Krishnan S, Singh UD, Prakash G, Sharma TR, Rathour R, Variar M, Prashanthi SK, Nagarajan M, Vinod KK, Bhowmick PK, Singh NK, Prabhu KV, Singh BD and Singh AK (2015) Development and evaluation of near isogenic lines for major blast resistance gene(s) in Basmati rice. <i>Theor. Appl. Genet.</i> DOI: 10.1007/s00122-015-2502-4.	9.51

Publication: NAAS Rating 8-9

S.No.	Publications	NAAS Rating
1.	Chunxu Song, Gustav Sundqvist, Erik Malm, Irene de Bruijn, Aundy Kumar, Judith van de Mortel, Vincent Bulone and Jos M Raaijmakers(2015) Lipopeptide biosynthesis in <i>Pseudomonas fluorescens</i> is regulated by the protease complex ClpAP <i>BMC Microbiology</i> , 15:29 doi:10.1186/s12866-015-0367-y	8.98
2.	Kumar A, Prameela TP, Bhai RS, Siljo A, Anandaraj M and Vinatzer BA (2014). Host specificity and genetic diversity of race 4 strains of <i>Ralstonia solanacearum</i> , <i>Plant Pathology</i> (BSPP), DOI: 10.1111/ppa.12189, http://onlinelibrary.wiley.com/doi/10.1111/ppa.12189/abstract .	8.97
3.	Goswami Suneha, Sahana Nandita, Pandey Vanita, Doblás Paula, Jain RK, Palukaitis Peter, Canto Tomas and Praveen Shelly (2012). Interference in plant defense and development by non-structural protein NSs of groundnut bud necrosis virus. <i>Virus Research</i> . 163: 368–373.	8.83
4.	Mandal B, Shilpi, S, Barman AR, Mandal S and Varma A. (2013). Nine novel DNA components associated with the fourkey disease of large cardamom: Evidence of a distinct babuvirus species in Nanoviridae. <i>Virus Research</i> .	8.83
5.	Dubey SC, Bhavani R and Singh B (2011). Integration of soil application and seed treatment formulations of <i>Trichoderma</i> species for management of wet root rot of mungbean caused by <i>Rhizoctonia solani</i> . <i>Pest Manag Sci</i> 67: 1163-1168.	8.74
6.	Akhter Md. Shamim, Holkar Somnath Kadappa, Akanda Abdul Mannan, Mandal Bikash, Jain Rakesh Kumar (2012). First report of Groundnut bud necrosis virus in tomato in Bangladesh. <i>Plant Disease</i> , dx.doi.org/10.1094/PDIS-02-12-0199-PDN.	8.74



7.	Baranwal VK, Singh P, Jain RK and Joshi S. First Report of <i>Garlic virus X</i> Infecting Garlic in India. <i>Plant Disease</i> 9:1197.	8.74
8.	Kumar S, Sawant S, Sawant IS, Prabha K, Jain RK and Baranwal VK (2012). First report of Grapevine leafroll-associated virus 1 infecting grapevines in India. <i>Plant Dis.</i> 96:1828.	8.74
9.	Mandal B, Jain RK, Krishnareddy M, Krishna Kumar NK, Ravi KS and Pappu HR (2012). Emerging Problems of Tospoviruses (<i>Bunyaviridae</i>) and their Management in the Indian Subcontinent. <i>Plant Disease.</i> 96(4): 468-479.	8.74
10.	Mazumder S and Baranwal VK (2009). First report of <i>Garlic common latent virus</i> in garlic from India. <i>Plant Disease.</i> 93: 106.	8.74
11.	Mondal KK., Verma, G., Mani, C. 2015. Emergence of bacterial panicle blight caused by <i>Burkholderia glumae</i> in North India. <i>Plant Dis.</i> In press.	8.74
12.	Aundy Kumar, T.P. Prameela, R. S. Bhai, A. Siljo, M. Anandaraj, and B. A. Vinatzer, (2014). Host specificity and genetic diversity of race 4 strains of <i>Ralstonia solanacearum</i> , <i>Plant Pathology</i> (BSPP), DOI: 10.1111/ppa.12189, ttp://onlinelibrary.wiley.com/doi/10.1111/ppa.12189/abstract.	8.73
13.	Sharma M, Babu TK, Gaur PM, Ghosh R, Rameshwar T, Chaudhary RG, Upadhyay JP, Gupta Om, Saxena DR, Kaur L, Dubey, SC, Anandani VP, Harer PN, Rathore A and Pande S (2012). Identification and multi-environment validation of resistance to <i>Fusarium oxysporum</i> f. sp. <i>ciceris</i> in chickpea. <i>Field Crops Res.</i> 135: 82-88.	8.61
14.	Singh VK, Singh A, Singh SP, Ellur RK, Choudhary V, Sarkhel S, Singh D, Gopalakrishnan S, Nagarajan M, Vinod KK, Singh UD, Rathore R, Prasanthi SK, Agrawal PK, Bhatt JC, Mohapatra T, Prabhu KV and Singh AK. (2011). Incorporation of blast resistance into “PRR78”, an elite Basmati rice restorer line, through marker assisted backcross breeding. <i>Field Crops Research.</i> Doi:10.1016/j.fcr.2011.12.003.	8.61
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77	Vishnu Vats, R. K. Upadhyaya and Pratibha Sharma (2010). Synthesis and antifungal activity of 2-ketophenyl-3-substituted aryl-1-thiazolidin-4-ones. <i>E-Journal of Chemistry</i> , 7(3):1040-1044.	6.66
78	Jahani M, Aggarwal Rashmi, Gupta Sangeeta, Sharma Sapna and Dureja P (2013). Purification and characterization of a novel toxin from <i>Bipolaris sorokiniana</i> causing spot blotch of wheat and analysis of variability in the pathogen. <i>Cereal Res. Comm.</i> 42(2): 252-261.	6.62
79	Jambhulkar P.P. and Sharma P. (2014). Development of bioformulation and delivery system of <i>Pseudomonas fluorescens</i> against bacterial leaf blight of rice (<i>Xanthomonas oryzae</i> pv. <i>oryzae</i>). <i>Journal of Environmental Biology</i> , 35(5):843-9.	6.55
80	Prabhakaran N, Prameeladevi T, Sathiyabama M and Kamil D 2015. Screening of different <i>Trichoderma</i> species against agriculturally important foliar plant pathogens. <i>Journal of Environmental Biology</i> 36(1): 191-198.	6.5
81	Shrawan Singh, D.R. Singh, Krishna Kumar and Ajanta Birah (2014). Eco-friendly management modules for bacterial wilt (<i>Ralstonia solanacearum</i>) of tomato for protected cultivation in a tropical island ecosystem. <i>Biological Agriculture & Horticulture</i> 30: 217-227.	6.51
82	Parmesh, D., and Baranwal, V. K. (2015). Production of virus-free garlic (<i>Allium sativum</i> L.) through meristem tip culture after solar or hot air treatment of cloves. <i>The Journal of Horticultural Science & Biotechnology</i> (In Press)	6.5
83	Bashyal, B.M., Chand Ramesh and Rashmi Aggarwal (2014). Emergence of aggressive population in the <i>Bipolaris sorokiniana</i> of barley (<i>Hordeum vulgare</i> L.) through anastomosis. <i>Proceedings of the National Academy of Sciences, India Section B: Biological Sciences.</i> DOI10.1007/s40011-014-0391-y.	6.40



84	Aggarwal R., Sharma, S., Gupta S., Jahani M., Banerjee S., Singh V. B., Bashyal B. M., Srinivas P., (2014). Phylogenetic relationship among <i>Bipolaris</i> species based on morphological and molecular variability in internal transcribed spacer region of the nuclear ribosomal DNA. <i>Res. J. Biotech.</i> 9(10): 1-8.	6.26
85	Priyanka, K., Dubey, S.C. and Singh, A.K. (2014). Intergenic spacer region based marker for identification and quantification of <i>Fusarium oxysporum</i> f. sp. <i>ciceris</i> in chickpea plant using real time PCR assay. <i>Res. J. Biotech</i> 9: 36-40.	6.26
86	Upadhyay BK, Dubey SC, Singh, Ravindra and Tripathi Aradhika (2013). Morpho-molecular characterization of Indian isolates of <i>Rhizoctonia solani</i> infecting mungbean. <i>Res. J. Biotech.</i> 8: 92-99.	6.26
87	Dubey, A.K., Pandian, R.T.P., Rajashekara, H., Singh, V.K., Kumar, G., Sharma, P., Kumar, A., Krishnan, S.G., Singh, A.K., Rathour, R. and Singh, U.D. 2014. Phenotyping of improved rice lines and landraces for blast and sheath blight resistance. <i>Indian J. Genet.</i> , 74(4): 499-501.	6.19
88	R Abdul Fiyaz, S Gopala Krishnan, H Rajashekara, Ashutosh K Yadav, BM Bashyal , PK Bhowmick, NK Singh, KV Prabhu and AK Singh (2014). Development of high throughput screening protocol and identification of novel sources of resistance against bakanae disease in rice (<i>Oryza sativa</i> L.). <i>Indian J. Genet.</i> 74(4): 414-422.	6.19
89	Singh AK, Gopalakrishnan S, Singh VP, Prabhu KV, Mohapatra T, Singh NK, Sharma TR, Nagarajan M, Vinod KK, Singh D, Singh UD, Chander S, Atwal SS, Seth R, Singh VK, Ellur RK, Singh A, Anand D, Khanna A, Yadav S, Goel N, Singh A, Shikari AB, Singh A and Marathi B (2011). Marker assisted selection: a paradigm shift in Basmati breeding. <i>Indian J. Genet.</i> 71(2): 1-9.	6.19
90	Sharma RR, SinghDinesh and Singh Rajbir (2009). Studies on transportation losses and quality parameters in apple packed in different containers. <i>Indian J. Hort.</i> 66 (2): 245-248.	6.11
91	Shri Dhar and Singh D (2014). Performance of cauliflower genotypes for yield and resistance against black rot (<i>Xanthomonas campestris</i> pv. <i>campestris</i>). <i>Indian J. Hort.</i> 71(2): 197-201.	6.1
92	Kamil D, Prameeladevi T, Sabarinathan D and Prabhakaran N 2014. Comparative morphology, genetic variability and taxonomy of genus <i>Phoma</i> and its agriculturally important species. <i>Journal of Pure and applied Microbiology</i> 8(6): 5029-5044.	6.07
93	Devi TP, Prabhakaran N, Kamil D, Borah JL and Pandey P (2012) b. Development of species specific markers for detection of <i>Trichoderma</i> species. <i>Vegetos</i> 25(02):207-217.	6.04
94	Honnareddy, N., Rashmi Aggarwal, sapna Sharma, Sangeeta Gupta, Gyanenedra Singh, Bishnu M. Bashyal and HemavatiRanebennur (2014). Isolation and identification of defense responsive genes in wheat during incompatible interaction with <i>Bipolaris sorokiniana</i> (<i>Cochliobolus sativus</i>) using SSH technique. <i>VEGETOS</i> 27: 11-20. DOI: 10.5958/2229-4473.2014.00064.0	6.04
95	Kumar, N.; Singh, D.; Kumar, A.; Kumar, V.; Prasad, L.; Malik, V. and Bhatnagar, S.K. 2010. Evaluation of rice genotypes for resistance to blast (<i>Magnaporthevesia</i>). <i>VEGETOS</i> Vol. 23 (01): 137-143	6.04
96	Prasad, L.; Sagar, S.; Chaudhary, S.; Kumar, N. and Tomar, A. 2012. Determination of biodiversity using ITS-PCR-CAPS markers For <i>Trichoderma</i> sp. from rhizospheric soils of different locations in India. <i>VEGETOS</i> . Vol. 25 (2) : 336-341.	6.04
97	Purushottam; Saifali; Agarwal, R.K.; Bhilegonkar, K.N.; Tomar, A. and Prasad, L. 2011. Isolation and characterization of <i>E. coli</i> from food and environmental samples. <i>VEGETOS</i> 24 (1): 142-146	6.04
98	Akhter MS, Basavaraj YB, Akanda AM, Mandal B and Jain RK (2013). Genetic diversity based on coat protein of Papaya ringspot virus (Pathotype P) isolates from Bangladesh. <i>Indian J. Virol.</i> DOI 10.1007/s13337-013-0127-2.	6.0
99	Bashyal BM, Chand R, Kushwaha Chanda, Prasad LC and Joshi AK (2010). Improved <i>in vitro</i> technique for screening of barley (<i>Hordeum vulgare</i> L.) genotypes against toxin produced by spot blotch pathogen <i>Bipolaris sorokiniana</i> . <i>Indian Journal of Agricultural Sciences</i> 79(7):562-64.	6.0
100	Bashyal BM, Chand Ramesh, Prasad LC and Joshi AK (2012). Influence of growth stage on sensitivity to helminthosporol toxin of <i>Bipolaris sorokiniana</i> of barley (<i>Hordeum vulgare</i> L.). <i>Indian Journal of Agricultural Sciences.</i> 82(8): 724–726.	6.0



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102	Chigurupati Phaneendra KR Rao, SS, Jain RK and Mandal B (2011). <i>Tomato leaf curl New Delhi virus</i> is associated with Pumpkin Leaf Curl: A New Disease in Northern India. <i>Indian Journal of Virology</i> DOI:10.1007/s13337-011-0054-z.	6.0
103	Dubey SC, Tripathi Aradhika and Singh Birendra (2012). Combination of soil application and seed treatment formulations of <i>Trichoderma</i> species for integrated management of wet root rot caused by <i>Rhizoctonia solani</i> in chickpea. <i>Indian J. agric. Sci.</i> 82: 357–364.	6.0
104	Dubey SC, Tripathi Aradhika, Dureja P and Grower A (2011). Characterization of secondary metabolites and enzymes produced by <i>Trichoderma</i> species and their efficacy against plant pathogenic fungi. <i>Indian J. agric. Sci.</i> 81: 455-461.	6.0
105	Dubey SC, Tripathi Aradhika, Upadhyay BK and Thakur M (2011). Pathogenic behaviour of leguminous isolates of <i>Rhizoctonia solani</i> collected from different Indian agro-ecological regions. <i>Indian J. agric. Sci.</i> 81:64-69	6.0
106	Gazala IF Saad, Sahoo RN, Pandey Rakesh, Mandal Bikash, Gupta VK, Singh Rajendra and Sinha P (2013).Spectral reflectance pattern in soybean for assessing yellow mosaic disease. <i>Indian J. Virol.</i> 24:242-249.	6.0
107	Geetanjali S, Rakesh Kumar, Srivastava A, and Mandal Bikash (2011). Biological and Molecular Characterization of Two Distinct Tomato Strains of Cucumber mosaic virus based on Complete RNA-3 Genome and Subgroup Specific Diagnosis. <i>Indian J. Virol</i> 22(2):117–126.	6.0
108	Jhambulkar Prashant P and Sharma Pratibha (2013). Promotion of rice seedling growth characteristics by development and use of bioformulation of <i>Pseudomonas fluorescens</i> . <i>Indian Journal of Agricultural Sciences.</i> 83 (2): 136-142.	6.0
109	Kumar S, Baranwal VK, Joshi S, Arya M and Majumder S (2010) Simultaneous Detection of Mixed Infection of <i>Onion yellow dwarf virus</i> and an <i>Allexivirus</i> in RT-PCR for Ensuring Virus Free Onion Bulbs. <i>Indian J Virology</i> 21:64-68.	6.0
110	Majumder S and Baranwal VK (2011). Sequence Comparison and Phylogeny of Nucleotide Sequence of Coat Protein and Nucleic Acid Binding Protein of a Distinct Isolate of Shallot virus X from India. <i>Indian J Virology</i> 22: 63-65.	6.0
111	Md. Jameel Jhalegar, Ram Roshan Sharma and Singh D (2014). Antifungal efficacy of botanicals against major postharvest pathogens of Kinnow mandarin and their use to maintain postharvest quality. <i>Fruits</i> , 69: 223–237	6.0
112	Mehdi A and Baranwal VK (2010). Molecular characterization and phylogeny of a phytoplasma associated with phyllody disease of toria (<i>Brassica rapa</i> subspecies <i>dichotoma</i>) in India. <i>Indian J Virology</i> 20: 9-11.	6.0
113	Prabha K, Baranwal VK and Jain RK (2013). Applications of next generation high throughput sequencing technologies in characterization, discovery and molecular interaction of plant viruses. <i>Indian J Virology</i> DOI 10.1007/s13337-013-0133-4.	6.0
114	Raghavendra BT, Singh Dinesh, Yadava DK, Mondal Kalyan K and Sharma Pratibha (2013). Pathogenic variability and genetic diversity using BOX -PCR of <i>Xanthomonas campestris</i> spv. <i>campestris</i> isolated from cole crops. <i>Indian Journal of Agricultural Sciences</i> 83(10): 1090–1094.	6.0
115	Singh D, Shweta Sinha, Garima Chaudhary, D K Yadav and K K Mondal (2014). Genetic diversity of biovar 3 and 4 of <i>Ralstonia solanacearum</i> causing bacterial wilt of tomato using BOX- PCR, RAPD and hrp gene sequences. <i>Indian Journal of Agricultural Sciences</i> 84(3): 391–395.	6.0
116	Singh D, Sinha Shweta, Yadav DK and Chaudhary Garima (2014). Genetic Diversity of Biovar 3 and 4 of <i>Ralstonia solanacearum</i> Causing Bacterial Wilt of Tomato. <i>Indian Journal of Agricultural Sciences.</i> 84: 391–5.	6.0
117	Singh JK, Tarafdar A, Sharma SK and Biswas KK (2012). Evidence of recombinant <i>Citrus tristeza virus</i> Isolate Occurring in Acid Lime cv. Pant Lemon Orchard in Uttarakhand Terai Region of Northern Himalaya in India. <i>Indian J. Virol.</i> DOI 10.1007/s13337-012-0118-8	6.0



118	Singh MK, Haq QMR, Mandal B and Varma A (2012). Evidence of the Association of Radish leaf curl virus with Tobacco Yellow Leaf Curl Disease in Bihar, India. <i>Indian J. Virol.</i> DOI 10.1007/s13337-012-0060-9.	6.0
119	Singh, A.K., Sharma, V., and Singh, V.K. 2014. Effect of leaf extracts, fungicides and bio-agents against root rot of pea. <i>Res. on Crops</i> , 15(3): 651-654.	6.0
120	Usha Mina and Dubey SC (2010). Effect of environmental variables on development of Fusarium wilt in chickpea (<i>Cicer arietinum</i>) cultivars. <i>Indian J. agric. Sci.</i> 80: 231-234.	6.0
121	Vijayanandraj S, Yogita M, Das Amrita, Ghosh Amalendu and Mandal Bikash (2013). Highly efficient immune diagnosis of Large cardamom chirke virus using the polyclonal antiserum against Escherichia coli expressed recombinant coat protein. <i>Indian Journal of Virology</i> , DOI 10.1007/s13337-013-0159-7.	6.0
122	Choudhary, V. and Prasad, L.2012. Morpho-pathological, genetic variations and population structure of <i>Sclerotinia sclerotiorum</i> . <i>VEGETOS</i> , 25 (1): 178-183	6.04

23. Details of patents and income generated:

None

24. Areas of consultancy and income generated:

Fungal and bacterial Identification, supply and accessioned services:

Period	Fungal cultures Maintained at ITCC	No. of cultures identified	No. of cultures supplied	Revenue generated Rs.	No. of cultures accessioned
2004-05	3300	140	276	1,11,200	136
2005-06	3365	145	290	1,19,600	65
2006-07	3420	151	230	1,09,800	55
2007-08	3520	335	345	1,98,800	108
2008-09	3663	355	320	1,94,200	143
2009-10	3705	420	509	2,51,200	42
2010-11	3750	340	520	3,33,200	45
2011-12	3795	543	655	4,01,000	58
2012-13	3808	250	280	5,39,200	38
2013-14	3904	244	345	7,09,200	72
2014-15	3946	315	213	7,48,400	42

Referral Lab for Tissue Culture Raised Plants (DBT):

Period	Revenue generated Rs.
2011	1000
2012	124000
2013	170000
2014	90000

**25 & 26. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:**

Name	Institutions and Industries Visited
R. K. Jain	University of Georgia, Tifton, USA
Rashmi Aggarwal	University of Western Australia, Nedlands
Pratibha Sharma	University of Gottingen and BBA, Braunschweig, Germany
V. K. Baranwal	University of Florida, CERC, Lake Alfred; Biotech Centre, Rutgers the state University of New Jersey
R. Gogoi	University of Manitoba, Winnipeg MB, Canada, School of Life Sciences, Jawaharlal Nehru University, New Delhi
A. Kumar	Laboratory of Phytopathology, Wageningen University and Research Centrum, The Netherlands
T. Prameela Devi	MTCC, Chandigarh, MBAIM, Mau
Parimal Sinha	Warwick Crop Centre University of Warwick, U.K.
K. K. Biswas	
Krishna Kumar	
K.K. Mondal	Stanford University, California, U.S.A.
V. Sahn mugam	Israel Institute of Technology, Haifa, Israel
Lakshman Prasad	Laboratory of Biological control, University of Naples, Federico-II, Portici, Italy
Deeba Kamil	Adelaide University, Adelaide, Australia, NBAIM-Mau
Vaibhav K. Singh	Kenya Agricultural Research Institute (KARI), Njoro, Kenya
G. Prakash	Borlaug Institute for South Asia (BISA), Jabalpur. M.P.
N. Srinivasa	IIHR, Bengaluru, Pearl Millet Scientists Interaction at ICRISAT, Patancheru, Telangana, University of Mysore, Mysore, Karnataka

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects**Percentage of students who have done in-house projects including interdepartmental projects:**

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level:**a) Faculty:**

Faculty	Awards/recognitions
Dr. R. K. Jain	1. Mundkur Memorial Award 2. VASVIK 3. ShriHariKrishanShastri Memorial Award 4. Recognition Award 5. Best Teacher Award



	<ol style="list-style-type: none"> 6. Chief Editor/Editor (Indian Journal of Virology), 2005-2011 7. Editor (Indian Phytopathology, 1998-2004 8. Associate Editor (Agricultural Research, 2012 9. President, Indian Phytopathological Society, IARI, New Delhi, 2010
Dr. Rashmi Aggarwal	<ol style="list-style-type: none"> 1. FAO Fellow to the University of Western Australia, Nedlands (1999) 2. National Fellow Award (2005), ICAR; V.P. Gokhale Award (2002), MACS 3. Sharda Memorial Award (1990) ISPP 4. KPV Menon best poster award Indian Phytopathological Society (1996) 5. K.C.Mehta and Manoranjan Mitra award (IPS 2014) 6. Zonal President (IPS-2010) 7. Editor (IPS-2011-13) 8. Senior Editor (IPS-2014-17) 9. Fellow of Indian Phytopathological Society (1998) 10. Fellow of the Society for Biocontrol Advancement (2014) etc
Dr. Prathibha Sharma	<ol style="list-style-type: none"> 1. Organizing Secretary, “International Trichoderma and Gliocladium workshop” to be organized at New Delhi in 2016 2. Sharda Lele award, Indian Phytopathological Society(2015) 3. National CrystalAgri award by KrishiAnusandhan and KisanVikas Foundation, 2014 4. General Secretary, Crop Protection Federation, New Delhi: Secretary, Indian Phytopathological Society 5. Member, Councilor, International Society of Plant Protection.2012-13 6. Best Citizens of India award, International Publishing House, New Delhi 7. SAB Women Scientist Award by Society for Applied Biotechnology, Tamil Nadu 8. Indian Society of Ornamental Horticulture (ISOH) Fellowship for contribution in floriculture 9. Rishi Award by Society for the Protection of Environment and sustainable Development, BHU, Varanasi 10. G. D. Verma Women Scientist Commendation Award by Society of Mycology and Plant Pathology, Udaipur 11. Fellowship Award by Bioved Research Society, Allahabad . 12. UNDP- FAO Fellowship,1993-1994
Dr. V.K. Baranwal	<ol style="list-style-type: none"> 1. CSIR Junior and Senior Research fellowship (1982-1985) 2. DBT Overseas Associateship (2000-2001) 3. Fellow, Indian Virological Society (1912) 4. Indian Phytopathological Society (2014) 5. Member, NASI 6. Secretary, Indian Virological Society 2007-2010
Dr. Gogoi	<ol style="list-style-type: none"> 1. Best poster award in 12th Asian Maize Conference (2014) at Bangkok, Thailand 2. M J Narasimhan Medal for best paper of Indian Phytopathological Society (2011) 3. H. C. Dube Outstanding Young Scientist Award (2008) 4. M.J. Narasimhan Academic Award of IPS (1998) 5. IARI Merit Gold Medal (1998) 6. Sunitibala Roychaudhary Award for best Ph. D. Student of Plant Pathology, IARI (1998).
Dr. Bikash Mandal	<ol style="list-style-type: none"> 1. Editor-in-Chief, <i>Indian Journal of Virology</i>, since 2011 2. Editor-in-Chief, <i>VirusResearch News</i>, since 2012 3. Member, Executive council, Indian Virological Society, New Delhi, India since 2008 4. Member, International working group on vegetable and legumes viruses, 28 March 2011 http://www.iwglvv.org/html/members_list.php 5. Member, International taxonomy committee for <i>Nanoviridae</i>, International Committee on Taxonomy of Viruses, 2011 6. Member of The National Academy of Sciences, Allahabad, 2010; 7. Fellow of Indian Virological Society, 2011
Dr. Parimal Sinha	<ol style="list-style-type: none"> 1. P.P. Singhal Memorial Pesticides India Award, ISMPP, 2005 2. Commonwealth Academic Fellowships Award, 2009



Dr. G.P. Rao	<ol style="list-style-type: none">1. National Biotechnology Associateship Award (1991-1992) from DBT2. Young Scientist Associateship Award (1994-1995) from DST3. Overseas BOYSCAST Associateship Award (1996) DBT4. President Award, Society for General Microbiology, UK 19985. Best U.P. Agriculture Scientist Award (UPCAR) UP 20026. Vigyan Ratna Award by CST, Govt. of UP 2003-20047. Jin Xiu Qiu Award in 2006 by People's Govt of Guangxi Zhuang Autonomous Region ,Nanning, China8. IAPSIT Award of Excellence, Guangxi Academy of Agricultural Sciences, Nanning, China 20069. Plant Virology Leadership Award, 2013 by IPS (MEZ) Zonal meeting10. Editor-in-Chief for Sugar Tech, an International Journal of Crops and Related Industries and Phytopathogenic Mollicutes, an international journal of phytoplasma, spiroplasma and phloem limited microorganisms11. Fellow of Indian Phytopathological Society, Society for Plant Research, Meerut & STAI, New Delhi, India12. Secretary, Society for Sugar Research & Promotion, New Delhi, and Indian Virological Society , New Delhi13. Member of International Phytoplasma Working Group, Italy
Dr. A. Kumar	<ol style="list-style-type: none">1. DBT overseas Associateship, 2009-102. JS Pruthi award for best research paper, 20053. International Foundation for Science (IFS) Grant for Young Scientist, 20004. MJ Narasimhan-Best paper Award, 20115. Two Best poster awards in National Symposium on "Understanding Host-Pathogen Interaction through Science of Omics" from March 16-17, 2015.6. Best paper Award in National <i>Seminar on Piperaceae</i>, organized by Indian Institute of Spices Research and National Research Centre for Medicinal and Aromatic Plants, 21-22, November 2008 at IISR, Calicut, Kerala
Dr. Dinesh singh	<ol style="list-style-type: none">1. SPPS Fellow (Society of Plant protection Sciences) – 20072. Dr. M. M. Alam Medal (Bioved Research & Communication Centre, Allahabad – 20083. Young Scientist Associate Award (Bioved Research & Communication Centre, Allahabad)4. 20105. Fellow of Indian Phytopathological Society (FIPS) 2010 Late Shri P. P. Shinghal Memorial Award (Society of Plant protection Sciences) 2013.
Dr. K.K. Biswas	<ol style="list-style-type: none">1. Prof. M. J. Narashimhan Academic Award by IPS, New Delhi, 19992. FPSI (Fellow of Indian Phytopathology) 2012, New Delhi3. SPPS Meritorious Scientist Award by Society of PI Prote Sci, New Delhi, 20104. Shiksha Ratan Puraskar, India International Friendship Society, New Delhi, 20115. Editor of IPS, New Delhi, 2014
Dr. Krishna Kumar	<ol style="list-style-type: none">1. Fakhruddin Ali Ahmed Award for Outstanding Research in Tribal Farming Systems-20102. SPPS Meritorious Scientist Award-2011 awarded by Society of Plant Protection Sciences3. Distinguished Service Award-2010 by BIOVED Research Society.
Dr. K. K Mondal	<ol style="list-style-type: none">1. Fellow Indian Phytopathological Society (2013)2. Member, The National Academy of Sciences India (2013)3. Amulya Lahiri Smriti Gold Medal, WBCHSE (1987)4. NAIP Aboard Training Grant (2010)5. Prof M. K. Patel Memorial Young Scientist Award (2008)6. DBT-CTEP grant for Beijing, China (2013)7. Best Paper Award in 4th Int. Conf. Bacterial Blight of Rice (ICBB-2013)8. Prof M J Narasimhan Academic Merit award (2001)
Dr. R. K. Sharma	<ol style="list-style-type: none">1. Elected as Jt. Secretary (2014-17) of Indian Phytopathological Society, New Delhi-122. Prof. M.J.Narsimhan Medal award (2006) by Indian Phytopathology society3. Member editorial board: <i>Annals of Plant Protection Sciences</i>4. Advisor for Hindi magazine "Krishi-Paridrashya" published by Devraj Prakashan, Mumbai and Delhi for farmers.



Dr. D. Bahukandi	<ol style="list-style-type: none"> 1. Fellow of Indian Phytopathological Society (F.P.S.I.), New Delhi, 1993 2. Prof.M.J. Narasimhan Medal Award for best research paper published in Indian Phytopathology in 2002
Dr. V. Shanmugam	<ol style="list-style-type: none"> 1. Fellow of the Society for Biocontrol Advancement (FSBA)-2014 2. Society of Plant Protection Sciences Fellow (SPPSF)-2013 3. Fellow of the Phytopathological Society of India (FPSI)-2012 4. DST Fast Track Project for Young Scientists 5. Biotechnology Overseas Long-Term Associateship International Travel Support Scheme by Department of Science and Technology
Dr. Anirban Roy	<ol style="list-style-type: none"> 1. Membership, NASI (2013) 2. Associateship (Plant Protection) NAAS (2012) 3. Fellow, Society of Plant Protection Sciences (2013) 4. Young Scientist Award, Society for Applied Biotechnology (2012) 5. Young Scientist Award (Plant Protection), NAAS (2011) 6. Pran Vohra Award, ISCA (2010) 7. Lal Bahadur Shastri Young Scientist Award (Plant Protection), ICAR (2009) 8. Young Scientist Award, ISCA (Agriculture and Forestry) (2005) 9. INSA Medal for Young Scientist (2005) 10. Best Orator/Presenter Award, NAARM(2004) 11. Sunitibala Ray choudhary Memorial Medal, IARI (2004) 12. IARI Merit medal (Ph.D.) (2004), Best Paper Presenter Award, University of Peradeniya, Srilanka, (2001) 13. IARI Merit medal (M.Sc.) (2001) 14. Editor (Plant Virology), Virus Disease
Dr. Deeba Kamil	<ol style="list-style-type: none"> 1. UGC Research Fellowship in PhD program 2. DST young Scientist to attend Fourth Barcode of Life Conference at Adelaide, Australia (2011)
Dr. Saritha R.K.	<ol style="list-style-type: none"> 1. Treasurer, Indian Virological Society
Dr. Bishnu Maya Bashyal	<ol style="list-style-type: none"> 1. University Gold medal in MSc Plant Pathology 2. UGC research fellowship to support PhD Prgram, BHU, 2006 3. ICAR SRF 2007-2009
Dr. Vaibhav K. Singh	<ol style="list-style-type: none"> 1. "Scroll of Honour" in recognition of dedicated services to the Indian Phytopathological Society as Zonal Councillor (Delhi Zone) 2014. "K.P.V. Menon Best Poster Award-2014" 2. "Dr. R.S. Paroda Medal Award-2014" 3. "Certificate of Appreciation" by Trust for Advancement Agricultural Science (TAAS), New Delhi
Dr. N. Srinivasa	<ol style="list-style-type: none"> 1. ICAR PGS-SRF Exam (2010-11) 2. Awarded Rajeev Gandhi National Fellowship from UGC (2011-2013).
Mr. Basavaraj	<ol style="list-style-type: none"> 1. Agricultural College Raichur, staff memorial award for "Best Sports Person of the year-2004"
Mr. Timmanna	<ol style="list-style-type: none"> 1. Rajiv Gandhi National Fellowship from UGC-2013

b) Students:

S. No.	Name	Award
1.	Mathew S. Baite	Rajiv Gandhi National Fellowship Award 2013 Student of the Year Award by AIASA 2013 Badminton Singles Runner-up in Diwali Tournament, 2014 Badminton Doubles Champion in Republic Day Sports, 2015
2.	Sajab-un-Nabi	IARI Merit Medal for M.Sc. Degree
3.	Laxman Singh Rajput	Gold Medal in M.Sc. Plant Pathology

**30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:**

Year	Title	No. of Participants
1996-97	Detection of plant pathogens	17
	Biological control in plant disease control	17
	Interaction of host pathogens; Toxins/ Mycotoxins	09
1997-98	Biological and molecular techniques for management of virus like diseases of fruit crops	32
1998-99	Detection and management of wheat pathogens	27
1999-00	Importance of teleomorphs and anamorphs in identification of fungi	15
	Variability in rust fungi and postulation of rust- resistance genes	20
2000-01	Identification of plant patho-genic biocontrol fungi of agricultural importance	19
2001-02	Application of molecular tech-niques in plant pathology	17
	Challenges and opportunities of biological control in plant disease management	20
2002-03	Plant disease management through host resistance	19
2003-04	Application of biochemical and molecular techniques for characterization of plant pathogens	18
2004-05	Biocontrol strategies for management of plant pathogens	18
2005-06	Taxonomy of microorganisms, management of herbaria and culture collection with special emphasis on identification and preservation	17
2006-07	Advanced technique in plant disease diagnosis and management	19
2007-08	Biocontrol of plant pathogens	21
	Detection of bacterial plant pathogens: Symptomatology to advanced techniques	15
2008-09	Biodiversity, taxonomy, conservation and characterization of fungi	17
	Molecular diagnostics of fastidious prokaryotes, viruses and viroids	20
2010-11	Viral genomics and transgenic development	2
	Pathogenomics and diagnostics-cloning and sequencing and bioinformatics of genomic regions of plant pathogens and developing diagnostics	15
2011-12	Monitoring and forecasting of plant disease epidemics under climate change scenario	22
2012-13	Genomics and Diagnosis of Emerging Phytopathogens in Indian Agriculture	20
2013-14	Subject Matter Training for Scientists, Islamic Republic of Afghanistan	25
	Understanding of mechanism of host –pathogen- bioagents interaction and sustainable biomanagement strategies for threatening crop diseases	25
2014-15	Genomics of plant virus for diagnosis and utilisation as gene expression tool	17
	MTC on “Eco-friendly management of major diseases of crops”	9
	Genetic and pathogenic characterization towards managing nationally important plant pathogens causing wilt and blight.	21

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard



32. Student profile programme-wise (2014-15):

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	7	-	-	-
Ph.D.	143	7	-	4.89	-

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	16.66
Ph.D.	50	NIL	50	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

- All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.
- Most of the students are selected as ARS scientist or Assistant Professor
- Many continuing career as researcher abroad
- No student of the discipline is Jobless.

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed Campus selection Other than campus recruitment	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Entrepreneurs	nil

36. Diversity of staff:

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	7.69
From universities from other States from	92.39
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

24 are Ph.D. and 2 are M.Sc.

**38. Present details of departmental infrastructural facilities with regard to:**

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: two
- Student's laboratories: One
- Research laboratories: 23

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

Sl. No.	Name of the M. Sc Students	University of Graduation
1	Saurabh Kumar Dubey	Banaras Hindu University, Varanasi
2	Ramyashree Devi G S	University of Agricultural Sciences, Bangalore
3	Veena. K H	University of Agricultural Sciences, Bangalore
4	Sunil Kumar Sunani	Odisha University of Agril & Technology, Bhubaneswar, Odisha
5	Rubin Debbarma	Central Agricultural University Imphal
6	Omer Abassy	shaikh zayed university, khost, Afghanistan
7	Kuleshwar Prasad Sahu	Banaras Hindu University, Varanasi
8	Manish Kumar	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
9	Rahul Kumar Tiwari	Punjab Agricultural University, Ludiana
10	Gopi Kishan	Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
11	Pradeep Kumar	chandra shekhar azad agriculture university kanpur
12	Verna Kolette Leon	University of Mauritius

Sl. No.	Name of the Ph.D. student	Host/other institute/ university
1	Sajad Un Nabi Naingroo	IARI, New Delhi
2	Pooja Kumari	IARI, New Delhi
3	Devendra Kumar Choudhary	IARI, New Delhi
4	Laxman Singh Rajput	UAS, Dharwad
5	Gopala	IARI, New Delhi
6	Sanjeev kumar	CCSHAU, Hisar
7	Mukesh Kumar	IARI, New Delhi
8	Vikash Chandra	IARI, New Delhi
9	Bharat Raj Meena	IARI, New Delhi
10	Abhishek Kumar Dubey	IARI, New Delhi
11	Kartar Singh	CCSHAU, Haryana
12	Saju S.S.	IARI, New Delhi



13	Jeevan B.	University of agricultural sciences Bangalore
14	Abhijeet Shankar Kashyap	University of Agricultural Sciences
15	P. Madhusudhan	Acharya N.G. Ranga Agricultural University
16	Dama Ram	SKRAU, Bikaner, Rajasthan
17	Nenavath Balram	Institute of Agricultural Sciences, Banaras Hindu University
18	Sesha Kiran Kollipara	UAS,Dharwad
19	Rishikesh Kumar	IARI, New Delhi
20	Mathew Seikholen Baite	IARI, New Delhi
21	Manjunatha. C	IARI, New Delhi
22	Daliyamol	IARI, New Delhi
23	Utpal Kumar Bhattachryya	Assam Agricultural University
24	Vanapalli Chandra Sekhar	CCSHAU, Haryana
25	Ram Prasanna Meena	COA, Indore, JNKVV, Jabalpur, Madhya Pradesh
26	K .Viswanath	ANGRAU
27	Rajesh Kumar Ranjan	BCKV,WB
28	R. Thava Prakasha Pandian	IARI, New Delhi
29	Neelakanth Hiremani	UAS Bangalore
30	B.T. Raghavendra	IARI, New Delhi

S.No.	Name	Designation	Host/other institute/ university
1	N. Prabhakaran	RA	Other university
2	Sapna Sharma	RA	Other university
3	Bhupendra Singh	RA	Other university
4	Abdul	SRF	Other university
5	Aditi Thakur	SRF	Other university
6	Balendu Upadhyay	SRF	Other university
7	Deepika Kursheshtra	SRF	Other university
8	Dhananjay Yadav	SRF	Other university
9	Garima Chaudhary	SRF	Other university
10	Geeta Verma	SRF	Other university
11	Jagat Kumar	SRF	Other university
12	Kirti Rawat	JRF	Other university
13	Kulbhusahan	SRF	Other university
14	Madhupriya	SRF	Other university
15	Manju	SRF	Other university
16	Manoj Yadav	SRF	Other university
17	Neelam Seoran	SRF	Other university
18	Rajshree Poswal	SRF	Other university
19	Richa Rai	SRF	Other university
20	Rohini Chawla	SRF	Other university



21	Seeti Kumari	SRF	Other university
22	Shailender Kumar	SRF	Other university
23	Sunil Thalor	SRF	Other university
24	Vibhuti Munjal	SRF	Other university
25	Vikas	SRF	Other university

40. Number of post graduate students getting financial assistance from the university:

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from :

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

S. No.	Name and address
1.	Dr. C. D. Mayee, Ex-ASRB Chairman, ICAR
2.	Dr. S. Nagrajan, ex- Director IARI, Ex Director DWRI, and ADG (Plant Protection)
3.	Dr. R. K. Jain, Dean , IARI, New Delhi

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.



46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

RESEARCH

1. Transgenic based virus resistance in tomato

Artificial micro RNA based construct for developing resistance against begomoviruses

Constructs based on artificial microRNA and replicase gene for developing transgenic resistance against begomoviruses were licensed to Advanta India, Hyderabad.

RNA interference (RNAi) is a double-stranded RNA (dsRNA)-induced gene-silencing phenomenon that is conserved among various organisms. Because of its high specificity and efficacy, it has been widely used as an efficient tool to down regulate the expression of a gene. Its application in the development of virus resistant transgenics is gaining momentum and numerous successful attempts have been made in that direction. Based on two different mechanisms of small RNA processing (siRNA and miRNA), a newer approach of using artificial microRNA (microRNA backbone embedded with siRNA sequences of target gene) has been used in the present study to silence viral gene. The target sequence for the RNA mediated silencing was coat protein encoded ORF AV1. These proteins are an indispensable for the virus survival in host. Here, we designed siRNA targeting AV1 ORF of ToLCNDV and incorporated into 273-nt miRNA backbone of *Arabidopsis thaliana* miR159a. We developed amiRNA construct, referred as amiRAV1 using viral AV1 gene sequences to develop resistance against different geminiviruses.

Primary transgenic tomato carrying dual resistance to tomato leaf curl disease and Groundnut bud necrosis virus were licensed to Bejo Sheetal Pvt. Ltd..

The leaf curl and bud necrosis disease of tomato are the two most destructive diseases of tomato crop. No single strategy is available for the management of these viruses individually as well as in combination with each other. Considering the severity of infection in tomato caused by these viruses and the economic and ecological importance of genetic engineering through transgenic approach, it is important to stack the candidate genes from individual viruses. The *rep* gene encoding replicase protein (AC1) is characterized and the presence of 319 bp was found as conserved core among the various isolates of the viruses causing the leaf curl disease in tomato. Similarly, 830 bp ORF of NP gene is also conserved among the various isolates of the viruses causing bud necrosis disease in tomato.

2. Genomics and race profiling of nationally important pathogens

The division has further exploited various phenomic and genomics tools to decipher the racial picture of nationally important plant pathogens. The most significant ones are occurrence of O2 type of blast fungi,



unique VCG group Fusarium, unique and highly virulence pomegranate bacterial blight pathogen, and races of *Xanthomonas oryzae* pv. *oryzae*, *X.campestris*pv. *campestris*, several new types of viruses. These tools enable us to understand the tentative origin of several pathogens that are of international significance as they are “quarantined pathogen”. Identification of South American origin race 3 of *Ralstonia solanacearum* in Indian subcontinent using Multilocus sequence typing is a case point.

3. Diagnostic and indexing tools developed for nationally significant pathogen

The Division of Plant Pathology has made significant advancements in the identification and rapid diagnostics of several nationally important plant pathogen belong to viruses, phytoplasma, fungi and bacteria. Several of them are already commercialized for large scale.

(i) ELISA Kit for GBNV (*Tospoviruses, Serogroup IV*)

About the virus

Groundnut bud necrosis virus (GBNV), Watermelon bud necrosis virus (WBNV) and Capsicum chlorosis virus (CaCV) are tospoviruses belong to serogroup IV. These viruses infect a wider range of crop plants and are vectored by Thrips. The natural infection has been recorded on grain legumes, Solanaceous crops, oilseed crops, Tuber crop and cucurbits. Characteristic symptoms include chlorotic spots, ring spots, mottling and yellowing of leaf followed by necrosis on foliage, stem and buds, which result into stunting and death of plants.

Specification of the kit

Antigen preparation: Full NP gene construct (~800 bp) of GBNV generating 30 kDa protein in E. coli. About 3 mg/rabbit is adequate to generate polyclonal antibody (PAb) against the recombinant viral protein. About 20-25 ml of antiserum can be obtained from one rabbit. The PAb can detect tospoviruses under serogroup IV GBNV, WBNV and CaCV. Sensitivity limit of ELISA is ~25 ng of antigen in crude leaf extract. An ELISA kit has been licensed to Chromous Biotech, Bangalore to detect GBNV and other related tospoviruses. A MoU was signed by JD(R) IARI on 22 April 2010 production and delivery.

(ii) Pomegranate blight- Kit

PCR Based Detection of Pomegranate blight

The bacterial blight caused by *X. axonopodis*pv. *punicae* becomes a major threat to pomegranate growers in India. The disease caused epidemic in southern states including Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu affecting 60-80% fruit yield losses and >50% loss in export-oriented revenue generation. Primary source of inoculum is planting material (cuttings) and presently certification of planting materials is based on visual observation alone. Therefore to restrict the spread of the disease from infected orchard to healthy one, a rapid and reliable PCR based diagnosis is essential.

PCR based detection

A PCR based detection technique for this blight pathogen has been developed using primer set (KKM5 & 6) designed from the 530 nucleotides of c-terminus region of gyrB gene. The primer set was validated for amplification of 491 bp.

Sensitivity of detection

The developed technique could detect the pathogen in infected pomegranate plant samples including leaf, fruit and stem within 3hr, at a detection limit 0.1 ng μ l⁻¹ template DNA.

Validation with field samples

Among the 128 infected samples (leaf-66, fruits-32 and stem-30) tested for PCR amplification, 121 samples were PCR positive indicating the suitability of the detection protocol for blight pathogen. The 10 leaf samples



from tissue culturally raised saplings were found to be PCR negative, indicating that the samples were free of blight bacteria. In control sets, the desired amplification was found in positive control and no amplification was detected in negative control.

The validation data indicated that the developed PCR detection system could successfully able to detect the presence of blight bacterium in the affected samples with 94.53% success rate. This technology has been transferred on 2 March, 2012 Pome Care Labs., Malegaon, Maharashtra.

4. Biocontrol Technology:

Commercialization of Trichoderma harzianum Th3 Technology

Trichoderma harzianum Th3 (ITCC 5593), pure culture, powdered and liquid formulations were tested toxicologically, found to be safe and non toxic in nature and being commercialized and transferred to Sai Bio Organics, Moga, Punjab (India) on 17th September, 2010 and to Department of Agriculture, Durgapura, Jaipur, Rajasthan for all IPM labs of the state on 6th March, 2014.

5. Epidemiology and development of forecasting models

Spot blotch under climate change scenario: A threat for sustained wheat production

Spot blotch once endemic to eastern Gangetic plains now emerged as major disease throughout Indo-Gangetic plains. Disease was first reported from eastern plains during early 70s. For assessment of temperature rise on spot blotch hourly generation rate and favorable period for initial infection of the disease have been established.

Generation rate of the pathogen and/or disease

- HoSpot blotch favorable threshold
- Air temperature 18-34°C and RH 95% or above for 15 hours. $urly\ generation\ rate = (0.002T - 0.03) \{1 - \exp [0.151(T - 36)]\}$

Spatial dynamics of generation rate and favorable period have been simulated throughout Indo-Gangetic plains. Under ambient conditions generation rate of the disease is comparatively higher in the eastern Gangetic plains as compared to western Indo-Gangetic plains and addition of 1.5°C over the ambient conditions indicated increase in generation rate throughout the Indo-Gangetic plains. A similar spatial dynamics of spot blotch favorable period with a gradient from east to west under ambient and temperature rise conditions indicated possibility of early and higher spot blotch incidence in the eastern plains as compared to western Indo-Gangetic plains. Spot blotch severity throughout Indo-Gangetic plains indicated a gradient from east to west and matches well with the spatial dynamics pattern for simulated generation rate and favorable period. Therefore, temperature rise indicated that eastern Gangetic plains already favorable (both in terms of generation rate and infection favorable thresholds) has become more conducive to spot blotch infection and Indo-Gangetic plains (western) crossed the borderline risk for infection. Current rise in severity could be ascribed to 0.6-0.8°C increase in temperature (IPCC 2013).

Field monitoring of spot blotch

- In north western region during February-March and eastern Gangetic plains in November-March temperature 18-34°C
- RH >95% for 15 hours daily

If above two conditions occurs consecutively for 3-4 days farmers are to look closely for spot appearance in the field

Forecasting model for spot blotch and management decision

- For estimation of daily infection index (Y) the following model has been developed based on temperature (T), RH-duration (D) and minimum RH-duration (m) dependent temperature.



- Accumulation of daily index about 1, can be used for scheduling of foliar spray with effective fungicides available in the market.
- Forecasting model has been validated at Samastipur with scheduling of fungicidal sprays and found to check the progress of the diseases.

$$Y = \left(\frac{36-T}{7}\right) \times \left(\frac{T-16}{13}\right)^{2.6} \times (1 - 0.8114^{(D-m)})$$

- Spot blotch is an emerging disease in wheat and likely to be increased throughout Indo-Gangetic plains. In absence of resistance, monitoring of the disease based on most influencing factors like temperature (above 18°C) and timely spray scheduling would enable to combat the disease.

Technologies ready for commercialization

1. Expression constructs of coat protein genes for serological diagnosis of twenty one plant viruses have been prepared. These expression constructs can be cloned in E coli and used to produce unlimited quantity of antibody, the key reagents for serodiagnosis of plant virus as and when required. This will help overcome limitation of tedious virus purification in traditional methodology of antiserum preparation.
2. Lateral flow devices are simple immune chromatographic devices which can detect the presence of a virus without the need for any specialized equipments. Dipsticks for rapid detection of three viruses Large cardamom chirke virus, Papaya ring spot virus and Potato virus Y have been developed. Using
3. A microarray chip for detection of all known plant viruses has been developed. This will be useful where a sample has to be screened for a large number of viruses simultaneously. In initial experiments the chip was able to detect many viruses and viroids previously not known to occur in the country.
4. Diagnostic probes in the form of primers for RT-PCR have been developed and validated for Onion yellow dwarf virus (OYDV), Garlic common latent virus and alexiviruses infecting onion and garlic. RT-PCR based detection has been developed also for viruses infecting citrus and grapevine. Nested PCR primers were developed for detection of grassyshoot, Catharanthus little leaf, toriaphyllody, brinjal little leaf and sesame phyllodyphytoplasmas.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths:

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni

Weaknesses:

- Lack of expertise in certain areas like nanotechnology
- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Centre for Advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

**Opportunities:**

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.

Challenges:

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department**EDUCATION*****Enhancement of the quality of human resources:***

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of crop Pathology, crop modeling, molecular Pathology and systems biology.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encourages to go for 6-12 months training at world leading Institutes through ICAR/ DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
- Monthly seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.

RESEARCH

Emphasis will be given to the basic and strategic research in the area of abiotic stress tolerance and nutrient use efficiency of crops. In the next five years, the Division will focus on “Deciphering Physiological, Biochemical and Molecular Mechanisms of Abiotic Stress Tolerance and Nutrient Use Efficiency of crop plants” in a multidisciplinary mode in collaboration with National and International Institutes. The main areas of the current research programme are:

1. *Identification of donors, mechanisms and component traits for nutrient use efficiency and tolerance to drought and heat stress in rice and wheat*

Phenomics and novel phenotyping approaches will be used to decipher component traits for tolerance to moisture deficit stress and high temperature stresses in rice and wheat. Emphasis will be given to develop sensors for high throughput non-destructive plant phenotyping (morphological as well as chemical) of large number of germplasm resources for accelerated analytical breeding. The major component traits focused are root system architecture (RSA), water use efficiency, radiation use efficiency, stem reserve mobilization, stay green, spikelet fertility and grain development. In case of nutrient use efficiency, N and P efficiency will be focused in rice, while N, Zn and Fe use efficiency will be focused in wheat. Efforts will be made to unravel the physiological basis of multiple stress interaction including biotic vs abiotic, and abiotic vs abiotic stresses.



2. *Genomics for identifications of promoters and genes for enhancing abiotic stress tolerance and nutrient use efficiency in wheat and rice*

Phenomics and molecular analysis of mutants, candidate gene transgenics and genome editing will be used to identify novel genes involved in abiotic stress tolerance of plants. Genome-wide DNA methylation analysis will be employed to understand short term and long term stress memory, acclimation and trans-generational stress memory in rice. Efforts will be made to identify and design strategies to overcome kinetic and metabolic bottlenecks in physiological processes for yield improvement. Efforts will be made to integrate cell biology, plant and crop Pathology with computational biology for prediction gain in plant trait from modification of genes/processes.

3. *Development of transgenic rice and wheat with enhanced abiotic stress tolerance*

Genes for ABA signaling and stress responsive transcription factors will be used to engineer drought tolerance in rice. Efforts will be made to engineer physiological pathways of carbon fixation, photosynthesis, photorespiration and nutrient use efficiency in rice. Cytokinin metabolism will be engineering for improving drought tolerance in wheat.



xix) Division of Plant Physiology

1. Name of the Department:

Division of Plant Physiology

2. Year of establishment:

14th November, 1966

3. Is the Department part of a School/Faculty of the university?

School of Basic Sciences

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Soil Science and Agricultural Chemistry, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology, etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Division of Biochemistry, Microbiology, Agronomy, Post Harvest Technology, Environmental Science, Floriculture and Landscaping, Horticulture, Soil Science and Agricultural Chemistry, Molecular Biology and Biotechnology, Genetics, Plant Genetic Resources, Seed Science and Technology etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	1	1	0	8
Senior Scientist (Associate Professor)	4	3	1	4
Scientist (Assistant Professor)	12	10	2	2



Besides above there are two permanent faculties in the discipline who are posted at sister department or sister institute as follows:

1.	Dr. Bhupinder Singh, Principal Scientist, CESCRA, IARI, New Delhi-12	Permanent faculty in the discipline of Plant Physiology from other Department
2.	Dr. Ishwar Singh, Principal Scientist, Indian Institute of Maize Research, New Delhi-12	Permanent faculty in the discipline of Plant Physiology from the sister institute

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr. Viswanathan Chinnusamy	Ph.D.	Head of the Division	Plant Physiology (Abiotic Stress Tolerance)	19	2	0
Dr. V. P. Singh	Ph.D.	Professor	Plant Physiology (Postharvest Physiology, Abiotic stress Tolerance)	30	3	6
Dr. Santosh Kumari	Ph.D.	Principal Scientist	Plant Physiology (Abiotic Stress Tolerance)	30	0	0
Dr. Ajay Arora	Ph.D.	Principal Scientist	Plant Physiology (Postharvest Physiology, Abiotic stress Tolerance)	24	5	3
Dr. Madan Pal Singh	Ph.D.	Principal Scientist	Plant Physiology (Climate change impacts & heat stress tolerance)	23	5	3
Dr. Poonam Natu	Ph.D.	Principal Scientist	Plant Physiology (Photosynthesis, Abiotic stress tolerance)	23	0	0
Dr. Vijay Paul	Ph.D.	Principal Scientist	Plant Physiology (Postharvest Physiology, Abiotic stress Tolerance)	19	2	0
Dr. Anjali Anand	Ph.D.	Principal Scientist	Plant Physiology (Seed Physiology, Climate change)	20	3	0
Dr. Pramod Kumar	Ph.D.	Senior Scientist	Crop Physiology	23	3	0
Dr. Rakesh Pandey	Ph.D.	Senior Scientist	Plant Physiology (Abiotic stress tolerance)	15	2	0
Dr. Sangeeta Khetarpal	Ph.D.	Senior Scientist	Plant Physiology (Climate change impacts & heat stress tolerance)	2	0	0
Dr. Renu Pandey	Ph.D.	Senior Scientist	Plant Physiology (Mineral nutrition, Climate change)	12	3	0
Dr. Lekshmy S.	Ph.D.	Scientist	Plant Physiology (Abiotic Stress Tolerance)	5	0	0
Dr. Puja Rai	Ph.D.	Scientist	Plant Physiology (Abiotic Stress Tolerance)	3	0	0



12. List of senior Visiting Fellows, adjunct faculty, emeritus professors:

S.No.	Name of the Faculty	Status
1.	Prof. M.C. Ghildiyal, Former Professor, Division of Plant Physiology, IARI, New Delhi	Adjunct Faculty
2.	Prof. M. Udaykumar, Former Prof. & Head, Department of Crop Physiology, UAS, Bangalore, Karnataka	Adjunct Faculty
3.	Prof. P.S. Deshmukh, Former Head & Professor, Division of Plant Physiology, IARI, New Delhi	Emeritus Scientist, DST
4.	Dr. R.K. Chopra, Ex-Principal Scientist, WTC, IARI, New Delhi	Emeritus Scientist, CSIR, New Delhi
5.	Prof. R.K. Sairam, Former Head & Professor Division of Plant Physiology, IARI, New Delhi	Guest Faculty
6.	Dr. Bhupinder Singh, Principal Scientist, CESCRA, IARI, New Delhi-12.	Permanent faculty in the discipline of Plant Physiology from other Department
7.	Dr. Ishwar Singh, Principal Scientist, Indian Institute of Maize Research, New Delhi	Permanent faculty in the discipline of Plant Physiology from the sister institute

13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio:

M. Sc. = 2:1.56 and Ph.D.= 2:1.56

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S. No.	Category	Sanctioned	Filled	Actual
1.	Technical	19	9	9
2.	Administrative	5	4	4
3.	Supportive	34	15	15

16. Research thrust areas as recognized by major funding agencies:

Phenomics, Global climate change, abiotic stress tolerance, post harvest physiology and nutrient use efficiency.

17 Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Total Grants Received (Lakh Rupees)
Dr. Viswanathan Chinnusamy and Dr. Lekshmi, S.	Phenomics of moisture deficit stress tolerance in rice (NASF, ICAR)	Nil	5293.92
Dr. V.P. Singh and Dr. Ajay Arora	Regulatory role of gibberelic acid under high temperature stress in wheat (<i>Triticum aestivum</i> L.) (CSIR)	Nil	24.00
Dr. Ajay Arora and Dr V.P. Singh	Molecular mechanisms of salicylic acid mediated improvement in shelf life and fruit quality of tomato" (DBT)	Nil	40.00



Dr. Madan Pal Singh	NICRA (ICAR)	ICAR - IRRI Collaborative project on Free Air CO ₂ Enrichment (FACE) and temperature interaction in a rice-rice cropping system	135.00
Dr. Pramod Kumar	Analyzing role of zeaxanthin cycle pigments for high temperature tolerance in chickpea (CSIR)	Nil	24.00
Dr. Renu Pandey		Nutrient delivery system in crop plants to augment acquisition, translocation and utilization efficiency (VFRC, IFDC, USA)	105.86
Dr. Rakesh Pandey (Indter-disciplinary with Genetics)		Molecular breeding and selection strategies to combine and validate QTLs for improving WUE and heat tolerance of wheat in India Generation Challenge Program - CGIAR	US\$: 165000.0 INR 107.25
Dr. Ajay Arora (Indter-disciplinary with Microbiology)	Role of archaeobacteria in alleviation of salinity and moisture stress in plants (NASF, ICAR)	Nil	205.00
Dr. Viswanathan Chinnusamy and Dr. Puja Rai (Indter-disciplinary with Seed Science & Technology)	Development of sucrose sensor for phenotyping soil moisture deficit stress tolerance in rice (NASF, ICAR)	Nil	62.26
Dr. Madan Pal Singh		Free Air CO ₂ Enrichment (FACE) and temperature interaction in a rice-rice cropping system. (IRRI, Philippines)	20.00
Dr. Renu Pandey	Study of transcriptomic and metabolomic changes induced by nitrogen and phosphorus stress in maize roots (DBT)	Nil	55.01
Dr. Renu Pandey Dr. Lekshmy	Proteome analysis of soybean roots to identify membrane transporters involved in organic anion exudation under phosphorus stress (CSIR)	Nil	18.2
Dr. Viswanathan C. / Dr. P. Kaur DBT {Women Scientist (Bio-CARe) Project}	Genetic modification of cytokinin levels to enhance root system architecture and source-sink relationship for improving drought tolerance of rice (DBT)	Nil	37.15

18. Inter-institutional collaborative projects and associated grants received:

a) National collaboration

1. *Project:* Phenomics of moisture deficit stress tolerance in rice (Funded by NASF, ICAR)

Institutes: IARI, New Delhi; NRCPB, New Delhi; IASRI, New Delhi; IIT, Delhi; UDSC, Delhi; IGKV, Raipur; CRRI, Cuttack; CAU, Umium; ICAR RC-NEH, Umium

Total Budget (for IARI): Rs. 5293.92 lakhs



- Project:* Study of transcriptomic and metabolomic changes induced by nitrogen and phosphorus stress in maize roots (Funded by DBT, Govt. of India)

Institutes: IARI, New Delhi; Jamia Hamdard, New Delhi

Total Budget (for IARI): Rs. 55.01 lakhs

b) International collaboration

- Project:* Free Air CO₂ Enrichment (FACE) and temperature interaction in a rice-rice cropping system (Funded by IRRI)

Institutes: IARI, New Delhi; IRRI, Philippines

Total Budget: Rs. 20.00 lakhs

- Project:* Nutrient delivery system in crop plants to augment acquisition, translocation and utilization efficiency (Funded by VFRC, IFDC, USA)

Institutes: IARI, New Delhi;

Total Budget: Rs. 105.86 lakhs

- Project:* Molecular breeding and selection strategies to combine and validate QTLs for improving WUE and heat tolerance in India [GCP Project Number: G7010.02.02. Funded by CGIAR, US \$1,65,000/-]

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

None under these programmes.

20. Research facility / centre with

State recognition

None

National recognition

Phenotyping facility is being developed

International recognition

None

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Not applicable

22. Publications:

	Chinnusamy V	Singh VP	Kumari S	Arora A	Pal M	Poonam Natu	Paul V	Anand A	Kumar P	Pandey Rakesh	Khetarpal S	Pandey Renu	Lekshmy S.	Rai P
Number of papers published in peer reviewed journals (national / international)	61	64	25	64	58	35	50	52	41	25	50	35	8	2
Monographs	0													
Chapters in Books	24	22	1	16	5	4	6	8	12	7	15	7	8	



Edited Books	0				1									
Books with ISBN with details of publishers	0	1		1				1		1	1	1		
Number listed in International Database	0													
Citation Index – range / average	0-812/ 80.25						0-44	0-26		0-80	0-24/13			
SNIP range / average	0-8.22/ 1.405													
SJR range / average	0-21.323/ 2.756													
Impact Factor– range / average	0-41.456/ 4.827	0 to 2.68			0 to 5.794		0-2.9		0-2.61	0-3.262	0-8.91/ 0.698			
h-index	28	11		12	13		6	8	6	4	7	5	3	

Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

S. No.	Publications	NAAS Rating
1	Mohan, R., Prasad, K.V., Kaur, C., Singh, S.K., Arora, A. and Kumar, S. (2011). Induction of anthocyanin pigments in callus cultures of <i>Rosa hybrida</i> L. in response to sucrose and ammonical nitrogen levels. <i>Plant Cell Tissue Organ Culture</i> , 104: 171-179.	9.63
2	Li, Z., Gao, X., Chinnusamy, V., Bressan, R., Wang, Z.X., Zhu, J.K., Wu, J.W. and Liu, D. (2012). ROP11 GTPase negatively regulates ABA signaling by protecting ABI1 phosphatase activity from inhibition by the ABA receptor RCAR1/PYL9 in Arabidopsis. <i>J. Integr. Plant Biol.</i> , 54: 180-188.	9.75
3	Dalal, M., Chinnusamy, V. and Bansal, K.C. (2010). Isolation and functional characterization of <i>Lycopene b-cyclase (CYC-B)</i> promoter from <i>Solanum habrochaites</i> . <i>BMC Plant Biol.</i> , 10: 61.	10.35
4	Van Oosten, M.J., Bressan, R.A., Zhu, J.K., Bohnert, H.J. and Chinnusamy, V. (2014). The role of the epigenome in gene expression control and the epimark changes in response to the environment. <i>Crit. Rev. Plant Sci.</i> , 33: 64-87.	10.36
5	Katiyar, A., Smita, S., Lenka, S.K., Rajwanshi, R., Chinnusamy, V. and Bansal, K.C. (2012). Genome-wide classification and expression analysis of MYB transcription factor families in rice and Arabidopsis. <i>BMC Genomics</i> , 13: 544.	10.40
6	Hardin, S.C., Clayton, T.L., Man-Ho, O., Jain, V. and Huber, S.C. (2009). Coupling oxidative signals to protein phosphorylation via methionine oxidation in Arabidopsis. <i>Biochem. J.</i> , 422: 305-312.	10.65
7	Pal, M., Jagadish, S.V.K., Craufurd, P.Q., Fitzgerald, M., Lafarge, T. and Wheeler, T.R. (2012). Effect of elevated CO ₂ and high temperature on seed-set and grain quality of rice. <i>J. Exp. Bot.</i> , 63: 3843-3852.	11.24
8	Smita, S., Rajwanshi, R., Lenka, S.K., Katiyar, A., Chinnusamy, V. and Bansal, K.C. (2013). Comparative analysis of fruit transcriptome in tomato (<i>Solanum lycopersicum</i>) genotypes with contrasting lycopene contents. <i>Plant Mol. Biol. Rep.</i> , 31: 1384-1396.	11.32
9	Zhang, X., Lii, Y., Wu, Z., Polishko, A., Zhang, H., Chinnusamy, V., Lonardi, S., Zhu, J.K., Liu, R. and Jin, H. (2013). Mechanism s of small RNA generation from cis-NATs in response to environmental and developmental cues. <i>Mol. Plant</i> , 6: 704-715.	12.126



10	Lenka, S.K., Katiyar, A., Chinnusamy, V. and Bansal, K.C. (2011). Comparative analysis of drought responsive transcriptome in Indica rice genotypes with contrasting drought tolerance. <i>Plant Biotech. J.</i> ,9: 315-327.	12.28
11	Ben-Chaabane, S., Liu, R., Chinnusamy, V., Kwon, Y., Park, J.H., Kim, S.Y., Zhu, J.K., Yang, S.W. and Lee, B.H. (2013). <i>STA1</i> , an <i>Arabidopsis</i> pre-mRNA processing factor 6 homolog, is a new player involved in miRNA biogenesis. <i>Nucleic Acids Res.</i> , 41: 1984-1997.	14.28
12	Zhan, X., Wang, B., Li, H., Liu, R., Kalia, R.K., Zhu, J.K. and Chinnusamy, V. (2012). Arabidopsis proline-rich protein important for development and abiotic stress tolerance is involved in microRNA biogenesis. <i>Proc. Nat. Acad. Sci. USA</i> ,109: 18198-18203.	15.74
13	Zhao, Y., Chan, Z., Xing, L., Liu, X., Hou, Y.J., Chinnusamy, V., Wang, P., Duan, C. and Zhu, J.K. (2013). The unique mode of action of a divergent member of the ABA-receptor protein family in ABA and stress signalling. <i>Cell Res.</i> , 23: 1380-95.	16.526

Publication: NAAS Rating 8-9

S.No.	Publications	NAAS Rating
1	Shine, M.B., Guruprasad, K.N. and Anand, A. (2011). Enhancement of germination, growth and photosynthesis in soybean by pre-treatment of seeds with magnetic field. <i>Bioelectromag.</i> , 32 : 474-484.	8.02
2	Pandey, R., Meena, S.K., Krishnapriya, V., Ahmad, A. and Kishora, N. (2014). Root carboxylate exudation capacity under phosphorus-stress does not improve grain yield in greengram. <i>Plant Cell Reports</i> , 33 : 919-928.	8.51
3	Sairam, R.K., Kumutha, D., Chinnusamy, V. and Meena, R.C. (2009). Waterlogging-induced increase in sugar mobilization, fermentation, and related gene expression in the roots of mung bean (<i>Vigna radiata</i>). <i>J. Plant Physiol.</i> 166 : 602-616.	8.70
4	Chakraborty, K., Sairam, R.K. and Bhattacharya, R.C. (2012). Differential expression of salt overly sensitive pathway genes determines salinity stress tolerance in <i>Brassica</i> genotypes. <i>Plant Physiol. Biochem.</i> , 51 : 90-101.	8.78
5	Nagarajan, S., Jagadish, S.V.K. Prasad, A.S., Tomar, A.K. Anand, A., Pal, M. and Aggarwal, P.K. (2010). Local climate affects on growth, yield, and grain quality of aromatic and non-aromatic rice in north western India. <i>Agric. Ecosys. Environ.</i> , 138 : 274-281.	8.86
6	Gurjeet, K., Chandana, R., Pandey, R., Abrol, Y.P., Iqbal, M. and Ahmad, A. (2011). Sulphur starvation and restoration affect nitrate uptake and assimilation in rapeseed. <i>Protoplasma</i> , 248 : 299-311.	8.86
7	Saha, S., Chakraborty, D., Lata, Pal, M. and Nagarajan, S. (2011). Impact of elevated CO ₂ on utilization of soil moisture and associated soil biophysical parameters in pigeon pea (<i>Cajanus cajan</i> L.). <i>Agric. Ecos. Environ.</i> , 142 : 213-221.	8.86

Publication: NAAS Rating 6-8

S.No.	Publications	NAAS Rating
1	Kumar, S., Dwivedi, S.K., Singh, S.S., Jha, S.K., Lekshmy, S., Elanchezhian, R., Singh, O.N. and Bhatt, B.P. (2014). Identification of drought tolerant rice genotypes by analysing drought tolerance Indices and morpho-physiological traits. <i>SABRAO J.</i> (accepted)	6.00
2	Kant, K., Arora, A., Singh, V.P. and Kumar, R. (2012). Role of oxalic acid on shelf life and physicochemical characteristics of tomato (<i>Solanum lycopersicon</i> L.). <i>Indian J. Hort.</i> , 69 : 209-214.	6.13
3	Sarkar, J., Misra, R.L., Singh, S.K., Prasad, K.V. and Arora, A. (2009). Effect of growth regulators on growth and flowering in tuberose under north India conditions. <i>Indian J. Hort.</i> , 66 : 502-507.	6.13
4	Krishna, H., Singh, S.K., Sairam, R.K. and Verma, S.K. (2010). Effect of different factors on in vitro shoot tip culture establishment in mango. <i>Indian J. Hort.</i> , 67 : 293-300.	6.13
5	Kant, K. and Arora, A. (2014). Effects of salicylic acid on postharvest physiology of tomato. <i>Indian J. Hort.</i> , 71 : 247-252	6.13
6	Kumar, M., Singh, V.P., Arora, A., Dhandapani, R. and Sakhare, A.S. (2014). Physiological alteration in gladiolus flower during senescence as affected by abscisic acid. <i>Indian J. Hort.</i> (Accepted)	6.13



7	Yadav, S., Kumar, P.N., Arora, A. and Singoda, A. (2014). Effect of protease inhibitors on physiological and biochemical changes influencing keeping quality in gladiolus. <i>Indian J. Hort.</i> (Accepted)	6.13
8	Anand, A., Nagarajan, S., Kishore, N. and Verma, A.P.S. (2010). Impact of high temperature at pod development stage on yield and quality of <i>Brassica juncea</i> cultivars. <i>Indian J. Agril. Sci.</i> ,80: 1043-1047.	6.18
9	Pandey, R., Kumari, A., Paul, V. and Ghildiyal, M.C. (2012). An efficient and thermostable soluble starch synthase in developing maize grain. <i>Indian J. Agric. Sci.</i> , 82: 548-551.	6.18
10	Kumari, A., Paul, V., Pandey, R. and Ghildiyal, M.C. (2014). Soluble starch synthase activity in relation to thermal tolerance of developing wheat (<i>Triticum aestivum</i> , <i>Triticum durum</i>) and maize (<i>Zea mays</i>). <i>Indian J. Agric. Sci.</i> ,84: 839-843.	6.18
11	Kumar, M., Sharma, R.K., Kumar, P., Singh, G.P., Sharma, J.B. and Gajghate, R. (2013). Evaluation of bread wheat (<i>Triticum aestivum</i> L.) genotypes for terminal heat tolerance through physiological traits and grain yield. <i>Indian J. Genet. Plant Breed.</i> , 73: 446-449.	6.20
12	Verma, S.S., Chinnusamy, V., Asif, M. and Bansal, K.C. (2013). Synergistic effect of C ₂ H ₂ type zinc-finger protein with LEA promoter to enhance abiotic stress tolerance in <i>Brassica juncea</i> . <i>Plant Omics J.</i> ,6: 208-214.	6.35
13	Saad Gazala, I.F., Sahoo, R.N., Pandey, R., Mandal, B., Gupta, V.K., Singh, R. and Sinha P. (2013). Spectral reflectance pattern in soybean for assessing yellow mosaic disease. <i>Indian J. Virol.</i> , 24: 242-249.	6.36
14	Joshi, A., Shukla, A. and Kumar, P. (2010). Interactive effect of GA ₃ and polyamines on <i>in vitro</i> somatic embryogenesis from immature embryos in maize (<i>Zea mays</i> L.). <i>Maydica</i> ,55: 111-119.	6.37
15	Prochazkova, D., Sairam, R.K., Lekshmy, S. and Wilhelmová, N. (2013). Differential response of a maize hybrid and its parental lines to salinity stress. <i>Czech J. Genet. Plant Breed.</i> ,49: 9-15.	6.39
16	Jhalegar, M.J., Sharma, R.R., Pal, R.K., Arora, A. and Dahuja, A. (2011). Analysis of physiological and biochemical changes in kiwifruit (<i>Actinidia deliciosa</i> cv. Allison) after the postharvest treatment with 1-Methylcyclopropene. <i>J. Plant Biochem. Biotech.</i> ,20: 205-210.	6.41
17	Sharma, S., Sharma, R.R., Pal, R.K., Paul, V. and Dahuja, A. (2012). 1-Methylcyclopropene influences biochemical attributes and fruit softening enzymes of 'Santa Rosa' Japanese plum (<i>Prunus salicina</i> Lindl.). <i>J. Plant Biochem. Biotec.</i> , 21: 295-299.	6.41
18	Kishor, A., Srivastav, M., Dubey, A.K., Singh, A.K., Sairam, R.K., Pandey, R.N., Dahuja, A. and Sharma, R.R. (2009). Paclobutrazol minimises the effects of salt stress in mango (<i>Mangifera indica</i> L.). <i>J. Hort. Sci. Biotech.</i> , 84: 459-465.	6.51
19	Kumar, N., Pal, M. and Srivastava, G.C. (2009). Proline metabolism in Senescing Rose (<i>Rosa hybrida</i> L.) Petals. <i>J. Hort. Sci. Biotech.</i> ,84: 536-540.	6.51
20	Pandey, R., Chacko, P.M., Prasad, K.V, Pal, M. and Choudhary, M.L. (2009). Physiological characterisation of two rose (<i>Rosa hybrida</i> L.) cultivars grown under different levels of CO ₂ enrichment. <i>J. Hort. Sci. Biotech.</i> 84: 35-40.	6.51
21	Pandey, R., Dubey, K.K., Ahmad, A., Nilofar, R., Verma, R., Jain, V., Zinta, G. and Kumar, V. (2014). Elevated CO ₂ improves growth and phosphorus utilization efficiency in cereal species under sub-optimal phosphorus supply. <i>J. Plant Nutr.</i> , (Accepted)	6.53
22	Jain, N., Singh, G.P., Yadav, R., Pandey, R., Ramya, P., Shine, M.B., Pandey, V.C., Rai, N., Jha, J. and Prabhu, K.V. (2014). Root trait characteristics and genotypic response in wheat under different water regimes. <i>Cereal Res. Comm.</i> , 42: 426-438.	6.55
23	Hegab, M.M., Abdelgawad, H., Abdelhamed, M.S., Hammouda, O., Pandey, R., Kumar, V. and Zinta, G. (2013). Effects of tricin isolated from jungle rice (<i>Echinochloa colona</i> L.) on amylase activity and oxidative stress in wild oat (<i>Avena fatua</i> L.). <i>Allelopathy J.</i> , 31: 345-354.	6.69
24	Pandita, V.K., Anand, A., Nagarajan, S., Seth, R. and Sinha, S.N. (2010). Solid matrix priming improves seed emergence and crop performance in okra. <i>Seed Sci. Technol.</i> , 38: 665-674.	6.70
25	Smita, S., Rajwanshi, R., Lenka, S.K., Katiyar, A., Chinnusamy, V. and Bansal, K.C. (2013). Expression profile of genes coding for carotenoid biosynthetic pathway during ripening and their association with accumulation of lycopene in tomato fruits. <i>J. Genet.</i> , 92: 363-368.	6.88
26	Sairam, R.K., Kumutha, D. and Ezhilmathi, K. (2009). Waterlogging tolerance: Non-symbiotic haemoglobin-nitric oxide homeostasis and antioxidants- A review. <i>Curr. Sci.</i> , 96: 674-682.	6.91



27	Lohot, V.D., Sharma-Natu, P., Pandey, R. and Ghildiyal, M.C. (2010). ADP-glucose pyrophosphorylase activity in relation to starch accumulation and grain growth in wheat cultivars. <i>Curr. Sci.</i> ,98: 426-430.	6.91
28	Pandey, R., Paul, V., Bhargava, S.C. and Dadlani, M. (2013). The earliest findings on the role of smoke as germination cue were reported by P. Parija and co-workers from India. <i>Curr. Sci.</i> , 104: 811-812.	6.91
29	Elanchezhian, R., Krishnapriya, V., Renu, R., Rao, A.S. and Abrol, Y.P. (2014). Physiological and molecular approaches for improving phosphorus uptake efficiency of crops. <i>Current Sci.</i> , (Accepted)	6.91
30	Paul, V., Pandey, R. and Srivastava, G.C. (2010). Ripening of tomato (<i>Solanum lycopersicum</i> L.). Part I: 1-Methylcyclopropene mediated delay at higher storage temperature. <i>J. Food Sci. Technol.</i> ,47: 519-526.	7.12
31	Paul, V., Pandey, R. and Srivastava, G. C. (2010) Ripening of tomato (<i>Solanum lycopersicum</i> L.). Part II: Regulation by its stem scar region. <i>J. Food Sci. Technol.</i> ,47: 527-533.	7.12
32	Paul, V., Pandey, R. and Srivastava, G.C. (2012). The fading distinctions between classical patterns of ripening in climacteric and non-climacteric fruit and the ubiquity of ethylene- An overview. <i>J. Food Sci. and Technol.</i> ,49: 1-21.	7.12
33	Kumar, M., Singh, B., Ahuja, S., Dahuja, A. and Anand, A. (2014). Gamma radiation and magnetic field mediated delay in effect of accelerated ageing of soybean. <i>J. Food Sci. & Tech.</i> , JFST-D-12-00180R2 (Accepted)	7.12
34	Paul, V. and Pandey, R. (2014). Role of internal atmosphere on fruit ripening and storability-a review. <i>J. Food Sci. Tech.</i> , 51: 1223-1250.	7.12
35	Verma, D., Joshi, R., Shukla, A. and Kumar, P. (2011). Protocol for <i>in vitro</i> somatic embryogenesis and regeneration of rice (<i>Oryza sativa</i> L.). <i>Indian J. Exp Biol.</i> ,49: 958-963.	7.20
36	Kholova, J., Sairam, R.K. and Meena, R.C. (2010). Osmolytes and metal ions accumulation, oxidative stress and antioxidant enzymes activity as determinants of salinity stress tolerance in maize genotypes. <i>Acta Physiol. Plant.</i> , 32: 477-486.	7.31
37	Tiwari, J.K., Munshi, A.D., Kumar, R., Pandey, R.N., Arora, A., Bhat, J.S. and Sureja, A.K. (2010). Effect of salt stress on cucumber: Na ⁺ /K ⁺ ratio, osmolyte concentration, phenols and chlorophyll content. <i>Acta Physiol. Plant.</i> , 32: 103-114.	7.31
38	Joshi, R., Shukla, A. and Sairam, R.K. (2011). <i>In vitro</i> screening of rice genotypes for drought tolerance using polyethylene glycol. <i>Acta Physiol. Plant.</i> , 33: 2209-2217.	7.31
39	Sairam, R.K., Dharmar, K., Lekshmy, S. and Chinnusamy, V. (2011). Expression of antioxidant defense genes in mung bean (<i>Vigna radiata</i> L.) roots under water-logging is associated with hypoxia tolerance. <i>Acta Physiol. Plant.</i> ,33: 735-744.	7.31
40	Sairam, R.K., Dharmar, K., Lekshmy, S. and Chinnusamy, V. (2011). Expression of antioxidant defense genes in mung bean (<i>Vigna radiata</i> L.) roots under water-logging is associated with hypoxia tolerance. <i>Acta Physiol. Plant.</i> , 33: 735-744.	7.31
41	Sairam, R.K., Vasanthan, B. and Arora, A. (2011). Calcium regulates <i>Gladiolus</i> flower senescence by influencing antioxidative enzymes activity. <i>Acta Physiol. Plant.</i> ,33: 1897-1904.	7.31
42	Chakraborty, K., Sairam, R.K. and Bhattacharya, R.C. (2012). Salinity-induced expression of pyrroline-5-carboxylate synthetase determines salinity tolerance in <i>Brassica spp.</i> <i>Acta Physiol. Plant.</i> ,34: 1935-1941.	7.31
43	Thomas, S., Anand, A., Chinnusamy, V., Dahuja, A. and Basu, S. (2013). Magnetopriming circumvents the effect of salinity stress on germination in chickpea seeds. <i>Acta Physiol. Plant.</i> ,35: 3401-3411.	7.31
44	Bahuguna, N., Jyoti, J., Pal, M., Shah, D., Lawas, L., Khetarpal, S. and Jagadish Krishna, S.V. (2014). Physiological and biochemical characterization of NERICA-L 44: A novel source of heat tolerance at the vegetative and reproductive stages in rice. <i>ActaPhysiologia Plantarum</i> . PPL-2014-00417.R1 (Accepted)	7.31
45	Kumar, M., Singh, V.P., Arora, A. and Singh, N. (2014). The role of abscisic acid (ABA) in ethylene insensitive <i>Gladiolus</i> (<i>Gladiolus grandiflora</i> Hort.) flower senescence. <i>Acta Physiol. Plant.</i> , 36: 151-159.	7.31
46	Kumar, M., Singh, V.P., Arora, A. and Singh, N. (2014). The role of abscisic acid (ABA) in ethylene insensitive <i>Gladiolus</i> (<i>Gladiolus grandiflora</i> Hort.) flower senescence. <i>Acta Physiol. Plant.</i> , 36: 151-159.	7.31
47	Pal, M., Chaturvedi, A.K., Pandey, S.K., Bahuguna, R.N., Khetarpal, S. and Anand, A. (2014). Rising atmospheric CO ₂ may affect oil quality and seed yield of sunflower (<i>Helianthus annus</i> L.). <i>Acta Physiologia Plantarum</i> , 36: 2853-2861.	7.31



48	Kumar, N., Pal, M., Singh, A. Sairam, R.K. and Srivastava, G.C. (2010). Exogenous proline alleviates oxidative stress and increase vase life in rose (<i>Rosa hybrida</i> L. 'Grand Gala'). <i>Scientia Hort.</i> ,127: 79–85.	7.40
49	Mohan, R., Prasad, K.V., Singh, S.K., Kaur, C., Arora, A. and Kumar, S. (2012). Induction of carotenoid pigments in callus cultures of <i>Calendula officinalis</i> L. in response to nitrogen and sucrose levels. <i>In vitro Cell. Dev. Biol. Plant</i> ,48: 99-106.	7.41
50	Singh, B., Ahuja, S., Pandey, R. and Singhal, R.K. (2014). ¹⁴ CO ₂ labeling: a reliable technique for rapid measurement of total root exudation capacity and vascular sap flow in crop plants. <i>J. Radio Analytical and Nuclear Chem.</i> , DOI 10.1007/s10967-014-3531-1.	7.47
51	Anand, A., Bhardwaj, J. and Nagarajan, S. (2010). Comparative evaluation of seed coat dormancy breaking treatments in <i>Stylosanthes seabrana</i> . <i>Grass and Forage Sci.</i> ,66: 272-276.	7.57
52	Manna, S., Singh, N. and Singh, V.P. (2013). Effect of elevated CO ₂ on degradation of azoxystrobin and soil microbial activity in rice soil. <i>Environ. Monit. Assess.</i> ,185: 2951-2960.	7.59
53	Kanakala, S., Sakhare, A., Verma, H.N. and Malathi, V.G. (2013). Infectivity and the phylogenetic relationship of a mastrevirus causing chickpea stunt disease in India. <i>European J. Plant Pathol.</i> ,135: 429-438.	7.61
54	Kholova, J., Sairam, R.K., Meena, R.C. and Srivastava, G.C. (2009). Response of maize genotypes to salinity stress in relation to osmolytes and metalion contents, oxidative stress and antioxidant enzymes activity. <i>Biol. Plant.</i> ,53: 249-256.	7.69
55	Kumutha, D., Ezhilmathi, K., Sairam, R.K., Srivastava, G.C., Deshmukh, P.S. and Meena, R.C. (2009). Waterlogging induced oxidative stress and antioxidant activity in pigeon pea genotypes. <i>Biol. Plant.</i> ,53: 75-84.	7.69
56	Sairam, R.K., Kumutha, D., Ezhilmathi, K., Chinnusamy, V. and Meena, R.C. (2009). Waterlogging induced oxidative stress and antioxidant enzymes activity in pigeon pea. <i>Biol. Plant.</i> ,53: 493-504.	7.69
57	Sairam, R.K., Dharmar, K. Chinnusamy, V., Lekshmy, S, Joshi, R. and Bhattacharya, P. (2011). NADPH oxidase as the source of ROS produced under waterlogging in roots of mung bean. <i>Biol. Plant.</i> ,55: 741-746.	7.69
58	Sairam, R.K., Dharmar, K., Chinnusamy, V., Lekshmy, S., Joshi, R. and Bhattacharya, P. (2012). The role of non-symbiotic haemoglobin and nitric oxide homeostasis in waterlogging tolerance in <i>Vigna</i> species. <i>Biol. Plant.</i> ,56: 528–536.	7.69
59	Sharma, D.K., Dubey, A.K., Srivastav, M., Singh, A.K., Sairam, R.K., Pandey, R.N., Dahuja, A., Kaur, C. (2011). Effect of Putrescine and Paclobutrazol on Growth, Physiochemical Parameters, and Nutrient Acquisition of Salt-sensitive Citrus Rootstock Karna khatta (<i>Citrus karna</i> Raf.) under NaCl Stress. <i>J. Plant Growth Regul.</i> ,30: 301-311.	7.99

23. Details of patents and income generated:

None

24. Areas of consultancy and income generated:

Foliar Fertilizer: Rs. 3.98 lakhs from Consultancy Project, Virtual Fertilizer Research Center, Washington DC, USA (2013) Biochemical nutrient pathways in plants applied as foliar spray: Phosphorus and iron. VFRC Report 2013/1.

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad:

Name	Institutions and Industries Visited
Dr. Viswanathan Chinnusamy	BOYSCAST Fellow (DST, Govt of India) at Prof. Jian-Kang Zhu's Lab, Dept of Plant Sciences, University of Arizona, Tucson, AZ 85721, USA (June 2001 to Sep 2002). Visiting Researcher at Prof. Jian-Kang Zhu's Lab, Department of Botany and Plant Sciences, University of California, Riverside, CA-92521, USA (Oct 2008-Oct 2010) Visiting Scholar at Prof. Jen Sheen's Lab, Department of Molecular Biology, Harvard Medical School, Harvard University, Boston, MA 02115, USA (7-23 May 2009).



Dr. V.P. Singh	BARC, TIFR, IISc, NCBS, Bangalore , UAS Bangalore and IIM Bangalore
Dr. Santosh Kumari	Advanced training on the use of Phytotron in stress physiology research, Australia
Dr. Ajay Arora	JSPS Fellow (Japan society for the Promotion of Science) long-term Post-doctoral fellowship in Tsukuba University, Japan (2001-2003)
Dr. Madan Pal Singh	Academic Visitor at Plant Environment Laboratory University of Reading, UK. Attended UNEP Environmental Effects Assessment Panel Review Committee meeting during August 16-24 at Zhengzhou, China Invited by IRRI to attend 4th International Rice Congress at Bangkok from 27th Oct to 1st Nov, 2014
Dr. Poonam Natu	Post Doctoral Scholar (1999 – 2001) at Dept. of Crop Physiology, UAS, GKVK, Bengaluru
Dr. Rakesh Pandey	NAIP funded three months training at Department of Agronomy, Kansas State University, USA (15 Dec 2013 - 13 March 2014)
Dr. Sangeeta Khetarpal	
Dr. Renu Pandey	BOYSCAST fellow at Donald Danforth Plant Science Center, St Louis, MO 63132, USA (2007-08)

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Viswanathan Chinnusamy	DBT Nominee, IBSC, GBU, Greater Noida; Member, RCGM sub-committee on SPT rice Member, DST INSPIRE Fellowship Committee	Editor, Indian Journal of Plant Physiology	Nil
Dr. V.P. Singh	BOS, BHU, Varanasi, Academic Council IARI, Staff selection Board and various selection and promotion Boards of Universities.	Member of editorial board, Indian Journal of Plant Physiology for 12 years, Consulting Editor Advances in Plant Physiology 13 Volumes	Ex-Vice President ISPP, Treasurer of Indian Society for Plant Physiology-2013-16
Dr. Santosh Kumari		Member of editorial board (2006- 07) and consulting editor (2009-10) of Indian Journal Plant Physiology	
Dr. Ajay Arora		Editor-in-Chief, Indian Journal of Plant Physiology, 2010-12; Editor, Indian Journal of Plant Physiology, 2013 onwards	Vice-President of Indian Society for Plant Physiology- 2013
Dr. Madan Pal Singh	Reviewer of UNEP Environmental Effects Assessment Panel	Executive Editor, Indian Journal of Plant Physiology	
Dr. Poonam Natu		Young Scientist award by ISPP	
Dr. Vijay Paul		Editor, Indian Journal of Plant Physiology	
Dr. Anjali Anand		Editor, Indian Journal of Plant Physiology	
Dr. Pramod Kumar		Editor, Indian Journal of Plant Physiology	
Dr. Rakesh Pandey		Editor, Indian Journal of Plant Physiology	
Dr. Renu Pandey		Editor, Indian Journal of Plant Physiology	Treasurer, Indian Nitrogen Group-Society for Conservation of Nature (ING-SCON) (2014-2016)

**27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):**

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects**Percentage of students who have done in-house projects including interdepartmental projects:**

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:**a) Faculty:**

Name	Awards/Recognitions
Dr. Viswanathan Chinnusamy	<ul style="list-style-type: none"> ICAR Jawaharlal Nehru Award (2001) NAAS Associate, 2010 onwards IARI Merit Medal for MSc (1994) and Ph.D (2000) JJ Chinoy Gold Medal of ISPP (2012) DST, Govt of India, BOYSCAST Fellowship
Dr. V.P. Singh	<ul style="list-style-type: none"> Gold Medal (M. Sc.)-1978 USDA Certificate of Appreciation for Best research (1992) Fellow of Indian Society for Plant Physiology.(2001) G.S. Sirohi best paper awardin IJPP of ISPP (2010)
Dr. Santosh Kumari	<ul style="list-style-type: none"> Fellow of Indian Society for Plant Physiology (1997)
Dr. Ajay Arora	<ul style="list-style-type: none"> IARI Best Teacher Award (2013) J.J. Chinoy Gold Medal (2010) AAAS Senior Award (2007) G.S. Sirohi best paper award (2010) ASBMB & IUBMB Young Scientist Fellowship (2003) Fellow of Indian Society for Plant Physiology (2007).
Dr. Madan Pal Singh	<ul style="list-style-type: none"> JJ Chinnoy Gold Medal Award, Indian Society for Plant Physiology (2008) Fellow of Indian Society for Plant Physiology
Dr. Poonam Natu	<ul style="list-style-type: none"> Young Scientist Award of ISPP (1996) ISCA Award for the best poster paper presentation (88th Indian Science Congress, Jan 2001) GS Sirohi Best Paper Award of ISPP (2004)
Dr. Vijay Paul	<ul style="list-style-type: none"> IPA Best Paper Award (2000) ISPP Young Scientist Award (2003) AFST (I) Best Paper Award (2010) Vigyan Bharti "Aryabhat Samman" (2013), Editor IJPP since 2012 Fellow of ISPP
Dr. Anjali Anand	<ul style="list-style-type: none"> Fellow of Indian Society for Plant Physiology Best poster award in Third International Agronomy Congress (2012) Best paper award by Society for Advancement of Human and Nature (2013) Best paper award by Fertilizer Association of India (2014)



Dr. Pramod Kumar	<ul style="list-style-type: none"> Fellow of ISPP, New Delhi (2010) First award for a scientific popular article in Hindi by IARI (2010) Six papers/poster awards in National & International Seminars/conferences
Dr. Rakesh Pandey	<ul style="list-style-type: none"> Best Paper Awards of ISPP (2003) Best Paper Awards of National Seminar on “Global Warming”, Ministry of Earth Sciences (2007) Best Paper Awards of Journal of Food Science and Technology (2010) Aryabhat Samman (2013) by Vigyan Bharti, Delhi.
Dr. Sangeeta Khetarpal	<ul style="list-style-type: none"> Best paper award in National Seminar on “Global Warming”, Ministry of Earth Sciences, New Delhi (2007) Best paper award in Young Scientist Session in ISPP Seminar (2008) Best Poster Award ISPP, New Delhi (2011).
Dr. Renu Pandey	<ul style="list-style-type: none"> Dr. RD Asana Gold Medal (2004) JJ Chinoy Award (2014) Fellow of Indian Society for Plant Physiology (2014).
Dr. Lekshmy S.	<ul style="list-style-type: none"> Young Scientist Award ISPP (2008) Best Poster Award ISPP (2012, 2014)
Dr. Puja Rai	<ul style="list-style-type: none"> Young Scientist Award ISPP

b) Students:

- ICAR Jawaharlal Nehru Award, 2001
- Six students got Young Scientist presentation award of ISPP in National Seminars.
- One student got best Young Scientist presentation award in National Conference, Delhi University (2014)
- Three students got GS Sirohi best paper published award in Indian Journal of Plant Physiology.
- More than 10 students have got best poster presentation award in different seminars and conferences.

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Seminar/Conference/Workshops	Source of Funding	Details of participants
Short course on “Physiological Analysis of yield in Crop Plants” from 15 th - 24 th June, 1998	Indian Council of Agricultural Research	21 participants (Assistant Professors and above rank)
Winter school on “Post-harvest physiology of fruits and flowers” from 27 th January to 16 th February 2009	Indian Council of Agricultural Research	20 participants (Assistant Professors and above rank)
Summer school on “Photosynthetic Efficiency and Crop productivity under Climate Change scenario”. From 25 th Aug. to 14 th Sept.) 2009	Indian Council of Agricultural Research	23 participants (Assistant Professors and above rank)
Short course on “Non-destructive phenotyping and phenomics for dissection of abiotic stress tolerance, gene discovery and crop improvement”, 14-23 July 2014	Indian Council of Agricultural Research	25 participants (Assistant Professors and above rank)

31. Code of ethics for research followed by the departments:

As per ISO 9001-2008 Standard

**32. Student profile programme-wise (2014-15):**

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	3	1	-	-
Ph.D.	57	2	3	3.50	5.26

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	-
Ph.D.	88.24	NIL	11.76	-

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.

5 Indian Administrative Service

5 Indian Police service

8 Indian Revenue Service

15 Indian Forest Service

Five students are in Reserve Bank of India and other nationalized banks.

All others are selected as ARS scientist or Assistant Professor

Many continuing career as researcher abroad

One student entrepreneur

One student after M.Sc. is preparing for civil services.

No student of the discipline is Jobless.

35. Student progression:**Student progression**

UG to PG

PG to M.Phil.

PG to Ph.D.

Ph.D. to Post-Doctoral

Employed

Campus selection

Other than campus recruitment

Entrepreneurs

Percentage against enrolled

No UG

No M. Phil.

100%

All students after Ph.D. get Jobs and only few go abroad for post doc.

All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.

In last 7 years only one student is entrepreneur



36. Diversity of staff:

Percentage of faculty who are graduates

Of the same university	None
From other universities within the state	14.29
From universities from other States from	85.71
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

All are Ph.D.

38. Present details of departmental infrastructural facilities with regard to:

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: two
- Student's laboratories
- Research laboratories: 14

39. List of doctoral, post-doctoral students and Research Associates:

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S.No.	Name of the M. Sc. student	University of Graduation
1.	Mr. Nitin Sharma	Chaudhary Sarwan Kumar Himachal Pradesh, Krishi Vishwavidyalya, Palampur
2.	Ms. Shamima Parveen	Vishwa Bharti University, Bolpur, West Bengal
3.	Ms. Lakshmi Raj	Kerala Agriculture University Kerala
4.	Mr. Mahesh Meena	Punjab Agricultural University, Ludiana
5.	Ms. Vasundhara Sharma	Navsari Agril University, Navsari, Gujarat
6.	Mr. Milan Kumar Lal	Odisha University of Agril & Technology, Bhubaneswar (Odisha)
7.	Mr. Suproakash Debnath	UBKV, Cooch Behar , West Bengal
8.	Mr. Rajeev Kumar	M.P.K.V., Rahuri, Maharashtra

S.No.	Name of the Ph.D. student	Host/other institute/ university
1	Mr. Mukesh Kumar Gupta (Ph.D.)	IARI
2	Mr. Bicky Kumar (Ph.D.)	IARI
3	Ms. Soumya P.R. (Ph.D.)	IARI
4	Ms. Priyanka Bagri (Ph.D.)	IARI



5	Mr. Gajendra Ramesh Rathod (Ph.D.)	IARI
6	Mr. Sakhare Akshay S (Ph.D.)	Other University
7	Mr. Ankit Pandey (Ph.D.)	IARI
8	Ms. Madhurima Das (Ph.D.)	IARI
9	Mr. Sukumar Taria (Ph.D.)	IARI
10	Ms. Sini Thomas K. (Ph.D.)	IARI
11	Mr. Shailesh Kumar (Ph.D.)	IARI
12	Ms. Shivani Nagar (Ph.D.)	IARI
13	Ms. Deepika Kumar Umesh (Ph.D.)	IARI
14	Mr. Krishna Kumar G. (Ph.D.)	IARI
15	Ms. Krishnapriya V. (Ph.D.)	Other University
16	Mr. R. Shiv Rama Krishnan.(Ph.D.)	Other University
17	Mr. Pankaj Kumar (Ph.D.)	IARI

S.No.	Name	Designation	Qualification	Host/other institute/ university
1	Rakesh Verma	SRF	M.Sc.	Other University
2	Shashank Yadav	SRF	M.Sc.	Other University
3	Santosh V	SRF	M.Sc.	Other University
4	Sanya Shrivastava	SRF	M.Tech.	Other University
5	Rahul Tiwari	Er	B.Tech.	Other University
6	Chandrapal Vishwakarma	PA	M.Sc.	Other University
7	Heena Sharma	SRF	Ph.D.	Other University
8	Dr. Ashish K Chaturvedi	RA	Ph.D.	Other University
9	Shweta Singh	SRF	M.Sc.	Other University
10	Divya Shah	RA	M.Sc.	Other University
11	Sadhna	SRF	M.Sc.	Other University
12	Pooja Dhuppar	SRF	Ph.D.	Other University
13	Sourabh Karwa	SRF	M.Sc.	Other University
14	Tushita Shukla	JRF	M.Sc.	Other University
15	Chunoti Changwal	JRF	M.Sc.	Other University
16	Dibyajyoti Pramanik	SRF	M.Sc.	Other University
17	Dr. Tushara Raghwan	RF	Ph.D.	Other University
18	Sandeep Sharma	RF	M.Sc.	Other University
19	Priyanka Borah	RF	M.Sc.	Other University
20	Anjali (Soil Sciences)	RF	M.Sc.	Other University
21	Dr Sanjay Yadav	SRF	M.Phil., Ph.D.	Other University
22	Archana Yadav	SRF	M.Sc.	Other University
23	Pragya Yadav	JRF	M.Sc.	Other University

* Five SRF are registered for their Ph.D. in various other universities.



40. Number of post graduate students getting financial assistance from the university:

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from:

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10):

S.No.	Name and address	Passing Year
1.	Dr. R.N. Basu Former Vice Chancellor, University of Calcutta, (Kolkata, West Bengal)	1962
2.	Dr. K. Mohan Naidu Former Director, Sugarcane Breeding Institute, Coimbatore (TN)	1962
3.	Dr. V. Balasubramanian Former Project Director, DRR Hyderabad (AP)	1968
4.	Dr. B. Venketeswarlu Former Director, CRRI Cuttack (Odisha)	1971
5.	Dr. Malvika Dadlani Former Joint Director (Research), IARI, New Delhi	1978
6.	Dr. Vinay Kumar Dadhwal Director, National Remote Sensing Centre (NRSC), ISRO, Hyderabad	1983
7.	Dr. M.B. Chetti ADG (Human Resource Development), ICAR, New Delhi	1985
8.	Dr. K.C. Bansal Director, NBPGR, New Delhi	1988
9.	Dr. P. Anand Kumar Former Director, NRCPB, New Delhi	1988
10.	Dr. Manoranjan Kar Vice Chancellor, OUAT Bhubneswar (Odisha)	1989



44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts:

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details:

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied:

CROP PHYSIOLOGY

- A concept of photothermal quantum requirement for phenophases was proposed that can be used to predict duration of varieties in different parts of the country, and thus yield in different agro-climatic conditions.
- For enhancing yield and stability of wheat under drought conditions, a method was suggested for selection of genotypes based on main ear yield under optimal conditions.
- Ear photosynthesis contributes significantly to grain yield of wheat. Hence, this trait should be given due consideration for improving wheat yield.
- In wheat, the available photoassimilate is not fully utilized due to the limitation in flow of assimilates to the developing grains located in distal spikelets. Hence, ear architecture with increasing spikelet number per spike instead of grains per spikelet is suggested to minimize the inverse relationship between grain number and grain size, and thus grain yield of wheat.

CROP IDEOTYPES

- Wheat Ideotype with following traits were suggested for enhancing yield under drought: 1) Early spike emergence that permits grain development for 35 days at a mean maximum temperature of 25°C, 2) Deep root system up to 90-120 cm at the time of ear emerging, 3) main ear with large number of fertile spikelets, preferably a branched ear, 4) about 7 leaves (preferably planophil) on the main stem.
- Mustard ideotype with following traits were suggested to achieve seed yield of 5 t/ha: 1) Plant height of 1-1.25m, 2) 5-6 primary branches at an upper plant profile, 3) main raceme bearing only 40 pods, 4) lower branches should have 15 pods each and upper branches 20 each, 5) small and thicker leaves (7-10 on main stem), 6) pods should have 20 seeds with a seed weigh of 5mg per seed.



MINERAL NUTRITION OF PLANTS

- Identified donors for phosphorus and nitrogen use efficiency in wheat, and N and P deficiency tolerance in maize.
- Tall wheat genotypes have higher N uptake and nitrogen utilization efficiency (NUE) for dry matter production while dwarf genotypes have greater NUE for grain production.
- Found that the difference in high nitrate reductase and low nitrate reductase in wheat genotypes was due to the coordinated expression of activity of transporters and the enzymes of nitrogen assimilation pathway.
- Found that genetic variability in carboxylate exudation capacity along with improved root traits is the key mechanism for phosphorus-deficiency stress tolerance in green gram and soybean.
- Developed a technique for rapid and easy screening of genotypes for P use efficiency based on total root carbon exudation of $^{14}\text{CO}_2$ labelled shoots and identified donors for phosphorus use efficiency in green gram and soybean.
- Interlinked phospholipid metabolism with ion uptake regulation in maize root.
- Found that associative symbiosis enhances the level of phytohormones and activity of the enzymes of ammonia assimilation pathway in maize under reduced chemical fertilization.
- High-affinity nitrate transporter gene, BjNRT2.1 from mustard and root specific promoters from tobacco and tomato were cloned. Plant transformation construct for root specific expression of BjNRT2.1 was developed.

ABIOTIC STRESS TOLERANCE

Selection criteria:

- A modified protocol for membrane stability index and chlorophyll stability index were developed, and the utility was demonstrated for selection of genotypes for improving drought and salinity tolerance in different crops.
- The utility of canopy temperature and Chlorophyll fluorescence as selection criteria for high temperature stress tolerance of wheat was demonstrated.

Identification of Traits and Donors:

- Identified Nerica L-44 as novel source of spikelet fertility and heat tolerance in rice.
- Phenotyping of large number of wheat genotypes led to the identification of contrasting set of wheat genotypes for stay green trait under drought stress. Drought susceptibility index and yield correlated with stay green trait. IPT gene from wheat was cloned.
- Identified donors for photosynthesis based parameters - carboxylation efficiency, photosynthetic radiation use efficiency and photosynthetic water use efficiency in rice, cotton, wheat, potato, and chickpea.
- Identified soluble starch synthase (SSS) as the most thermosensitive enzyme in starch biosynthetic pathway in developing grains of wheat. The thermosensitivity of SSS is one of the major causes for grain weight reduction under terminal heat stress. Comparative physiological analyses revealed that maize SSS is more thermostable and has high catalytic efficiency. Hence, maize SSS can be used to broaden thermal kinetic window of starch synthesis in developing grain and thus grain weight stability in wheat.
- Low relative growth rate under late sown conditions was found to be a major cause for yield reduction in chickpea under late sown conditions. Hence, selection for genotypes with high RGR is suggested for chickpea yield improvement under late shown conditions.
- Low light stress reduces grain yield due to increase in spikelet sterility in early and medium duration varieties, while it reduces panicle number in long duration varieties of rice.
- Found that high level of expression of *Trehalose-6-phosphate synthase*, *Pyroglutamate 5-carboxylate synthase* and *Betaine aldehyde dehydrogenase (BADH)* genes correlates significantly with osmolyte content and salinity tolerance in wheat.
- Use of drip irrigation for leaf area modification and enhanced water use efficiency in different crops.



Signaling pathways and genes:

- Elucidated the role of ROS detoxification as crucial mechanisms of abiotic stress tolerance in different crops.
- Demonstrated the conservation of Salt Overly Sensitive (SOS) pathway of salt tolerance in wheat and mustard, and showed that SOS pathway genes contribute to low cellular Na⁺ accumulation and salt tolerance in wheat and mustard.
- Elucidation of the mechanism of action of plant stress hormone ABA receptors (ABARs) in abiotic stress signaling (collaboration with Purdue University, USA). Cloned rice ABA receptors, and validated the function of *ABAR6* in drought tolerance.
- Discovery and elucidation of the SICKLE a novel protein involved spliced intron catabolism, microRNA biogenesis and abiotic stress tolerance in *Arabidopsis* (collaboration with Purdue University, USA).
- Elucidation of the role of STABILIZED1 (STA1), a pre-mRNA processing factor 6 homolog, in the biogenesis of miRNAs in *Arabidopsis* (collaboration with Sogang University, Korea and Purdue University, USA).
- Contributed to the functional validation stress responsive genes such as *AtRAS1*, *BnLEA4-1* and *BcZF1* transcription factor genes and *LEA4* promoter.
- Omics and genome-wide analyses led to the identification of ABA responsive genes, coexpression network and stress responsive MYB genes in rice.
- Exogenous application of ascorbic acid (AsA) and cytokinin conferred enhanced drought tolerance to wheat by delaying leaf senescence and reducing oxidative stress. Endogenous AsA content under drought stress correlated with the drought tolerance in wheat. Dehydroascorbate reductases (DHAR) gene involved AsA regeneration was cloned from wheat.
- Gene for cytokinin biosynthesis and catabolism were cloned from wheat for improving staygreen trait and drought tolerance of wheat.
- Genes for ethylene and polyamine biosynthesis were cloned from wheat. Higher polyamine accumulation may help impart drought tolerance in wheat.
- Drought and heat stress-induced reduction in endogenous IAA content was found to be one of the causes of spikelet sterility in rice genotypes

CLIMATE CHANGE

- Impact of elevated CO₂ on yield of various crops was assessed using FACE and OTC methods. Rice, wheat, pulses and mustard showed yield improvement due to elevated CO₂.
- Elevated CO₂ significantly decreased in grain protein, HMW glutenin, Zn, Fe and Mg content but increased Cu and Mn content in wheat grains suggesting the need for genetic improvement and change in nutrient management practices to maintain nutritional qualities in future climate change scenarios.
- Found that enhanced yield under elevated CO₂ is due to enhanced partitioning of carbon towards roots and thus enhanced nodulation and nitrogenase activity in pulses such as chickpea and mungbean.
- Elucidated the basis for improving sustenance of photosynthesis in wheat by overcoming end product inhibition of photosynthesis.
- Elevated CO₂ enhances NUE and short term carbon sequestration in wheat
- Elevated CO₂ could not ameliorate effects of 3 and 6°C increase in temperature above ambient in rice and chickpea.
- Showed that expression of high affinity nitrate transporter (*NRT2.2*) and nitrate reductase (*NR*) genes are inhibited by elevated CO₂ conditions in wheat seedlings.
- Analyzed UV-B tolerance in various crops and categorized as wheat and oat as tolerant, and mustard and peas as sensitive. Flavonoids accumulation in leaf was found to contribute to UV-B tolerance.



POST HARVEST PHYSIOLOGY

- Elucidation of ABA-mediated flower senescence in ethylene insensitive gladiolus.
- Cloning and functional validation of ethylene receptors *GgERS1a* and *GgERS1b* from gladiolus revealed that ethylene insensitivity of these receptors as a major cause for ethylene insensitivity of gladiolus flowers. Developed *GgERS1* overexpressing tomato plant with delayed ripening. This gene can be used to delay senescence and ripening.
- A method was developed to increase the vase life of gladiolus by 5-sulphosalicylic acid, alpha lipoic acid, polyamines and inositol in vase solution.
- Standardized protocol for 1-methylcyclopropene (1-MCP) and ethanol mediated extension of shelf-life of tomato fruits at room temperature storage.
- Established morphological/anatomical bases (stem scar) for variability in fruit ripening and storability.
- Developed non-destructive methods for assessment of fruit quality.
- Expression and allelic variation in genes for asparagine synthesis and sugar metabolism were found to be associated with genotypic variation in cold-induced sweetening (CIS) in potato, and candidate gene based molecular markers were developed.

YIELD ENHANCEMENT METHODS

- Developed protocols for static and pulsed magnetic field mediated dry seed priming for improving seed vigour and yield in various crops and found that vigour improvement is mediated through ROS signaling.
- Found that magnetopriming of seeds can ameliorate moisture deficit and salinity stress at seedling establishment stage.
- Developed PGR based formulations for enhancing yield of wheat, chickpea, pea and soybean.

VARIETY DEVELOPMENT

- Contributed to the development of wheat varieties HD 3086 and HD 3118.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department:

Strengths:

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni

Weaknesses:

- Lack of expertise in certain areas like nanotechnology
- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Centre for Advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

Opportunities:

- Centrally located hence, many Research Institutes, University are there for collaboration



- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.

Challenges:

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department

EDUCATION

Enhancement of the quality of human resources:

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of crop physiology, crop modeling, molecular physiology and systems biology.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encouraged to go for 6-12 months training at world leading Institutes through ICAR/DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
- Monthly seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.

RESEARCH

Emphasis will be given to the basic and strategic research in the area of abiotic stress tolerance and nutrient use efficiency of crops. In the next five years, the Division will focus on “Deciphering Physiological, Biochemical and Molecular Mechanisms of Abiotic Stress Tolerance and Nutrient Use Efficiency of crop plants” in a multidisciplinary mode in collaboration with National and International Institutes. The main areas of the current research programme are:

1. Identification of donors, mechanisms and component traits for nutrient use efficiency and tolerance to drought and heat stress in rice and wheat

Phenomics and novel phenotyping approaches will be used to decipher component traits for tolerance to moisture deficit stress and high temperature stresses in rice and wheat. Emphasis will be given to develop sensors for high throughput non-destructive plant phenotyping (morphological as well as chemical) of large number of germplasm resources for accelerated analytical breeding. The major component traits focused are root system architecture (RSA), water use efficiency, radiation use efficiency, stem reserve mobilization, stay green, spikelet fertility and grain development. In case of nutrient use efficiency, N and P efficiency will be focused in rice, while N, Zn and Fe use efficiency will be focused in wheat. Efforts will be made to unravel the physiological basis of multiple stress interaction including biotic vs abiotic, and abiotic vs abiotic stresses.

2. Genomics for identifications of promoters and genes for enhancing abiotic stress tolerance and nutrient use efficiency in wheat and rice



Phenomics and molecular analysis of mutants, candidate gene transgenics and genome editing will be used to identify novel genes involved in abiotic stress tolerance of plants. Genome-wide DNA methylation analysis will be employed to understand short term and long term stress memory, acclimation and trans-generational stress memory in rice. Efforts will be made to identify and design strategies to overcome kinetic and metabolic bottlenecks in physiological processes for yield improvement. Efforts will be made to integrate cell biology, plant and crop physiology with computational biology for prediction gain in plant trait from modification of genes/processes.

3. *Development of transgenic rice and wheat with enhanced abiotic stress tolerance*

Genes for ABA signaling and stress responsive transcription factors will be used to engineer drought tolerance in rice. Efforts will be made to engineer physiological pathways of carbon fixation, photosynthesis, photorespiration and nutrient use efficiency in rice. Cytokinin metabolism will be engineering for improving drought tolerance in wheat.

**xx) Division of Food Science and Post Harvest Technology****1. Name of the Department**

Division of Food Science & Postharvest Technology

2. Year of establishment

February 5, 2002

3. Is the Department part of a School/Faculty of the university?

School of Horticulture

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., M.Sc., D.Litt., etc.):

M.Sc. M Tech and Ph.D.

5. Interdisciplinary programmes and departments involved:

Division of Floriculture and Landscaping, Horticulture and Agricultural Engineering, Microbiology, Bio Chemistry, Molecular Biology and Biotechnology, Soil Science and Agricultural Chemistry

6. Courses in collaboration with other universities, industries, foreign institutions, etc.:

None

7. Details of programmes discontinued, if any, with reasons:

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester System

9. Participation of the department in the courses offered by other departments:

The faculty deliver lectures and guide dissertations in the sister departments Division of Horticulture, Floriculture and Landscaping and Agricultural Engineering

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	6			6
Senior Scientist (Associate Professor)	2			2
Scientist (Assistant Professor)	1	09	03	1

Besides above there are two permanent faculties in the discipline who are posted at sister department or sister institute as follows: NA

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

SN.	Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
						M.Sc.	Ph.D.
	Dr. V. R. Sagar	Ph.D.	Head of the Division	Development of osmo-dehydrated /RTU/RTE products, value addition, packaging, storage of processed products	29	5	9
	Dr. Charanjit Kaur	Ph.D.	Professor	Antioxidant phytochemicals, Natural colorants, enzyme assisted	24	4	6



Dr. Sunita Singh	Ph.D.	Principal Scientist	processing for functional ingredients, new product development, extrusion processing, functionality in cereals	23	18	2
Dr. Ram Asrey	Ph.D.	Principal Scientist	Post harvest preservation by fermentative processing of fruits and vegetables, wines & application	12	6	3
Dr. R. R. Sharma	Ph.D.	Principal Scientist	Pre-harvest management, edible coatings, non-chemical alternatives, handlings and storage physiology of fruits & vegetables	28	2	2
Dr. S. K. Jha	Ph.D.	Principal Scientist	Post harvest physiology, senescence and pathology, fresh fruit handling, biological agents, pre-harvest management, Non-Chemical approaches for PHM	17	4	1
Dr. Shruti Sethi	Ph.D.	Senior Scientist	Extrusion processing, cereal processing	12	3	2
Dr. Abhijit Kar	Ph.D.	Senior Scientist	Development of convenience foods, value addition of horticulture & arable crops, surface coatings for shelf life extension, minimal processing	15	5	-
Dr. Shalini Gaur Rudra	Ph.D.	Scientist	Micro/nano encapsulation; application of alternate technologies for food processing; novel packaging materials/coatings for fresh and minimally processed fruits and vegetables	12	2	-
			Cereal processing, rheological approaches for foods, thermal processing value added vegetable & food products, mathematical modeling kinetics			

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S.No.	Name of the Faculty	Status
1.	Dr. D. S. Khurdiya Retired Head, Division of PHT IARI	Adjunct Faculty
2.	Dr. Sukhvinder Pal Singh, (Scientist C PHT) National Agricultural Food Biotechnology (NABI) DBT, Ministry of Science & Technology, Mohali, Punjab,	Guest Lectures
3.	Dr. H. C. Kapoor, Retired Professor, Division of Biochemistry IARI	Guest Lecture
4.	Dr. Mahesh Gupta, Associate Professor, Palampur University	Guest Lecture

13. Percentage of classes taken by temporary faculty – programme-wise information

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio

M. Sc. = 1:1 and Ph.D. = 2:1



15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	-	7	7
2.	Administrative	-	3	3
3.	Supportive	-	6	6

16. Research thrust areas as recognized by major funding agencies

Neutraceuticals functional food, Extrusion processing, post harvest ripening, shelf life extension, nano technology

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Dr. V. R. Sagar	Development of protocol for export of fresh fruits and vegetables from India- Outreach project	-	4.0
Dr. Charanjit Kaur	“Development of phenolic multigrain bread with improved functional quality” MOFPI	-	47
Dr. S. K. Jha	Niche Area Excellence’s project entitled “Pilot Scale Processes for Cereal Based Functional Foods through Extrusion Processing”	-	400
Dr. Abhijit Kar	Extraction and Micro-encapsulation of nutraceutical for effective delivery into different food matrices- NFBSFARA Polymeric nano materials for packaging efficient delivery of nutraceuticals- NFBSFARA	-	

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

- Extraction and Micro-encapsulation of nutraceutical for effective delivery into different food matrices- NFBSFARA (Institute IARI, New Delhi), Division of Agricultural Chemistry
- Polymeric nano materials for packaging efficient delivery of nutraceuticals- NFBSFARA (Institute IARI, New Delhi), Division of Agricultural Chemistry

b) International collaboration - NA

19. Departmental projects funded by

DST-FIST, UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received none under these programmes

20. Research facility / centre with State recognition

Not applicable

21. Special research laboratories sponsored by / created by industry or corporate bodies

Not applicable

22. Publications

	Sagar V.	Kaur C.	Singh S.	Asrey R.	Sharma R.	Jha S. K.	Sethi S.	Kar A.	Rudra S. G.
Number of papers published in peer reviewed journals (national / international)		50			22		19	32	21
Monographs					-		1	-	-
Chapters in Books		1			5		9	2	6



Edited Books	-			
Books with ISBN with details of publishers	4	-	1	
Citation Index – range / average	2330	1022		142
h-index	12	15	8	7

Some of the important publication from 2010-2014

S. No.	PAPERS	NAAS ratings (≥6-8)
1.	Sharma R.R., Pal R.K., Singh D., Samuel, D.V.K., Kar Abhijit and Asrey Ram (2010). Storage life and fruit quality of individually shrink-wrapped apples (<i>Malus domestica</i>) in zero energy cool chamber. <i>Indian J Agric. Sci.</i> , 80(4): 338 – 341.	6.00
2.	Bal Lalit M, Kar Abhijit, Satya Santosh, Naik Satya N (2010). Drying kinetics and effective moisture diffusivity of bamboo shoot slices during microwave drying. <i>Int. J Food Sci. & Technol.</i> , 45 : 2321 – 2328	7.24
3.	Singh, R., Gupta, R.K., Patil, R.T., Sharma, R.R., Asrey, R., Kumar, A and Jangra, K.K. (2010). Sequential foliar application of vermicompost leachates influence marketable yield and quality of strawberry (<i>Fragaria x ananassa</i> Duch.). <i>Sci. Hort.</i> , 124:34	7.50
4.	Srivastav, M., Kishore, A., Dahuja, A. and Sharma, R.R. (2010). Effect of paclobutrazol and salinity on onion leakage, proline content and activities of antioxidant enzymes in mango (<i>Mangifera indica</i> L.). <i>Sci. Hort.</i> , 125: 785	7.40
5.	Singh, S.K., Singh, S.K. and Sharma, R.R. (2010). Effects of pruning on biochemical status of shoot buds in three mango (<i>M. indica</i> L.) cultivars planted at high density. <i>J. Hort. Sci. Biotechnol.</i> , 85 (6): 483	6.51
6.	Sharma, R.R., Singh, D. (2010). Effect of different packing materials on shelf life and quality of apple during storage. <i>Indian J Hort.</i> , 67(1): 94	6.13
7.	Singh, S.K., Singh, S.K., Sharma, R.R. and Patel, V.B. (2010). Influence of different pruning intensities on leaf nutrient composition in some mango cultivars planted under high density. <i>Indian J. Hort.</i> , 67 (1):16	6.13
8.	Sharma, R.R. and Singh, D. (2010). Phenolic content pattern, polyphenol oxidase and lipoxygenase activity in relation to albinism, fruit malformation and nubbins production in strawberry (<i>Fragaria x ananassa</i> Duch.). <i>J. Plant Biochem. Biotechnol.</i> , 19(1): 67	6.81
9.	Singh, S.K., Singh, S.K., Sharma, R.R. and Patel, V.B. (2010). Influence of pruning intensity on flowering, fruit yield and floral malformation in three mango cultivars planted under high density. <i>Indian J. Hort.</i> , 67 (special issue):84	6.13
10.	Singh, R., Sharma, R.R. and Singh, D.B. (2010). Effect of vermin compost on plant growth, fruit yield and quality of strawberries in irrigated arid region of northern plains. <i>Indian J. Hort.</i> , 67(3): 318	6.13
11.	Koley, T.K.,Walia, S.,Nath, P. and KaurCharanjit(2010) Nutraceutical composition of Indian ber : Effect of enzyme assisted processing. <i>Intl J. Food Sci. Nutr.</i> , 23: 1-4	7.26
12.	Lalit, M.B., Kar, A., Satya, S. and Naik, S.N. (2010). Drying kinetics and effective moisture diffusivity of bamboo sjott slices undergoing microwave drying. <i>Intl. J. Food Sci. Technol.</i> , 45:2321-2328.	7.26
13.	N. V.Phong, V.R. Sagar and S.K. Singh (2010). Value addition through blending in Langra mango pulp for β-carotene. <i>Indian J. Hort.</i> 67(4): 478-481	6.13
14.	Sagar V.R. and Suresh Kumar P (2010). Recent advances in drying and dehydration: AReview. <i>J. Food. Sci. Technol.</i> , 47(1): 15-26.	8.02
15.	Sharma, R.R., Pal, R.K., Singh, D., Samuel, D.V.K., Kar, A. and Asrey, R. (2010). Storage life and fruit quality of individually shrink-wrapped apples (<i>Malusdomestica</i>) in zero energy cool chamber. <i>Indian J Agric. Sci.</i> , 80(4): 338-341.	6.00
16.	Sharma, R.R., Singh, D. (2010). Effect of different packing materials on shelf life and quality of apple during storage. <i>Indian J Hort.</i> , 67(1): 94-104	6.13
17.	Sharma, R.R., Singh, D., Singh, R., Singh, D.B. and Saharan, V.K. (2010). Effect of modified atmospheric packing on the quality and shelf-life of apple (<i>Malusdomestica</i>). <i>Indian J Agric. Sci.</i> , 80 (3):22-226	6.00



18. Singh, Meenakshi, ShwetaWalia, Charanjit Kaur, Raj kumar and Subodh Joshi. (2010). Processing characteristics of some tomato (*Solanumlycopersicon* L.) cultivars. Indian J.Agric. Sci. 80:174 -176(NAAS rating-) 6.00
19. Singh, S.K., Singh, S.K., Sharma, R.R. and Patel, V.B. (2010). Influence of different pruning intensities on leaf nutrient composition in some mango cultivars planted under high density. Indian J. Hort., 67 (1):16-20 6.13
20. Udal Singh and Sagar V.R. (2010). Quality characteristics of dehydrated leafy vegetables influenced by packaging materials and storage temperature. J. Sci. Ind. Res.69:785-789 6.49
21. Walia, S., Meenakshi Singh, Charanjit Kaur, Raj Kumar, Subodh Joshi. (2010). Antioxidant composition of red and orange cultivars of tomatoes (*Solanumlycopersicon* L): A comparative evaluation. J Plant Biochem. Biotechnol. 19: 95-97. 6.81
22. Rudra S.G., Chhibber, S. Shivhare, U.S. (2010). Thermal death kinetics of *B. stearothermophilus* in coriander leaf puree. Biosystems Engineering, 106(4): 544-550. 7.87
23. Jha, S. K., Sethi, S., Srivastav, M., Dubey, A. K., Sharma, R. R., Samuel D. V. K., and Singh, A. K. 2010. Firmness characteristics of mango hybrids under ambient storage. *Journal of Food Engineering*, 97: 208-212 8.58
24. Jhalegar, M.J., Sharma, R.R. and Pal, R.K. (2012). Post-harvest treatments of polyamines influence shelf-life and quality of kiwifruit (*Actinidia deliciosa*). *Indian J. Agric. Sci.*, 82: 81–84. 6.00
25. Barman, K Asrey, R, Pal, R.K, Kaur C, Jha, S.K (2011). Influence of putrescine and carnauba wax on functional and sensory quality of pomegranate fruits during storage J Food Sci Technol, DOI 10.1007/s13197-011-0483-0 8.02
26. Barman, Kalyan, Asrey, Ram and Pal, R.K. (2011). Putrescine and carnauba wax pretreatments alleviate chilling injury, enhance shelf life and preserve pomegranate fruit quality during cold storage. *Scientia Horticulturae* 130: 795-800 7.50
27. Jayachandran K S., Sethi V., Sethi S. and Singh, G. (2011). Standardization of a method for the development of hurdle processed bitter gourd rings. *Ind J. Hort.* 86(2): 250 254. 6.13
28. Eric Moreau, Floyd Inman, III, Sunita Singh, Heather Walters and Leonard Holmes (2011). Remote Control of Fed-Batch Fermentation Systems. *J. Chem. Chem. Eng.* 5 897-902. 6.28
29. Jhalegar, M., Sharma, R.R., Pal, R.K., Arora, A. and Dahuja, A. (2011). Analysis of physiological and biochemical changes in kiwifruit (*A ctinidiadeliciosa* cv. allison) after the postharvest treatment with 1-Methylcyclopropene. *J. Plant Biochem. Biotechnol.*, 20(2):205-210. 6.81
30. Khandare, V., Kaur, C., Walia, S. and Singh M. (2011). Black carrot (*Daucuscarota* ssp.sativus) juice: Processing effects on antioxidant composition and color. *Food and Bioproduct Processing*, 89: 482-486. 7.86
31. Koley, T.K., Walia, S., Nath, P.andKaur, C. (2011). Nutraceutical composition of Indianber: Effect of enzyme assisted processing. *Intl J Food Science and Nutrition*, 62: 276-279. 7.26
32. Sethi S, Samuel D V K, Islam. (2011). Development of quick cooking dhal- A convenience product. *J. Fd. Sci. Tech.* Published online DOI 10.1007/s13197-011-0534-6. 8.02
33. Sethi S, Srivastav M, Samuel D V K, Singh A K, Dubey A K and Singh G. (2011). Evaluation of newly developed mango (*Mangiferaindica*) hybrids for their storage behaviour and peel colour. *Ind. J. Agric. Sci.*81 (3): 252-255 6.00
34. Sharma R R, Pal R K, Singh D, Samuel D V K, Sethi S, Kumar A. (2011). Evaluation of heat shrinkable films for shelf life and quality of individually wrapped Royal Delicious apples under ambient conditions. *J. Fd. Sci. Tech.* March 2011 published online 8.02
35. Singh, D. and Sharma, R.R. (2011). Beneficial effects of pre-harvest carbendazim and calcium nitrate sprays in Kinnow (*C. nobilis* x *C. deliciosa*) storage. *Indian J. Agric. Sci.*, 81(5):470-472. 6.00
36. Singh, D.B., Singh, R. Kingsley, A.R.P. and Sharma, R. R. (2011). Effect of aloe vera coatings on fruit quality and storability of strawberry (*Fragaria* x *ananassa*). *Indian J. Agric.Sci.*, 81(5): 407-412 6.00
37. Uadal Singh, Sagar, V.R. and Ram Asrey (2011). Influence of slice thickness on quality of dehydrated bittergourd rings. *Indian Journal of Horticulture* 68(2):283-285. 6.13
38. Sharma, D.K., Dubey, A.K., Srivastav, M., Singh, Sairam A.K., Pandey, R.N., Dahuja, A., Kaur Charanjit. (2011). Effect of Putrescine and Paclobutrazol on growth, physiochemical parameters, and nutrient acquisition of salt-sensitive Citrus rootstock Karna khatta (*Citrus karna* Raf.) under NaCl Stress. *J. Plant Growth Regulation*, 30, 301-311 8.32
39. Bal Lalit M, Kar Abhijit, Satya Santosh, Naik Satya N (2011). Kinetics of colour change of bamboo shoot slices during microwave drying. *Int. J Food Sci. & Technol.*46 : 827 – 833 7.24
40. RUDRA, S.G., JHA, S.K.,SETHI, S., GUPTA, S. AND PAL, R.K. (2012). Inactivation of trypsin inhibitor in soybeans through microwaves: A kinetics approach. *International Journal of Agriculture and Food Science Technology*, 3(3): 230-233. 7.24



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| 41. | Sharma, S., Sharma, R.R., Pal, R. K., Paul, V. and Dahuja, A. (2012). 1-Methylcyclopropene influences biochemical attributes and fruit softening enzymes of 'Santa Rosa' Japanese plum (<i>Prunus salicina</i> Lindl.). <i>J. Plant Biochem. Biotechnol.</i> 21(2):295–299. | 6.81 |
| 42. | Jhalegar, M.J., Sharma, R.R., Pal, R.K. and Sharma, S. (2012). Effect of 1-MCP on shelf-life and quality of kiwifruit stored under ambient conditions. <i>Indian J. Hort.</i> , 69 (2): 258-262. | 6.13 |
| 43. | Sharma, R.R., Pal, R.K. and Rana, V. (2012). Effect of heat shrinkable films on storability of kiwifruits under ambient conditions. <i>Indian. J. Hort.</i> , 69(3): 404-408. | 6.13 |
| 44. | Jhalegar, Md. J., Sharma, R.R., Pal, R.K. and Rana, V. (2012). Effect of postharvest treatments with polyamines on physiological and biochemical attributes of kiwifruit (<i>Actinidia deliciosa</i>).CV. Allison. <i>Fruits</i> , 67(1): 13-22. | 6.79 |
| 45. | Rymbai, H., Srivastav, M., Sharma, R.R. and Singh, S.K. (2012). Lenticels on mango fruit: Origin, development, discoloration and prevention of their discoloration. <i>Sci. Hort.</i> , 135: 164-170. | 7.50 |
| 46. | Sunita Singh, Moreau Eric, Inman Floyd and Holmes D Leonard (2012) Characterization of <i>Photobacterium luminescens</i> Growth for the Rearing of the Beneficial Nematode <i>Heterorhabditis bacteriophora</i> . <i>Indian J. Microbiol.</i> 52 (3): 325-331. | 6.46 |
| 47. | Floyd L. Inman III, Sunita Singh and Leonard D. Holmes (2012). Mass Production of the Beneficial Nematode <i>Heterorhabditis bacteriophora</i> and Its Bacterial Symbiont <i>Photobacterium luminescens</i> (Review Article). <i>Indian J. Microbiol.</i> 52 (3), 316-324. [Online first 10.1007/s12088-012-0270-2 | 6.46 |
| 48. | Sharma, R.R., Jhalegar, M.J. and Pal, R.K., (2012). Response of kiwifruit (<i>Actinidia deliciosa</i> cv. Allison) to post-harvest treatment with 1-methylcyclopropene. <i>J. Hortic. Sci. Biotechnol.</i> , 87 (3): 278-284. | 6.51 |
| 49. | Sharma, R.R., Pal, R.K., Singh, D., Singh, J., Dhiman, M.R. and Rana, M.R. (2012). Relationships between storage disorders and fruit calcium contents, lipoxygenase activity, and rates of ethylene evolution and respiration in 'Royal Delicious' apple (<i>Malus x domestica</i> Borkh.). <i>J. Hortic. Sci. Biotechnol.</i> , 87 (4): 367–373. | 6.51 |
| 50. | Sharma, S., Sharma, R.R., Pal, R.K., Jhalegar, M.D., Singh, J., Srivastav, M. and Dhiman, M.R. (2012). Ethylene absorbents influence fruit firmness and activity of enzymes involved in fruit softening of Japanese plum (<i>Prunus salicina</i> Lindell) cv. Santa Rosa. <i>Fruits</i> , 67: 257–266. | 6.80 |
| 51. | Patel Krishna Kumar and Kar Abhijit (2012). Heat pump assisted drying of agricultural produce – an overview. <i>J Food Sci. & Technol.</i> , 49(2): 142–160 | 8.02 |
| 52. | Swain Sachidananda, Samuel DVK, Bal Lalit M, Kar Abhijit, Sahoo, G. P. (2012). Modeling of Microwave Assisted Drying of Osmotically Pretreated Red Sweet Pepper (<i>Capsicum annum</i> L.). <i>Food Sci. Biotechnol.</i> 21(4): 969 – 978 | 6.70 |
| 53. | Patel Krishna Kumar, Kar Abhijit, Jha S.N. and Khan M.A. (2012). Machine vision system: a tool for quality inspection of food and agricultural products. <i>J Food Sci. & Technol.</i> , 49(2): 123 – 141 | 7.12 |
| 54. | Rymbai, H., Srivastav, M., Sharma, R.R., Patel, C.R. and Singh, A.K. (2013). Bio-active compounds in mango (<i>Mangifera indica</i> L.) and their roles in human health and plant defence – a review. <i>J. Hortic. Sci. Biotechnol.</i> , 88 (4) 369–379. | 6.51 |
| 55. | Sharma, R.R., Pal, R.K., Singh, D., Samuel, D. V. K., Sethi, S. and Kumar, A. (2013). Evaluation of heat shrinkable films for shelf life, and quality of individually wrapped Royal Delicious apples under ambient conditions. <i>J. Food Sci. Technol.</i> , 50(3): 590-594 | 8.02 |
| 56. | Sharma, S., Sharma, R.R. and Pal, R.K. (2013). Effect of ethylene absorbents on compression injury and quality of Santa Rosa plum (<i>Prunus salicina</i>) during transportation. <i>Indian J. Agric. Res.</i> , 83(2): 223-226. | 6.00 |
| 57. | Sharma, S., Sharma, R.R., Pal, R.K. and Singh, S.K (2013). Influence of 1-MCP on compression injury, fruit firmness and quality of Japanese plum cv. Santa Rosa during transportation. <i>Indian J. Hort.</i> , 70(1): 101-106. | 6.13 |
| 58. | Tiwari, A., Jha, S. K., Pal, R. K., Sethi, S. and Lal Krishan. 2013. Effect of pre-milling treatments on storage stability of pearl millet flour. <i>Journal of Food Processing and Preservation</i> . DOI: 10.1111/jfpp.12082 | 6.45 |
| 59. | Jalgaonkar Kirti R, Jha S. K., Pal R K, Jha G K and Samuel D V K. 2013. Effect of species and particle size on essential oil yield of citrus peel (<i>Citrus</i> spp). <i>Indian Journal of Agricultural Sciences</i> 83 (12): 1285–88. | 6.00 |
| 60. | Sharma, S., Sharma, R.R. and Pal, R.K. (2013). Effect of ethylene absorbents on compression injury and quality of Santa Rosa plum (<i>Prunus salicina</i>) during transportation. <i>Indian J. Agric. Res.</i> , 83(2): 223-226. | 6.00 |
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| 62. | Tiwari, A., Jha, S. K., Pal, R. K., Sethi, S. and Lal Krishan. 2013. Effect of pre-milling treatments on storage stability of pearl millet flour. <i>Journal of Food Processing and Preservation</i> . DOI: 10.1111/jfpp.12082 | 6.45 |
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86.	Mohan Ram, Prasad K.V., Kaur Charanjit, Singh S.K., Ajay Arora A., Kumar, S. (2011). 2 / 4Post Harvest Technology Research Papers Induction of anthocyanin pigments in callus cultures of <i>Rosa hybrida</i> L in response to sucrose and ammonia nitrogen levels. Plant Cell Tissue Organ Culture 104, 171–179.	9.63
87.	Bal Lalit M., Satya Santosh, Naik Satya N. and Kar Abhijit (2012). Bamboo shoot preservation for enhancing its business potential and local economy – a review. <i>Critical Rev. Food Sci. & Nutrition</i> , 52(9):804- 814	10.82

23. Details of patents and income generated

None

24. Areas of consultancy and income generated:

Bio-efficacy: Rs. 4.2 Lakhs consultancy project, Rajhans Fertilizer project code-79-28/2013.

25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad

Name	Institutions and Industries Visited
Dr. Charanjit Kaur Dr. Sunita Singh	Post harvest technological advancements in fusion food products USA, 2 months (14.4.10 -13.6.2010) Visiting Research Scientist. Collaborative Research on: 'Fermentative production and upscale of a food bio preservative 'Nisin' - for food uses' The University of North Carolina- Pembroke, North Carolina USA in collaboration with IARI New Delhi, 90 days, UNCP, USA
Dr. Abhijit Kar	Application of Image Processing USA 4 months (1.2.2010-31.5.2010)

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Charanjit Kaur		<ul style="list-style-type: none"> LWT, Food Science & Technology, Journal of food properties 	
Dr. Sunita Singh	Panel member of Scientific panel FSSAI (Govt of India) on 'Food Additives, Flavourings, Processing Aids and Materials in contact with foods'.	<ul style="list-style-type: none"> Member Editor, JFST (Springer) food science & technology (STEM group of journals) (2014) 	
Dr. R. R. Sharma	Chief Editor, International Journal of Processing & Post Harvest Technology, India member, Editorial Board, Indian Journal of Hort.	<ul style="list-style-type: none"> Scientia Horticulture, Netherlands American Journal of Plant Science, US Agricultural Sciences, US Intl. Journal of Horticulture & Forestry, US Intl. Journal of Fruit Science, UK 	Reviewer to several international & National Journals
Dr. S.K. Jha	<ul style="list-style-type: none"> Associate Editor, International Agricultural Engineering Journal Associate Editor, Journal of Agricultural Engineering (2010-12) Member of Food and Agriculture Division (FAD 20), Bureau of Indian Standards, New Delhi Member of Institute Management Committee of CIPHET, Ludhiana (2014-2017) Secretary, Indian Society of Agricultural Engineers (2010-2012) 		
Dr. Shruti Sethi Dr. Shalini G. Rudra	Indian Journal of Horticulture Editorial board member of International Journal of Agriculture, Food Science and Technology, Nutrition and Environmental Sustainability		

**27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):**

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects**Percentage of students who have done in-house projects including interdepartmental projects:**

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two disciplines is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:**a) Faculty**

Name	Awards/Recognitions
Dr. V. R. Sagar	<ul style="list-style-type: none"> Member of project appraised committee (PAC) MOFPI, Govt. (New Delhi)(2013) Dr. J.C. Anand Gold Medal Award, The Horticultural Society of India(2014)
Dr. Charanjit Kaur	<ul style="list-style-type: none"> Best Poster Award at 8th Nutra India Summit (2013) Best Poster Award at 9th Nutra India Summit (2014)
Dr. Ram Asrey	<ul style="list-style-type: none"> Hindi Essay writing award Young Scientist Award (2014) Best Teacher Award (2015)
Dr. R. R. Sharma	<ul style="list-style-type: none"> Himachal Shri award (2010) Dr. Rajinder Prasad Award of the ICAR New Delhi(2010) Dr. Ram Nath Singh Award of IARI New Delhi (2010) Fellow, Horticultural Society of India(2014) Education award of MHRD, Govt. of India for expansion and extension of horticultural science in Rajbhasa(2014)
Dr. S. K. Jha	<ul style="list-style-type: none"> IARI, Best Teacher Award(2012) Best paper award from Indian Society of Agricultural Engineers (2012)
Dr. Shruti Sethi	<ul style="list-style-type: none"> ISAE Best Paper Award(2012) Best Poster Award at 8th Nutra India Summit (2013)
Dr. Abhijit Kar	<ul style="list-style-type: none"> Indian Society of Agricultural Engineer (ICAE) Distinguished service certificate(2013)
Dr. Shalini Gaur Rudra	<ul style="list-style-type: none"> Best Poster Award at 8th Nutra India Summit (2014) Young Scientist Award (2014)

b) Students

S. No.	Name of the student	M.Sc./ Ph.D.	Name of the award	Year for which given
1.	Mr. Tanmay K Koley	PhD	IARI Gold medal & Jawaharlal Nehru Award for significant research work	2010
2.	Mr. Vishwanath Khandare	PhD	Jawaharlal Nehru Award for 2010 the best doctoral thesis-Entitled "Antioxidants in black carrot: Processing strategies for improved stability and functional quality	2010
3.	Ms Kirti J. Ramesh,	M.Sc.	"Reddy award" for best thesis in 45 th ISAE. Convention held at Nagpur Post Graduate (I, II, III) and level the rank of the student award (Institute/Inter-Institute) "INSPIRE" AWARD by Department of Science & Technology.	2011
4.	Ms. Kalyani Gorrepati	Ph.D	Indian Society of Agril. Engineering 'Best Thesis Award'	2011
5.	Mr. S.Murali	Ph.D.	ICAR SRF Award	2011
6.	Ms. Swati Sharma	Ph.D	INSPIRE- Award	2011
7.	Ms. Shameena Beegum P.P.	Ph.D	INSPIRE- Award, Rajiv Gandhi National Fellowship Award (UGC) Best fresher- IARI	2011



8.	Mr. Vijay Rakesh Reddy	Ph.D.	INSPIRE- Award	2012
9.	Mr. Sandeep Dewange	PhD	INSPIRE- Award	2012
10.	Ms. Patil Sharmila	Ph.D	INSPIRE Award	2012
11.	Ms. Vimla Beera	Ph.D	Rajiv Gandhi National Fellowship Award(UGC)	2012
12.	Mr. Alemwati Pongener		Rajiv Gandhi National Fellowship Award(UGC)	2012
13.	Ms. Prerna Nath	Ph.D	Rajiv Gandhi National Fellowship Award(UGC)	2012
14.	Mr. Pankaj Kumar Kannaujiya	Ph.D	Rajiv Gandhi National Fellowship Award(UGC)	2012
15.	Mr. Aabon Yanthan	Ph.D	Rajiv Gandhi National Fellowship Award(UGC)	2012
16.	Ms. Prerna Nath	Ph.D	DU Point Innovative Award,	2013
17.	Mr. Om Prakash	Ph.D	ICAR SRF Award	2014
18.	Ms. Jyoti P. Dhakane	Ph.D	ICAR SRF Award, INSPIRE Award	2014
19.	Mr. Manjit M. Lad	Ph.D	Young Scientist Award (Biored Society, Allahabad)	2014
20.	Ms. Shameena Beegum.P.P	Ph.D	Lakshadweep Students Association, "Student of the Year"	2014
21.	Ms. Shaghaf Kaukab	MSc.	"Bihar Gaurav Samman" for outstanding performance in JRF	2014
22.	Mr. K. Prasad	MSc.	Best Poster Presentation, Indian Horticulture Congress	2014
23.	Mr. K. Rama Krishna	Ph.D	Best Poster	2014

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any

Seminar/Conference/Workshops participants	Date	Source of Funding	Details of
International Conference on Post Harvest Management and Valorization of Horticultural and Arable crops	19-20 Feb. 2010	Indian Council of Agricultural Research	21 participants (Assistant Professors and above rank)
National Training Programme at PHT Div on 'Fermentation Technology with emphasis on 'Methods and scale up strategies in Fermentation'	9 to 22 Dec 2011	NAIP	20 participants (Assistant Professors and above rank)
Recent advances in valorisation of horticultural produce	6-26 December, 2013	Indian Council of Agricultural Research	23 participants (Assistant Professors and above rank)
'Appropriate post harvest technologies for fresh fruits and vegetables'.	16- 22 March, 2010	Outreach Project, ICAR	15 Participants
Post Harvest Management of fruits and vegetables for export	28-31 March, 2011	Outreach Project, ICAR	15 Participants
Pre & Post Harvest Management of Horticultural Process for export	13-17 March, 2012	Outreach Project, ICAR	15 Participants
Soynut: Processing and Packaging	13-15 December, 2012	Outreach Project, ICAR	8 Participants
Post harvest management and value addition of horticulture. Produce for export	12-16 March, 2013	Outreach Project, ICAR	15 Participants
Post-harvest management and value addition of horticultural produce for export	19-24 March, 2014	Outreach Project, ICAR	15 Participants
MTC "Valorization of Horticultural and arable crops"	4-11 December, 2014	DAE, MOA, Government of India	18 Participants (State department official)
"Post harvest management and processing of Horticultural produce"	17-21 March, 2015	Outreach Project, ICAR	15 Participants

**31. Code of ethics for research followed by the departments**

—

32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	2	3	-	-
Ph.D.	74	5	6	6.75	8.10

33. Diversity of students

—

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise

S. No	Name of the student	Achievements of students
1.	Mr. Nageshwar Patel	Asstt. Professor
2.	Mr. Patil Swapnil Abhay	Agril. Officer
3.	Ms. Swati Sharma	ARS
4.	Mr. Sadananda G.K.	Asst. Professor, UHS
5.	Ms. Kalyani Gorrepati	ARS, NRC
6.	Ms. Vimla Beera	Asst. Professor, ANGRAU
7.	Mr. Kale Sakharam Jagan	ARS, CIPHET
8.	Mr. Darshan M.B	Asst. Professor, UAS, Bangalore
9.	Ms. Ajita Tiwari	Asst. Professor, Assam
10.	Mr. Kalyan Barman	Asst. Professor, BAU
11.	Mr. Alemwati Pongener	ARS, NRC, Litchi
12.	Mr. Mohd. Jameel Jhalegar	Asst. Professor, UHS
13.	Ms. Prerna Nathh	ARS, CIPHET
14.	Mr. Charnder Bhann	Asst. Professor, KUK, Ganganagar
15.	Ms. Kavita Bhatia	Teaching
16.	Mr. Harpreet Singh Mattu	Horticultural Officer
17.	Ms. S. Ruth Assumi	ARS, ICAR, Res Complex NE Region
18.	Ms. Kirti Jalgaonkar	ARS, CIPHET
19.	Mr. Aabon W. Yanthan	ARS
20.	Ms. Pankaj Kr. Kannuajia	ARS
21.	Ms. Shameena Begum P.P.	ARS
22.	Mr. Indore Navnath Sakharam	ARS
23.	Mr. Vijay Rakesh Reddy S.	ARS
24.	Mr. Suresh Kumar P.	ARS
25.	Mr. Uadal Singh	Asst. Professor

35. Student progression:

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Campus selection	
Other than campus recruitment	
Entrepreneurs	In last 7 years only one student is entrepreneur



36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	-
From other universities within the state	2
From universities from other States from	7
Universities outside the country	-

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

Not applicable

38. Present details of departmental infrastructural facilities with regard to

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ clas room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: One
- Student's laboratories- One
- Research laboratories: Four

39. List of doctoral, post-doctoral students and Research Associates

- from the host institution/university:
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S. No.	Name of the M. Sc. & Ph. D student	M Sc./Ph. D
1.	Mohd. Jameel Jhalegar	M Sc. & Ph. D
2.	Prerna Nath	Ph. D
3.	Kavita Bhatia	Ph. D
4.	S. Ruth Assumi	Ph. D
5.	Kirti Jalgaonkar	M Sc. & Ph. D
6.	Sandeep Kr. Duhan	Ph. D
7.	Shameena Beegum P.P	Ph. D
8.	Om Prakash	M Sc. & Ph. D
9.	D.Jyoti Prabhakar	M Sc. & Ph. D
10.	Janagam Venu Madhav	M Sc. & Ph. D
11.	Pankaj Kumar	Ph. D
12.	Pushpendra Kumar	M Sc. & Ph. D
13.	Shrikrishana Shrinivas Nishani	M Sc. & Ph. D
14.	Vijay Rakesh Reddy S.	Ph. D
15.	Sandeep Dawange	Ph. D
16.	Mohan Lal	M Sc.
17.	Anamika Thakur	M Tech
18.	K. Prasad	M Sc.
19.	Supriya Priyadarsani	M Tech
20.	Nirmal Kumar Meena	M Sc.
21.	Nasir Ahmed Haqbeen	M Sc.
22.	Gajanan Gundewati	M Sc.
23.	Puneet Kumar	M Tech
24.	Shaghaf Kaukab	M Tech
25.	Smruthi Jayarajan	M Sc.
26.	K. Rama Krishna	Ph. D
27.	Jyoti Nishad	Ph. D

**40. Number of post graduate students getting financial assistance from the university**

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology:

Not applicable

42. Does the department obtain feedback from

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Feedback from students is used to improve in teaching and bridge the deficiencies.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

Feedback is incorporated to improve the performance.

43. List the distinguished alumni of the department (maximum 10):

S.No.	Name and address
1.	Dr. Sukhvinder Pal Singh, (Scientist C PHT) National Agricultural Food Biotechnology (NABI) DBT, Ministry of Science & Technology, Mohali, Punjab
2.	Dr. Tanmay Koley, Scientist IVRI, Varanasi
4.	Dr. PS Negi , Principal Scientist, CFTRI Mysore
5.	Dr. C.K. Narayan, Head, Div. of PHT, IIHR Bangalore
6.	Dr. Sudhakar Rao, Principal Scientist, Div. of PHT, IIHR, Bangalore

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department:

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi



50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied

Postharvest Handling of Horticultural Crops

1. Fruit bagging considerably reduced cracking, scratches, and development of bacterial spots with reduced incidence of sun burning in pomegranate. About 20 % higher marketable fruit yield was obtained from bagged trees in comparison to control.
2. Pre-harvest fruit bagging in Royal Delicious apples significantly influenced the fruit colour, texture, quality and occurrence of bitter pit incidence. Apples covered with red or yellow coloured bags produced apples of intense red colour with best quality fruits and low incidence of bitter pit (nearly 2%) over control (14.6%) during storage.
3. Foliar application of polyamine putrescine @100 ml L⁻¹ at flower initiation stage reduced occurrence of misshapen fruit in strawberry upto 18%.
4. Pre-harvest foliar application of bioagent *Pseudomonas fluorescens* at flower initiation stage reduced the incidence of post harvest diseases of strawberry fruits during one week storage at room temperature (26 ± 2°C and 55 % RH).
5. Spray of calcium chloride (1%) as aqua solution 15 days prior to harvest significantly was found to check the bitter pit disorder of apple after 5 months of storage.
6. Treatment with Sodium nitroprusside (1.5 mM) and Salicylic acid were found to ameliorate chilling injury in mango. In addition alum was also found to inhibit the sap injury symptoms in mango.
7. Application of edible coating, namely lac based and semperfresh™ was found to extend storage life of plum cv. 'Santa Rosa' by 3 days at 20±2°C and 1 week at 2±1°C respectively along with maximum retention of other quality attributes.
8. Salicylic acid (2.0 mM) delayed the ripening of plum cv. 'Santa Rosa' up to 36 days in cold storage and also inhibited the activities of phenylalanine ammonia lyase (PAL) and pectin methyl esterase (PME) enzymes over untreated plums.
9. Combined application of hot water treatment (48°C for 5 minutes) and cordia mixa gel extended the shelf-life of Amrapali mango fruits stored at 13°C+25±2% RH

Processing & value addition

1. Development of novel purple and orange breads as functional food using natural colours
2. Ready-to-eat Pusa puffs from pearl millet
3. Protein rich cookies and Low fat *aonla* and beetroot crackers
4. Micronutrient enriched cookies using pearl millet flour, soy flour and chickpea flour
5. Studies on estimation of α-glucosidase inhibitory and hypoglycemic activity of food
6. Process has been standardized for production of Aonla leather with high retention of vitamin C, and antioxidants.
7. Unmarketable apple fruits have been successfully utilized for development of value added products as fruit leather/ or fruit bars in combination with aonla.
8. Polysaccharides from jackfruit and tamarind seeds have been used as encapsulating agent.
9. A protein and iron rich expanded ready-to-eat snack, named as "pearl puff" was developed as using pearl millet, QPM and green gram through extrusion processing. The project was found to be financially feasible based on economic indicators like gross and net profit, return on investment, payback period and break even production.
10. Formulation of a popped pearl millet based product has been standardized. The germplasm IC-283734 was found to have huge potential for popping variety.
11. Strawberry variety 'Camarosa' continuously gave good results during all the three harvesting months at two different storage conditions in terms of better physico-chemical properties, which shows it's wider adaptability under climatic variability.



12. Optimized a enzyme mediated processing strategy using enzyme mixture for developing a green, solvent free and functional concentrate from capsicum as value added ingredient for food applications.
13. Microwave treatment has been optimized for maximum stability of rice bran, based on peroxide value, free fatty acid and TBA value.
14. A low calorie and dietetic Amla and Jamun based beverage has been standardized which has high α - glucosidase inhibitory activity.
15. A process for Soy based beverages with mango and bael has been developed. Blanching treatment has been standardized for developing a low beany flavor soyamilk from Soybean variety PUSA 9814 and Kalitur with minimum lipoxygenase activity.
16. Protocol for minimal processing of pomegranate arils developed.
17. Technology for development of vine and vermouth was developed remaining core for making animal feed block.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms

Weaknesses

- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Lack of integrated food technology research
- Dearth of technical support

Opportunities

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.

Challenges

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department

RESEARCH & EDUCATION

Upgradation of human resource

1. Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of Food technology, rheological concepts, extrusion processing, bioactive characterization and nutraceuticals.
2. Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
3. Young scientists will be encourages to go for 6-12 months training at world leading Institutes through ICAR/ DST/DBT fellowships
4. Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
5. Monthly seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
6. To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.



xxi) Division of Seed Science and Technology

1. Name of the Department

Division of Seed Science and Technology

2. Year of establishment

Central Seed Testing Laboratory : 1960

Division of Seed Technology : 1968

Division of Seed Science and Technology : 1984

3. Is the Department part of a School/Faculty of the university?

School of Crop Improvement

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

PG Diploma⁺, MSc and PhD

5. Interdisciplinary programmes and departments involved

Divisions of Agricultural Chemicals, Agricultural Engineering, Agriculture Extension, Agricultural Physics, Biochemistry, Centre for Protected Cultivation Technology, Entomology, Environmental Science, Floriculture and Landscaping, Fruits and Horticultural Technology, Genetics, Microbiology, Molecular Biology and Biotechnology, Plant Genetic Resources, Plant Pathology, Plant Physiology, Seed Production Unit, Vegetable Sciences, Water Technology Centre, in addition to IARI Regional Stations Karnal, Pusa Bihar and Wellington, etc.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons

One year PG Diploma was offered in 1978, which was later upgraded as MSc Programme

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester System

9. Participation of the department in the courses offered by other departments

The faculty deliver lectures and guide dissertations in the sister departments Divisions of Agricultural Chemicals, Agricultural Engineering, Biochemistry, Centre for Protected Cultivation Technology, Entomology, Environmental Science, Floriculture and Landscaping, Fruits and Horticultural Technology, Genetics, Molecular Biology and Biotechnology, Plant Genetic Resources, Plant Pathology, Plant Physiology, Seed Production Unit, Vegetable Sciences, Water Technology Centre, in addition to IARI Regional Stations Karnal, etc.

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others):

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)				6+1*
Senior Scientist (Associate Professor)				5
Scientist (Assistant Professor)				2+2**
Total	18	14	03	13+1*+2**

*Seed Production Unit; **Likely to be relieved

Besides above there are nine permanent faculties in the discipline who are posted at IARI Regional Station Karnal or NBPGR New Delhi a sister institute as well 13 dual faculties (one each from Plant Physiology, Plant Pathology and 11 from genetics) as follows:



1	Dr VS Lather, PS	IARI RS Karnal
2	Dr VK Pandita, PS	IARI RS Karnal
3	Dr Anuja Gupta, PS	IARI RS Karnal
4	Dr Rakesh Seth, PS	IARI RS Karnal
5	Dr PB Singh, PS	IARI RS Karnal
6	Dr RN Yadav, PS	IARI RS Karnal
7	Dr Ashwani Kumar, Senior Scientist	IARI RS Karnal
8	Dr Sushil Pandey, Senior Scientist	NBPGR New Delhi
9	Dr (Ms) Chitra Pandey, Senior Scientist	NBPGR New Delhi

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided	
					M.Sc.	Ph.D.
Dr DK Yadava	PhD	PS & Head	Genetics & Plant Breeding- Plant Breeding	12	2	1
Dr SK Jain	PhD	PS & Professor	SST- Seed Quality Assurance & Seed Storage	36	3	1+4
Dr PC Nautiyal	PhD	PS	Plant Physiology – Biotic and Abiotic Stress	29	1	1
Dr SK Chakrabarty	PhD	PS	SST- Plant Breeding, hybrid seed research, DUS testing for PVP	23	3	0
Dr BS Tomar	PhD	PS	SST- Vegetable and flower seed production under open & protected condition	19	4	5
Dr SK Yadav	PhD	PS	SST- Seed Testing, Seed Enhancement, Seed Physiology, Seed Production, Plant Variety Protection	18	3	2
Dr Sangita Yadav	PhD	PS	SST- Biochemistry, Seed Physiology, Molecular Biology	18	1	0
Dr (Ms) Sudipta Basu	PhD	Senior Scientist	SST- Seed Quality Enhancement & Hybrid Seed Production	15	5	2
Dr Sandeep Lal	PhD	Senior Scientist	SST-Seed Production, Seed Quality Enhancement	15	1*	0
Dr Arun Kumar MB	PhD	Senior Scientist	SST- Seed Biotechnology, seed Priming	13	3	0
Dr Monika A Joshi	PhD	Senior Scientist	SST- Plant Breeding	12	3	0
Dr Atul Kumar	PhD	Senior Scientist	SST-Fungal Pathology	11	2	0
Mr Manjunath Prasad CT	MSc	Scientist (Sr Scale)	SST- Seed Biotechnology, Seed Quality Assurance	06	0	0
Dr (Ms) Sarla Yadav	PhD	Scientist	SST- Seed Production	04	0	0
Ms Nagamani	MSc	Scientist	SST-Seed Pathology, Hybrid Seed Production	0	0	0
Ms Usha Rani	MSc	Scientist	SST	0	0	0

12. List of senior visiting fellows, adjunct faculty, emeritus professors:

SNo.	Name of the Faculty	Status
1.	Dr PK Agrawal, Former Head, DSST, now Consultant to Seed Sector	Adjunct Faculty
2.	Dr RK Chowdhary, Former PC/PD, NSP, now Consultant to IFFCCO	Adjunct Faculty
3.	Dr RR Hancinal, Chairman, PPV&FRA	Adjunct Professor



13. Percentage of classes taken by temporary faculty – programme-wise information:

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio

MSc = 1:1.4 and PhD = 1: 0.68

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Vacant	Actual
1.	Technical	27	17	10
2.	Administrative	10	07	03
3.	Supportive	30	20	10

16. Research thrust areas as recognized by major funding agencies

Enhancement of seed quality; Management in quality seed production

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise

Name	a) National	b) International	c) Total Grants Received (Lakh Rs)
Dr PC Nautiyal	“Development of sucrose sensor for phenotyping of soil moisture-deficit stress tolerance in rice” under the National Fund for Basic, Strategic and Frontier Application Research in Agriculture (NFBSFARA)	-	220.34
Dr SK Yadav	Development of Eco-friendly Seed Treatment Technologies for Successful Plant Establishment under Less Favourable Environments (DST)	-	36.81
Dr SK Lal	Contract research project on “Standardization and field testing of Agrinos green technology products for seed treatment in green gram, chickpea and soybean (M/s Agrinos India Pvt Ltd)	-	3.36
Dr Arun Kumar MB	“Identification, Cloning and Characterization of Genes Associated With Cytoplasmic Male Sterility (CMS) and Designing PCR Based Markers for Seed Purity Testing in Pearl Millet” (DBT, Mini. of Science and Technology, Govt of India)	-	48.09
	“Strengthening of Grow-Out-Test (GOT) Farm Facilities and Hi-tech DNA Testing Laboratory” (DAC, Mini. of Agriculture, Govt of India)	-	71.00
Dr Monika A Joshi	Use of machine vision for distinguishing among crop varieties (NASF, ICAR)	-	51.44154
Dr Atul Kumar	Development of diagnostic for detection of <i>Bipolaris oryzae</i> in India by molecular markers and its eco friendly management.(DST) GOI <i>Proposed</i>	-	21.0
Dr Monika A Joshi	“Studies on morphological, biochemical and seed quality characteristics in relation to seed storage for DUS testing in rice and wheat” PPV&FRA	-	25.00
Dr Monika A Joshi & Mr Manjunath	“Seed, grain and quality testing facilities for business development NAIP	-	997.00
Mr. Manjunath Prasad, C.T. and Dr. P. Nallathambi	Plant Growth Promoting Rhizobacteria for the management of major seed-borne diseases and enhancement of seed quality of vegetables and planting material for North Eastern Region of India (DBT)	-	45.65



18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

- **Project:** “Development of sucrose sensor for phenotyping of soil moisture-deficit stress tolerance in rice” under the National Fund for Basic, Strategic and Frontier Application Research in Agriculture (NFBSFARA), Budget 220.34 lakhs

Centres Associated: Jadavpur University Kolkata, ISI Kolkata, NBPGR New Delhi

- **Project:** “Use of machine vision for distinguishing among crop varieties” (Funded by NASF, ICAR) **Total Budget (for IARI):**Rs. 51.44154lakhs

Institutes: CIAE, Bhopal (Lead centre); IARI, New Delhi; NBPGR, New Delhi, C-DAC, Kolkata

- **Project:** “Standardization and field testing of Agrinos green technology products for seed treatment in green gram, chickpea and soybean (Agrinos) **Total Budget (for IARI):**Rs. 3.36lakhs

Institutes: National Seed Project (Crops), DSR, Mau

- **Project:** Plant Growth Promoting Rhizobacteria for the management of major seed-borne diseases and enhancement of seed quality of vegetables and planting material for North Eastern Region of India **Total Budget (for IARI):**Rs. 45.65 lakhs

Institutes: IARI, New Delhi; University of Mysore, Mysore and College of Horticulture and Forestry, Pasighat, Arunachal Pradesh.

b) International collaboration

With **International Seed Testing Association (ISTA)** for Accreditation of SST through Proficiency Tests and Centre of Excellence for development of HRD in Seed Quality Assurance and maintaining Uniformity in Seed Testing Results

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc. & total grants received (Rs in lakhs)

- International : 105.936 = 105.936
Trainings
- National trainings : 2.69 = 2.69

20. Research facility / centre with

• State recognition

None

• National recognition

PG lab was developed

• International recognition

Division of Seed Science and Technology has been identified as Centre-of-Excellence to impart training on hybrid seed production technology, seed quality assurance and seed quality enhancement to SAARC Region, Asian-African member countries, FAO sponsored members, African, Iraq and Afghanistan countries.

21. Special research laboratories sponsored by / created by industry or corporate bodies

- ‘Facility for ensuring the genetic purity of seeds’ is being created under DAC sponsored project “Strengthening of Grow-out-Test (GOT) Farm Facilities and Hi-tech DNA Testing Laboratory” from DAC funded project
- Establishment of plant pathological laboratory at IARI, RS, Pusa Bihar from the DST project fund.



22. Publications

	SKJ	PCN	SKC	SKY	SY	BST	SB	SKL	AKMB	MAJ	AK	MP
Number of papers published in peer reviewed journals (national/international)	14	7	24	15	12	23	4	12	12	10	9	08
Monographs	0	-	-	0	0	-	-	-	-	-	-	-
Chapters in Books	2	-	6	4	4	13	4	-	-	8	5	01
Edited Books	10	-	2	3	4	2	-	-	-	3	1	-
Books with ISBN with details of publishers	-	-	1	0	0	-	-	6	-	-	2	-
Number listed in International Database		52	-	NA	NA	-	-		12	-	-	-
Citation Index – range / average		-		1-6	1-6	-	-		0-22		-	-
SNIP range / average		-		NA	NA	-	-		0.243-1.547		-	-
SJR range / average		-		NA	NA				0-1.262		-	-
Impact Factor– range / average	4.30-7.20	7.0	3.75-7.64	0.0	0.0				0.11-2.74/1.122		-	-
h-index		-		2.0	4.0				-		-	-

Where, SKJ: SK Jain; PCN: PC Nautiyal; SKC: SK Chakrabarty, SKY: SK Yadav; SY: Sangita Yadav; BST: BS Tomar; SB: Sudipta Basu; SKL: Sandeep Kr Lal; AKMB: Arun Kumar MB; MAJ: Monika A Joshi; AK: Atul Kumar; MP: Manjunath Prasad CT

Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

SNo.	Publications	NAAS Rating
1.	Yadav, S., P. Suneja, Z. Hussain, Z. Abraham and S. K. Mishra. (2011). Genetic variability and divergence studies in seed and oil parameters of Mahua (<i>Madhuca longifolia</i> Koenig) J.F. Macbride accessions. <i>Biomass and Bioenergy</i> .35(5): 1773-78	9.41
2.	Yadav, S., P. Suneja, Z. Hussain, Z. Abraham and S. K. Mishra. (2011). Prospects and potential of <i>Madhuca longifolia</i> (Koenig) J.F. Macbride for nutritional and industrial purpose. <i>Biomass and Bioenergy</i> 35(4):1539-44	9.41
3.	Yadav, S., S. Kumar, Z. Hussain, P. Suneja, Shiv K. Yadav, M. A. Nizar and M. Dutta. (2012). <i>Guizotia abyssinica</i> (L.f.) Cass.: An Untapped Oilseed Resource for the Future. <i>Biomass & Bioenergy</i> , 43:72-78	9.41
4.	Yadav, S., Z. Hussain, P. Suneja, M. A. Nizar, Shiv K. Yadav and M. Dutta. (2012). Genetic divergence studies in niger (<i>Guizotia abyssinica</i>) germplasm. <i>Biomass & Bioenergy</i> , 44: 64-69	9.41

Publication: NAAS Rating 8-9

SNo.	Publications	NAAS Rating
1.	Nautiyal, P.C., Ravindra V, Rathnakumar, A.L., Ajay, B.C. and Zala, P.V. Genetic variation in photosynthetic rate, pod yield and yield components in Spanish groundnut cultivars during three cropping seasons. <i>Field Crop Research</i> , 125:83-89.	8.47

Publication: NAAS Rating 6-8

SNo.	Publications	NAAS Rating
1.	Abraham, Z. Sangita Yadav, M. Latha, Mani S. and S. K. Mishra. (2010). Seed variability in <i>Madhuca longifolia</i> (Koenig) J. F. Macbride, a source of oil for use as bio-energy. <i>Genet Resour Crop Evol.</i> 57:619–623	7.48
2.	Akhtar, J. Tiu, K. Kumar, A. Singh Vaibhav and Khan, Z. (2012). Impact Of Soil Solarization On Some Solanaceous Vegetables Nursery In Plateau Region Of Jharkhand, India. <i>VEGETOS</i> , Vol.25(2): 109-114	6.2



3. Chakrabarty SK, Aniruddha Maity, Jung B. Yadav 2015. Influence of cyto-sterility sources of female line on seed quality of Indian mustard (*Brassica juncea* L. Czern & Coss.) in relation to storage period. Plant Breeding doi:10.1111/pbr.12267 7.34
4. Chakrabarty SK, Monika A. Joshi, Yogendra Singh, Aniruddha Maity, Veena Vashisht (2012) Characterization and evaluation of varieties in Farmers' varieties rice from West Bengal. *Indian Journal Genet* 72 (2): 136-42 6.19
5. Chakrabarty SK, Monika A. Joshi, Yogendra Singh and Malavika Dadlani (2012) Example Varieties for DUS Testing in Rice (*Oryza sativa*) *Indian Journal of Agric Sci* Vol 82 (12) 6.00
6. Chakrabarty SK., Monika A. Joshi, Yogendra Singh and Malavika Dadlani 2012. Example varieties for DUS testing in rice (*Oryza sativa*) *Indian Journal of Agricultural Sciences* 82 (12): 753-8 6.18
7. Chakrabarty SK., U. S. Chandrashekar, Manjunath Prasad, J. B. Yadav, J. N. Singh and M. Dadlani. 2011. Protogyny and self-incompatibility in Indian mustard (*Brassica juncea* (L.) Czern and Coss)- a new tool for hybrid development. *Indian J. Genet.* 71(2) Special Issue: 170-173 6.20
8. Chandrashekar U.S., Ramwant Gupta, Manjunath Prasad, Cholanayakanahalli Thyagaraju, Krishnappa Vishwanath, Shyamal Kumar Chakrabarty and Malavika Dadlani (2014): Pollen-pistil interaction in protogyny and self-incompatibility system of Indian mustard (*Brassica juncea* (L.) Coss.). *Grana*, DOI:10.1080/00173134.2014.897750 6.77
9. Chandrashekar, U.S., Malavika Dadlani, Vishwanath, K, S. K. Chakrabarty and Manjunath Prasad, C.T. (2013). Study of Morpho-Physiological, Phenological and Reproductive Behaviour in Protogynous Lines of Indian Mustard [*Brassica juncea* (L.)]. *Euphytica* 193: 277-291. 7.64
10. Dadlani Malavika, S. K. Chakrabarty and Sudipta Basu (2009) : Impact of climate change and IP regime on the production and availability of quality seed. *Indian Journal of Genetics and Plant Breeding* 69(4) : 325-330. 6.20
11. Gotyal BS, Srivastava Chitra, Walia Suresh, Jain SK and Reddy DS 2010 Efficacy of *Lantana camara* extract against *Cadra cautella* in stored wheat seeds *Indian J agri Sci* 80 (5): 433-436 6.18
12. Gupta V; Shamas, N; Razdan, V.K; Sharma, B.C; Sharma, R; Kaur, K; Singh, I; John, D and Kumar, A. (2013) Foliar application of fungicides for the management of brown spot disease in rice (*Oryza sativa* L.) caused by *Bipolaris oryzae*. *African Journal of Agricultural Research*, Vol 8(25), pp.3303-3309. 6.0
13. Hosamani J., Dadlani, M., Shantha I.M., Kumar, M.B.A. and Sherry R.J. (2013) Biochemical phenotyping of soybean [*Glycine max* (L.) Merrill] genotypes to establish the role of lipid peroxidation and antioxidant enzymes in seed longevity. *Agricultural Research*, 2 (2): 119-126. -
14. Hosamani Jagdish, V.K. Pandita and B.S. Tomar (2012) Seed development and acquisition of desiccation tolerance during maturation of okra seed. In: *Indian Journal of Horticulture*. 69 (3), September 6.11
15. Hosamani, J., Kumar, M.B.A., Talukdar, A., Lal, S.K. and Dadlani, M. (2013) Molecular characterization and identification of candidate markers for seed longevity in soybean [*Glycine max* (L.) Merrill]. *Indian Journal of Genetics and Plant Breeding* 73(1): 64-71. 6.20
16. Hussain, Z., S. Yadav, S. Kumar, P. Suneja, M. A. Nizar, S. K. Yadav, Shiv K. Yadav and M. Dutta. (2015). Molecular characterization of niger (*Guizotia abyssinica*) germplasm diverse for oil parameters. *Research Journal of Biotechnology*, Accepted 6.26
17. Jha NK, Sherry RJ, Napoleon T, Jain SK and Kumar MB Arun (2015) Simple sequence repeat marker for genetic purity testing of brinjal hybrids *Seed Sci Technol*. (Submitted) 6.7
18. Joshi Monika A, Divya Aggarwal, Anupama Pandey, Devmani Bind and Md Wasi Alam (2015) Generation of Distinct Profiles Of Rice Varieties Based On Agro-Morphological Characters And Assessment Of Genetic Divergence. *Research on Crops* (accepted) 6.00
19. K. Prakash, J. Radhamani, A. Pandey and S. Yadav. (2014). A preliminary investigation of cultivated and wild species of *Luffa* for oil and protein contents. *Plant Genetic Resources Characterization and utilization*. 12 (01), 103-111. 6.00
20. K. Vinod, B.S. Tomar, Balraj Singh and Sanjay Kumar (2014). Effect of post harvest ripening and drying methods on seed quality and storability in pumpkin cv. Pusa Hybrid-1. In: *Indian Journal of Agricultural Sciences*, 84(9). 120-124 6.00
21. K. Vinod, B.S. Tomar, Girish Kaddi and Sanjay Kumar (2014). Effect of stage of harvest and post harvest ripening of fruit on hybrid seed yield on pumpkin (*Cucurbita moschata*). In: *Indian Journal of Agricultural Sciences*, 84(5):337-341 6.00
22. Kalyanrao, B.S. Tomar and Balraj Singh (2014) Effect of stage of harvest on seed yield and quality in bottle gourd cv. Pusa Hybrid-3. *Indian Journal of Horticultural Science*, 71(3) 428-432 6.11
23. Kaushik, P., Najam Akhtar Shakil, Jitendra Kumar, Mukesh Kumar Singh, Manish Kumar Singh and Shiv K. Yadav. (2013). Development of controlled release formulations of thiram employing amphiphilic polymers and their bioefficacy evaluation in seed quality enhancement studies. *J. ENV. SCI. HEALTH, PART B; Pesticides, Food Contaminants, and Agricultural Waste*. 48: 677-685. 7.99



24.	Kishor S, B S Tomar, Balraj Singh and A D Munshi (2010). Effect of season, spacing and planting time on seed yield and quality in cucumber. In; <i>Indian Journal of Horticulture</i> , 67(1), 66	6.11
25.	Kumar, M.B.A., Dadlani, M., Kumar, R. and Jacob, S.R. (2014) Identification and validation of informative SSR markers suitable for ensuring the genetic purity of brinjal (<i>Solanum melongena</i> L.) hybrid seeds. <i>Scientia Horticulturae</i> , 171: 95-100.	7.50
26.	Kumar, M.B.A., Ruth, C.M. and Nonogaki, H. (2011) Isolation of miRNAs that regulate seed germination and dormancy. <i>Methods in Molecular Biology</i> , 773(4):199-213.	-
27.	Lamichaney A, Jain SK and Singh CP (2014) Seed development, maturation and onset of germination in anise (<i>Pimpinella anisum</i> (L) <i>Indian J Agri Sci</i> (Submitted)	6.18
28.	Martínez-Andújar, C., Martín, R.C., Bassel, G.W., Kumar, M.B.A., Pluskota, W.E. and Nonogaki, H. (2011) post-transcriptional gene regulation during seed germination and stand establishment. <i>Acta Horticulturae (ISHS)</i> , 898:53-59.	-
29.	Menka, Jain SK, Tiwari Preeti, Srinivasan Kalyani and Lal SK (2014). Formulation of seed standards for seed quality parameters in ashwagandha [<i>Withania somnifera</i> (L) Dunal]. <i>Indian J Agri Sci</i> (Submitted)	6.18
30.	Mir Heena Rasool, Sudipta Basu, Malavika Dadlani, Shantha Nagarajan and Pramila Aggarwal (2014): Bio-physical and physiological changes associated with seed enhancement treatments in speciality maize. 86(1) (In press). <i>Indian Journal of Agricultural Sciences</i> .	6.18
31.	Nautiyal P.C. & Mariko Shono, 2010. Analysis of the role of mitochondrial and endoplasmic reticulum localized small heat shock proteins in tomato (<i>Lycopersicon esculentum</i> Mill.) plant. <i>Biologia Plantarum</i> , 54 (4): 715-719.	7.69
32.	Nautiyal, P.C. 2009. Seed and seedling vigour traits in groundnut (<i>Arachis hypogaea</i> L.). <i>Seed Science and Technology</i> , 37: 721-735.	6.7
33.	Pandita VK., Parveen Patil B.S. Tomar and R. Seth (2014) Controlled deterioration and paper-piercing tests predict seedling emergence potential in okra seed lots. <i>Scientia Horticulturae</i> , 179 (2014) 21-24	7.5
34.	Parihar S.S., M. Dadlani, S. K. Lal, V. A. Tonapi, P. C. Nautiyal and Sudipta Basu (2014). Effect of seed moisture content and storage temperature on seed longevity of hemp (<i>Cannabis sativa</i> L.). <i>Indian Journal of Agricultural Sciences</i> 84(11):1303-1309.	6.18
35.	Rai H., Raju, D.V.S., Kumar, M.B.A., Janakiram, T., Namita, Gopala Krishnan, S. and Rana, J.C. (2015) Characterization and analysis of genetic diversity among different species of rose (<i>Rosa species</i>) using morphological and molecular markers. <i>Indian Journal of Agricultural Sciences</i> , 85(2):240-245.	6.00
36.	Ruth C. M., Masashi A., Po-Pu Liu, Jessica R. K., Jennifer L. C., Wioletta E. P., George W. B., Natalya A. G., Theresa T. N., Cristina M., Kumar M. B.A., Piotr P. and Nonogaki H. (2010) The microRNA156 and microRNA172 gene regulation cascades at post-germinative stages in <i>Arabidopsis</i> . <i>Seed Science Research</i> . 20(2): 79-87.	7.93
37.	Ruth C. M., Masashi A., Po-Pu Liu, Jessica R. K., Jennifer L. C., Wioletta E. P., George W. B., Natalya A. G., Theresa T. N., Cristina M., Kumar M. B.A., Piotr P. and Nonogaki H. (2010) The regulation of post-germinative transition from the cotyledon-to Vegetative-leaf stages by microRNA-targeted SQUAMOSA PROMOTER BINDING PROTEIN LIKE13 in <i>Arabidopsis</i> . <i>Seed Science Research</i> . 20(2): 89-96.	7.93
38.	Sarao Navraj K., Yogesh Vikal, Kuldeep Singh, Monika A. Joshi and R. C. Sharma (2010). SSR marker-based DNA fingerprinting and cultivar identification of rice (<i>Oryza sativa</i> L.) in Punjab state of India. <i>Plant Genetic Resources, Characterization & Utilization</i> 8, pp 42-44	7.06
39.	Shaheen, R., Kalyani Srinivasan, Shahid Umar, Poonam Sunaja and Sangita Yadav. (2013). Qualitative and quantitative changes in lipids of cowpea (<i>Vigna unguiculata</i> L.): impact of changes in seed vigour. <i>Ind. J. Agril. Sci.</i> , 83 (1) 87-92	6.00
40.	Sharma SK, Y V Singh, Suruchi Tyagi and B S Tomar (2015). Influence of varieties and integrated nitrogen management on productivity and nutrient uptake in aerobic rice (<i>Oryza sativa</i>). In: <i>Indian Journal of Agricultural Sciences</i> , 85 (2): 246-50	6.00
41.	Singh PK, V K Pandita, B S Tomar and Rakesh Seth (2014). Germination and field emergence in osmotic and solid matrix priming in onion (<i>Allium cepa</i>), In: <i>Indian Journal of Agricultural Sciences</i> 84 (12):1561-1564	6.00
42.	Singh PK, V.K. Pandita, B.S. Tomar and Rakesh Seth (2014). Use of seed vigour tests to predict seedling emergence of carrot. In: <i>Indian Journal of Horticulture</i> . 71 (4): 516-521.	6.11
43.	Singh SP., Y.P. Singh, Sandeep Kumar and B.S. Tomar (2014) Development of artificial diets for rearing of adult lady bird <i>Coccinella septempunctata</i> in laboratory In: <i>Indian Journal of Agricultural Sciences</i> 84 (11):1358-62	6.00



44.	Thomas Sini, Anjali Anand, Viswanthan Chinnasamy, Anil Dahuja and Sudipta Basu (2013): Magneto priming circumvents the effect of salinity stress on germination in chickpea seeds. <i>Acta Physiologia Plantarum</i> (35) : 3401-3411.	7.31
45.	Thube S.H., Mahapatro, G.K. and Kumar, M.B.A. (2015) In vitro evaluation of insecticidal seed treatments in wheat. <i>Indian Journal of Entomology</i> , 76(3):215-218.	-
46.	Verma, M., Rathi, S., Munshi, A.D., Kumar, M.B.A., Arya, L., Bhat, K.V. and Kumar, R. (2012) Genetic diversity of Indian brinjal revealed by RAPD and SSR markers. <i>Indian Journal of Horticulture</i> 69(4): 517-522.	6.13
47.	Vidyadhar Bontha, B S Tomar, Balraj Singh and Girish Kaddi (2015) Effect of growing conditions on growth, seed yield and quality attributes in cherry tomato (<i>Solanum lycopersicum</i> var <i>cerasiforme</i>). <i>Indian Journal of Agricultural Sciences</i> 85 (1): 114–117.	6.00
48.	Vidyadhar Bontha, B.S. Tomar and Balraj Singh (2014). Effect of truss retention and pruning of berry on seed yield and quality attributes of cherry tomato (<i>Solanum lycopersicum</i> var. <i>cerasiforme</i>) grown under different polyhouse structures. <i>Indian Journal of Agricultural Science</i> , 84 (11): 1335-41	6.00
49.	Yadav, Shiv K., V. Vashisht, S.S. Gaurav, H. Sindhuja, D.V. Singh and S. K. Lal . (2012). An Efficient and Rapid Method of DNA Extraction for Molecular Marker Studies in Cotton (<i>Gossypium hirsutum</i> L.). <i>Vegetos</i> , 25 (02): 13-19.	6.04
50.	Yadav, Shiv K., D.K. Yadava, S. Vasudev, S. Yadav, P. R. Kumar, and R. Nigam (2013). Assessment of seed quality and oil content in Indian mustard (<i>Brassica juncea</i>) cultivars among different branches at different storage intervals. <i>Ind. J. Agril. Sci.</i> , 83 (2): 227-233.	6.00
51.	Yadav, Shiv K., H. Jalink, S.P.C. Groot, R. V. D. Schoor, S. Yadav, M. Dadlani, and J. Kodde. (2015). Quality improvement of aged cabbage (<i>Brassica oleracea</i> var. <i>capitata</i>) seeds using chlorophyll fluorescence sensor. <i>Scientia Horticulturae</i> , 189: 81-85.	7.50

23. Details of patents and income generated

None

24. Areas of consultancy and income generated

NA

25. Faculty selected nationally / internationally to visit other laboratories / institutions/ Industries in India and abroad

Name	Institutions and Industries Visited
Dr SK Jain	<ul style="list-style-type: none"> Royal Botanic Garden, Kew- Wakehurst Genebank, UK for Training on Seed Technology for Genebanks July-August 1986
Dr PC Nautiyal	<ul style="list-style-type: none"> University of Nottingham, UK, Department of Plant Sciences, Nottingham, Discussion regarding collaborative project on bambara groundnut, <i>BAMLINK</i> Project University of Stellenbosch, Cape Town, South Africa, Invited for talk on drought tolerance in bambara groundnut by Water Resource Commission/ University of Kwazulu-Natal, South Africa, 2009. JIRCAS Visiting Fellow, Japan, Okinawa, JIRCAS Sub-tropical Research Station, Ishigaki, Japan, 2002-03. ICRISAT-India Centre, Visiting Scientist, 1999
Dr SK Chakrabarty	<ul style="list-style-type: none"> International Rice Research Institute, Manilla, Phyllipines (March-May, 2007) Ministry of Agriculture, Forestry and Fisheries, Japan (Aug.-Nov., 2002)
Dr BS Tomar	<ul style="list-style-type: none"> FAO, vegetable seed production consultant at Tashkant, Uzbekistan <i>w.e.f.</i> 23-08-2009 to 7-09-2009 (15 days)
Dr. Shiv K. Yadav	<ul style="list-style-type: none"> International Training on “Fluorescence Sensor Technology for Non Destructive Seed Quality Evaluation” under NAIP in “SENSOR BASED APPLICATIONS INCLUDING BIO-INDICATORS”, the broad area identified by Crop Science Division, ICAR, New Delhi at Wageningen UR, Green House Horticulture, PRI, Wageningen, The Netherlands during 21.03.2011 to 18.06.2011
Dr (Ms) Sangita Yadav	<ul style="list-style-type: none"> Three months international training from 5.09.12 to 7.12.12 under HRD programme of NAIP (ICAR) in the area of biomolecules at Genome Center and Bioinformatic Programme, College of Biological Sciences, Genome and Bioscience Facility, UC Davis, California, USA
Dr. Arun Kumar MB	<ul style="list-style-type: none"> BOYSCAST Fellow (DST, Govt of India) at Prof. HiroNongaki’s Lab, Dept of Horticulture, Oregon State University, Oregon, USA (June 2008 to Sep 2009)



Dr. Atul Kumar	<ul style="list-style-type: none"> Visited Agrosaw and Indosaw industries with foreign delegates from Iraqon 31st May 2014 in International Training programme held in the DSST IARI from 26th May to 2nd June 2014
Dr (Ms) Sudipta Basu	<ul style="list-style-type: none"> Editor, Indian Journal of Plant Physiology

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr SK Jain	<ul style="list-style-type: none"> Member expert for Selection/Promotion Committees up to Professor Grade Designated Member Secretary for <ol style="list-style-type: none"> Identification of institute developed varieties of field and horticultural crops for release and notification both at central and state level IARI Seeds and Saplings Price Fixation Committee Meeting Nodal Officer (Seeds) for IARI Breeder Seed and TL Seed production at SPU-IARI, IARI Regional Stations Karnal, Indore, Katrain and Pusa Bihar 	<ol style="list-style-type: none"> Chief Editor – Seed Research (A Referred Journal), ISST, IARI New Delhi (Since 2010) Reviewer: IJAS, Seed Research, IJPGR, KJAS 	<ul style="list-style-type: none"> Secretary, Indian Society of Seed Technology, IARI New Delhi, India (Since 2009) Councillor (Delhi Zone), Indian Society of Plant Genetic Resources, NBPGR, New Delhi (since 2009) Professor, DSST, IARI, 19.02.11 to 02.01.12 & 22.08.13 to contd Head (I/C), DSST, IARI, 01 January to 21 October 2014
Dr PC Nautiyal	<ol style="list-style-type: none"> Member, Scientific Programme Committee, National Seminar on Groundnut, organized by DGR, Junagadh. Member, National Organising Committee, ISST, National Seed Seminar, Bangaluru. Co-chairman of a Scientific Session, National Seminar of Plant Physiology 	Editor, Indian Journal of Plant Physiology	<ol style="list-style-type: none"> COMPENDIUM Nautiyal, P.C., 2003. Groundnut- Postharvest, Fao.org.Agri/post- arvest/ compendium/groundnut. No. of Chapters 6, numberof pages 163. <i>FAO web-site</i>. Nautiyal, P.C., Y.C. Joshi&Devi Dayal, 2002. Response of groundnut todeficit irrigation during vegetative growth. FAO, Water Report, 22: 39-46.
Dr SK Chakrabarty	Co-opted Member, National Core Committee, ICAR; Consultant & Member Secretary, Task Force, PPV&FR Authority	Nil	Nil
Dr Sandeep Kumar Lal	-	Editorial Board, Society for Recent Development in Agriculture, Meerut	Nil
Dr Shiv K Yadav	None	<ol style="list-style-type: none"> Member of editorial board: Seed Research, ISST Member editorial board: Indian J Agric Res Member editorial board: Indian Farming, Member of Editorial Board: African Journal of Biotechnology, Member of Editorial Board: Haryana Journal of Agronomy 	



		6. Member of Editorial Board: National Journal of Plant Improvement;	
		7. Member of Editorial Board: Karnataka Journal of Agricultural Sciences,	
		8. Member of Editorial Board: Indian Journal of Genetics and Plant Breeding;	
		9. Member of Editorial Board: Journal of Food Legume	
Manjunath Prasad CT	Member, ISTA Vigour Committee	Nil	Nil

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs)

Faculty regularly attends international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by:

a) Faculty

Name	Awards/Recognitions
Dr SK Jain	<ul style="list-style-type: none"> Coordinator – Library (January 2015) Advisory Committee Member - 2015-2017, Vigyan Pragati (March 2015) Organizing Secretary, ISST XIII National Seed Seminar (08-10 June 2013) Bengaluru, Examiner/Paper Setter/Moderator- ARS, IARI, FRI, SAUs & Traditional Universities [National Institution} since 2010 Secretary, Indian Society of Seed Technology, IARI New Delhi, India (Since 2009) Councilor (Delhi Zone), Indian Society of Plant Genetic Resources, NBPGR, New Delhi (since 2009) Nirman Bhumi Award Pariwar for Outstanding Work in the Field of Seed Testing (2008)
Dr PC Nautiyal	<ul style="list-style-type: none"> Academy for the Advancement of Agricultural Sciences AAAS (Senior), Indian Society for Plant Physiology, New Delhi, during AGM at UAS, Dharwad, Karnataka.
Dr BS Tomar	<ul style="list-style-type: none"> IARI, Best Teacher Award 2014 ICAR Jawaharlal Nehru Award 1995
Dr. Shiv K. Yadav	<ul style="list-style-type: none"> Best Paper Presentation “Seed the key to agricultural development in North East: SOWT analysis of region” in 7th National Extension Education Congress 2014 on “Translational Research- Extension for sustainable small farm development” held at ICAR Research Complex for NEH Region, Umiam, Meghalaya during November 08-11, 2014 SEE Fellow in 7th National Extension Education Congress 2014 on “Translational Research- Extension for sustainable small farm development” held at ICAR Research Complex for NEH Region, Umiam, Meghalaya during November 08-11, 2014. Best Poster on Presentation “Improvement of soybean seed planting value through static magnetic field treatment” in National Seed Congress on Quality Seed for Food Security jointly organized by National Seed Research and Training Centre, Varanasi & Haryana State Seed Certification Agency during January 23 to 25, 2012 at Chandigarh Certificate of Appreciation during 2011 by Chairperson, Protection of Plant Varieties and Farmers Right Authority (PPV&FRA), for excellence in capacity building and providing technical support to PPV&FRA, New Delhi, GoI



- Certificate of Appreciation during 2011 for writing book “Seed Production Technology of Self Pollinated Crops of Tribal Areas of Rajasthan” by the Director, IARI and Joint Director Research & Chairman, Rajbhasha Karyanvayan Simiti, IARI, New Delhi Identified for empanelment as an Advisor by UPSC in 2011.
 - Selected as Registrar, PPV&FRA during 2010 (Not availed)
 - Young Scientist Award for the year 2008-09 by Society of Extension Education
 - Best Paper Presentation on “Farmers’ Participatory Seed Production: An Auto-Driven Extension Approach” in 5th National Extension Congress to be held at CSAUA&T, Kanpur during March 2009
 - First Prize for Oral Presentation in Hindi on “PPV & FR Act and Farmer’s Rights” in National Agriculture Science Workshop being organized jointly by Indian Agricultural Research Smiti and Indian Agricultural Research Institute at IARI, New Delhi during 13-15 April, 2009
 - Best Paper Presentation in National Agriculture Science Workshop being organized jointly by Indian Agricultural Research Smiti and Indian Agricultural Research Institute at IARI, New Delhi during 13-15 April, 2009
 - Fellow of Indian Society of Seed Technology (ISST), New-Delhi, India during 2007
 - Certificate of Merit- IARI (ICAR) For Being member of IARI Volley Ball Smashing team standing first in the Inter - Zonal Sports Tournament held at IARI during November 20-24, 2007 and Central Zone Sports Meet held at IARI during April 24-28, 2007
 - Ram Nath Award for the year 2000 for popular article writing
 - Best Poster in Session-II in National Seed Seminar at Hissar (India) during December 1998.
 -
 - Fellow of Indian Society of Seed Technology (2008)
 - IARI Merit Medal and Gold medal (2007)
 - Outstanding Worker of ICAR (2003) -Under the process of monitoring of the Institutional Research programme by the COUNCIL, the progress of my work has been rated as outstanding by Secy. (DARE) and DG, ICAR.
 - Silver Jubilee Prize with Certificate of Excellence (1992)
 - Niti Taluja Prize for excellence (1991)
 - Kashyap S. Shah Memorial Prize with Certificate of excellence in the Gujarat University (1991)
 - Best oral presentation award from the Society for scientific development in agriculture and technology in December 2014
 - Young Scientist award from the Society for scientific development in agriculture and technology in February 2014
 - IASc-INSA-NASI Summer Research Fellowship in 2013 for 8 weeks at IARI New Delhi with a fellowship of Rs 10,000/month
 - Young scientist award by DST as Fast track project grant in 2012
 - Best Poster Presentation award by IPS New Delhi at AAU Anand, 2010
 - Suniti Bala Chaudhary award for best PhD student of the Division of Plant Pathology, 2005
 - IARI Merit Medal for outstanding Academic Performance in PhD 2005
 - Prof. M.J. Narasimhan Commendation Award at National level 2005
 - Best research paper presentation award in M.J. Narasimhan Award 2004
 - Eastern Zone IARI fellowship for Ph.D Studies at IARI New Delhi 2000-2004
 - Junior Research Fellowship for MSc at IARI New Delhi 1998-2000
 - Best Oral Paper Award, ERCICA International Conference 2014, Bengaluru
 - Best Poster Award, National Seed Seminar, 2013, Bengaluru
 - PAU Merit Fellowship (1994-2003)
 - PAU Gold Medal for MSc (1998)
 - Fellow of Indian Society of Seed Technology (ISST), New-Delhi, India during 2013
 - Best Poster Award: Sandeep Kumar Lal, Shiv K. Yadav, S. Basu and O. K. Sharma (2014)- Efficacy of organic and conventional seed treatments for enhancing seed quality in chickpea varieties at *International Conference on “Agriculture, Forestry, Horticulture, Aquaculture, Animal Sciences, Food Technology, Biodiversity and Climate Change: Sustainable Approaches”*(AFHAFBC-2014), Jawaharlal Nehru University, New Delhi (Aug. 30-31, 2014)
 - Chairman-Technical Session II: *International Conference on “Agriculture, Forestry, Horticulture, Aquaculture, Animal Sciences, Food Technology, Biodiversity and Climate Change: Sustainable Approaches”*(AFHAFBC-2014), Jawaharlal Nehru University, New Delhi (Aug. 30-31, 2014)
 - Co-chairman-Technical Session II: International Conference on Global IPR system and WTO issues (GIPRS-2013). CCS University, Meerut (Nov. 16-17, 2013)
 - Fellow, Indian Society of Seed Technology
- Dr (Ms) Sangita Yadav
- Dr. Atul Kumar
- Dr Monika A Joshi
- Dr Sudipta Basu
Dr Sandeep Lal



Mr Manjunath
Pd CT

- Scientist of the Year Award (2011). ICLDBT-2011, SVPUA&T, Meerut (October 8-10, 2011)
- Best Poster Award: Sudipta Basu Bhaumik, S.K. Lal, Heena Rasool Mir, Sukhbir Singh and Malavika Dadlani (2011)- Effect of pre-sowing seed enhancement treatments on field emergence and crop performance of specialty maize at 11th Maize Conference, China (Nov. 7-11, 2011)
- Innovations in Science and Technology Award (2010). National symposium on Emerging trends in Agricultural Research, Scientific and Applied Center, Meerut (Sept. 11-12, 2010)
- Awarded Appreciation Certificate by DDG(CS), ICAR for seed multiplication work at SPU
- Awarded Dr BR Ambedkar State Award for Merit during Doctoral Degree Program (2008)
- Mr. Manjunath Prasad CT, ICAR International Fellowship - 2014

b) Students

- More than 10 students have got best poster presentation award in different seminars and conferences
- Young Scientist Award - Manish Kumar Vijay -2015
- IARI Merit Medal - Ms Heena Rasool Mir — 2011
- IARI Gold Medal _ Dr Arnab Gupta -2009

30. Seminars/Conferences/Workshops/Trainings organized and the source of funding (national/ international) with details of outstanding participants, if any

Seminar/Conference/Workshops	Source of Funding	Details of participants
Short course on “Hybrid Seed Production, Plant Variety Protection, Value Addition and Quality Assurance for Enhancing Productivity”, 3-12 September, 2013, DSST, IARI.	Indian Council of Agricultural Research	18 participants (Assistant Professors and above rank)
XIII National Seed Seminar at UAS, GKVK, Bengaluru- Innovations in Seed Research and Development, 2013, 03 days	DAC, Ministry; ICAR, NSC, SFCI, NRAA, Delegate registration fee; Seed Industries and Advertisements	Delegates comprised galaxy of scientists and other invited dignitaries, policy makers, ISST members, students, farmers, and NGO's
XII National Seed Seminar at ANGRAU Hyderabad- Prosperity through Quality Seed, 2006, 03 days	Ministry; SAU's; Delegate registration fee; Seed Industries and Advertisements	-do-
National Conference on Seed at NASC, New Delhi- Seed: A Global Perspective, 2004, 03 days	-do-	-do-
XI National Seed Seminar at UAS Dharwad- Quality Seed to Enhance Agricultural Profitability, 2002, 03 days	-do-	-do-
X National Seed Seminar at CCS HAU Hissar, Seed Technological Developments: Challenges for 21 st Century, 1998, 03 days	-do-	-do-
International Trainings Short Term International Training for the staff of the Improved Seed Enterprise (ISE), Ministry of Agriculture, Government of Afghanistan	Word bank sponsored and Popularization” (2015)	15 staff of the Improved Seed Enterprise (ISE), Ministry of Agriculture, Government of Afghanistan on “Principles and Methods of Quality Seed Production and Certification of Field Crops with special reference to Wheat including Varietal Identification, Release and Popularization” (2015)
Capacity building programme for African-Asian senior officials	Govt of India through African-Asian Rural Development Organisation –(AARDO) sponsored	Skill enhancement of 09 participants from African-Asian countries on Seed Production and Quality Evaluation (2015)



Capacity building programme for African-Asian senior officials	Govt of India through African-AsianRural Development Organisation – (AARDO) sponsored	Skill enhancement of 08 participants from African-Asian countries on Seed Production and Quality Evaluation (2014)
Capacity building programme for Iraq senior officials	Iraq Government	Skill enhancement of 05 senior officials from Iraq Ministry of Science and Technology on Seed Technology (2014)
Capacity building programme for Nigerian senior officials	West Africa Agricultural Productivity Programme (WAAPP)-Nigeria sponsored	Skill enhancement of 05 senior officials from Nigerian Council on Seed Quality Assurance (2014)
Capacity building programme for African-Asian senior officials	Govt of India through African-AsianRural Development Organisation – (AARDO) sponsored	Skill enhancement of 09 participants from African-Asian countries on Seed Production and Quality Evaluation (2013)
Capacity building programme for African-Asian senior officials	Govt of India through African-AsianRural Development Organisation – (AARDO) sponsored	Skill enhancement of 07 participants from African-Asian countries on Seed Production and Quality Evaluation (2011)
Capacity building programme for African-Asian senior officials	Govt of India through African-AsianRural Development Organisation – (AARDO) sponsored	Skill enhancement of 06 participants from African-Asian countries on Seed Production and Quality Evaluation (2010)
Capacity building programme for Myanmar senior officials	FAO sponsored	02 Senior Officials from Myanmar (2007)
National Trainings		
Farmers' training	ICAR-Mega Project on Seed	27 farmers (2014)
Farmers' training	ICAR-Mega Project on Seed	25 farmers (2014)
Model Training Course on "Seed Quality Assurance" held at DSST, IARI	Directorate of Extension, DAC, GOI	21 Seed Analysts and Quality Control Officers (2014)
Training on "Seed Quality Assurance" (An IARI-NSAIcapacity building initiative for Indian seed industry) held at DSST, IARI	NSAI, New Delhi	23 participants from 19 companies attended the programme (2012)
National Training on "Seed Quality Assurance" held at DSST, IARI	NSRTC, Varanasi	25 Seed Analysts and Quality Control Officers (2012)
Short course on "Plant Variety Protection & Farmers' Rights Act and its Implementation"	Indian Council of Agricultural Research	15 participants (Assistant Professors and above rank) (Jan., 2008)
Training programme under Centre-of-Excellence for PQP	PPV&FR Authority	Masters and above degree holder including Scientists and Asst. Professors (2006-2009)

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	4	1	-	-
Ph.D.	58	5	1	8.62	1.72

**33. Diversity of students**

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	20.00	10.0	70.00	0.00
Ph.D.	68.75	12.5	12.5	6.25

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

All students are selected for M.Sc. and Ph.D. after clearing All India competitive examinations and all will get fellowships.

05 Indian Administrative Service

03 Indian Police service

05 Indian Revenue Service

03 Indian Forest Service

16 ARS scientist

20 Assistant Professor

10 student AO, State Services

08 student FCI

Many students selected as PO in Nationalized Banks

One student entrepreneur

Many continuing career as researcher abroad

A few students after M.Sc. are preparing for civil services

No student of the discipline is Jobless.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	80-100%
Ph.D. to Post-Doctoral	All students after PhD get Jobs and only few go abroad for post doc research etc.
Employed	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree
Campus selection	
Other than campus recruitment	
Entrepreneurs	In last 6 years a few students are entrepreneur

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	12.50
From other universities within the state	18.75
From universities from other States	68.75
Universities outside the country	None

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

All are Ph.D.

38. Present details of departmental infrastructural facilities with regard to

a) Library	one
b) Internet facilities for staff and students	Every room/ laboratory/class room/lecture room has computer with internet connection and WIFI.
c) Total number of class rooms	One
d) Class rooms with ICT facility	One
e) Student's laboratories	One
f) Research laboratories	10



39. List of doctoral, post-doctoral students and Research Associates

- from the host institution/university
- from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph.D. Entrance Examination at National level

SNo	Name of the MSc student	University of Graduation
1.	Mr Rajesh Kumar Sharma	RAU, Bikaner, Rajasthan
2.	Mr Swami Sunil Ramling	Marathwada Krishi Vidyapeeh, Parbhani, MS
3.	Mr Sunny Kumar Munditiya	RAU, Bikaner, Rajasthan
4.	Mr Venkatesha MG	UAS, Bangalore, Karnataka
5.	Mr Deshmukh Vinod Gulabrao	Marathwada Krishi Vidyapeeh, Parbhani, MS
6.	Mr Praveen S Patted	UAS, Dharwad, Karnataka
7.	Mr Ravi Bhushan Prasad	BHU, Varanasi, UP
8.	Mr Dhanush KS	UAS, Bangalore, Karnataka
9.	Mr Damodar Das	CSAUA&T, Kanpur, UP
10.	Mr Sanjay Kumar	BHU, Varanasi, UP

SNo	Name of the PhD student	Host/other institute/ university
1	Mr Parveen Kumar Singh	IARI
2	Mr Reza Joudaki	Iran
3	Mr Sumit Kumar Singh	IARI
4	Mr Sanjay Kumar	IARI
5	Mr Vinod Kumar SB	UAS, Dharwad
6	Mr Sooganna	ANGRAU, AP
7	Mr Nakul Gupta	IARI
8	Mr Manish Kumar Vijay	IARI
9	Mr Hrishikesh Sutradhar	IARI
10	Mr Viswanath Sharma	IARI
11	Mr C Kiran Kumar Reddy	ANGRAU, AP
12	Mr Gaurav Kumar	UAS, GKVK, Bangalore
13	Ms Archana Sanyal	IARI
14	Mr Ghanshyam Dan	IARI
15	Mr Niraj Kumar Jha	IARI
16	Mr Murali CN	UAS, GKVK, Bangalore

SNo	Name	Designation	Qualification	Host/other institute/ university
1.	Dr Manisha	SRF	M.Sc.	Other University
2.	Dr Preeti	SRF	M.Sc.	Other University
3.	Dr Deborati	SRF	M.Sc.	Other University
4.	Ms Kamna Kumari	JRF	M.Sc.	Other University
5.	Ms Divya Aggarwal	SRF	M.Sc.	Other University
6.	Ms Anupama Pandey	SRF	M.Sc.	Other University
7.	Mr Devmani Bind	RA	Ph.D.	Other University
8.	Soni Kumari	JRF	M.Sc.	Other University
9.	Dr. Peeyush Kumar	YS (DST)	Ph.D	Other University

40. Number of post graduate students getting financial assistance from the university:

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology

Not applicable

**42. Does the department obtain feedback from**

Yes

- a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching-learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

- b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

- c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for improvement. We try to incorporate suggestions given by alumni and agencies.

43. List the distinguished alumni of the department (maximum 10)

SNo.	Name and address	Passing Year
1	Dr Arnab Gupta, Bioersivity International	2011
2	Dr Girish Kaddi, Entrepreneur	2009
3	Dr Sushil Pandey, FAO Consultant and Nodal Officer in South East Asia	2009
4	Mr Pandiyaraj N, IRS	2008
5	Pham, Duc Tuan- Country Manger Biotechnology, Syngenta, Vietnam	2006
6	Hanumanthappa, IFS	2005
7	Kishore S Mankar, IFS	1999
8	Mr Sameer Ilme, IPS	1992
9	Dr Jai Singh, MD, M/s Sakata Seeds, Gurgaon	1988
10	Dr KPR Prasanna, Former Director Extension and Dean, UAS, GKVK, Bangalore	1980

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts

Guest lectures, lectures by adjunct faculty, and award lectures held on regular basis; the students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes

Black board, white board, LCDs and assignments, term papers, quizzes, practical/ hand's-on-training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities, whereas Dean and Joint Director (Education) monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities

Faculty and students participate in extension activities especially during Pusa Krishi Vigyan Mela and also have interaction with various stake holders at divisional level.

48. Give details of "beyond syllabus scholarly activities" of the department

Study tours, visit to various Centre-of-Excellence, State-of-the-Art facilities, Institutes and Laboratories for exposure are being arranged for demonstrations and spot doubt clearance; sports are held at institute, region, all India and universities level. Students have students union which has Cultural and Sports Secretary, for organizing various events.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi



50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied

1. *Protocols for hybrid purity testing*

- A. Molecular technique for testing the seed purity in brinjal hybrids PH-5, PH-9, DBHL-20 and Kashi Komal
- B. Molecular technique for testing seed purity of pearl millet hybrids RHRBH8609, RHRBH8924, GHB538, GHB732, GHB744, GHB719, GHB558, PUSA605, PUSA23 and HHB67 improved
- C. Hybrid purity testing through DNA markers in maize single cross hybrids namely, Vivek Hybrid-9, HM-11, Vivek QPM-9, PEHM-2 and HQPM-1
- D. Hybrid purity testing in cotton hybrids namely, RAHB87 and DCH32

2. *Seed/tissue crushed supernatant PCR' technology as an alternative to DNA extraction*

3. *Seed Standards*

- A. *Nigella sativa* L. (Kalonji)
- B. *Carum carvi* L. (Caraway)
- C. *Withania somnifera* (L.) Dunal (Ashwagandha)

4. *Seed Testing Protocols*

- A. *Pimpinella anisum* L. (Aniseed)
- B. *Nigella sativa* L. (Kalonji)
- C. *Carum carvi* L. (Caraway)
- D. *Withania somnifera* (L.) Dunal (Ashwagandha)

5. *PGPR bio-formulations for seed-borne disease management and growth promotion in Solanaceous and Cruciferous vegetables*

6. *Hybrid seed production technology in rice, mustard, bottlegourd, bittergourd, brinjal, tomato, cauliflower, cucumber*

7. *Seed enhancement technology in cotton, soybean, maize, paddy and chickpea*

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths

- Scientists with diverse expertise, high motivation and dedication
- Centre-of-Excellence for developing DUS test guide lines, hybrid seed production technology, seed quality assurance and seed quality enhancement
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, Online resources
- Highly placed alumni

Weaknesses

- Lack of expertise in certain areas like nanotechnology
- International and national linkages with well defined collaborative research programmes and with seed industries
- Young scientist for capacity building and advance training in frontline area is the immediate need of the hour
- Centre for Advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

Opportunities

- Centrally located hence, many research institutes, university are there for collaboration
- Liberal availability of Resource Personnel/ Expertise as well Guest/visiting scientist lecture
- Training in front areas
- Establishing linkages with International agencies and Centre-of-Excellence in Seed Sector
- Major funding agencies are in Delhi hence can be approached for funding.



Challenges

- Competition from ICAR and other institutes/SAUs and other Universities
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich research programme at Centre-of-Excellence with Universities abroad
- Fast track integrated MSc & PhD programme with quality research.

52. Future plans of the department

EDUCATION

Enhancement of the quality of human resources:

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of climate resilient seed production technology, seed quality assurance using modern molecular tools, seed quality enhancement, precision planting and policies issues
- Regular skill enhancement of the available faculty by deputing them to the Centre-of-Excellence both within India and abroad
- Encouragement of faculty for presenting research findings at various international platforms with the financial supports from Institute/ICAR.
- Young scientists will be encourages to go for 6-12 months training at world leading Institutes through ICAR/IARI/DST/DBT fellowships
- Establishing strong linkages with seed industries, frequent informal interactions, problem solving research with the support of seed industries
- Compulsory 10 days to 03 months internship at Centre-of-Excellence at both public/private seed sector for MSc and PhD students, respectively
- Efforts will be made to initiate sandwich PhD programmes for all PhD students with International Institutes/ Centre-of-Excellence
- Organization of monthly seminars by invited eminent scientists from other Institutes; and regular faculty
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to assist in teaching on the topics of their interests

RESEARCH

Emphasis will be given to the basic and strategic research in the area of climate resilient seed production technology (both for hybrids and OP varieties), seed quality assurance with special reference to hybridity testing, and seed quality enhancement. In the next five years, the Division will focus on the above stated aspects in a multidisciplinary mode in collaboration with National and International Institutes. The main areas of the current research programme will be:

- Evaluation of seed vigour and dormancy traits in rice
- **To study the basis of** differential response of seed quality traits in conventional and quality Indian mustard genotypes
- To understand the relation of seed composition with seed vigour and storability in speciality maize.
- To understand the physiological and molecular mechanisms of seed priming in pigeonpea and soybean under various abiotic stresses.
- To evaluate morphological, physiological and molecular traits associated with seed vigour and longevity in mini-core collections of soybean.
- To standardize the machine and crop variables for multi-stage mechanical seed processing.
- To develop seed quality enhancement technology for direct seeded rice, summer mungbean, chickpea and pigeon pea.



xxii) Division of Soil Science and Agricultural Chemistry

1. Name of the Department

Division of Soil science and Agricultural Chemistry

2. Year of establishment

1958

3. Is the Department part of a School/Faculty of the university?

Yes, School of natural resource management

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved

Agronomy, Microbiology, Water Science and Technology, Agril. Physics, Ag. Chemicals, Centre for Environment Science and Climate Resilient Agriculture (CESCRA)

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

None

7. Details of programmes discontinued, if any, with reasons

None

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Trimester System

9. Participation of the department in the courses offered by other departments

The faculty deliver lectures and guide dissertations in the sister departments Microbiology, Agronomy, Environmental Science, Water Science and Technology, Agril. Physics, Agril. Chemicals

10. Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others)

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	2	2	0	10
Senior Scientist (Associate Professor)	6	2	4	2
Scientist (Assistant Professor)	18	15	3	7

Besides above there is one permanent faculty in the discipline who is posted at sister department as follows:

1. Dr. Ranjan Bhattacharya, Senior Scientist, CESCRA, IARI, New Delhi-12	Permanent faculty in the discipline of soil science & agricultural chemistry from other Department
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11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	Ph.D.
Dr. B.S. Dwivedi	Ph.D.	Head	Soil Chemistry/Fertility/Microbiology and nutrient management	28	Nil



Dr. R.D. Singh	Ph.D.	Professor	Agricultural Chemistry: Recycling of organics, soil fertility, soil biology	32	01
Dr. S.C. Datta	Ph.D.	Principal Scientist	Soil Chemistry/Fertility/Microbiology; Clay mineralogy, Modelling	31	14
Dr. N.P.S. Yaduvanshi	Ph.D.	Principal Scientist	Soil Science - Soil Fertility	29	Nil
Dr. R.N. Pandey	Ph.D.	Principal Scientist	Soil Science-Soil Chemistry/Fertility/ Microbiology	23	02
Dr. Nayan Ahmed	Ph.D.	Principal Scientist	Pedology, Remote Sensing, Soil Organic Matter, Clay Mineralogy	23	Nil
Dr. D.R. Biswas	Ph.D.	Principal Scientist	Soil Chemistry/Fertility/ Microbiology: recycling of wastes	23	04
Dr. K.M. Manjaiah	Ph.D.	Principal Scientist	Soil Chemistry/Fertility/ Microbiology: Soil Clay mineralogy and radionuclide	22	06
Dr. T. J. Purakayastha	Ph.D.	Principal Scientist	Soil carbon sequestration, soil quality/ phytoremediation/ soil pollution	23	07
Dr. S.P. Datta	Ph.D.	Principal Scientist	Soil Chemistry /Fertility/ Microbiology- Metal pollution and micronutrients	20	03
Dr. S.K. Singhal	Ph.D.	Sr. Scientist	Soil Fertility, Waste Management	23	Nil
Dr. V.K. Sharma	Ph.D.	Sr. Scientist	Soil fertility/Agricultural Chemistry/ Soil Microbiology	13	Nil
Dr. Ranjan Bhattacharyya	Ph.D.	Sr. Scientist	Carbon sequestration, conservation agriculture, Nitrogen management	13	Nil
Dr. M.C. Meena	Ph.D.	Scientist	Soil Fertility and plant nutrition	07	Nil
Dr. Sarvendra Kumar	Ph.D.	Scientist	Conservation Agriculture / Soil biotechnology/ Soil Ecology	04	Nil
Dr. (Ms.) Mandira Barman	Ph.D.	Scientist	Soil Chemistry /fertility/ microbiology	03	Nil
Dr. (Ms.) Sunanda Biswas	Ph.D.	Scientist	Soil Science-Soil Chemistry / Fertility / Microbiology	03	Nil

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S.No.	Name of the Faculty	Status
1.	Dr. S.K. Sanyal, Former vice chancellor, BCKV, WB	Adjunct Professor
2.	Dr. P.K. Chhonkar, Former Prof. & Head, Division of Soil Science & Agricultural Chemistry, IARI, New Delhi	Adjunct Faculty
3.	Dr. G. Narayanasamy, Former Prof. & Head, Division of Soil Science & Agricultural Chemistry, IARI, New Delhi	Adjunct Faculty

13. Percentage of classes taken by temporary faculty – programme-wise information

About 10%

14. Programme-wise Student Teacher Ratio

Student: teacher :: 9:17 (M. Sc.) and 31:17 (Ph.D.)

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	-	15	15
2.	Administrative	09	07	07
3.	Supportive	-	21	21



16. Research thrust areas as recognized by major funding agencies

Soil management, nutrient management, development of novel fertilizers, soil ecology and soil pollution

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	National	International	Budget (Rs. in Lakh)	Period
Dr B.S. Dwivedi	Nil	Appraisal of multi-nutrient deficiencies in soils and their redressal through site specific nutrient management-IPNI (South Asia Programme)	14.7	2007-12
Dr. T. J. Purakayastha	Development of soil quality index under different land use systems in Chandrabhaga watershed of Tehri Garhwal- DST	Nil	25	2010-14
Dr. Nayan Ahmed	Soil carbon pool assessment of West Bengal-IIRS	Nil	7.6	2009-12
Dr. S.P. Datta	Enhancing use efficiency of micronutrients: Novel delivery systems-ICAR	Nil	150.3	2012-17
Dr. R. D. Singh	Probing of microbial diversity in relation to soil health and productivity of Central Himalaya Region-DST	Nil	20.1	2007-11

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

Nil

b) International collaboration

Nil

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

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20. Research facility / centre with

State recognition

Nil

National recognition

Soil testing lab

International recognition

Nil

21. Special research laboratories sponsored by / created by industry or corporate bodies

Nil



22. Publications

	B.S. Dwivedi	R.D. Singh	S.C. Datta	N.P.S. Yaduvanshi	R.N. Pandey	Nayan Ahmed	D.R. Biswas	K.M. Manjaiah	T. J. Purakayastha	S. P. Datta
Number of papers published in peer reviewed journals (national / international)	82	97	72	57	26	40	50	70	53	50
Monographs	5	5		5			3		3	
Chapters in Books	16	7	4	1	5		6	10	19	17
Edited Books	3			1	0		4	03	4	3
Books with ISBN with details of publishers	1 ISBN-81-85873-26-7		1	1978-81-7233-790-2						
Number listed in International Database										
Citation Index – range / average	1125	301	205	04-5.7/18	141	54	427	3.12-9.6	560	933
SNIP range / average										
SJR range / average										
Impact Factor–range / average										
h-index	15	9	9		4	5	10		12	14

	S.K. Singhal	Dr. V.K. Sharma	R. Bhattacharyya	M.C. Meena	S. Kumar	Dr. (Ms.) Mandira
Number of papers published in peer reviewed journals (national / international)	25	55	57	32	5	4
Monographs		3				
Chapters in Books	2	1	3	11	2	
Edited Books		3		2	1	
Books with ISBN with details of publishers	1 ISBN-81-85873-26-7		1	1978-81-7233-790-2		
Number listed in International Database						
Citation Index – range / average	25	56	495	68	15	10
SNIP range / average						
SJR range / average						
Impact Factor–range / average						
h-index	1	2	12	4	2	2
i10-index	1	2		10	1	1



Some of the important publication from 2010-2014

NAAS > 8.00

- Basak, B.B. and Biswas, D.R. 2010 Co-inoculation of potassium solubilizing and nitrogen fixing bacteria on solubilization of waste mica and their effect on growth promotion and nutrient acquisition by a forage crop. *Biology and Fertility of Soils*, 46: 641–648 (NAAS rating: 8.51)
- Bhaduri, D., Purakayastha T. J. (2014) Long-term tillage, water and nutrient management in rice–wheat cropping system: Assessment and response of soil quality. *Soil and Tillage Research* 144 (2014) 83–95. (NAAS rating: 8.37)
- Bhatia, A., Singh, Geeta, Datta, S.P., Kar, A., Singh, Billu, Singh, Parmendra, Pathak, H., Vyas, A.K. and Jat, M.L. (2014). Conservation agriculture in an irrigated cotton-wheat system of the western Indo-Gangetic Plains: Crop and water productivity and economic profitability. *Field Crops Research* 158, 24-33. (NAAS rating: 8.47)
- Bhattacharyya, R., Fullen, M.A., Booth, C.A., Black, A. and Townrow, D. (2013) Using palm-matgeotextiles for soil conservation: II. Effects on in situ soilparticle size distribution and nutrient concentration. *Catena*, 101, 143-156. (NAAS rating: 8.48)
- Bhattacharyya, R., Tuti, M.D., Kundu, S., Bisht, J.K. and Bhatt, J.C. (2012) Conservation tillage impacts on soil aggregation and carbon pools in a sandy clay loam soil of the Indian Himalayas. *Soil Science Society of America Journal*, 76, 617-627. (NAAS IF: 8.00)
- Bhattacharyya, R., Zheng Yi, Li Yongmei, Tang, Li, Panomtarachichigul, M. Peukrai, S., Dao Chau Thu, Tran Huu Cuong, and Truong Thi Toan, Jankauskas, B., Jankauskiene, G., Fullen, M.A., M. Subedi, Booth, C.A. (2012). Effects of biological geotextiles on aboveground biomass production in selected agro-ecosystems. *Field Crops Research*, 126, 23-36. (NAAS rating: 8.47)
- Das Bappa, Chakraborty D, Singh VK, Aggarwal P, Singh Ravender, Dwivedi BS and Mishra RP (2013) Effect of integrated nutrient management practice on soil aggregate properties, its stability and aggregate-associated carbon content in an intensive rice-wheat system. *Soil and Tillage Research* 136, 9-18(NAAS rating: 8.37)
- Das, T.K., Bhattacharyya, R., Sharma, A.R., Das, S. Saad, A.A. and Pathak, H. 2013. Impacts of conservation agriculture on total soil organic carbon retention potential under an irrigated agro-ecosystem of the western Indo-Gangetic Plains. *European Journal of Agronomy*. 51, 34-42. (NAAS IF: 8.92).
- Dwivedi BS, Singh VK, Shukla Arvind K and Meena MC (2012) Optimising dry and wet tillage for rice on a Gangetic alluvial soil: effect on soil characteristics, water use efficiency and productivity of the rice-wheat system. *European Journal of Agronomy* 43, 155-165 (NAAS rating 8.80).
- Kumar Sarvendra, Patra, A.K., Singh, Dhyana, Purakayastha, T. J., Rosin, K.G., Kumar, Manoj (2013) Long-term chemical fertilization along with farmyard manure enhances resistance and resilience of soil microbial activity against heat stress. *Journal of Agronomy and Crop Science* doi:10.1111/jac.12050. (NAAS rating: 8.65).
- Kumari M, Chakraborty, D, Gathala MK, Pathak H, Dwivedi, BS, Tomar RK, Garg RN, Singh Ravender and Ladha JK (2011) Soil aggregation and associated organic carbon fractions as affected by tillage in a rice–wheat rotation in north India. *Soil Science Society of America Journal* 75, 560-567(NAAS IF: 8.00)
- Mahanta, Dibakar, Rai, Raj K., Mishra Shiva Dhar, Raja Arunkumar, Purakayastha, Tapan J., Varghese, Eldho (2014) Influence of phosphorus and biofertilizers on soybean and wheat root growth and properties. *Field Crops Research* <http://dx.doi.org/10.1016/j.fcr.2014.06.016>. (NAAS rating: 8.47).
- Mandal N, Dwivedi BS, Meena MC, Dhyana Singh, Datta SP, Tomar RK and Sharma BM (2013) Effect of induced defoliation in pigeonpea, farmyard manure and sulphitation pressmud on soil organic carbon fractions, mineral nitrogen and crop yields in a pigeonpea-wheat cropping system. *Field Crops Research* 154, 178–187 (NAAS rating 8.47). (NAAS rating: 8.47)
- Mandal, Asit, Purakayastha, T. J., Patra, A.K. (2014) Phytoextraction of arsenic contaminated soil by Chinese brake fern (*Pteris vittata*): Effect on soil microbiological activities. *Biology and Fertility of Soils* DOI 10.1007/s00374-014-0941-8. (NAAS rating: 8.51).
- Mandal, N., Dwivedi, B.S., Meena, M.C., Dhyana-Singh, Datta, S.P., Tomar, R.K. and Sharma, B.M. (2013) Effect of induced defoliation in pigeonpea, farmyard manure and sulphitation pressmud on soil organic carbon fractions, mineral nitrogen and crop yields in a pigeonpea–wheat cropping system. *Field Crops Research*, 154: 178-187 (NAAS IF: 8.47).
- Moharana PC, Sharma BM, Biswas DR, Dwivedi BS and Singh RV (2012) Long-term effect of nutrient management on soil fertility and soil organic carbon pools under a 6-year-old pearl millet-wheat cropping system in an Inceptisol of subtropical India. *Field Crops Research* 136, 32-41(NAAS rating: 8.47)



- Purakayastha, T. J., Kumari, Savita, Pathak, H. (2015) Characterisation, stability and microbial effects of four biochars prepared from crop residues. *Geoderma* 239-240:293-303. (NAAS rating: 8.51)
- Singh VK, Dwivedi BS, Shukla Arvind K and Mishra RP (2010) Permanent raised bed planting of the pigeonpea-wheat system on a Typic Ustochrept: effects on soil fertility, yield, and water and nutrient use efficiencies. *Field Crops Research* 116, 127-139 (NAAS rating: 8.47)
- Singh VK, Dwivedi BS, Tiwari KN, Majumdar K, Rani M, Singh SK and Timsina J (2014) Optimizing nutrient management strategies for rice-wheat system in the Indo-Gangetic Plains and adjacent region for higher productivity, nutrient use efficiency and profits. *Field Crops Research* 164, 30-44 (NAAS rating: 8.47)
- Tong, X., Xu, M., Wang, X., Bhattacharyya, R., Zhang, W. and Cong, R. (2014). Long-term fertilization effects on organic carbon fractions in a red soil of China. *Catena*, 113, 251-259. (NAAS rating: 8.48)
- Viswanath, Thulasi, Pal Deo, Purakayastha, T. J. (2010) Elevated CO₂ reduces rate of decomposition of rice and wheat residues in soil. *Agriculture Ecosystems and Environment* 139: 557-564. (NAAS rating: 8.86).
- Yaduvanshi, N.P.S., Setter, T.L., Sharma, S.K. Singh, K.N. and Kulshreshtha, N. (2012). Influence of waterlogging on yield of wheat (*Triticum aestivum*), redox potential, and concentrations of microelements in different soils in India and Australia. *Soil Research* 50: 489-499. (NAAS Rating:9.44)

NAAS 6.00-7.99

- Ahamed Shabeer T. P., Ajoy Saha, V.T. Gajbhiye, Suman Gupta, K.M. Manjaiah and Eldho Varghese. 2015. Exploitation of nano-bentonite, nano-halloysite and organically modified nano-montmorillonite as an adsorbent and coagulation aid for the removal of multi-pesticides from water: A sorption modeling approach. *Water, Air and Soil Pollution* 226:41 DOI 10.1007/s11270-015-2331-8 (NAAS Rating: 7.75)
- Ahamed Shabeer T. P., Ajoy Saha, V.T. Gajbhiye, Suman Gupta, K.M. Manjaiah and Eldho Varghese. 2014 Simultaneous removal of multiple pesticides from water: Effect of organically modified clays as coagulant aid and adsorbent in coagulation-flocculation process. *Environmental Technology*, <http://dx.doi.org/10.1080/09593330.2014.914573> (NAAS rating: 7.61)
- Ahamed Shabeer T. P., Ajoy Saha, V.T. Gajbhiye, Suman Gupta, K.M. Manjaiah and Eldho Varghese. 2014 Effect of Nano and Modified Nano-clays as a Flocculation Aid and Adsorbent in Coagulation-flocculation Process. *Polycyclic Aromatic Compound*, 34:452-467. (NAAS rating: 7.04)
- Barman M, Datta SP, Rattan RK and Meena MC (2013) Sorption and desorption of nickel in soils in relation to its availability to plants. *Agrochimica*, LVII (3), 235-249 (NAAS rating 6.31).
- Barman M, Datta SP, Rattan RK and Meena MC (2015) Chemical fractions and bioavailability of nickel in alluvial soils. *Plant Soil and Environment* 61, 17-22 (NAAS rating 7.11).
- Barman, M., Datta, S.P. and Rattan, R.K. (2013) Identification of the solid phase in relation to the solubility of nickel in alluvial soils. *Journal of Environmental Biology* (In press) (NAAS IF: 6.68).
- Barman, M., Shukla, L.M., Datta, S.P. and Rattan, R.K. (2014) Effect of applied lime and boron on the availability of nutrients in an acid soils. *Journal of Plant Nutrition* 37:357-373 (NAAS IF: 6.53).
- Basak, B.B., Biswas, D.R. and Pal Sharmistha 2013 Soil biochemical properties and quality as affected by organic manures and mineral fertilizers in soil under maize-wheat rotation. *Agrochimica* 57(1): 49-66. (NAAS IF: 6.31)
- Bhaduri D., Purakayastha T. J., Bhar L. M., Patra A. K., Sarkar B. (2014) Impact of integrated management on yield sustainability in relation to soil quality under a rice-wheat cropping system. *National Academy Science Letters*, 37(1):25-31. DOI:10.1007/s40009-013-0202-7. (NAAS rating: 6.07).
- Bhaduri D., Purakayastha T. J., Patra A. K., Chakraborty D. (2014) Evaluating soil quality under a long-term integrated tillage-water-nutrient experiment with intensive rice-wheat rotation in a semi-arid Inceptisol, India. *Environmental Monitoring and Assessment* 186(4):2535-2547. DOI:10.1007/s10661-013-3558-8. (NAAS rating: 7.59).
- Bhaduri, D., Purakayastha T. J., Patra A. K., Singh, M., Sarkar, S. (2014) Combined effect of tillage-water-nutrient management under rice-wheat agro-ecosystem: A study on chemical indicators of soil quality. *Agrochimica* 58 (1): 63-76. (NAAS rating: 6.31).
- Bhattacharyya, R., Das, T.K., Pramanik, P., Ganeshan, V. Saad, A.A. and Sharma, A.R. (2013). Impacts of conservation agriculture on soil aggregation and aggregate-associated N under an irrigated agroecosystem of the Indo-Gangetic Plains. *Nutrient Cycling in Agro-Ecosystems*, 96, 185-202. (NAAS IF: 7.73)



- Bhattacharyya, R., Pandey, S.C., Bisht, J.K., Bhatt, J.C., Gupta, H.S., Tuti, M.D., Mahanta, D., Mina, B.L., Singh, R.D., Chandra, S., Srivastva, A.K. and Kundu, S. (2013) Tillage and irrigation effects on soil aggregation and carbon pools in the Indian sub-Himalayas. *Agronomy Journal*, 105, 101-112. (NAAS IF: 7.54).
- Bhattacharyya, R., Tuti, M.D., Bisht, J.K. Bhatt, J.C. and Gupta, H.S. (2012) Conservation tillage and fertilization impacts on soil aggregation and carbon pools in the Indian Himalayas under an irrigated rice-wheat rotation. *Soil Science*, 177, 218-228. (NAAS IF: 7.04)
- Biswas, D.R. 2011. Nutrient recycling potential of rock phosphate and waste mica enriched compost on crop productivity and changes in soil fertility under potato-soybean cropping sequence in an Inceptisol of Indo-Gangetic Plains of India. *Nutrient Cycling in Agroecosystems*, 89: 15–30. (NAAS IF: 7.73).
- Biswas, D.R. and Basak, B.B. 2014 Mobilization of potassium from waste mica by potassium-solubilizing bacteria (*Bacillus mucilaginosus*) as influenced by temperature and incubation period under *in vitro* laboratory conditions *Agrochimica* Vol. LVIII - No. 4(NAAS IF: 6.31).
- Chakraborty, D, Garg RN, Tomar RK, Dwivedi BS, Aggarwal P, Singh R, Behra UK, Thangasamy A and Dhyani-Singh (2010) Soil physical quality as influenced by long-term application of fertilizers and manure under maize-wheat system. *Soil Science* 175, 128-136(NAAS IF: 7.24).
- Chaudhary, N., Swaroop, K., Janakiram, T., Biswas, D.R. and Singh, G. 2013 Effect of integrated nutrient management on vegetative growth and flowering characters of gladiolus. *Indian Journal of Horticulture* 70(1), 156-159. (NAAS IF: 6.53).
- Das, T.K., Bhattacharyya, R., Sudhishri, S., Sharma, A.R., Saharawat, Y.S., Bandyopadhyay, K.K., Sepat, Seema, Bana, R.S., Aggarwal, Pramila, Sharma, R.K., Datta, S C , Sunil Singhal & Debashish Mandal (2012) Development of resin disc soil testing in rice crop in relation to kinetics of nutrient adsorption on resin. *Communications in Soil Science and Plant Analysis*. 43(8):1109-1120(NAAS IF: 6.42)
- De, Nirmal and Datta S C. 2014 Assessing role of competing anions like silicate and bicarbonate on diffusion of P vis-a-vis its bioavailability in different soils measured by resin disc technique. *Communications in Soil Science and Plant Analysis* , DOI:10.1080/00103624.2014.941853(NAAS IF: 6.42)
- Deshmukh, S.K., Singh, A.K., Datta, S.P. and Annapurna, K. (2011) Impact of long-term wastewater application on microbiological properties of vadose zone. *Environmental Monitoring and Assessment*, 175: 601-612 (NAAS IF: 7.68).
- Dey A, Dwivedi BS, Datta SP, Meena MC and Agarwal BK (2015) Soil boron status: impact of lime and fertilizers in an Indian long-term field experiment on a Typic Paleustalf. *Acta Agriculturae Scandinavica, Section B — Soil & Plant Science* 65, 54-62(NAAS rating 6.71).
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23. Details of patents and income generated

None

24. Areas of consultancy and income generated

Advisory service on soil testing provided to farmers and entrepreneur generates an annual income of Rs. 5 lakh approximately.

25. Faculty selected nationally / internationally to visit other laboratories / institutions/Industries in India and abroad

Name	Institutions and Industries Visited
Dr. B.S. Dwivedi	<ul style="list-style-type: none"> GOI delegation to Tehran Year 2015 IRRI -2010 (SSNM Workshop). IRRI -1998 (Modelling-Rice-wheat Consortium) PCARD – 1997 Visiting Scientist (ICAR PCARD Workshop)
Dr. R.D. Singh	<ul style="list-style-type: none"> Visited University of Queensland, Brisbane (Australia) during June, 1996 to July, 1996 Visited Cornell University, Ithaca, New York, USA, June, 2002 to August, 2002
Dr. NPS Yaduvanshi	<ul style="list-style-type: none"> Visited International Lands Reclamation Institute, Wageningen, The Netherlands in Oct. 2001 Visited University of Western Australia, Perth in Oct. 2003. Visited IRRI, Philippines in March, 2009. Visited Brisbane, Queensland to attend 19th World Congress on Soil Science in August, 2010 and University of Adelaide in July-August, 2010. Visited Thailand, to attend the 4th International Rice Congress held at Bangkok, in November 2014.
Dr. Nayan Ahmed	<ul style="list-style-type: none"> Visited University of Nottingham, U.K, under Commonwealth fellowship during 2004-2005.
Dr. S.P. Datta	<ul style="list-style-type: none"> Visited University of Nottingham, U.K, under Commonwealth fellowship during 2003.
Dr. T. J. Purakayastha	<ul style="list-style-type: none"> Visited University of Georgia, during 2010-2011, under Fulbright- Nehru Senior Research Fellowship. Visited USDA-ARS, Washington State University, Pullman, during 2000- 2001, under BOYSCAST fellowship, DST.



26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. B.S. Dwivedi	Selected as a member of Trade Delegation of Ministry of Commerce to visit Tehran on 31 Jan-03 Feb. 2015	Chief Editor, Journal of the Indian Society of Soil Science Member, FAD-7 Committee of the Bureau of Indian Standards (BIS) Member, Advisory committee of the Fertilizer Association of India, New Delhi.	
Dr. K.M. Manjaiah	Regional Coordinator (North), National Agricultural Education Accreditation Board (NAEAB, ICAR)	Editor (i) Clay Research (2014- continuing) (ii) Annals of Agricultural Research (2009-2011)	Nil
Dr. N. P. S. Yaduvanshi	Consultant of Tsunami affected areas of A & N and Maldives Islands (2006-07) Consultant, Sand mining affected areas in Haryana (2007)		
Dr. S.P. Datta		Editor, Journal of the Indian Society of Soil Science since 2009	

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs)

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools and other events.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments.

Percentage of students doing projects in collaboration with other universities/industry/institute:

—

29. Awards/recognitions received at the national and international level by

a) Faculty

Name	Awards/Recognitions
Dr. B.S. Dwivedi	<ul style="list-style-type: none"> IPNI-FAI Award (2014) jointly by International Plant Nutrition Institute and Fertiliser Association of India, New Delhi ISSS-Dr. J.S.P. Yadav Memorial Award for Excellence in Soil Science (2011) PPIC-FAI Award (2004) jointly by Potash and Phosphate Institute of Canada and Fertiliser Association of India, New Delhi TSI FAI Award (1989) jointly by The Sulphur Institute, Washington and Fertiliser Association of India, New Delhi Shri Ram Award (1982, 2003, 2007 and 2008) of the Fertiliser Association of India Dhiru Morarji Memorial Award (1982, 2000, 2005 and 2007) of the Fertiliser Association of India
Dr.R.D.Singh	<ul style="list-style-type: none"> Member Programme Advisory Committee (2012-15), Dept. of Science & Technology (DST), New Delhi Member steering Committee of the TSBF/UNEP/GEF (2004), JNU, New Delhi Fellow of Natural Resource Society, International Society for Conservation of Natural Resources (1998) B.H.U. Varanasi
Dr. S.C. Datta	<ul style="list-style-type: none"> A cash prize of \$1000 by International Potash Institute, Switzerland B.C. Deb Memorial Award 2000 by Indian Science Congress Association Best Teacher Award, IARI 2010



Dr. N.P.S. Yaduvanshi	<ul style="list-style-type: none">• Dr. J.S.P. Yadav Memorial Award for Excellence in Soil Science (2014), Indian Society of Soil Science• IMPHOS- FAI AWARD (2008) by Fertilizer Association of India, New Delhi• Fellowship (2007) Indian Society of Salinity Research Scientist• Ch. Charan Singh National Award (2007) by Shree Krishna Sewa Dham, Karnal
Dr. R.N. Pandey	<ul style="list-style-type: none">• Chaudhary Devi Lal ICAR Team Award on AICRP on STCR scheme.
Dr. Nayan Ahmed	<ul style="list-style-type: none">• Commonwealth Academic Staff Fellowship Award for Post Doctoral Research (2004-2005).• Vice-president, Clay Minerals Society of India.• Secretary, Indian Society of Soil Science (Delhi Chapter)
Dr. T.J. Purakayastha	<ul style="list-style-type: none">• IARI Best Teacher Award 2014• §BOYSCAST Fellowship Award 2000-2010• Dhiru Morarji Memorial Award 2009-2010• Dhiru Morarji Memorial Award 2007-2008• Fulbright-Nehru Senior Research Fellowship Award 2010-2011• £Occasional Lecture Fund (OLF) Travel Award 2011
Dr. K.M. Manjaiah	<ul style="list-style-type: none">• Fellow of The Clay Minerals Society of India (2013)• Fellow of the Indian Society for Nuclear Techniques in Agriculture and Biology (2009)
Dr. S.P. Datta	<ul style="list-style-type: none">• Best Teacher Award-2012 by Indian Agricultural Research Institute, New Delhi.• Commonwealth Post-doctoral Fellowship by Commonwealth Scholarship Commission, United Kingdom at University of Nottingham, Nottingham NG7 2RD, UK (1.3.2003-1.9.2003)• Dr. B.C. Deb Memorial Award for Soil/ Physical Chemistry by Indian Science Congress Association for the year 2007-2008.• Jawaharlal Nehru Award for outstanding Post Graduate Agricultural Research (1998) by the Indian Council of Agricultural Research (ICAR), New Delhi.• The XII International Congress Commemoration Award by Indian Society of Soil Science for the year 2011.• Dhiru Morarji Memorial Award for best article in Agricultural Sciences (2008-09) by Fertiliser Association of India, New Delhi.• Dhiru Morarji Memorial Award for best article in Agricultural Sciences (1998-99) by Fertiliser Association of India, New Delhi.
Dr. D.R. Biswas	<ul style="list-style-type: none">• Fellow of the Indian Society of Soil Science (FISSS) in 2011• World Phosphate Institute–Fertiliser Association of India (IMPHOS–FAI) Award–2012• Certificate of Excellence Bharat Jyoti Award in 2013 by India International Friendship Society.• Secretary, Indian Society of Soil Science (ISSS)
Dr.V.K. Sharma	<ul style="list-style-type: none">• Award Fellow of Indian Society of Salinity Research Scientists• Young Scientist Award
Dr. R. Bhattacharya	<ul style="list-style-type: none">• Fellow of the National Academy of Agricultural Sciences (2014)• B.C. Dev Memorial Award (2011-12) by the Indian Science Congress Association.• B. Laxminarayana Memorial Award from the Division of Soil Science & Agricultural Chemistry.• National Academy of Agricultural Sciences (2011-13) Associate-ships.• Golden Jubilee Commemoration Young Scientist Award (2010) by the Indian Society of Soil Science.• Asian Scientist Award (2009) by World Association of Soil and Water Conservation.• Team award (2007-08) by the Indian Council of Agricultural Research, New Delhi.

b) Students

- ICAR Jawaharlal Nehru Award, 2011, 2013 , 2014
- S.P. Raychaudhary Gold Medal by Delhi Chapter several students of the division
- Best Student of the year Award-2011
- IARI Gold Medal- several students of the division
- IPNI Scholar Award @ US\$ 2000 several students of the division
- Fulbright-Nehru Doctoral and Professional Award-2011
- Indian Society of Soil Science Best Poster Presentation Award several students of the division



30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any

Seminar/Conference/Workshops	Source of Funding	Details of participants
Advanced Level Training on Soil Testing, Plant Analysis and Water Quality Assessment organized by the division each year	Indian Council of Agricultural Research	25 participants (Assistant Professors and above rank)

31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	5	3	-	-
Ph.D.	107	6	1	5.60	0.93

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	100	-
Ph.D.	60	NIL	30	10

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise

All students are selected for M. Sc. and Ph.D. after clearing All India competitive examinations

1 Indian Administrative Service

1 Indian Police service

1 Indian Revenue Service

All others are selected as ARS scientist (Net qualified) or Assistant Professor

No student of the discipline is Jobless.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	100%
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Campus selection	
Other than campus recruitment	
Entrepreneurs	Nil

36. Diversity of staff:

Percentage of faculty who are graduates	
Of the same university	None
From other universities within the state	None
From universities from other States from	100
Universities outside the country	None

**37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period**

Three

38. Present details of departmental infrastructural facilities with regard to

- | | |
|---|---|
| a) Library | One-Total Books 2389
ISSS Journal 953-2004 |
| b) Internet facilities for staff and students | Yes-Each and every room and special facility for students |
| c) Total number of class rooms | Two |
| d) Class rooms with ICT facility | One (Smart Class room) |
| e) Student's laboratories | One PG laboratory exclusively for students |
| f) Research laboratories | Fifteen |

39. List of doctoral, post-doctoral students and Research Associates

- a) from the host institution/university
b) from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level

S.No.	Name of the Ph.D. student	Host/other institute/ university
1	Abir Dey	IARI
2	Ms. Trisha Roy	IARI
3	Prasenjit Ray	IARI
4	Debarup Das	IARI
5	Debasis Golui	IARI
6	Ranjan Paul	IARI
7	Ms.Sonalika Sahoo	IARI
8	Ms. Kirti Saurab	IARI
9	Ramesh Chandra Yadav	IARI
10	Saubhagya Kumar Samal	IARI
11	Mahaveer Nogiya	IARI
12	Abhijit Sarkar	IARI
13	Niranjan Kumar	IARI
14	Krishna Kumar Mourya	IARI
15	Bassel Mhalla	IARI
16	Ms.Immanuel Chongboi Haokip	IARI
17	Ms. Suvana Sukumaran	Other University
18	Arijit Barman	Other University
19	R. Gobinath	Other University
20	Shiva Nath Suman	Other University
21	Ampee Tasung	Other University
22	Ms. Tarinder Kaur	Other University
23	Mahipal Choudhary	Other University
24	Raj Mukhopadhyay	Other University
25	Kiran, K.R.	Other University
26	Sankhdip Das	Other University

S.No.	Name	Designation	Qualification	Host/other institute/ university
1.	D.S. Rana	RA	Ph.D.	Other University
2.	Asoish Rai	SRF	M.Sc.	Other University
3.	Tonoy Kumar Das	SRF	M.Sc.	Other University
4.	Rupesh Kumar	SRF	M.Sc.	Other University

40. Number of post graduate students getting financial assistance from the university

All the students are getting fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.



41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology

Not applicable

42. Does the department obtain feedback from

Yes

a) Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improving teaching-learning evaluation. Rigorous exercise at divisional, school and Institute level is done and input is taken from experts and resource persons. This helps in revising and improving the course curriculum regularly.

b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement in teaching as well as course content.

c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

Alumni interact with the staffs and students when they visit the Division. Their formal and informal feedbacks are utilized for further improvement.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and Address
1.	Dr. Rattan Lal, Director, Carbon Management and Sequestration Centre, FAES/ OARDC, The Ohio State University, USA
2.	Dr. S.M. Virmani, Former Principal Agro-Climatologist, NRM programme, ICRISAT, Hyderabad
3.	Dr. J.C. Katayal, Former Vice- Chancellor, CCS-HAU, Hissar and former DDG (edu), ICAR, New Delhi
4.	Dr. I.P. Abrol, Former DDG (SAE), ICAR and Former Facilitator, Rice-wheat Consortium, New Delhi
5.	Dr. N.N. Goswami, Former Vice- Chancellor, CS Azad Univ. of Agri & Technolgy, Kanpur, U.P.
6.	Dr. S.K. Sanyal, Former Vice- Chancellor, BCKV, West Bengal
7.	Dr. S.K. De Datta, Former Director (Edu. & Dev.) Virginia Tech, USA
8.	Dr. J. S. Samra, CEO, National Rainfed Area Authority and former DDG (NRM), ICAR, New Delhi
9.	Dr. P. N. Takkur, Former Director, IISS, Bhopal, M.P.
10.	Dr. A.K. Patra, Director, IISS, Bhopal, M.P.

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly

45. List the teaching methods adopted by the faculty for different programmes:

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training. Audio-visual and tour programmes used for teaching purpose

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitors academic activities and Dean and Joint Director (Edu.) monitor the same at Institute level.

47. Highlight the participation of students and faculty in extension activities:

Faculty and students participate in extension activities especially during Pusa krishi Vigyan Mela, Farmers Day and also have interaction with various stake holders at divisional level.



48. Give details of “beyond syllabus scholarly activities” of the department

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/department is accredited/graded by other agencies? If yes, give details

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied

a. List of major contribution by Division

- Potassium carbonate as an extractant of soil available phosphorus
- First soil map of India
- First cow-dung gas plant
- Alkaline permanganate method of soil available nitrogen
- First soil fertility (N, P & K) maps of India
- First laboratory in the country on use of radio tracers in plant nutrition studies.
- Equilibrium phosphate potential and potassium adsorption ratio.
- Targeted yield concept of fertilizer recommendation
- Contribution of non-exchangeable potassium in plant nutrition
- Phasing of fertilizer phosphorus in cropping systems
- Coated calcium carbide as nitrification inhibitor
- First soil boron fractionation scheme compatible with colorimetry
- Pusa digital soil test fertilizer recommendation (STFR) meter

b. Details of major contribution in different identified sections of the Division

(i) Development novel fertilizers

- Nano-clay polymer composites (NCPCs) were synthesized, and protocols for loading of N, P, Zn and B standardized. Release of these nutrients from NCPCs was considerably slower as compared to the conventional fertilizers, indicating that NCPCs formulations may be useful in enhancing nutrient use efficiency of these nutrients
- Use of oxalic acid based NCPC helped increasing P availability in soil, wheat yield and P uptake, indicating possibility of reducing fertilizer P application on soils having considerable P build-up due to continuous P dressings.

(ii) Nutrient management

- A low-cost digital portable soil testing tool named Pusa Soil Test Fertilizer Recommendation (STFR) Meter was developed to test five soil parameters i.e. pH, EC, organic C, P and K, and give soil test based crop-specific fertilizer recommendation.
- Modified fertilizer N scheduling helped enhancing N use efficiency and productivity of pearl millet-wheat system. Instead of conventional N application (one basal dressing + 2 top dressings), skipping of the basal N application for one additional top dressing led to substantial increases in pearl millet and wheat grain yields (about 0.3 and 0.4 t ha⁻¹), agronomic efficiency and apparent recovery. It was also possible to curtail 20-25 kg fertilizer N ha⁻¹ in each crop by modified N scheduling.
- Use of microbial inoculants helps in curtailing fertilizer P demands by mobilizing native and applied P under maize-wheat cropping system. Seed treatment with PSB and arbuscular mycorrhizae (AM) enhanced crop yields, P uptake and P use efficiency in both crops, especially when 50% recommended P was applied.
- Soil-test crop response based integrated fertilizer prescriptions were developed for different crops, which proved superior to local ad-hoc recommendations and farmers' practices.
- Field evaluation of different organic manures, namely vermicompost, NADEP compost and FYM under maize-wheat cropping system revealed that application of various composts along with 50% NPK recorded



significantly higher yield and uptake of N, P and K by maize and wheat than 100% NPK. Significant improvements in labile fractions of soil organic C were found in plots receiving integrated use of manures and fertilizers over 100% NPK after both the crops. Similarly, significant increases in dehydrogenase, α -glucosidase and FDA activities in soil were recorded under conjoint use of manure and fertilizers over 100% NPK, implying that 50% of recommended N could be curtailed with the use of organic manures.

(iii) Soil management

- Long-term experiment with maize-wheat system continuing since 1971-72 revealed that balanced use of fertilizers alone not only sustained but also improved soil organic C content in alluvial soil. Results further suggested for an upward revision of fertilizer recommendations to achieve high yield goals and minimize nutrient mining from soil. 3
- Soil fertility maps of IARI farm along with soil test-based fertilizer recommendations were generated and uploaded on IARI website for use by the scientists and students. 3
- In view of increased incidence of B deficiency in Indian soils, multi-nutrient extractants were evaluated for B extraction. Mehlich-3 emerged as the superior extractant for soil B, which could be used for ascertaining B deficiency in soils. 3
- Conceptual framework-based and PCA-based soil quality indices were developed across different land uses in Chandrabhaga and Danda watersheds located in Tehri Garhwal district, Uttarakhand. Both the methods correlated significantly, while the sensitive indicators emerged across two watersheds varied. This suggests that the minimum dataset is site specific. Development of Soil Health Card is in the process. 3
- Adoption of conservation agriculture (CA) under both rainfed and irrigated systems enhanced soil organic C, and available macro- and micronutrients. Fertilizer N could be saved to the extent of 24-48% by manipulating sources, rates, methods and time of application under different tillage and residue management conditions. Significantly higher content of different N fractions, Olsen-P and organic P were observed under no-till plots as compared to conventional tillage. 3

(iv) Soil ecology

- In organically produced rice-wheat system, the combined application of SGM (*Sesbania* green manure) + FYM + BGA (blue green algae) to rice and LGLM (*Leucaena* green leaf manure) + FYM + *Azotobacter* to wheat emerged as the best management practice for enhancing the buildup of soil organic matter and its stability and quality.
- Conceptual framework-based and PCA-based soil quality indices were developed across different land uses in Chandrabhaga and Danda watersheds located in Tehri Garhwal district, Uttarakhand.
- Soil health cards were developed for farmers of Mumtazpur village
- Designed and developed low-cost pyrolysis kiln and temperature controlled biochar maker for production of biochar
- Because of higher stability of maize biochar (negative priming effect) due to presence of stronger structural surface functional groups including aromatic C=C stretching, it might be having greater potential for long-term carbon sequestration in soil. On the other hand rice biochar having relatively higher labile carbon, the application of which might enhance microbial activities and thus could be useful for restoration of degraded soil. Wheat biochar being rich in K could be used in crops with higher requirement for K. Conversion of crop residues into biochar and its further application to soil enhanced yield of three wheat-based cropping systems. The additional benefits harnessed due to application of biochar were enhancement of soil quality and C sequestration.
- Bioaccumulation of Fe- and Zn- nanoparticles (NPs) in rice plant was recorded with higher rates of applied NPs.
- Integrated application of organic amendments (vermicompost VC, crop residues CR) along with chemical fertilizer (NPK) in potato-based cropping system could be the best management practices for enhancing carbon sequestration in Inceptisol of semi-arid tropics of India. Among the three potato-based cropping system, rice-



potato-wheat or maize-potato-onion could be the best potato-based cropping system for higher carbon enrichment. The major mechanisms of greater carbon sequestration in VC/CR and the above cropping systems was probably be due to formation of macroaggregates which protect the carbon due to formation of polysaccharides.

(v) Soil pollution

- Maximum permissible limit of Cd, Pb, Ni, Cu and Zn in soil in respect to human health hazard for intake of these metals through green leafy vegetables grown on contaminated soils was established. Also, protocol for fixing permissible limit of sludge to agricultural lands was developed. 5
- As nickel (Ni) is the latest addition to the list of essential nutrients, critical limits of its deficiency are not available. Hence, critical limits of deficiency of DTPA-extractable Ni in soil were worked out as 0.18 and 0.15 mg/kg for soybean and wheat, respectively. Whereas, critical concentration of deficiency of plant Ni for soybean and wheat were worked out as 0.20 and 0.37 mg/kg, respectively. Phytotoxicity limits of DTPA extractable Ni in soil was computed as 3.24 mg/kg. Plant Ni content of 12.0 mg/kg on dry weight basis can be considered as toxic limit using soybean as a test crop.
- Solubility model was calibrated to predict free ion activity of Zn, Cu, Ni, Cd and Pb in metal contaminated soil as a function of pH, soil organic C and extractable metal content. A computer program was also developed for computing metal ion activity in soil solution using Baker soil test.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths

- Scientists with diverse expertise, high motivation and dedication in quality research and education.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni
- Laboratories are equipped with cutting-edge technology and instruments
- Meritorious, dedicated and highly creative students from India and other countries

Weaknesses

- Dearth of technical support, Working hand and supporting staff
- Young faculty for capacity building and advance training in frontline area is required to compete the international standard research and education
- Lack of expertise in certain areas like radio-tracer technique, soil genomics etc.
- Lack of international and national linkages with well defined collaborative research programmes and with industries/NGO.

Opportunities

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Frontier areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for funding
- Up to date knowledge in subject areas as well as opportunity to interact with renowned national and international scientists

Challenges

- Competition from international organizations like ICRISAT and ICAR sister institute
- Regular upgrading of technology and human resource in core areas
- Further strengthening of in-house laboratories with skilled manpower
- Development of sandwich programme for Ph.D. students with Universities abroad
- Development of e-courses for the benefit of SAUs and relevant organizations



52. Future plans of the department

EDUCATION

Enhancement of the quality of human resources

- Efforts will be made to enable the scientists through upgradation of knowledge and skill
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encouraged to go for 6-12 months training at world leading Institutes through ICAR/DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
- Regular seminars by faculty members and invited scientists
- To enhance the research quality and output, Ph.D. students

RESEARCH

Basic, strategic and applied research will be carried out mainly in the areas related to development of novel fertilizer-products, restoration/improvement of soil health, waste management and soil ecology. Some of the important output as envisaged for coming five years are as follows:

- Development of novel products for controlled delivery system of nutrients, organic acids and inoculants for enhancing the bio-availability of nutrients
- Understanding processes regulating bio-availability of P, Zn and Fe in different soil chemical environments
- Prediction of structural stability of clay-humus complex *vis-a-vis* carbon sequestration potential of major soil groups
- Identification of microbes with higher carbon utilization efficiency
- Development of novel products for enhancing solubility of low-grade P and K minerals
- Developing protocols for optimization of P and K fertilizer prescriptions for high P and K soils
- Development of CA-specific nutrient management protocols
- Quantification of C sequestration potential and N dynamics under CA
- Protocols for risk assessment of metal-polluted soils
- Feasibility of using municipal and industrial wastes as sources of plant nutrients
- Development of modified clay products to manage metal-polluted soils
- Comprehensive package for management of metal-polluted soils



xxiii) Division of Vegetable Science

1. Name of the Department

Division of Vegetable Science

2. Year of establishment:

1982

3. Is the Department part of a School/Faculty of the university?

School of Horticultural Science

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.):

M.Sc. and Ph.D.

5. Interdisciplinary programmes and departments involved

Collaborations with other divisions of the institute

Division of Agronomy	Division of Nematology
Division of Plant Pathology	Division of Entomology
Division of Agril. Extension	Division of Post Harvest Tech.
Division of Microbiology	Division of Ag. Engineering
Division of Environmental Science	Division of Pl. Physiology
Water Technology Center	C P C T
Division of Soil Science & Ag. Chem.	NRC on Plant Biotechnology
Division of Biochemistry	Seed Production Unit
IARI, Regional Station, Karnal	IARI, Regional Station, Wellington
IARI, Regional Station, Katrain	IARI, Regional Station, Pune

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

At National level

NBPGR, New Delhi
IIVR, Varanasi (U.P.)
Directorate on Onion & Garlic, Pune
IIHR, Bangalore
CSKHPKV, Palampur
GBPUA&T, Pantnagar; Ranichauri Campus
VPKAS, Almora
Dr. Y.S.Parmar University of Hort. & Forestry, Nauni, Solan

At International Level

AVRDC, The World Vegetable Centre

7. Details of programmes discontinued, if any, with reasons

Nil

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System:

Trimester

9. Participation of the department in the courses offered by other departments:

Division of Fruits and Horticulture Technology
Division of Floriculture
Division of Genetics
Division of Plant Pathology
Division of Entomology
Division of PHT
NRC on Plant Biotechnology



10. Number of teaching posts sanctioned, filled and actual (Professors/AssociateProfessors/Asst. Professors/others)

	Sanctioned	Filled	Actual (includingCAS \$ MPS)
Professor/Principal Scientist	2	2	6
Associate Professors/Senior Scientist	4	4	4
Asst. Professors/Scientist	11	5	5 Through ARS Examination
Others (Technical and Supporting)	71	56	56

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of Ph.D./ M.Phil.students guided for the last 4 years
Dr. Pritam Kalia	Ph.D	Head & Principal Scientist	Cauliflower, Broccoli and Carrot breeding	32	2 Ph.D. completed, 3 Ph.D. under guidance
Dr A. D. Munshi	Ph.D	Professor & Principal Scientist	Cucumber breeding	23	4M.Sc and 7Ph.D., 4Ph.D.under guidance
Dr Shri Dhar	Ph.D	Principal Scientist	Pea breeding	30 years	2 M.Sc. completed; 2 Ph. D. under guidance
Dr Anil Khar	Ph.D	Principal Scientist	Onion breeding	18 years	1 MSc under guidance
Dr T. K. Behera	Ph.D	Principal Scientist	Bitter gourd breeding	17 years	
Dr Zakir Hussain	Ph.D	Principal Scientist	Tomato breeding	16 years	Nil
Dr Manisha Mangal	Ph.D	Senior Scientist	Biotechnology	12 years	Nil
Dr Amish K. Sureja	Ph.D	Senior Scientist	Pumpkin & squash breeding	12 years	2 MSc, 1 PhD under guidance
Dr. Harshwardhan Choudhary	Ph.D	Senior Scientist	Musk melon breeding	12 years	2 MSc guiding
Dr Ramesh Kumar Yadav	Ph.D	Senior Scientist	Okra breeding	15 years	2 MSc, 1 PhD under guidance
Dr (Mrs.) Sabina Islam	Ph.D	Scientist	Onion, Lettuce breeding	7 years	Nil
Dr Partha Saha	Ph.D	Scientist	Brinjal breeding	4 years	1 MSc guiding
Dr. (Mrs.) Arpita Srivastava	Ph.D	Scientist	Chilli breeding	2 ½ years	Nil
Sh Brij Bihari Sharma	M. Sc.	Scientist	Cauliflower breeding	1 year	Nil
Sh. Muthukumar Palanisamy	M. Sc.	Scientist	Cauliflower & tomato	1 year	Nil

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

1. Dr. V.A.Parthasharathy, Former Director,IISR,Calicut
2. Dr. Narendra Singh, Former Head, Division of Vegetable Science
3. Dr. P.S. Sirohi,Former Head, Division of Vegetable Science

13. Percentage of classes taken by temporary faculty – programme-wise information

There is no temporary faculty

14. Programme-wise Student Teacher Ratio

22 students and 15 faculty Ratio-1.46

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual

Category	Sanctioned strength	Filled	Vacant
Technical	18	10	8
Administrative	07	07	-
Supporting	46	39	7



16. Research thrust areas as recognized by major funding agencies:

- To conduct applied and strategic research on improvement and production technology of vegetable crops.
- To impart post-graduate education and training for Human Resource Development.
- To disseminate information on recent advances in vegetable crops
- To provide advisory and consultancy services on crop and seed production technology and improvement of vegetable crops.

17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

1. Crop plants which remove their own major biotic constraints(RNAi gene silencing technology). : Australian-Indian(DST) Strategic Fund– 97.62 lakhs
2. *Or* gene introgression for enhancing beta-carotene in Indian cauliflower using marker assisted breeding: DBT-46.5 lakhs
3. Validating crop specific DUS Testing guidelines for Cucumber (*Cucumis sativus*), Bottle Gourd (*Lagenaria siceraria*), Bitter Gourd (*Momordica charantia*), Pumpkin (*Cucurbita moschata*) and Pointed Gourd (*Trichosanthes dioica*): PPV&FRA: 8 lakhs
4. Formulation and Validation of DUS Testing Guidelines for Amaranth, Palak and Ridge Gourd: PPV&FRA – 7.25 lakhs
5. Development of Guidelines for the Conduct of Tests for Distinctiveness, Uniformity and Stability of Chilli, Sweet Pepper and Paprika (*Capsicum annum L.*): PPV&FRA - 9 lakhs
6. Development of Guidelines for the Conduct of Tests for Distinctiveness, Uniformity and Stability of Onion and Garlic: PPV&FRA - 7.75 lakhs
7. Marker assisted breeding for development of gynoecious Indian cucumber (*Cucumis sativus L.*) lines. DBT funded - 60.59 lakhs

18. Inter-institutional collaborative projects and associated grants received

- a) National collaboration
- b) International collaboration
Indo Australian project: Crop plants which remove their own major biotic constraints : Australian-Indian funded by DST – 97.62 lakhs

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

1. Crop plants which remove their own major biotic constraints : Australian-Indian funded by DST – 97.62 lakhs
2. *Or* gene introgression for enhancing beta-carotene in Indian cauliflower using marker assisted breeding: DBT-46.5 lakhs
3. Marker assisted breeding for development of gynoecious Indian cucumber (*Cucumis sativus L.*) lines. DBT funded- 60.59 lakhs

20. Research facility / centre with

State recognition; **None**
National recognition:**None**
International recognition:**None**

21. Special research laboratories sponsored by / created by industry or corporate bodies:

Nil

22. Publications

Number of papers published in peer reviewed journals (national /international)

Research papers (2009-2014)

1. Baranwal, V.K., Singh, P., Jain, R.K. and Joshi, S. (2011). First report of Garlic virus X infecting garlic in India. *Plant Disease* 95(9): 1197. (NAAS Rating; 8.74)



2. Behera T. K. Anand pal and A. D. Munshi (2013). PreGy-1, a bitter gourd germplasm with predominately gynoecious habit. *Indian J. Plant Genet. Resour.* 25:322-323. (NAAS Rating; 4.61)
3. Behera, T. K., Staub, J. E., Behera, S. and Mason, S. (2010). Response to phenotypic and marker-assisted selection for yield and quality component traits in cucumber (*Cucumis sativus* L.). *Euphytica* 171:417–425. (NAAS Rating; 7.69)
4. Behera, T.K., Dey, S.S., Munshi, A.D., Gaikwad, A.B., Pal, A and Singh, I. (2009). Sex inheritance and development of gynoecious hybrids in bitter gourd (*Momordica charantia* L.). *Scientia Horticulturae*, 120: 130-133.(NAAS Rating; 7.50)
5. Behera, T.K., H. Tiwari, Swati saha and P. Singhal (2013). Variation in chlorophyll and carotenoids content in bitter gourd genotypes at edible maturity stage. *Indian J. Hort.* 70: 599-602.(NAAS Rating; 6.11)
6. Behera, T.K., Pal, A. and Munshi, A.D. (2012) PreGy-1 (IC0591254; INGR12014), a bitter gourd (*Momordica charantia* L.) germplasm with predominately gynoecious habit. *Indian J. Plant Genet. Resour.* 25(3): 322-323. (NAAS Rating; 4.61)
7. Bharathi L. K., A. D. Munshi, T. K. Behera, Vinod, K. Joseph John, A. B. Das, K. V. Bhat and A. S. Sidhu (2012). Production and preliminary characterization of inter-specific hybrids derived from *Momordica* species. *Current Science* 103: 178–186.(NAAS Rating; 6.83)
8. Bharathi, L. K., A. D. Munshi, T. K. Behera, K. Joseph John, K. V. Bhat and A. S. Sidhu (2013) Morphological relationship among the *Momordica* species of Indian occurrence. *Indian J. Genet.*, 73: 278-286. (NAAS Rating; 6.19)
9. Bharathi, L. K., A. D. Munshi, T. K. Behera, K. Joseph John, Vishal Nath, and I. S. Bisht (2010). Genetic resources of spine gourd (*Momordica dioica* Roxb. ex Willd.): an underexplored nutritious vegetable from tribal regions of eastern India. *Plant Genetic Resources: Characterization and Utilization* 8 : 225–228. (NAAS Rating; 7.06)
10. Bharathi, L. K., Munshi, A. D., Vinod, Chandrashekar, S., Behera, T. K., Das, A. B., Joseph John, K. and Vishalnath. (2011). Cytotaxonomical analysis of *Momordica* L. (Cucurbitaceae) species of Indian occurrence. *Journal of Genetics* .90(1): 21-30.(NAAS Rating; 7.01)
11. Bharathi, L.K., A.D. Munshi, T.K. Behera, K. Joseph John, Vishal Nath, and I. S. Bisht (2010). Genetic resources of spine gourd (*Momordica dioica* Roxb. ex Willd.): an underexplored nutritious vegetable from tribal regions of eastern India. *Plant Genetic Resources: Characterization and Utilization* 8 : 225 – 228.(NAAS Rating; 7.06)
12. Bharathi, L.K., Vinod, Munshi, A.D., Behera, T.K., Shanti-Chandrashekar, Kattukunnel, J.J., Das, A.B. and Vishalnath.(2010). Cyto-morphological evidence for segmental allopolyploid origin of Teasle gourd (*Momordica subangulata* subsp. *renigera*). *Euphytica* 176(1) :79-85. (NAAS Rating; 7.69)
13. Choudhary, H and Singh, D.K. 2010. Breeding potential of Indian germplasm of *Cucumis sativus* var. *hardwickii* for cucumber improvement. *Acta Horticulture* 871: 409-416. (NAAS Rating)
14. Choudhary, H., Ram, H. H. and Singh, D. K. 2011. Genetic Variability Study in Muskmelon. *Progressive Horticulture* 43(2): 231-233. (NAAS Rating; 3.25)
15. Choudhary, H., Singh, D.K. and Ram, H.H. (2010). Character association study in muskmelon. *Progressive Horticulture*, 42(2): 169-172. (NAAS Rating; 3.25)
16. Dalamu and T. K. Behera (2013) Character association and path coefficient analysis of indigenous and exotic bitter gourd (*Momordica charantia*) germplasm. *Indian J Agric. Sci.* 83: 525–528.(NAAS Rating; 6.0)
17. Dalamu, Behera, T. K., Tara Satyavati, C. and Pal, Anand (2012) Generation mean analysis of yield related traits and inheritance of fruit colour and surface in bitter gourd. *Indian J. Hort.* 69: 65-69. (NAAS Rating; 6.11)
18. Dalamu, Behera, T.K., Verghese, C. and Khan, Swati (2012). Genetic variability and character association analysis in bitter gourd (*Momordica charantia* L.). *Pusa AgriScience* 35: 20-25. (NAAS Rating; 2.20)
19. Dey S.S., T.K. Behera, A.D. Munshi and Anand Pal (2010). Combining ability analysis in bitter gourd. *Indian J. Hort.* 67: 399-401. (NAAS Rating; 6.11)
20. Dey, S.S., Behera, T.K., Munshi, A.D., Rakshit, S. and Bhatia, R. (2012) Utility of gynoecious sex form in heterosis breeding of bitter gourd and genetics of associated vegetative and flowering traits. *Indian J. Hort.* 69(4): 523-529. (NAAS Rating; 6.11)
21. Dey, S.S., Behera, T.K., Munshi, A.D. and Bhatia, R (2011). Estimation of gene action in bitter gourd. (*Momordica charantia* L.). *Vegetable Science*, 38(1): 85 -87. (NAAS Rating; 3.85)
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23. Dey, S.S., T.K. Behera, A.D. Munshi and Anand Pal (2010). Combining ability analysis in bitter gourd. *Indian J. Hort.* 67:399-401. (NAAS Rating; 6.11)
24. Droka Dechin, Kumar Raj, Joshi Subodh and Yadav R.K. 2013. Genetics of yield and yield contributing traits in tomato under low temperature grown climatic regime. *Indian Journal of Horticulture*, 70(2):243-247. (NAAS Rating; 6.11)



25. Droka, D., Raj Kumar, Joshi, S. and Yadav, R.K. (2011). Genetic study of quality traits in tomato. *Vegetable Science*. (Accepted). (NAAS Rating; 3.85)
26. Hedau, N.K, Shri Dhar, Mahajan, V., Gupta, H.S., Hooda, K.S. and Vedprakash (2009). VL Bean 2: A New Early Dwarf Cultivar of *Phaseolus vulgaris* L for green pods. *HortScience* 44(7):1-2.(NAAS Rating; 3.07)
27. Hooda, K.S., Bhatt J.C., Joshi, D., Shri Dhar and Mahajan, V. (2010). Resistance in pea genotypes against powdery mildew in North-west Himalayas. *Pl. Dis. Res.* 25(1):69-70.(NAAS Rating; 3.30)
28. Islam S., Munshi, A.D., Kumar, R., Behera, T.K. and Lal, S.K. 2008-2009. Evaluation of sponge gourd hybrids for yield and related traits. *Cucurbit Genetics Cooperative Report*, 31-32:1-2.
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32. Jagesh Kumar, A.D. Munshi, Ravinder Kumar, A.K. Sureja and R.K. Sharma (2011) Combining ability and its relationship with gene action in slicing cucumber. *Indian J. Hort.* 68(4): 507-511. (NAAS Rating; 6.11)
33. Kalia, P. (2009). Genetic improvement in vegetable crucifers. In: *Biology and Breeding of Crucifers*. Published by Taylor & Francis, USA (2009), p.309-342.
34. Kalia, P. and Meenakshi, S. (2009). Combining ability in the F₁ and F₂ generations of diallel cross for horticultural traits and protein content in garden pea (*Pisum sativum* l.). *SABRAO J. Breed. & Genet.* 41(1): 53-68. (NAAS Rating; 5.0)
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39. Kaur C., Joshi S. and Kapoor H.C. (2009). Antioxidants in selected onion (*Allium cepa* L.) cultivars grown under Indian conditions. *Journal of Food Biochemistry* 33(7-8): 184-200.(NAAS Rating; 6.85)
40. Khan, S. and Behera, T.K. (2011). Performance of Gynoecious x monoecious hybrids of bitter gourd (*Momordica charantia* L.). *Cucurbit Genetics Cooperative Report* 33-34: 65-66.(NAAS Rating;)
41. Khan, Swati and T. K. Behera (2012). Gynoecious hybrid breeding in bitter gourd (*Momordica charantia* L.). *Pusa AgriScience* 35: 99-102. (NAAS Rating; 2.20)
42. Kishor, S. Tomar, B.S. Balraj Singh and Munshi, A.D. (2010). Effect of season, spacing and planting time on seed yield and quality in cucumber. *Indian J. Hort.* 67(1): 66-69.(NAAS Rating; 6.11)
43. Kumar R., Munshi, A.D., Behera, T.K., Kumar, R. and Sureja, A.K. (2012) Estimates of genetic components of variation in sponge gourd (*Luffa cylindrica* Roem.). *Vegetable Science* 39(2): 214-217. (NAAS Rating; 3.85)
44. Kumar, J., Munshi, A.D., Kumar, R. and Sureja, A.K. (2009). Combining Ability Studies in Cucumber (*Cucumis sativus* L.) under salinity condition. *Indian J. Plant Genet. Resour.* 22(3): 221-224. (NAAS Rating; 4.61)
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46. Kumar, Mahesh, P. Kalia, S.R. Sharma and P. Saha (2011). Genetic variability for curd traits in heat tolerant cauliflower. *Cruciferae Newsletter* 30: 28-32.
47. Kushlaf, N.A. and Kalia, P. (2012) Nutrient rich CMS hybrid breeding in tropical carrots (*Daucus carota* L.). *Acta Horticulturae* 939: 53-61.



48. Mishra, S; Behera, T.K; Munshi, A.D; Gaikwad, Kand Mohapatra, T (2014). Identification of RAPD marker associated with gynocious trait ('gy-1' gene) in bitter melon ('Momordica charantia' L.). *Australian Journal of Crop Science*. 8(5):706-710. (NAAS Rating; 5.0)
49. Munshi, A.D., Krishna Kumar, B. Sureja, A.K. and Joshi, S. (2010). Genetic variability, heritability and genetic advance for growth, yield and quality traits in chilli. *Indian J. Hort.* 67(1): 114-116. (NAAS Rating; 6.11)
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52. Nagal, S, Kaur, C, Choudhary, H, Singh, J., Singh, B.B, and Singh K. N 2012. Lycopene content, antioxidant activity and color attributes of selected watermelon cultivars grown in India *International Journal of Food Science and Nutrition* Dec 63(8):996-1000. (NAAS Rating; 7.20)
53. Negi, P.K., R.R. Sharma, Raj Kumar and V.B.S. Chauhan (2011). Genetic analysis for yield and its contributing traits in tomato under low temperature regime. *Indian Journal of Horticulture*. (Accepted). (NAAS Rating; 6.11)
54. Pandey, S., Dhillon, N.P.S., Sureja, A.K., Singh, D. and Malik, A.A. (2010) Hybridization for increased yield and nutritional content of snake melon (*Cucumis melo* L. var. *flexuosus*). *Plant Genetic Resources: Characterization and Utilization* 8(2): 127-131. (NAAS Rating; 7.06)
55. Pati, K, A. D. Munshi, T. K. Behera and R. Kumar (2012). Genetic analysis of yield and its contributing characters in cucumber (*Cucumis sativus* L.). *Pusa AgriScience* 35: 73-77. (NAAS Rating; 2.20)
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57. Rathi, S., Kumar, R., Munshi, A.D. and Verma, M. (2011). Breeding potential of brinjal (*Solanum melongena* L.) genotypes using D² analysis. *Indian Journal of Horticulture* 68(3): 328-331. (NAAS Rating; 6.11)
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59. Reddy, A.N.K., Munshi, A.D., Kumar, R. and Singh, B. (2009). Studies on heterosis and its component traits in cucumber (*Cucumis sativus* L.). *Pusa AgriScience*, 32: 22-25. (NAAS Rating; 2.20)
60. Sabina Islam, Munshi, A.D., Mandal, B., Kumar, R and. Behera, T. K. (2010) .Genetics of resistance in *Luffa cylindrica* Roem. against *Tomato leaf curl New Delhi virus*. *Euphytica* 174(1): 83-89. (NAAS Rating; 7.69)
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62. Saha, P., Kalia, P. and Sharma, P. (2012). Evaluation of cauliflower (*Brassica oleracea* var. *botrytis* L.) germplasm for resistance against *Xanthomonas campestris* pv. *campestris* (Pam.) Dowson causing black rot. *Pusa AgriScience*. 35: 85-91. (NAAS Rating; 2.20)
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Number listed in International Database (For e.g. Web of Science, Scopus Humanities International Complete, Dare Database - International SocialSciences Directory, EBSCO host, etc.) 2010-2014

	PK	SD	ADM	AK	TKB	ZH	RKY	AKS	HC	MM	SI	PS	AS	PMK	BBS
Number of papers published in peer reviewed journals (national / international)	18	10	42	4	47	10		18		19	4	7	-	-	-
Citation Index –	72	20	0-254	90	0-606	0-36	0-90	0-254	-	0-96	0-10	0-5	-	-	-
SNIP range	0-1.19		0-121.	0-2.02	0-1.43		0-1.42	0-1.21	-	0-2.27	0-1.06	0-1.10	-	-	-
SJR range	0-0.84		0-0.73	0-1.55	0-0.77		0-0.83	0-0.73	-	0-2.08	0-0.74	0-0.62	-	-	-
Impact Factor–range	0-2.74		0-1.99	0-3.26	0-1.69		0-2.02	0-1.99	-	0-5.58	0.11-1.69	0-1.34	-	-	-
h-index	5	3	9	6	13	4	5	8	-	6	4-64	1	-	-	-

PK-DR.P.Kali, SD-Dr Shridhar, ADM-Dr A D Munshi, A K-Dr.Anil Khar, TKB-Dr.T.K.Behera , ZH-Dr.Zakir Hussain, RKY-Dr R.K.Yadav, AKS-Dr.A.K.Sureja, MM-Dr Manisha Mangal, SI-Dr Sabina Islam, PS-Dr Partha Saha

23. Details of patents/varieties F₁ hybrids developed and income generated Vegetable Varieties/F₁ hybrids released during last five years (2009-2014)

Sl. No.	Crop	Varieties/ F ₁ hybrids	Identified/ released by	Year of release	State for which recommended	Key characteristics
1.	Brinjal	DBL-02	AICRP (VC)	2010	Delhi, Punjab, Haryana	Fruits long, violet-purple with round distal end, each fruit weighing 80-90 g. Av. yield 38.2 t/ha,. Maturity 55 days from transplanting.
2.		DBHL-20	AICRP (VC)	2011	Punjab, Delhi, Uttar Pradesh and Bihar	Fruits long, dark purple, glossy, weighing 90-100 gram. Maturity 55 days from transplanting to first harvest. Average yield is 52.5.0 t/ha.
3	Cauliflower	Pusa Shukti	Delhi State Variety Release Committee	2009	Delhi State	Dec.-Jan. maturity, curd compact white. Maturity 75days, Av. Yield 44.0 t/ha.
4		Pusa Paushja	AICRP (VC)		Punjab, U.P., Uttarakhand and Bihar	Mid-late maturity group i Its curd compact, weighing about 900 g with an average curd yield potential of 30-35



5	Ridge gourd	Pusa Nutan	Delhi State Variety Release Committee	2009	Delhi State	tonnes per hectare and marketable yield 40-45 tonnes/ha. Tolerant to downy mildew and black rot diseases.
6	Carrot	Pusa Rudhira	Delhi State Variety Release Committee		Delhi State	Fruits long (25-30 cm), straight, attractive green, av. fruit wt. 105 g, flesh tender, suitable for spring summer and <i>kharif</i> season. Av. Yield 16.0 t/ha, Maturity 45-50 days.
7		Pusa Asita	Delhi State Variety Release Committee		Delhi State	Long blood red attractive obtriangular roots with self-core, maturity 75-90 days after seed sowing giving average root yield (33.0 tonnes/ha).
8		Pusa Vrishti	Delhi State Variety Release Committee	2009	Delhi State	Long black attractive obtriangular roots with self core. Average root yield of 27.0 tonnes/ha. Maturity 90-110 days
9		Pusa Vasuda	Delhi State Variety Release Committee	2012	Delhi State	It is a new heat tolerant tropical carrot variety. It is suitable for early sowing beginning in July under North Indian plains. Av. Yield 25.0 t/ha, Maturity 85-90 days.
10	Radish	Pusa Jamuni	Delhi State Variety Release Committee	2012	Delhi State	First public sector are smooth, red, attractive, vigorous, self-coloured, tropical carrot hybrid developed using CMS system. Average yield 40 t//ha.
11		Pusa Gulabi	Delhi State Variety Release Committee	2012	Delhi State	First purple fleshed nutritionally rich variety with higher anthocyanins and ascorbic acid. Average yield 50.0 tonnes/ha.
12	Cucumber	Pusa Barkha	Delhi State Variety Release Committee	2012	Delhi State	First entire pink fleshed radish variety. Medium root size, cylindrical shape, High total carotenoids, anthocyanins and optimal ascorbic acid. Average yield 60.0 t/ha.
13	Onion	Sel. 126	AINRPOG	2011		First extra early improved variety of cucumber for Kharif season cultivation for North Indian plains. Average fruit yield 18.8 t/ha during kharif season.
14		Pusa Riddhi	Delhi State Variety Release Committee	2012	Delhi State	Bulb, flat globe, and brownish in colour. The variety is with high TSS, average around 170 ± 2 Brix. Average yield is 25.0 t /ha
15	Bunching Onion	Pusa Soumya	Delhi State Variety Release Committee	2012	Delhi State	Bulbs compact, flat globe, and dark red in colour. It is suitable for kharif and rabi season. Average yield is 32.0 t/ha
16	Broad bean	Pusa Udit	Delhi State Variety Release Committee	2012	Delhi State	First bunching onion variety proposed for commercial cultivation in India for round the year green onion production. Average yield potential is 26.0 t/ha.
17	Ash gourd	Pusa Shreyali (DAGH-14)	AICRP (VC)	2013	Zone IV (Punjab, U.P, Bihar and	The pods are extra long, flattish and light green. Average yield is 17.63 t/ha, Fruits of this hybrid are cylindrical with white rind and white flesh. Fruits



18	Pusa Urmi (DAGH-16)	AICRP (VC)	2013	Jharkhand) Zones VI (Rajasthan, Gujarat, Haryana and Delhi) and VIII (Karnataka, Tamil Nadu and Kerala)	weight 10.5kg. Average yield is 52.0 t/ha. Fruits of this hybrid are oblong ellipsoid with greenish white rind and white flesh. Average fruit weight is 11.0 kg. Average yield is 47.5 t/ha.
19	Bitter gourd Pusa Aushadhi (Sel-1)	AICRP (VC)	2013	Zone VI (Rajasthan, Gujarat, Haryana and Delhi).	Fruits light green, medium long (16.5cm) with 7-8 continuous narrow ridges, mature in 48-52 days. Average fruit weight is 85 g. Average yield 19.80 t/ha.
20	Garden pea Pusa Agrani (GP 17)	AICRP (VC)	2014		Pod dark green colour having 6-7 seeds/pod. <i>Fusarium</i> wilt resistant early variety. Maturity 50-55 days after sowing in early October. Pod yield 4.5-5.0 t/ha during early sowing and 9.0-10.0 t/ha November sowing.

Germplasm Registered at NBPGR

Sponge gourd DSG-6 (IC-0588956; INGR 12013), resistant to *Tomato Leaf curl New Delhi Virus* and predominantly gynocious bitter gourd PreGy-1 (IC-059254; INGR 12014) were registered at NBPGR.

24. Areas of consultancy and income generated:

Division also engage in Production and sale of breeder and truthfully labeled (TFL) seeds and seedlings of newly released varieties and parental lines of F_1 hybrids to the vegetable seed industry in public as well as private sector and to the growers. Division also engages in selling fresh vegetable and literatures (book and bulletins) to different beneficiaries. Divisional scientist also involved in various consultancy services viz., Vegetable crop improvement, Hybrid seed production of vegetable crops, Production technology of vegetable crops, Raising of vegetable nursery and Vegetable home gardening.

Production of Vegetable Breeder Seed, IARI Seed, Sale of literature and Resource Generation during the period 2009-10 to 2013-14.

Year	Breeder Seed (in kg)	Resource Generation (in Rs)	IARI Seed (in kg)	Resource Generation (in Rs)	No. of Books Sold	Resource Generation (in Rs)
2009-10	56.765	51328	1212.850	131257	430	32600
2010-11	20.160	61649	896.670	147800	2225	17245
2011-12	100.250	114976	694.500	174062	456	21030
2012-13	56.721	57263	849.040	311506	206	14675
2013-14	38.000	105058	787.405	426046	63	6090
Total	271.896	390274	4440.465	1190671	3380	91640
Total Revenue Generation						Rs. 16,72,585/-

The gynocious line PVGy-201 (DBGy-201) was licensed to M/S Ankur Seeds, Nagpur, India for further utilisation in hybrid development. The company acknowledged the performance of this line and is utilising it in a large scale hybrid development. (Revenue Generated-3 lakhs)

25. Faculty selected nationally / internationally to visit other laboratories / institutions / industries in India and abroad

1. Dr T.K. Behera availed Post Doctoral fellowship at University of Wisconsin, Madison, Wisconsin, 2008
2. Dr. P. Kalia attended and participated with two presentations in International Horticulture Congress, 2010 at Lisbon, Portugal.



3. Dr. T.K. Behera, visited Libya as FAO consultant on vegetable crop breeding from 20th March to 18th April, 2010.
4. Dr. Subodh Joshi visited Chinese Academy of Agricultural Sciences (CAAS), Beijing in the Institute of Vegetables and Flowers from May 25 to June 3, 2010 to know their R&D activities on vegetable crops.
5. Dr. Pritam Kalia, and Dr. T.K. Behera, Senior Scientist attended the 2nd Workshop on Grand Challenge Project on “Crop plants which remove their own major biotic constraints” from Australia-India Strategic Fund at University of Melbourne, Australia from 8-12 December, 2012
6. Dr. Harshwardhan Choudhary, Senior Scientist undergone Training in the area of Marker Assisted Selection (Horticulture) in the lab of Dr. Kai-Shu-Ling, Research Plant Pathologist, USDA-ARS, South Atlantic Area, U.S. Vegetable Laboratory, 2700 Savannah Highway, Charleston, SC 29414, USA from 16th September- 14th December, 2013
7. Dr T.K. Behera availed Fulbright-Nehru Academic and Professional Excellence Fellowship-2014-15 for conducting research on Marker assisted breeding in cucumber at University of Maryland, USA from 1st September - 31st Jan 2015

26. Faculty serving in

a) National committees b) International committees c) Editorial Boards d) any other (please specify)

Dr. A.D. Munshi	Principal Scientist	Member, Editorial Board, Prasar Doot
Dr. P. Kalia	Head and Principal Scientist	Member editorial board International Journal of Vegetable Science Executive Councilor, Horticultural Society of India
Dr. Harshwardhan Choudhary		(i) Asstt. Editor. Indian Journal of Horticulture, Horticulture Society of India
Dr T.K. Behera	Principal Scientist	(ii) Associate Editor CGC Report, Cucurbit Genetic Cooperative, North Carolina, USA (iii) Editor, Indian Journal of Horticulture, Horticulture Society of India, New Delhi -2011
Dr. P. Kalia	Member	(iv) PPV & FRA Task force for Validation of DUS test guidelines for seed species (Coriander & fenugreek) 2013
Dr. P. Kalia	Secretary	(v) Horticultural Society of India from January 23 rd 2013

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

Faculty regularly attend international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

1. Drs. Subodh Joshi, R. K. Yadav, & Ravinder Kumar attended XXVIII AICRP(VC) Group Meeting held at IIHR, Bangalore, 13-16 Jan., 2010.
2. Drs. P. Kalia, Raj Kumar, A. D. Munshi, T. K. Behera and A. K. Sureja attended XIXth AICRP(VC) Group Meeting held at GAU, Junagadh, 27-30 Jan., 2011.
3. Dr. P. Kalia attended Harnessing Intellectual Property for strategic competitive and collaborative advantage programme at IIM, Ahmedabad during February 8-10, 2011.
4. Dr. P. Kalia attended and Co-Chaired a session in Onion and Garlic Group meeting at CITH, Srinagar, during May 2010.
5. Drs. P. Kalia, Raj Kumar, A. D. Munshi, T. K. Behera and A. K. Sureja attended XIXth AICRP(VC) Group Meeting held at GAU, Junagadh, 27-30 Jan., 2011
6. Dr. A.D. Munshi has attended stake holder workshop of National Agricultural Innovative Project at MPUA&T, Udaipur (Raj.) on 5th March, 2012.
7. Drs. P. Kalia, Shri Dhar, R.K. Yadav, H. Choudhary, Swati Saha and Partha Saha have attended AICRP on Vegetable Crops XXVI group meeting at GB Pant Univ. Agril. & Technology, Pantnagar from 12-15 Jan, 2012.



8. Drs. Shri Dhar and R.K. Yadav attended National Seminar on Indian Agriculture: Preparedness for climate change at NASC Complex, New Delhi from 24-25, March, 2012.
9. Dr. R.K. Yadav attended workshop at IGNOU on capacity building for development of e-learning resources and self- instruction learning material under NAIP project.
10. Drs. T.K. Behera and A.K. Sureja have attended 7th Nutra India Summit, 15-17th March 2012, Lalit Ashok, Bengaluru.
11. Dr. T.K. Behera attended National Symposium on Rice-based Farming Systems for Livelihood security under Changing Climatic Scenario held at College of Agriculture, Chiplima, Odisha, 27-29 February, 2012.
12. Drs. T.K. Behera and A.K. Sureja attended Global Conference on “Horticulture for Food, Nutrition and Livelihood Options” held at OUAT, Bhubaneswar, Odisha from 28-31st May 2012
13. Dr Partha Saha attended International conference on Agricultural and Horticultural Sciences, from September 14-15, 2012 at Hyderabad International Convention Centre, Hyderabad.
14. Dr. Shri Dhar attended VI International Conference on Legume Genetics & Genomics” organised by ICRISAT and ICAR held at Marriot Hotel, Hyderabad, India from 2-7 Oct, 2012
15. Drs. P. Kalia, Raj Kumar, Shri Dhar, A.D. Munshi, R.K. Yadav, H. Choudhary, A.K. Sureja attended Third International Agronomy Congress on “Agriculture diversification, climate change management and livelihoods”, 26-30 Nov., 2012, IARI, New Delhi-12
16. Dr. A.D. Munshi attended First International Conference on Bio-Resource and Stress Management, held at Kolkata, Feb 6-9, 2013.
17. Drs P.Kalia, A.D.Munshi, T.K.Behera,Harsawardhan Chaudhary,Swati Khan,Partha Saha and Arpita ShrivastavaAICRP-VC XXXI Workshop held at CSK,HPKV, Palampur from 2-5th May,2013
18. Dr Anil Khar attended One day Interactive meeting on Doubled Haploids: Scope and Future in Horticultural Crops at IIHR on 4th October 2013.
19. Drs Shridhar and Harsawardhan Chaudhary attended National Symposium on Abiotic and Biotic Stress Management in Vegetable Crops, from 12-14 April, 2013 at IIVR, Varanasi.
20. Dr.R.K.Yadav.attended .2nd International conference on “Agriculture, Food Technologies and Environment – New approaches” (*AFTENA - 2013*) on 19th and 20th October, 2013 at JNU, New Delhi.
21. Dr. R.K.Yadav attended and participated International conference on impact of technological tools on food security under global warming scenario (ITTFS-2012), 11-12 May 2013 Shobhit University, Modipuram, Meerut, U.P. India.
22. Dr. R.K.Yadav Attended and participated in Brainstorming session on okra at IIVR, Varanasi on 28th Sept., 2013.
23. Dr A.K.Sureja participated in 2 days workshop on “*Hindi main gunbatta purn vigyan lekhan: Samasyen aban samadhan*” at NPL, IARI, New Delhi fro 20-21 June, 2013.
24. Dr A.K.Sureja,Dr Zakir Hussain Participated in one day Interactive meeting on “Doubled Haploids: Scope and Future in Horticultural Crops” at IIHR, Bengaluru on 4th October 2013
25. Drs T.K.Behera and Harsawardhan Chaudhary attended KrishiVasant held at Central Institute of Cotton Research, Nagpur from 9 to 13th February, 2014
26. All the scientists of the division attended and participated in Mid-term Review meeting of AICRP-VC XXXI at NAAS Complex, New Delhi from 17 to 18th December 2013.
27. Dr Zakir Hussain attended 11th Satellite based distance learning program on ‘Basics of remote sensing, GIS and GNSS’ duration 5 Aug. to 20th Nov. 2013 at Division of Agriculture Physics, IARI, New Delhi.
28. Dr P.Kalia and all the scientist of the Division attended “Vegetable Field Day” on January 30th.2014 organised by the division.
29. Dr A D Munshi attended and delivered a lecture on *Kitchen and Container Gardening* in the Empowerment of Woman and Urban Horticulture Workshop held on February 27, 2014 during Krishi Vigyan Mela.

**28. Student projects****a) percentage of students who have done in-house projects including interdepartmental projects**

There is no provision as students are assigned research topics by the concern guide and thesis submission based on independent research work is mandatory for both M.sc and Ph.d students.

b) percentage of students doing projects in collaboration with other universities / industry / institute

There is no provision for student doing project work in collaboration with other University. However, all the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two discipline is must.

29. Awards / recognitions received at the national and international level by Honours and awards received by the faculty from 2009-2014

Sl. No.	Name of Scientist(s)/Staff	Designation	Name of the Awards/Recognition(s)
1.	Dr. P. Kalia	Head of the Division	<ol style="list-style-type: none"> 1. Elected as Executive Councillor of Indian J. Hort., Horticultural Society of India. 2. Fellowship of the Horticulture Society of India on 21st Nov., 2010. 3. Himachal Shri Award for contribution in Agricultural Science, Himotkarsh Sahitya Academy of H.P. 4. Himachal Gaurav Award by the Govt. of Himachal Pradesh 5. Fellow of NAAS, New Delhi in Dec.2013 6. Awarded of NAAS Fellowship, 2014. 7. Received best poster award in the 4th Horticulture Congress organised by Horticulture Society of India in New Delhi during 18 – 21 November, 2010.
2.	Dr. T.K. Behera	Principal Scientist	<ol style="list-style-type: none"> 1. Hooker Award during the 49th convocation on 5th Feb., 2011. 2. Elected as Fellow of Horticulture Society of India, New Delhi -2011 3. Editor, Horticulture Society of India, New Delhi -2011 4. Fellow of NAAS, New Delhi in Dec.2014 5. Best oral presentation in the National Conference on Production of Quality Seeds and Planting Material – Health Management in Horticultural Crops held at NASC, New Delhi, during March 11-14, 2010.
3.	Dr. A.D. Munshi	Principal Scientist	<ol style="list-style-type: none"> 1. IARI Best Teacher Award for the year 2009 2. Member, Editorial Board, Prasar Doot 3. Received appreciation letter from Ms. Seema Chopra Joint Director (Raj Bhasha) for the Hindi Book <i>Swa-Paragit Phaslon ki Beej Utpadan Takniki</i>. 4. Best oral presentation in the National Conference on Production of Quality Seeds and Planting Material – Health Management in Horticultural Crops held at NASC, New Delhi, during March 11-14, 2010.
4.	Dr. Harshwardhan Choudhury	Sr. Scientist	<ol style="list-style-type: none"> 1. Awarded Second prize for oral presentation in National Seminar on Protected Cultivation of Vegetables and Flowers- A Value Chain Approach. 11-12th January 2012 Pantnagar. 2. Best poster at 4th International Cucurbitaceae Symposium at Changsa, Hunan, China during September 2009 3. Best poster award in the 4th Horticulture Congress organised by Horticulture Society of India in New Delhi during 18 – 21 November, 2010.
5.	Dr. Partha Saha	Scientist	<ol style="list-style-type: none"> 1. ICAR-Jawahar Lal Nehru award , 2013 2. Dwarka Nath Memorial Gold Medal Award by Indian Society of vegetable Science, Varanasi, India, 2012



6.	Dr. R.K. Yadav	Sr. Scientist	3. Best poster award in the 4th Horticulture Congress organised by Horticulture Society of India in New Delhi during 18 – 21 November, 2010.
7.	Dr. Subodh Joshi		1. Young Scientist Award by Deptt. of Science & Technology, Council of Science & Technology, U.P.
8.	Dr. Balraj Singh		1. Fellowship of Indian Society of Vegetable Science in April, 2011. 1. Distinguish Scientist Award by the Hi-Tech Horticultural Society, Meerut. 2. Nominated as the member of the consultative group on Protected Cultivation in Haryana Farmer's Commission by the Chairman Haryana Commission.
9.	Dr. Arpita Srivastava	Scientist	1. Dwarka Nath Memorial Gold Medal Award, IIVR, Varanasi
10.	Dr. Sri Dhar	Principal Scientist	1. Best poster award in the 4th Horticulture Congress organised by Horticulture Society of India in New Delhi during 18 – 21 November, 2010.

Doctoral / post doctoral fellows

Nil

Award received by students

Dr Partha Saha	• Dwarka Nath Memorial Award by Indian Society of Vegetable Science	2013
	• Jawaharlal Nehru Award for P.G. Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences, ICAR, 16 July, 2013.	2014
Dr. Swati Saha	• Dwarka Nath Memorial Gold Medal Award	2014
Dr. E.S. Rao	• ICAR-Jawahar Lal Nehru award	2007
Dr L.K. Bharati	• First RS Paroda Young Scientist Award from ISPGR	-

30. Seminars/ Conferences/ Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

S. No.	Name of training programme	Date	Number of trainee(s)
1.	Vegetable Variety Development and Evaluation sponsored by FAO	15-09-2009 to 14-10-2009	7
2.	Quality seed production in vegetable crops-An entrepreneurial perspective sponsored by ZTMU & BPD, IARI, New Delhi	26-10-2009 to 31-10-2009	28
3.	Shakiye phasalon ka unnat evam sankar beej utpadan sponsored by UPDASP	20-04-2009 to 16-04-2009	22
4.	Hybrid seed production of vegetable crops sponsored by Deptt. of Agril. under NHM	23-03-2009 to 24-03-2009	10
5.	Hybrid seed production of vegetable crops sponsored by Deptt. of Agril. under NHM	26-03-2009 to 27-03-2009	10
6.	Winter School on "Designing nutraceutical and food colorant rich vegetable crop plants"	15th Oct. to 4th Nov., 2010	25

Training Programmes Organised

Subject of the training programme	Duration
Hybrid seed production in vegetables for two days by Deptt. of Agriculture, Govt. of Delhi under National Horticulture Mission (NHM)	March 23-24 and March 26-27, 2009
Training programme on vegetable variety Development and evaluation for one month sponsored by FAO, Rome	September 15 th to October 14 th 2009



A training on quality seed production in Vegetable Crops- An entrepreneurial perspective	October 26 th to 31 st 2009
Hybrid seed production in vegetables for two days by Deptt. of Agriculture, Govt. of Delhi under National Horticulture Mission (NHM)	October 15 th to November 04 th 2010
Model Training Course on “Advance Techniques in Vegetable Hybrid Seed Production” by Min. of Agril., Govt.. of India	October 3 rd to 10 2012
Dutch delegation by PPVF & RA	December 3-4 th 2012
Winter School on “Breeding for high productivity and industry suitable food colorants and bioactive health compounds in Vegetable Crops – Conventional and Hi-Tech cutting edge approaches” Sponsored by ICAR	December 3-24 th 2012
Study Tour cum Training – Vegetable seed production techniques and post harvest handling of seeds for the DPR Korean Nationals	December 27 th , 2012 to January 11 th , 2013
Study Tour cum Training – Vegetable seed production techniques and post harvest handling of seeds for the DPR Korean Nationals sponsored by FAO and organized by Head, Veg. Science	December 27 th , 2012 to January 11 th , 2013
Entrepreneur Development Programme On “Vegetable Seed Production” Division of Vegetable Science & Zonal Technology Management & Business Planning and Development Unit Indian Agricultural Research Institute, New Delhi - 110012	October 1 st to 5 th , 2013
Entrepreneurship Development Programme (EDP) on “Vegetable Seed Production Technology” Division of Vegetable Science in collaboration of Zonal Technology Management & Business Planning and Development Unit (ZTM & BPD Unit) IARI, New Delhi	October 1 st – 5 th , 2013
Subject matter training programme in Horticulture for six months for six scientists of Islamic Republic of Afghanistan, sponsored by Ministry of External Affairs, GOI,	August 1 st , 2013 to January 30 th , 2014
Model Training Course on “Entrepreneurship development to ensure quality vegetable seed production for making the country nutritionally secure sponsored by Directorate of Extension, Ministry of Agriculture, Govt. of India, held at Division of Vegetable Science, IARI, New Delhi	January 4 th to 11 th , 2014

31. Code of ethics for research followed by the departments

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32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	1	3	-	-
Ph.D.	120	11	1	9.16	0.83

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.SC	NIL	NIL	83	17
Ph.D	65%	31%	31%	4%

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

All the students are well placed. While most of the students cleared ARS examination and joined ICAR as Scientist, few students got placement in state Agricultural University/Central Agricultural University as Assistant Professor.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	None
PG to M.Phil.	None



PG to Ph.D.	82%
Ph.D. to Post-Doctoral	None
Employed	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree and majority of them joined
Campus selection	Agricultural Research Service conducted by ASRB through all India competitive examination
Other than campus recruitment	
Entrepreneurs	None

36. Diversity of staff

Percentage of faculty who are graduates	
Of the same university	46
From other universities within the state	0
From universities from other States from	54
Universities outside the country	0

37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:

One

38. Present details of departmental infrastructural facilities with regard to

- Library: 1
- Internet facilities for staff and students: Available
- Total number of class rooms: 2
- Class rooms with ICT facility: 2
- Student's laboratories: 1
- Research laboratories: 3

39. List of doctoral, post-doctoral students and Research Associates

- from the host institution/university: Nil
- from other institutions/universities:
 - Research Associate: 1
 - Post doctoral fellow: 2
 - Senior Research Fellow: 7
 - Junior Research Fellow: 1

40. Number of post graduate students getting financial assistance from the university:

All

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

Not applicable

42. Does the department obtain feedback from

Yes

- faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching-learning evaluation. Rigorous exercise first at divisional level and then at Institute level is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

- students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.



c. alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10)

1. Padmashri Brahma Singh, Former Director, DRDO and Former OSD, Rastrapati Bhawan
2. Dr. M.G. Som, Former VC, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal
3. Dr. TA. More, Former Director, IIVR, Varanasi, UP and VC, Mahatma Phule Krishi Vidyapith, Rahuri, Maharashtra.
4. Dr. M. Anwar, Former Director, IISR, Ajmer, Rajasthan.
5. Dr. PS Sirohi, Former Head, Division of Vegetable Science, IARI, New Delhi
6. Dr. Narendra Singh, Former Head, Division of Vegetable Science, IARI, New Delhi

44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes.

Black board, white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training. At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and vegetable field day and also through Doordarshan and radio programme and by distributing different literature pertaining to vegetable science

47. Highlight the participation of students and faculty in extension activities.

At national level Dissemination of knowledge and technology transfer to farming community through Radio, Television and published literature are being done regularly. Rehabilitation works through introduction of improved varieties and technology for higher production in shortest period in earthquake and drought affected areas were undertaken. The Division is associated with the “Technology dissemination and field implementation of IARI technologies to a cluster of model villages in the selected 4 villages of Mewat, district Haryana” and also associated with the programme on “Livelihood and Nutritional Security of Tribal Dominated Areas through Integrated Farming System & Technology Models” in collaboration with Agricultural Extension Division.

At Institute Level a strong centre has been developed for demonstration of several aspects of vegetable growing for the benefit of different kinds of visitors, like students, trainees, farmers, extension workers, seed and nursery men, kitchen garden lovers, V.I.Ps and foreign dignitaries. It is useful for practical teaching, training and transfer of technology on recent advances in vegetables. About 2000 visitors visit the demonstration centre every year. Several lectures and trainings were conducted for subject matter specialists, farmers, VLWs of ORP and IVLP villages. New varieties / technologies are exhibited during Krishi Vigyan Mela and Field day organized by the Institute every year. The Division is also associated with Associated with farmer’s training programmes conducted by Agricultural Extension Division/ CATAT/ ATIC.

48. Give details of “beyond syllabus scholarly activities” of the department.

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi



50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.

Genetical studies viz., heterosis, combining ability, sex expression and gene action, inheritance of important qualitative and quantitative traits have been studied in all the important vegetable crops. Self-incompatible lines and Ogora CMS system have been developed in Indian cauliflower and cabbage to be used in hybrid seed production. Inheritance of sex forms in muskmelon and cucumber and bitter gourd was studied in detail and stable gynocious lines have been developed in cucumber and bitter gourd. Male sterile and maintainer lines have been isolated in short day onion Pusa Red for developing F_1 hybrids in onion for commercial cultivation. Stable CMS systems in cauliflower and carrot were developed and utilized for hybrid seed production. Recessive gene marker has been isolated in pumpkin, which can be used for hybrid seed production on commercial scale. Detailed investigation in the germplasm of cauliflower led to the development of the theory that Indian cauliflower was a separate group and it was distinctly different from the European types. Different maturity groups originated by simple selection, and later perhaps of re-combination, as a result of natural crossing between different European types. Detailed karyotype analysis of cucumber and muskmelon led to the establishment of the theory that cucumber and muskmelon followed two different courses of evolution in Asia and Africa, respectively. Electrophoretic analysis of enzymes revealed that there was little similarity between two species of the genus *Cucumis*.

Molecular diversity and its relationship with morphological traits and heterosis have been studied in cucumber, brinjal, ash gourd and bitter gourd. Two molecular markers RAPD and ISSR were developed as close flanking to black rot resistant gene at 1.6 cM distance in cauliflower.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

Strength

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni
- Well qualified and dedicated scientific staff available
- Access for interaction with different organisations like NBPGR, NCIPM, IASRI and NRC on Plant Biotechnology
- Exotic and indigenous germplasm resistance source, land races available for utilisation in the breeding programme
- Facilities of two regional stations (Katrain and Karnal) are available for research and seed production of temperate and tropical vegetables.
- Access to multidisciplinary centres and national institutes situated at IARI Campus to facilitate advanced research
- Access to IARI Library, the Asia's biggest, for biological sciences

Weakness

- Shortage of scientific staff for teaching and research.
- Paucity of funds sometime does not allow to fulfill the research and teaching.
- Inadequate lab facility to conduct qualitative and nutritional studies. Field storage and field laboratory facilities are poor
- Facilities for Post Harvest Technology work are meagre.
- Inadequate faculty up gradation programme through AHRD
- Lack of technical staff with proper qualification
- Inadequate supporting/field staff
- Inadequate support from Farm Operation Service Unit



- Lack of safety and security of experimental crops from theft, stray animals and birds
- Lack of centre for Advanced Studies (CAS) related to vegetable science
- Globalization has given opportunity to develop varieties/ F_1 hybrids suitable for export as such value added products.
- Opportunity, though meagre, exists to upgrade the faculty by training them in advance laboratories of developed countries under AHRD programme.
- Opportunity to improve our efficiency by interacting/ competing with private seed industries.

Challenge

- Due to ever increasing salinity of soil and water at IARI research farm raising successful experiments of some vegetables has become difficult and we have been losing some valuable germplasm of vegetables
- There is a threat from some private seed companies, which sometime sell the seeds of our varieties in their brand name
- Due to slowing down of activities of N.S.C., fast multiplication, distribution and spread of our varieties to the farmers have been suffering
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department

EDUCATION

Enhancement of the quality of human resources

- Efforts will be made to enable the scientists through upgradation of cutting edge research related vegetable breeding using conventional and molecular approaches.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encouraged to go for 6-12 months training at world leading Institutes through ICAR/ DST/DBT/UGC/International fellowships
- Establishment of center of excellence for conducting training programme on recent technological advancement in conventional and molecular breeding aspects of vegetable crops

RESEARCH

- Conversion of the fatigued productivity of different vegetable crops into a vibrant and productive phase through hybrid technologies with assured hybrid seed production machinery:
- Enhancement of crop productivity under medium and medium-low input conditions through cumulative component breeding:
- Prebreeding in vegetable crops on priority to build a national reservoir of genetic stocks and 'heterotic pools' available to feed the different regional breeding programmes
- Targeting breeding programmes specifically for protected agri-horticulture and organic agriculture integrated with resource conservation technologies (RCTs)



xxiv) Water Science and Technology

1. Name of the Department

Water Technology Centre

2. **Year of establishment:** 1969; Discipline of Water Science and Technology was started in 1985.

3. **Is the Department part of a School/Faculty of the university?**

yes, it is part of School of Natural Resources Management

4. **Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)**

M.Sc. and Ph.D. programme in Water Science and Technology

5. **Interdisciplinary programmes and departments involved**

Division of Microbiology, Agronomy, Environmental Science, Floriculture and Landscaping, vegetable science, Soil Science and Agricultural Chemistry etc.

6. **Courses in collaboration with other universities, industries, foreign institutions, etc.**

None

7. **Details of programmes discontinued, if any, with reasons**

None

8. **Examination System: Annual/Semester/Trimester/Choice Based Credit System**

Trimester System

9. **Participation of the department in the courses offered by other departments**

The faculty deliver lectures and guide dissertations in the sister departments Division of Agricultural Engineering, Agronomy, Environmental Science, Soil Science and Agricultural Chemistry etc.

10. **Number of teaching posts sanctioned, filled and actual (Professors/Associate Professor/Asst. Professors/others)**

Staff	Cadre strength	Filled	Vacant positions	Actual (including CAS and MPS)
Principal Scientist (Professor)	2	2	0	11
Senior Scientist (Associate Professor)	3	2	1	3
Scientist (Assistant Professor)	11	12	-1	5

11. **Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance**

SN.	Name	Qualification	Designation	Specialization	No. of Years of Experience	No. of students guided M.Sc.	Ph.D.
1.	Dr. Ravinder Kaur	Ph.D.	Project Director & Director (Acting), IARI	Soil Physics & Soil & Water Conservation	23+	9	5 +2 (on-going)
2.	Dr. Man Singh	Ph.D.	Professor	Irrigation and Drainage Engineering	29	6	5
3.	Dr. S.S. Parihar	Ph.D.	Principal Scientist	Irrigation & water management	30	02	01
4.	Dr. B.S. Kalra	Ph.D.	Principal Scientist	Agricultural Economics	32	2	-
5.	Dr. Manoj Khanna	Ph.D.	Principal Scientist	Soil & Water Conservation Engineering	29	2	4



6.	Dr. Khajanchi Lal	Ph.D.	Principal Scientist	Management of marginal quality water and salt affected soils	22	—	—
7.	Dr. Susama Sudhishri	Ph.D.	Principal Scientist	Soil and Water Conservation Engineering, watershed management, water resource management, optimization and modeling	20	1	nil
8.	Dr. Rajendra Singh	Ph.D.	Senior Scientist	Soil Science/Soil fertility/ microbiology	31	Nil	Nil
9.	Dr. Neeta Dwivedi	Ph.D.	Senior Scientist	Plant Physiology(Abiotic stress Physiology and climate change)	6	-	-
10.	Dr. D.S. Gurjar	Ph.D.	Scientist	Soil Physics/Soil & Water Conservation (Wastewater management, water quality management)	6.5	NIL	NIL
11.	Mrs. Rosin KG	M.Sc.	Scientist	Soil Science: Soil Chemistry/ Fertility/Microbiology (Soil and Water Quality Management)	4	-	-

12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

S.No.	Name of the Faculty	Status
1.	Dr. (Mrs.) R. K. Chopra, Ex-Principal Scientist, WTC, IARI, New Delhi	Emeritus Scientists
2.	Dr. T B S Rajput, Ex-Principal Scientist, WTC, IARI, New Delhi	Emeritus Scientists

13. Percentage of classes taken by temporary faculty – programme-wise information

Not in all programmes but in specific courses, only 10% in all the courses including by permanent faculty members who are posted in other institute or discipline.

14. Programme-wise Student Teacher Ratio

M.Sc.* = 5 students: 1 teacher and **Ph.D.*** = 5 students: 1 teacher

(* The faculty in IARI is able to contribute only 25 % of their total time available, the rest 75% time is devoted to research)

15. Number of academic support staff (technical) and administrative staff: sanctioned, filled and actual: Supporting and Technical staff position

S.No.	Category	Sanctioned	Filled	Actual
1.	Technical	28	18	18
2.	Administrative	6	6	6
3.	Supportive	55	37	17

16. Research thrust areas as recognized by major funding agencies:

Waste water management technologies, biodrainage, heavy metal accumulation, health hazards, saline, sodic irrigation water

17. Number of faculty with ongoing projects from a) national b) international funding Agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise:

Name	a) National	b) International	c) Total Grants Received (Lakh Rupees)
Dr. Ravinder Kaur	1. Bioremediation of contaminants in polluted sites: use of weedy plants under National Fund for Basic, Strategic &	NIL	206.31 Lakhs



	Frontier Application Research in Agriculture, NFBSFARA –ICAR (2013-17) –As PI		
	2. Bioremediation of agrochemicals and heavy metals present in Yamuna and drainage water used for irrigation in urban and peri-agricultural areas, NFBSFARA, ICAR (2012-2016) – As Co-PI		210.0599 Lakhs
Dr. Manoj Khanna	1. National Initiative on Climate Resilient Agriculture (NICRA), ICAR	NIL	200 lakhs
Dr. Khajanchi Lal	3. Bioremediation of agrochemicals and heavy metals present in Yamuna and drainage water used for irrigation in urban and peri-agricultural areas, NFBSFARA, ICAR (2012-2016).	NIL	210.0599 Lakhs
	4. Bioremediation of contaminants in polluted sites: use of weedy plants under National Fund for Basic, Strategic & Frontier Application Research in Agriculture, NFBSFARA, ICAR (2013-17)		206.31 Lakhs
Dr. Susama Sudhishri	1. Biotechnology led socio-economic empowerment of farm women (funded by DBT, Ministry of Science and Technology, Govt. of India.		246.357 lakhs
Dr. Neeta Dwivedi	1. Physiological and Molecular Markers for Drought Resistance in Wheat. (NPTC, ICAR)	NIL	41.93 lakhs
	2. Bioremediation of contaminants in polluted sites: use of weedy plants. (National fund for basic, strategic and frontier application research in agriculture (NFBSFARA, ICAR)		206.31 Lakhs
Mrs. Rosin KG	1. Bioremediation of agrochemicals and heavy metals present in Yamuna and drainage water used for irrigation in urban and peri-agricultural areas (NFBSFARA, ICAR)	NIL	210.0599 Lakhs

18. Inter-institutional collaborative projects and associated grants received

a) National collaboration

- (1) *Project:* Bioremediation of agrochemicals and heavy metals present in Yamuna and drainage water used for irrigation in urban and peri-agricultural areas (Funded by ICAR).

Institutes: IARI, New Delhi, IIT Delhi, University of Delhi, Delhi.

- (2) *Project:* Bioremediation of contaminants in polluted sites: use of weedy plants under National Fund for Basic, Strategic & Frontier Application Research in Agriculture (Funded by ICAR).

Institutes: IARI, New Delhi, DWSR, Jabalpur, M.P



(3) *Project:* Evaluation of “Watershed Development Programme (DPAP & IWDP) in selected districts of Uttar Pradesh”. Study of 98 micro watersheds, (Funded by Department of Land Resources, Ministry of Rural Development (M&E Division), Govt. of India. Rs

Institutes: IARI, New Delhi.

Total Budget (for IARI): Rs. 3,67,500/-

b) International collaboration

19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received

None under these programmes.

20. Research facility / centre with

State recognition

- Haryana State Government has recognized WTC as centre of excellence in irrigation water management.

National recognition

The Centre was recognized as one of the “Centres of Excellence” in Water Management by the Directorate of Extension, Department of Agriculture and Co-operation, Ministry of Agriculture, Govt. of India.

International recognition

The centre is well known world over by its over 45 years contribution in the field of agricultural water management. This is evident from the publication done by its galaxy of scientists of three generations and the impacts made out in the development made in human resources development. The proof may be had from the google search.

21. Special research laboratories sponsored by / created by industry or corporate bodies:

None

22. Publications

	Dr. Ravinder Kaur	Dr. Man Singh	Dr. S.S. Parihar	Dr. B.S. Kalra	Dr. Manoj Khanna	Dr. Khajanchi Lal	Dr. Susama Sudhishri	Dr. Rajendra Singh	Dr. Neeta Dwivedi	Dr. D.S. Gurjar	Mrs. Rosin KG
Number of papers published in peer reviewed journals (national / international)	36	50	60	22	52	28	65	26	25	12	6
Monographs	3			-	-	-	1			-	-
Chapters in Books	15	5	03	19	4	8	-	3	1	5	5
Edited Books	-	2		-	1	2	35			-	-
Books with ISBN with details of publishers	1		02	2	-	-	-			-	-
Number listed in International Database							-			-	-
Citation Index – range (average)	0-56 (6.86)	0-33 (7.06)					0-25	-		-	3.0
SNIP range (average)		0-2.13 (0.50)					-			0-0.287 (0.037)	
SJR range (average)		0-1.54 (0.33)					-			0-0.155 (0.022)	
Impact Factor– range (average)	4.9- 9.21 (6.75)	0-2.89 (0.56)		0 to 4	3.5-7.5 / 5.0		9.2			-	
h-index	9	7			5	6.0	6			-	1.0



Some of the important publication from 2010-2014

Publication: NAAS Rating Above 9

S.No.	Publications	NAAS Rating
1.	Bhatia, V., Bhattacharya, R., Uniyal, P.L., Singh, R. and R.S. Niranjana (2012). Host generated siRNA Attenuate expression of serine protease gene in <i>Myzus persicae</i> . <i>PLOS-One</i> , 7: (10) e46343 doi.10.1371/journal.pone.0046343.	9.53
2.	Khajanchi Lal, R.K. Yadav, Ravinder Kaur, D.S. Bundela, M. Inayat Khan, Madhu Chaudhary, R.L. Meena, S.R. Dar and Gurbachan Singh. 2013. Productivity, essential oil yield, and heavy metal accumulation in lemon grass (<i>Cymbopogon flexuosus</i>) under varied wastewater-groundwater irrigation regimes. <i>Industrial Crops and Product</i> . 45: 270– 278.	9.21

Publication: NAAS Rating 8-9

S.No.	Publications	NAAS Rating
1.	Abedinpour M., A. Sarangi, T.B.S. Rajput and Man Singh. (2014) Prediction of maize yield under future water availability scenarios using the aqua crop model. <i>Journal of Agricultural Science : Cambridge, UK</i> 152:558-574	8.88
2.	Abedinpour, M., A. Sarangi, T.B.S. Rajput, Man Singh, H, Pathak and T. Ahmed (2012: Performance evaluation of AquaCrop model for maize crop in semi-arid environment <i>Agricultural Water Management</i> ,	8.2
3.	Babu, S., Prasanna, R., Bidyarani, N. and Singh, R. (2014). Analyzing the colonization of inoculated cyanobacteria in wheat plants using biochemical and molecular tools. <i>Journal of Applied Phycology</i> , DOI 10. 1007/s 10811-014-0322-6.	8.33
4.	Das, T.K., Bhattacharyya, R., Sudhishri, S., Sharma, A.R., Saharawat, Y.S., Bandyopadhyay, K.K., Sepat S., Bana R.S., Aggarwal, P., Sharma, R.K., Bhatia, A., Singh G., Kar, A., Singh, B., Singh, P., Pathak, H., Vyas, A.K. and Jat, M.L. 2014. Conservation agriculture in an irrigated cotton-wheat system of the western Indo-Gangetic Plains: Crop & water productivity and economic profitability. <i>Field Crops Research</i> . 158:24–33.	8.47
5.	Das, T.K., Bhattacharyya, R., Sudhishri, S., Sharma, A.R., Saharawat, Y.S., Bandyopadhyay, K.K., Sepat S., Bana R.S., Aggarwal, P., Sharma, R.K., Bhatia, A., Singh G., Kar, A., Singh, B., Singh, P., Pathak, H., Vyas, A.K. and Jat, M.L. 2014. Conservation agriculture in an irrigated cotton-wheat system of the western Indo-Gangetic Plains: Crop & water productivity and economic profitability. <i>Field Crops Research</i> . 158:24–33.	8.61
6.	Gurbachan Singh, D. S. Bundela, Madhurama Sethi, Khajanchi Lal, and S. K. Kamra. 2010. Remote Sensing and Geographic Information System for Appraisal of Salt-Affected Soils in India. <i>J Environ Qual</i> . 39: 5-15.	8.35
7.	Lenka N.K, Choudhury P.R., Sudhishri S., Dass A. and Patnaik U.S. 2012 Soil aggregation, carbon build up and root zone soil moisture in degraded sloping lands under selected agro-forestry based rehabilitation systems in eastern India. <i>Agriculture Ecosystems and Environment</i> . 150:54-62	8.86
8.	Lenka N.K, Choudhury P.R., Sudhishri S., Dass A. and Patnaik U.S. 2012. Soil aggregation, carbon build up and root zone soil moisture in degraded sloping lands under selected agro-forestry based rehabilitation systems in eastern India. <i>Agriculture, Ecosystems and Environment</i> . 150:54-62.	9.20
9.	Lenka N.K., Dass Anchal, Sudhishri, S. and Patnaik, U.S. 2012. Soil carbon sequestration and erosion control potential of hedge rows and grass filter strips in sloping agricultural lands of eastern India. <i>Agriculture, Ecosystems and Environment</i> . 158: 31-40.	8.86
10.	Lenka N.K., Dass Anchal, Sudhishri, S. and Patnaik, U.S. 2012. Soil carbon sequestration and erosion control potential of hedge rows and grass filter strips in sloping agricultural lands of eastern India. <i>Agriculture, Ecosystems and Environment</i> . 158: 31-40.	9.20
11.	Lenka N.K., Sudhishri S., Dass Anchal, Choudhury P.R., Lenka Sangeeta and Patnaik U.S (.2013) Soil carbon sequestration as affected by slope aspect under restoration treatments of a degraded alfisol in the Indian sub-tropics. <i>Geoderma</i> . 204-205:102-110.	8.35
12.	Lenka N.K., Sudhishri S., Dass Anchal, Choudhury P.R., Lenka Sangeeta and Patnaik U.S. 2013. Soil carbon sequestration as affected by slope aspect under restoration treatments of a degraded alfisol in the Indian sub-tropics. <i>Geoderma</i> . 204-205:102-110.	8.51



13.	Minhas, P.S., R.K. Yadav, K. Lal and R.K. Chaturvedi. 2015. Effect of long-term irrigation with wastewater on growth, biomass production and water use by Eucalyptus (<i>Eucalyptus tereticornis</i> Sm.) planted at variable stocking density <i>Agricultural Water Management</i> 152:151-160.	8.33
14.	Panigrahi, P., R.K.Sharma, M.Hasan and S.S.Parihar (2014).Deficit irrigation scheduling and yield prediction of Kinnow mandarin (<i>Citrus reticulate</i> Blanco) in a semiarid region. <i>Agricultural Water Management</i> 140(20) 48-60	8.2
15.	Rakshit, R., Patra, A. K., Pal, D., Kumar, M. and Singh, R. (2012) Effect of elevated CO ₂ and temperature on nitrogen dynamics and microbial activity during wheat (<i>Triticum aestivum</i> L.) growth on a sub-tropical inceptisol in India. <i>Journal of Agronomy and Crop Science</i> ,198:452-465.	8.62
16.	Santosh Babu, Radha Prasanna, Ngangom Bidyarani & Rajendra Singh (2013) Analysing of Colonisation of Inoculated Cynobacteria in Wheat P using Biochemical and Molecular tools. <i>Journal of Applied Phycology</i> DOI: 10.1007/S10811-014-0322-6	8.33

Publication: NAAS Rating 6-8

S.No.	Publications	NAAS Rating
1.	A.K.Singh, V.Goyal, A.K.Mishra and S.S.Parihar 2013 Validation of CropSyst simulation model for direct seeded rice-wheat cropping system <i>Current Science</i> 104 (10) 1324-1331	6.90
2.	A.K.Singh, V.Goyal, A.K.Mishra and S.S.Parihar 2013 Validation of CropSyst simulation model for direct seeded rice-wheat cropping system <i>Current Science</i> (10);1324-1331	6.91
3.	Abedinpour, M., A Sarangi, T.B.S. Rajput, Man Singh, H. Pathak, T. Ahmad, 2012 Performance evaluation of AquaCrop model for maize crop in a semi-arid environment., <i>Agricultural Water Management</i> , Vol.110: 55-66.	7.60
4.	Abraham, G., Pande, N., Mishra, V., Chaudhary, A. A., Ahmed, A., Singh, R. and Singh, P. K. (2013) Development of SCAR based molecular markers for identification of different species of <i>Azolla</i> . <i>Indian J. of biotechnology</i> . Vol. 12- pp489-492.	6.51
5.	Bhaduri D., T.J. Purakayastha, A.K. Patra, M. Singh, S.Sarkar 2014 Combined effect of tillage-water-nutrient management under rice-wheat agro-ecosystem: A study on chemical indicators of soil quality. <i>Agrochimica</i> Vol. 58 (1): 63-76	6.70
6.	Bhaduri, D., T.J. Purakayastha, A.K. Patra, M. Singh, S.Sarkar. (2014) Combined effect of tillage-water-nutrient management under rice-wheat agro-ecosystem: A study on chemical indicators of soil quality. <i>Agrochimica</i> 58 (1):63-76	6.31
7.	Bharathi, L. K., Behera, T. K., Singh, R. and Singh, Anita.(2013). Carotenoid contents in sweet gourd (<i>Momordica cochinchinensis</i> Spreng.) accession of India. <i>Indian J.Hort.</i> 70(2) 165-169.	6.11
8.	Chauhan, M K., G T Patle, M Khanna., J.C.Dagar 2013 Climate smart water conservation management technologies. <i>International Journal of Water Resources and Environmental Engineering</i> . 8(xx), pp. xxx-xxx.	7.71
9.	Choudhary, V., Prasanna, R., Nain, L., Dubey, S.C., Gupta, V., Singh, R., Jaggi, S. and Bhatanagar, A.K. (2012) Bioefficacy of novel cyanobacteria-amended formulations in suppressing damping of disease in tomato seedlings <i>World Journal of Microbiology and Biotechnology</i> , 28:3301-3310.	7.35
10.	Dar, S. R., T. Thomas, J. C. Dagar, Khajanchi Lal, Samreen Mehboob, Megna Rashid Bakshi, A. H. Mir, Hidayatullah Mir, A. Kumar and R. K. Malik. 2012. Effect of fertilizer nitrogen and varied C:N ratio of mushroom compost on rice yield and nitrogen forms of soil. <i>Journal of Food, Agriculture & Environment</i> 10: 423-427.	6.00
11.	Dass Anchal, Nain, Ajit Singh, Sudhishri, S. and Chandra, Subhash. 2012 Simulation of maturity duration and productivity of two rice varieties under system of rice intensification using DSSAT v 4.5/CERES-Rice model. <i>Journal of Agrometeorology</i> . 14(1):26-30	6.15
12.	Dass Anchal, Nain, Ajit Singh, Sudhishri, S. and Chandra, Subhash. 2012. Simulation of maturity duration and productivity of two rice varieties under system of rice intensification using DSSAT v 4.5/CERES-Rice model. <i>Journal of Agrometeorology</i> . 14(1):26-30.	6.16
13.	Dass Anchal, Sudhishri, S., Lenka, N. K. and Patnaik, U. S. 2011 Runoff capture through vegetative barriers and planting methodologies to reduce erosion, and improve soil moisture, fertility and crop productivity in southern Orissa, India <i>Nutrient Cycling Agroecosystems</i> . 89:45-57.	7.42



14.	Dass Anchal, Sudhishri, S., Lenka, N. K. and Patnaik, U. S. 2011. Runoff capture through vegetative barriers and planting methodologies to reduce erosion, and improve soil moisture, fertility and crop productivity in southern Orissa, India. <i>Nutrient Cycling Agroecosystems</i> . 89:45–57.	7.73
15.	Douglas, K.B. Dassanayake, D.F. Chapman, I.R. Johnson, M. Khanna, H. Malano (2010). An integrated model for simulation of border-check irrigated dairy pasture production systems. <i>Computers and Electronics in Agriculture</i> . 74(1):39-50.	7.49
16.	Gajender, Gurbacahan Singh, JC Dagar, Khajanchi Lal and RK Yadav. 2014. Performance of edible cactus (<i>Opuntia ficus indica</i>) in saline environments. <i>Indian Journal of Agricultural Sciences</i> 84(4): 509-13.	6.60
17.	Gazala, S. F. I., Sahoo, R. N., Pandey, R., Mandal, B., Gupta, V. K., Singh, R., and Sinha, P. (2013). Spectral reflectance pattern in soybean for accessing yellow mosaic disease. <i>Indian J. Virology</i> . DOI: 10.1007/s13337-013-0161-0.	6.0
18.	Kumar, M., Prasanna, R., Vidyarani, N., Babu, S., Mishra, B. K., Kumar, K., Adak, A., Jauhari, S., Yadav, K., Singh, R. and Saxena, A. K. (2013). Evaluating the plant growth promoting ability of thermotolerant bacteria and cyanobacteria and their interactions with seed spice crops. <i>Scientia Horticulturae</i> 164 pp 94-101.	7.50
19.	Kumar, M., Swarp, A., Bhadraray, S., Patra. A. K., Chandrakala, J.U., Manjaiah, K.M., Rakshit, R., Kumar, S. and Singh, R. (2012) Yield nutritional quality and phosphorous requirement of wheat (<i>triticum aestivum</i> L.) grown under projected elevation of atmospheric CO ₂ and temperature in subtropical India. <i>Agrochimica</i> 56(03):156-174.	6.31
20.	Lenka NK, Mandal D. and Sudhishri S. 2014 Permissible soil loss limits for different physiographic regions of West Bengal <i>Current Science</i> . 107(4):665-669	6.91
21.	Lenka NK, Mandal D. and Sudhishri S. 2014. Permissible soil loss limits for different physiographic regions of West Bengal. <i>Current Science</i> . 107(4):665-669.	6.83
22.	N. Jain , R. Dubey , D. S. Dubey, J.P. Singh, M. Khanna , H. Pathak and A. Bhatia (2013). Mitigation of greenhouse gas emission with system of rice intensification in the Indo-Gangetic Plains. <i>Paddy and Environment</i> ; DOI 10.1007/s10333-013-0390-2	7.03
23.	Nijamudeen, M Singh, M Khanna, B Singh, R Singh, R Pandey and M Hasan 2013 N and K fertilizer application rate under drip-fertigation for green house grown sweet pepper. <i>Indian J. Hort.</i> 70(1): 54-59	6.6
24.	Nijamudeen, M Singh, M Khanna, B Singh, R Singh, R Pandey and M Hasan. (2013) N and K fertilizer application rate under drip-fertigation for green house grown sweet pepper. <i>Indian J. Hort.</i> 70(1): 54-59.	6.11
25.	Panigrahi, P., R.K. Sharma, S.S. Parihar, M. Hasan and D.S. Rana 2013 Economic analysis of drip-irrigated kinnow mandarin orchard under deficit irrigation and partial root zone drying. <i>Irrigation and Drainage</i> 62: 67-73	6.69
26.	Panigrahi, P., R.K. Sharma, S.S. Parihar, M. Hasan and D.S. Rana 2013. Economic analysis of drip-irrigated kinnow mandarin orchard under deficit irrigation and partial root zone drying. <i>Irrig. & Drainage</i> 62:67-73	6.69
27.	Panigrahi, P., R.K.Sharma, M.Hasan, S.S.Parihar. 2014. Deficit irrigation scheduling and yield prediction of Kinnow mandarin (<i>Citrus reticulata</i> Blanco) in semiarid region. <i>Agricultural Water Management</i> 140: 48-60	7.1
28.	Parihar, S.S. and L.K. Idnani 2012. Agronomic research on water management in India: An overview <i>Indian Journal of Agronomy</i> . 52: 102-106	6.0
29.	Pathak H, P Pramanik, M Khanna, A Kumar (2014). Climate Change and Water Availability in Indian Agriculture: Impacts and Adaptation. <i>The Indian Journal of Agricultural Sciences</i> . 84 (6); 671-679.	6.18
30.	Pathak H, P Pramanik, M Khanna, A Kumar 2014 Climate Change and Water Availability in Indian Agriculture: Impacts and Adaptation. <i>The Indian Journal of Agricultural Sciences</i> . 84 (6); 671-679.	6.18
31.	Patil, T., M. Singh, B. Singh, M. Khanna, D.K. Singh and S.S. Parihar 2012 Influence of irrigation interval, nitrogen level and crop geometry on production of trickle irrigated lettuce. <i>Indian J. Horticulture</i> . 69 (3): 360-368	6.6
32.	Patil, T., M. Singh, B. Singh, M. Khanna, D.K. Singh and S.S. Parihar 2012. Influence of irrigation interval, nitrogen level and crop geometry on production of trickle irrigated lettuce <i>Indian J Horticulture</i> 69 (3):360-368	6.13
33.	Patil, T., M. Singh, B. Singh, M. Khanna, D.K. Singh and S.S. Parihar. (2012). Influence of irrigation interval, nitrogen level and crop geometry on production of trickle irrigated lettuce. <i>Indian J. Hort.</i> 69(3): 360-368.	6.11
34.	Patle, G T, D K Singh, A Sarangi, Anil Rai, M Khanna and R N Sahoo. (2013). Temporal variability of climatic parameters and potential evapotranspiration. <i>Indian Journal of Agricultural Sciences</i> 83 (5): 518–24.	6.18



35.	Patle, G T, DKSingh, ASarangi, Anil Rai, M Khanna and R NSahoo 2013 Temporal variability of climatic parameters and potential evapotranspiration. <i>Indian Journal of Agricultural Sciences</i> 83 (5): 518–24	6.18
36.	Patle, G. T., Singh, D. K., Sarangi, A., Rai, Anil, Khanna, M and Sahoo, R.N. 2013 Time series analysis of groundwater levels and projection of future trend. <i>Journal of Geological Society of India (Accepted)</i>	6.57
37.	Prasanna, R., Chaudhary, V., Gupta, V., Babu, S., Kumar, A., Singh, R., Shivay, Y. S., and Nain, L. (2013). Cyanobacteria mediated plant growth promotion and bioprotection against Fusarium wilt in tomato. <i>Eur. J. Plant Pathol.</i> , 136: 337-353.	7.71
38.	R. C. Yadav, A.K. Patra, T. J. Purakayastha, R. Singh & Shiv Kumar 2014 Effect of Engineered Nanoparticles of Fe and Zn Oxides on Enzyme Activity and Bacterial Abundance in Soil at Ambient and Elevated Atmospheric CO ₂ . Proceedings of the National Academy of Sciences, India Section B: Biological Sciences DOI 10.10007/s40011-014-0316-9	6.0
39.	Ram, J., J. C. Dagar, Khajanchi Lal, G. Singh, O. P. Toky, V. S. Tanwar, S. R. Dar and M. K. Chauhan. 2011. Biodrainage to combat waterlogging, increase farm productivity and sequester carbon in canal command areas of northwest India. <i>Current Science</i> 100 (11): 1673-1680.	6.83
40.	Sarvendra kumar, Patra A K, Singh D, Purakayastha T J, Rosin K G and Manoj Kumar 2013 Balanced fertilization along with farm yard manure enhances abundance of microbial groups and their resistance and resilience against heat stress in a semi arid Inceptisol. <i>Communications in Soil Science and Plant Analysis</i> , vol.44, 2299-2313, DOI:10.1080/00103624.2013.803562.	7.0
41.	Satpute S T, Man Singh, M Khanna, A.K. Singh and T. Ahmad 2013 Response of drip irrigated onion crop in irrigation intervals and fertigation strategies. <i>Indian J. Hort.</i> 70(2): 293-295.	6.6
42.	Satpute S T, Man Singh, M Khanna, A.K. Singh and T. Ahmad. (2013). Response of drip irrigated onion crop in irrigation intervals and fertigation strategies. <i>Indian J. Hort.</i> 70(2): 293-295.	6.11
43.	Shahnawaz, R.D., T. Thomas, J. C. Dagar, Khajanchi Lal, A.H. Mir, Ajay Kumar, H. Mir, M.R. Bakshi, Samreen Mehboob and Dhananjay Singh 2012 Zinc and cadmium availability as affected by zinc fertilization and saline water irrigation in wheat (<i>Triticum aestivum</i> L.) grown on cadmium polluted soil. <i>African Journal of Agricultural Research</i> 7: 4996-5004.	6.7
44.	Shridhar, A.S., Prasanna, R., Dubey, S.C., Nain, L., Chaudhary, V., Singh, R. and Saxena, A.K. (2011). Evaluating novel microbe amended composts as biocontrol agents in tomato. <i>Crop Protection</i> 30: 436-442.	7.54
45.	Singh, D., Dikshit, H.K. and Singh, R. (2012). Variation of aluminium tolerance in lentil (<i>Lens culinaris</i> Medik.) <i>Plant Breeding</i> , 131:751-761.	7.34
46.	Singh, D., Dikshit. H.K. and Singh. R.(2013). A new phenotyping technique for screening for drought tolerance in lentil (<i>Lens culinaris</i> Medik.) <i>Plant Breeding</i> doi:10.1111/pbr.12033.	7.34
47.	Sood, A., Singh, P.K., Kumar, A., Singh, R. and Prasanna, R. (2011). Growth and biochemical characterization of associations between cyanobionts and wheat seedlings in co-culturing experiments. <i>Biologia</i> 66/1: 104 – 110.	6.7
48.	Sudhishri S., Kumar A., Singh J. K., Dass A. and Nain A. S. 2014 Erosion tolerance index under different land use units for sustainable resource conservation in a Himalayan watershed using remote sensing and geographic information system (GIS). <i>African Journal of Agricultural Research</i> . 9 (41): 3098-3110.	6.0
49.	Talukdar, A., Verma, K., Gowda, D.S.S., Lal, S. K., Sapra, R. L., Singh, K. P., Singh, R. & Singh, P. (2009) Molecular breeding for charcoal rot resistance in soybean 1. Screening and mapping population development. <i>Indian J. Genet.</i> 69(4): 367-370.	6.19
50.	Yadav, R.C., Patra, A.K., Purakayastha, T.J., Singh, R and Kumar, C. (2014). Effect of engineered nanoparticles of Fe and Zn oxides on enzyme activity and bacterial abundance in soil at ambient and elevated atmospheric CO ₂ . <i>Proceedings of the National Academy Of Sciences, India Section B: Biological Sciences</i> , DOI 10. 1007/s 40011-014-0316-9.	6.0
51.	Yadav, R.K., P.S. Minhas, Khajanchi Lal and R.K. Chaturvedi, Gajender and T.P. Verma. 2015. Accumulation of metals in soils, groundwater and edible parts of crops grown under irrigation with sewage mixed industrial effluents. <i>Bulletin of Environmental Contamination and Toxicology</i> 94 (5):	7.22

23. Details of patents and income generated

None

24. Areas of consultancy and income generated



25. Faculty selected nationally / internationally to visit other laboratories / institutions / Industries in India and abroad

Name	Institutions and Industries Visited
Dr. Ravinder Kaur	<ul style="list-style-type: none"> • Deputed as an Indian expert (from Agricultural Water Mgmt Sector) for an Interactive workshop on development of the South Asia Drought Monitoring System & meetings of the South Asian Climate Outlook Form 6 (SASCOF-6) & Water User Forum at Bangladesh • Invited as an expert Panelist/ Rapporteur in Fulbright Regional Workshop on “Water-Energy-Food Nexus” at Kathmandu • Deputed for Leadership Development Program on “High Performance People Skills for Leaders” at London Business School • Deputed as a panelist/ speaker in a session on “Producing More with Less – What can We Learn from Managing Drought?” at Stockholm World Water Week on “Water Co-operation - Building Partnerships” • Deputed as an Asian/ Indian Panelist/ speaker for a discussion on “Safe Use of Wastewater in Agriculture” in an International Workshop at Sharif Univ. of Technology, Iran • Invited Lead Speaker in Global Water for Food Conference on “Too Hot, Too Wet, Too Dry: Building Resilient Agro-Ecosystems” at Nebraska, USA. • Oral presentation on “Nutrient and trace metal removal efficiency of small scale (batch fed) vertical flow municipal wastewater treatment wetland” (as a <i>Principal Author</i>) in 4th International Eco-summit at Ohio, USA. • Chairman, session on “Ecosystem restoration & ecological engineering” in International Conference on Ecological Sustainability-Restoring the planet’s ecosystem services at Columbus, Ohio, USA. • Consultant to NTOU, Taipei on Developing real time flood forecasting & sediment yield estimating techniques for agro-climatically diverse un-gauged watersheds • Visiting Scientist at Florida University, Gainesville under Environmental Leadership Program on “Evaluating Optimal Design & Processes of Varied Wetland Systems for Water Pollution Control” • Invited Speaker on Land –Water resource monitoring/ mgmt. through field/ watershed scale tools under Occasional Lecture Program around Florida, USA. • Invited Speaker in Spring Seminar Series On Constructed wetlands for improving water quality and livelihood of a backward Indian village at Imokelee, USA. • Member of ICAR delegation for India-US partner collaborative research planning under Indo-US Agricultural Knowledge Initiative at USA. • Visiting Scientist under Food Security and Environmental Sustainability program at ISU, USA. • Invited Indian representative for an Oral Presentation in an International Agriculture Seminar at Purdue University, USA. • Crop-Weather Modeler at WMO, Israel.
Dr. Man Singh	<ul style="list-style-type: none"> • During the professional career the following countries were visited in connection with higher education, training, skill learning and excursions. Belgium, Denmark, France, The Netherlands, Luxembourg, England, Germany, Israel, Italy, Vatican City, Malaysia and Singapore. • Katholieke Universiteit Leuven, Belgium. • Institute of soils and water, State of Isreal.
Dr. Manoj Khanna	<ul style="list-style-type: none"> • National Drought Mitigation Center (NDMC), University of Nebrasaka, Lincoln, USA.
Dr. Khajanchi Lal	<ul style="list-style-type: none"> • University of California, Davis, USA. • Iowa State University, USA. • University of The Melbourne, Australia. • Study visit on ‘Water Quality and Bioremediation’ at Soil, water & Environmental Research Institute (Agricultural Research Centre, Ministry of Agriculture and land Reclamation, Cairo Egypt from September 1 to 14, 2007.



- Advanced training on 'Impact of poor quality waters on plant growth and soil properties' from 1st April to 30th April 2003 held at University of California, Davis, USA.
- Advance training on "Use and adaptation of effluent irrigation design and scheduling models (WATLOAD and WATSKED) for safe disposal of domestic sewage through agro-forestry in Indian conditions" at the Department of Forest and Ecosystem Science, The University of Melbourne, Australia from 27th October to 25th November 2012
- North Karolina State University Raliegh N.C. USA.

Dr. Rajendra Singh

26. Faculty serving in

Name	National/International Committees	Editorial Boards	Any other
Dr. Ravinder Kaur	<p>Deputy Chair, Ethic Committee of International Instt. of Health Mgmt. Research (Since 2014)</p> <p>Member, Joint Panel of ICAR-CWC on Optimizing Returns from Investments on Irrigation.</p> <p>Member, Institute Management Committee, IASRI, New Delhi</p> <p>Member, India-EU/MS GSO, GOI Thematic Group on Water (Since 5.8.2012)</p> <p>Member, GOI, MOWR-NWM constituted Study Group on Water Footprint & Water Audit Standards (Since 30th Sept., 2013).</p> <p>Member, State Ground Water Coordination Committee for National aquifer mapping & management</p> <p>Member, Water Quality Assessment Authority</p> <p>Member, Second Technical Committee for Organizing India Water Week-2015.</p>	<p>Indian Society of Soil Science</p> <p>Indian Society of Soil & Water Conservation</p> <p>Indian Society of Soil Conservation</p>	<p>Coordinator, School of Natural Resource Management</p> <p>Chairman, Water Auditing Committee, IARI</p> <p>Chairman, IARI- Standing Committee on Faculty & Discipline</p> <p>Chairman, Technical Specification Committee w.e.f.15.1.2014</p> <p>Chairman, Interview Board for selection of candidates for PhD degree programme for academic session 2014-15.</p> <p>Member Secretary, Institute Water Mgmt. Committee</p> <p>Member Secretary, ISO 9001: 2008 Recertification Committee of IARI.</p> <p>Member Secretary, Up gradation of the Quality of Teachers & Teaching Techniques at IARI</p> <p>Advisor, Screening of the applications for the post of Head, Division of Biochemistry, Physiology and Environmental Sciences of CRRI, Cuttack (at ASRB on 23 June 2014)</p> <p>Member, Web Content Committee of IARI</p> <p>Member, Academic Council, IARI, New Delhi</p> <p>Member, Extension Council, IARI</p> <p>Member, Results Framework Documents Committee, IARI, New Delhi</p> <p>Member, Plan Monitoring Cell, IARI</p>



Dr. Man Singh	<p>Member Standing Committee on Faculty and Discipline, PG School, IARI, New Delhi (2008 & 2009). Member of the committee of the abstract screening, Transport committee, Indian Science Congress, 2001. Core member of the team of the International Conference Secretariate on managing natural resources, 2001.</p>	<ul style="list-style-type: none"> • Member of Editorial Board Hindi Publications, IARI (2007 -11) • Member of the Editorial board of "Pusa Surabhi", IARI, 2013 • Member of the Editorial board, Journal of Water Management, 2012 • Reviewer, of Journal of Agricultural water management, Elsevier Science, 2005 	<p>Member, Krishi Mela organizing committee Chairman, IARI Fellow Farmer Award-Committee.</p> <ul style="list-style-type: none"> • Member, Academic Council, PG School, IARI, New Delhi (Elected Faculty Representative-2008 & 2009) • Nominated for Best Teacher Award, PG School, IARI, New Delhi (2008 & 2009) • Incharge, examination Center, IARI Ph.D Entrance Examination Varanasi 2013 • Expert Member in DPC of CIFE, Mumbai, Nominee, July,2013 • Member Hindi work-Inspection committee, IARI, 2013 • Invited Key note speaker in National Conference of Plant Physiology – 2013 on Current Trends in Plant Biology Research, Junagadh, Gujarat,2013
Dr. S.S. Parihar	<p>International Agronomy Congress (2012), Member Organizing Committee 4th World Congress on Conservation Agriculture(2009) Member Organizing Committee. International Rice Congress (2006) Member Organizing Committee. 44th Indian Society of Agricultural Engineers Convention (2010) Member Organizing Committee.</p>	<p>Member, ISA, New Delhi (2007 continuing) Member, ISWM, New Delhi (from 2011 continuing)</p>	
Dr. B.S. Kalra	NIL	NIL	NO
Dr. Manoj Khanna	<p>Member, Panel on irrigation water management, Bureau of Indian Standards, GOIMember, Working group of WMO on development of Hydrological Drought Indices.</p>	NIL	
Dr. Khajanchi Lal	<p>Member of MS Thesis Examination Committee of University of Illinois, Urbana Champaign , USA. Participating scientist from Indian Side for the planning and formulation workshop of Water Management under Indo-US AKI.</p>	Nil	
Dr. Susama Sudhishri	<p>Member in Technical and publication committee, and poster evaluation committee in International conference held at NASC complex, New Delhi</p>	-	<ul style="list-style-type: none"> • Question paper setter for ICAR and some of the agricultural universities examinations.



	during February 2015 organized by SCSI			<ul style="list-style-type: none"> Acted as Co-chairman and convener of three sessions of conferences organized by ISAE during 2012-2015 Member-secretary of BoS of WST discipline and Member in credit seminar (WST) evaluation committee Member in Technical cell (WTC) till 2013 I/C of SWC and Watershed Hydrology lab. Nodal Officer of Internet and network facility
Dr. Rajendra Singh	Member of Phytotron International training panel of UNDP FAO.			
Dr. Neeta Dwivedi				<ul style="list-style-type: none"> Joint Secretary in “The Society for Science of Climate change and sustainable environment
Dr. D.S. Gurjar	Nil		Nil	<ul style="list-style-type: none"> Member-Secretary of BOS of WST discipline in 2013-14 and 2014-15. OIC(Building), WTC. Store Officer, WTC (2013 & 2014)
Mrs. Rosin KG	Nil		Nil	<ul style="list-style-type: none"> Member of Purchase Committee. Member of Quotations Collection Committee.

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs):

Faculty regularly attends international and national conferences, seminars, workshops, winter schools, summer schools, training and other events.

28. Student projects

Percentage of students who have done in-house projects including interdepartmental projects:

All the students have done their dissertation in the department or with sister departments. In MSc. Collaboration with one discipline and in Ph.D. with two disciplines is must.

Percentage of students doing projects in collaboration with other universities/industry/institute:

None

29. Awards/recognitions received at the national and international level by

a) Faculty

Name	Awards/Recognitions
Dr. Ravinder Kaur	<ul style="list-style-type: none"> Dr V.R. Rao Memorial Award in 1990 ICAR- Jawaharlal Nehru Award in 1992 ICAR-Young Scientist Award in 1998 ICAR- Punjab Rao Deshmukh Women Agricultural Scientist Award in 2001



Dr. Man Singh	<ul style="list-style-type: none"> • ICAR- National Fellow position in 2005 • Environmental Leadership Award in 2011 • Bharat Jyoti Award in 2012 • Honorary Membership Award by the Soil Conservation Society of India, in 2015 • CGIAR - IHELP Fellow at Iowa State University, USA (2000); • Fulbright Fellow at University of Florida, USA (2010) & • Visiting Scientist at National Taiwan Ocean University, Taiwan (2010 to 2012). • Team Award, ISAE, 2014 • Award of Honour as an Expert in Irrigation Engineering 2007-2011 Indo-US Science and Technology Forum, Min. of Science and Technology, Govt. of India. • Best Poster Award, Indian Society of Agriculture Engineers, 2008-09 • Best Poster Award , Indian Society of Water Management 2007 • Best Paper Award, Indian Society of Agriculture Engineers 2012 • Best Paper Award , Indian Society of Coastal Agricultural Research, Canning Town, WB, India, 2002-03 • Jawaharlal Nehru Award , ICAR, 2002 • MASHAV Fellowship of the State of Israel, 1996 • Krishi Vigyan Sambandhi Hindi Lekh Pratiyogita Puraskar, MoA, GOI & State of Israel, 1996 • Belgian Govt. Fellowship, Jointly by Min. of HRD, Govt. of India and Kingdom of Belgium 1992 • Krishi Vigyan Sambandhi Hindi Lekh Pratiyogita Puraskar, IARI, 1995-96
Dr. S.S. Parihar	<ul style="list-style-type: none"> • Ground Water Augmentation Award, Ministry of Water Resources, GOI • Best Paper Award, Indian Society of Agronomy (1999) • Best Paper Award, Indian Society of Agronomy (2004) • Best Paper Award, Indian Society of Water Management (2007) • Best Paper Award, Indian Society of Agriculture Engineers (2013)
Dr. B.S. Kalra	<ul style="list-style-type: none"> • First Prize under Award Scheme For Case Studies In CAD Projects, 1998-99 and 1999-2000 by CAD Wing Ministry of Water Resources Government of India)
Dr. Manoj Khanna Dr. Khajanchi Lal Dr. Susama Sudhishri	<ul style="list-style-type: none"> • Team Award, ISAE, 2014 • Nil • Vasant Rao Naik Award from ICAR during 2002-03 • Distinguished service certificate award from Indian Society of Agricultural Engineers during 2015 • Life member of six national societies related to my discipline • Appointed as Treasures of ISAE from 2015-2018 • Consolation prize for the project NATP, RRPS-24 • Received best poster ward in a team during 2012 for “Effect of conservation practices on C-sequestration, water and system productivity in wheat based cropping system” in Third International Agronomy Congress held at New Delhi
Dr. Rajendra Singh	<ul style="list-style-type: none"> • FAO (UNDP) Fellowship award for advance study in phytotron research technique(International), 1996. • Best paper on “Role of aromatic plants for treatment of heavy metal toxicity”, 2012 • Best poster on “Impact of elevated CO₂ and temperature on nitrogen dynamics and microbial activity in soil”, 2012. • Best poster on “Hemtaoxylin staining as a potential screening method for aluminium tolerance in maize.
Dr. Neeta Dwivedi	<ul style="list-style-type: none"> • Best Poster Award in International Conference on Natural Resource Management for Farming Systems and Rural Livelihood during 10-13 February, 2015 to Dwivedi N, Singh K, Shukla S, Kaur R, on Effect of Drought stress on yield and photosynthetic related traits in maize (<i>Zea mays</i> L.) varieties. • Best paper award for the publication of research paper Entitled Uprety, D.C., D.C. Saxena, Neeta Dwivedi, Anupam Raj , Ganesh Paswan, Ranjan Das and Sujatha (2006). “Response of plants to the rising concentration of atmospheric carbon dioxide: An analysis” (Bharati vayganik avm audogik anusandhan patrika) J.Sci. Ind. Res. 14, 2: 186-191.
Dr. D.S. Gurjar Mrs. Rosin KG	<ul style="list-style-type: none"> • Young Scientist Associate Award, SRDA (2009) • Best oral presentation award, RAINFED-2015

b) Students

- Two Ph.D students of the discipline of Water Science and Technology won IARI Merit Medal in the convocation of 2012 and 2015.



- One Ph.D student of the discipline of Water Science and Technology received ICAR Jawaharlal Nehru Award for his outstanding Doctoral work.

30. Seminars/Conferences/Workshops organized and the source of funding (national/ international) with details of outstanding participants, if any:

Seminar/Conference/Workshops	Source of Funding	Details of participants
1. Course Director: 21 Days Summer/Winter School on 'Recent Advances in Diagnostic Technologies for Management of Poor Quality Water/Soils' at CSSRI, Karnal from 18 th November 2008 to 8 th December 2008.	ICAR	20
2. Convener/ Coordinator: National Training Course on Conjunctive Use of Canal and Ground Water including Use of Brackish Water organized at CSSRI, Karnal sponsored by Ministry of Water Resources from 18-23 February 2008.	Ministry of Water Resources, Government of India	18
3. Experiential Learning Training Programme on Wastewater Use in Agriculture for Graduate Student from Iowa State University, USA from 27.5.2008 to 15.8.2008	Indo-US AKI on Water Management	2
4. Organized a brain storming session on 'Sustainable Disposal of Domestic Sewage Effluents' sponsored by AusAID at Water Technology Centre, IARI, New Delhi on 30 th March 2012	AusAID	30
5. Organized International Workshop on "Understanding Water-Energy-GHG nexus for future water and food security" September 27-28, 2012, New Delhi; Sponsored by Australia-India Institute, Organizing Secretary	Sponsored by Australia-India Institute, The University Of Melbourne, Australia	202 participants (Both National and International)
6. National Convention on Knowledge-Driven Agricultural Development: Management of Change in 2006	ARS Scientist Forum, New Delhi Sponsored by ICAR and Society for Promotion of Agricultural Research and Knowledge	300
7. Summer School on Use of Modern Tools for Increasing on Farm Water Use Efficiency, 2003 -Course Coordinator	Education Division, ICAR, KAB-II, New Delhi -110012	
8. 88 th Indian Science Congress on Food, nutrition and environmental security (2001), IARI, New Delhi-Member, Transport committee Member, Abstract Screening committee Received Director's appreciation letter for the contribution.	Indian Science Congress Association, scientific Professional societies and several Agency of Govt. of India	4000
9. International Conference on Managing Natural Resources for Sustainable Production in the 21 st Century. (2000)- Member, Core group of the Conference Secretariat.	Main sponsors: ICAR; MoA, GOI; NAAS; MoEF, GOI; IDRC; MAHYCO Co-sponsors: Ministry of Water Resources, Govt. of India and Monsanto Enterprises	3000
10. National Workshop on "Agricultural Scientists' Perception on National Water Policy" under the leadership of Dr. M.S. Swaminathan (1995)- Editor of the presented and invited papers culminating into the publication of the draft: "Agricultural Scientists' Perceptions"	The National Academy of Agricultural Sciences (NAAS) and ICAR	
11. Workshop-cum-seminar on Water Management Technology (1989)- Course Coordinator	Directorate of Extension, Ministry of Agriculture, Govt.of India	



31. Code of ethics for research followed by the departments

As per ISO 9001-2008 Standard

32. Student profile programme-wise (2014-15)

Name of the Programme (refer to question no. 4)	Applications received	Selected		Pass percentage	
		Male	Female	Male	Female
M.Sc.	Admissions are made through ICAR	4	1	-	-
Ph.D.	10	2	-	20.0	-

33. Diversity of students

Name of the programme (refer to question no. 4)	% of students from the same university	% of students from other universities within the state	% of students from universities outside the State	% of students from other countries
M.Sc.	NIL	NIL	50	50
Ph.D.	78	NIL	11	11

34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise:

- 1 Student is in Indian Administrative Service (IAS)
- 2 Students are in IAS Allied services
- 1 Student is in Indian Revenue Service (IRS)
- 1 Student is in Indian Forest Service (IFS)
- 3 Students are in Agricultural Research Service (ARS)
- 2 Students are in Bank Services in India
- 1 Student is Assistant Professor in PAU, Ludhiana
- 1 Student is in IWMI as Researcher
- 2 Students are continuing their career as researcher abroad
- Other students are working in private organizations at higher positions.
- No student of the discipline is Jobless.

35. Student progression

Student progression	Percentage against enrolled
UG to PG	No UG
PG to M.Phil.	No M. Phil.
PG to Ph.D.	85 %
Ph.D. to Post-Doctoral	All students after Ph.D. get Jobs and only few go abroad for post doc.
Employed	All our students get 100% (at least class I) Job and many have more than one job in hand and before the completion of their degree.
Campus selection	
Other than campus recruitment	
Entrepreneurs	Nil

36. Diversity of staff:

Percentage of faculty who are graduates	
Of the same university	50
From other universities within the state	14
From universities from other States from	18
Universities outside the country	18

37. Number of faculty who were awarded M. Phil., Ph.D., D.Sc. and D.Litt. during the assessment period:None

**38. Present details of departmental infrastructural facilities with regard to**

- Library: one
- Internet facilities for staff and students: Every room/ laboratory/ class room/lecture room has computer with internet connection and WIFI.
- Total number of class rooms: Two
- Class rooms with ICT facility: two
- Student's laboratories: 1
- Research laboratories: 8

39. List of doctoral, post-doctoral students and Research Associates

- from the host institution/university: b) from other institutions/universities

ICAR holds M.Sc. Entrance and IARI holds Ph. D. Entrance Examination at National level.

S.No.	Name of the M. Sc. student	University of Graduation
1	Piyush Rai	BHU, Varanasi, Utter Pradesh
2	Abhinav Krishna	MPKV, Rahuri, Maharashtra
3	Gregory M Kpowulu	Cuttington University, Suacoco, Liberia
4	Raghu Kumar Addamane S	UAS, Raichur, Karnataka
5	Vikash Kumar	BHU, Varanasi, Utter Pradesh
6	Ali Mohammad	Balkh University, Mazari Sharif, Balkh, Afghanistan
7	Fardin	Balkh University, Mazari Sharif, Balkh, Afghanistan
8	Naqibullah	Nangarhar University, Jalalabad, Afghanistan.

S.No.	Name of the Ph.D. student	Host/other institute/ university
1	Sunil Kumar	IARI, New Delhi
2	Arun Kumar Gupta	IARI, New Delhi
3	Vijay Kumar Prajapati	IARI, New Delhi
4	Aslam Latif Pathan	IARI, New Delhi
5	Basavaraj Rayappa Pujari	IARI, New Delhi
6	Amin Chirag	IIT, Kharagpur, W.B.
7	Celestin Defo	University of Dschang, Cameroon
8	Prachi Dhananjay Patil	IARI, New Delhi
9	Suman Kumar	IARI, New Delhi

RA/SRF in the Division

S.No.	Name	Designation	Qualification	Host/other institute/ university
1.	Kalpna singh	SRF	M.Sc	Jiwaji University
2.	Jitesh Kumar	SRF	M.Sc	Jiwaji University
3.	Vimal Kumar	SRF	M.Sc	Jiwaji University

40. Number of post graduate students getting financial assistance from the university

All the students get fellowship either from IARI, ICAR, UGC, DST, CSIR and other funding agencies.

41. Was any need assessment exercise undertaken before the development of new Programme (s)? If so, highlight the methodology

Not applicable

42. Does the department obtain feedback from

Yes

- Faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

Feedback from students and faculty is taken into consideration for revising course curricula as well as improve teaching –learning evaluation. Rigorous exercise first at divisional level, school level and then at Institute level



is done and input is taken from experts and resource persons from the particular field from renowned Universities and Institutes.

- b) Students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Faculty is advised to improve and students' suggestions are taken into consideration for further improvement.

- c) Alumni and employers on the programmes offered and how does the department utilize the feedback?

This is also discussed with alumni. There is a strong feeling amongst the alumni that we should have a dynamic process for this. We try to incorporate suggestions given by alumni and requirement agencies.

43. List the distinguished alumni of the department (maximum 10)

S.No.	Name and address	Passing Year
1.	Mr. Kapil Shirsat, Indian Administrative Service, Bihar Cadre, Patna	2005
2.	Dr.Santosh Deshmukh, Manager, Jain Irrigation Private Ltd., Jalgoan, Maharashtra	2007
3.	Dr. Dhara Singh Gurjar, Scientist, IARI, New Delhi	2008
4.	Mr.Abhijeet Choudhary, Indian Revenue Service, GOI	2008
5.	Dr. Amol Shinde, Pune	2010
	Dr.Sanjay Kumar Satpute, Assistant Professor, Department of Soil & Water Engineering, PAU, Ludhiana	2011
7.	Dr.Abdel-rahmanA. Mustafa, Lecturer, Soil & Water Department, Sohag University, Sohag, Egypt	2011
8.	Mr.Tushar Chauhan, Indian Forest Service	2011
9.	Dr. Sami I. M. N. Gabir, Assistant Professor, Dept. of Agricultural Engineering, Faculty of Agricultural Science, University of Gezira, Wad Madani, Sudan.	2014
10.	Dr.N.S.Abeysingha, Lecturer, Department of Agric.Engineering and Soil science, Rajarata University of Sri Lanka, Anuradhapura, Sri Lanka	2015

44. Give details of student enrichment programmes (special lectures/workshops/seminar) involving external experts

Guest Lectures, lectures by adjunct faculty, and award lectures held very regularly and students and faculty attend seminars, workshops and conferences very regularly.

45. List the teaching methods adopted by the faculty for different programmes

white board, OHP, LCDs and smart class room, assignments, term papers, quizzes, practical training.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

At Divisional level professor monitor academic activities and Dean and Joint Director monitor at Institute level.

47. Highlight the participation of students and faculty in extension activities

Faculty and students participate in extension activities especially during Pusa krishi Vigyan mela and also have interaction with various stake holders at divisional level.

48. Give details of “beyond syllabus scholarly activities” of the department

Study tours, visit to various institutes and laboratories for exposure, sports are held at institute, region, all India and Universities level. Participation in performance art, students have students union which have cultural and sports secretary.

49. State whether the programme/department is accredited/ graded by other agencies? If yes, give details

Accredited by the Accreditation Board, Indian Council of Agricultural Research, New Delhi

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied

- Designing and developing the new course “WST 615 Water management technologies for rainfed agriculture (2+1)) jointly w.e.f 1st Trimester 2008-09.
- Developed a new course Wastewater Management in Agriculture WST 515/AG 515



- Different improvement technologies for saving of water and nutrient in crop and cropping system using different agricultural conservation practices and other efficient management practices were developed on sustainable basis.
- Strategy formulation for management of poor quality groundwater to achieve higher productivity in Biwan watershed of Mewat, Haryana.
- Developed optimized cropping pattern plan using soil quality information for Biwan watershed of Mewat.
- Developed conjunctive water use strategy for use of saline and wastewater irrigation in Indian mustard.

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department

Strengths

- Scientists with diverse expertise, high motivation and dedication.
- Dynamic course curricula of International standard
- Infrastructure: Laboratories, Instruments, Library, online resources, Smart class rooms
- Highly placed alumni

Weaknesses

- International and national linkages with well defined collaborative research programmes and with industries
- Young scientist for capacity building and advance training in frontline area is required.
- Centre for Advanced Studies (CAS)
- Dearth of technical support, Working hand and supporting staff.

Opportunities

- Centrally located hence, many Research Institutes, University are there for collaboration
- Training in Front areas
- Guest/visiting scientist lecture
- All funding agencies are in Delhi hence can be approached for liberal funding.

Challenges

- Competition from ICAR and other institutes/SAUs and other Universities
- Linkages with International research Organizations
- Regular updating of technology and manpower in core area is needed
- Further strengthening of in house laboratories with skilled manpower
- Develop sandwich programme for Ph.D. students with Universities abroad.

52. Future plans of the department

EDUCATION

Enhancement of the quality of human resources

- Efforts will be made to enable the scientists through upgradation of knowledge and skill specifically in the area of water quality, wastewater management and irrigation water management.
- Efforts will be made to initiate sandwich Ph.D. programs for all Ph.D. students with International Institutes
- Young scientists will be encourages to go for 6-12 months training at world leading Institutes through ICAR/ DST/DBT fellowships
- Efforts will be made to attract significant number of DST Inspire Scientists, DBT Ramalinga Swamy Fellows, BioCare women scientists, etc.
- Monthly seminars by invited scientists from other Institutes and regular faculty seminars will be organized.
- To enhance the research quality and output, Ph.D. students who have completed 2 years will be encouraged to present research progress once in six months.



RESEARCH

1. Improving water and nutrient use efficiency of irrigated and rainfed agricultural systems

After achieving full irrigation potential in India, about 50 per cent of the cultivated area will continue to remain rainfed. Water and nutrient saved due to efficient agricultural practices is equivalent to generation of these precious resources. Under adequate irrigation water supply condition the objective of irrigation is to secure potential yield of crops without wasting water. However, under limited water supplies, optimizing production is a bigger challenge than that with adequate water supplies. Nitrogenous fertilizers are widely used in agriculture and there exists scope for improvement in the water and nitrogen use efficiency. Therefore basic and applied research pertaining to the Nitrogen dynamics, its budgeting and pathways besides its uptake by plant system through state-of the art experimentation facility is essential to devise water and nutrient schedulers for different crops and vegetables in different soil types and agro-hydro-climatic conditions. This necessitates development and standardization of location specific in-situ and ex-situ moisture conservation practices for enhancing productivity under rain fed conditions. It also requires development of suitable crops and cropping system for enhancing water and nutrient use efficiency under both irrigated and rain fed situations. Therefore, these studies under different irrigation regimes, fertilizer and irrigation schedules and rain fed situations need to be undertaken to develop and standardize water and nutrient schedules for different crops and its dissemination and adoption by farmers for enhancing input use efficiency.

2. Crop yield forecasting, drought detection, monitoring and risk assessment using agro-meteorology, remote sensing and crop simulation models

It is understood that there is no substitute for generation of experiment/primary data and models cannot replace or performs better than the data acquired from real field experiments. But, conduction of experiments for a longer period is not only costly but also a time consuming affair. Therefore, mathematical models which acts as the abstract of real world phenomenon developed through more plausible and process based parameters can be used for prediction of crop yield, detection of drought and uncertainties associated in different agricultural activities. In this context, it becomes imperative to develop or use different models for simulation of crop growth and yield, hydrological responses of different systems and monitoring of drought based on agro-hydro-climatic information in conjunction with bio-physical environment and devise adaptation measures to prevent the damage and ensure certain level of agricultural production. These models when used in conjunction with geospatial tools, assists in better input data preparation and display of the model output with easy-to-interpret and discernable format. In this context, development and refinement of models in these areas will assist in generation of deliverables for subsequent up-scaling which can be disseminated not only to policy makers and academicians but also to stakeholders for devising appropriate adaptation strategies for sustaining agricultural production.

3. Waste water management for use in agriculture

Under water scarcity scenarios, use of wastewater for irrigation will be inevitable. Indiscriminate use of raw or partially treated wastewater impairs quality of natural resources, contaminate food chain and pose serious threat to human and animal health. It calls upon developing best management practices, effective and affordable remediation technologies. Phyto-remediation that uses hyper accumulator plants are in general slow growing and produces low biomass. Therefore, plants which are both high biomass producing and hyper-accumulator with some economic value need to be identified. Chelating agents which facilitate metal uptake can make this technology a commercial reality. Use of chemically treated low-cost bio-adsorbents obtained either from cellulosic waste materials or dead microbial biomass can be another innovative and alternative technology for removal of heavy metals from wastewater. Crops with non-edible part like cut flowers, aromatic grasses etc., which will also prevent the entry of pollutant in the food chain, need to be evaluated for their tolerance to salinity, heavy metal toxicity and phytoremediation potential. Role of phosphate, lime, kaolin, zeolites, vermiculite which render the metal unavailable to the plants need to be studied for their efficiency. Use of biopolymers as specific chemical binding agents also.

