

**Prioritization Monitoring and Evaluation Cell  
ICAR-IARI, NEW DELHI**

**Information for IARI Annual report (2017- 2020)**

**1. The information on various projects during the period is as follows.**

**Externally funded projects sanctioned during the period 01.04.2017 to 31.03.2020**

<b>Name of funding Agency</b>	<b>Number of Projects</b>
<b>National</b>	
Agricultural Technology Application Research Institute	1
Board of Research in Nuclear Sciences (BRNS)	4
Council of Scientific and Industrial Research (CSIR)	5
Department of Agriculture, Cooperation and Farmer's Welfare (DAC&FW)	2
Department of Biotechnology (DBT)	37
Defence Research and Development Organization (DRDO)	1
Department of Science Technology	48
Himachal Pradesh Council for Science Technology & Environment	1
Indian Council of Agricultural Research	36
Ministry of Environment, Forest & Climate Change (MOEF&CC)	1
Ministry of Human Resource Development (MoHRD)	2
National Bank for Agriculture & Rural Development	3
National Food Security Mission (NFSM)	2
Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA)	1
Space Application Centre (SAC)	1
SERB-Federation of Indian Chambers of Commerce and Industry	1
<b>International</b>	
BeutscheGesellschaftfür International Zusammenarbeit (GIZ) GmbH, Germany	2
Bill & Melinda Gates Foundation	1
Centre for Agriculture & Biosciences International	1
Harvest Plus-International Food Policy Research Institute, USA	1
Japan International Research Centre for Agricultural Sciences, Japan	1
PEER, US-National Academies of Sciences	1
IRRI (International Rice Research Institute), Laguna	1
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## All India Coordinated Research Projects

Sl. No.	Name of the project	Division
<b>Project Head Quarters</b>		
1.	All India Coordinated Project on Plant Parasitic Nematodes with integrated Approach for their control.	Division of Nematology
2.	All India Network Project on Pesticide Residues	Division of Agricultural Chemicals
3.	All India Coordinated Research Project on Honey Bees and Pollinators	Division of Entomology
<b>National/Voluntary Centres functioning at IARI under AICRP</b>		
4.	All India Network project on Soil Biodiversity - Biofertilizers (Erstwhile All India Coordinated Research Project on Biological Nitrogen Fixation)	Division of Microbiology
5.	All India Coordinated Project on Long Term Fertilizer Experiments	Division of Soil Science & Agricultural Chemistry
6.	All India Coordinated Research Project on Soil Test Crop Response Correlations	Division of Soil Science & Agricultural Chemistry
7.	All India Coordinated Research Project on Floriculture	Division of Floriculture & Landscaping
8.	All India Coordinated Research Project on Renewable Energy Sources for Agriculture and Agro-based Industries	Division of Environmental Sciences
9.	All India Coordinated Research Project on Soybean	Division of Microbiology
10.	All India Coordinated Research Project on Fruits	Division of Fruits & Hort. Technology
11.	All India Coordinated Research Project on N.S.P.(Crops)	IARI, New Delhi
12.	All India Coordinated Research Project on Mustard.	Division of Genetics
13.	All India Coordinated Research Project on Wheat.	Division of Genetics
14.	All India Coordinated Research Project on Rice	Division of Genetics
15.	All India Coordinated Research Project on Pulses.	Division of Genetics
16.	All India Coordinated Research Project on Vegetable	Division of Vegetable Science.
17.	AINP on Whitegrubs and other Soil Arthropods (AINPWOSA)	Division of Entomology
18.	All India Coordinated Wheat & Barley Improvement Project (AICW&BIP)	K.V.K. Shikohpur, Gurgaon
19.	Front Line Demonstration on Pearl Millet – AICRP Pearl Millet under National Food Security Mission (NFSM)	K.V.K. Shikohpur, Gurgaon
20.	All India Coordinated Research Project on Vegetable Crops	IARI RS, Katrain
21.	Adhoc Cooperating Center of AICRP on Micro and Secondary Nutrients and Pollutant Elements in Soils and Plants, Indian Institute of Soil Science, Bhopal	Division of Soil Science & Agricultural Chemistry
22.	All India Coordinated Research Project on Ergonomics & Safety in Agriculture (ESA)	Division of Agril. Engineering
23.	All India Coordinated Research Project on Pearl Millet	Division of Agronomy
24.	All India Coordinated Research Project on Rapeseed-Mustard	Division of Agronomy
25.	All India Network Research Program on Onion & Garlic (AINRPOG)	Division of Vegetable Science

## Research Advisory Committee

### School-wise Recommendations of RAC 2019

Subject: RAC Recommendations for ICAR-IARI, New Delhi- reg. The RAC meeting of ICAR-IARI was held on December 12–13, 2019 under the Chairmanship of Prof. V. L. Chopra, Former Member Planning Commission, Govt. of India and Former Secretary, DARE and DG ICAR at Dr. M.S. Swaminathan Library Conference Hall. The meeting was attended by other members of RAC viz., Dr. A.K. Sikka, Former DDG (NRM), ICAR, New Delhi and currently Representative-India and Principal Researcher, IWMI; Dr. J.P. Tandon, Former Project Director, Directorate of Wheat and Barley Research, Karnal; Dr. K.V. Peter, Ex. Vice Chancellor, KAU, Vellanikkara, Kerala; Dr. B.S. Parmar, Former Joint Director (Research), IARI, New Delhi; Dr. J.P. Khurana, Professor, Plant Molecular Biology, South Campus and Pro Vice Chancellor, Delhi University; Dr. R. S. Deshpande, Ex-Director, Institute of Social and Economic Change, Bengaluru; Dr. D.K. Yadava, Assistant Director General (Seed), ICAR, New Delhi; Dr. A. K. Singh, Director, IARI, New Delhi and Dr. Ashok. K. Singh, Joint Director (Research) (Member Secretary), Joint Director (Extn.), Joint Director (Education) and Dean, Joint Director (Admn), Comptroller, Head of Divisions, Head of Regional Stations, Incharges of Units and Chief Admn Officers also participated in the meeting. School-wise presentations were made by School Coordinators for research achievements which were followed by Dean & Joint Director (Education) for post graduate school achievements, Joint Director (Administration) for Administrative activities and Comptroller for financial matters. In addition to the school-wise discussions, the Chairman and all RAC Members also held a separate meeting with Director and Joint Director (Research), IARI and discussed about the future thrust areas and road map to make IARI an Institution of Eminence. RAC members also visited the field experiments and laboratories of some of the Divisions, The salient recommendations along with comments of Crop Science Division are placed below for kind perusal and necessary action

SN	Recommendations	Comments by SMD
	<b>School of Crop Improvement</b>	
1.	In the varietal development programme for conservation agriculture, water use efficiency (WUE), nutrients use efficiency (NUE), physical, chemical and biological properties of soil should also be taken into consideration.	Agreed
2.	Special efforts are required to popularize bio-fortified maize hybrids for crop diversification in rice-wheat cropping system	Agreed
3.	Focus to be given on pre-breeding and use of innovative methods like genome editing for crop improvement	Agreed
	<b>School of Horticultural Sciences</b>	
4.	Biotic stress in solanaceous crops should be focused especially on Phomopsis and bacterial blight in brinjal and tomato, respectively as well as abiotic stress against salt and cold resistance.	Agreed
5.	Iron deficiency is major threat and anaemic population is increasing in India. Therefore, vitamin and mineral rich bio-fortified vegetable varieties should be developed to alleviate nutritional hunger.	Agreed
6.	Comparison of vegetable production under traditional farming vis-a vis natural or good agricultural practices (GAP) production systems should be done.	Agreed

7.	Pre-breeding should be integral part of different horticultural crops for transferring specific traits in otherwise popular varieties/rootstocks.	Agreed
8.	Rootstock breeding should be given emphasis. In vegetables, grafting should be attempted using indigenous rootstock species to address the problems of bacterial wilt and other diseases in tomato, brinjal, chilli and melon etc.	Agreed
9.	To minimize the post harvest losses, research on extending the shelf-life, primary and secondary processing and scalable value-addition technologies should be strengthened to enhance farmers' house-hold income and to meet demand of industry.	Agreed
10.	Processing technologies needs to be developed and optimized to improve the yield, functionality, shelf-life and bioavailability of various macro-, micro- and phyto-nutrients in the processed and fortified foods for enhancing their consumer acceptability and economic viability.	Agreed
11.	More impetus to vertical farming particularly on scheduling and fertigation and minimizing cost of cultivation is required.	Agreed
	<b>School of Basic Sciences</b>	
12.	Rice germplasm and RILs have been identified for variation in diurnal and nocturnal transpiration using phenomics facility. The physiological and molecular mechanisms of nocturnal transpiration need to be addressed for its use in crop improvement.	Agreed
13.	Water use efficient germplasm identified in rice and wheat in the phenomics facility should be taken forward for their use in QTL mapping and crop improvement.	Agreed
14.	Interaction of elevated CO <sub>2</sub> on WUE of crops needs to be studied considering the climate change scenario.	Agreed
15.	Genome editing need to be given more emphasis for development of elite mutants with high resource use efficiency, stress tolerance and quality	Agreed
16.	Abscisic acid receptors play key role in stress tolerance and developmental process. Role of different ABA receptors on reproductive development and stress tolerance may be analysed using functional genomics approach.	Agreed
17.	Studies on physiological interventions such as spray of MOP or other growth regulators to enhance heat stress tolerance and grain yield in wheat may be undertaken.	Agreed
18.	Research work on P and K, and micronutrient efficiency and tolerance to heat stresses may be taken up in the new projects	Agreed
19.	In addition to rice and wheat, millets, oilseeds and pulses may be included in the basic research	Agreed
20.	Research work on changes in quality of crops under abiotic stresses may also be taken up.	Agreed
21.	Targeted nutrient profiling should be attempted in major cereals (wheat, rice, pearl millet), pulses (chickpea and pigeonpea) and oilseeds (soybean) to identify nutrient-dense donors and factors	Agreed

	controlling their accumulation need to be unearthed to develop nutritionally enhanced food crops, with improved content and bioavailability of essential nutrients.	
	<b>School of Natural Resource Management</b>	
22.	Field experiments need to be conducted to evaluate STFR Meter-based recommendations with the conventional fertilizer recommendations.	Agreed
23.	Research on risk assessment of arsenic-contaminated soils should be strengthened including the areas with high possibility of such contamination.	Agreed
24.	For CA experimentation, specific varieties developed by the Crop Improvement School should be used.	Agreed
25.	Complete analysis of treated waste water with respect to heavy metals and other contaminants, impact on soil physical and chemical properties, microorganisms and the food safety of produce needs to be studied. Guidelines for use of waste water should be developed.	Agreed
26.	In Integrated Farming System model interaction among different enterprisers in terms of nutrient, water and energy saving needs to be analyzed.	Agreed
27.	Research work on sensor-based soil and plant health characterization and inputs application should be initiated.	Agreed
28.	Research work on drone-based monitoring of crop disease, pest, nutrient and irrigation should be strengthened.	Agreed
29.	Potential use of alternate sources for urea coating in mitigation/mitigationadaptation of greenhouse gas emission in agriculture should be explored.	Agreed
30.	The efficacy of plant-based oil extract (egKaranj oil) and its use with urea should be compared with neem coated urea for their GHG mitigation potential in agriculture.	Agreed
31.	Crop residue management technologies integrating mechanical and microbial solutions should be demonstrated at farmers' fields to alleviate residue burning problems.	Agreed
32.	Use of green energy (solar and bio) powered technologies should be demonstrated at farmers' fields.	Agreed
33.	Efforts may be intensified for obtaining patent, license and commercialization of developed technologies.	Agreed
34.	Saving of water due to hydrogel application must be worked out and hydrogel should be aggressively promoted along with precision irrigation	Agreed
	<b>School of Plant Protection</b>	Agreed
35.	A document on potential biocontrol agents/ bioformulations with proven bio efficacy be prepared for generating toxicological data before commercialization.	Agreed
36.	A clear roadmap with timeline needs to be developed for discovery and commercialization of the potential new molecules. A strategy needs to be developed by the Institute in line with	Agreed

	industry requirements and partnership, for the validation of bio efficacy, safety and toxicological data required before offering the products to the industry.	
37.	Work on the development of indigenous quality formulations, particularly those of biopesticides, should be supported to keep pace with the current international interest in these products. Economics of bioformulations developed should be estimated.	Agreed
38.	Impact assessment of the formulations already commercialised should be done.	Agreed
39.	Concerted efforts must be made to promote and commercialize the new version of Pusa Hydrogel technology viz. Pusa SPG 1118 hydrogel and constraints in large scale adoption, if any, should be identified and addressed	Agreed
40.	Emphasis should be given on establishment of pilot plant facility for synthesis of bulk materials like hydrogels and extraction/ synthesis of bio actives.	Agreed
	<b>School of Social Sciences</b>	Agreed
41.	Impact analysis of various flagship programmes of the Government should be undertaken.	Agreed
42.	Latest and robust research methodologies should be used in Social Sciences research.	
43.	Impact assessment of IARI technologies should be carried out and documented.	Routine
	<b>Post Graduate School</b>	
44.	Student intake should be increased to improve ranking in National Institute Ranking Framework.	May move a separate proposal
	<b>Administration/ Finance</b>	
45.	Vacancies of technical and supporting staff should be filled on priority.	To be done on priority
	<b>General recommendations</b>	
46.	Institutional Mechanism for field testing/ on-farm testing of technology developed by Divisions/ scientists which are not field oriented, be developed.	Agreed
47.	Since many institutes have come up in ICAR, there should be clear distinction of work between IARI and other institutes.	Needs to be considered while formulating EFC 2020-25
48.	We should get out of divisional approach and integrate in cross cutting interdisciplinary mode.	
49.	Some of our disciplines are thinly populated in expertise. To become internationally competitive, this issue should be addressed.	
50.	Worldwide concerns of restricted water and pesticide use should be	

	addressed.	
51.	Discipline wise 3-4 focused areas should be identified while formulating the project for 2020-25 period.	
52.	Efforts should be made to develop processable varieties of vegetables and other crops.	

## **Information on Institute Research Council**

### **Recommendations of the Institute Research Council (2019)**

#### **Meetings of ICAR-IARI**

The Institute Research Council meeting IRC-I was convened during June 10<sup>th</sup> to July 4<sup>th</sup>, 2019 while IRC- II was convened during the period Aug 20 to Sept 4, 2019 under the Chairpersonship of Dr. A.K. Singh, DDG (Extension) and Director, IARI and Co-Chairpersonship of Dr. Ashok. Kr. Singh, Head, Division of Genetics and Joint Director Research, IARI, New Delhi. The Achievements during the period (**Annexure-I**), Action Taken Report on recommendation of IRC (2017-18) (**Annexure-II**), Schedule of IRC meetings (**Annexure-III**), Schedule of Supplementary IRC-I (**Annexure-IV**) and Schedule of IRC-II (2018-19) are attached as (**Annexure-V**).

In the **IRC-I**, individual scientists of related disciplines of the concerned school made a brief presentation of salient accomplishments on research, teaching and extension activities for the review period (2018-19) and also presented research, education and extension targets for the period 2019-20. The research work carried out by the scientists under the in-house projects of a particular discipline during the period was evaluated by the concerned HoDs, and resource persons. The experts evaluated the qualitative and quantitative performance of scientists and gave useful suggestions for further improvement of the research activities of the concerned scientists. Scientists from other collaborating disciplines and related schools as well as regional stations who were associated in the projects also participated in the IRC-I presentations of the entire school for interactions/inputs.

In the **IRC-II**, presentations were made school-wise wherein the School Coordinators presented the action taken report of the recommendations of IRC-(2017-18). This was followed by the project wise presentations of all the in-house research projects as well as the flagship programmes. The progress of the research work done under various research projects were appreciated by the eminent resource persons, who offered valuable and critical inputs for further improvement and strengthening of the research programmes of the Institute. Suggestions / inputs

/ comments of the scientists of the Institute were also taken for further modification / mid-course corrections of the various ongoing research programmes.

The salient research achievements of the various in-house/flagship programmes of different schools and the action taken report of IRC (2017-18) on the action suggested have been included in the proceedings as **Annexures I & II** respectively.

## **SCHOOL OF CROP IMPROVEMENT**

**Resource Persons: Dr. B. D. Singh, Dr. A. K. Pradhan**

### **General comments:**

1. The scientific reasons behind the seed science technologies shall be identified in collaboration with genetics division to find out the genes/QTLs controlling seed quality parameters.

### **Specific Comments:**

**Project 1: Improvement of wheat for productivity, disease resistance, climate resilience, quality and cropping system perspective in different agro ecologies and barley for western Himalaya (PI- Dr. K. V. Prabhu/ Dr. R.K. Sharma)**

1. Sources of resistance for rusts should be presented.
2. DH frequency should be increased for commercial success.

**Project 2: Improving resilience, productivity and quality in rice through genetic and genomic approaches (PI- Dr. A. K. Singh)**

1. No comments

**Project 3: Improving of maize productivity and quality for favourable and marginal environments. (PI- Dr. T. Napolean)**

1. Tolerance to drought stress at seedling stage should be validated at reproductive stage.
2. N-fixation reported in Mexican landrace should be explored in native germplasm.



**Project 4: Development of varietal and hybrid technologies of pearl millet for higher yield and nutritional improvement (PI-Dr. S.P. Singh).**

1. Heterotic pools should be developed
2. Antinutritional factor phytic acid should be addressed as target trait to enhance bioavailability of micronutrients.

**Project 5: Genetic improvement of chickpea for higher productivity under marginal environments (PI- Dr. V. S. Hegde)**

1. Target level for phytate should be mentioned in order to enhance micronutrients bioavailability.
2. Presence of lpa (low phytic acid) gene should be searched in native germplasm. If required, EMS may be used to create variation.

**Project 6: Genetic improvement of pigeonpea for plant type, early maturity and grain yield (PI- Dr. R. S. Raje)**

1. Genetics for resistance to wilt and wrapped and cleistogamous flowers should be studied.
2. Since, increase in plant density is targeted in dwarf pigeonpea lines, incidence of disease should also be studied.

**Project 7: Enhancement of genetic potential of mungbean and lentil in multi-season and different cropping system adaptations (PI- Dr. H.K. Dikshit)**

1. Molecular mechanism for drought tolerance at seedling stage should be deciphered.
2. In hydroponics experiment on drought, data should be taken on hourly basis to study the inheritance

**Project 8: Breeding climate resilient high yielding rapeseed mustard varieties and hybrids with enhanced quality (PI- DR. D.K. Yadav)**

1. Carinata introgression lines should be characterized by cytological analysis.

**Project 9: Genetic enhancement of soybean for yield, abiotic stress, biotic stress and seed quality (PI- Dr. S. K. Lal)**

1. In high oleic (low linoleic) x low oleic (high linoleic) crosses germination should be recorded in F<sub>2</sub> population.
2. RILs population showed a range of 21-85% germination after 2 years, fatty acid profiles of the RIL population should be studied in relation to germination.

3. Fine mapping and identification of candidate gene(s) in genomic region harbouring QTL for seed viability should be undertaken.

**Project 10: Understanding gene functions through genetic and molecular analysis in *Drosophila melanogaster* (PI- Dr.PrachiYadav)**

1. Strong collaboration with labs in other institutes should be established.
2. Efforts should be directed for publication.

**Project 11: Development of technologies/ methodologies for quality seed production, maintenance of seed purity and varietal identification (PI- Dr. S. K. Chakrabarty)**

1. Characterization of CMS lines of different crops using molecular markers.

**Project 12: Seed quality enhancement by processing, packaging and storage options in high volume seed crops (PI-Dr. S. K. Yadav)**

1. Screening of speciality maize lines for seed quality and study the genetics of differential quality parameters.
2. Basic and strategic research should be more focussed in future programmes of seed technology.
3. In the rice seed longevity studies, the EPPO studies shall be compared with high temperature and high moisture ageing (accelerated ageing) studies.

**Project 13: Seed quality enhancement by processing, packaging and storage options in low volume seed crops (PI- Dr. V.K. Pandita)**

1. No comments

**Project 14: Development of protocols, validation and execution for quality seed production through farmers for sustainable truthfully labeled seed production system (PI- Dr. Sanjay Kumar).**

1. No comments

## **SCHOOL OF HORTICULTURE**

**Resource persons: Dr. D. S. Rathore and Dr. Harihar Ram**

## **General Comments:**

1. Research programme should be need based and problemsolving.
2. Major focus should be based on nationalproblem.
3. Most of the applied programme should be cost effective in nature and livelihood oriented.
4. Concept oriented & market led non-repetitive research isrequired.
5. The product/technology envisaged from the project should be acceptable toindustry.

## **Specific Comments:**

### **Project 1. Pre-breeding for biotic and abiotic stress resistance and quality in selected vegetable and flower crops (PI: Dr. Anil Khar)**

1. Restructuring/ realignment of the project with main breeding programmeisrequired.
2. Biofortification research in prebreedingprogramme needs to bestrengthened.
3. Emphasis on resistance breeding for major biotic/abiotic stresses in different vegetable crops.

### **Project 2. Genetic improvement of selected annual open field vegetable and flower crops (PI: Dr. T. K. Behera)**

1. Pre-breeding activities in vegetable crop improvement can be integrated with the genetic improvement project for broadening genetic base through conventional and biotechnologicalmeans.
2. The major biotic and abiotic stresses of important vegetable crops required to be prioritized in the present scenario of climate changes and accordingly the crop improvement programmeineach vegetable crop need toreorient.
3. Besides the nutritional profiling of the varieties/hybrids developed, the anti-nutritional factors also need to be estimated while transferring the favourable genes from the wild relatives.
4. In addition to the yield traits, the special traits such as processing quality, export quality, nutraceuticals etc. need to be given dueemphasis.
5. The crop varieties developed for the cultivation under protected conditions must be evaluated under open field condition in order to find out the  $G \times E$  interaction.

### **Project 3. Genetic improvement of selected perennial fruit and ornamental crops. (PI: Dr. S.K. Singh)**

1. Priority should be given on rootstock development in crops like mango rather than

kinnowandguava.

2. Totapari and Neelum should be considered as parent in hybridization with Amrapali mango

Long lasting problems like mango malformation and guava wilt should be addressed only through management strategies utilizing bio-agents/ bio-fertilizers rather than breeding.

1. In citrus, there must be priority of the crops in order to address requirement of juice industry.
2. Frost and water logging resistant papaya cultivar should be developed.

**Project 4. Development of improved technologies for higher yield and quality in selected fruit crops (PI- Dr. O. P. Awasthi)**

1. Stionic effect of the rootstock and scion needs to be worked out systematically based on biochemical and physiological basis.
2. In crops like guava pruning should be done judiciously for canopy management and maintaining fruit yield.
3. The technology for controlling mango malformation need to be demonstrated then conducting on limited trees.
4. Economics of application of the new generation molecules (MeJa, Pro calcium Hexidione etc.) in fruit crops needs to be worked out before their recommendation.
5. Experiments on water and nutrient management in mango and papaya need to be strengthened.

**Project 5. Development of production technologies and post harvest management of flower crops and turfgrasses. (PI- Dr. S. S. Sindhu)**

1. No comments.

**Project 6. Development of technologies for realizing production potential of new varieties and hybrids of vegetable crops. (PI- Dr. Shri Dhar)**

1. Cost benefit ratio to be provided for recommending the best treatment.

**Project 7. Integrated pre and post harvest management for loss reduction and quality retention in fruits and vegetables (PI- Dr. Ram Asrey)**

1. Concentrate only on fruit bagging experiments in fruits in which division of FHT is working.
2. Work out the cost benefit ratio for fruit bagging in kinnowandguava.
3. Studies on ripening of sapota should be discontinued.

**Project 8. Development of nutraceutical & functional food from horticultural produce and cereal & pulse based convenience food products (PI- Dr. V.R. Sagar)**

1. Avoid pick and choose approach in selection of crop commodities. It should be need based and addressing the problems of commercial crops.
2. Avoid repetition of work on onion, pineapple and bittergourd dehydration.
3. Work out the cost benefit ratio of nutraceutical and functional foods.

**Project 9. Development of hi-tech cost effective technologies for protected horticulture (PI- Dr. Neelam Patel)**

1. Design of protected structures for growing vegetable and flowers should be standardized.
2. Technology for growing vegetables and flowers under protected structures.
3. Standardization of fertigation technology for flowers and vegetables grown under protected structures.

**Project 10. Flagship Project: Breeding vegetables and flowers for protected Environment. (PI: Dr. A.D. Munshi)**

1. Breeding for high value vegetables like broccoli, garden pea and lettuce should be attempted for cultivation under protected cultivation.
2. Performance of the varieties/F1 hybrids of crops suitable for protected condition should be evaluated simultaneously under protected and open field conditions to assess GxE interaction.
3. The promising and popular hybrids marketed by reputed private seed companies need to be characterized to identify the traits suitable for protected condition.

**SCHOOL OF NATURAL RESOURCE MANAGEMENT**

**Resource Persons: Dr. A. K. Singh, Dr. A. P. Srivastava, Dr. Y.D Gaur**

**Specific Comments:**

**Project 1: Restoration and Improvement of Soil Health (PI: Dr. B.S. Dwivedi)**

1. Work should be carried out to reduce the cost of NCPCs for enhancing nutrient use efficiency
2. Comparative information should be generated on carbon buildup under conventional (long-term experiment) and conservation agriculture
3. Microbial community structure of long-term fertilization experiment should be worked out
4. Water budgeting should be done in CA.

**Project 2: Safe Use of Waste water in Agriculture (PI: Dr. Ravinder Kaur)**

1. The objective 1 of the program may be reframed to include impacts and risks associated with sewage - sludge application on agricultural lands.
2. Use of waste water for green leafy vegetables should not be recommended.

**Project 3. Integrated Crop and Resource Management for Enhanced Productivity and Profitability (PI: V.K. Singh)**

1. The results may be presented experiment-wise as mentioned in the report for clarity.
2. Can Nutrient Expert (NE) and Green Seeker (GS) be combined for advising nutrient application? Are they complementary?
3. Contribution of *nifH* genes to soil and plant needs to be studied.
4. Explore the practical combinations of IFS. Instead of the whole enterprise (Cattle No., pond size etc. should be mentioned). Quantify and specify the number of enterprises that can be included under ideal resource conditions.
5. Popularize and mobilize resources for needful tools usable for farmers. Also characterize the real situations for developing farming system approach. For this, DSR under bed planting needs to be visited at Mr Sandeep Dahiya's farm located in Sonapat district.

**Project 4. Risk Assessment & Management of Hydro-climatic Hazards on Natural Resource Degradation & Agricultural Sustainability (PI: Dr. P. Krishnan)**

1. How the irrigation water quality index was computed and what was the sample size?
2. In the HYDRUS-2D model validation, there should be comparison with the measured data on NH<sub>4</sub>-N and NO<sub>3</sub>-N.
3. The ecosystem services addressed by the study should be stated clearly.

4. Was the feedback from farmers' estimated properly for weather advisory studies?
5. Who are the stake holders for the maps generated in this project?
6. Are the research findings being disseminated to the stakeholders?
7. What interventions are made to improve the sustainability?

**Project 5. Agri-residue & Biomass Management. (PI: Dr. K. Annapurna)**

1. Pusa Decomposer should be evaluated for its efficacy against Waste Decomposer of NCOF.

**Project 6. Development of technologies and strategies for scale neutral farm mechanization (PI: Dr. Indra Mani Mishra)**

1. A large number of technologies are under various stages of development. Focus should be on technologies those could be brought to logical conclusion by the end of project period i.e. current year.
2. Targets for 2019-20 may be reviewed and pruned based on prioritized theme of the Division and achievable based on current status. Efforts should be made to file patents and commercialize the developed technologies.
3. Economics of machines developed may be included in the completion report of the project.
4. The use of drones for spraying is increasing. Hence, guidelines for spraying by drone may be prepared for different operating conditions.
5. Soil compaction study should also include depth as one of the variables of study.

**Project 7. Precision Farming for Enhanced Input Use Efficiency. (Flagship programme) (PI: Dr. Manoj Khanna)**

1. Life of hydrogels should be indicated in the studies.
2. Application methodology of hydrogels such as basal application or seed coating should be indicated.
3. Variable rate fertilizer applicator should be georeferenced using GPS system.
4. Detailed data on water saving and water balance should be indicated in hydrogel based studies.

5. Use of SPAD technology used for N monitoring may be explored for Microbiological studies.
6. Studies on environmental Impact of surface covered cultivation on operators should be initiated.

**Project 8. Diversification of rice-wheat cropping system for enhanced sustainability and profitability (Flagship programme). (PI: Dr. Dinesh Kumar)**

1. More data on water productivity needs to be generated to work out the water economy of different cropping system.
2. There is further need to have the control cropping system in this study, i.e. rice-wheat cropping system.
3. No need to give the replication wise data in the presentation. The data should be presented with proper statistical treatment.
4. The soil quality index for each cropping system needs to be generated.

**SCHOOL OF CROP PROTECTION**

**Resource persons: Dr. C. D. Mayee and Dr. T. P. Trivedi**

**Specific Comments:**

**Project 1. Biosystematics of insects, fungi, bacteria and nematodes of economic importance (PI-Dr. Debjani Dey)**

1. Any new report should be categorized as pest or non-pest?
2. Continue monitoring of reported pests and diseases every year.

**Project 2. Studies of population dynamics/epidemiology, host-plant relationship, tritrophic interactions, and development of pest management strategies in relation to climate change and contemporary cropping systems (PI- Dr. R.K. Sharma)**

1. Cropping phenology, natural enemies and crop interventions to be included in the models.
2. Developed models have to be validated in pest management programs in 2-3 hotspots-NCIPM can be approached for this.



3. Pest plant interactions- should have physical and bio-chemical components particularly, in case of new varieties released undercultivation.
4. Models for assessment of avoidable yield losses should be worked out that will be useful for convincing policy makers,etc.

**Project 3. Development of novel chemicals, toxicological evaluation, structure-activity relationship and formulations for crop protection (PI- Dr. N A Shakil)**

1. Since soil application is not acceptable now, seed treatment and foliar application should be attempted for the synthetic and natural products developed.
2. Under different objectives, ultimately we should aim at product development unless its purely basic research.

**Project 4. Studies on biochemistry, physiology and molecular biology of insects and nematodes of economic importance (PI-Dr. S. Subramanian)**

1. Future courses of action of endosymbiontics need to be projected or worked out.
2. Large scale validation of endosymbionts consortium should be done in field.

**Project 5. Identification of important plant viruses and virus like pathogens, their diagnostics, interaction with hosts / vectors and management (PI-Dr. V K Baranwal)**

1. Loss estimates by viruses should be worked out.
2. Link diagnostics with management.
3. Interaction of viruses with fungi, bacteria, nematodes and other viruses.
4. Virus pathology should be focused.

**Project 6. Virulence, variability, pathogenomics and diagnostics of major fungal and bacterial plant pathogens (PI-Dr. Rashmi Aggrawal)**

1. Whether the genes which have been identified for leaf blast resistance in rice, also show resistance to neck and node blast phases of disease.
2. Use of CRISPR/Cas9 technology for fungal disease management may be explored.
3. Survey on distribution of different diseases at farmer's fields should be carried out so that losses due to diseases can be estimated.

4. Emphasizes to be given on safe use of fungicides. The use of drones for spraying of fungicides as it will reduce quantity of pesticide as well as water requirement and time and labours requirement beexplored.
5. Since most of rice varieties grown in India are susceptible to bakanae disease, there is urgent need to find out the effective fungicides for diseasemanagement.
6. Capacity building in the area of host pathogen interaction to utilize the information generated throughgenomics.

**Project 7. Assessment and management of contaminants in agricultural produce and in the environment (PI-Dr. Irani Mukherjee)**

1. Farmers need to be educated regarding SOPs for safe use of agro chemicals including pesticide spraying.
2. Research is required for safe use ofpesticides.
3. Innovative formulations for hi-tech pesticide application using dronespraying.

**Project 8. Interactions of parasitic and beneficial nematodes with rhizosphere microbes and insect pests (PI- Dr. SharadMohan)**

1. What is the mode of action of photox. Identify variants those are good for photox production rather than studying their diversity at molecular level.

**SCHOOL OF BASIC SCIENCE**

**Resource persons: Dr. D. C. Upreti and Dr. R. Srinivasan**

**Specific Comments:**

**Project 1. Deciphering physiological, biochemical, and molecular mechanisms of abiotic stress tolerance and nutrient use efficiency of crop plants (PI: Dr. C. Vishwanathan).**

1. Superior donors and RILs for WUE, NUE and heat tolerance in rice and wheat identified by using Phenomics and field phenotyping should be taken forward for their use in crop improvement in collaboration with Division ofGenetics.

2. Mutants of Nagina 22 and 3K rice panel of IRRI should be analyzed for various physiological traits for yield and stress tolerance, and to identify the genes controlling these traits.
3. The outcome of the projects i.e., donors and genes identified for drought and heat tolerance, and nitrogen use efficiency in rice and wheat should be carried forward in the next plan for deciphering the mechanisms and functional validation.
4. Research work on transgenic and genome-editing for enhancing stress tolerance and yield in rice have made significant progress. Genome-editing may be given more emphasis for improving yield and stress tolerance in rice.
5. Efforts should be made to explore the possibility of commercialization of the magnetopriming machine and the priming technology.

**Project 2: Genetic modification of soybean for improved nutritional / flavour quality  
(PI: Dr. Anil Dahuja).**

1. The technology developed for cost-effective extraction of vitamin E from soybean holds great potential and thus needs to be taken forward to industrial scale for its further commercialization.
2. The work on enhancing the bioavailability of nutrients isoflavones using enzymes from probiotic bacteria was appreciated and it was suggested to explore it further for the development of soy products with improved isoflavone bioavailability.
3. It was suggested to include lipid profiling as one of the parameters to understand the mechanism of low rancidity in nutritionally rich landraces of Pearl millet from Rajasthan.
4. In quality improvement program, the scientists should work in collaboration with industry so the industrially relevant technologies are developed and commercialized.

**SCHOOL OF SOCIAL SCIENCE**

**Resource Persons: Dr. C. Prasad, Dr. Chandra**

**General Comments:**

1. Policy papers on important findings may be published and communicated to stakeholders.

**Specific Comments:**

**Project 1: Enhancing Smallholder's productivity and agricultural growth through technology, sustainable intensification and ecosystem services.  
(PI- Dr. G. K. Jha)**

1. Economists to explore workable solution or incentives to stop crop residue burning at farmer level

**Project 2: Impact of policy reforms on development of Agricultural Markets and food processing industries. (PI-Dr. Amit Kar)**

1. Detailed analysis of some selected successful and not so successful FPOs should be carried out in relation to different parameters to identify the important indicators for successful model.

**Project 3: Commercialization and Impact of Improved Agricultural Technology (PI- Dr. Pramod Kumar)**

1. Technologies which are available to enhance farm income including IARI technologies and upscaling of agricultural innovations may bestudied
2. Certain criteria should be followed for selecting study area, sample and analysis

**Project 4: Development of Innovative Agriculture Extension Models. (PI- Dr. R.N. Padaria)**

1. Farmers' clubs of NABARD may be involved in the post office model.
2. Innovative approaches through WhatsApp may be developed to address the real problems of farmers.

**Project 5: Maximizing farm profitability through entrepreneurship development and farmer led innovations. (PI: Dr. Rashmi Singh)**

1. Impact of entrepreneurship development on farmers' income may be captured.
2. Institute/Scientists role in creating innovators and deciding at what stage innovators have to be picked-up may be explored.
3. Methods of upscaling farmer-led innovations may be devised.

**Project 6: Enhancing nutritional security and gender empowerment. (PI: Dr. V. Sangeetha)**

1. Region-specific nutrition education may be devised considering their dietary diversity, nutrition source and types of food consumption.

**Project 7: Outscaling Agricultural Innovations for Enhancing Farm Income and Employment. (PI: Dr. J.P.S. Dabas)**

1. DeenDayal Research Institute models of development may be studied

Report of the  
Quinquennial Review Team (2009-2016)

**SUB: ACTION POINTS EMERGED FROM THE MINUTES OF 245<sup>TH</sup> MEETING OF THE GOVERNING BODY.**

	<b>Action Point (ICAR)</b>	<b>Action Taken</b>
<p>Recommendation made by QRT in respect of Indian Agricultural Research Institute, New Delhi for the period 2009-2016. The recommendations made by QRT in respect of Indian Agricultural Research Institute, New Delhi for the period 2009-2016 with the comments of the council were accepted, with the following observations:</p>		
<b>1. Research</b>		
a.	Strengthen interdisciplinary genomics research with emphasis on horticultural crops, pulses, millets and oilseed crops for their genetic improvement.	Agreed, cereals may also be included.
b.	There is need for greater utilization of the resources and their outputs and hence there is a need to integrate the NRCPB with IARI	Agreed for integration through collaborations
c.	Provision for additional funds for AMC/CMC of the high value equipment should be made. Upgradation of old items of equipment should be taken up on priority.	Agreed
<b>1.1 Crop Improvement</b>		
<b>Genetics</b>		
a.	To accelerate the breeding cycles, considering the excellent expertise available, it is recommended that an Accelerated Breeding Centre (ABC)-a centralized facility including high throughput genotyping centre, doubled haploid facility, bioinformatics centre, rapid generation advancement facility and transgenic facility should be created.	Agreed
b.	In order to maintain the active germplasm pool long term seed storage of 20,000 sample capacity required.	May establish short term storage facility
c.	In view of significant contributions by the Division, it is required to showcase the mega achievements of the excellent research with modern display tools and a museum for the benefit of farmers, students and scientists of the country and abroad.	Existing museum may be renovated
<b>Seed Science and Technology</b>		
a.	To upscale the activities for seed testing and seed biology, state-of-the-art laboratories in the areas of physiology and biochemistry and molecular biology need to be established	Agreed

b.	Large scale seed multiplication and maintenance of the notified and released varieties of field and horticultural crops is an essential activity for dissemination of quality seed to the farmers and seed producer agencies of the country. A large scale seed storage facility (for one year) with temperature and humidity control and processing plants are required to be created in <b>Delhi, Karnal, Indore and Pusa Bihar</b>	Agreed
c.	The horticultural seed materials need protected system for maintenance and multiplication which need to be created at <b>IARI and RS, Karnal</b>	Agreed

<b>Regional Station, Pusa</b>		
	Pusa Bihar station is at the moment in deteriorating conditions. No new wheat or pigeon pea varieties have been developed for over two decades and no new project proposal for funding support has been submitted in the recent 5 years	Special recruitment drive for Pusa Bihar
<b>Regional Station, Wellington</b>		
	In order to facilitate the excellent off-season nursery, seed multiplication and full-season rust genetics work, the station needs to be provided with one additional controlled condition glass house and two laboratories, one for field based work and another for molecular marker analyses.	Agreed
<b>Regional Station, Shimla (Wheat and Barley), Tutikandi</b>		
	The wheat breeding and geneticist team should be provided with infrastructure for doubled haploidy production including culture room, net house and controlled greenhouse for rapid DH production	Agreed
<b>Off-season Rice-Breeding and Genetics Unit, Aduthurai and Pulses and Maize Unit, Dharwad</b>		
a.	The irrigation facilities at both Aduthurai and Dharwad have to be fully equipped with micro irrigation system to meet the needs of the off season materials as well as the main season work.	Agreed
b.	Seed storage systems and equipment required for quality analysis need to be provided	Agreed
<b>1.2 Basic Sciences</b>		
<b>Plant Physiology</b>		
a.	Towards identification of germplasm/traits/genes for resource use efficiency and abiotic stress tolerance, the work in automated controlled environment facility needs to be strengthened with establishment of field phenomics facility including UAV/drone/air borne phenotyping sensors, metabolite and mineral-nutrient profilers.	Agreed
b.	Rhizosphere phenotyping facility to identify donors and genes for better root system architecture for enhancing water and nutrient use efficiency and stress tolerance. For this Genome editing Lab needs to be established.	Agreed
c.	Emerging genome editing tools need to be used to identify and validate physiological pathways and processes for resource use efficiency and stress tolerance. For this Genome editing Lab needs to be established.	Agreed, Needs a centralized state of the art facility
<b>Biochemistry</b>		
	Biochemical metabolite analysis lab: Equipped for metabolic profiling, UPLC, GCMS, Chemi Doc Gel Imaging system, Plate reader etc.	Agreed
<b>1.3 Plant Protection</b>		
<b>Agricultural Chemicals</b>		
a.	A pilot reactor for bulk hydrogel/chemical synthesis and for prior art search on novel molecules, a Scifinder facility needed	Agreed

b.	Support for pesticide testing laboratory (NABL accredited) up gradation and scope enhancement from the current 9 pesticides to more than 150 to utilize the same for high end research on design and development of bioactive molecules, formulations.	Agreed
<b>Nematology</b>		
	Microscopy facilities need to be strengthened with better equipped microscopes and the scanning electron microscope is needed with cryostat for quick and efficient sample preparation for better results	Agreed
<b>Plant Pathology</b>		
	Some facilities and activities which are to be supported are listed: <ul style="list-style-type: none"> <li>• Climate Chambers: To conduct research on rust, blast, mildews, blight, spots and wilt for working throughout the year.</li> <li>• BSL III level plant growth facilities-to conduct research on threatening plant pathogens and exotic diseases</li> <li>• Create bioinformatics facilities</li> </ul>	Agreed for first two. Bioinformatics should be one centralized facility not on divisional basis.
<b>Regional Station, Pune</b>		
a.	The station should develop system for providing virus free planting materials for clonally propagated plants like banana and citrus.	Agreed for high tech tissue culture laboratory.
b.	The green houses should be refurbished.	Agreed
<b>Regional Station, Kalimpong</b>		
a.	There is a requirement of Staff quarters of Type IV and Type II and this should be protected by RCC boundary wall.	Agreed
b.	The green houses should be refurbished.	Agreed
c.	The Station should develop system for providing virus free planting materials and clonally propagated plants like large cardamom and citrus.	Agreed for contained facility
<b>Entomology</b>		
a.	The laboratory which was destroyed by the fire four years ago needs to be refurbished.	Agreed
b.	Field level insect screening facility of fine net and rearing system at field environment needs to be created for epidemiological investigations	Agreed
c.	Facility for intensifying IPM	Agreed
<b>Social Sciences</b>		
<b>Agricultural Extension</b>		
a.	Both Economics and Extension Division should intensify work on impact analysis of IARI technologies in the country.	Agreed
b.	Mobile training vans with multimedia facilities are needed for effective transfer of technology and capacity building of farmers at their doorstep to enhance income (Common for Agri. Extn. and CATAT)	Agreed



c.	Should undertake data collection through Computer Aided Personal Interview (CAPI). This will help researcher to monitor data collection on a real time basis. It will also help to quickly analyse the data. Scientists and technical staff may be given training of using CAPI for data collection. <b>(Agri. Extn. and Economics)</b>	Agreed
d.	Special norms for TA and hiring skilled enumerators for data collection may be made for undertaking pan India surveys for research studies. <b>(Agri. Extn. and Economics)</b>	Agreed
e.	Modernization of Audio-Visual Laboratory	Agreed
<b>Agricultural Economics</b>		
a.	Should undertake studies on barriers (institutional and policy) in scaling up promising varieties and technologies.	Agreed
b.	Scientists should be given training on advances on policy tools, econometric analysis and models for policy analysis.	Agreed
c.	It should establish a Marketing Intelligence and Forecasting Cell (Artificial Intelligence Cell) with (Computers and accessories) to regularly monitor prices of essential food commodities at farm and retail level to provide information to the government for taking informed decision in advance.	Agreed
<b>Centre for Agricultural Technology Assessment and Transfer (CATAT)</b>		
a.	Developing model villages for demonstrating doubling farmers income need to be taken up by CATAT.	Agreed
<b>Zonal technology Management and Business Promotion and Development Unit</b>		
a.	There is a need to decentralize the Council's power at institute level for decisions on PCT/National phase application filing for patents, collaboration with other marketing agencies, institute situated outside etc.	Institute may propose
b.	Farmer enterprises, whether in the form of FPO, cooperatives or startups, have to be recognized/hand held/supported in a very systematic way to address the requirements such as value chain development and promoting the processing part.	Agreed
<b>1.5 Natural Resource Management</b>		
<b>Soil Science and Agricultural Chemistry</b>		
a.	In order to undertake the basic and applied research as recommended, the laboratory facilities have to be strengthened as follows: 1. X-ray Diffractometer (XRD) 2. Atomic Absorption Spectrophotometer (AAS) 3. Microwave digestion system 4. Nitrogen analysis facility including digestion and distillation systems.	Agreed
<b>Microbiology</b>		
a.	Strengthen and focus research in the areas of microbial ecology of soils, meta genomics, microbial genetics/genomics and proteomics under abiotic stresses for nutrient management of the soils.	Agreed

b.	Scaling up production of Biofertilizers and Bioethanol using bioreactor based technologies by setting up a pilot plant and at least 3 bioreactors of 50L capacity.	Agreed
<b>Agricultural Physics</b>		
a.	Explore the potential of drone remote sensing for soil and crop environment parameters. Work should be initiated on sensor based image processing techniques.	Agreed
b.	Satellite data based products should be developed for crop yield prediction. Infrastructure facilities need to be created for the above.	Agreed
<b>Agronomy</b>		
a.	Complete support system for Precision farming, Integrated farming system and Organic farming needs to be provided.	Agreed
b.	Complete refurbishing of laboratory and field facilities.	Agreed
<b>Agricultural Engineering</b>		
a.	One time catch up grant for renovation of old workshop and laboratories of the Division.	Agreed
b.	Develop technologies and designs for bulk cold-storage, bulk storage, short term small/medium storage systems at farm-gate or local community level along with low cost cold storage transport systems employing solar/wind energy.	Agreed
<b>Centre for Environment Science and Climate Resilient Agriculture</b>		
a.	Environment Science division should upscale the crop production technologies throughout the Indo-gangetic plains. The climate resilient technologies in rice-wheat cropping system with vegetables and utilization of Krishi to be strengthened for wider application.	Agreed
b.	The impacts of primary and secondary air pollutants and suspended particulate matter (SPM) on the productivity and quality of important field, vegetables and fruit crops and also the level of food chain contamination especially heavy metal through environmental pollution such as soil and water pollution need to be assessed.	Agreed
c.	The crop simulation modelling activities need to be strengthened at the Division.	Agreed
<b>Water Technology Center</b>		
a.	Water Technology Centre should undertake the responsibility of managing and maintaining the irrigation/water reservoir and prioritized recharging with precisely assessed distribution of the dwindling water resources for irrigation by quantifying available water in the production system (reservoirs, groundwater, water bodies) with appropriate WUE and micro-irrigation systems.	Agreed

b.	While the waste water treatment plant is being highlighted, there are several infrastructural or system linked activities require appropriate positioning in the concept for it to assume a repeateable/predictable technology package. The system is more biological and ecological in orientation than physics or engineering angle while the research infrastructure is inadequately ad hoc. Mechanism for remediation of waste water needs to be studied in multidisciplinarymode.	
<b>Agriculture Knowledge Management</b>		
a.	Strengthening of AKMU with respect to latest servers and operating systems is urgently required with adequate training, skill andexpertise in field of large data handling, data analytics and web services which cangoalongwaytofullyexploittechnicaladvancementinICTforthe benefit of agriculturalsector.	Agreed
b.	Facility for tele-teaching needs to be developed.	Agreed
<b>1.6 Horticulture</b>		
<b>Fruits and Horticultural Technology</b>		
a.	Basicprocessingunitwithfruitshandlingandover-seasonmaintenance systems need to be created either separately or integrated over the School,withpropermaintenanceinthespacevactedbytheDirectorateofFl oriculture.	Agreed
b.	Strengthening of infrastructure for pre-breedin as well as application of molecular marker technology and <i>in vitro</i> methods in crop improvement.	Agreed
c.	The research laboratories dealing with tissue culture, physiology and molecular breeding need to be modernized.	Agreed
<b>Vegetable Science</b>		
	Efforts to be made for introgression or recombination breeding of desired genes in commercial varieties/hybrids and for rich in phyto-nutrients, nutraceuticals and processing	Agreed
<b>Floriculture and Landscaping</b>		
	Infrastructure including expertise in the science related to molecular marker technology and invitro methods in crop improvement needs to be strengthened for success in the markeable products development.	Agreed.
<b>Post-Harvest Technology and Food Science</b>		
	Thereisaneedtoutilizehorticulturalwasteinvalueaddedproducts in order to reduce environmental pollution and for this purpose upgradation of fruit handling and food processing laboratory and processing units arerequired.	Agreed
<b>Regional Station, Shimla</b>		
a.	Development of rootstock for temperate and stone fruits having wider adaptability for biotic and abiotic stresses.	Agreed
b.	Farm roads, storage and irrigation facilities needs to be developed.	Agreed
<b>Regional Station, Katrain</b>		
a.	There is need for extension of tissue culture laboratory to expand its capacity.	Agreed

b.	Standardization of seed production and processing of vegetable crops.	Agreed
c.	Renovation of tissue culture and molecular laboratories is required along with new equipments like flow cytometer for double haploid breeding programme.	Agreed
d.	Work should be concentrated to upgrade integrated viral diseases management for vegetables and fruits to cope up with emerging diseases and pests.	Agreed
<b>Centre for Protected Cultivation and Technologies</b>		
a.	Need to emphasize on designing of protected structures for different agro-climatic conditions/situations.	Agreed
b.	Multi utility structures for protected cultivation need to be exploited to achieve the maximum crop response for higher productivity.	Agreed
c.	The use of solar operated poly houses may be explored.	Agreed

## 2. Policy Issues

	<b>Recommendations</b>	<b>Comments of SMD</b>
a.	The original institution's relics and remains of Naulakha building (Phipps Laboratory) is in a corner of the Central Agricultural university. As per the policy of the Government to preserve the historical heritage of the country, it is recommended to consider proper archaeological excavation/restoration of this monumental site with a "National Heritage" recognition as well as making it an official agri-science history spot.	Institute may initiate the matter with concerned department as per extent guidelines.
b.	The institute has to evolve a transfer policy for scientists between Delhi and its 10 outstations. There has to be a term-transfer at all approved cadres with a ready replacement. A roster of replacement in each discipline should be in place within the ICAR guidelines such that Regional Station postings are neither construed as punishment postings nor secondary to IARI.	Institute may propose
c.	The Council may make a special effort to maintain high scientific standards of performance comparable to any of the contemporary institutes of National Importance such as IISc or IITs. To this end, it is most critical to minimize lateral entries by transfer into IARI from other ICAR institutes. Director of the institute has to be consulted by the council based on merit for appropriateness in the standards and vacancy in the discipline concerned.	Institute may propose
d.	Provision of special budget for overseas post doc training in emerging areas for young and mid level scientists.	Institute may propose
e.	Training of technicians for high end equipments and providing highly trained technicians for these equipments.	Institute may propose
f.	To inspire the newly joined ARS scientists, one time catch-up grant as is followed in UGC/DST should be provided (within six months of their joining) for creation of lab facility, procurement of equipment and hiring ad-hoc personnel.	Institute may propose

g.	Currently, Scientist:Technical staff ratio is 1: 0.8-which is not adequate. A minimum ratio of 1:1.5 for technical staff is desired, thus provisions for allotment of more technical lands supporting staff should be made.	Sanctioned posts should be filled on priority.
h.	IARI has excellent opportunities to harness the solar power, so that the power consumption can be saved and also we can produce enough for providing to the research facilities.	Agreed
i.	Institute should be able to use the HRD funds for sending Scientists for training abroad, at least to a permissible limit to an extent of 30% of the grant available in a year.	Institute may propose

### 3 Education

	Recommendations	Comments of SMD
a.	<b>Upgradation of academic environment-</b> Regular financial support to be provided for modernizing and strengthening of academic facilities and course curriculum delivery.	Education Division of ICAR is already funding these activities.
b.	<b>Provision of Post-Doctoral Programme-</b> To improve quality research, Post Doctoral programme needs to be initiated at IARI. Provision of at least two Post Doctoral Fellow in each teaching disciplines could be made and separate allocation of funds for Post-Doctoral programme under funds received for PG Strengthening from Education Division of ICAR needed.	Institute may submit a proposal to Education Division.
c.	<b>Provision for sandwich Ph.D. programme-</b> Institute has signed MoUs with several International institutes. In order to develop competent human resource, provision for sandwich Ph.D. programme with these institutions is desirable. Similar programme was in operation earlier at IARI with the International Rice Research Institute, Phillipines.	Institute may submit a proposal to Education Division.
d.	<b>Incentive for the faculty to promote quality teaching-</b> Participation in International Seminar/Symposium once in five years to update knowledge and also in building confidence. Provision of short-term and long-term overseas associateship. A minimum of 20 faculty members every year should receive international exposure.	Agreed
e.	<b>IARI needs to introduce a post-graduate course in Agri-business Management.</b>	Institute may propose.
f.	The course curriculum on Agricultural processing and food processing needs to be advanced with supporting facilities for practicals extended to all commodities of agricultural produce.	General
g.	Provision for establishing Chair to attract talent- In order to attract young talent from outside in certain identified areas, the Institute should have freedom to establish Chair (at least one per School)	Institute may propose.

## 4. Establishment

### 4.1 Scientific Staff

a	At the time of reporting, as in March 2017, the scientific staff approved at IARI stood at 578 of which 506 were in position. It is critical to fill positions in certain disciplines at both Regional Stations and Divisions so that the continuity is maintained in the experiments for meeting the objectives set out in the research projects and institutional mandates are not left unattended.	Process of recruiting and posting is going on
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<b>4.2 Renaming CESCRA</b>		
a	The Institute renamed the Division of Environment Sciences as Centre for Environment Science and Climate Resilient Agriculture (CESCRA) in 2009 which could be restored as the Division of Environment Sciences.	Agreed
<b>4.3 Renaming Division of Fruits and Horticulture Technologies</b>		
a	It is recommended to rename the Division as Division of Fruit Science in sync with nomenclature of the Divisions of Vegetable Science of Floriculture & Landscaping.	Historical division, not required
<b>4.4 Technical and Supporting Staff</b>		
a	There is a general shortage of Technical and supporting staff in almost all divisions, Centre/Units, Regional Stations as well as PME section and an acute shortage of technical and supporting staff was particularly noted in the Schools of Horticulture, Crop Improvement and Division of Agronomy, Soil Science and Agricultural Engineering. The required strength is essential in order to keep the experiments and equipment in correct order and functional. The recommended technical staff and supporting staff is indicated in the report.	Process of recruitment to vacant posts should be intensified
<b>4.5 Administration &amp; Governance</b>		
a	Tele-conferencing facility with the HoDs and the Regional Station Heads should be established.	Agreed
<b>4.6 Finance</b>		
a	Auditing and accounting requires to be decentralized within the GFR 2017 limits for faster processing of proposals for approvals as well as completing the procurement liabilities.	Agreed
b	The grants on operational and maintenance head should earmark a proportion for AMC, Division-wise of all items of equipment so that their utilization is always ensured without any break.	Institute may prioritise during budget distribution

## 5. GENERAL RECOMMENDATION

a	One time Catch up Grant for infrastructure	Institute may propose
b	Autonomy at par with IISc, IITs or CAUs.	Institute may propose
c	Item No 20, 23 and 29 of the ATR of last QRT from 2000-2009 (Page No. 163-164) is again recommended for action. They are as follows:	
20	The QRT is of the considered opinion that the names of the Division of Genetics and the Division of Fruits and Horticultural Technology be changed as Division of Fruit Science, respectively. ATR by IARI: The action has already been taken and the matter is under consideration at Council's level.	Historical name. Status quo may be kept
23	The position of Professor in each discipline may be filled by direct recruitment with the designation of Principal Scientist (Professor) ATR by IARI: Proposal has been sent to the Council again.	Present system is fine
29	The post of the head of the Division be made RMP ATR by IARI: It is a policy issue and Council has to consider.	Institute may propose again

**Visits to IARI by delegates Coordinated by PME Cell during this period (2017-2020) are given below**

SN.	Particulars	Country	Participants Numbers	Date
1	Mr. Jon Georg Dale Minister of Agriculture	Norwegia	13	15.02.2017
2.	Mr.H.K. Suanthang, Director (IC), Department of Agricultural & Farmers Welfare & Cooperation	Taiwan	8	3.07.2017
3.	Dr. Thani Al Zeyoudi UAE Minister	UAE	5	30.08.2017
4.	Mr. Nguyen Hong Son	Vietnam	8	21.12.2017
5.	Nepalese delegation	Nepal	2	19.12.2017
6.	Mr. Andrew Paul Barkley Kansas University consisting of students of 2018 batch	USA	25	4.1.2018
7.	Delegates of 4th ASEAN	ASEAN countries	20	12.1.2018
8.	Secretary ICAR	ICAR, India	1	18.1.2018
9.	Mr. Lori Louise Cope South Dakota Agricultural and Rural leadership (SDARL)	USA	30	15.2.2018
10.	Parliamentary delegates, Dr. NazarAfzali from the University of Birjand,	Iran	10	27.2.2018
11.	Polish delegates lead by H.E. Mr. Jacek Bogucki	Poland	15	14.3.2018
12.	Nepali delegation led by Mr. H.K. Chakra Dani Khanal, Minister for Agriculture	Nepal	9	20.6.2018
13.	Nepali delegation led by Dr. Yogendra Kr. Karki, Joint Secretary, Govt. of Nepal, Ministry	Nepal	5	21.06.2018
14.	Mr. AlekseiIlliuvier Russian Delegation	Russia	2	21.06.2018
15.	Thailand delegation led by Miss RossakonKeosa ARD, Chief, Foreign and Special Projects Group Bureau of Rice Policy and Strategy, Rice Department, Ministry of Agriculture and Cooperation;	Thailand	5	17.7.2018
16.	UK delegation led by Minister Sam Gyimah- UK Minister of State for Universities, Science, Research and Innovation	UK	7	25.7.2018
17.	Chinese delegation led by Prof. Wan Jianmin (Vice President, CAAS)	China	5	10.9.2018
18	Kansas State University, led by Professor, Basic and Agri. Engg. , KSU	USA	3	11.10.2018
19.	Kansas Stae University led by Dr. (Ms) Hutchinson Stacy L.Professor, B&AE, KSU, USA	USA	3	16.10.18
20.	Chile delegation, Minister for Agriculture, Antonio Walker	South America	9	30.10.2018
21.	Zanzibar, Tanzania, led by Abdulla Saadalla, Permanent Secretary, Zanzibar	Tanzania	4	5.11.18
22.	Montana State Univ. , USA,REAL Leadership Program led by Tara BaleyBecken	USA	21	8.11.18
23.	FAO team through International Commission on irrigation and drainage (ICID) led by Ayman Elsayed Ibrahim Shahin	Egypt, Tunisia and Yemen	4	8.1.2019
24.	Secretary of State H.E. Khalid Samadi and Said	Morocco	6	21.1.2019

	Ezzahri Kingdom of Morocco			
25.	ING. Carlos Friguin,	Argentina	8	16.2.19
26.	Mr. Victor Canhemba, Permanent Secretary, Ministry of Agriculture and food security	Mozambique	2	15.3.19
27.	Eng. Abdullah Lahlouh Under secretary of the Ministry of Agriculture	Palestine	4	18.3.19
28.	Hon'able Minister of State for food security, UAE- Her Excellency Mariam Saeed Hareb Al Muhairi,	UAE	8	27.3.19
29.	Mr. Saif Mohammed Al Shara, Assistant Under Secretary, Ministry of Climate Change and environment, UAE	UAE	4	8.4.2019
30.	Maj. Gen. GA Wahab	Nigeria	28	14.5.2019
31.	Mr. Pan Xianzheng, Director General, Department of Personnel & Labor, Ministry of Agriculture & Rural Affairs, China	China	6	15.5.2019
32.	Dr. Hermanto, Senior Researcher, centre for Agricultural Socio Economic and poliy studies, Ministry of Agriculture.	Indonesia	13	17.6.2019
33.	H.E. Mr. Mahala Motapo, Hon'ble Minister of Agriculture & Food Security, Government of Lesotho	Lesotho	19	20.8.19
34.	Dr. Khalilullah Kaliwal, Chancellor, Balkh University, Mazar-e-Sharif, Afganistan	Afganistan	2	12.9.19
35.	Mr Eugenio Aguiló – Agricultural Attaché of Chile in India	Chile	1	9.10.2019
36.	Han Thein Kyaw, director BIMSTEC Secretariate	BIMSTEC	23	12.12.2019
37.	Dr. Ramgopal Agarwala, Distinguished Fellow (Secretary Level), NITI Aayog.	NITI Aayog	3	22.01.2020
38.	Daslo Karma Tsheetin, Chairman Civil Services, Bhutan	Bhutan	13	23.01.2020
39.	Mr. Michael Hawkins, Counsellor, (Agriculture and Agri-Food) and Senior Trade Commissioner, High Commission of Canada, New Delhi	Canada	1	30.01.2020



