Transforming Indian Agriculture

Challenges, opportunities and Way Forward

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Agricultural transformation

- A process by which individual farms shift from highly diversified, subsistence-oriented production system to more specialized and market oriented production.
- The process involves increased integration of agriculture with other sectors of the domestic and global markets.
- Agricultural transformation is a necessary part of the broader process of structural transformation
  - *Increasing proportion of economic output and employment are generated by sectors other than agriculture.*

Outline

Challenges in transforming Indian agriculture

Opportunities for agricultural transformation

Conditions for success

Conclusions and way forward

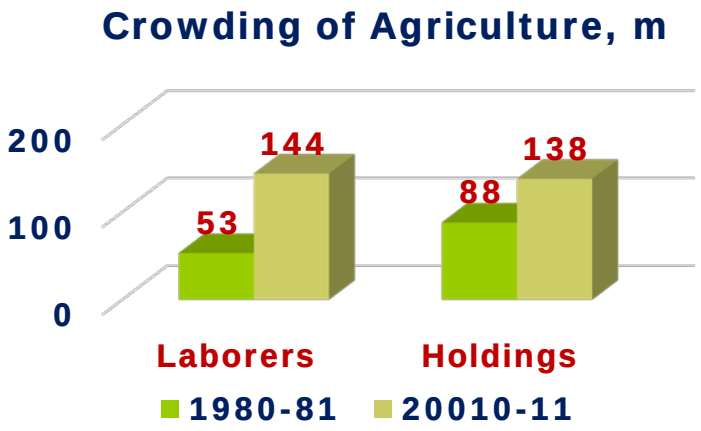
I

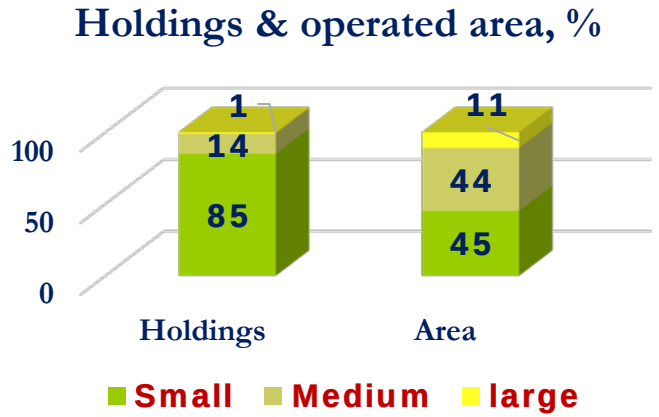
Challenges in transforming Indian agriculture

Indian agriculture

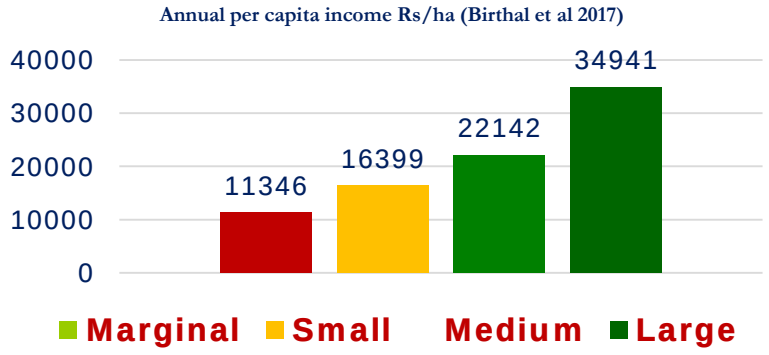
- Key characteristics of Indian agriculture
  - *Low land and labor productivity*
  - *Labor intensive and capital starve*
  - *High dependency on agriculture & steep fall of its share in GDP*
- Dominance of cereals in production system
  - *Policies, technologies and institutions suit more to rice and wheat*
- Rising food demand on limited land and water resources
  - *Food grain demand would rise by 330 mts*
  - *Deficit of pulses and edible oil. Sugar???*
  - *Deficit of HVCs if post-harvest is not addressed*
  - *Degradation of land and water resources*
- Lack of non-farm employment opportunities

Crowding of Indian agriculture: dominance of small & marginal farmers

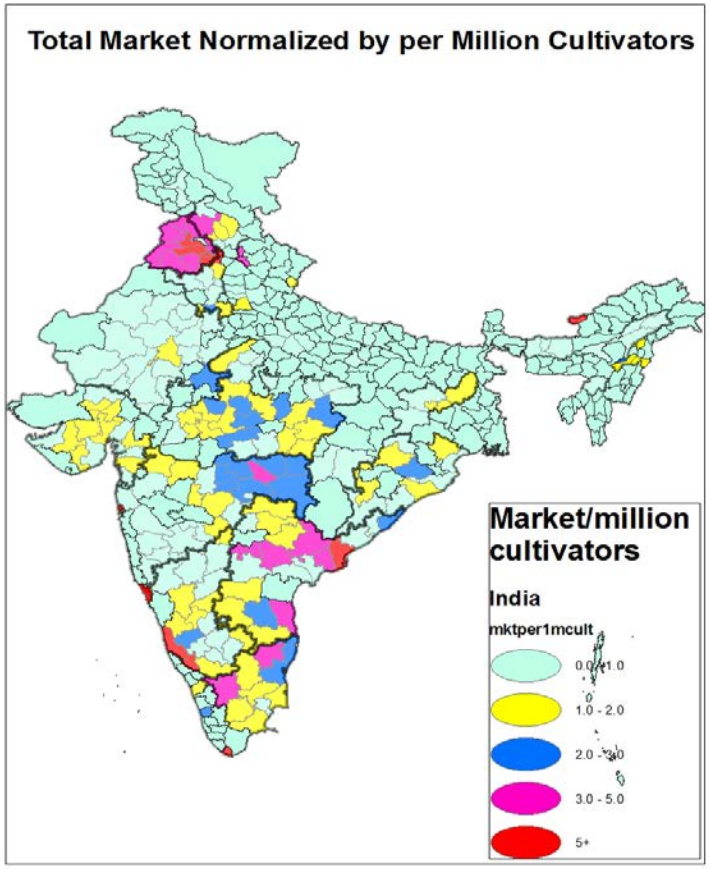


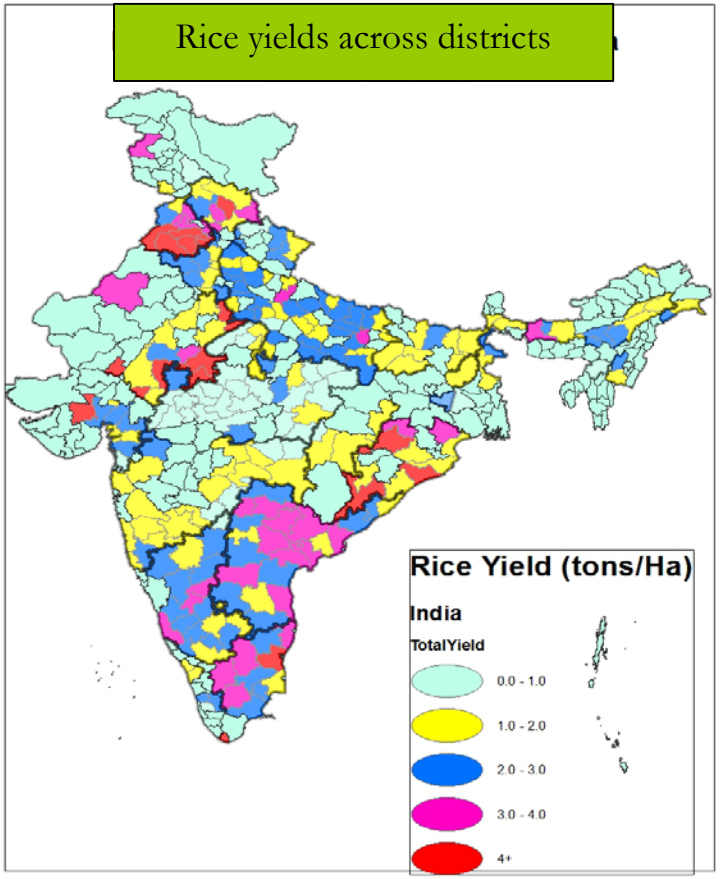


- Doubled the number of landless laborers and land owners
- Operated area fell by 4 m ha
- Smallholders increased by 70%
- Smallholder's projections for 2020:
  - *155 million will control about 51% area*
  - *90 million if 40% leave agriculture*
- Low income due to small holdings

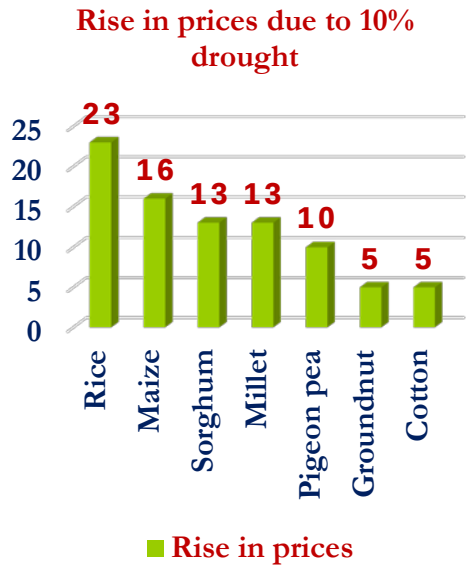


Missing markets constraining in transformation





Growing risk of climate change



Source: Kumar, et al 2013

- Climate change affects food production
  - *10-40 percent loss in crop production due to rise in temperature (Aggarwal et al 2009; Nelson et al 2010; Knox et al 2012)*
  - *4-20 percent yield loss of rice under irrigated condition*
  - *35-50 percent yield loss under rainfed condition by 2030*
- 2008 prices of major food crops increase due to drought
- Price spikes negatively affected about 77% of the population in the world
- Demand will go down due to rise in prices
  - *Rice by 5.5%; and 2-4% for other commodities*
- India might import 15 million tons of rice due to 20% drought in 2020
  - *Affect global prices significantly*
  - *Adverse effects on poverty*

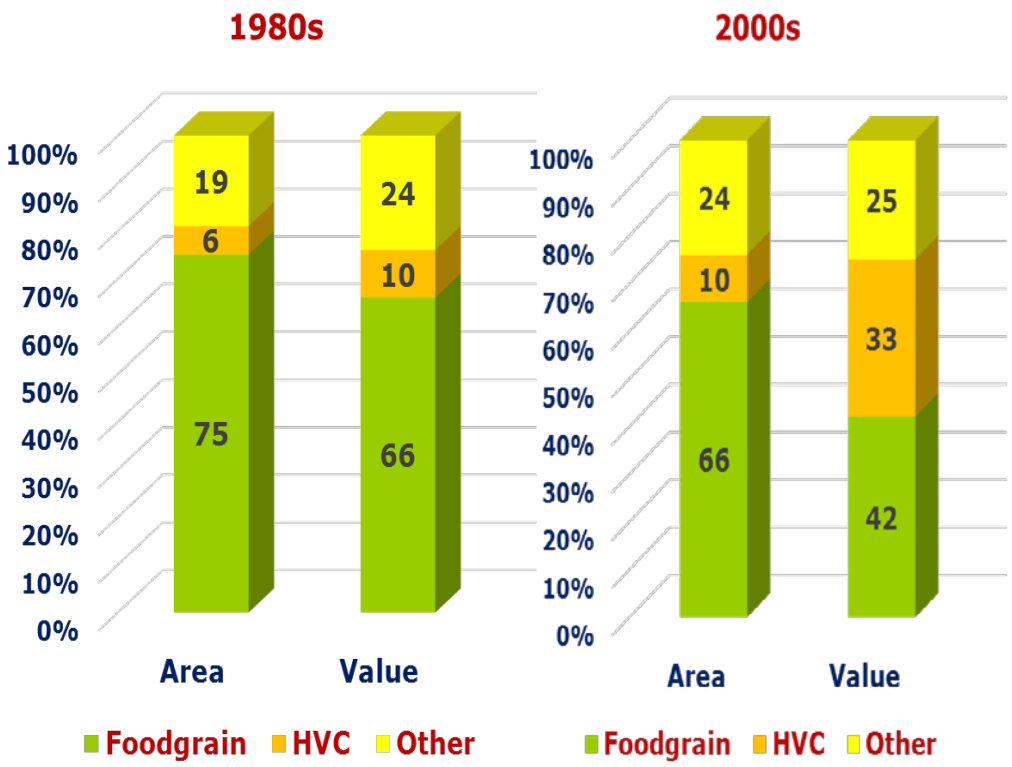
II

Opportunities for transforming Indian agriculture

1. Changing consumption pattern (Kumar and Joshi 2016)

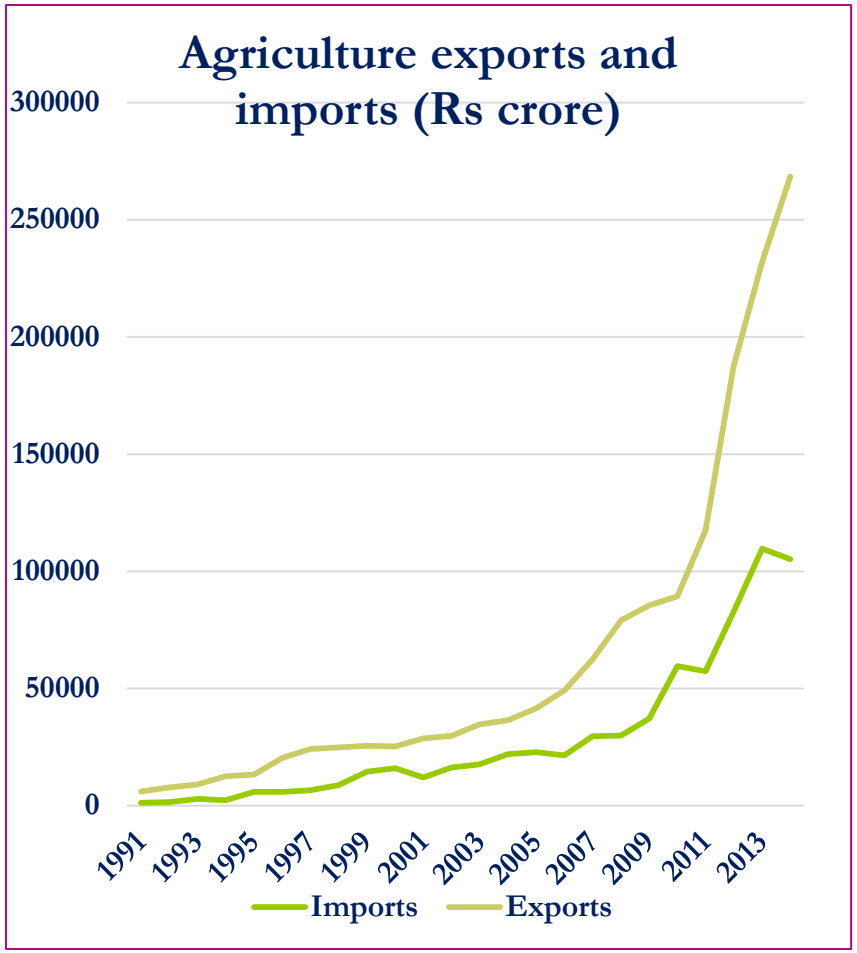
- Nearly half of all expenditure is on food
- Dietary pattern is changing
  - *Income, urbanization, globalization and change in taste & preference*
- Per capita consumption of cereals and pulses is declining
- Consumption of HVCs (fruits, vegetables, milk and meat) and processed commodities is rising
- Same trends for rich and poor but magnitude vary
- Price effect was higher than income effects

2. Diversification of agriculture (Source: Birthal et al 2014)



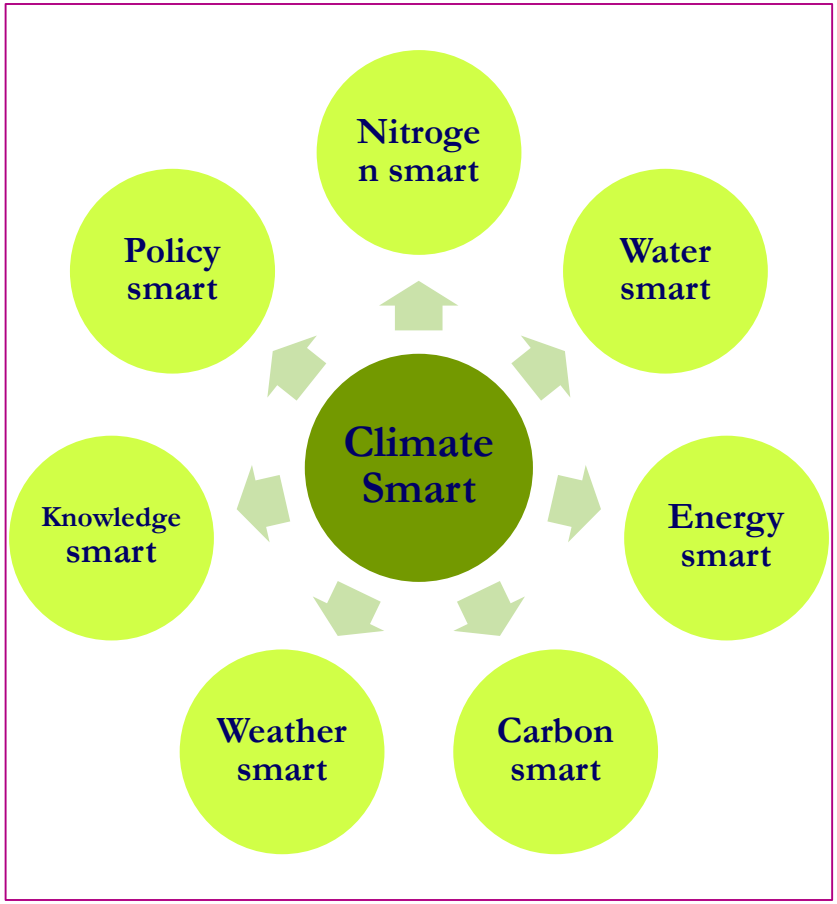
- Share of crop sector declines (66% in 1990s to 42%) Share of cereals declining in area as well as value
- Share of fruits & vegetables increasing in area and value
- Their contribution in value of agri output increased from 10 to 33%
- Share of livestock sector is 25% of total value of ag output
- All HVCs contribute roughly 50% in total value of ag output

3. Integrate with global market and agro-processing



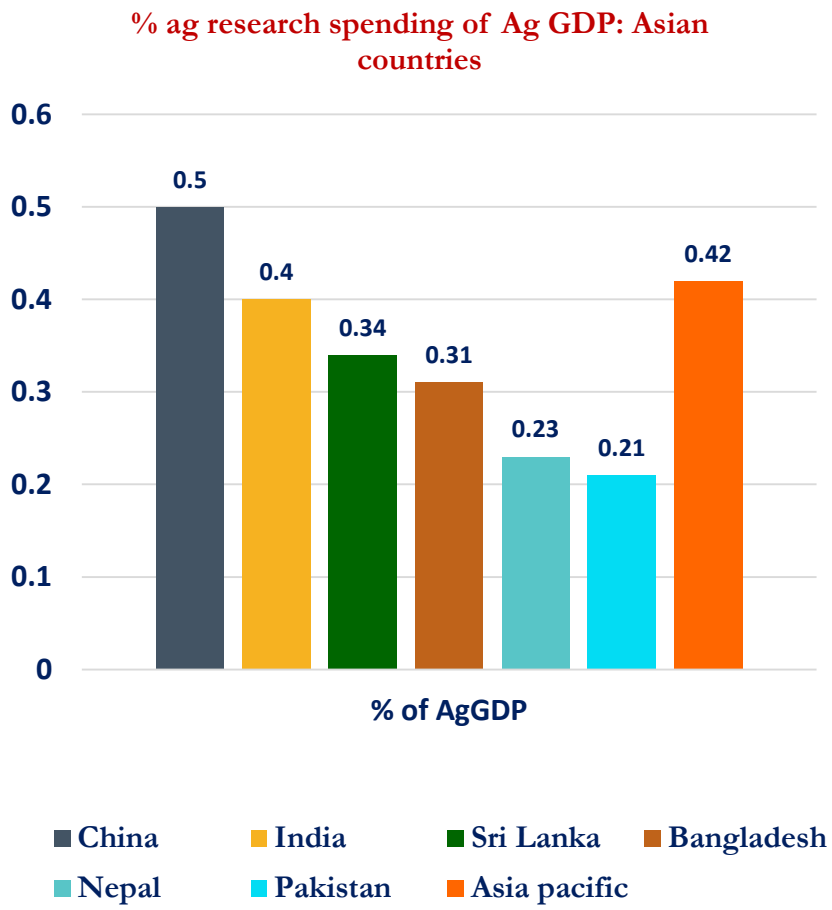
- Agricultural exports outpaced imports (14.17% vs 3.8%)
- Exports are zooming and showing positive balance of trade
- Enormous opportunities
  - *13% increase in agricultural production*
  - *3% rise in rural incomes*
- Agro-food processing sector is sunrise sector, growing at growing >11.74%
  - *Share in AgGDP* *12.2%*
  - *Share in MnGDP* *14.0%*
  - *Share in export* *13%*
- Processed food market is of US$ 292b
- Exports of processed food is rising
  - *2009-10* *USD 15 thousand million*
  - *2013-14* *USD 38 thousand million*

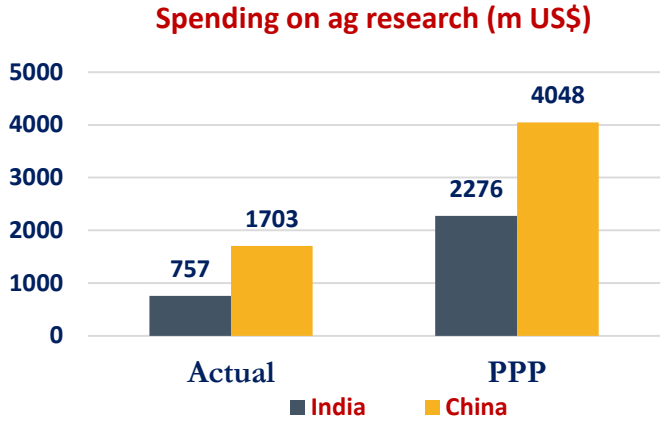
4. Climate smart agriculture



- Climate smart interventions (FAO)
  - *Adapting/mitigating climate change*
  - *Ensure reducing the risk arising due to climate change*
  - *Augmenting farm income.*
- Triple wins (World Bank)
  - *Higher yields, more carbon sequestration, and greater resilience to heat and drought*
- CSA consists of smart technologies, value added advisory services and insurance
- Feasible interventions
  - *Resource endowments*
  - *Capacity indicators*

5. Public agricultural research spending (Source: GFPR 2015)





- Spending in African countries
  - *South Africa* *2.18%*
  - *Kenya* *1.21%*
  - *Malawi* *1.03%*
  - *Ghana* *0.69%*
  - *Africa* *0.51%*
- Latin American & Caribbean
  - *Brazil* *1.52%*
  - *Mexico* *1.15%*
  - ***LA&C*** ***1.10%***

Returns to research investment on agricultural income and poverty reduction (income Rupees/rupee invested)

Component	Low income	Medium income	High income	All states
Private Inv (Irri)	19.80	2.87	1.66	9.72
Agri R&D	9.92	4.44	3.23	2.47
Education	1.50	2.27	1.74	2.39
Health	1.74	0.84	1.55	1.83
Energy	1.01	1.18	1.57	1.73

In low income states, investment in agricultural R&D ranked number 2 next to investment in private irrigation

In reducing poverty: Rs one million investment on Ag R&D reduces poverty by 1231 of rural people, and private irrigation by 1286.)

III

Conditions for success

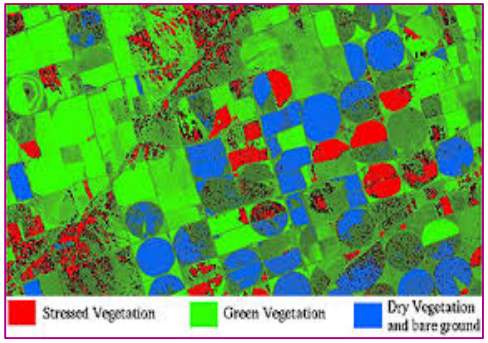
1. Future technologies

- Harness potential of existing technologies and practices
  - *Hybrids, GMOs, biofortifired varieties/hybrids, nano technology*
- Poly house farming
- e-agriculture
  - *Input delivery, knowledge, marketing (e-NAM), banking*
- Sensor agriculture
  - *Precision water and nutrition management*
- Application of remote sensing
- Use of drone in agriculture
  - *Soil & field analysis; planting; spraying; irrigation; health & loss assessment*
- Robotic agriculture
  - *Land preparation, planting, spraying, harvesting*

Future technologies

Polyhouse agriculture

Sensor agriculture



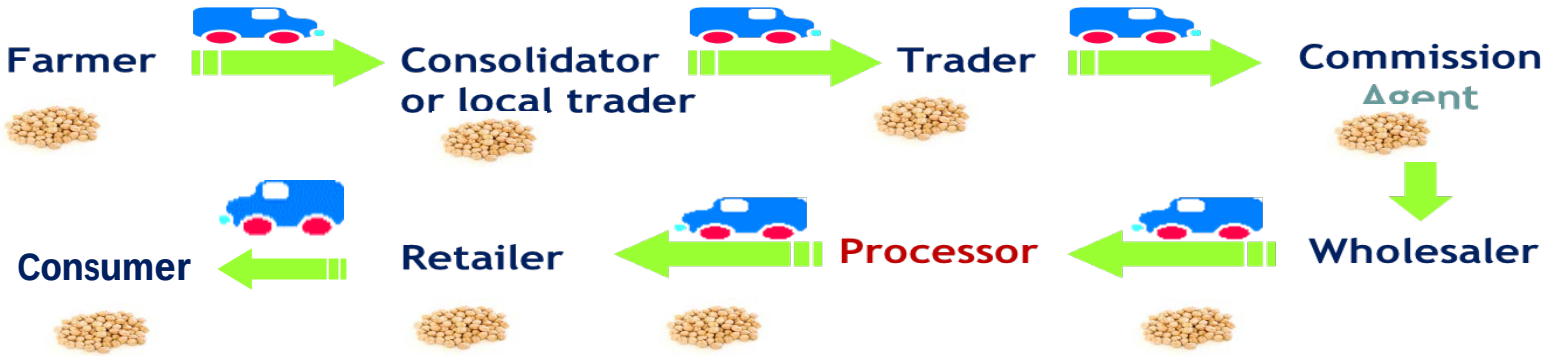
Remote sensing in agriculture

Drone in agriculture

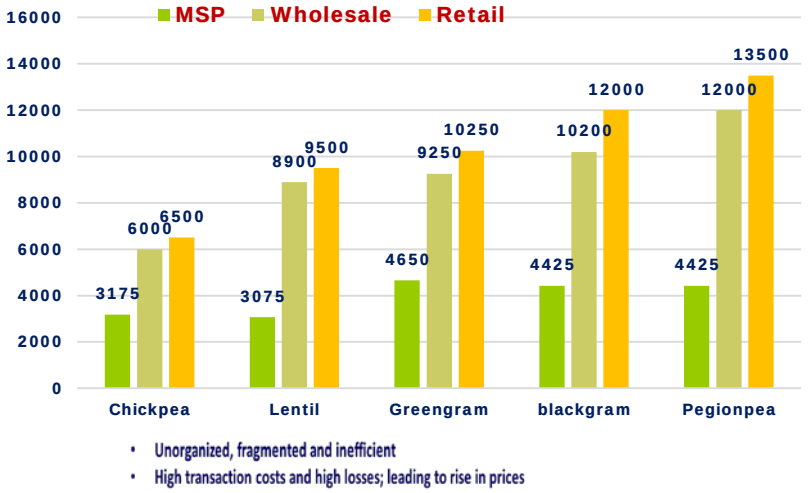
Robotic agriculture

Mobile in agriculture

2. Aggregate farmers: scale and market linkages



- Aggregate farmers
- Self help groups
- Cluster farming
- Cooperatives
- Farmer Producer Organizations
- Contract farming
- e-NAM
- Warehouse receipt



3. Human resource development

- Labor scarcity
  - *Need for farm mechanization*
- Skill development
  - *Skill to operate as agri-professional*
  - *Skills to operate new tools*
  - *Skill to participate in e-NAM*
  - *Skill to value addition*
- New initiatives
  - *Start up and skill development*
- Financing
  - *Take advantage of MUDRA Bank*

N·S·D·C
National
Skill Development
Corporation

4. Foreign direct investment (FDI)

- Agro-processing
  - *100 percent in equity*
- Seed development and production
- Single brand retail
  - *100%*
- Multi-brand retail
  - *51%*
- Conditions for FDI in multi-brand retail:
  - *50 % in backend*
  - *30% procurement from SMEs*

- Food sector received only 3.3% of the gross FDI flow in India between 2000 and 2010
- Seed sector
  - *Cargill, Syngenta, Monsanto*
- Processing sector
  - *Britannia; Nestle; Kellogg; PepsiCo., Perry, etc.*
- Major players in back-end
  - *Wal-Mart cash & carry*
  - *Metro cash & carry*
- Food service restaurants (single brand FDI)
  - *KFC; Pizza Hut; Dominoes; McDonald's etc*

IV

Way forward

SMART agriculture to produce SMART food

SMART Agriculture

S: Strengthen Services

M: Modernize agriculture

A: Agri-business

R: Resilient

T: Technology

SMART Food

S: Safe

M: Modern

A: Affordable

R: Resource efficient

T: Total (complete)

The way forward

- Consolidate farmers and cluster commodities
  - *694 FPOs covering about 7 lakh farmers*
- Focus on innovation and delivery mechanisms
- Diversify and modernize agriculture
  - *Diversification in favor of HVCs*
  - *Incentives on labor-saving practices and precision agriculture*
- Farm level value addition, processing and branding
  - *Beyond farming; develop business models*
- Attract organized private sector in agriculture and agribusiness
  - *Scale, taxes, trade policy, regulation compliance*
- Reform research-extension sector
  - *Prioritize and need-based research and extension*

Right innovations, incentives and institutions will definitely transform Indian agriculture