



# Agri-Innovations at the Technological Frontier: Sharing Experiences from India

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# Innovation Matrix – Reshaping Indian Agriculture

## Agri-food POLICIES

- Price policy to Income policy- Direct Benefit Transfer (DBT) – 84 schemes shifted to DBT by Feb17, saving more than Rs 50,000 crores;

## Production PROCESS

- Biotechnology – crops & Inputs
- Crop & Farm Management
- Farm Mechanization

## Supply Chain Management

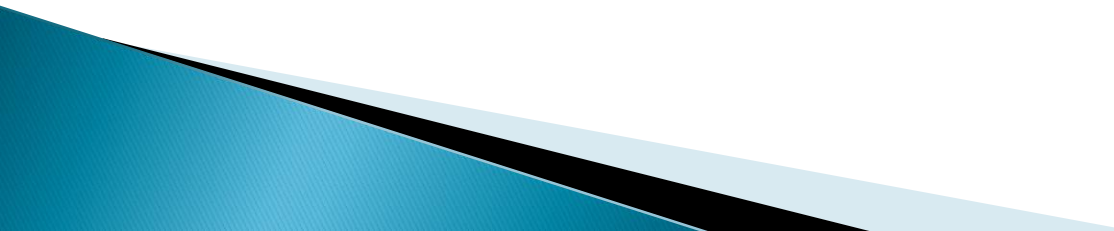
- Transportation & Storage
- Marketing

## Processing and Value Addition

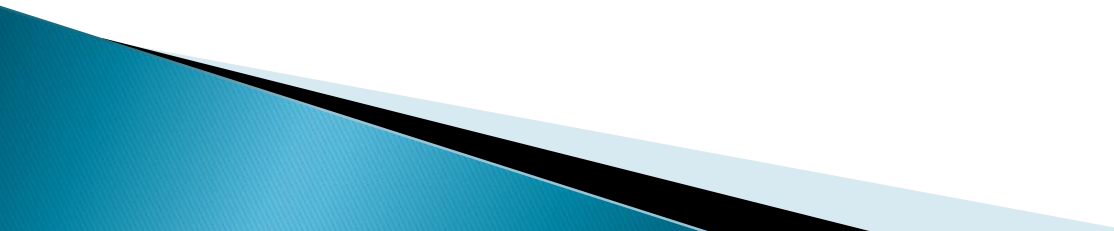
- Value addition in fruits and vegetables to extend shelf life and value addition

# India's Green Revolution:

## Innovations in Policy, Seeds, and Marketing Institutions

- ▶ India 1965–66: Living 'from ship to mouth' with back to back droughts and heavy dependence on PL-480 imports (of 10 mt/year)
  - ▶ Policy decision to import 18,000 tons of HYV seeds from Mexico (Sonora-64, and Lerma Rojo)
  - ▶ Agricultural Prices Commission (APC) and Food Corporation of India (FCI) created in Jan 1965
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# Results of Green Revolution

- ▶ By 1971, India almost self-sufficient in basic staples of wheat and rice; (Food security ensured from availability point of view ensured)
  - ▶ Building buffer stocks from domestic production (In June 2012– 82 MMT)
  - ▶ 2012–14, India exported 63 MMT of cereals; Grain prod. 276 MMT (2016–17)
  - ▶ Largest/second largest exporter of rice (2012–16);
  - ▶ Poverty least in Punjab which was in forefront of Green Revolution (Ill effects: declining water table due to free power policy)
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# India's White (Milk) Revolution:

An Innovation in Institutional Engineering, Technology and Value Chain development

- ▶ 1951: India's milk production 17mt; USA 53 mt;  
(late 1960s/early 1970s acute scarcity of milk in India)
- ▶ 1975: **Operation Flood** (Dairy program led by small holders under cooperative network)
- ▶ **Innovations in building Milk Value Chains:**
  - (Linking milk-producer cooperatives to demand centres thru investments in collection centres, logistics, processing, and retailing: resources came from monetisation of EC aid)
- ▶ 2016: India largest producer of milk at 160 MMT; USA second with around 95 MMT

# Gene Revolution made India 2<sup>nd</sup> largest exporter of Cotton

## India's only Bt crop: Bt Cotton

- Bt cotton permitted in 2002; 95 per cent of cotton acreage (11 m ha) under Bt Cotton now; Yields increased from 186 kg/ha in 2001–02 to 532kg/ha in 2013–14
- pesticides use declined by >50 per cent
- Net gain 2002–16, USD 67 billion compared to BAU scenario



## Global Trends

GM crops on 180 m ha;  
Drought tolerant Maize  
in US in 2013, and by  
now almost a million  
ha area covered

Bio-fortification (non-  
GM) unfolding now...

India iron rich pearl  
millet released in India;  
adopted by more than  
100,000 farmers; zinc  
rich wheat ready for  
release

# India's Horticultural Revolution

- ▶ Horticulture production 300 MMT against grain production of 275 MMT (2016–17)
- ▶ Largest producer of **bananas** (Largest tissue culture labs);
- ▶ **Mangoes:** (high density cultivation: 350 trees/ha) and **Ultra-High Density** (UHD) (1,675 trees/ha) as against a normal of 100 trees/ha
- ▶ increases productivity by more than 4-fold



# India's budding brown revolution:

Precision farming; 'producing more with less'; hydroponics and aeroponics

- ▶ Drips n Sprinklers (9 m ha); hydroponics and aeroponics; Urea– neem coating (slow release; checks on misuse)



# Innovations in use of Farm-machinery & Solar power

- ▶ UBERISATION of farm machinery
  - Mahindra and Mahindra (Trringo); TAFE...and many others...
- ▶ SOLAR power as third crop; Solar for cold/cool storages/chillers (JISL; ecoZen, etc)



# What is coming globally? Innovations in Advanced technologies...

## Precision Technologies

## What they do

Global Positioning System  
(GPS)  
(guidance systems)

Efficient field coverage,  
reduce fuel and other  
input costs

Sensors  
(Yield, Nitrogen, Moisture)

Facilitate variable rate  
application of inputs

Unmanned Aerial Vehicles  
(UAV's)/Drones

Surveillance, imagery,  
spraying pesticides

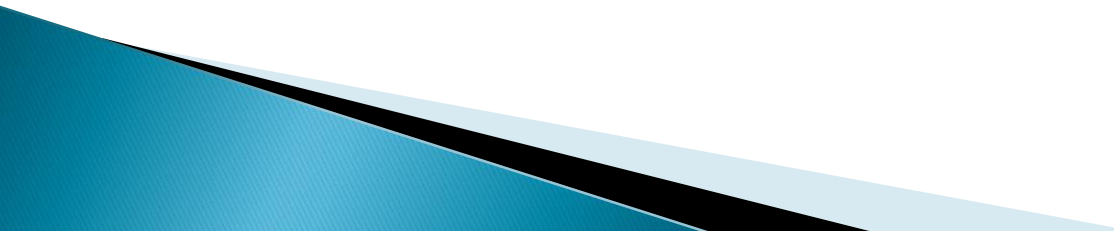
Robotics

Weeding, fruit harvesting,  
pruning vines

Big Data, Internet of  
Things

Analysis of data collected  
on field, facilitates  
planning

# Innovations in Digitization of Welfare Programs; e-markets

- ▶ JAM Trinity: Linking Jan Dhan accounts with Aadhaar and Mobile
  - ▶ Jan Dhan Accounts (massive mobilisation to open bank accounts)
  - ▶ Aadhaar (Unique Identification Number)
  - ▶ Mobile; POS machines
  - ▶ E-markets; eNAM
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# (India–Africa Forum: Oct.23–26, 2015, Delhi)

(meets once in 3 years) 54 countries participated; USD10 billion committed as line of credit, including for agriculture education, etc..

