Dynamics of Banana Research and Development in India for farm profitability enhancement

Harishchandra Prasad Singh & Prof. Babita Singh
Founder and Chairman, Confederation of Horticulture Associations of India (CHAI)
Email: hpsingh2008@gmail.com/confedhorti@gmail.com
Global situation of Food and nutrition

- 9.6 billion people have to be fade with declining land and water in 2050
- About 1 billion undernourished people
- Most affected – the poorest households
- High levels of acute and chronic malnutrition
- Food crises may drive another 100 million more people into poverty and hunger
- In India, food is secured, but more than 350 million people are malnourished
Emerging Scenario

- Growing population
- Declining land and Water
- Increasing malnutrition
- New diseases, pests and uncertainty of weather

Task –

- Food,
- Fuel,
- Fibre
- Neutraceutical
- Nutritional security and Health care
Crops, horticulture, livestock, dairy & fish supports

18% of global population
11% of the animals of the globe
From only 2.3% land &
4.5% water of the world
HOW THE INDIAN AGRICULTURE CHANGED IN THE LAST 60 YEARS

Rapid stride

5 times
6 times milk
11 times horticulture
9 times fish

Laudable achievements –
but declining factor productivity drives
farmers away from farm – Banana an option
Banana an option for Nutrition and higher profitability

- Banana for food, nutrition, fibre and optimum utilization of land and water resources
- Enhances farmer income per Unit area, even for small holder farmers and provides high profitability
- Knowledge based enterprise attracts youth for farming and value chain management
- Provides better employment opportunities in production and value chain management
- Healthy source of food and nutrition for youth, sportsmen and Senior Citizen
Global situation of Banana

• Grown in about 150 countries
• Source of livelihood for millions
• Rich nutritionally – a complete food
• Grown by small and marginal farmers
• Wide adaptability to climate and soil conditions
• Multifaceted uses – *Kalpatharu* or *Kalpavriskha*
Asian countries contribute conspicuously (about 60%) to global banana production. India contributes 20.6% of world production and 48% of Asian production.

### Global and Indian Scenario of Banana Production

<table>
<thead>
<tr>
<th>Country</th>
<th>Area (million ha)</th>
<th>Production (million tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>10.10</td>
<td>113.40</td>
</tr>
<tr>
<td>India</td>
<td>0.85</td>
<td>29.20</td>
</tr>
</tbody>
</table>

![Graph showing banana production over years for India and the world](image)
Contribution of Asia to banana production over last four decades
Trend in production of banana in different countries

HPS
Trend in Area, Production and Productivity of Banana in India
Banana varieties

Traditional varieties – Subtropics, Humid tropics (Ney Poovan, Silk, Mysore, Pisang Awak)

Commercial varieties – Mild subtropics, Dry tropics (Grand Naine, Robusta etc.)
DRIVERS FOR GROWTH

Technology
Investment
Policy
Technologies that transformed Banana

• Technological changes in propagation from suckers planting to tissue cultured plants

• Improved production system including high density planting

• Change from flood irrigation to drip irrigation and fertigation

• Mat and bunch management including protection against diseases and pest

• Value chain management and marketing
POLICY CHANGES

• Policy for marketing
• Policy for investment
• Mission mode approach
  ▪ Policy for micro-irrigation
  ▪ Policy for value chain management
Institutional support for Technology Development in India

- National Research Centre on Banana, Trichy - 1993
- 11 AICRP centers located in the different agro climatic zones
- NBPG, Delhi for cryopreservation of Germplasm
- Emergence of private player for research and technology support – Jain Irrigation Systems Limited, Jalgaon, Maharashtra, India
RESEARCH FOCUS OF NRC, BANANA

- Improvement through selection, mutation, breeding and bio-technological approaches
- Production systems management – nutrients, water and plant architecture
- Management of biotic and abiotic stresses
- Development of diagnostics for quick detection of diseases
- Post-harvest management and value addition
Cryoconservation of *Musa* germplasm for perpetuity

Total 200 accessions

100 accessions each from ITC and NRCB

Till date 28 Accessions cryo-conserved
Regionally differentiated technology development under All India Co-ordinated Research Programs
Technology development in private sector – JISL, Jalgaon

- Bio-technological approaches for improvement in Banana
- Production of clean tissue culture plants – 100 million plants annually
- Technology for planting geometry, efficient management of water and nutrients
- Production systems management including bunch management
- Value chain management and export
Why tissue culture?

- To avoid the risk of
- Transmission of viral diseases
- Pathogens
- Insect-pests like borers – nematodes
- And to get higher return per unit area
Macropropagation

for large scale production
of plants at farmers’ level
And Government nurseries
Micro-propagation in banana
Micro-propagated Plants
Uniformity and high yield in Banana
National Certification System for Tissue Culture Plants

Appellate Authority (DBT)

Tissue Culture Certification Agency (DBT, Govt. of India)

Referral Laboratory
- Virus Diagnosis - IARI
- Genetic Fidelity - CDFD

Accreditation / Certification Unit (BCIL)

Accreditation /Certification Panel

Accredited Test Laboratories

Certification of Tissue Culture Material (Issue of certificate of Quality)

Certified Production Facility
PRESENT SITUATION OF PLANTING MATERIAL CERTIFICATION IN INDIA

• Standards have been developed for certification
• Nurseries are accredited
• Accreditation system for TC plants is in place
• Standards for TC industries have been developed
• Implementation – through accreditation agencies
Production Management
Soil health management – a key

Priority themes for research support

• Substrate dynamics of existing systems
• Soil health
• Soil moisture
• Microflora and their antagonistic and synergistic interactions
• Solar radiation profile etc.
Site Specific Nutrient Management

- The ‘fertilizer tailoring equations’ for banana based on soil test crop response approach
Mat and Bunch management -
Plant health management

- Integrated management of insects, pests and diseases
- Solarization of potting mixer
- Exploitation of botanical for management of pests
- Bio-control of pests and diseases
Important Pests of Banana and Plantains

• Banana stem weevil, *Cosmopolites sordidus*
• Banana corm weevil, *Odoiporus longicollis*
• Banana aphid, *Pentalonia nigronervosa*
• Banana scarring beetle, *Nodostoma subcostatum*
• Banana rust thrips, *Chaetanaphothrips signipennis*
• Banana leaf eating caterpillar, *Spodoptera litura*
Major Nematodes in Banana

- Burrowing nematode, *Radopholus similis*
- Root-lesion nematode, *Pratylenchus coffeae*
- Root-knot nematode, *Meloidogyne incognita*
- Spiral nematode, *Helicotylenchus multicinctus*

- **Cultural and biological control measures are available**
Bio control agents

- Bio-agents like *Trichogramma*, NPV and Paecilomyces for control of pests

- *Trichoderma, Pseudomonas, Bacillus* for reducing soil-borne pathogens
Fungal Diseases of Banana

- **Fusarium milt of Banana (FOC)** Race-1, 2 virulent strain VCG-124 and Race-4
- **Leaf spot diseases**
- **Bacteria** – Heart rot
Major Banana Viruses
Diagnostics development

- ELISA Kit
  - Banana bunchy top
  - Banana mosaic
  - Citrus tristeza virus

- PCR based
  - Banana bunchy
  - Banana streak virus

- NASH based detection
  - Banana bunchy top/streak

- RT - PCR based detection
  - Banana bract mosaic
  - Banana mosaic caused by CMV
  - CMV and Piper Yellow mottle of

Diagnostics developed for banana
Post-harvest handling and management

- Maturity standards worked out
- Harvesting and handling
- Physiology of fruits and vegetable
- Storage system to enhance shelf life
- Diversified products
- Packing for enhanced shelf life
Farm waste utilization to meet the fibre needs
Developmental initiatives

- Support for the development of banana
- Infrastructure development - cold storages and post-harvest management
- Technology Mission for NE region and Himalayan states
- National Horticulture Mission-2005
- Policy change for cold storage, marketing and wine production
- National mission on micro-irrigation
Banana – A potential to meet

- Need of food and nutrition
- Wide range of agro-climatic zones
- Employment and income
- Livelihood
Our Vision

- Achieve a vibrant, responsive and resilient
- Banana industry, which shall be eco-friendly, equitable, sustainable and economically productive
Conclusions

- Banana “a tree of life” for its multifaceted use and is valued for socio-economics of the country
- There is a revolution in production of banana in the country in last three decades
- Research and development strategies have been a prime mover for achieving revolution
- Technological changes - use of tissue culture, high density planting, drip and fertigation, Mat and bunch management, production system and value chain
- The Govt. has focused on enabling environment through infrastructure, policy and support
- However, challenges of biotic and abiotic stresses continues - needs collective efforts
LET US ADDRESS THE CONCERNS FOR THE GROWTH OF BANANA INDUSTRY