Space Technology for Decision Support in Agriculture

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**Indian Agriculture: Opportunities & Challenges**

- **Net Area Sown**: 139.93 Mha (43%)
- **Foodgrain production**: 270 Mt
- **Horticulture Production**: 287 Mt
- **Net Irrigated Area**: 66.1 Mha (47.2%)
- **Agrl. & Allied Sector Share of GDP**: 14.6%
- **Employment Opportunity**: 54.6%
- **Fragmented Land**: Average Field size: 1.15 ha
- **Dependent upon Rainfall**
- **Low Productivity/Yield Gap**
- **Low Cropping Intensity (139%)**
- **Flood, Drought, Hailstorm, Pest/Disease, Climate Change**
- **Limited Infrastructure**

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the Goal: Doubling Farmers’ Income by 2022

Recommendations of Group of Secretaries: Agriculture

Two-pronged Approach

Sustainable Productivity

• Enhanced Productivity
• Diversification: Horticulture & Agro-Forestry; Dairy, Fisheries & Small Livestock

Enablers

• Credit/Insurance & Technology
• Rural Infrastructure & Institutions
• Capacity Building and Governance

Post-harvest Value Addition & Market Integration

• Food Processing
• Post harvest infrastructure & Market Linkages

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48 Years of Use of Remote Sensing in Crop Assessment:
Involvement of Ministry of Agriculture

- **1969**: NASA-ISRO-MoA
- **1978**: JEP
- **1988**: CAPE
- **1997**: FASAL Pilot
- **2007**: FASAL
- **2012**: MNCFC

- **1978**: Experimental Studies on Crop Discrimination
- **1978**: Area & production Estimates of major crops at State level.
- **1997**: National Wheat, FASAL-Odisha
- **2007**: District-State-National forecasts using multiple approaches for multiple forecasts
- **2012**: Institutionalisation of Space Technologies developed by ISRO

**Coconut Root Wilt study in Kerala**
FASAL (Forecasting Agricultural output using Space, Agrometeorology & Land based observations) Project: Since 2007

Multiple Crop production forecasts of 8 major crops (Rice, Wheat, Cotton, Sugarcane, Mustard, Sorghum, Pulses & Jute)

Satellite data of optical and Microwave (National and International): One of the largest users of Indian Satellite data

Yield Models (Empirical, Semi-physical, Crop Growth Simulation)

Forecasts National/ State/ District level: Pre-sowing to pre-harvest

Used as one of the inputs for Government’s Final Estimates

>90 partner organisations (DACFW, MNCFC, 3 ISRO centres, 19 SDAs, 18 SRSACs, 46 AMFUs, IEG, IMD,)

Smartphone based Field Data Collection
### Horticultural Crop Estimation

#### CHAMAN (Coordinated Horticultural Assessment & Management using geoinformatics) Project: Since 2014

Production estimation for 7 major horticultural crops (Potato, Onion, Tomato, Chilli, Mango, Banana, Citrus)

#### Satellite Data: Resourcesat 2 (AWiFS, LISS III, LISS IV), Cartosat, Sentinel-2 & Landsat-8

#### Yield Models: Operational for Potato, Developmental stage for other crops

#### Estimates at State/ District level; For Orchards – Maps on Bhuvan

#### Used as one of the inputs for Government’s Final Estimates

#### Partner organisations (DACFW, MNCFC, ISRO centres, State Horticulture Departments, State Remote Sensing Centres, IMD, Agri. Univ, IEG)

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**Potato Area-Jalandhar, Punjab**

**Tomato using LISS IV Data**

**Chilli using LISS IV Data**

**Mango Orchard Inventory – Sitapur District, Uttar Pradesh**

**LISS IV + Cartosat Data**

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As per New Drought Manual 2016, Remote Sensing Index is one of the 4 impact indicators to be used for drought declaration.

Remote Sensing Index: NDVI/NDWI Deviation or VCI

Use of Drought Manual is Mandatory for Drought Declaration

High Demand for Satellite based Vegetation Index Data

Satellite based soil moisture can be input for another Impact Indicator: Moisture Adequacy Index

Rainfall Deviation (Jun-Sep, 2017)

Vegetation Condition Index (Sep, 2017)

Moisture Adequacy Index (Jun-Sep, 2017)
Crop Insurance

Pradhan Mantri Fasal Bima Yojana (PMFBY) promotes use of technology for implementation

KISAN (C[K]rop Insurance using Space technology and geoiNfformatics) project to support PMFBY

Use of Remote Sensing Data for Crop Cutting Experiment Planning and Optimization (Smart Sampling)

Satellite Data for Area Discrepancy and Yield Quality Checking

Remote Sensing for Loss Assessment

Clustering of Districts based on long-term satellite data

UAV/Drone for Crop Assessment
Site Suitability for Horticultural Expansion in North Eastern States in Jhumlands

Plans for Infrastructure (Cold storage) development

Site suitability of growing pulses in Post-kharif Rice Fallow Lands

Potential Assessment for growth of Micro-irrigation
New Proposed Programme

National Programme on Space Technology for Agriculture (NPSTA)

Programme Goal
Integrated use of Space and Geospatial Tools for Mapping, Monitoring and Management of Agriculture

Sub-Programme 1
Crop Assessment & Monitoring

Sub-Programme 2
Agricultural Resources Management

Sub-Programme 3
Disaster Monitoring and Mitigation

Sub-programme 4
Satellite Communication and Navigation Applications

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Reasons for the Success Story

• The prime goal of “Space Technology for solving national problems”, set by Prof Vikram Sarabhai

• Perseverance and interest shown at very highest level,

• The NNRMS concept

• The concept of developing technology and transferring to user department.

• Involving users from the project planning to execution and implementation level.

• Giving agriculture the prime importance for sensor development.

• Initiatives towards institutionalization.