Operational Mapping and Monitoring of Agricultural Crops in India

Mahalanobis National Crop Forecast Centre
Mahalanobis National Crop Forecast Centre was established under Ministry of Agriculture & Farmers Welfare with technical and human resources support from Indian Space Research Organization (ISRO). Centre was inaugurated on 23rd April, 2012.

Mandate: Use geospatial technology for agricultural assessment.

Human Resources: Technical: 24; Administrative: 5

A state-of-the art RS&GIS lab

Collaboration: 20 State Agriculture Dept., 12 State Horticulture Dept., 16 State Remote Sensing Centres, 3 ISRO Centres, IMD, ICAR …

5 National Programmes: FASAL, NADAMS, CHAMAN, KISAN, Rice-Fallow
Indian Agriculture

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

Low Cropping Intensity (139%)

Disasters (Flood, Drought, Hailstorm Pest/Disease)

Limited Infrastructure
Agriculture: the Major Driver for Indian Space Programme

- Birth of Remote Sensing with Coconut Wilt Experiment
- A Major Role in Defining Indian Remote Sensing Satellites
- Growth of Digital Analysis
- Largest Number of Professionals
- Biggest Single User of Remote Sensing Data
- Institutionalization
Agricultural Applications of Remote Sensing

- Crop Production Forecasting
- Horticulture Development
- Sustainable Agriculture
- Climate Change
- Disaster (Drought & Flood)
- Watershed Development
- Soil Resources
- Fishery
- Irrigation Management

Mahalanobis National Crop Forecast Centre
Crop Forecasting

Forecasting Agricultural output using Space, Agro-meteorology and Land based observations

- Econometry
- Early Season (State)
- Mid Season (State)
- Pre Harvest (District)

Multiple in-season Forecasts

- Statistical Model
- Simulation Model
- GT
- Yield
- Mod Res. Data
- High Res. Data
- Revised Forecast

Mahalanobis National Crop Forecast Centre
FASAL: Crop Forecasting

FASAL (Forecasting Agricultural output using Space, Agrometeorology & Land based observations)

Multiple Pre-harvest production forecasts of 8 major crops

Both optical (R2 AWiFS & LISS III; L8 OLI; S2 MSI) and Microwave (RISAT-1 SAR/Sentinel 1) Data

Spectral Yield Model (Empirical/Semi-physical)

18 forecasts in a year at National/ state/ district level

>90 partner organisations (DACFW, 3 ISRO centres, 19 SDAs, 18 SRSACs, 46 AMFUs, IEG, IMD, MNCFC)
Smartphone for Field Data Collection
Improving Quality of Crop Cutting Experiment

CCE Points for Seoni district of Madhya Pradesh under Crop Insurance 2015

Seoni District Yield Map From CCE Data

Stratumwise Average Yield in Seoni District (MP)

Mahalanobis National Crop Forecast Centre
Drought Assessment

Satellite Data: NOAA-AVHRR, MODIS, AWIFS

- NDVI
- VCI (NDVI)
- NDWI
- VCI (NDWI)

Logical Rules

Level 1 Assessment

Logical Rules

Level 2 Assessment

Logical Rules

Rainfall Data: IMD, State Agriculture Dept.

- Rainfall Deviation
- Rainfall Data

SASI
- Soil Moisture Index

Irrigated Area (%)

Other ancillary Data
(Sowing area etc.)

Final Assessment

Legend
- Normal
- Watch
- Alert
Agricultural Loss Assessment

- Flooded Area Assessment, 2016

- Impact Assessment of Heavy Rainfall and Hailstorm in Northern India during Feb-Mar, 2015

- Whitefly Attack Assessment of Cotton Crop, September, 2015
Horticultural Inventory

**Coordinated Horticulture Assessment and Management using geoinformatics (CHAMAN)**

- Area assessment and production forecasting of major horticultural crops in selected districts of major states.
- Geospatial Applications for Horticultural Development and Management Planning
- R&D studies for crop identification, yield modeling and disease assessment.

**Area and Production Estimate (12 states, 185 Districts)**
- Fruits: Banana, Mango and Citrus
- Vegetables: Potato, Onion and Tomato
- Spices: Chili

**Horticultural Development Studies**
1. Site Suitability
2. Post-Harvest Infrastructure
3. Crop Intensification
4. GIS database creation
5. Orchard Rejuvenation
6. Aqua-horticulture
Infrastructure Planning

Mahalanobis National Crop Forecast Centre

Cold Storage Location Map for Bihar State

Proposed Cold Storages Map for Bihar State

Legend
- Proposed Cold Storages
- Existing Cold Storages
- Major Roads
- District Boundary

Source: DAC, Ministry of Agriculture, Prepared by NCFC

Cold Storage indicating Priority Crop
- Apple
- Litchi
- Mango
- Grapes
- Pineapple
- Khaj
- Pomegranate
- Cabbage
- Carrot
- Cauliflower
- Onion
- Peas
- Potatoes (raw)
- Pulses
- Seeds
- Spices
- Flowers
- Others

Existing

Proposed
Crop Intensification: Rice-Fallow Area

Mahalanobis National Crop Forecast Centre
Space Technology in Support of Flagship Programmes

- Pradhan Mantri Fasal Bima Yojana
- Pradhan Mantri Krishi Sinchai Yojana
- Soil Health Card

Mahalanobis National Crop Forecast Centre
Developments in Technology

- Satellite Constellations (e.g. Doves of Planet Labs)
- UAV/Drones
- Wireless Sensor Network
- Smartphone and Crowd-sourcing of Data
- Big Data Analytics
- Cloud Computation
- Internet of Things
- Modeling/Decision Support
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
And the Goal is Doubling Farmers’ Income by 2022.

Mahalanobis National Crop Forecast Centre

shibendu.ncfc@nic.in; +91-9871963449; shibendu_ray