

**NITI Aayog**  
**Task Force on Use of Technologies for Agriculture Insurance**

Sub Group-1  
**(REMOTE SENSING AND UAVs)**

**Satellite and UAV Remote Sensing for  
Agriculture Insurance**

## Objective

Comprehensive assessment of the scope for using

- Satellite remote sensing technology
- Geospatial technology
- Unmanned Aerial Vehicle (UAV) based remote sensing

for strengthening Agriculture insurance in the country

## Focus

- Immediate deliverables and operational capabilities
- Research issues – medium and long term

## Inputs used

- Satellite data sets/derived indices
- Satellite derived thematic layers
- Satellite based biophysical parameters
- Reports
- UAV studies and reports
- Discussions with experts

The sub-group has identified the following technology intervention areas in the crop insurance value chain

- (1) rate making**
- (2) insurance coverage and compliance**
- (3) prevented /failed sowing risk**
- (4) crop mapping & area discrepancy**
- (5) mid-season adversaries**
- (6) crop loss due to natural calamities**
- (7) localized risk**
- (8) Crop Cutting Experiments and**
- (9) post-harvest damage assessment**

Opportunities for technology utilization under each component have been discussed in the report

- Technology based information products and services are useful inputs in each of the identified 9 segments of crop insurance and hence establishing a viable mechanism to generate these inputs is recommended.
- Information products and services currently available from NRSC, SAC, IMD ... are highly relevant and hence evolve a mechanism for their effective utilisation
- Strong geo-referenced cadastral map base and its linkage with different records
- Low cost/free satellite data of moderate resolution (5-60m), reasonable revisits, proven tools and techniques for analysis, Mobile technology offer scope for immediate use.

- Crop mapping and crop distribution information products for major crops in rabi season and selected crops in monsoon season
- Crop surveillance and agricultural intelligence information products are to be generated continuously and integrate with crop insurance.
- Scope exists for developing operational procedures to generate GIS maps with mobile data and link the same with indemnity assessment process
- Institutional participation – Line Departments, special emphasis – KVKs of ICAR and Dept. of Posts

## Crop Cutting Experiments (CCE) – Road map for improvement

**Phase 1: Transparent CCE** – Use GNSS enabled mobile apps for data recording, CCE auditing and timely information reporting. These interventions can be brought in to the system with immediate effect.

**Phase 2: Improved CCE** – Improve the sampling design using yield proxy information, reduce the sample size and improved distribution of the sample plots. Remote sensing derived crop vigour indices, weather data sets and field information are to be effectively blended to generate crop yield proxy indices that act as basis to refine the sampling designs.

**Phase 3: Alternate to the CCE mechanism:** Development of crop yield estimation methods based on simulation models or empirical models with multiple (including remotely sensed) inputs will enable generation of scalable crop yield maps. Such maps are potential data sets as alternate options to CCE process for crop yield estimation. Considering the complexities and challenges associated with crop yield models, this activity is rightly positioned as a long term activity.

**Research Issues:** *Development, validation and standardization of yield proxies with an integrated approach is a medium term research activity and Development of crop yield models based on remotely sensed inputs*

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Sl No.	Crop insurance requirement	Technology based deliverables	Technology utilization status		
			Immediate	Medium term (next 3-4 years)	Long term (next 4--7 years)
1	Insurance rate making	Hazard and vulnerability maps	For selected states and disasters	For all states and major disasters	
2	Insurance coverage and expansion	Digital geo-referenced land records Real-time field info. on coverage	Can be used all over	--	--
3	Prevented/failed sowing risk	Spectral indices, Surface soil moisture, Modelled soil moisture, Rainfall data	Implementable at Taluk/district level	Downscale to finer scale. Improved assessment	---
4	Mid-season adversary	Realtime field information	Can be used all over		



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5	Natural calamity Flood/cyclones	Flood maps, Cropped area maps	Extent of crop area affected	Improved products	---
6	Crop mapping & surveillance, area discrepancy	Crop mapping Crop condition maps, Weather anomaly maps	Kharif and Rabi. Cloud free data availability in kharif. Microwave for rice mapping	Improved methodologies	---

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7	Crop yield estimation in the insurance units				
	Improving CCE mechanism		Mobile Apps Satellite data	--	--
	Reduce CCE plots/ optimal sampling design		--	Crop yield proxy	--
	Replace CCE process		--	--	Modeling
8	Crop loss assessment from abnormal events	Satellite indices Mobile apps	To some extent. Mobile Apps and limited spectral indices	Improved methodologies	Modeling, Methodology improvements
9	Post harvest losses	Real time field information	Mobile App based enumeration		

# EO Systems for Crop Insurance

## Satellite Data / Services

- 3-4 optical satellites
  - 10-30m spatial resolution
  - 10 day repitivity
  - Visible, NIR, SWIR
- 2 microwave satellites
- 1 hyper-spectral satellite

## Cost aspects

- Satellite data sets – low priced/free
- Mobile technology – low cost
- Softwares – open source

- Cost of technology use – Rs.5-10/ha
- Small fraction of indemnity/sum insured

# UAV remote sensing

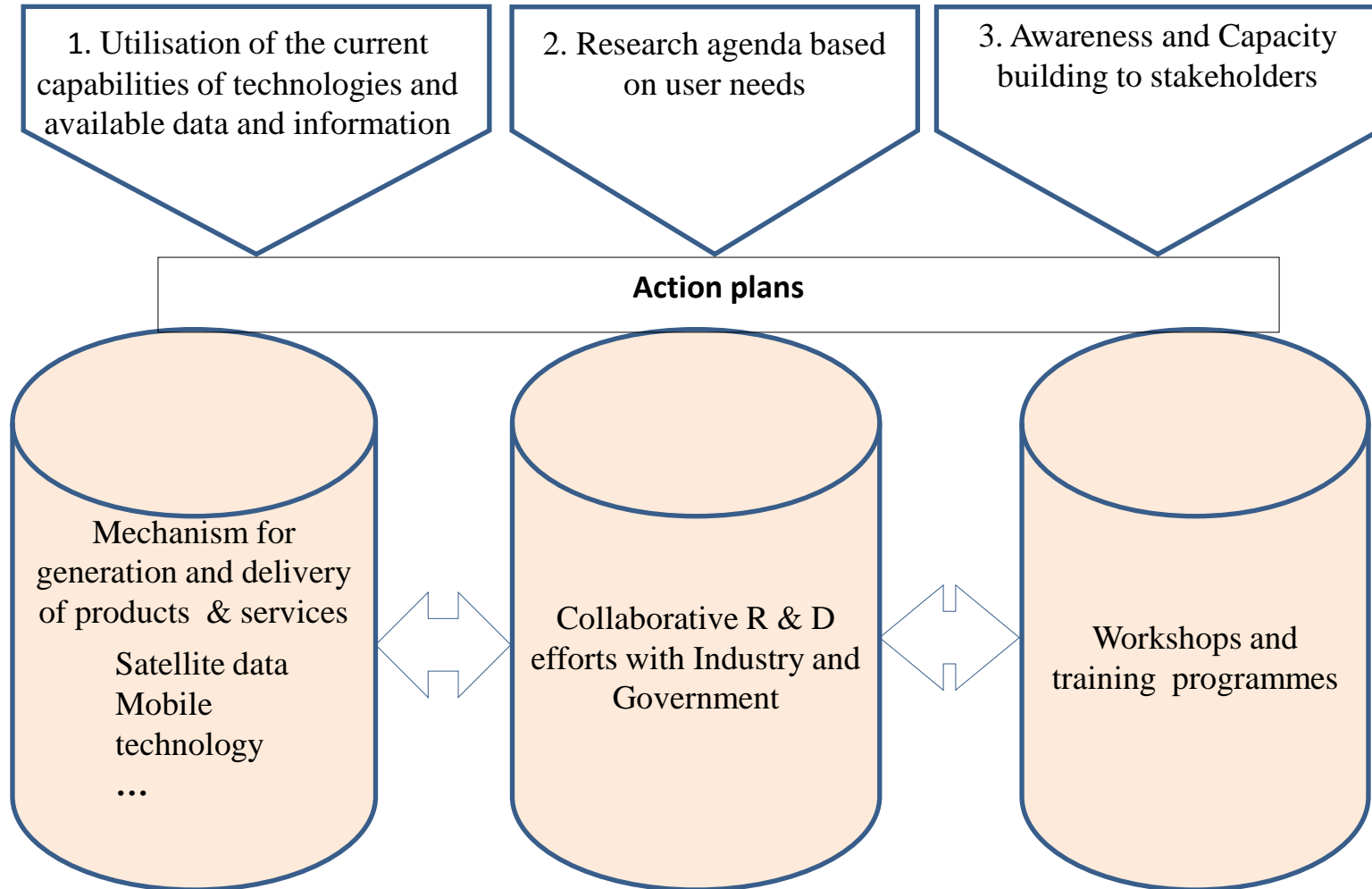
- Selective use to complement/supplement satellite data
- Quick assessment over inaccessible areas
- Assessment for certain specific events
- Not many success stories in India
- Nor detailed analysis is reported
- Isolated case studies

## Issues

- Standard procedures for rapid acquisition
- Radiometry / geometry corrections
- Integration with satellite indices
- Data storage issues
- Permissions

**Researchable Issue :**  
*Developments of methodology on UAV based remote sensing for growth monitoring of different crops (cereals, pulses fruit crops, growth stages, crop coverage (varying LAI) and environment like irrigated and rainfed conditions and upscale to regional scale using satellite images*

# Strategies for integrating technologies with crop insurance



Coordination with S & T institutions, Commitment and participation from States and insurance companies are vital for successful use of technologies in crop insurance

Thank you