Technology Innovations – Agriculture Insurance

Global Index Insurance Facility

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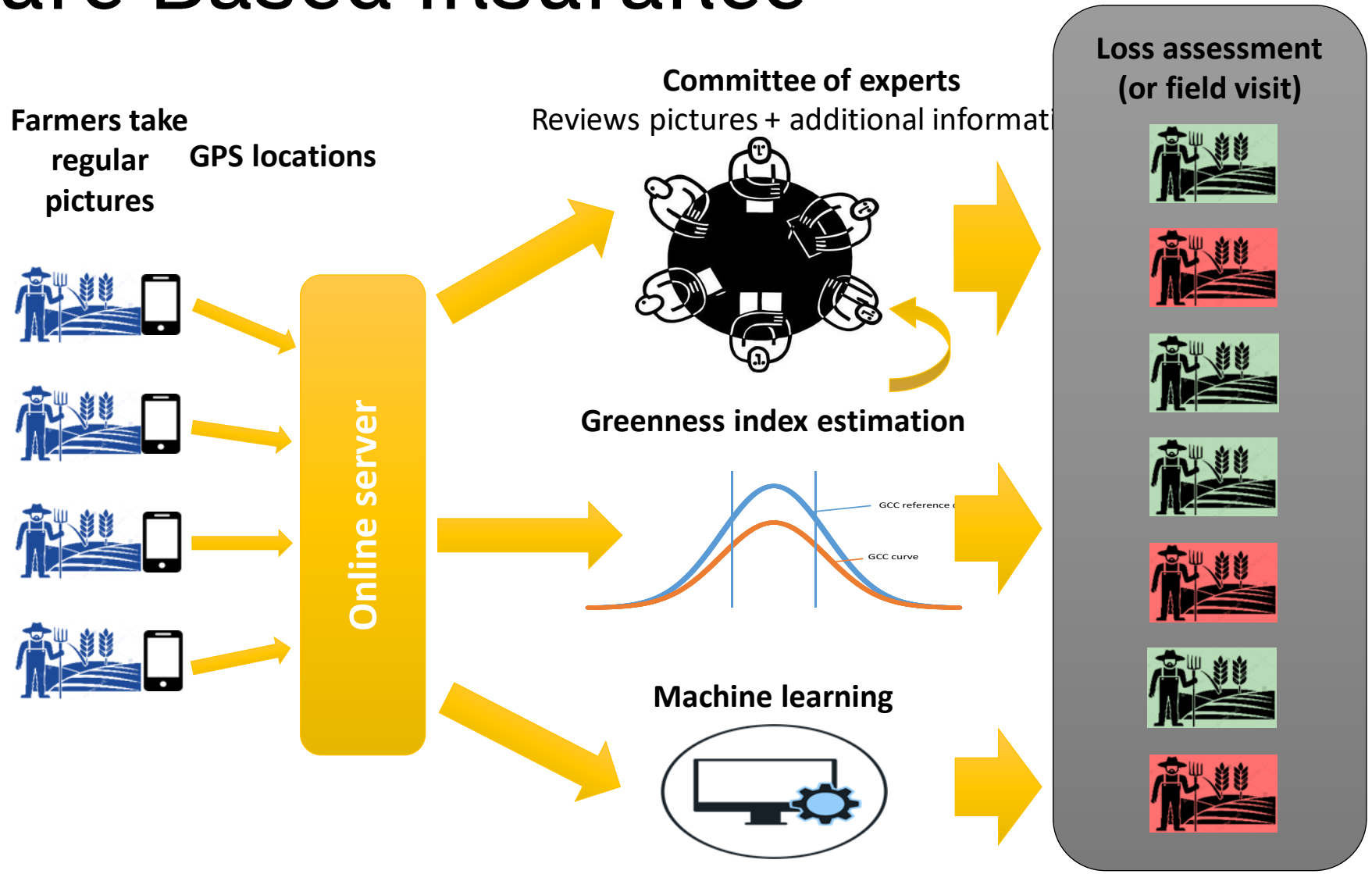
DAKAR2017

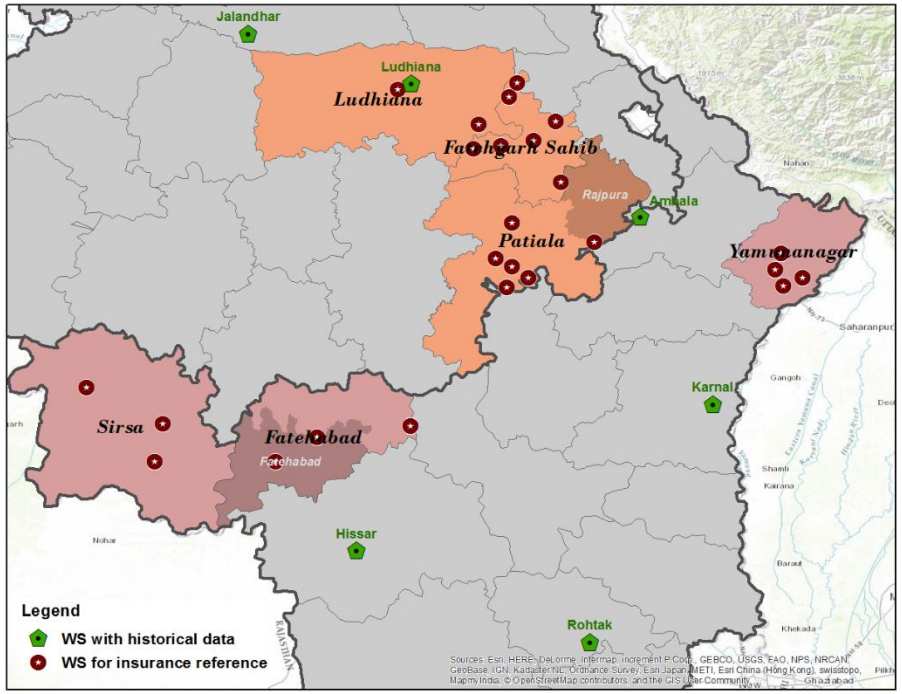
Global Index Insurance Conference

Picture Based Insurance



Picture Based Insurance

- States: Punjab & Haryana
  - 6 districts
  - 50 villages
  - 750 farmers
- Wheat crop (winter/rabi)



RESEARCH PROGRAM ON Climate Change, Agriculture and Food Security

CGIAR

CCAFS

RESEARCH PROGRAM ON Policies, Institutions, and Markets

CGIAR

Led by IFPRI

BISA Borlaug Institute for South Asia

HDFC ERGO GENERAL INSURANCE

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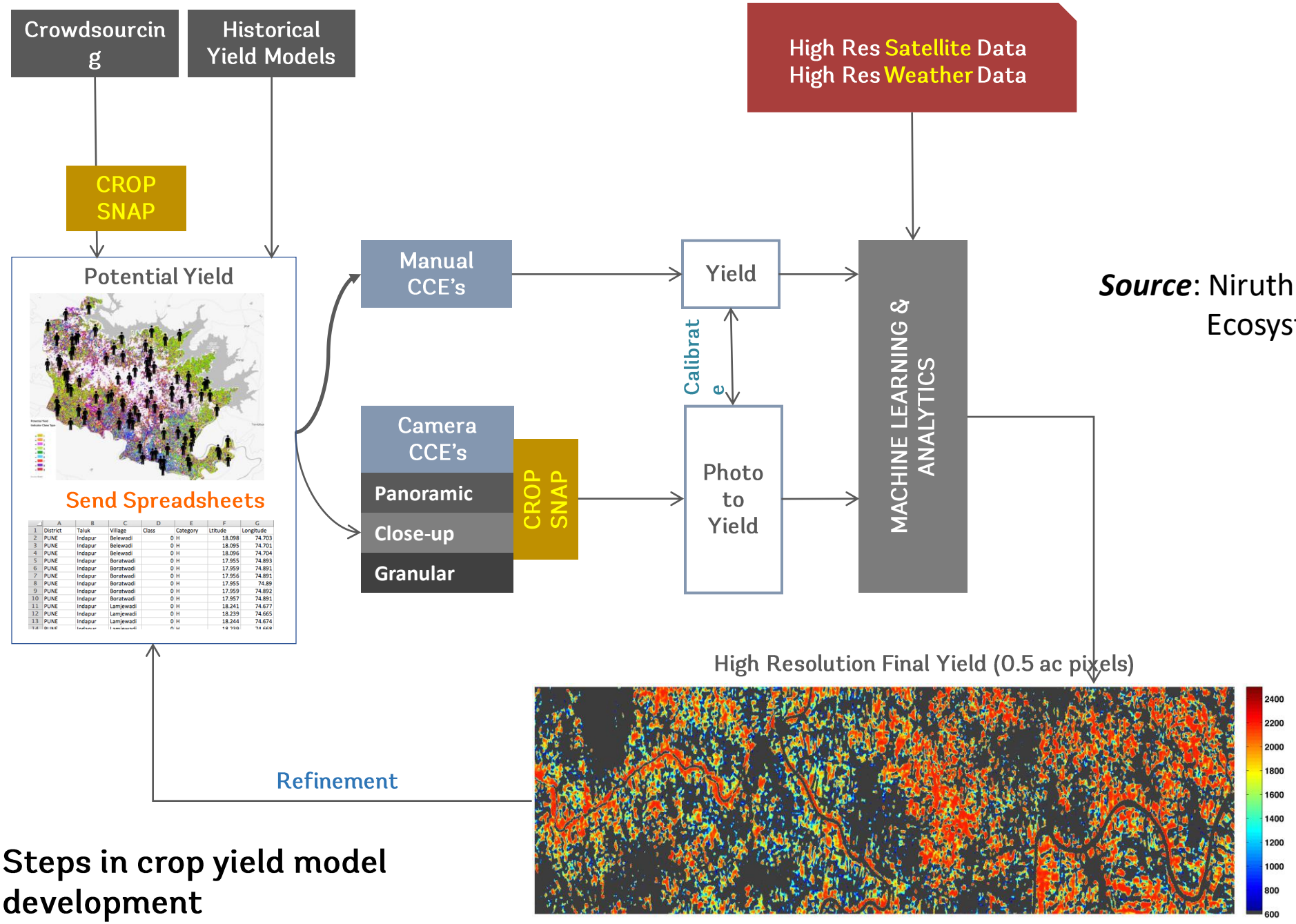
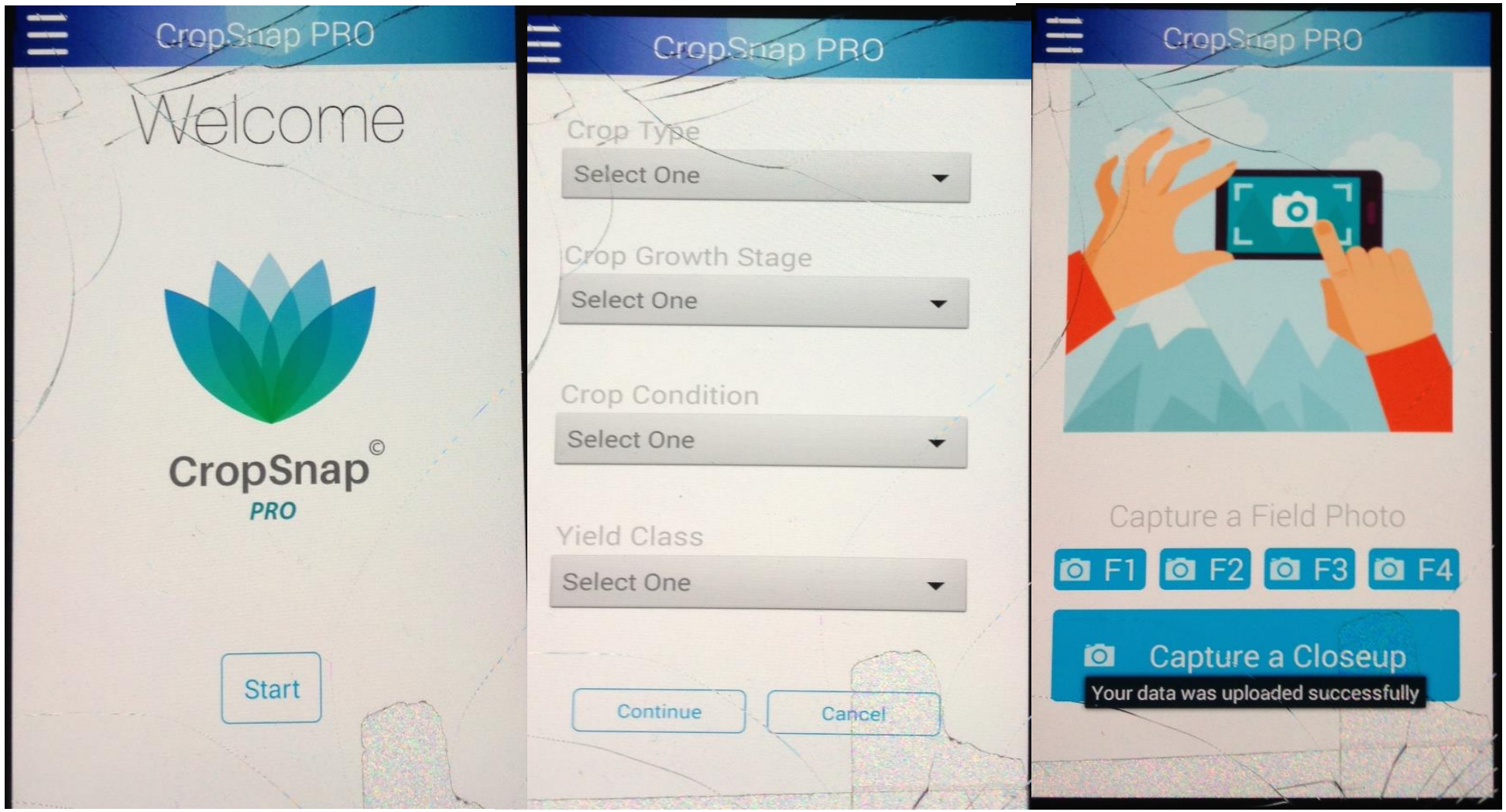
Village-level Yield Monitoring



Source: Niruthi Climate & Ecosystems Ltd

Steps in crop yield model development

Mobile App for field-level data collection



- CropSnap allows users to record a variety of information about crops grown, crop condition, canopy density, pest/disease prevalence and expected yields.
- Information is automatically uploaded onto the cloud where it is integrated with satellite data to create maps of farm-village-regional assessments.

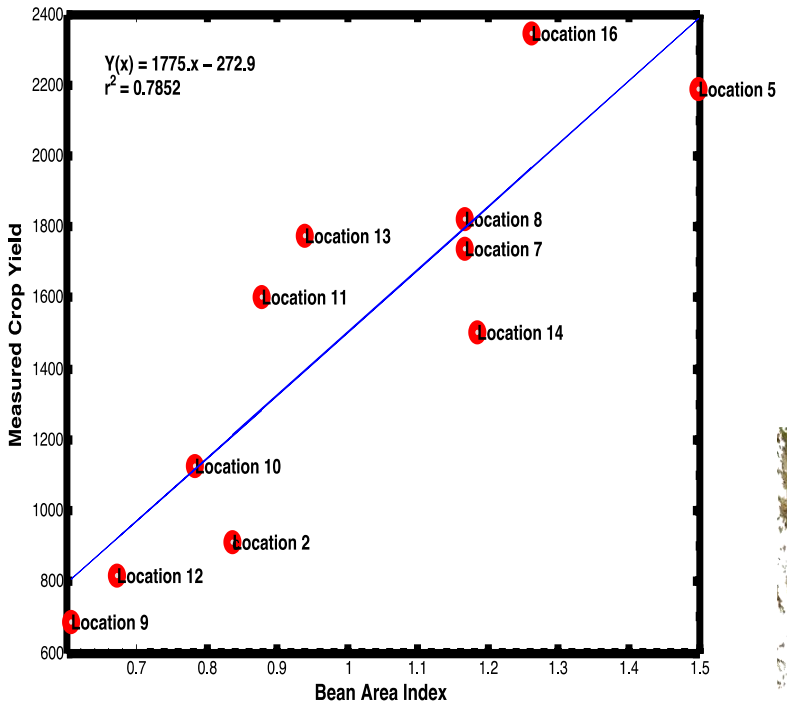
Source: Niruthi Climate & Ecosystems Ltd

Crop Yield Recognition System

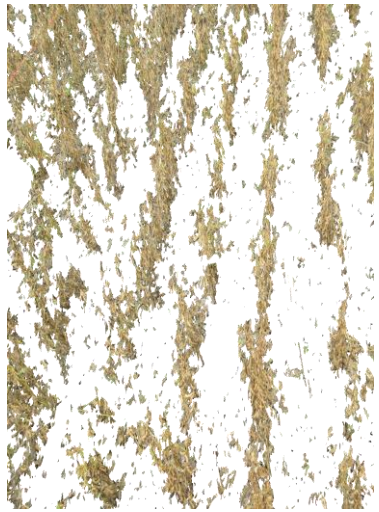
Soybean Crop

Bean Area Extraction

Bean Area vs Yield



High Yield



Low Yield

CropSnap pictures are analyzed using machine learning techniques to extract key features of crop yields (bean area, number of pods, panicle length, number of grains/panicle, etc.). Extracted features such as bean area index (area of beans per unit ground area) are then calibrated against measured yields.

Source: Niruthi Climate & Ecosystems Ltd

Different Remote Sensing Platforms

PLATFORM	Spatial Resolution	Field of View	Usability	Payload Mass	Cost of Data Acquisitions
UAV	0.5-10 cm	50 – 500 cm	Very good/easy	Limited	Very Low
Helicopter	5-50 cm	0.2 – 2 KM	Pilot Mandatory	Almost Unlimited	Medium
Airborne	0.1-2.0 m	0.5 – 5 KM	Pilot Mandatory	Unlimited	High
Satellite	1-25 cm	10 – 50 KM			Very high, particularly for high resolution imagery

Source: Rabi Sahoo, Indian Agriculture Research Institute, India

Satellite vs. UAV based Remote Sensing

Satellite

Advantages:

- Reliable
- Need not to have special skills to obtain and use the data

Disadvantages:

- Lower resolution
- Quality & resolution of data and imagery obtained may not sufficient for accurate diagnostics
- Easily affected by bad weather conditions
- Non availability of data "when and where" required
- Expensive to develop, launch and maintain

UAV

Advantages:

- Easy deployment – a mission can be completed with only a one-member "flight crew" and very quick setup time..
- Flight need not be scheduled. It can be based on weather conditions and preference of farmer
- Availability of data and imagery immediately after the flight
- Super high resolution spectral/spatial imaging
- Less time consuming when compared to conventional
- Failsafe – the drone can be programmed to "return to home" even in case of link loss

Disadvantages:

- Significant experience required to fly
- Easily destructible
- Need to be stitched

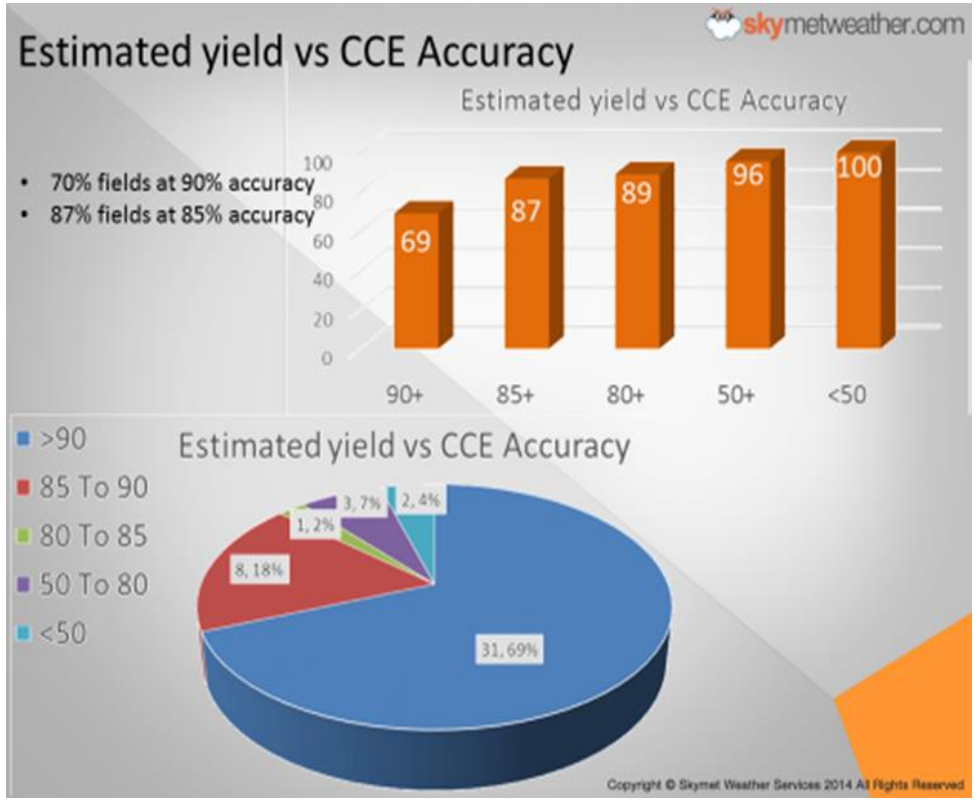
Source: Rabi Sahoo, Indian Agriculture Research Institute, India

Comparison With Status Quo

- Number of CCEs conducted using smart site selection technique to fit this model: 45
- Number of CCEs required as per present guidelines : 204
- Reduction in number of CCEs : 78%

Validation:

- Village wise average of estimated yield is compared with village wise average yield of CCEs.
- The correlation coefficients are significant at 99% confidence level.



Remote Sensing and UAV Technologies Feasibility

TOOLS	Description	Applicability in the Context of National Agri Insurance, INDIA			
		Localized Calamities	Post-Harvest Losses	Area Correction	Overall Yield Assessment
Satellites	From Landsat, Sentinel, Risat, Several types of indices available e.g., NDVI	Feasible, but possible only with high resolution		Feasible	Feasible
UAVs	Standard protocol of data acquisition and processing for crop information needs to evolved	Feasible	Feasible	Difficult (Heavy investment required)	
Mobile Phones	Apps for geo tagging and capturing crop images and understanding leaf area index as well as grain quality	Feasible	Feasible	May not be applicable	Feasible
Ground Sensors	For collection of soil and weather datasets	Feasible	May not be applicable	Not Applicable	Feasible

Source: Candiago el al (2015)

Technology Solutions for Agri Insurance

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 disasters	For all major disasters	
2	Insurance coverage and expansion	Digital geo-referenced land records	Can be used all over		
		Real-time field info. on coverage			
3	Prevented/failed sowing risk	Spectral indices, Surface soil moisture, Modelled soil moisture	Implementable at Sub-District /District level	Downscale to finer scale	
		Rainfall data		Improved assessment	
4	Mid-season adversary	Realtime field information	Can be used all over		
5	Natural calamity Flood/cyclones	Flood maps, Cropped area maps	Extent of crop area affected	Improved products	---

Source: Task Force Report on "Use of Technology for Agriculture Insurance, NITI Aayog (2017)

Technology Solutions for Agri Insurance

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6	Crop mapping & surveillance, area discrepancy	Crop mapping, Crop condition maps, Weather anomaly maps	Cloud free data availability; Microwave for rice mapping	Improved methodologies	
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		

Source: Task Force Report on "Use of Technology for Agriculture Insurance, NITI Aayog (2017)

Thank You