

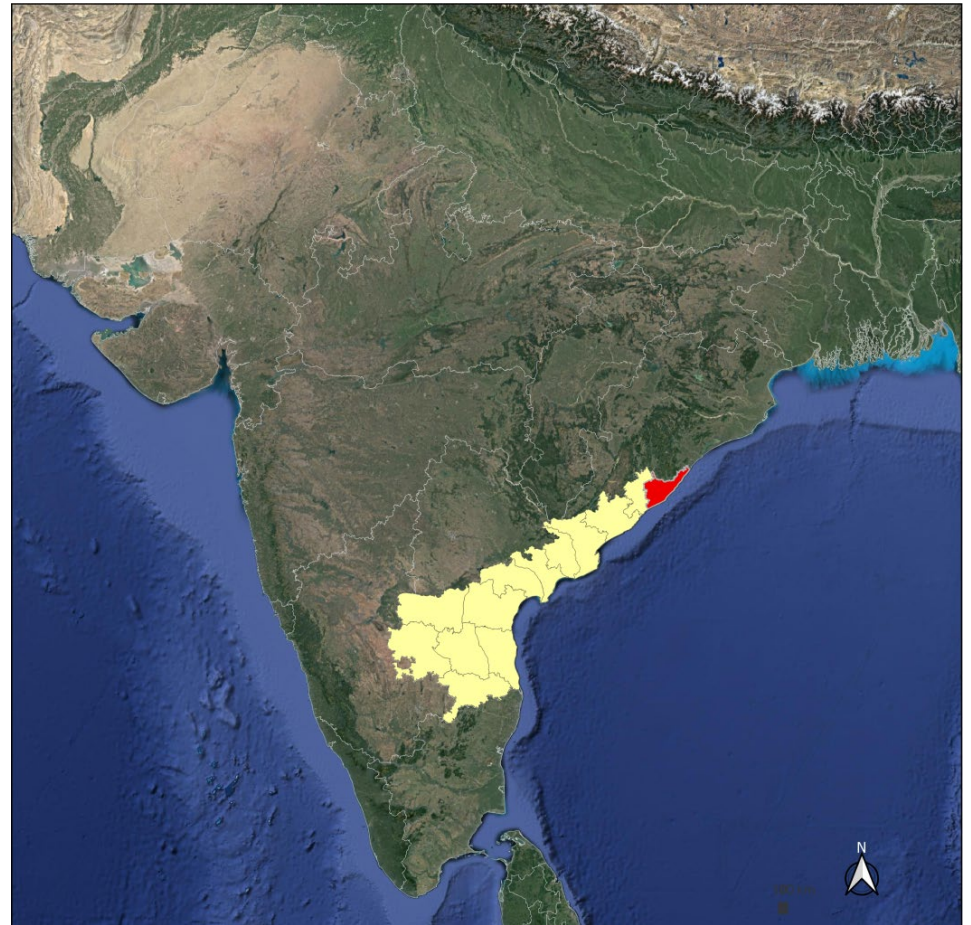


Holistic Approach for Assessing Tropical Cyclone Damage on Rice Crop: The Case of Cyclone Titli in Srikakulam District, Andhra Pradesh, India

Emma D. Quicho
International Rice Research Institute

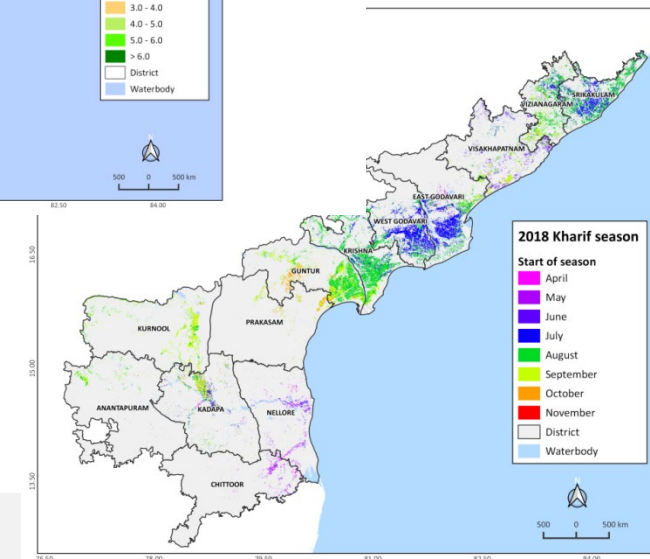
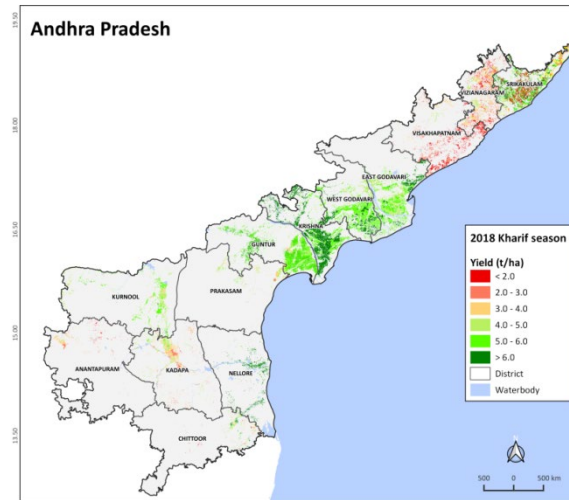
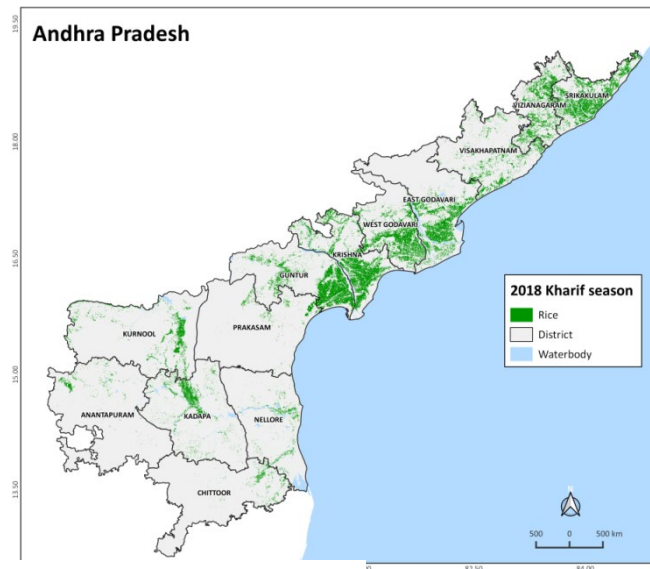
Introduction

- ❑ Andhra Pradesh is one of the largest crop producing state in India, with almost 60% of its population depending on agriculture.
- ❑ Rice is the main food crop and staple food. In 2018 Kharif season, around 1.4 M ha was planted to rice (DoA)
- ❑ However, because of its coastal location (927 km. long) is prone to cyclones/tropical storms/sea level rise/tsunami, etc.
- Srikakulam district is one of the 9 coastal districts of Andhra Pradesh – located in Northeastern portion of the state.
- In the flood damage assessment, **SAR data** along with ground data observation, interview with farmers and key local staff in the district.



Introduction

- ❑ Satellite based Rice Monitoring System for Andhra Pradesh (AP-SRMS) is a collaborative project among International Rice Research Institute (IRRI), Acharya N. G. Ranga Agricultural University (ANGRAU), Government of Andhra Pradesh, and sarmap
- ❑ 3- years project (Feb 2017 – Jan 20: started with 2 districts in 2016/17 Rabi season; since 2018 Kharif season whole state of AP is covered
- ❑ Objective: support capacity development by establishing and maintaining rice monitoring system that provides regular crop condition updates and rapid **damage assessment** in the event of extreme climate conditions





Rice area affected by cyclone Titli, 16-18 Oct 2018



Rice crop damage post cyclone Titli in Pundi, Santabommali, Srikakulam, 16 Oct 2018

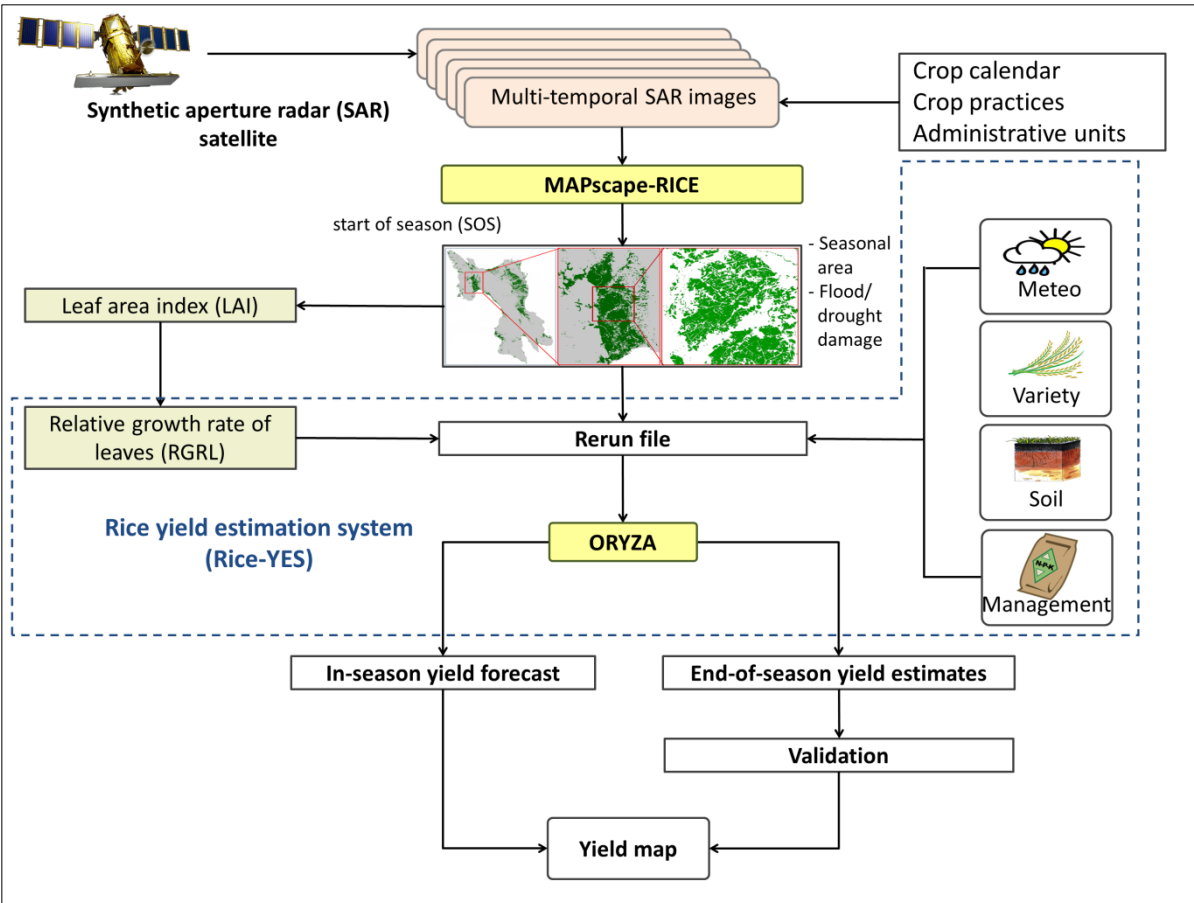


Rice crop damage post cyclone Titli in Dasupuram, Pathapatnam, Srikakulam, 18 Oct 2018

Methodology

Rice area and yield estimation using MAPscape-Rice and Rice-YES

- SAR-based area and yield estimation system (MAPscape-RICE®, ORYZA, and Rice-YES)
- MAPscape-RICE® converts multi-temporal SAR data into terrain-geocoded images to generate maps of rice area, start of season (SoS), and leaf area index (LAI).
- ORYZA crop growth model estimates yield using processed-based approach accounting for G x E x N
- Rice-YES assimilates SAR products, particularly LAI (converted into relative leaf growth rate, RGRL) into yield estimation by ORYZA



Bouman, B. A. M. et al. 2001. ORYZA2000: Modeling Lowland Rice. Los Baños, Philippines: International Rice Research Institute and Wageningen, Netherlands: Wageningen University and Research Centre.

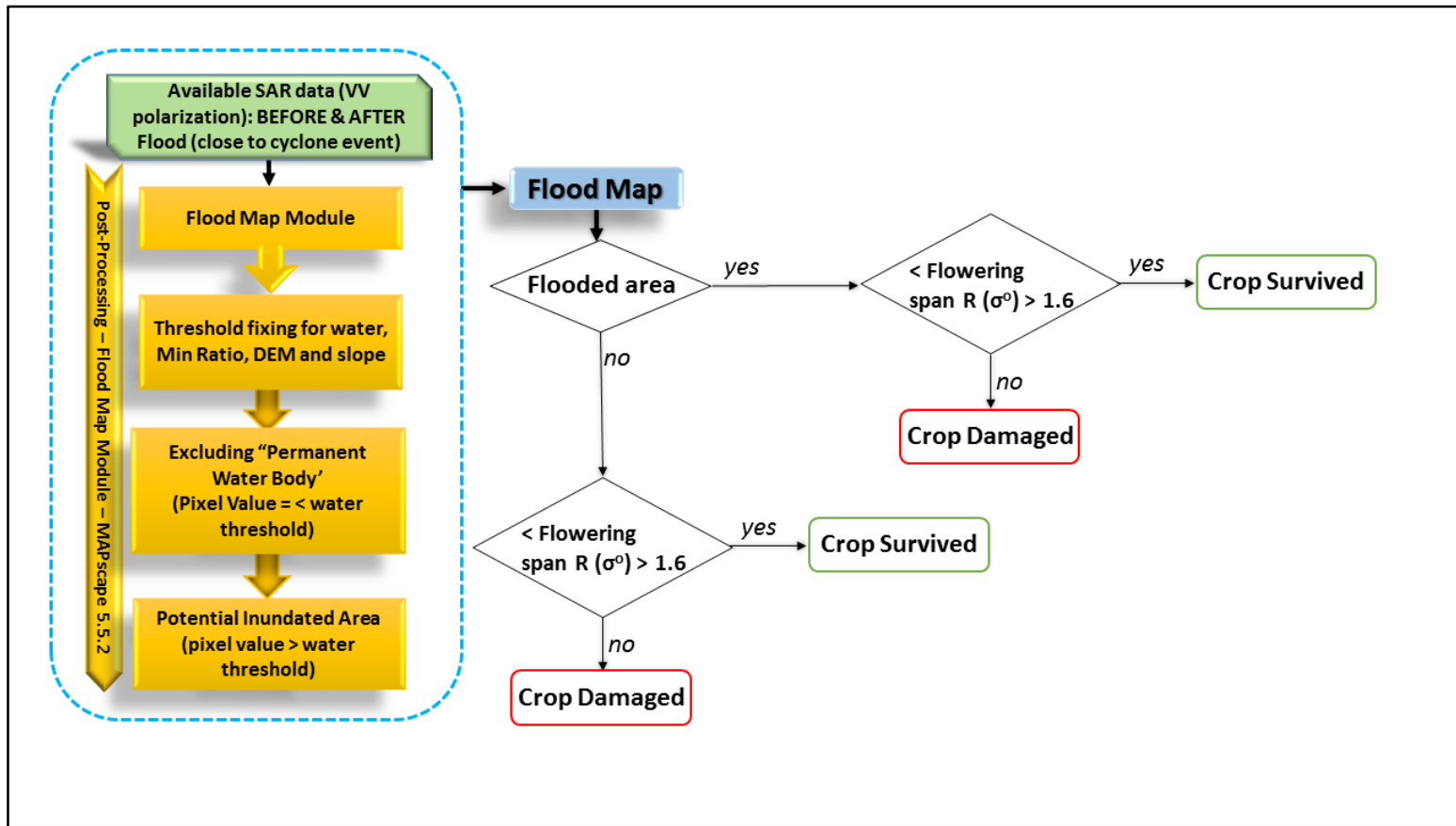
A. Nelson, T. Setiyono, A. B. Rala, E.D. Quicho, et al. (2014) Towards An Operational SAR-Based Rice Monitoring System in Asia: Examples from 13 Demonstration Sites across Asia in the RIICE Project. *Remote Sens.*, 6, pp. 10773-10812.

T.D. Setiyono, E.D. Quicho, et al. (2018). Rice yield estimation using synthetic aperture radar (SAR) and the ORYZA crop growth model: development and application of the system in South and South-east Asian countries. *International Journal of Remote Sensing*. <https://doi.org/10.1080/01431161.2018.1547457>



Methodology

Rule based classification for flood damage assessment



Pre-&Post Flood Map: C-band Sentinel-1 VV-pol data of 5th October 2018 for pre-cyclone inundation map.

X-band TerraSAR-X HH-pol data of 13th October 2018 for post-cyclone inundation map.

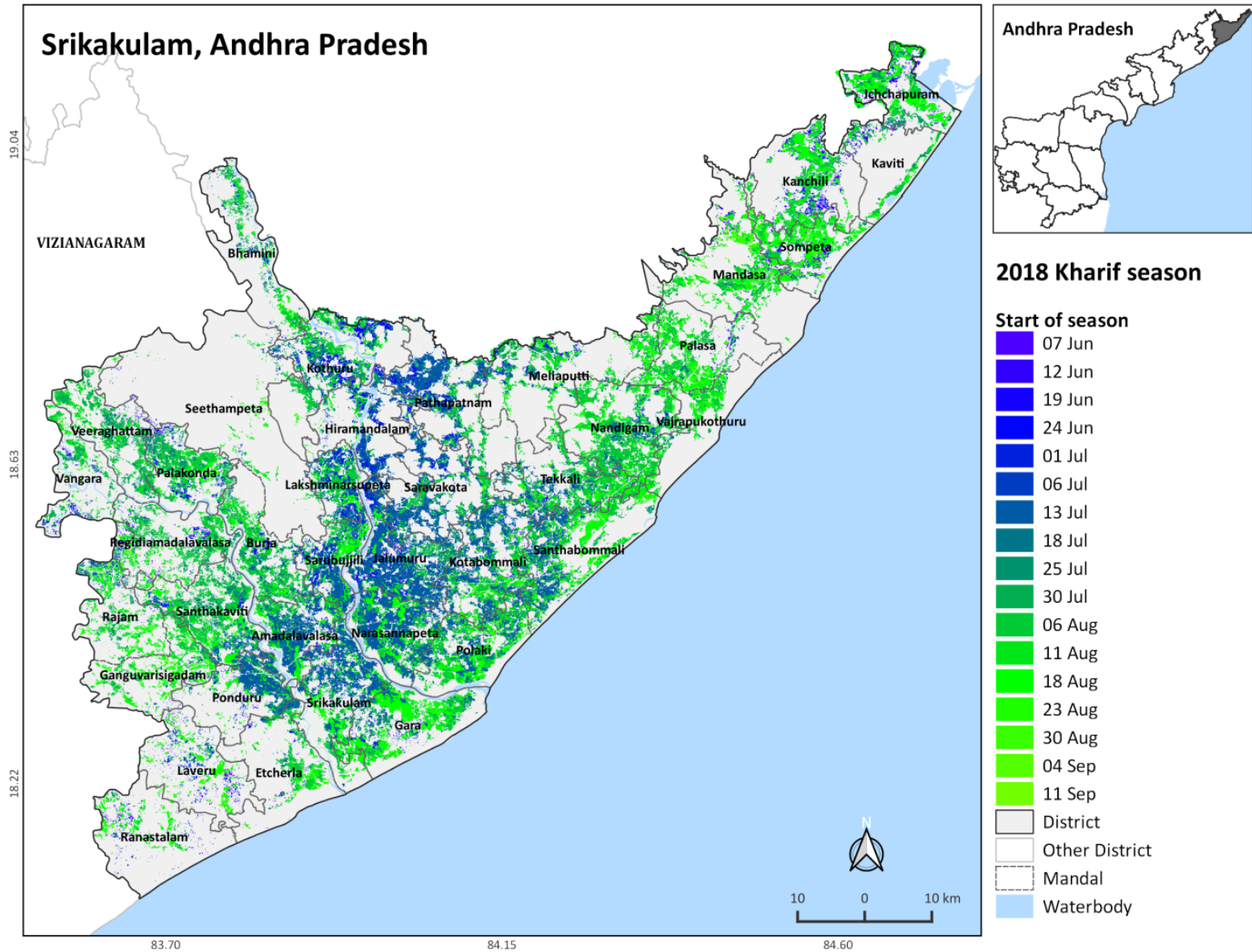
GT for Flooded & non-Flooded 16-18 October 2018: validation of inundation map.



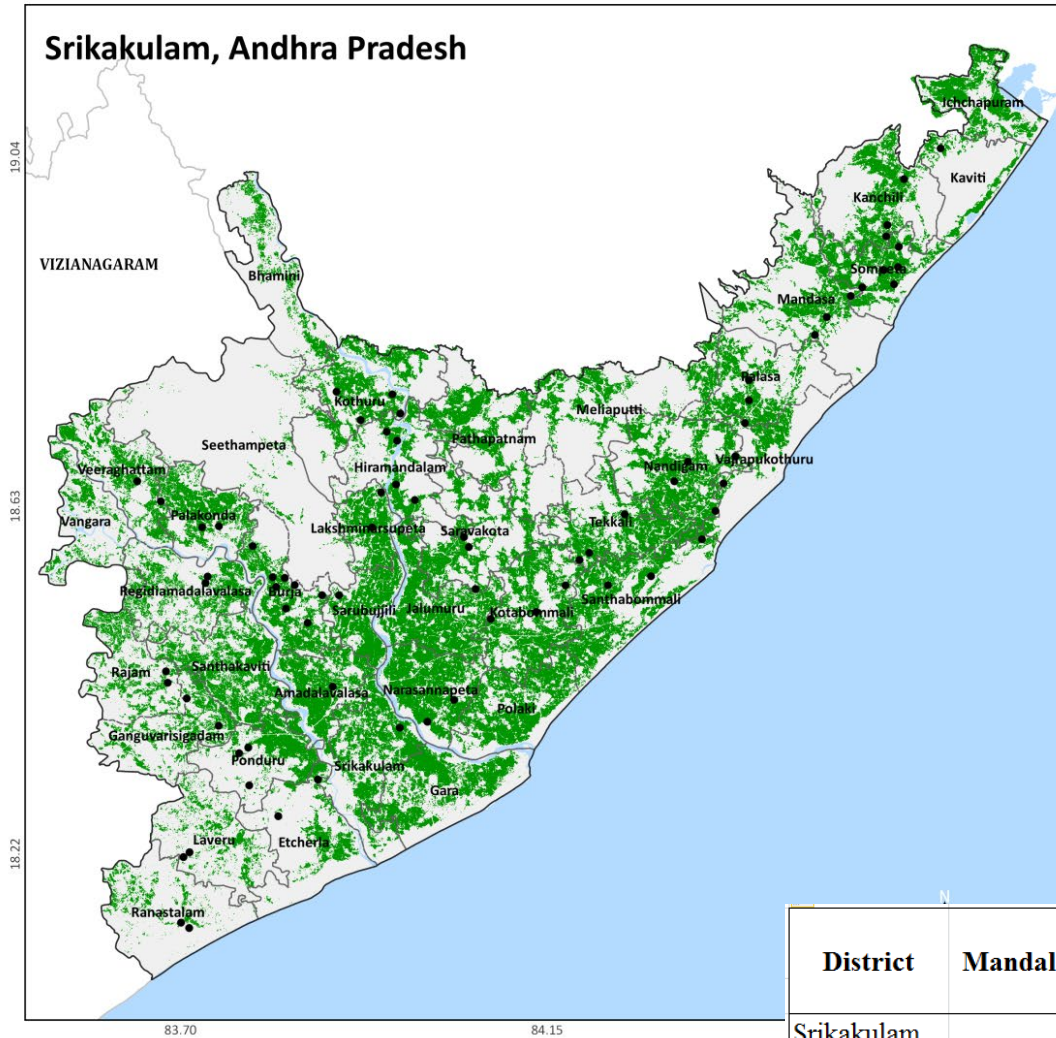
Focus group discussion and key informant interview



Rice start of season



Rice area estimates



District level accuracy

Andhra Pradesh

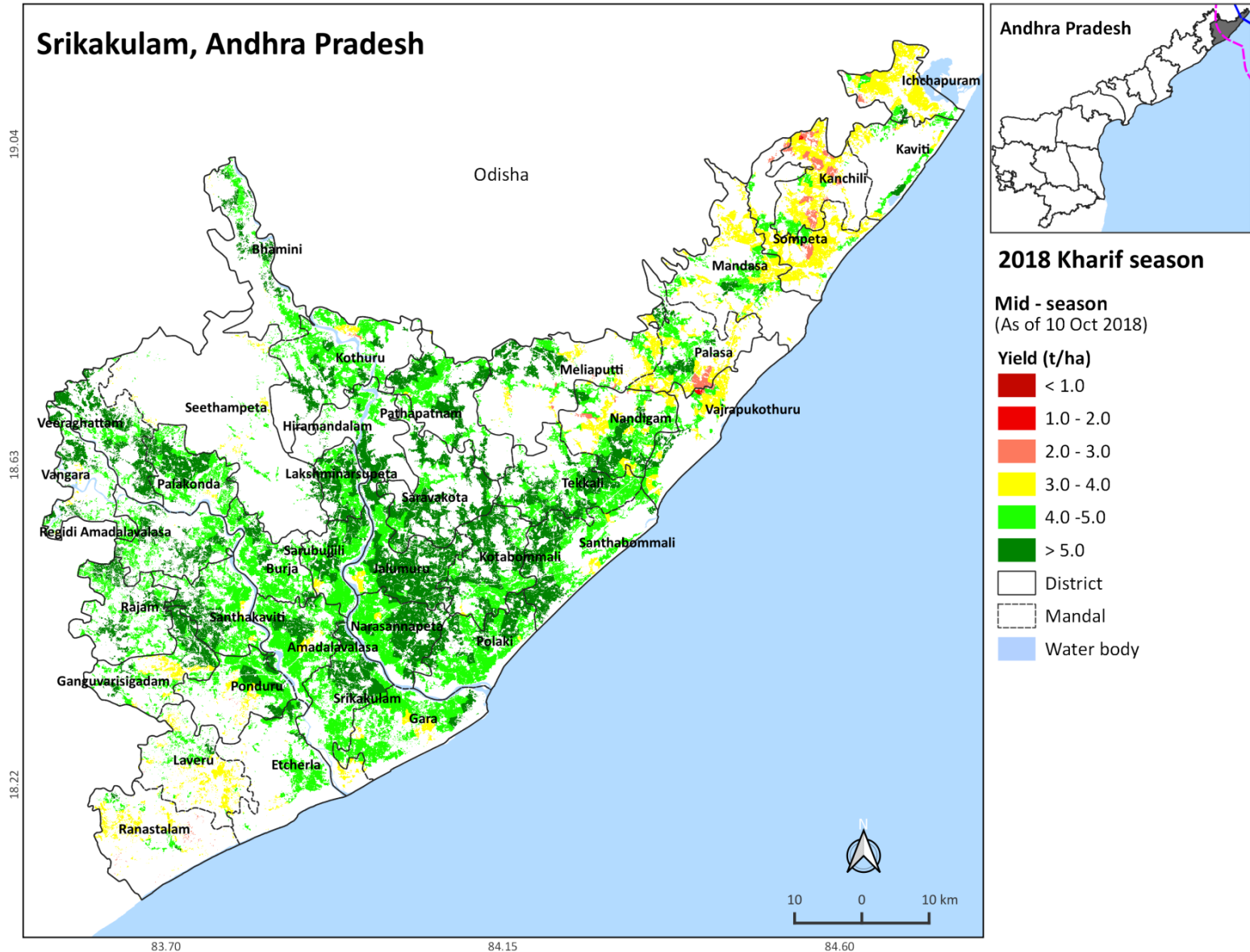
Confusion matrix computations from the "Accuracy Data" worksheet

		Predicted class from the map			Accuracy
		Rice	Non-Rice		
201	Actual class from survey	Rice	69	0	100.0%
	Non-Rice	3	4	57.1%	
Reliability		95.8%	100.0%	96.1%	
Average accuracy		78.6%			
Average reliability		97.9%			
Overall accuracy		96.1%	Good Accuracy		
Kappa index		0.92			

District	Mandal	Village	Validation Points	Average Accuracy (%)	Average Reliability (%)	Overall Accuracy (%)	Kappa Index
Srikakulam			76	78.6	97.9	96.1	0.92
	Jalumuru		104	99.5	92.9	99	0.98
		Jalmur	33	98	90	97	0.94

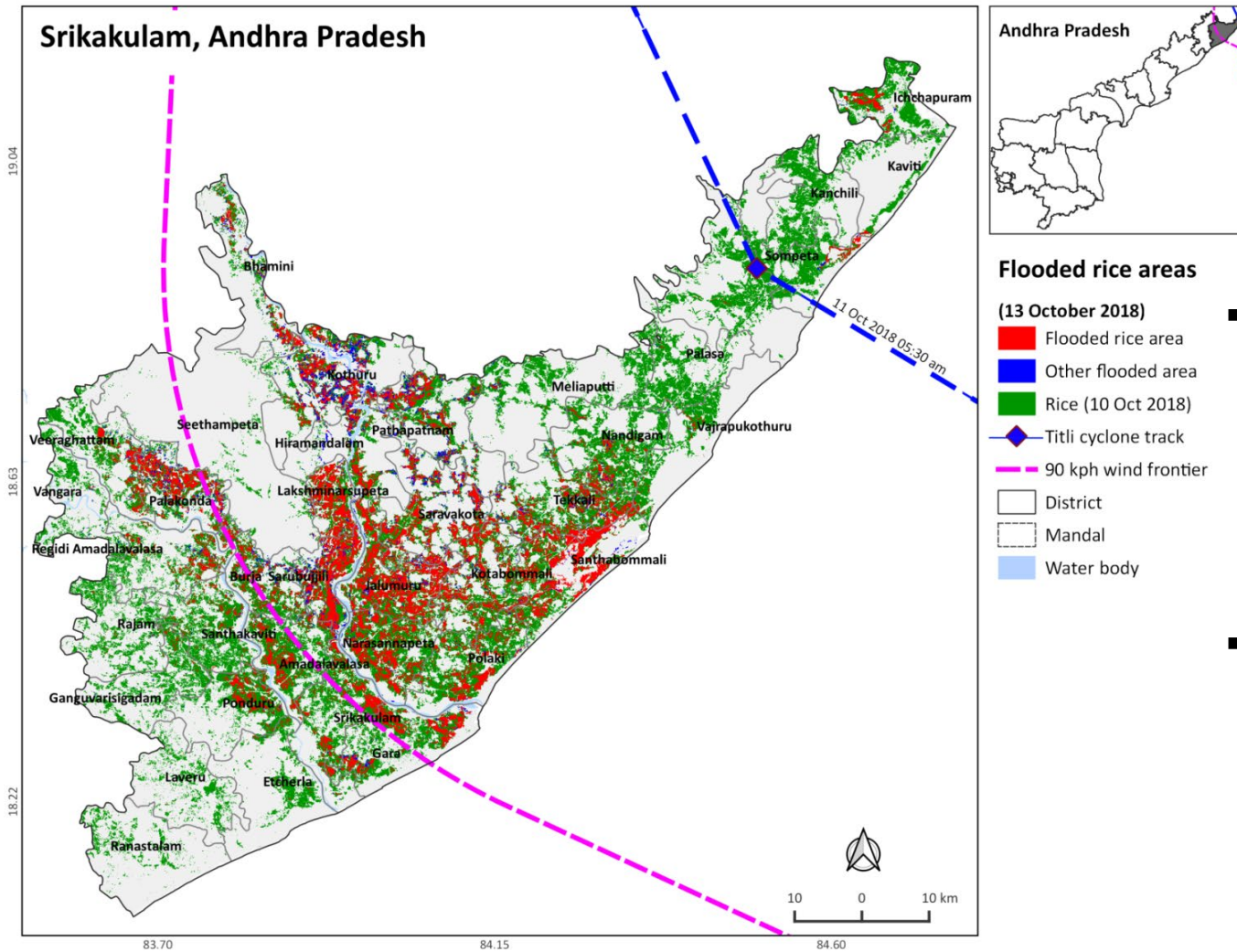


Rice yield estimates (mid-season)





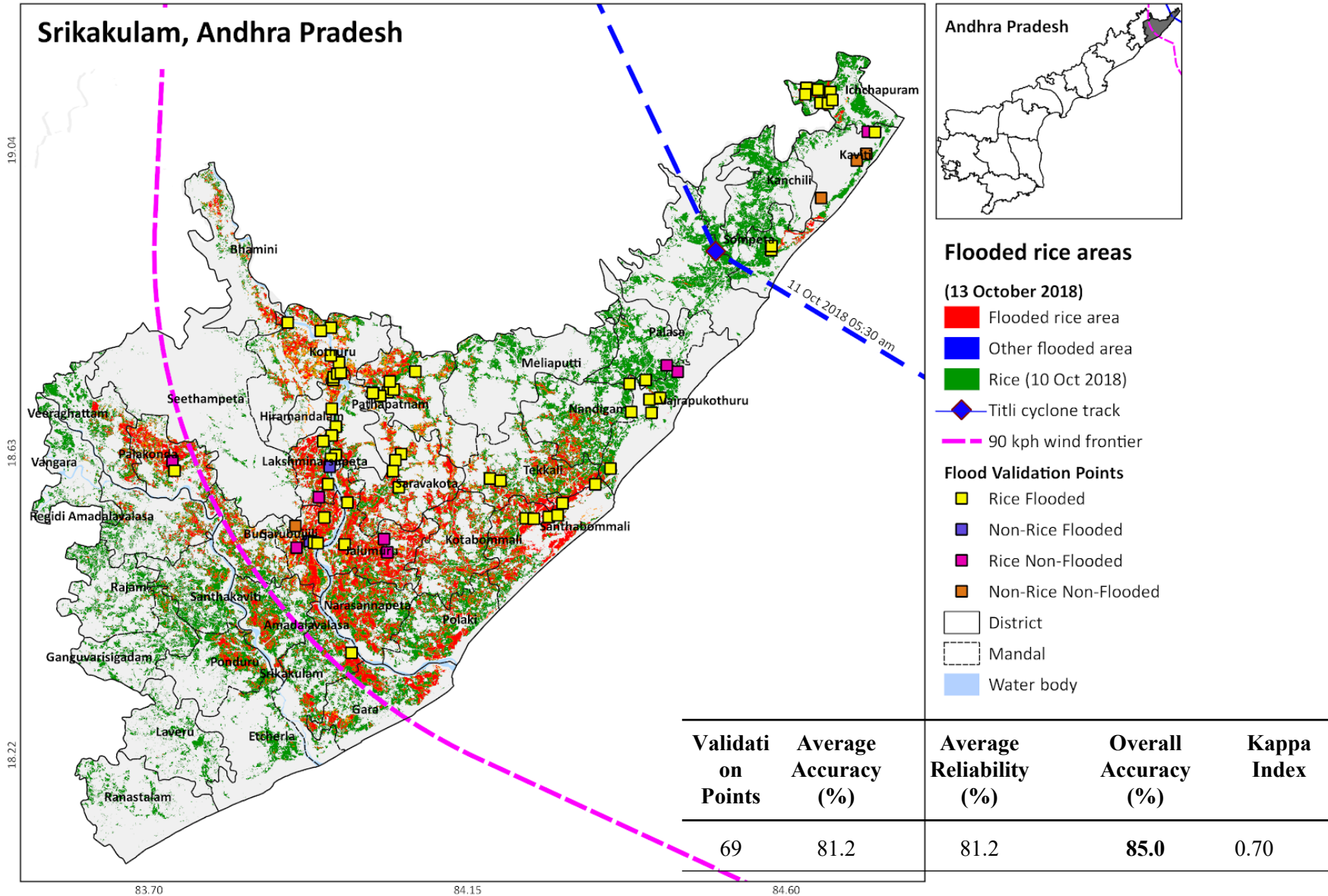
Inundation map affecting rice areas, 13 Oct 2018



- SAR-based rice monitoring system estimated **rice area** prior to the cyclone event in Srikakulam district at **205,174 ha**
- Inundation assessment with SAR data on 13 Oct 2018 indicated **53,312** or **26%** of estimated rice area of were affected

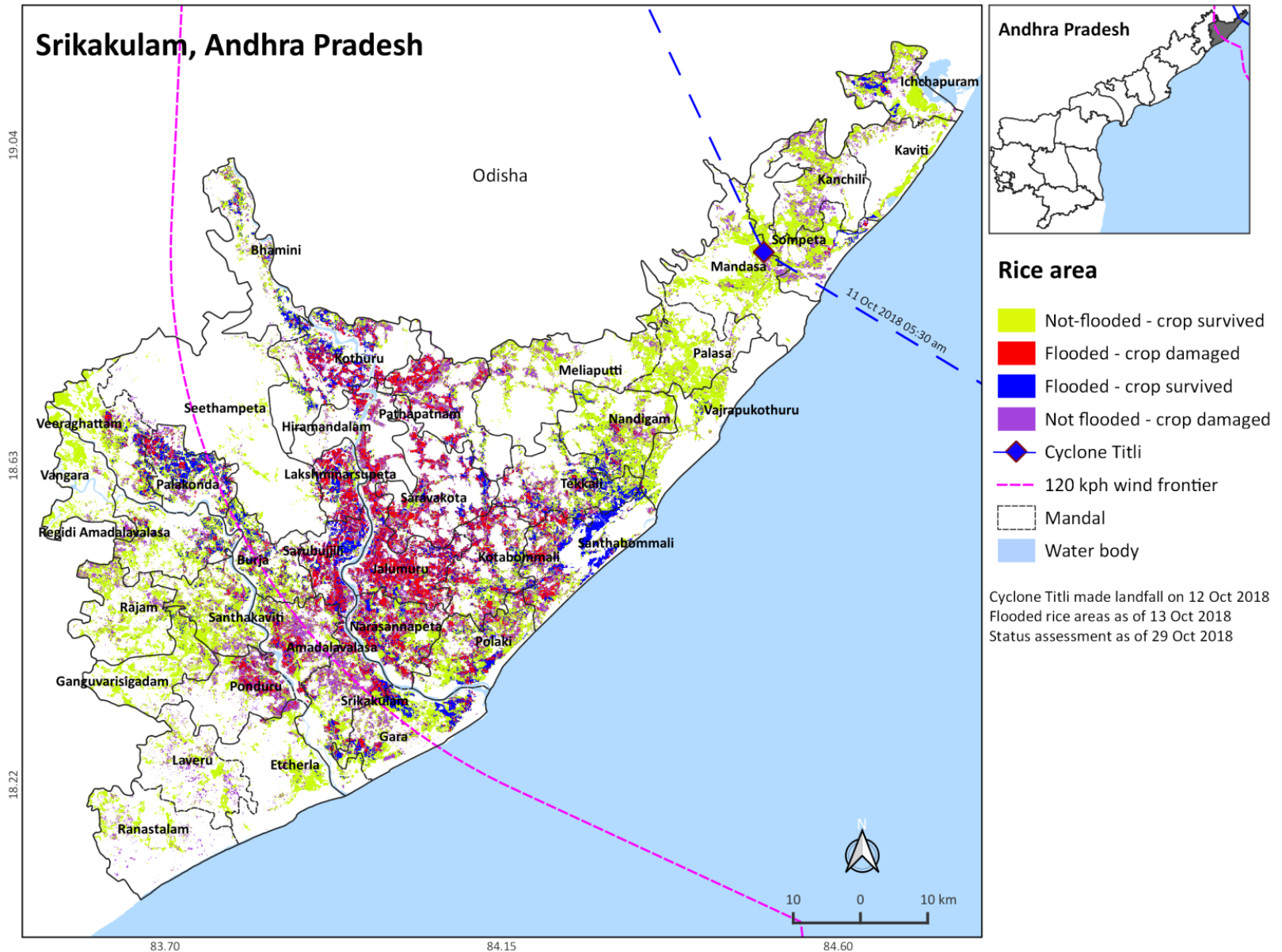


Inundation map affecting rice areas, 13 Oct 2018



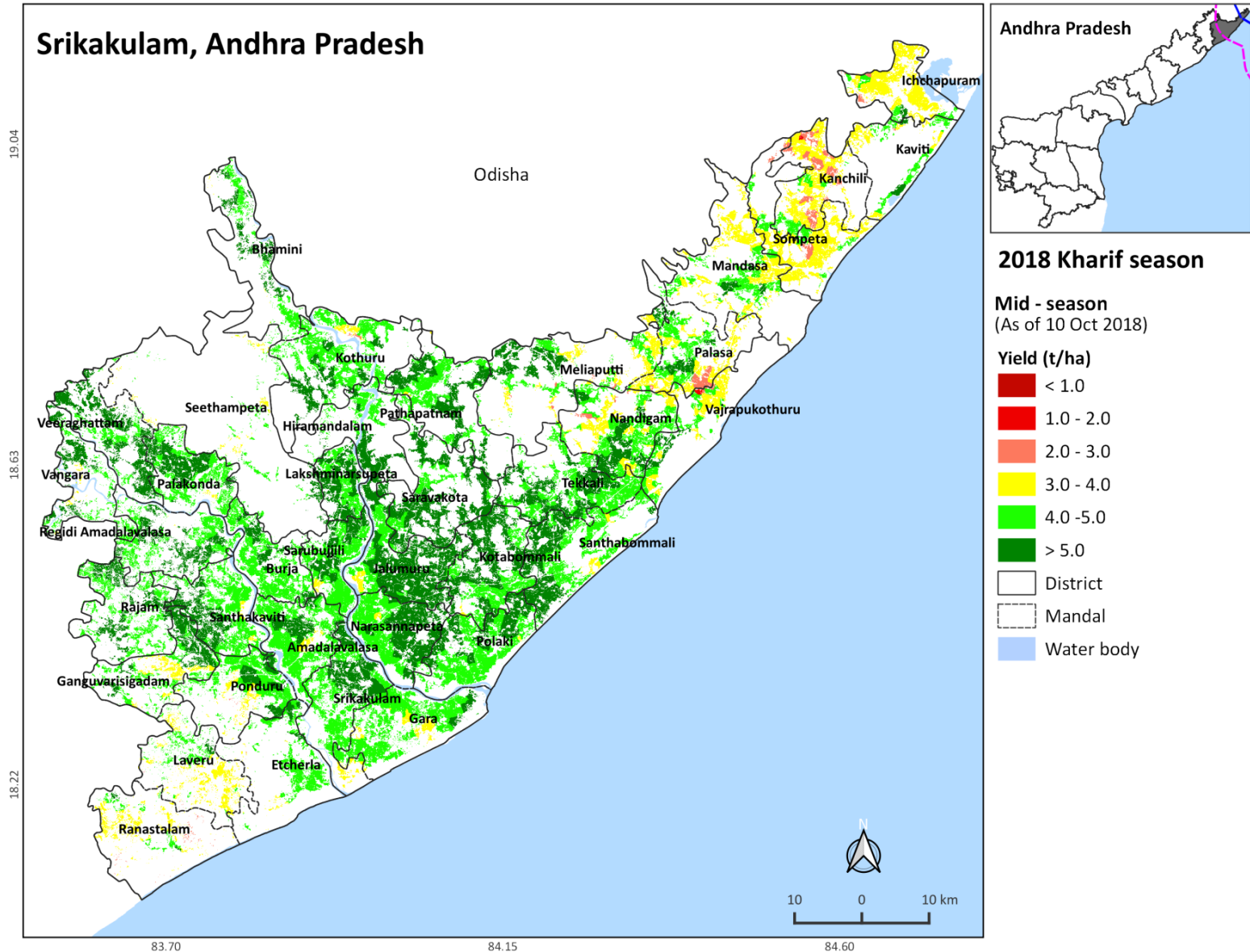


Rice damage assessment after rule based classification



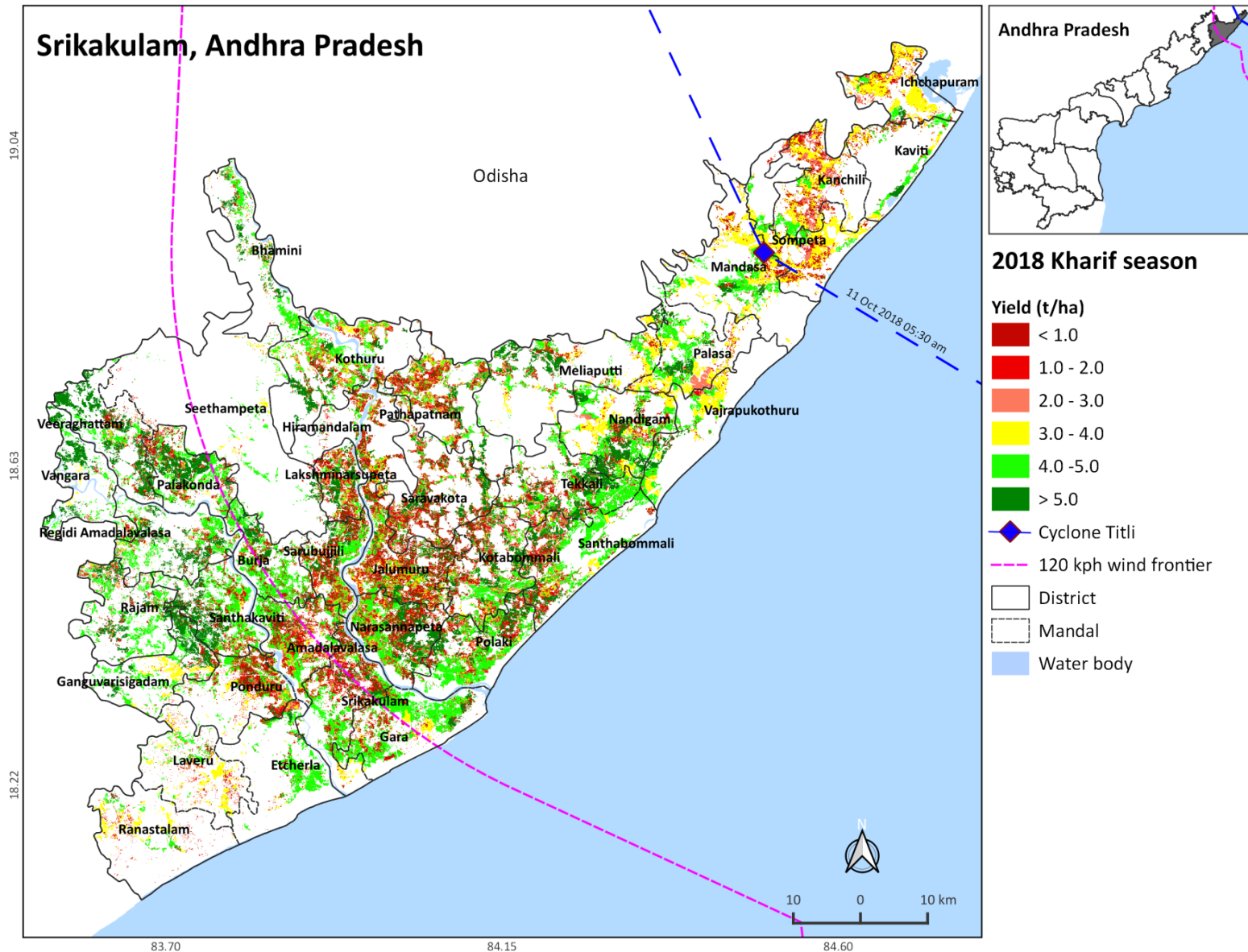


Rice yield estimates (mid-season)





Rice yield estimates (end-season)





Terima Kasih

