

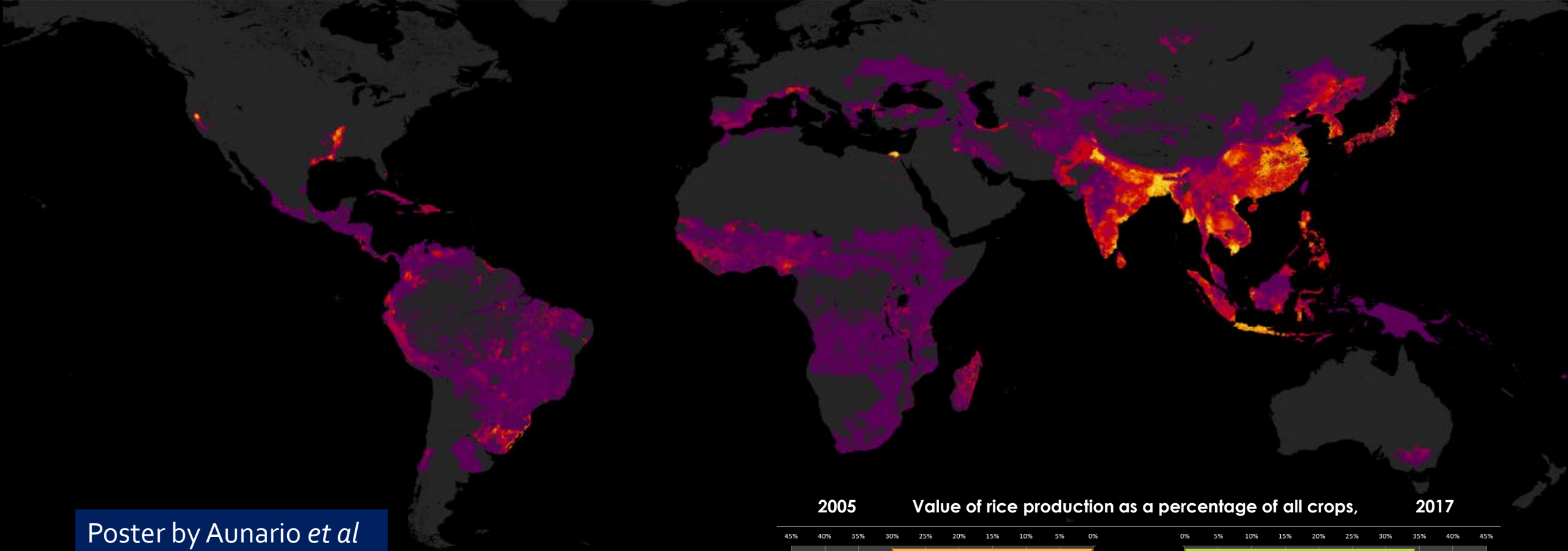
Geospatial Science & Modeling in Rice Agrifood Systems: Updates from IRRI

Tri Setiyono

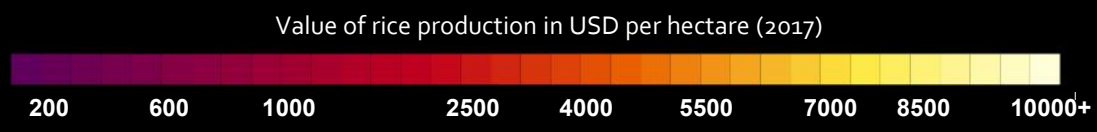
International Rice Research Institute (IRRI)

Los Baños, Philippines

t.setiyono@irri.org

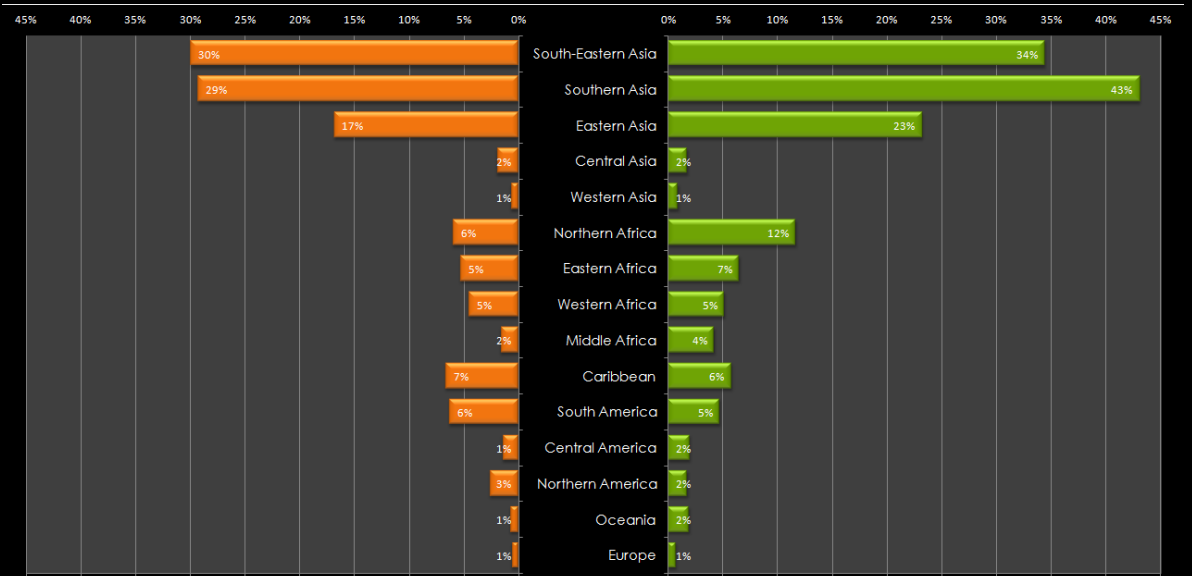


Poster by Aunario *et al*

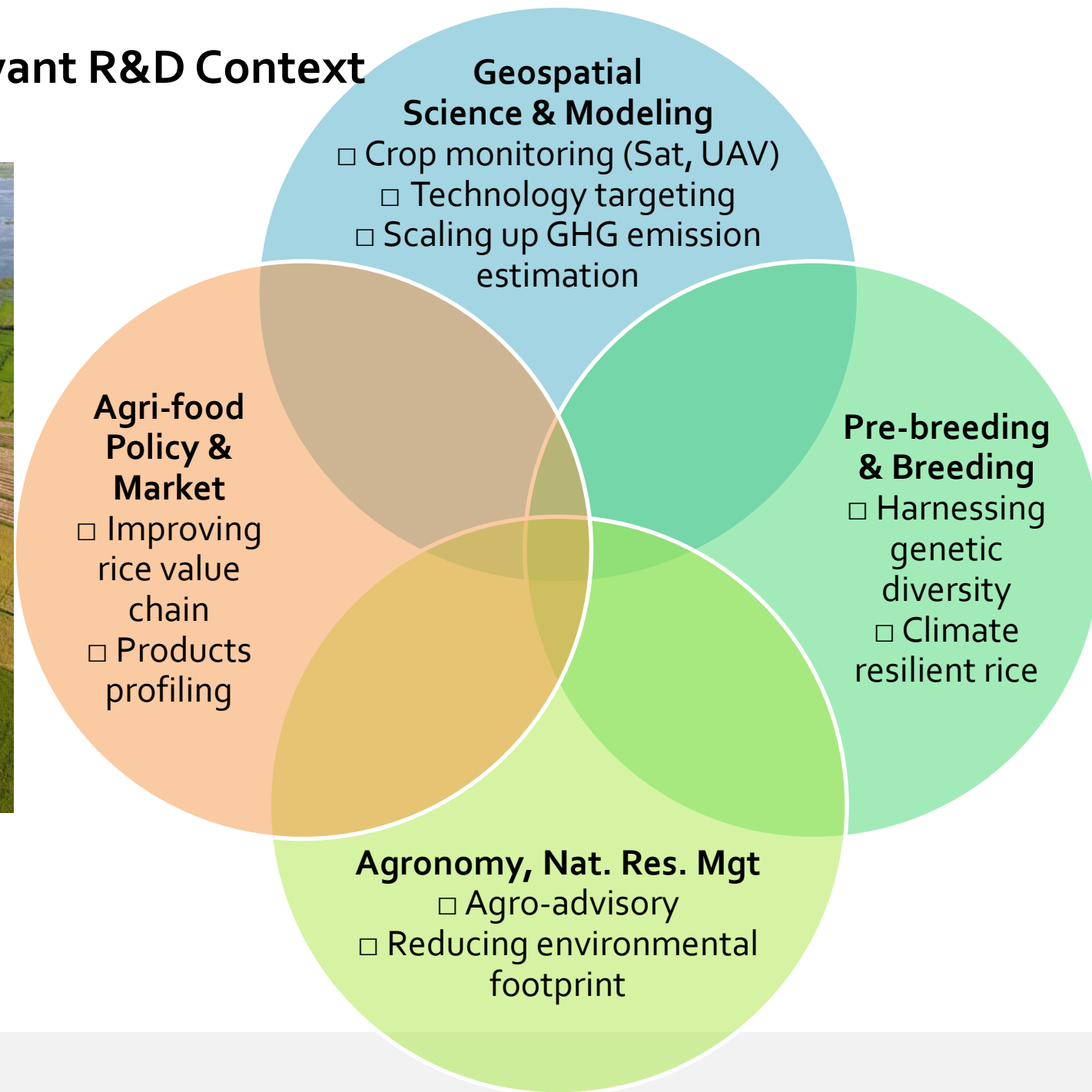


- Rice is even more important economically in 2017 than in 2005! Especially in South Asia & South East Asia
- Investing in R&D for rice-based agri-food system is a viable business plan

2005 Value of rice production as a percentage of all crops, 2017



IRRI's Geospatial & Other Relevant R&D Context





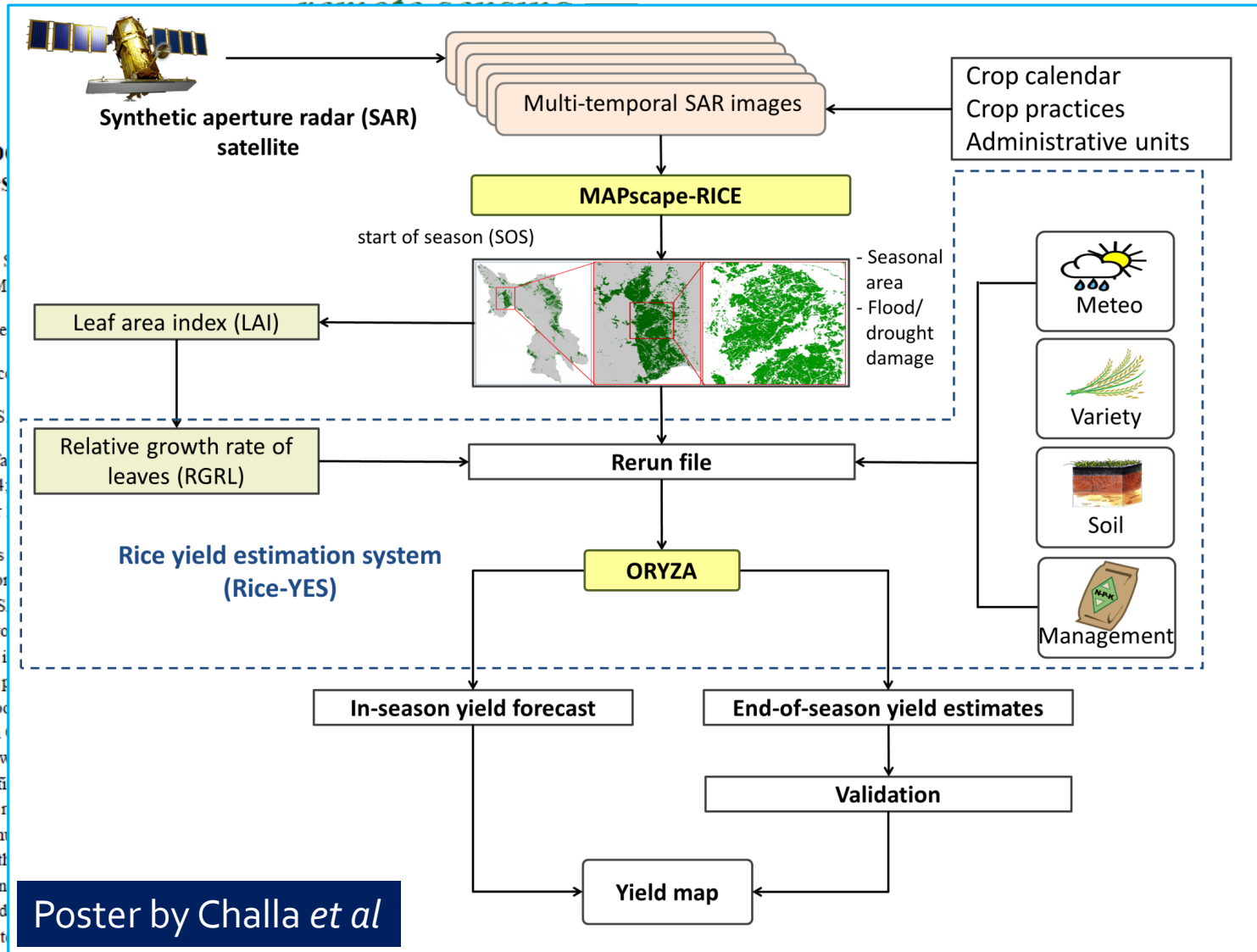
Satellite based Rice Monitoring

Remote Sens. 2014, 6, 10773-10812; doi:10.3390/rs61110773

OPEN ACCESS

Remote Sens. 2018, 10, 293; doi:10.3390/rs10020293

INTERNATIONAL JOURNAL OF REMOTE SENSING
2019, VOL. 40, NO. 21, 8093–8124
<https://doi.org/10.1080/01431161.2018.1547457>



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

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ABSTRACT

A rice yield estimation system was developed based on the crop growth model ORYZA and SAR-derived key information such as start of season (SOS) and leaf area growth rate. Results from study sites in South and South-east Asian countries suggest that incorporating remote sensing data, specifically Synthetic aperture radar (SAR), into a process-based crop model improves the spatial distribution of yield estimates. This article highlights the detailed methodology of SAR data incorporation into crop yield simulation and comprehensive validation of yield forecast and estimates in the Philippines, Vietnam, Cambodia, Thailand, and Tamil Nadu, India. Remote sensing data assimilation into a crop model effectively captures the responses of rice crops to environmental conditions over large spatial coverage, which otherwise is practically impossible to achieve. A process-based crop simulation model is used in the system to ensure that climate information is captured, and this provides the capacity to deliver a mid-season yield forecast for national planning and policy for rice. Good agreement between SAR-based yield and crop-cut-based yield and official yield statistics and ensuring efficiency of the processing suggest that the system is a promising solution for the needed timely information on rice yield for application in food security and policies, climate disaster management, and crop insurance programs.

ARTICLE HISTORY

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Poster by Challa *et al*



Satellite based Rice Monitoring

Activities

- Philippines (PRISM, PHL DoA)
- Tamil Nadu, India (TN DoA)
- Vietnam (SDC-RIICE, MARD)
- Cambodia (SDC-RIICE, MAFF)
- Thailand (SDC-RIICE, TRD)
- Andhra Pradesh, India (AP DoA)
- Odisha, India (Odisha DoA)



PRISM – Philippines Rice Information System

RIICE - Remote-Sensing based Information and Insurance for Crops in Emerging economies



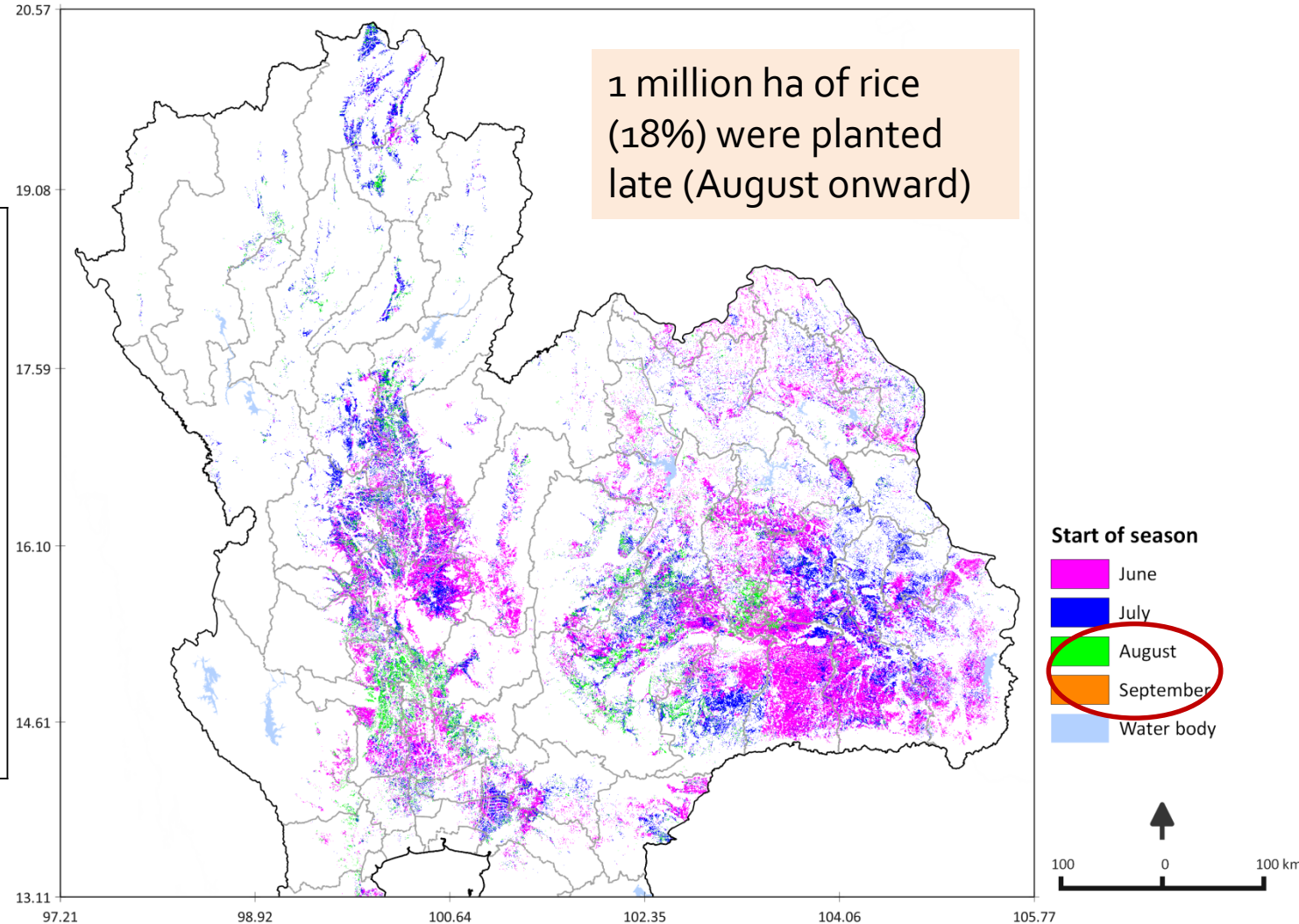
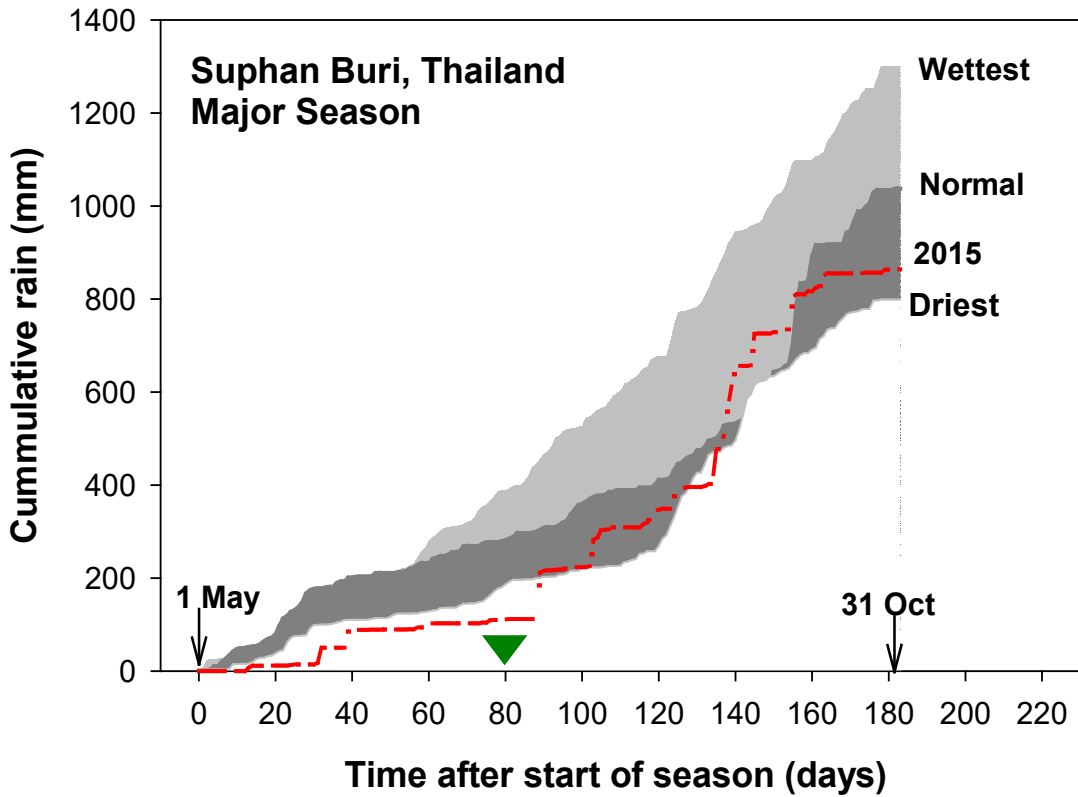
2015 & 2016 Drought in Central Plain, Thailand

Drought in central plain Thailand triggered delayed rice planting



Thailand, 2016 Wet Season

1 million ha of rice (18%) were planted late (August onward)

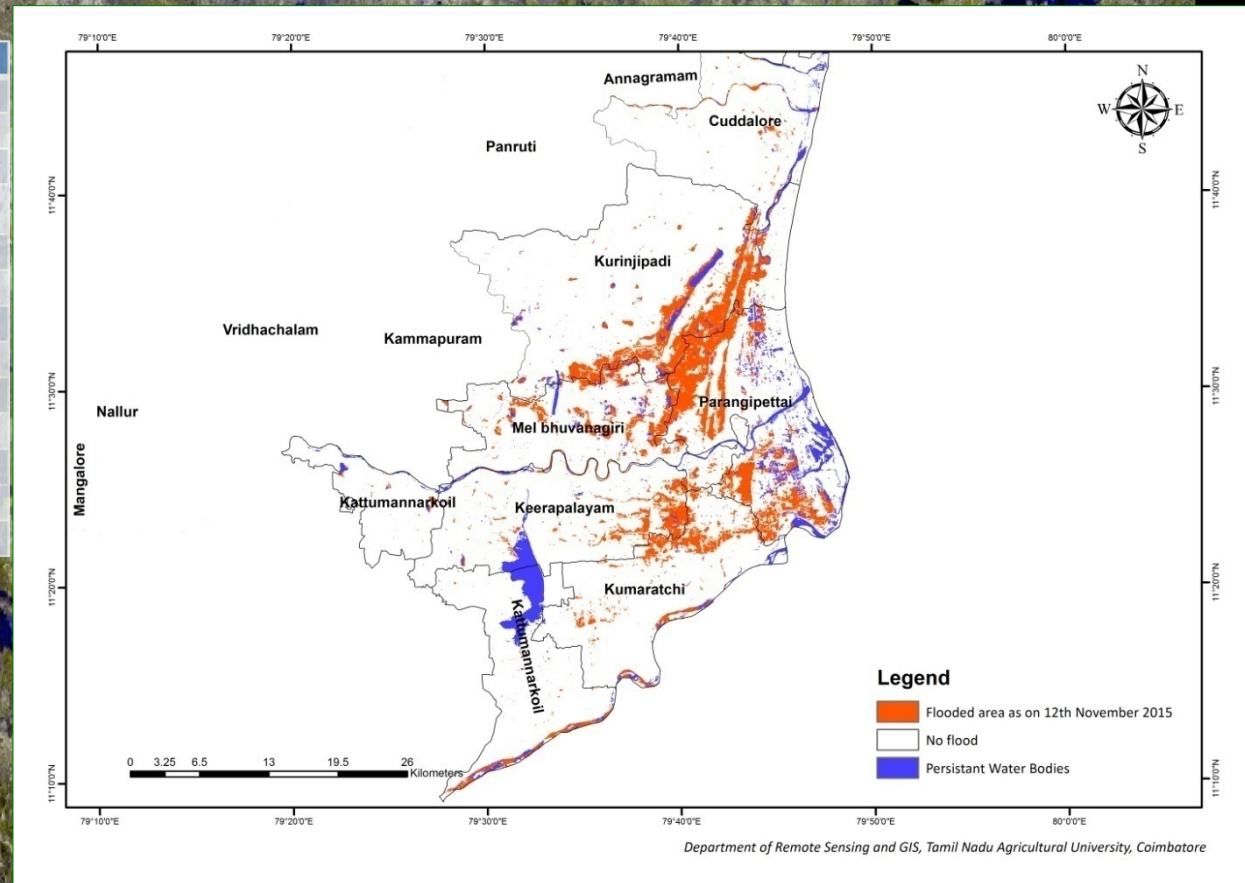




2015/16 Flood affecting rice in Cuddalore & surrounding in Tamil Nadu

Information delivered by RIICE* helped TN government in relief efforts

Block	Flooded area (ha)
Parangipettai	5817
Kurinjipadi	4719
Melbhuvangiri	2398
Kumaratchi	1987
Keerapalayam	1729
Kattumannargudi	627
Vridhachalam	601
Cuddalore	596
Panruti	480
Kammapuram	463
Annagramam	226
Nallur	209
Mangalore	159



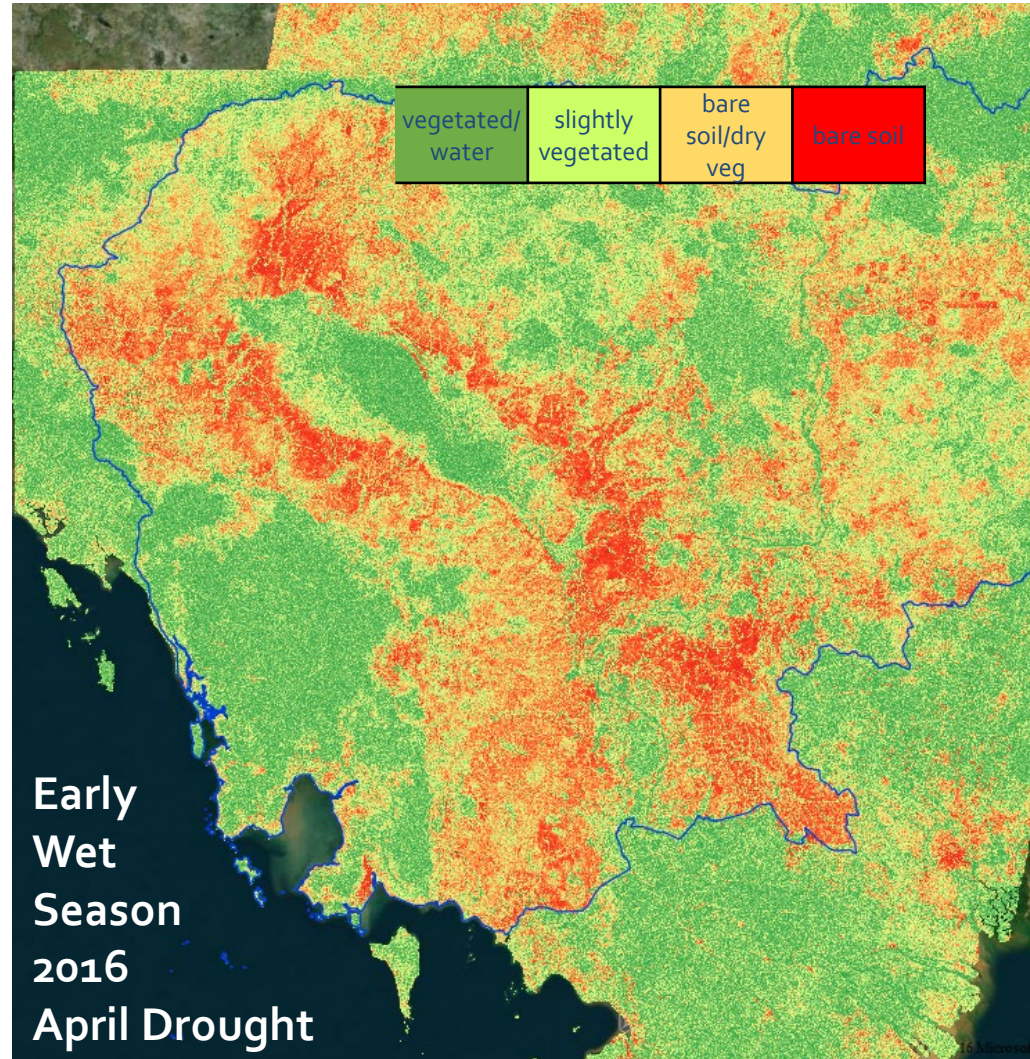
* Remote-Sensing based Information and Insurance for Crops in Emerging economies



2016 Drought in Cambodia resulted in reduced yields

RIICE* map also captures contrasting condition across the border in Mekong Delta Vietnam with extensive irrigation system allowing rice cultivation to proceed unaffected by drought in the region

Mid-April map shows a delay of the start of the Early Wet season due to drought. Compared to the previous years, farmers delay the planting by several weeks. Some farmers missed out on planting altogether.

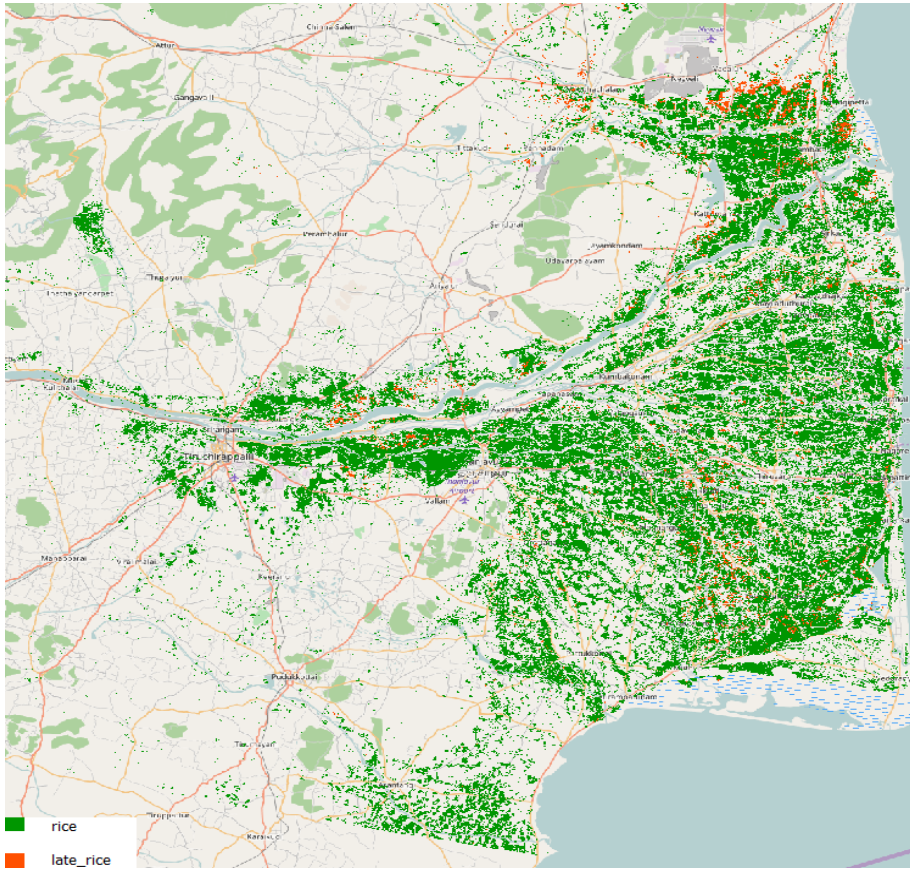




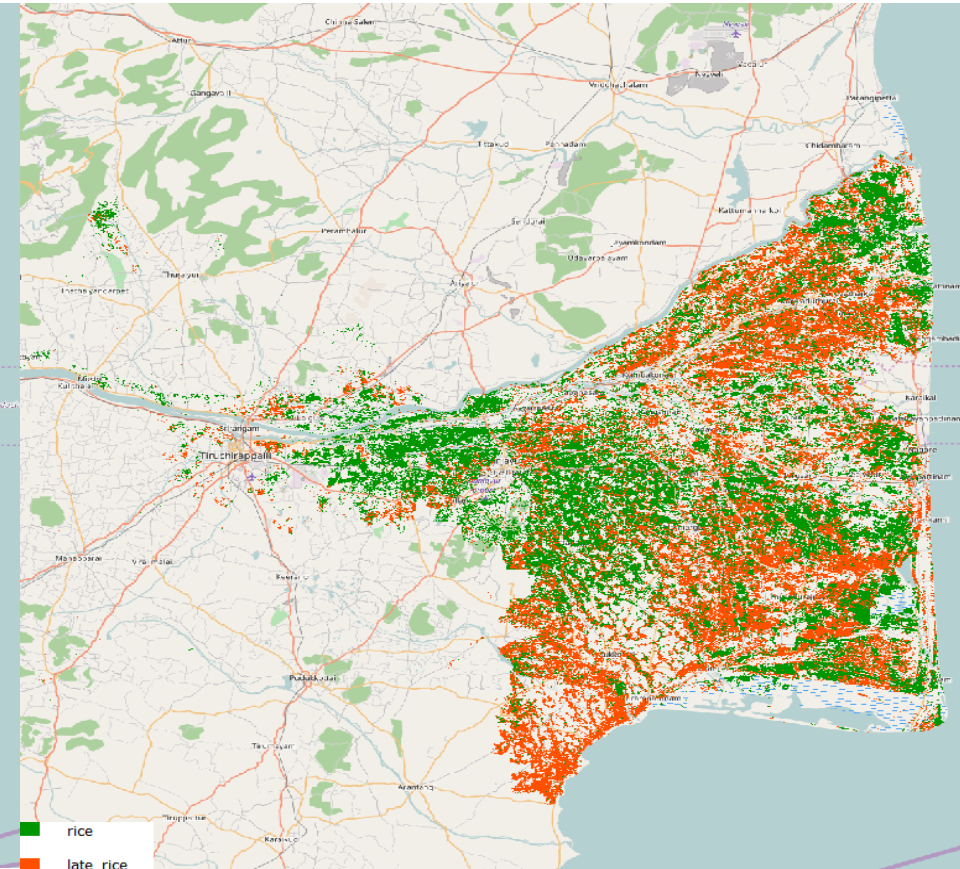
2016/17 Drought in Tamil Nadu, India resulted in fail sowing

Local RIICE* team lead by TNAU provide report on rice area under prevented sowing to the insurance companies

2015-16 Rabi Season Rice Area



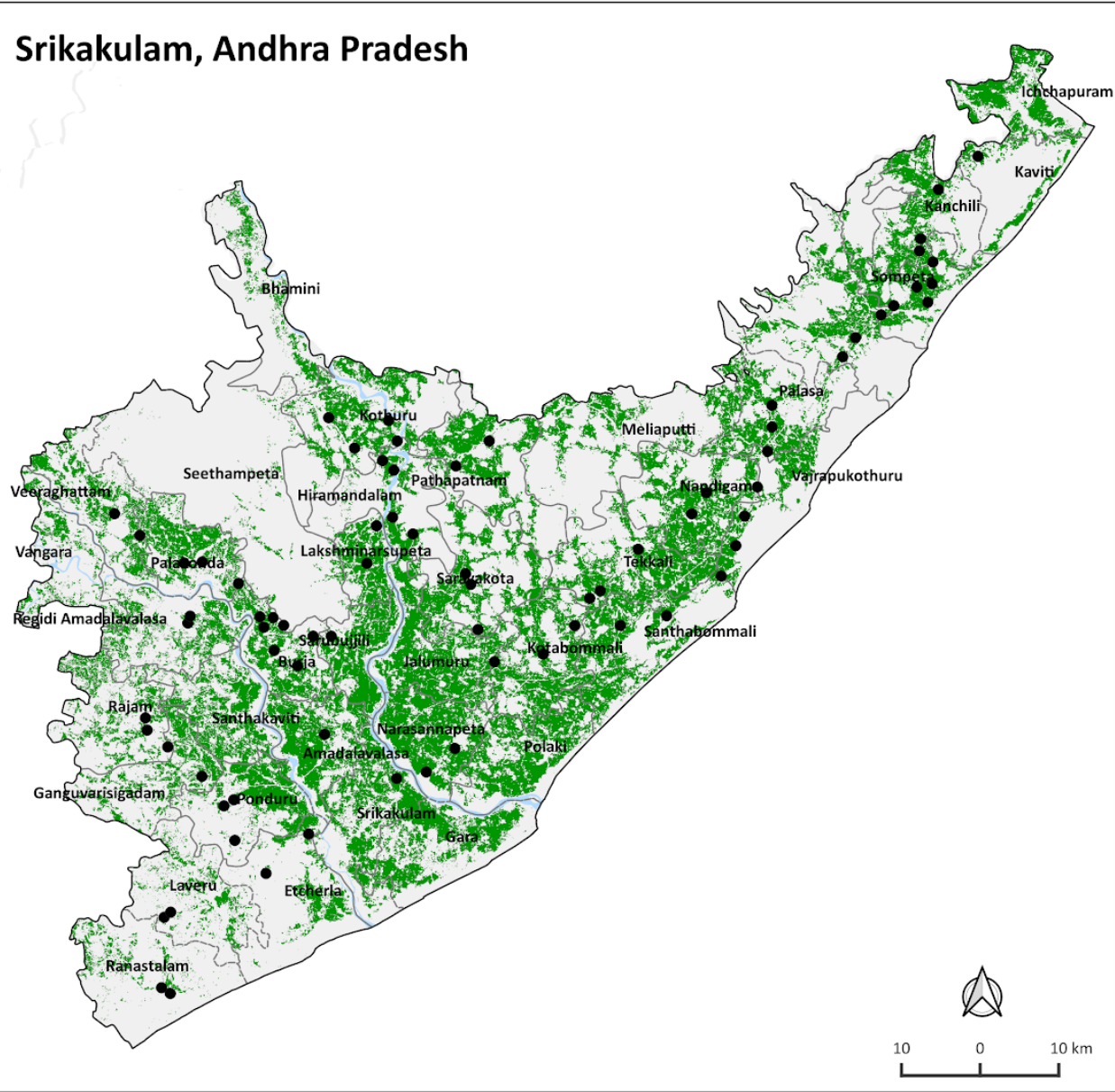
2016-17 Rabi Season Rice Area





Satellite based Rice Monitoring, Andhra Pradesh, India

Srikakulam, Andhra Pradesh



DoA: 208,947

APSRMS: 202,943

Agreement at mandal (block) level: 97%

Accuracy against e-panta data from 2 mandals: 87% (kappa index 0.73)

2018 Kharif season

(As of October 10)

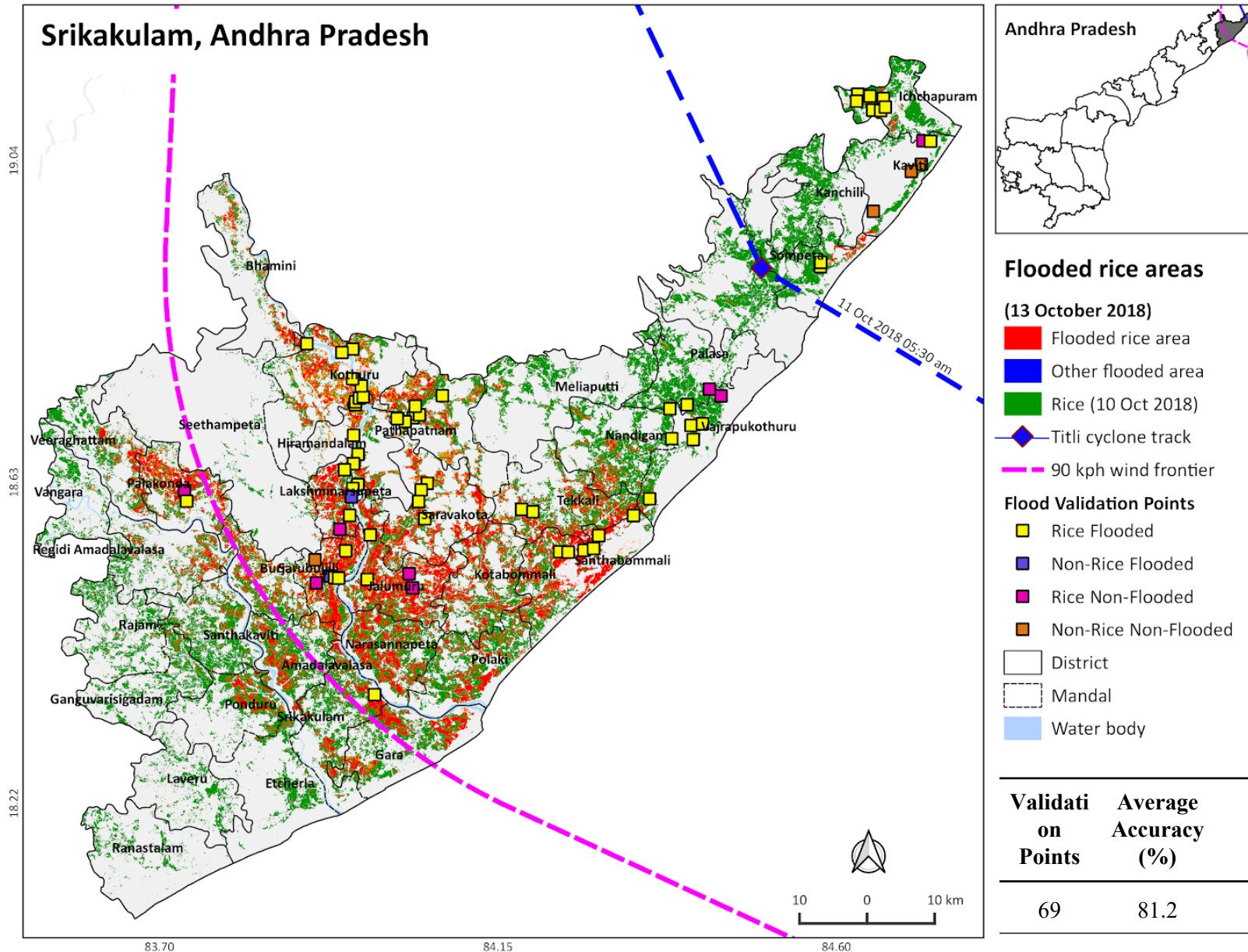
- Validation point
- Rice
- District
- Mandal
- Water body

Name of Administrative Entity (District, Mandal and Villages)	Validation Points	Average Accuracy (%)	Average Reliability (%)	Overall Accuracy (%)	Kappa Index
<i>District Level</i>					
Srikakulam	76	78.6	97.9	96.1	0.92
<i>Mandal Level</i>					
Srikakulam, Jalmuru	104	99.5	92.9	99.0	0.98
<i>Village Level</i>					
Srikakulam, Jalmuru, Jalmur	33	98.3	90.0	97.0	0.94



Satellite based Rice Monitoring, Andhra Pradesh, India

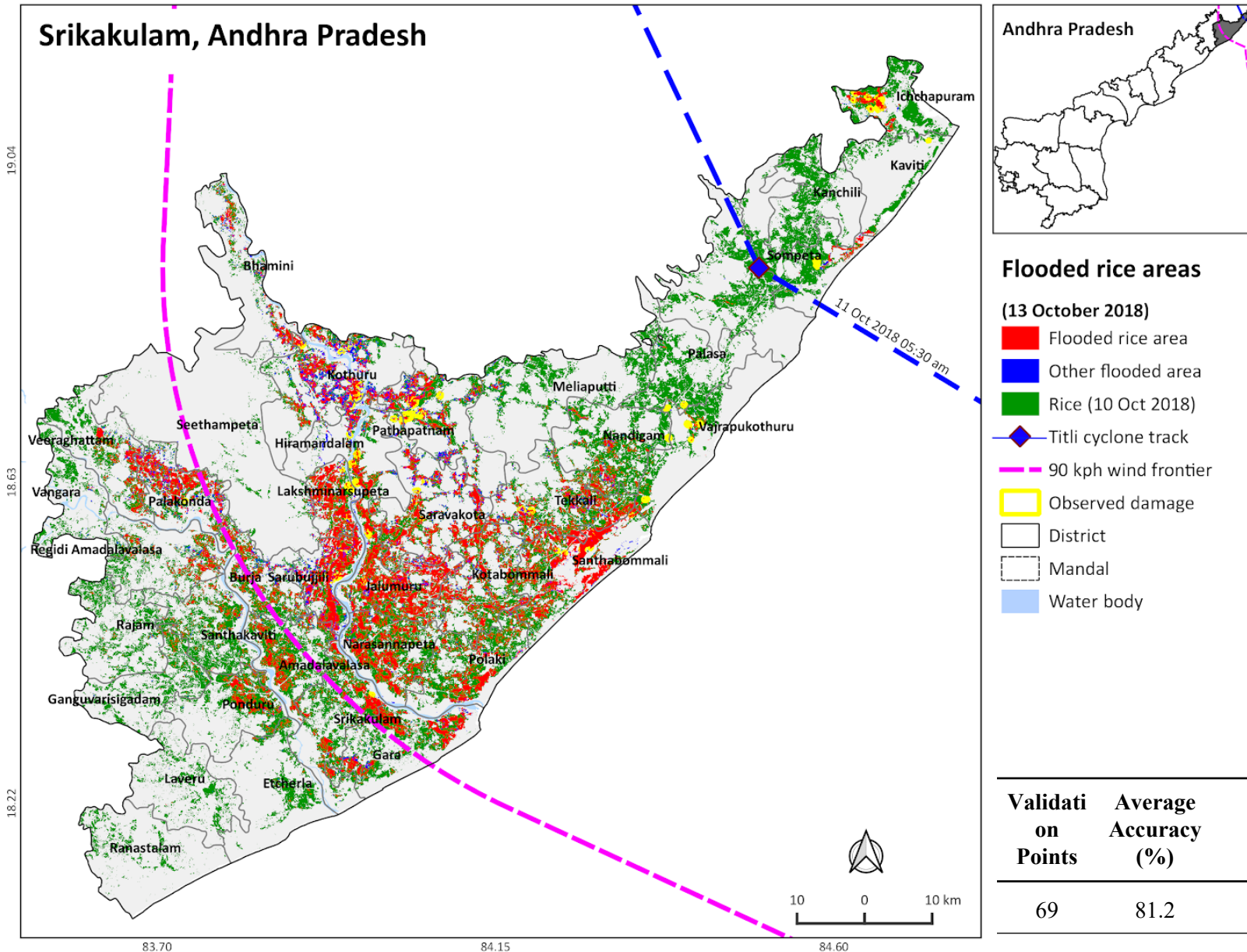
Cyclone Titli Srikakulam District 13 Oct 2018





Satellite based Rice Monitoring, Andhra Pradesh, India

Cyclone Titli Srikakulam District 13-18 Oct 2018



Validation Points	Average Accuracy (%)	Average Reliability (%)	Overall Accuracy (%)	Kappa Index
69	81.2	81.2	85.0	0.70



Satellite based Rice Monitoring, Andhra Pradesh, India

Cyclone Titli, Srikakulam District, 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

Presentation by Emma Quicho, Ag. Session Day 2

Poster by Murugesan *et al* – Cyclone Fani, Odisha



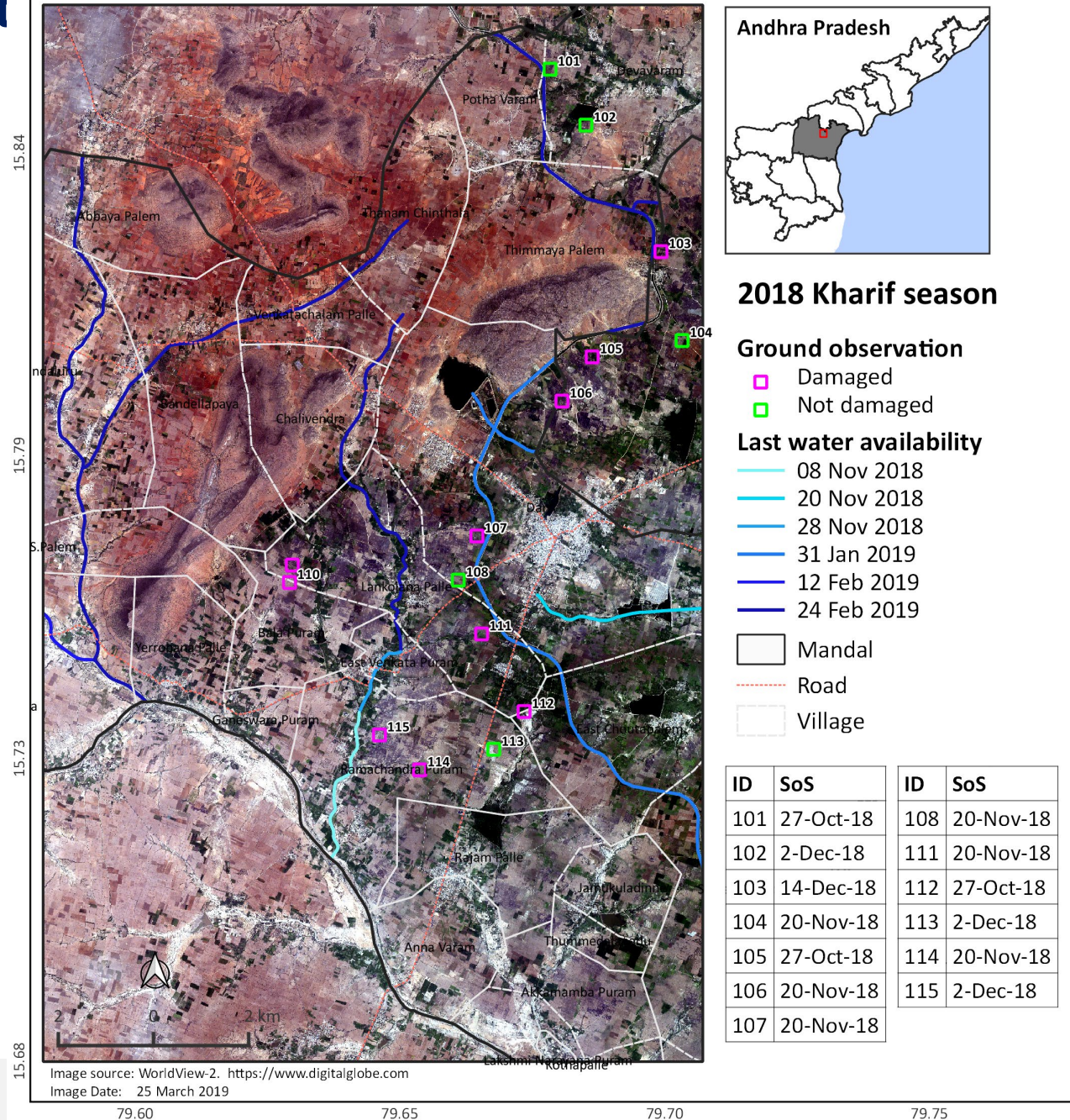
SRM, AP, India

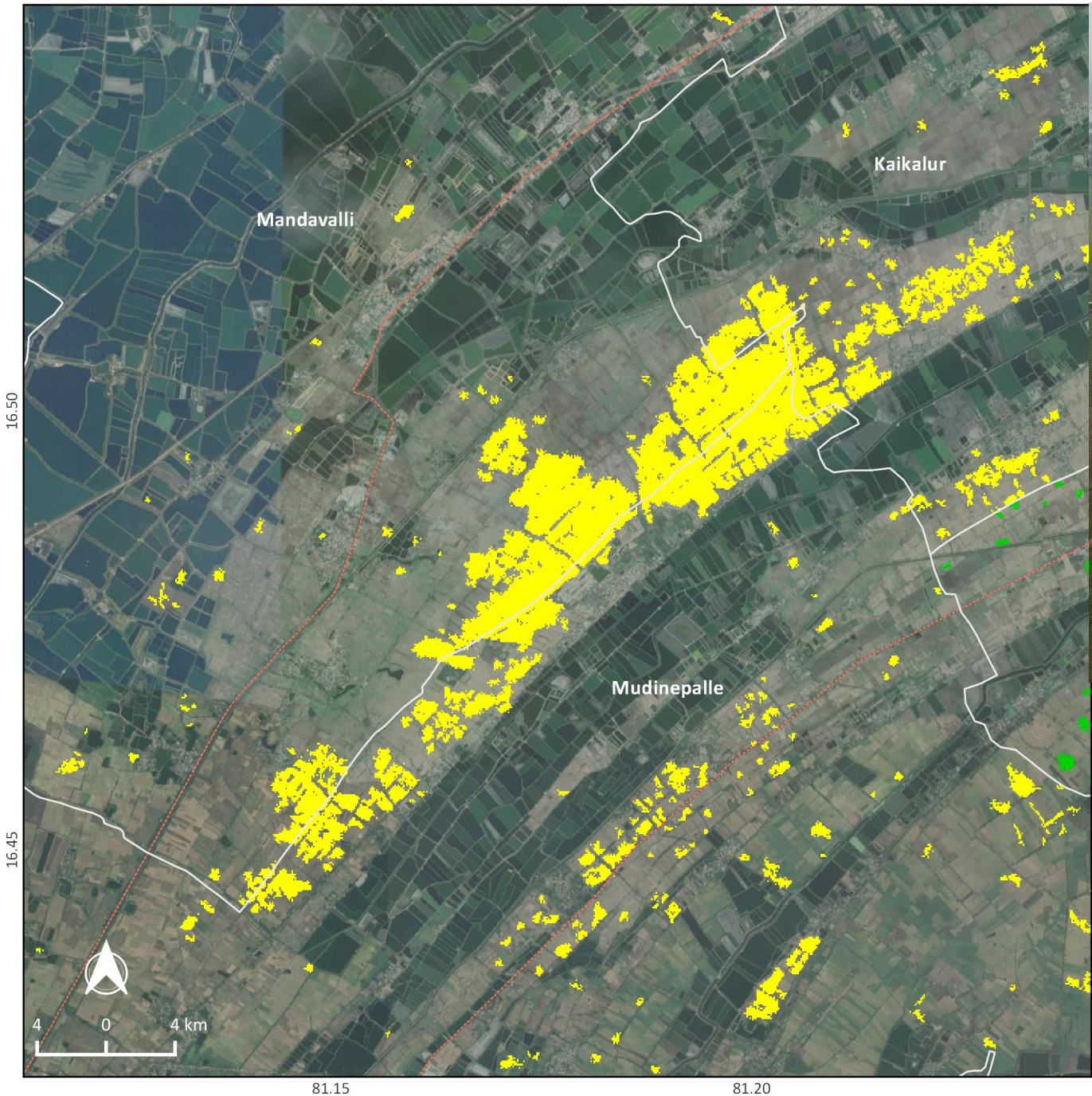
Drought in Prakasam District

Late Kharif 2018/19



Darsi, Prakasam, Andhra Pradesh





2019 Rabi season

-  Blackgram
-  Rice
-  District
-  Mandal
-  Waterbody
-  Road

SRM, AP, India Land Use Monitoring

Data Source: Sentinel 1
Processed using MapsScape-Rice

SRM, AP, India

Water Resource Study in Cumbum, Prakasam

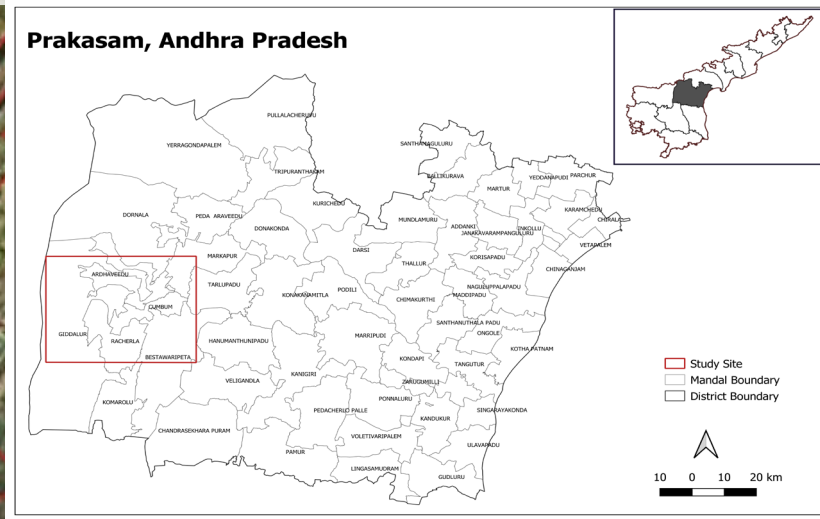
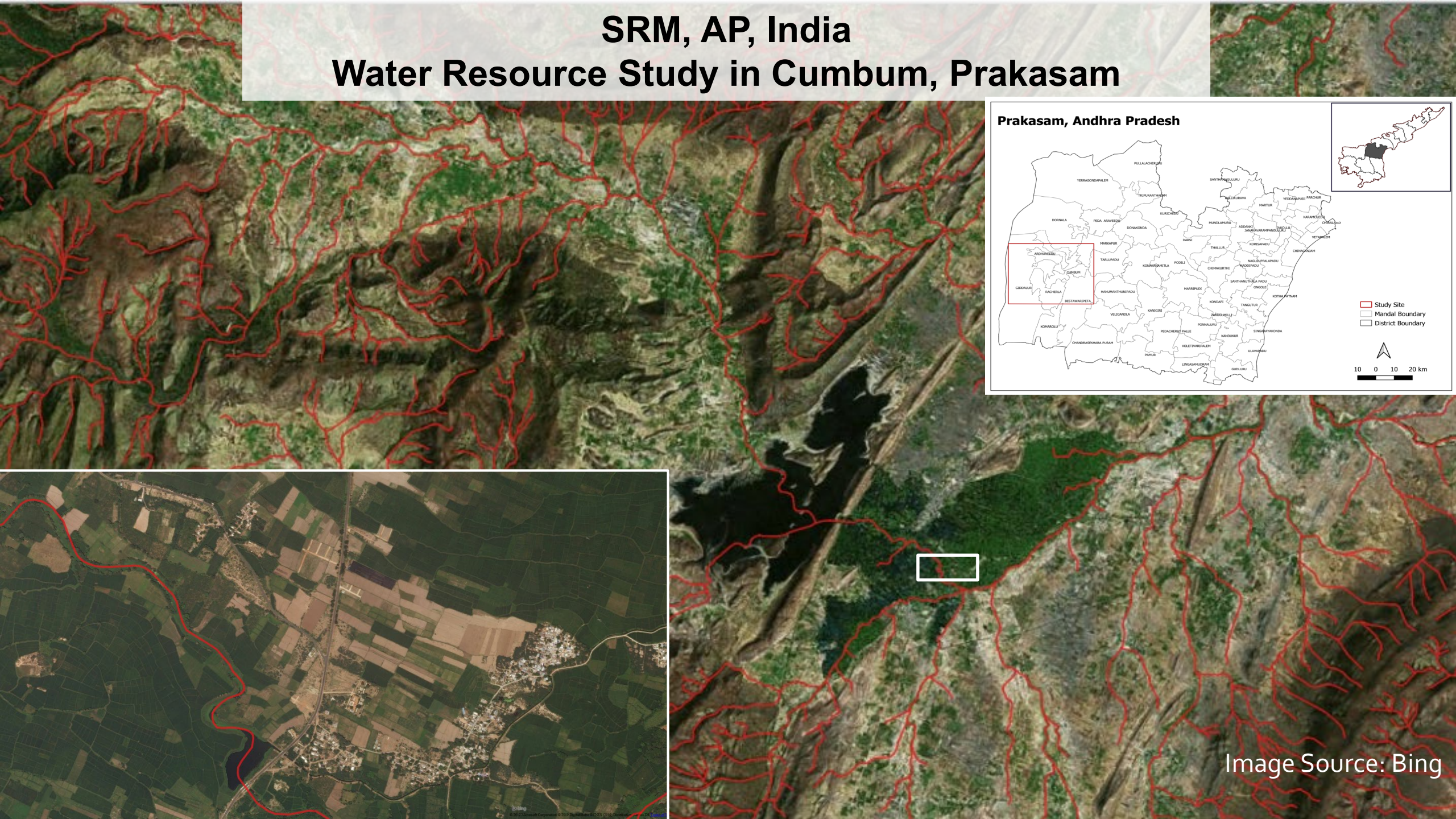


Image Source: Bing



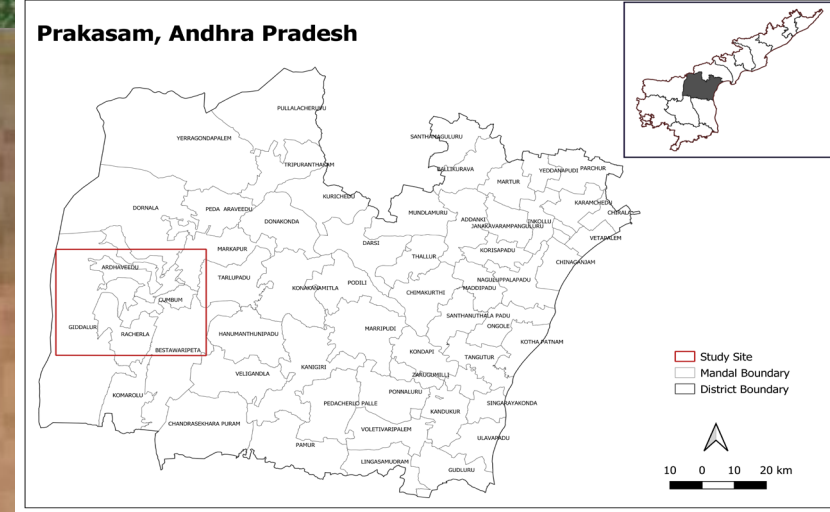
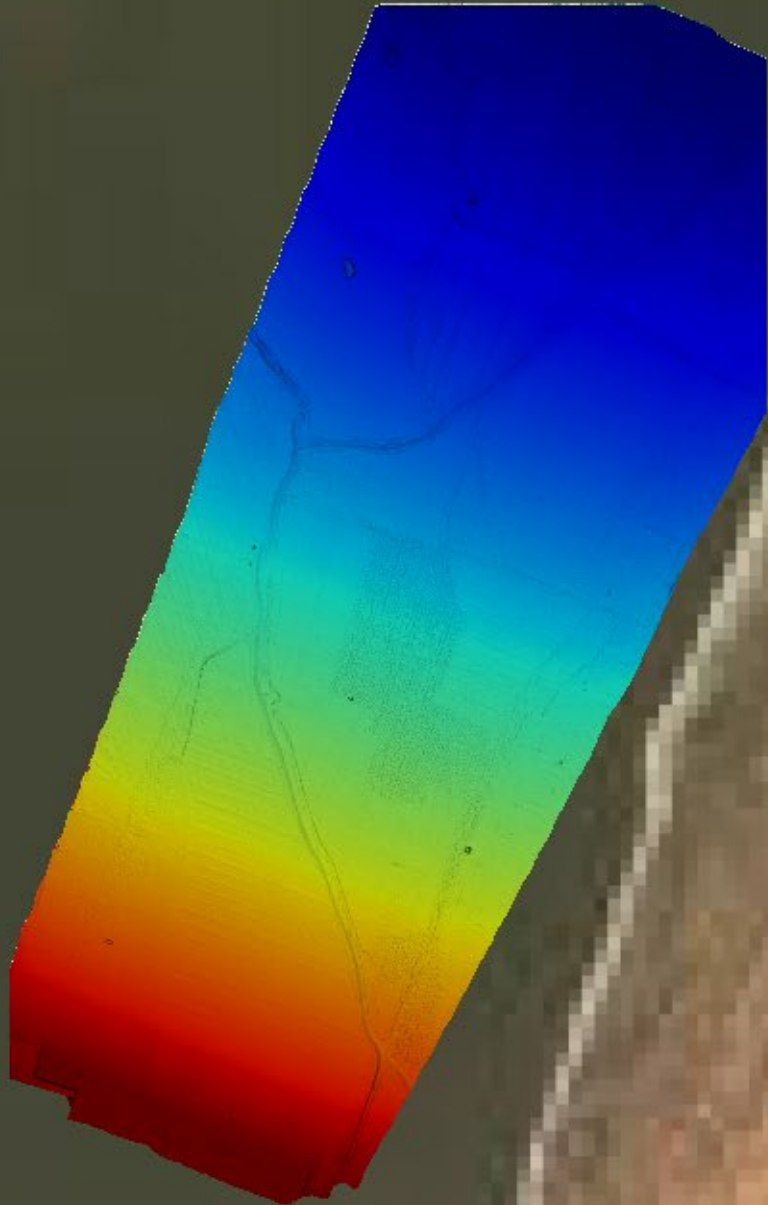
SRM, AP, India

Water Resource Study in Cumbum, Prakasam



SRM, AP, India

Water Resource Study in Cumbum, Prakasam



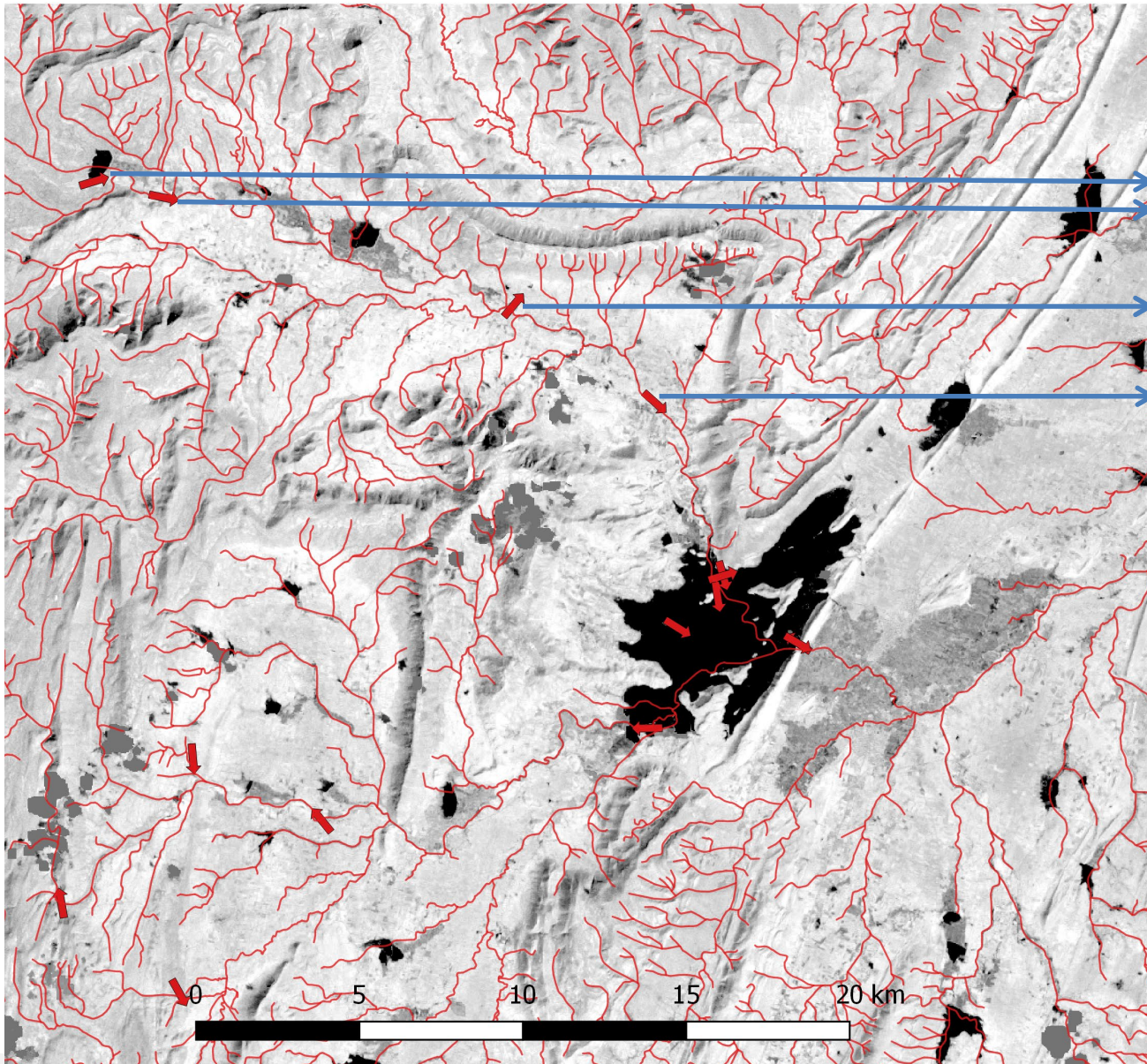


Photo from small UAV (DJI Mavic Pro), 7-8 Jul 2019

Data Source: Landsat 4,5,6, Sep-Dec 1996
Retrieved using Climate Engine



SRM, AP, India

Water Resource Study in Cumbum, Prakasam

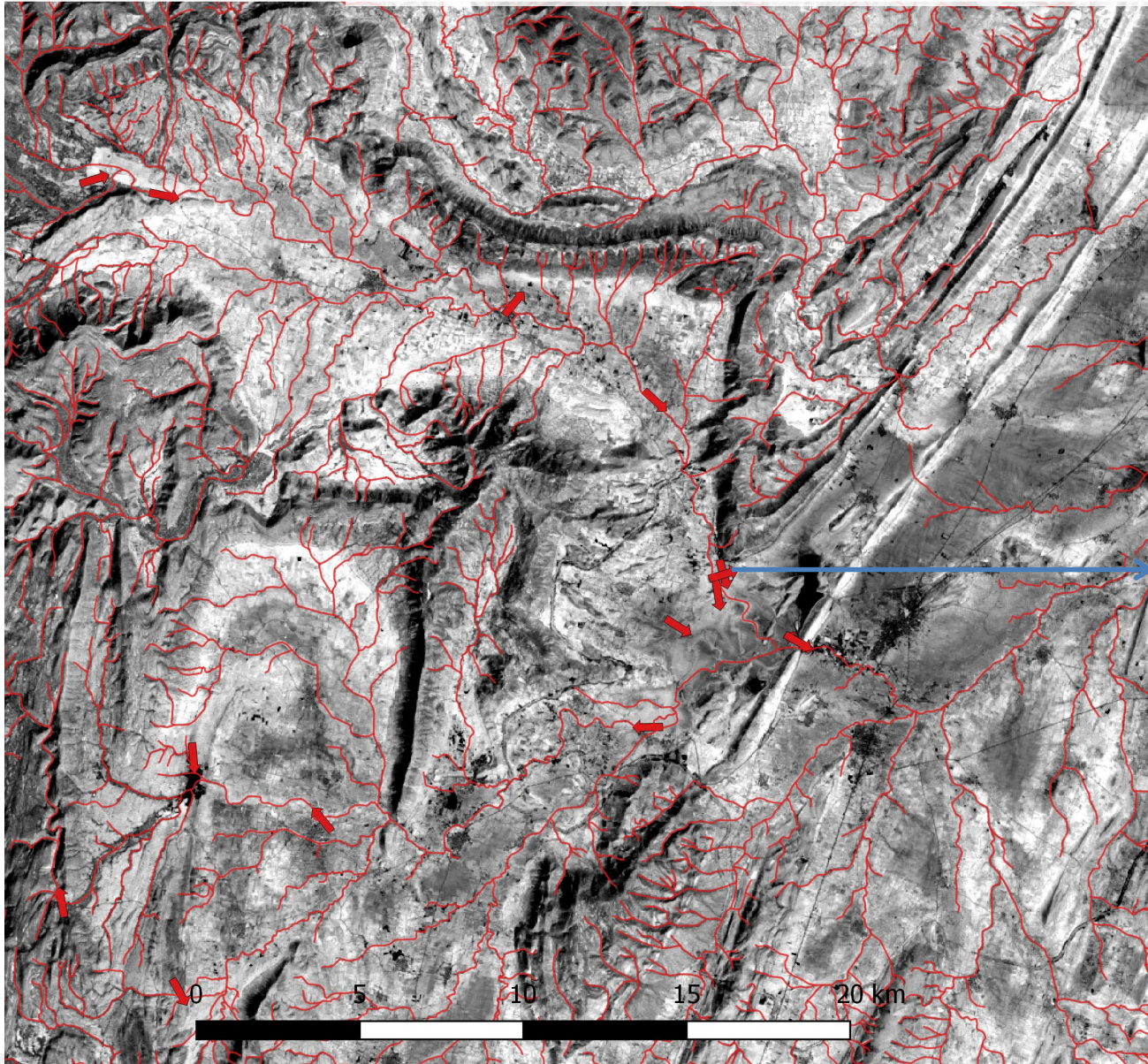


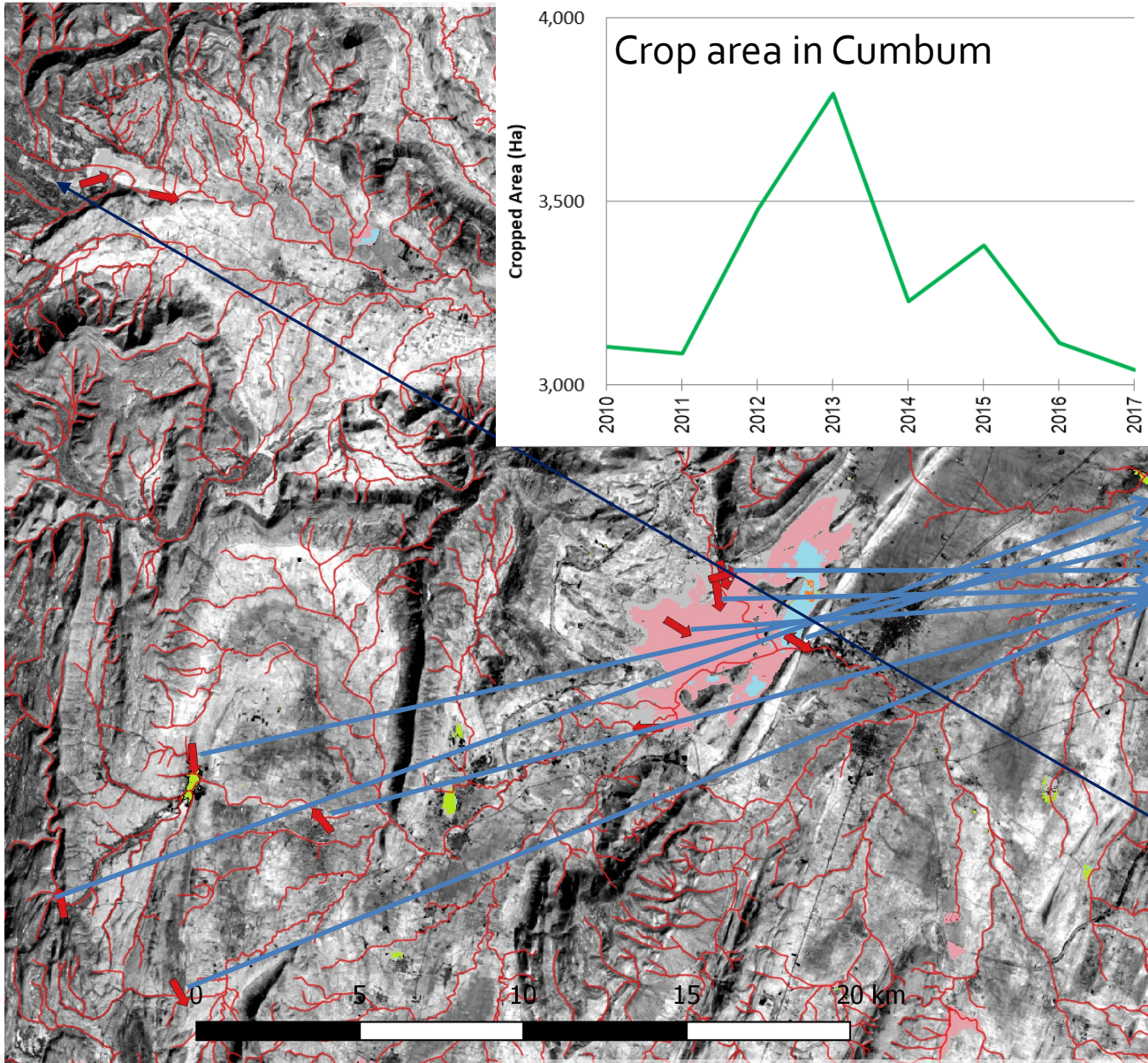
Photo from small UAV (DJI Mavic Pro), 7-8 Jul 2019

Data Source: Landsat 8, Sep-Dec 2018
Retrieved using Climate Engine



SRM, AP, India

Water Resource Study in Cumbum, Prakasam



Poster by Maunhaan *et al*



Photo from small UAV (DJI Mavic Pro), 7-8 Jul 2019





Thanks!
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