Remote sensing based Information and Insurance for Crops in emerging Economies (RIICE)

Donor, objectives and countries

RIICE national partners

Thailand

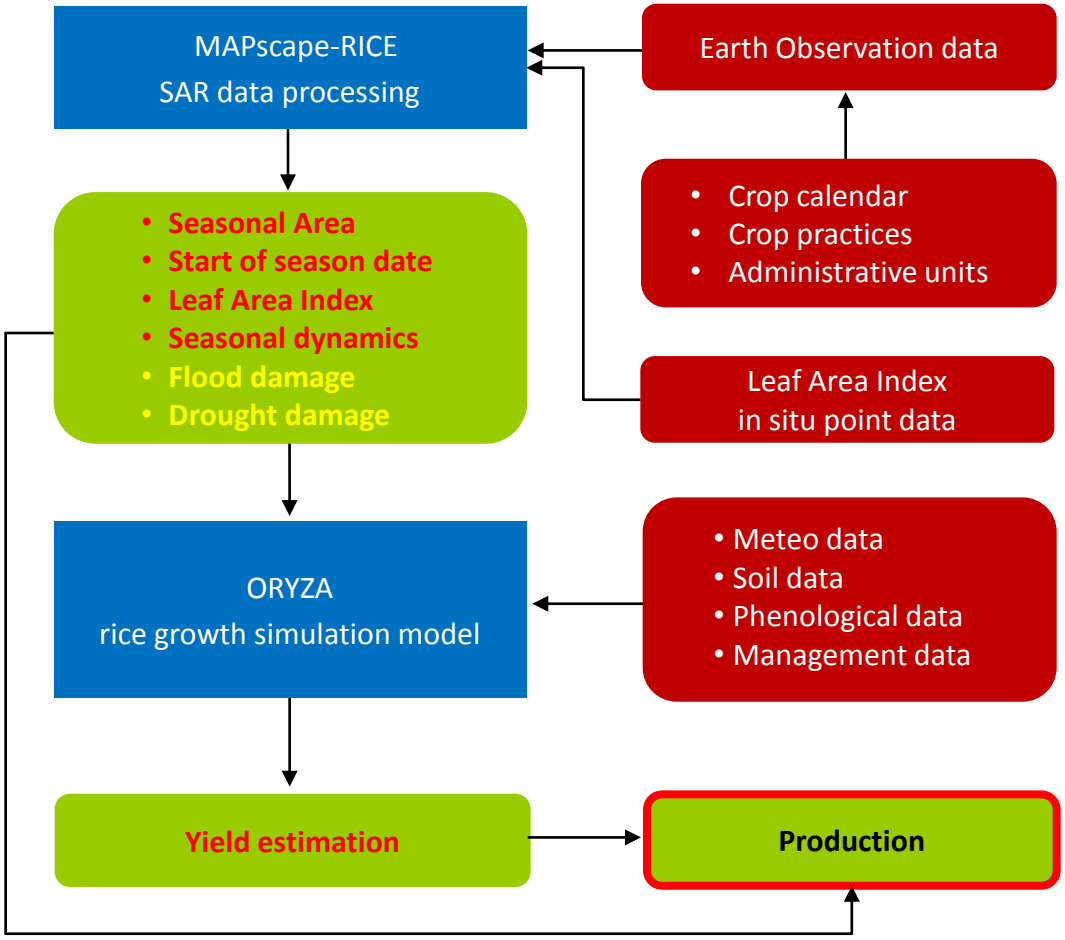
Vietnam

India

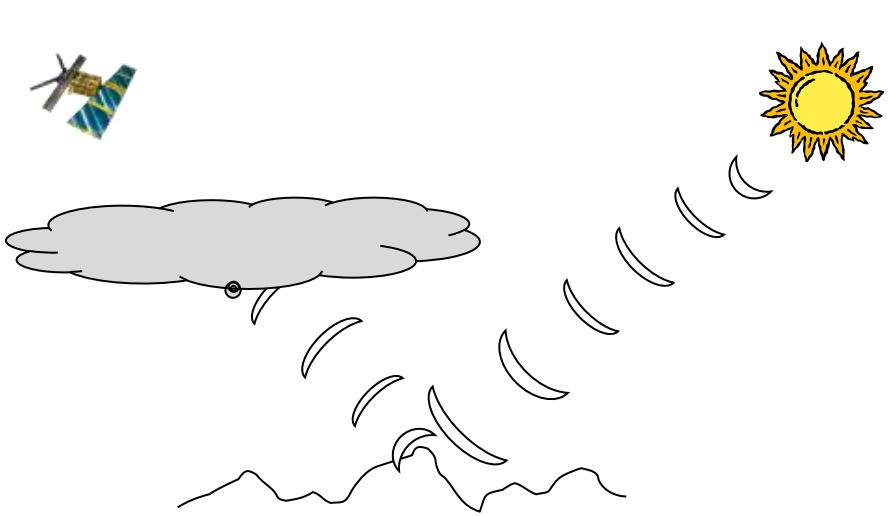
Cambodia

Phillipines

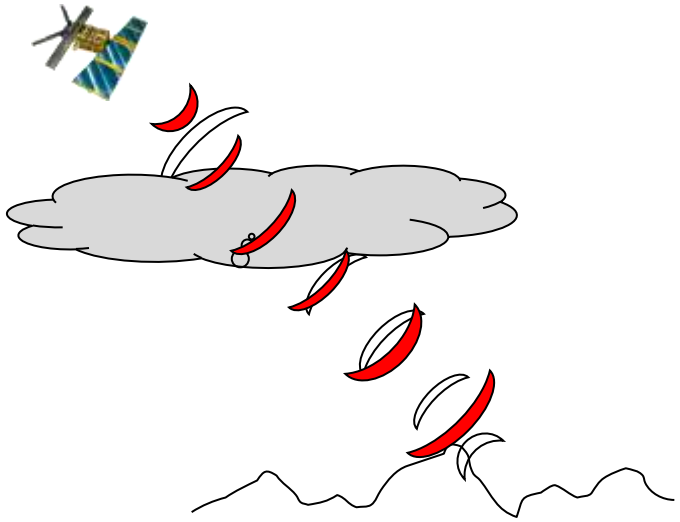
The service


MAPscape-RICE
SAR data processing
Earth Observation data
• Seasonal Area
• Start of season date
• Leaf Area Index
• Seasonal dynamics
• Flood damage
• Drought damage
• Crop calendar
• Crop practices
• Administrative units
Leaf Area Index
in situ point data
ORYZA
rice growth simulation model
• Meteo data
• Soil data
• Phenological data
• Management data
Yield estimation
Production

Optical and Radar systems



Optical



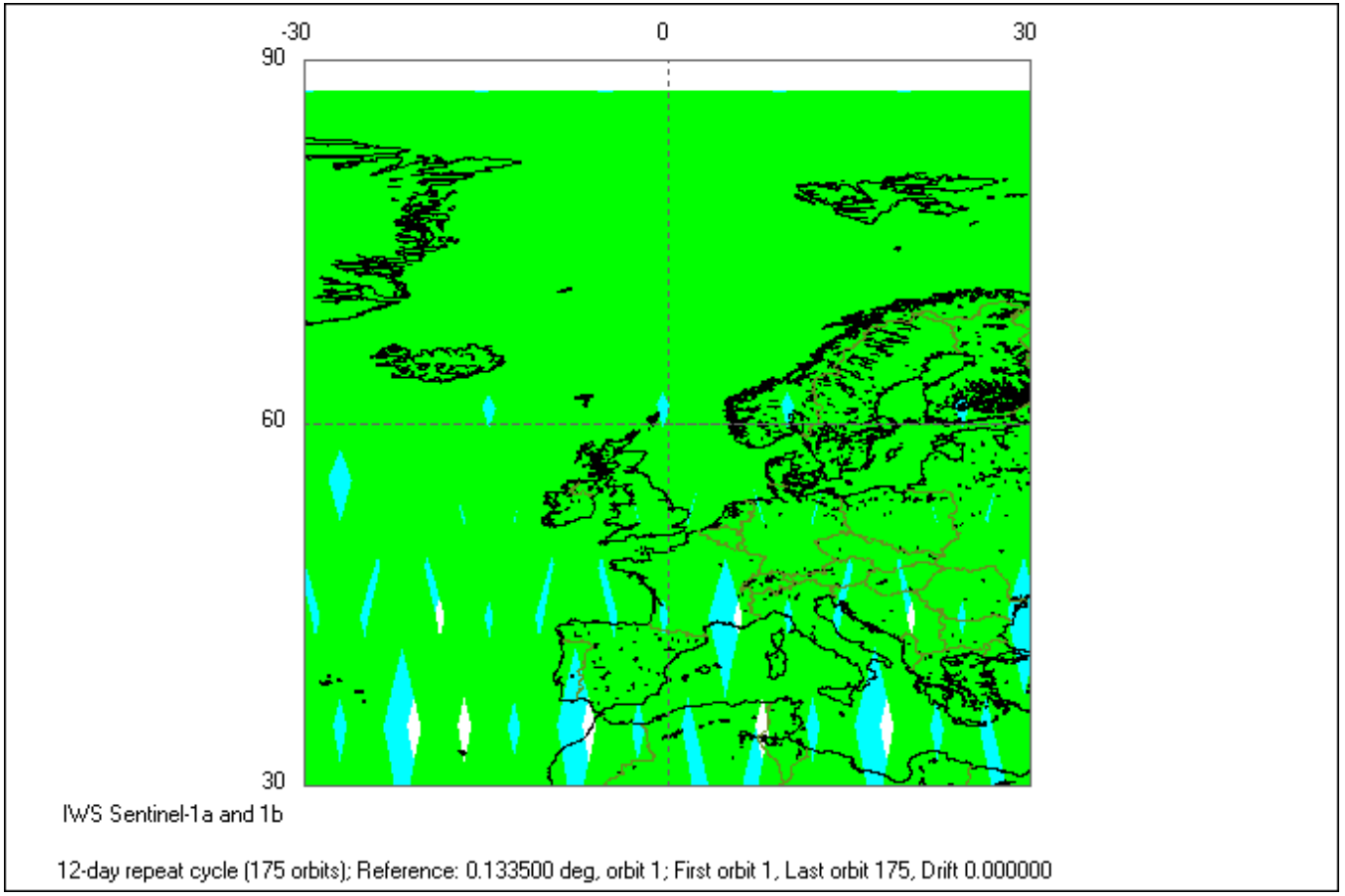
Synthetic Aperture Radar (SAR)

Free of charge satellite optical and radar data

Landsat-5	1985-2012	30m	global coverage
Landsat-8	2013	30m	global coverage
Sentinel-1A	2014	20m	global coverage
Sentinel-1B	2016	20m	global coverage
Sentinel-1C/1D	2020	20m	global coverage
Sentinel-2A	2015	10,20m	global coverage
Sentinel-2B	2016	10,20m	global coverage
Sentinel-2C/2D	2020	10,20m	global coverage

Satellite **free of charge** data are ensured until 2030

Sentinel-1A/B



Global coverage every 6 days (1A & 1B) at a resolution of 20 meter

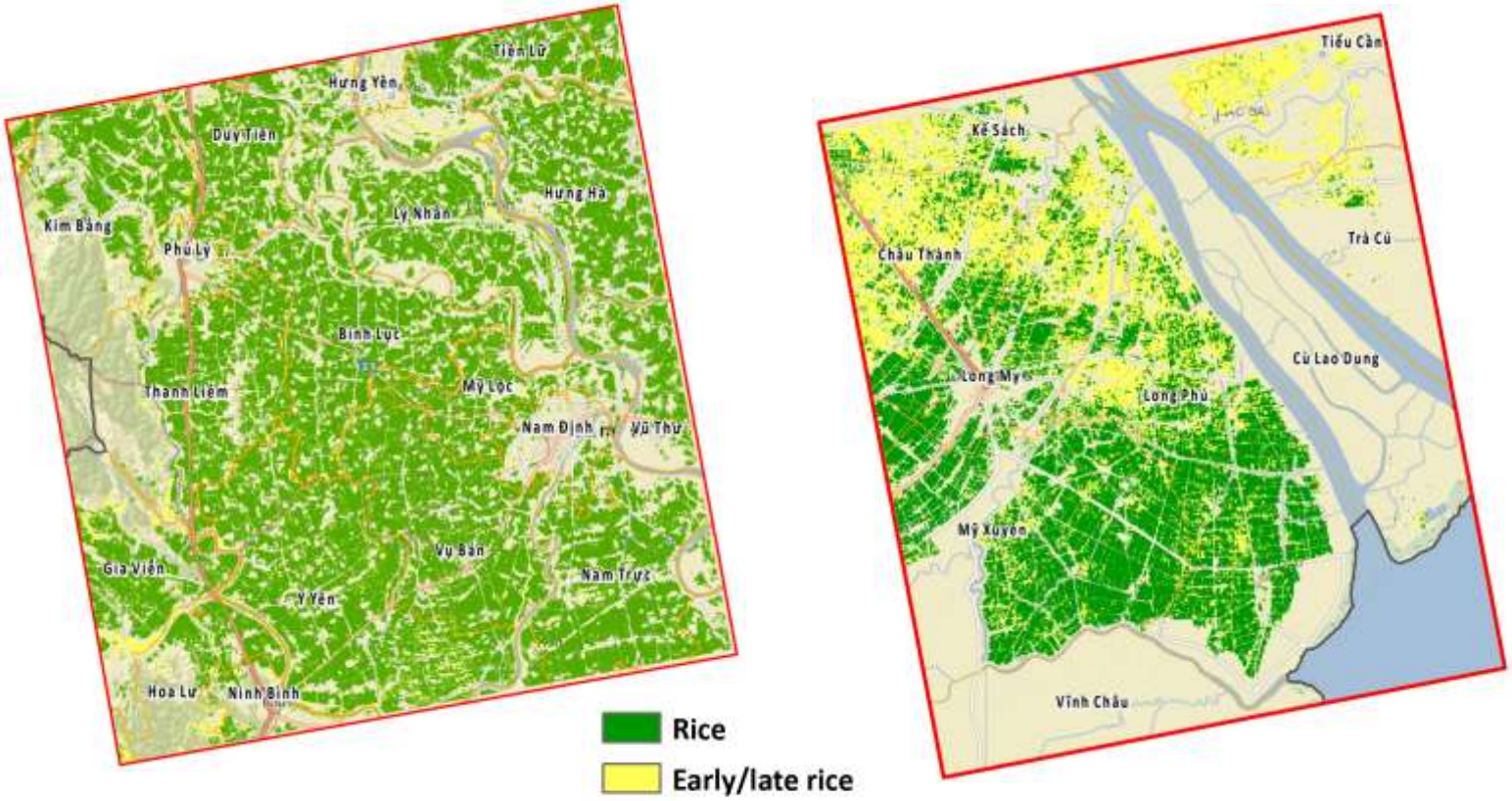
Service infrastructure

All **Earth Observation** data are transferred, stored, processed and analyzed on the cloud.

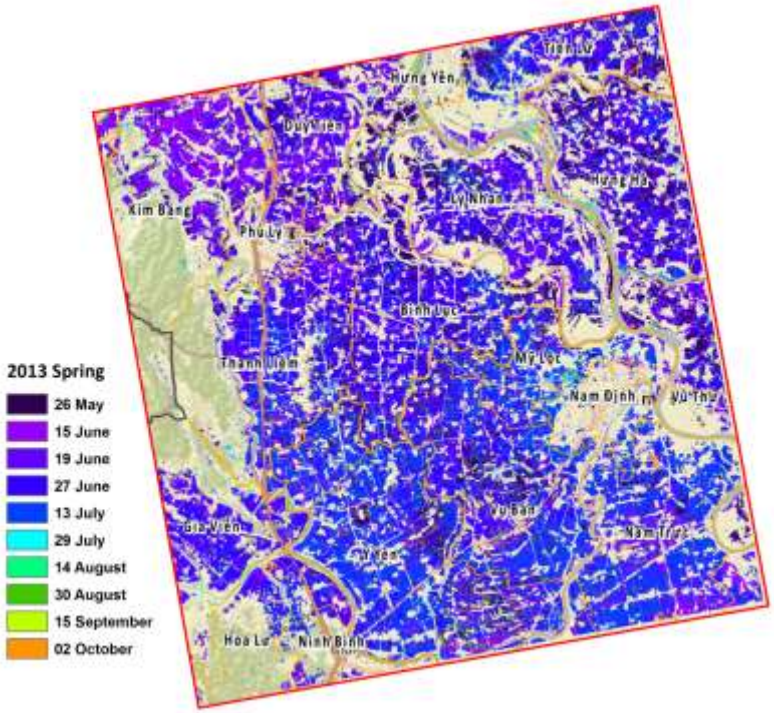
All **field data** collected by mobile phone, sent to the cloud over mobile or Wi-Fi network.

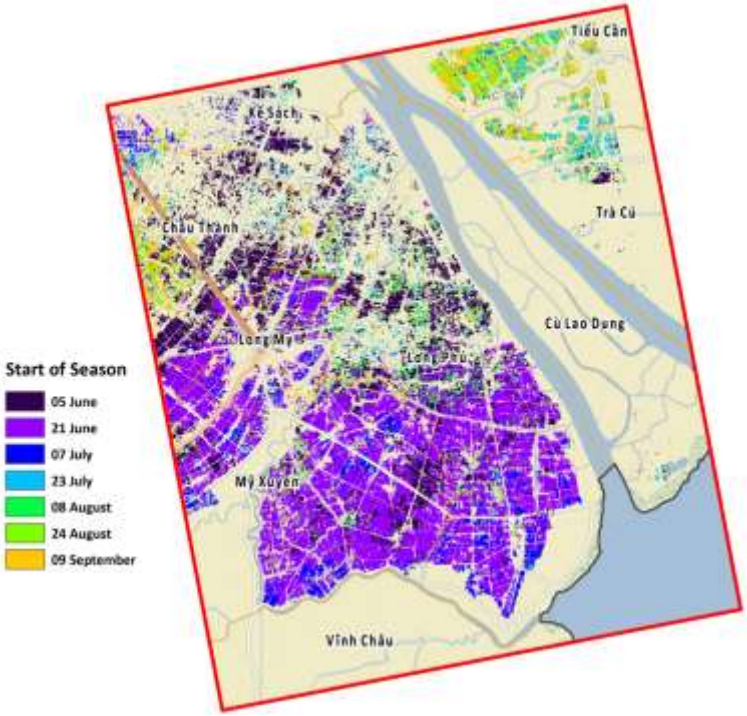
Users **access information via a web-based** platform from any internet enabled device.

Seasonal rice area – Red and Mekong River Delta, 2013



Start of season – Red and Mekong River Delta, 2013

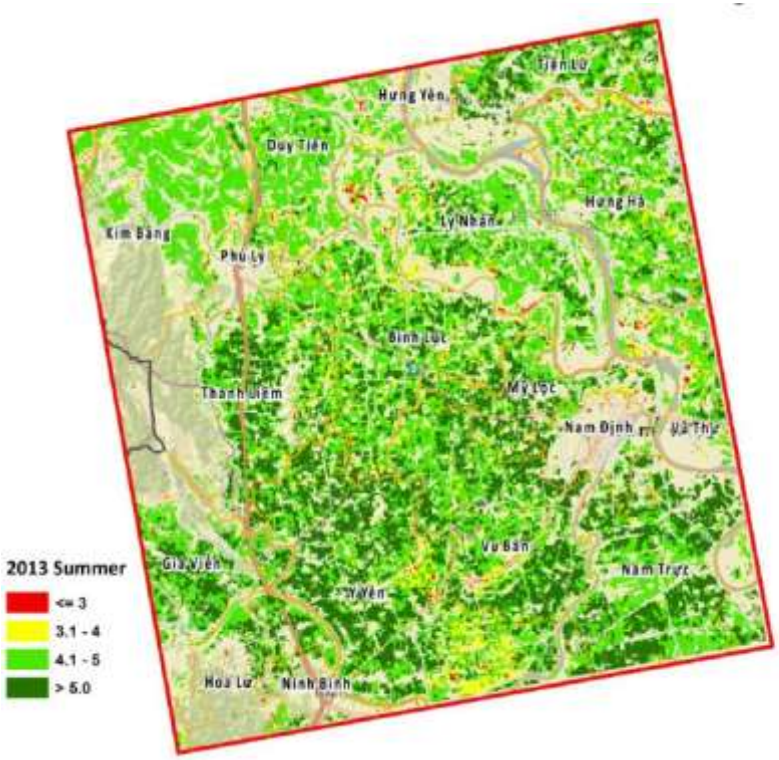


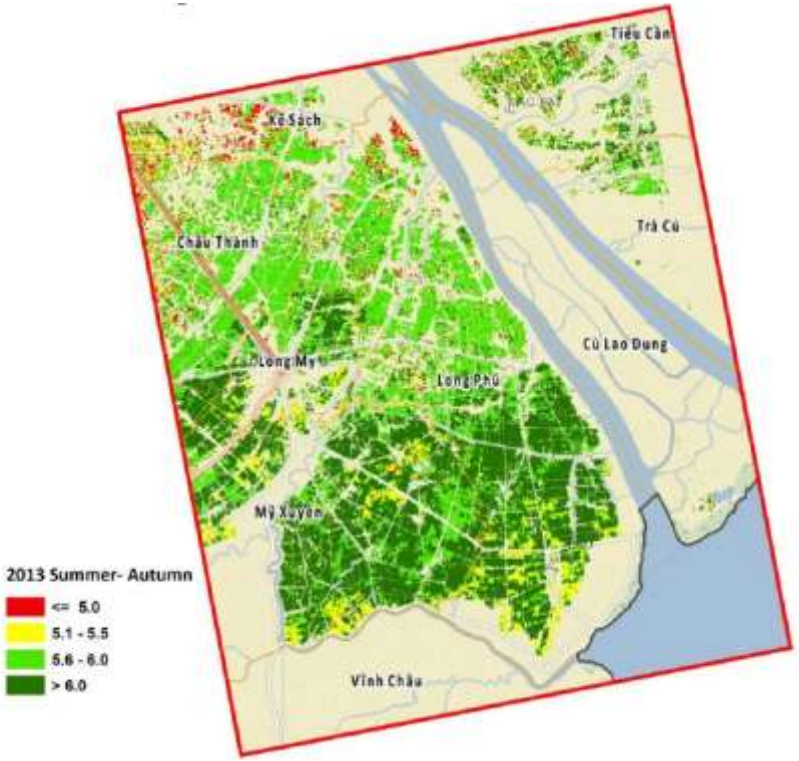


Seasonal rice dynamics – Red and Mekong River Delta, 2013

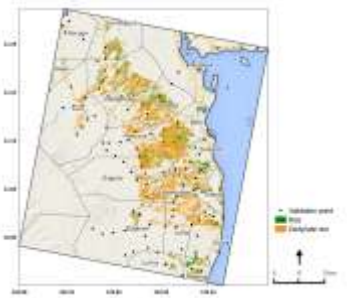
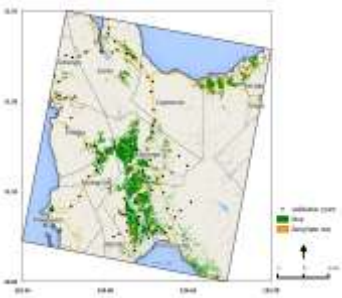
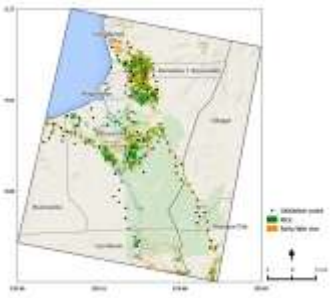
Growing
Scenescence
Harvest
End of cycle

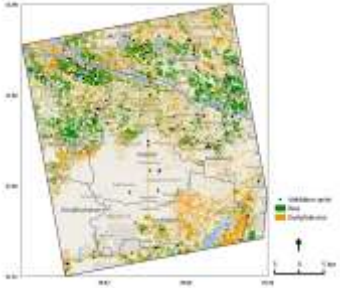
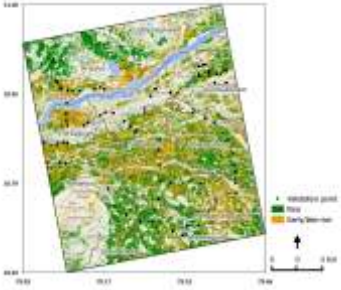
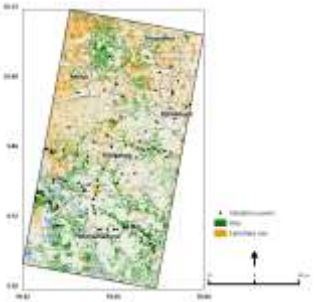
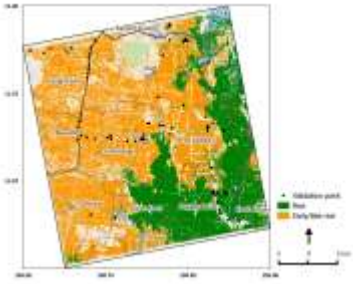
How much yield – Red and Mekong River Delta, 2013



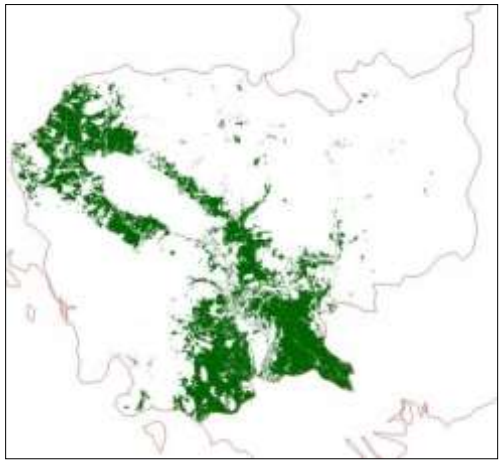


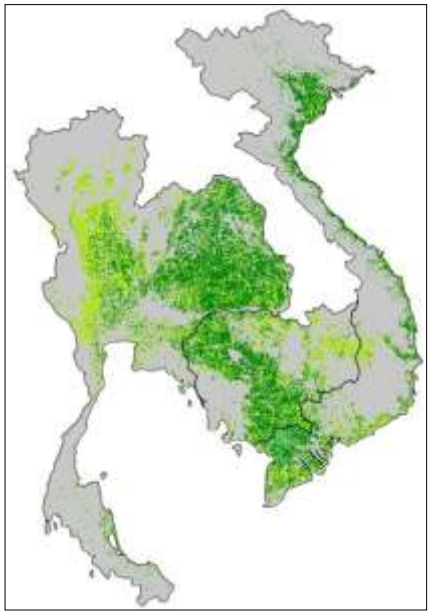
Rice area – Philippines, Java, Tamil Nadu, Cambodia, Thailand

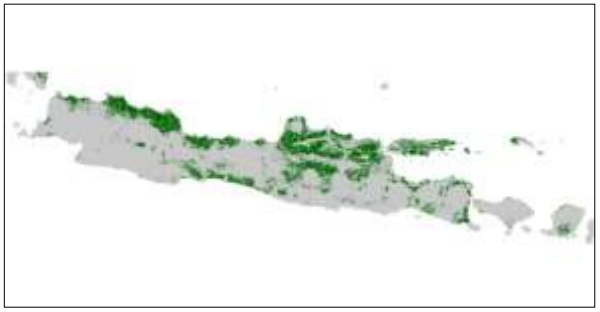




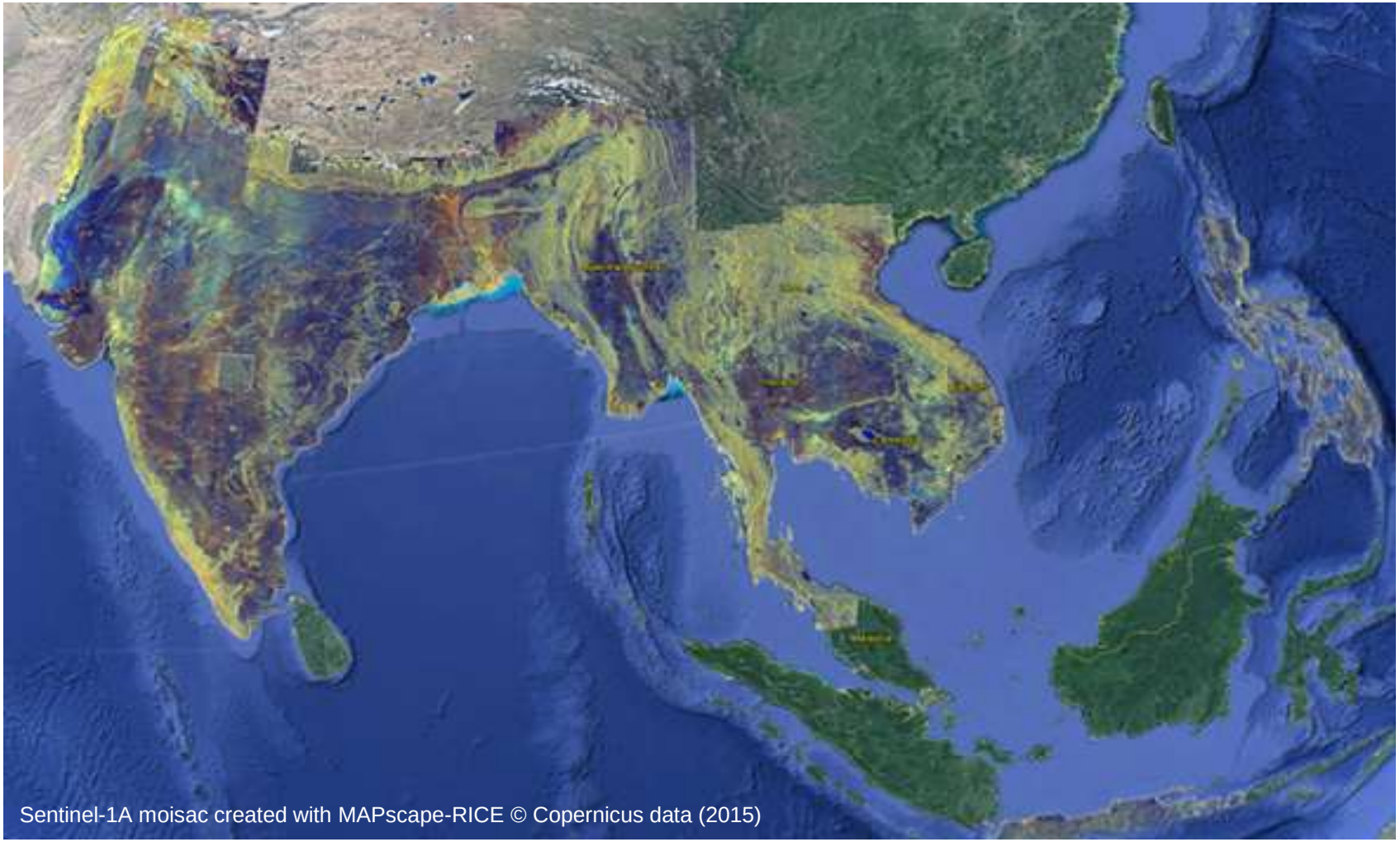
National scale RIICE products (1ha) based on ENVISAT ASAR





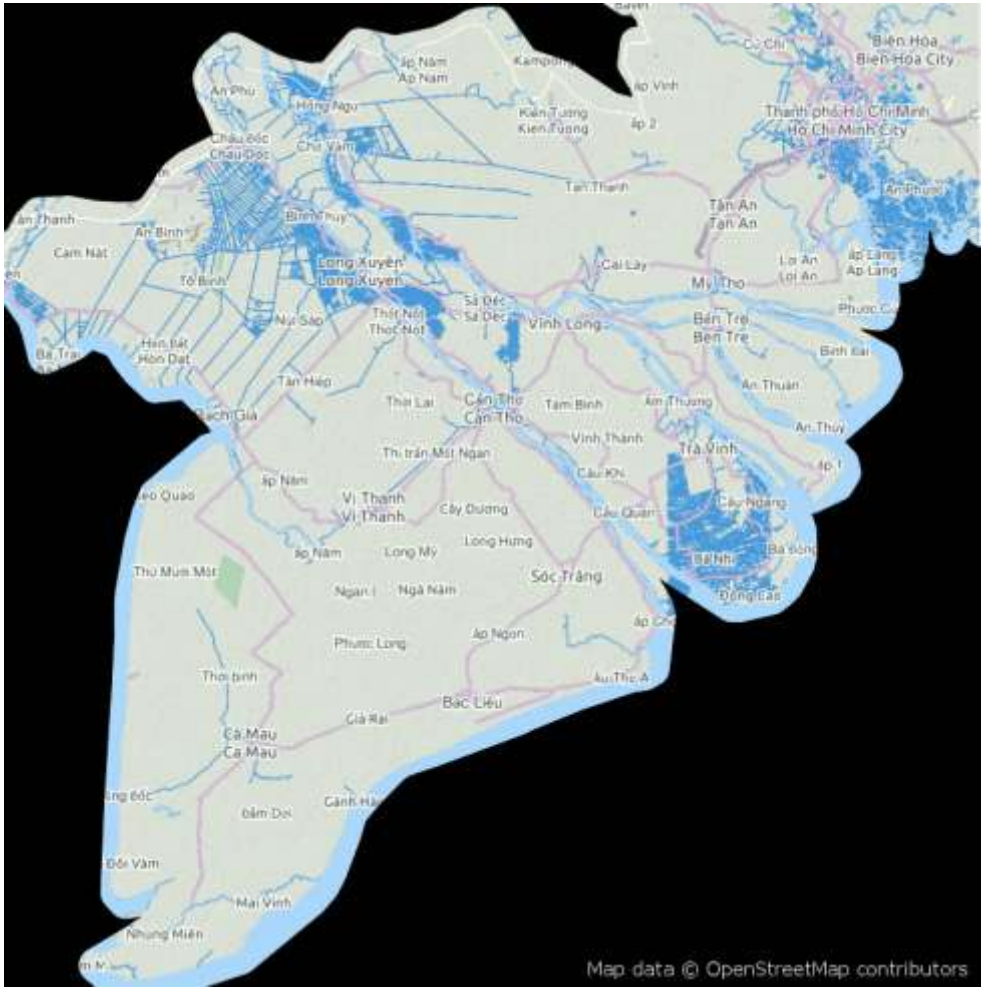


Sentinel-1 – National to continental scale

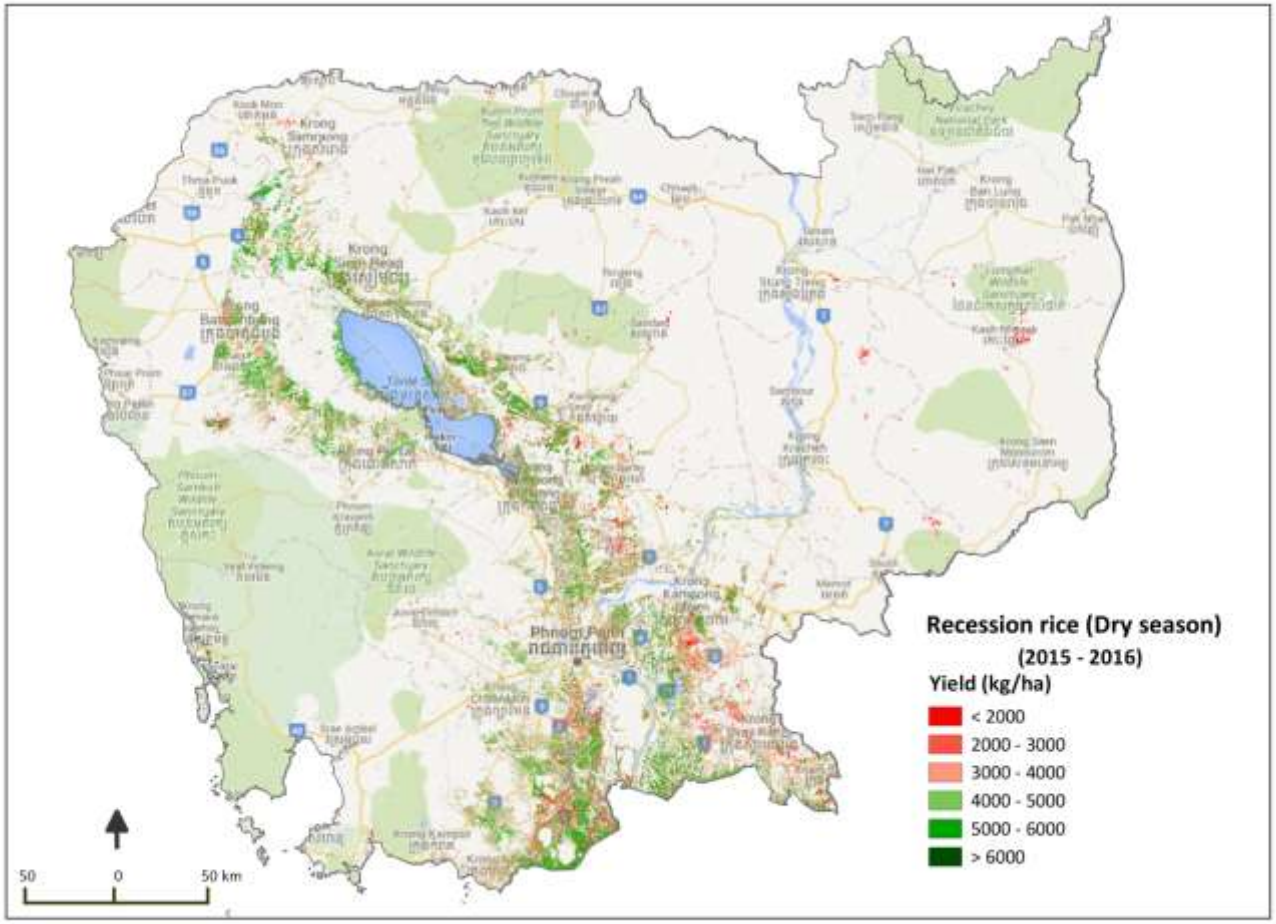


Sentinel-1A moisac created with MAPscape-RICE © Copernicus data (2015)

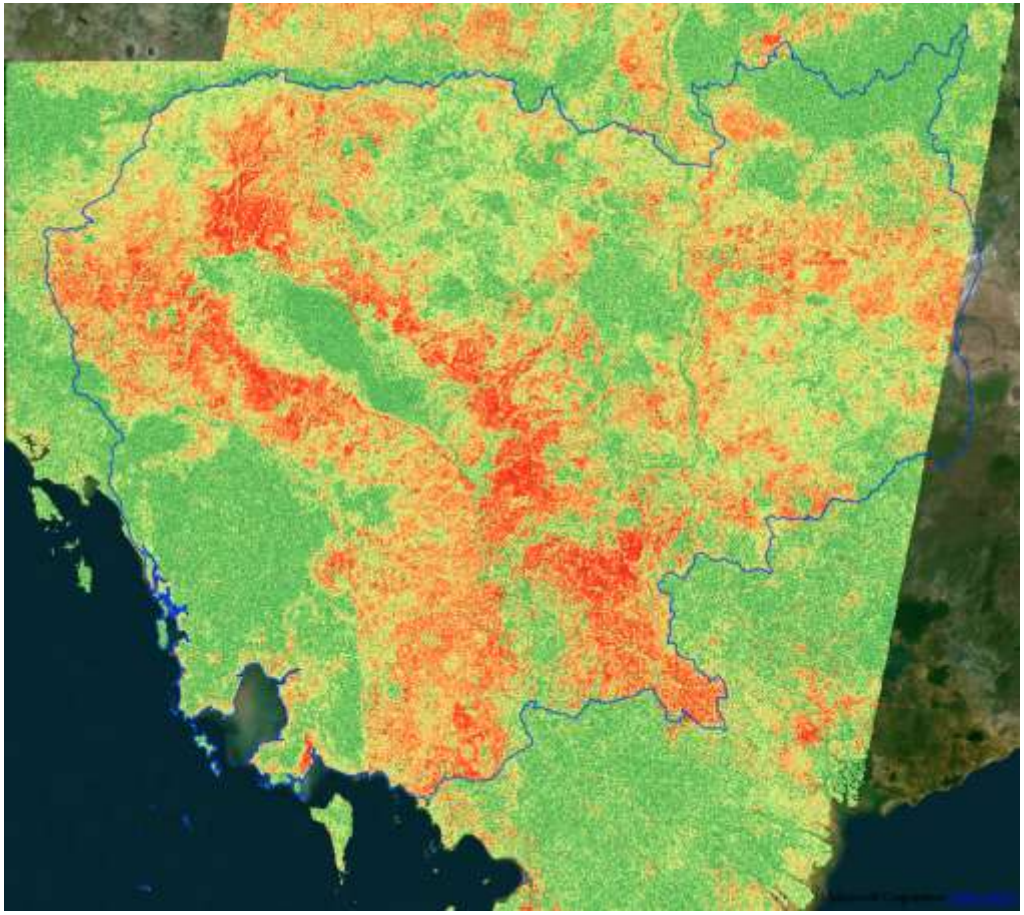
Sentinel-1 – 12-days monitoring at large scale



Cambodia – Dry season 2015-16

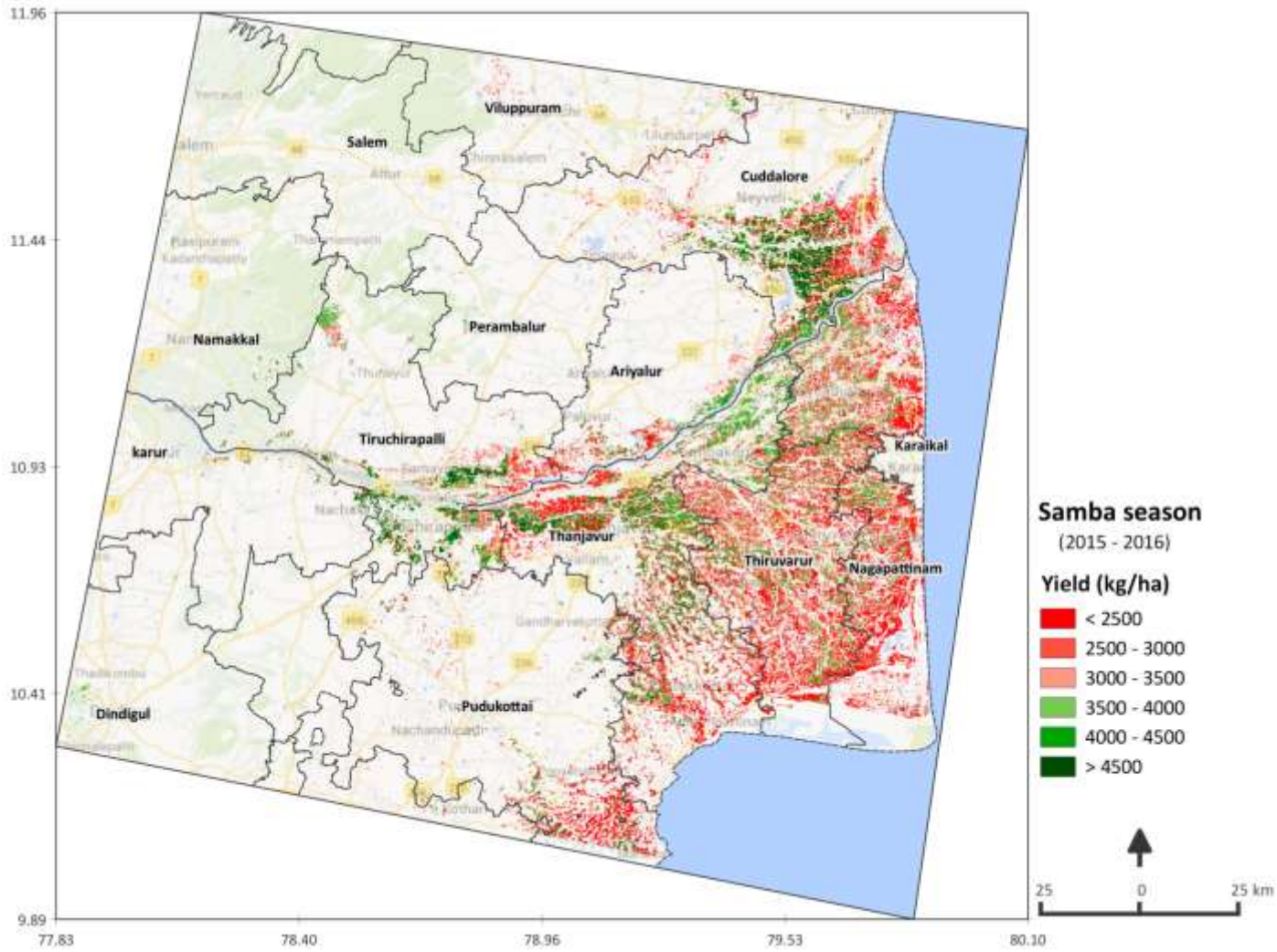


Cambodia – Early Wet Season 2016 – April Drought

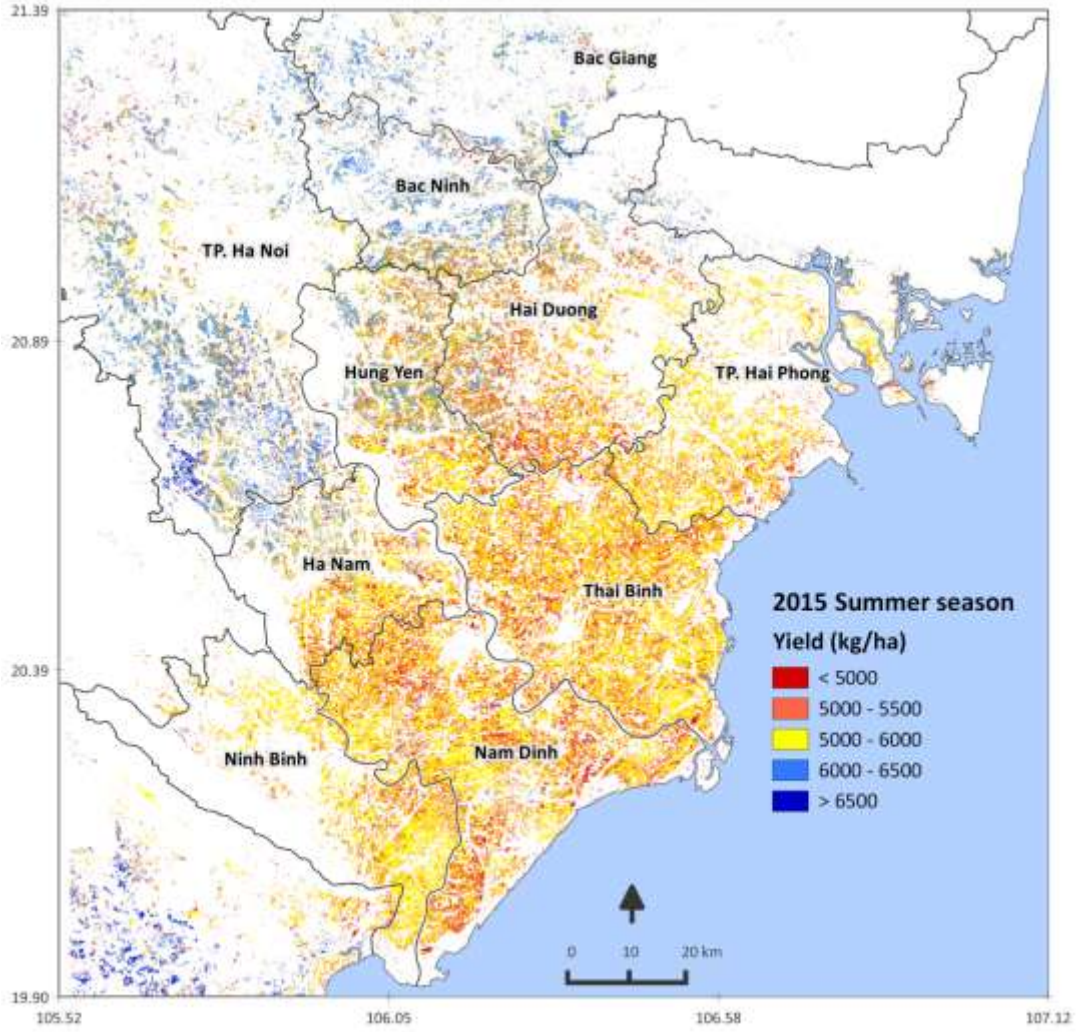


dense vegetated	medium vegetated	bare soil/dry veg	bare soil

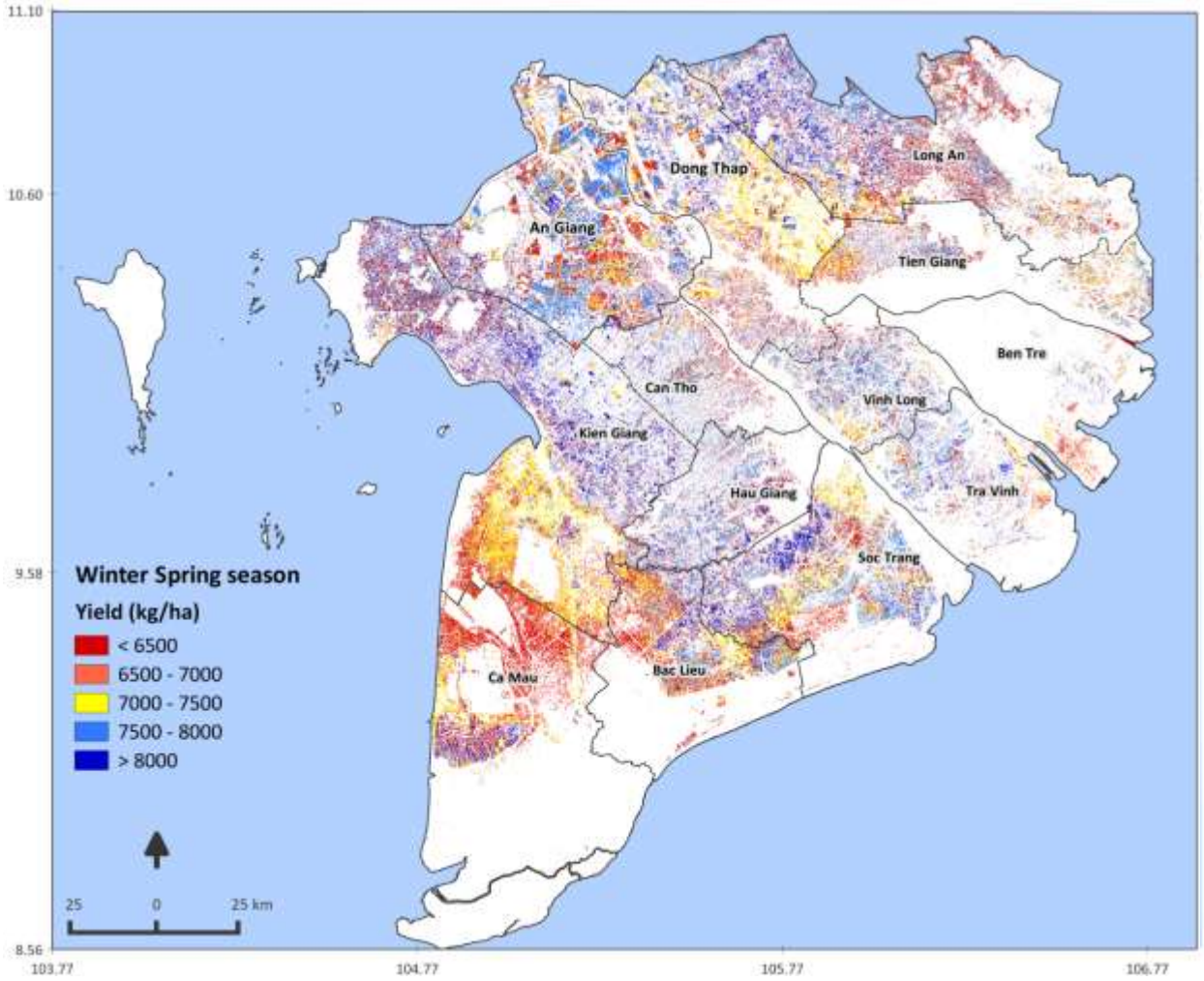
Tamil Nadu – Samba season 2015-16



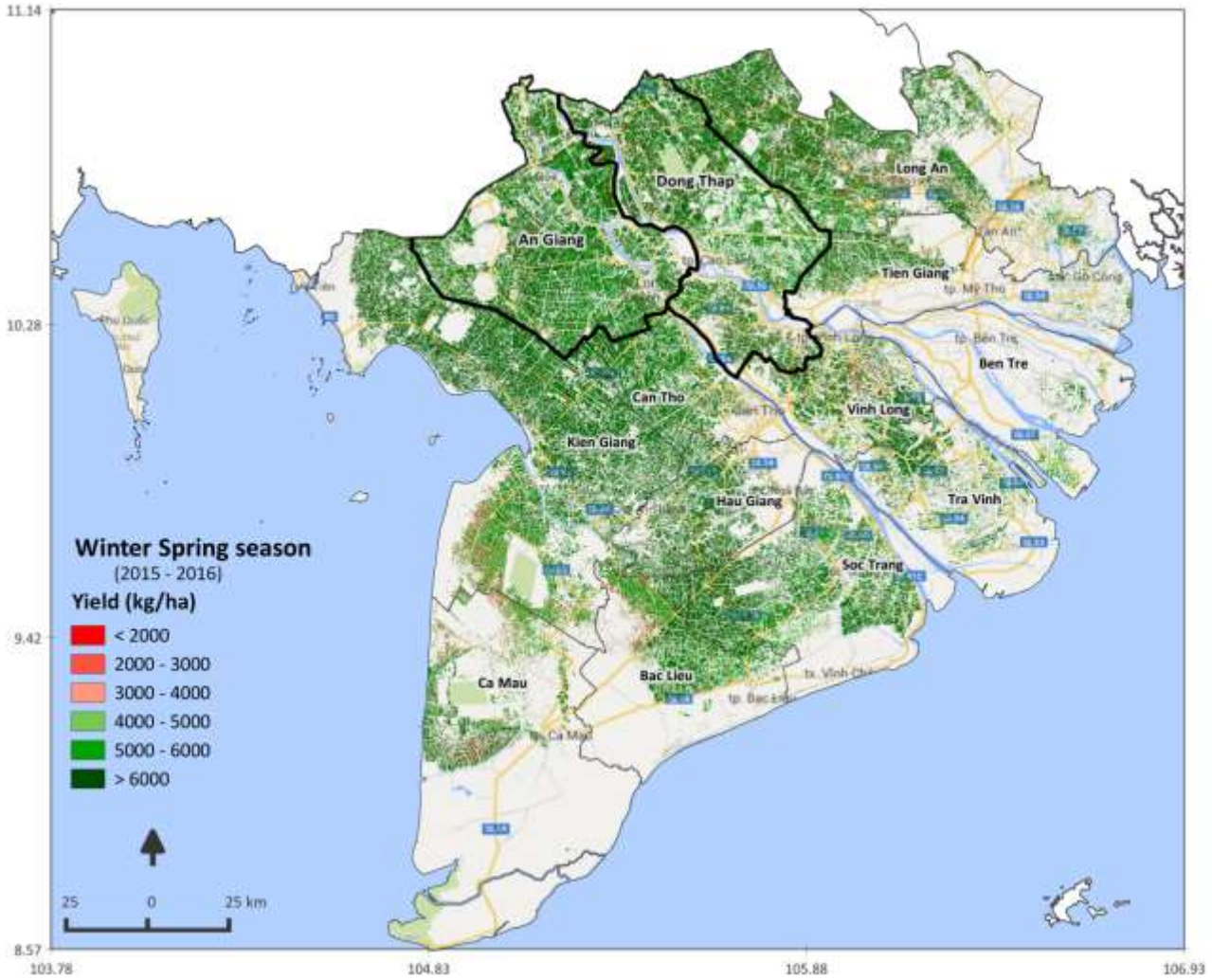
Red River Delta – Summer season 2015



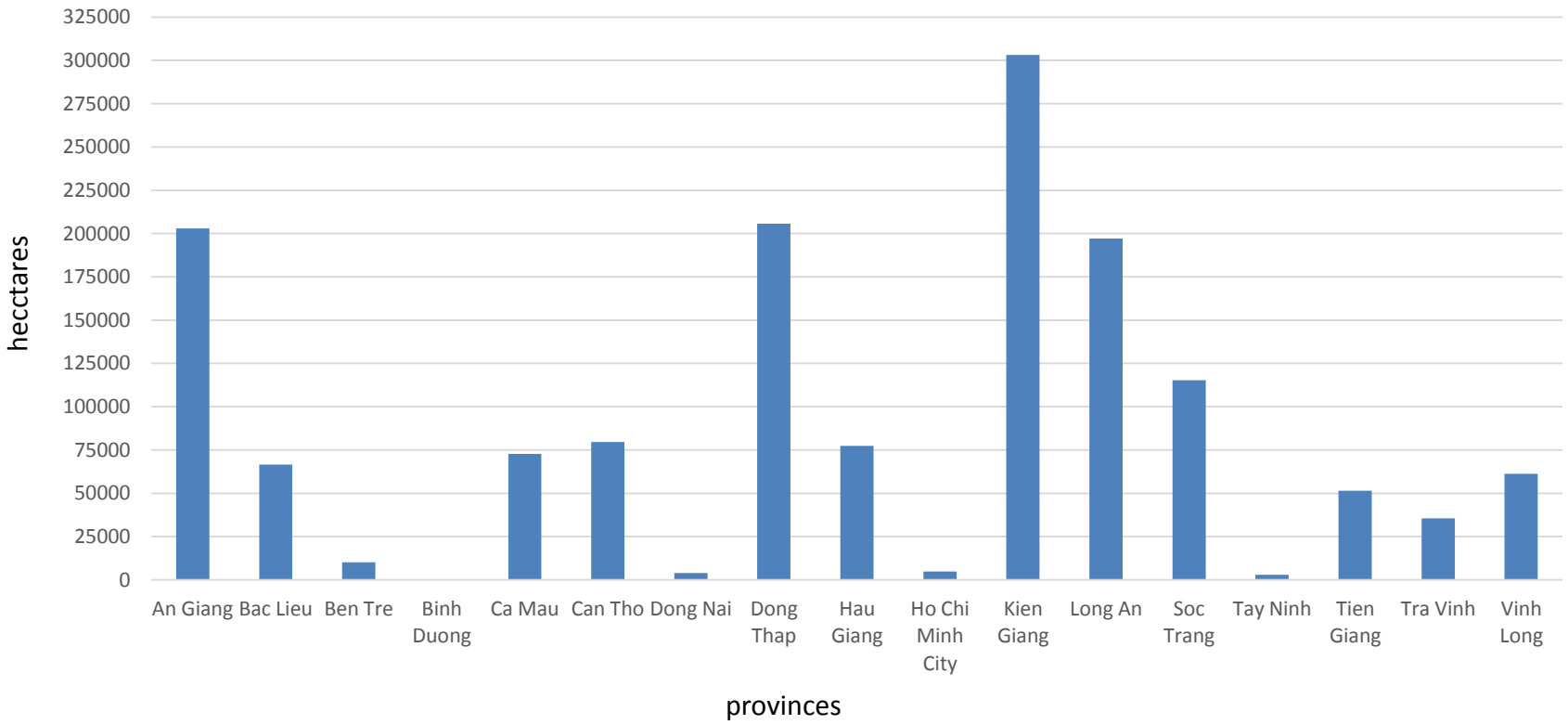
Mekong River Delta – Winter Spring season 2014-15



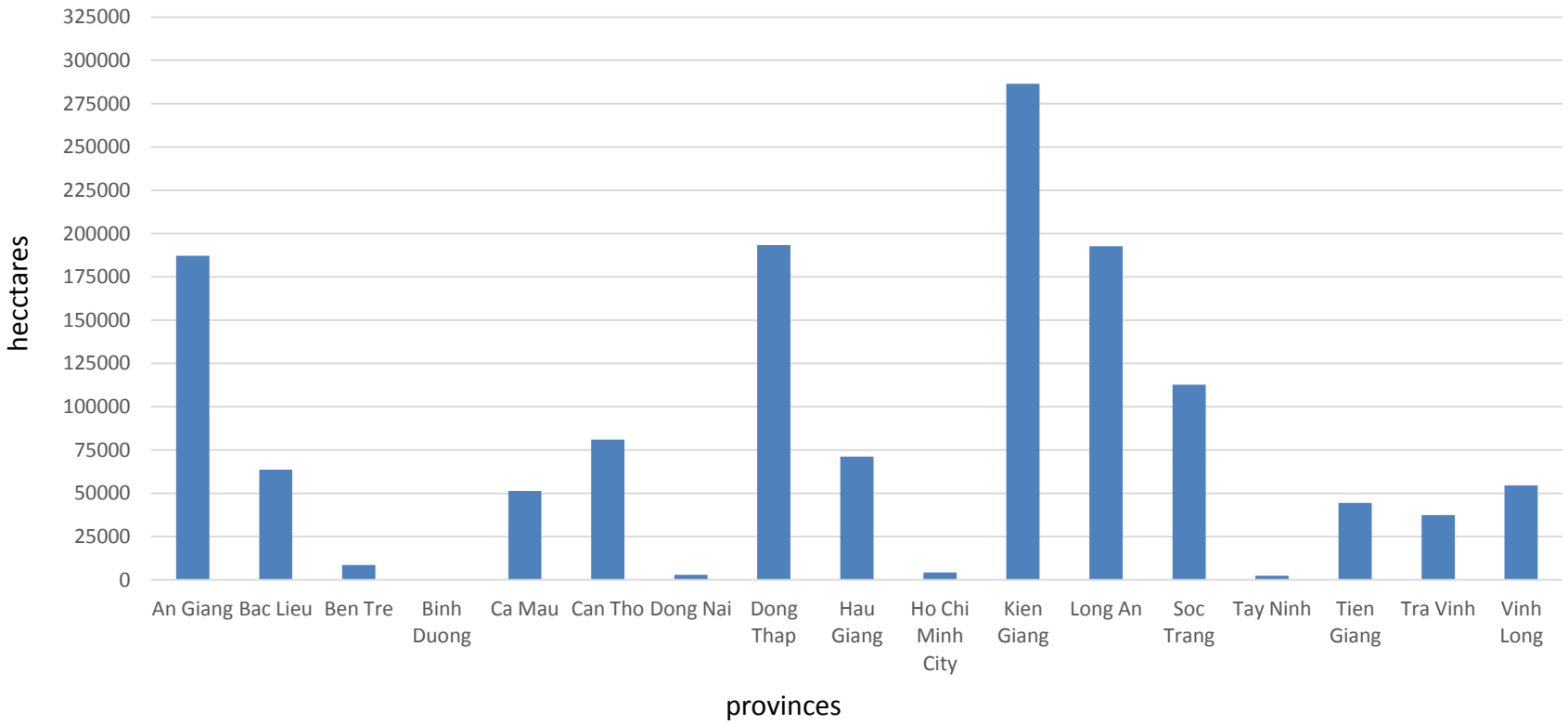
Mekong River Delta – Winter Spring season 2015-16



Mekong River Delta – Winter Spring season 2014-15



Mekong River Delta – Winter Spring season 2015-16

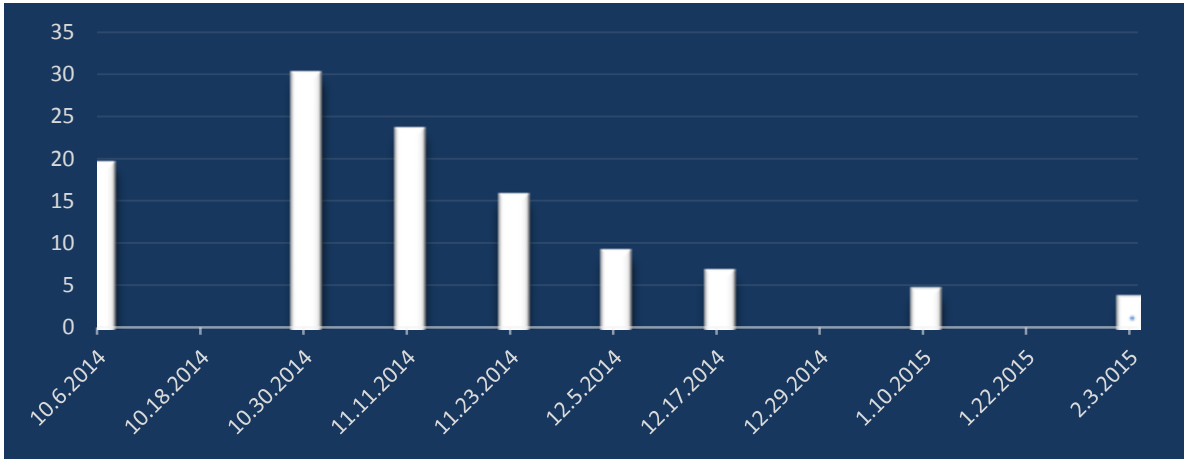


Difference of around 7%

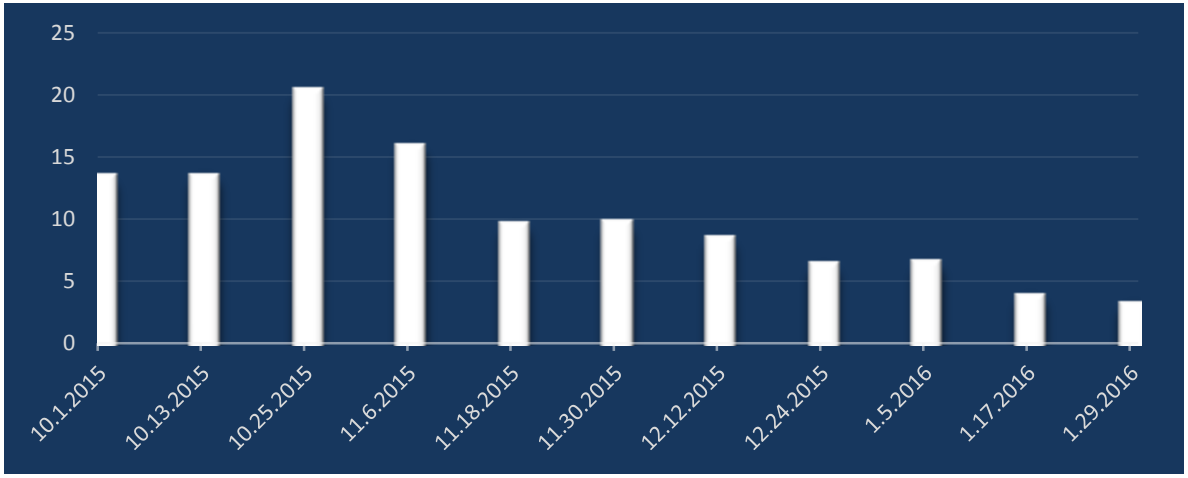
Mekong River Delta – Winter Spring season 2014-15 vs 2015-16

Start of Season – Percentage of rice planted for An Giang province

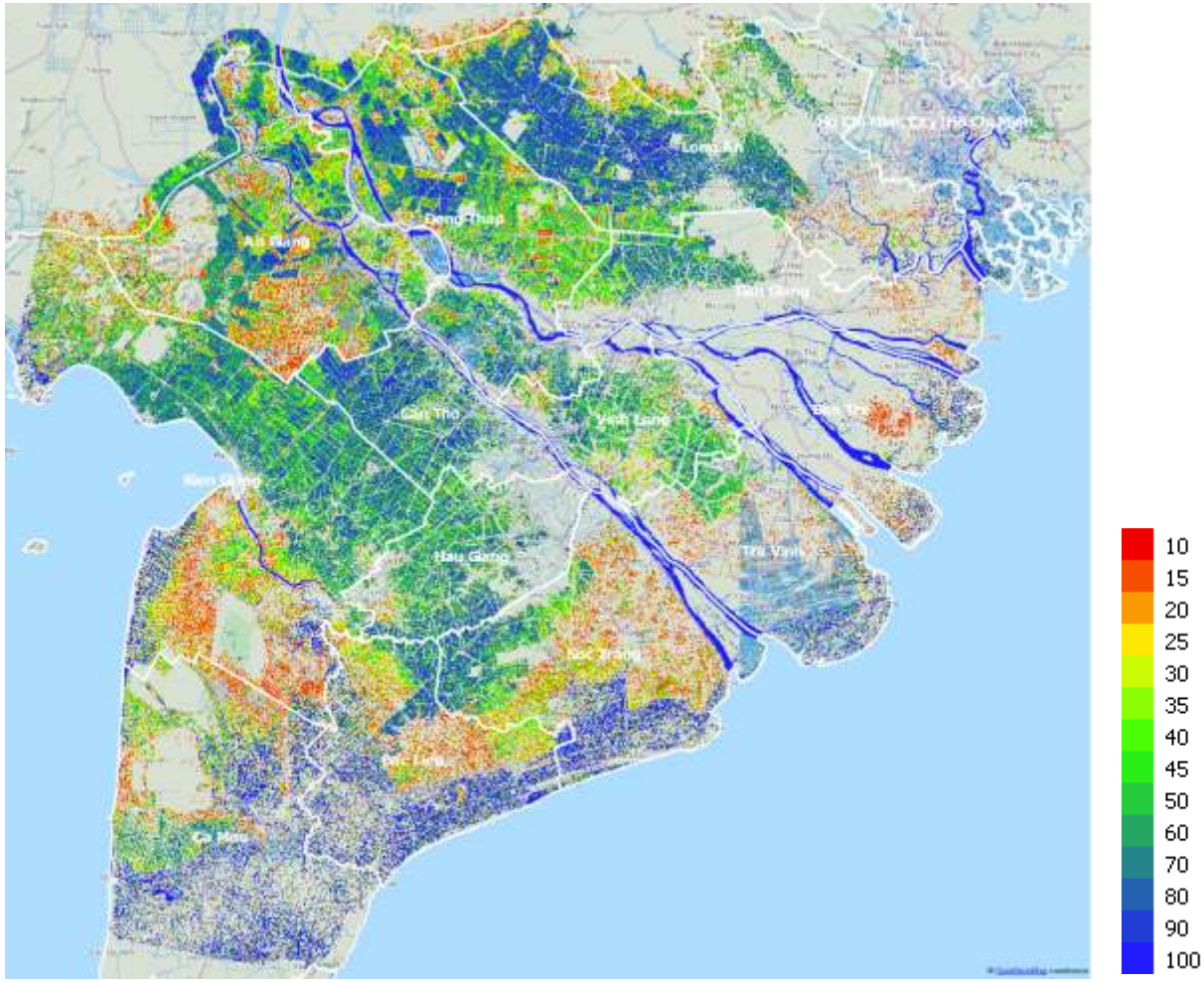
2014-15



2015-16

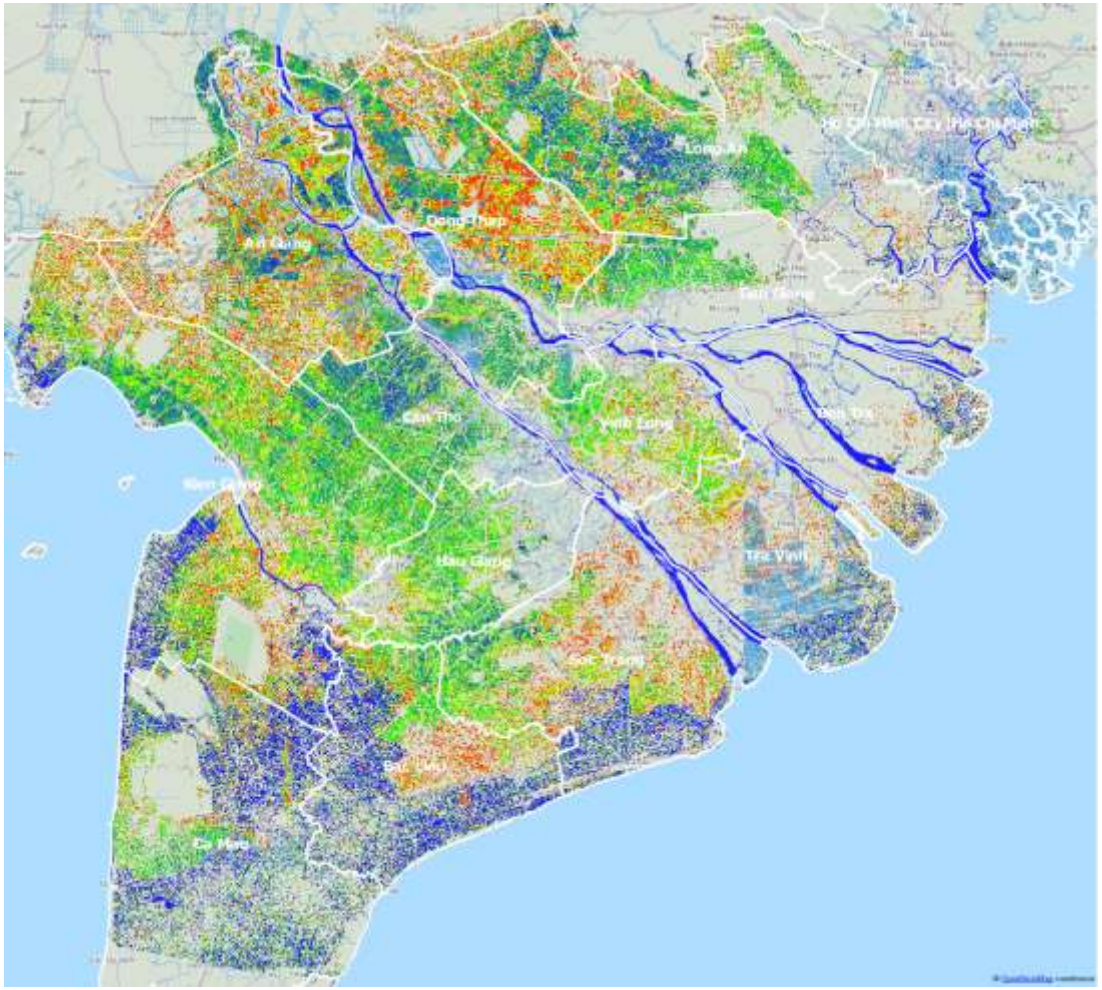


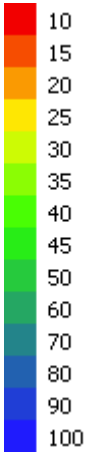
Mekong River Delta – Winter Spring season 2014-15



water detected on the ground (in percentage)

Mekong River Delta – Winter Spring season 2015-16



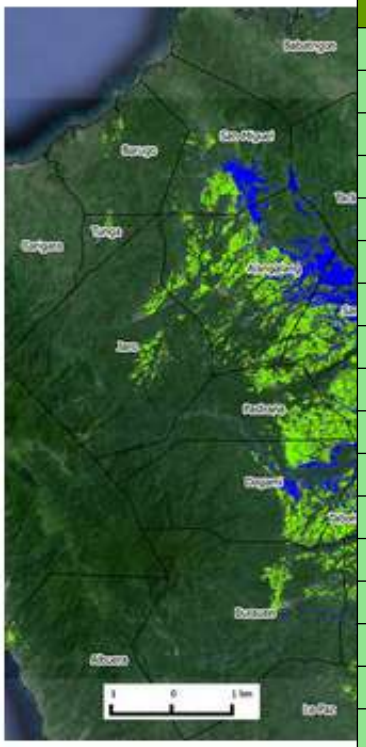


water detected on the ground (in percentage)

Satellite images map rice damage from typhoon

on 26 November 2013.

Satellite images *(click image on the right for more maps)* showing flooded rice farms and buildings that were damaged by Typhoon Haiyan (local name Yolanda) in the northeastern part of Leyte Province have been released as part of ongoing work to track rice production in the Philippines.



The satellite-generated maps, developed by the International Rice Research Institute in collaboration with sarmap and the Department of Agriculture-Philippine Rice Research Institute (DA-PhilRice), show that flooding has affected about 1,800 hectares of standing rice crop across 15 municipalities and that the typhoon badly damaged buildings where harvested rice may have been stored.

Municipality	Rice area	Flooded area
Alangalang	3,079	939
Albuera	58	2
Burauen	570	124
Dagami	1,757	681
Dulag	1,055	370
Jaro	400	14
Julita	1,017	140
La Paz	209	17
Mayorga	395	199
Ormoc City	0	1
Palo	2,104	402
Pastrana	1,427	71
San Miguel	711	611
Santa Fe	1,715	781
Tabontabon	861	227
Tanauan	1,628	1,545
Tolosa	286	376
Total	17,272	6,501

RIICE remote sensing-based flood assessment helps Government of Tamil Nadu, India in quickly directing flood relief measures

The State Government of Tamil Nadu, India initiated several policy level measures in alleviating the losses in the aftermath of the 2015 devastating floods based on a timely assessment report containing flood maps and statistics provided by the 'Remote Sensing-based Information and Insurance for Crops in Emerging Econo
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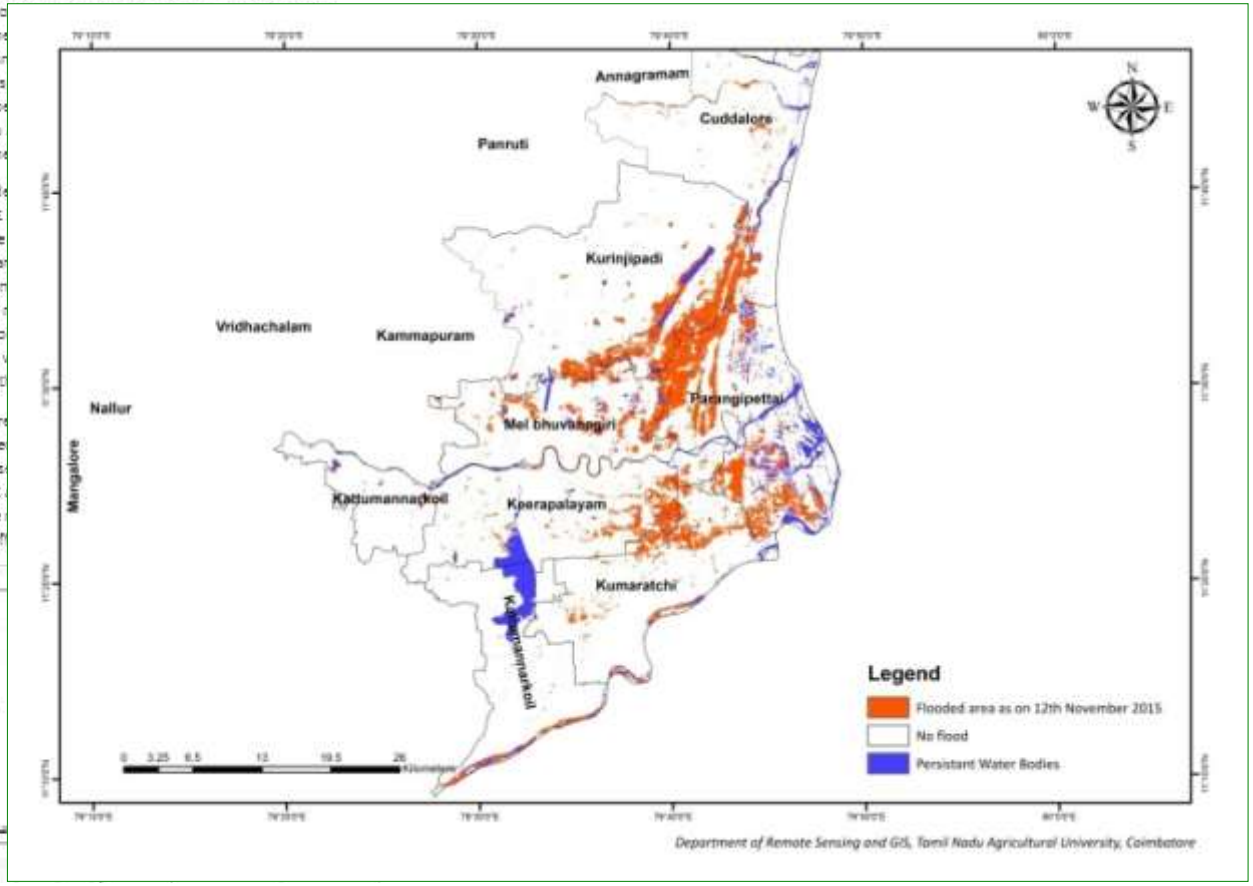
image

heavy rains and subsequent flooding in many districts of Ta
347 lives in addition to severe damage to agricultural land ar
RIICE's flood assessment report was delivered as part of the
Vice-Chancellor of the Tamil Nadu Agricultural University, Co
the flood map below) . The report was subsequently shared
the Chief Secretary to the Government of Tamil Nadu on 13

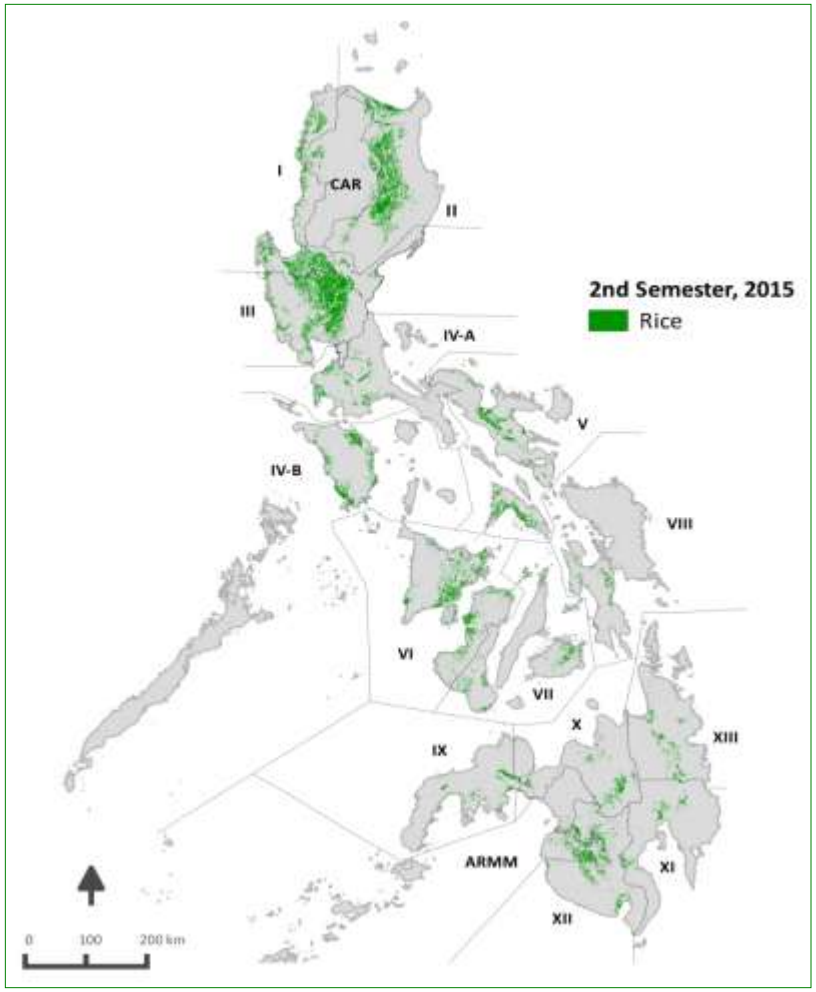
The report initially helped in identifying the flood affected ar
undertaken by the State Government. Dr. M. Bhaskaran, Spe
Department highly appreciated the quick delivery and the us
assessment report provided by TNAU and RIICE. Speaking at
administration he explained that the report was used as the
materials such as input, seeds and seedlings to 400 flood af

TNAU as a stakeholder in the RIICE project has been monitoring rice crop and estimating yield using satellite data in the Cauvery Delta Region in the state of Tamil Nadu. TNAU has been trained by RIICE parties to acquire and locally process high resolution Synthetic Aperture Radar (SAR) data from different space agencies to obtain the rice area maps and to further link the generated data to a specialized crop growth yield model to generate yield maps. During the current cropping season Sentinel 1A data was acquired from the European Space Agency (ESA) and used for crop monitoring.



Philippines Rice Information SysteM – PRISM

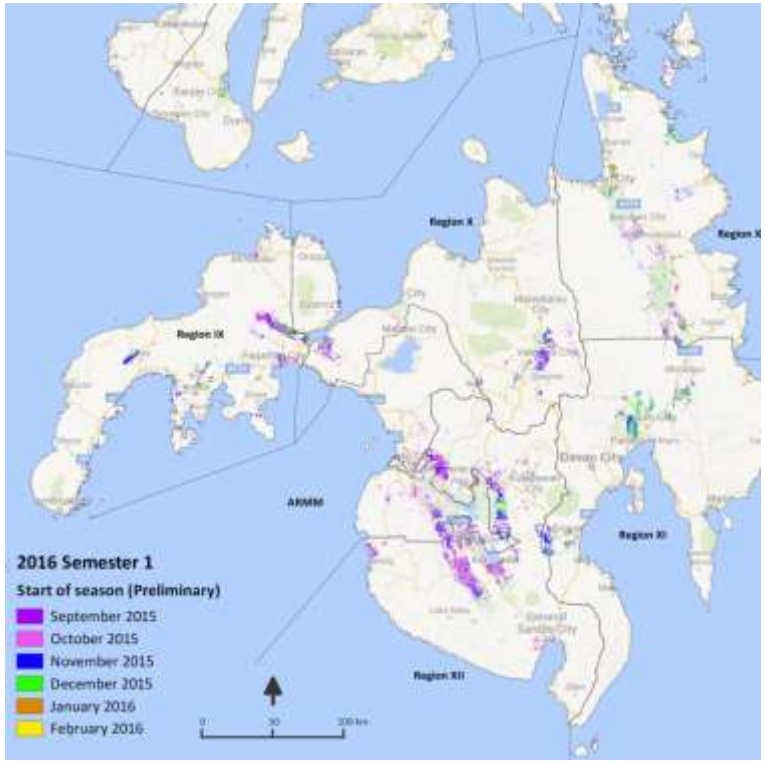
PRISM – Rice Area

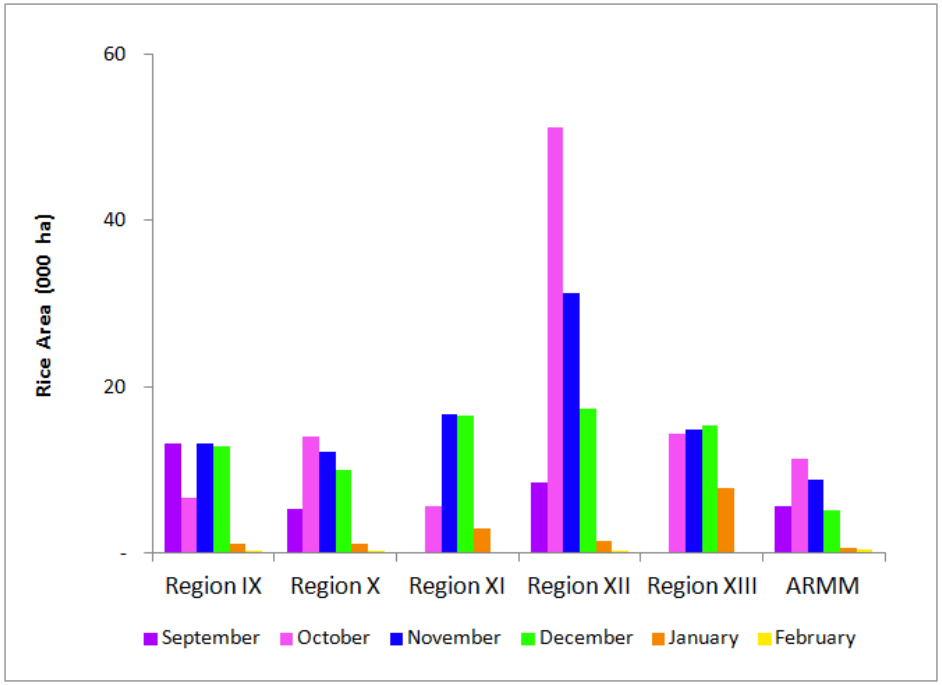


in 000 ha

Region	2015, 2nd sem	2016, 1st sem*
CAR	64,092	32,923
Region I	227,083	152,695
Region II	316,497	202,676
Region III	422,381	406,000
Region IVA	47,560	29,439
Region IVB**	108,797	117,388
Region V	122,367	124,304
Region VI	241,675	129,145
Region VII	51,150	24,605
Region VIII	46,840	39,474
Region IX	54,518	47,016
Region X	67,943	42,395
Region XI	44,874	41,723
Region XII	130,295	109,723
Region XIII	59,248	52,267
ARMM	57,275	31,712

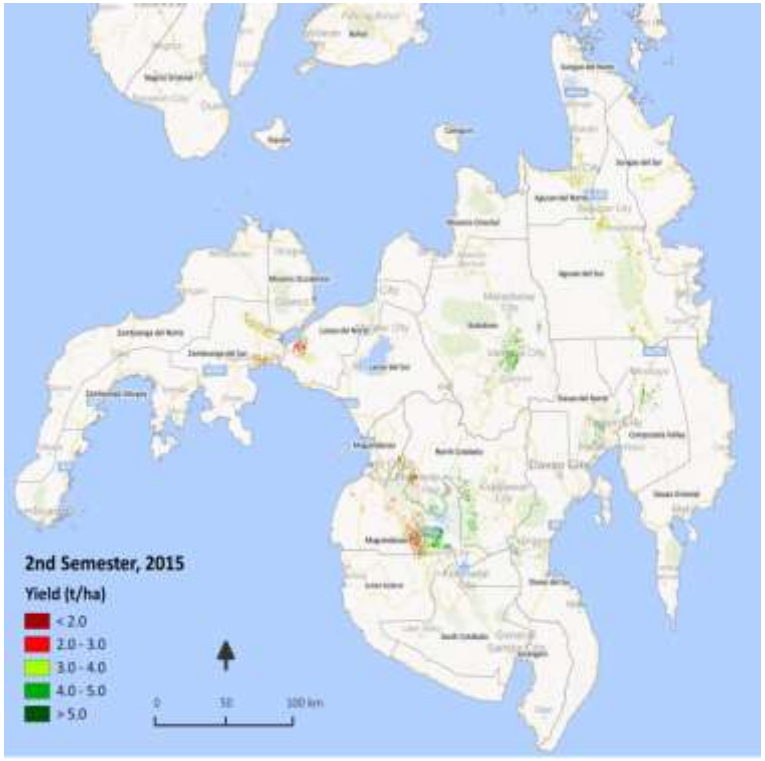
PRISM – When planted?





reveals heterogeneity in planting

PRISM – Yield



in tons/ha

Region	PRISM estimate	PSA-BAS estimate
Region IX	4.35	4.23
Region X	4.80	4.58
Region XI	4.52	4.56
Region XII	4.17	3.83
Region XIII	3.30	3.00
ARMM	2.67	2.80

Capacity building

- Capacity building events in each country every year.
- Capacity building on remote sensing, crop modeling and field activities.
- A total of 50 training courses have been carried out.
- The RIICE service (MAPscape-RICE, Oryza, and field protocol) has all improved thanks to feedback from national partners.

Field work

- Fieldwork is conditio sine qua non.
- It validates the products and provides essential information for improving and extending them.
- It alerts to any problems.
- Consistent field protocols are crucial.

Fieldwork is more expensive than remote sensing

RIICE developments 2011 - 2016

2011-12

Where is rice?

Testing the protocols

Some successes, but also several problems

2013

Revised protocols and reporting – better than 2012, but still room to improve

Google Drive to rapidly share field monitoring data

Better processing of SAR images, better validation of maps, better accuracy

Yield results are very promising in most sites

WebGIS set up to share the results with partners

Rapid response to typhoon Haiyan (Philippines)

Rapid response of floods in Thailand

RIICE developments 2011 - 2016

2014

Development of cloud computing for massive SAR processing

Testing of Smart Phones for field data collection

2015

Use of Sentinel-1A in all countries

Cloud computing for processing Sentinel-1A data is operational

2016

Rapid response of 2015/16 drought in Vietnam

Rapid response of 2016 drought in Cambodia

Sentinel-1A acquisition plan for S/SE Asia optimized with ESA

Launch of Sentinel-1B

Launch of Sentinel-2B in Q2

Conclusions

- Monitoring of agriculture and natural resources with remote sensing is a fast growing development, in particular now where Sentinel data – ensured until 2030 – are freely available.

- Digital information enables a better management and planning of agriculture and natural resources, complement and support field data collection, and reduce costs.

Conclusions

- The availability of **systematic multi-sensor acquisitions is essential** for an operational service in particular for agricultural applications (complementarity and redundancy).

- **Understanding of crop practices** and **fieldwork validation** are both conditio sine qua non (learning and credibility).

- It is essential that **national partners have an active role**, in particular wrt:
  - products acceptance;
  - drivers of education in the country;
  - local expertise;
  - access to field sample data for calibration/validation.

Thank you for your attention