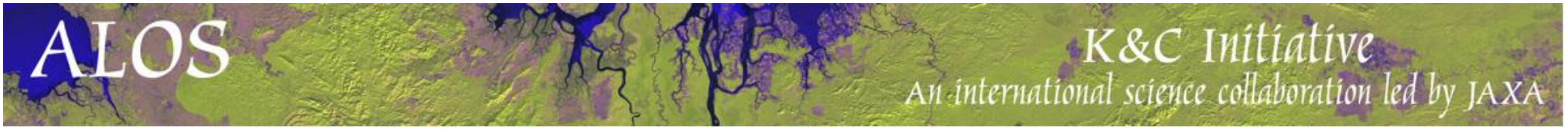


K&C Phase 4 – Status report

Asia-RiCE

Toshio Okumura (RESTEC)
Shin-ich Sobue, Kei Ohyoshi (JAXA)
Thuy Le-Toan (CESBIO)
Rizatus Shofiyati (ICARLD)
Lam Dao Nguyen (VNSC)
and Asia-RiCE team members

Science Team meeting #24
Tokyo, Japan, January 29-31, 2018

ALOS

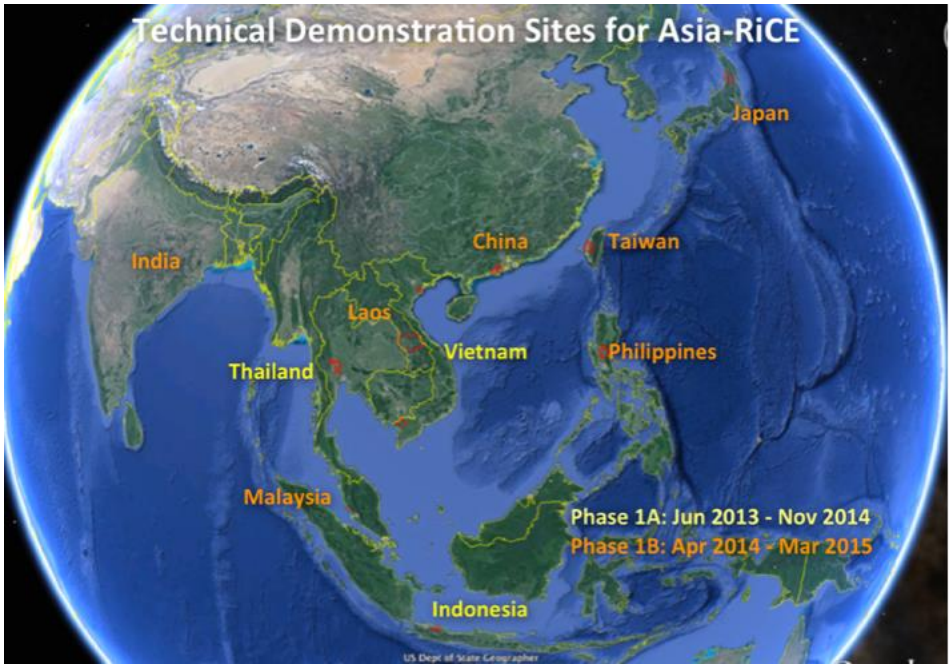
K&C Initiative
An international science collaboration led by JAXA

Asia-RiCE for GEOGLAM (Global Agriculture Monitoring)

- **GEOGLAM** was endorsed by the G20 Summit, aims to enhance regional and global agricultural production (wheat, maize, soybean, and **rice**) estimates through the use of Earth observations

[Meeting of G20 Agriculture Ministers, G20 France 2011 Summit final declaration, 2011]

- Asian agencies are implementing ***Asia-RiCE (Asia Rice Crop Estimation & Monitoring)*** to strengthen ***rice crop*** monitoring ability ***by using remote sensing***, which is a component for GEOGLAM.



Asia-RiCE Crop Estimation and Monitoring

GEOGLAM Global Agricultural Monitoring

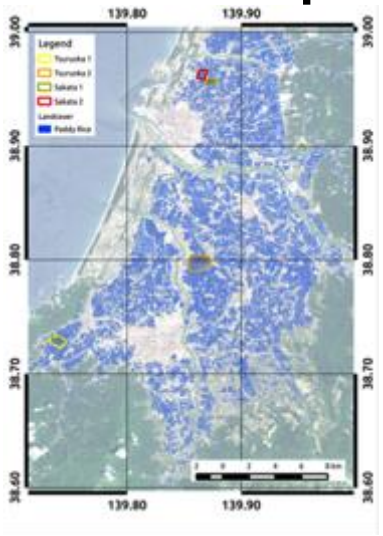
G20 FRANCE 2011 NOUVEAU MONDE NOUVELLES IDÉES

Asia-RiCE Website: http://www.asia-rice.org

Asia-RiCE Target Products

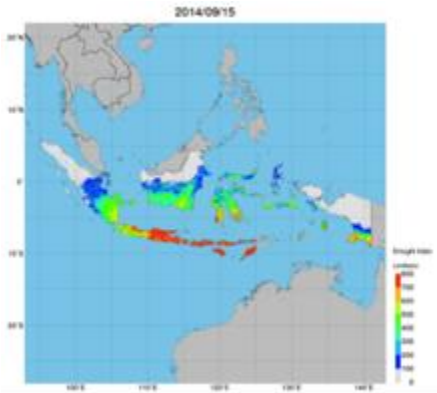
ID	Product
P1	**Rice Planting Area Estimates and Mapping**
P2	**Crop Calendars/Crop Growth Status**
P3	**Crop Damage Assessment**
P4	**Agro-meteorological Information Products**
P5	**Production Estimation and Forecasting**

Example of Products

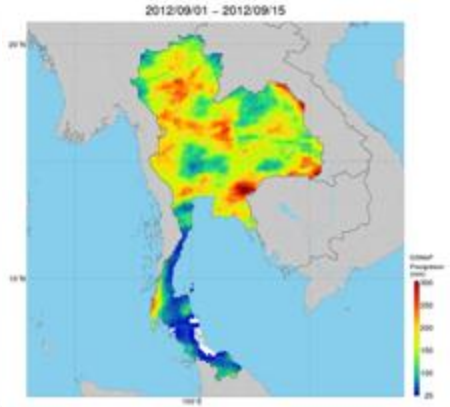


P1: Planted Area

P2: Crop Calendar



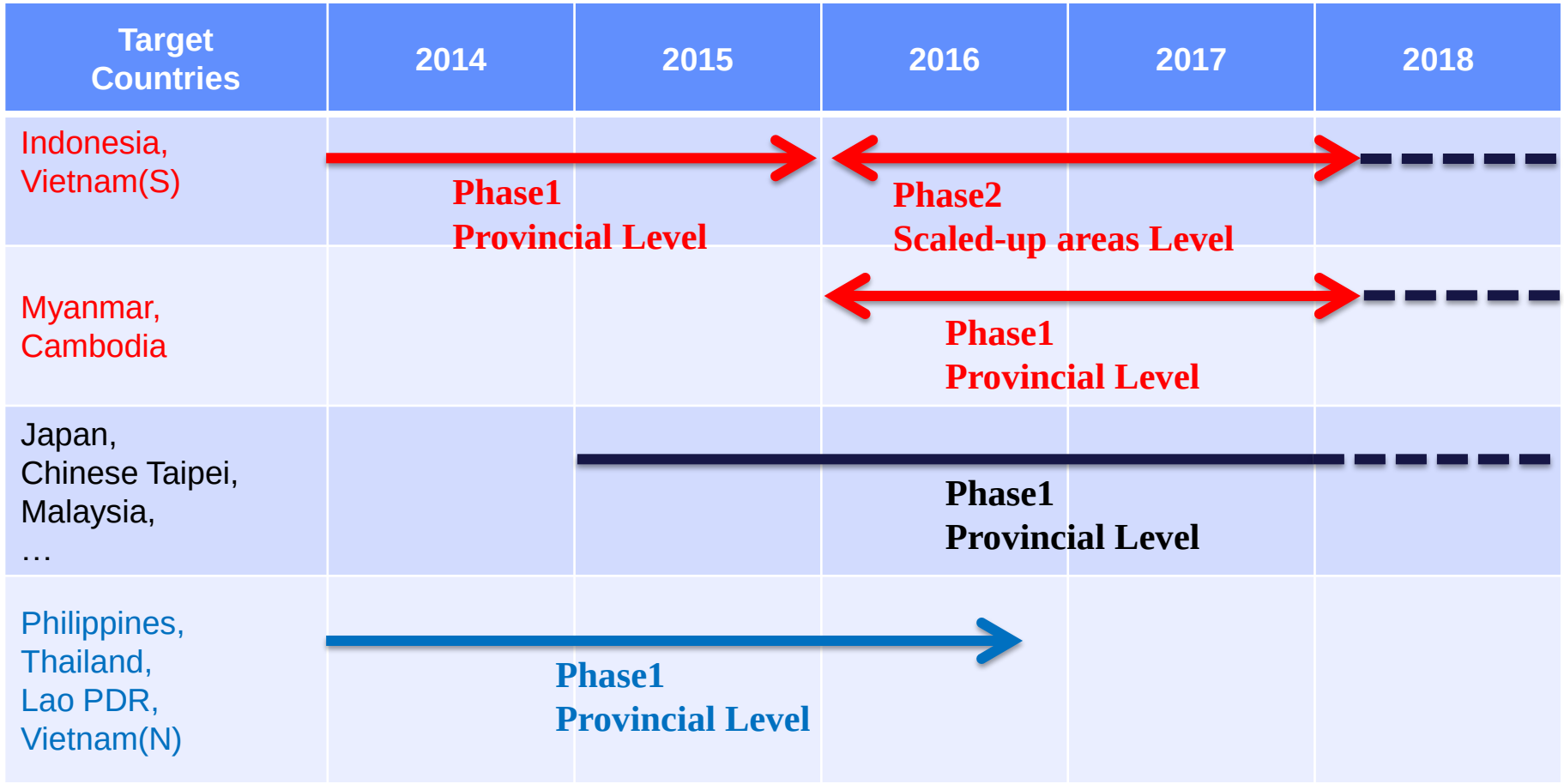
P3: Drought Warning



P4: Precipitation

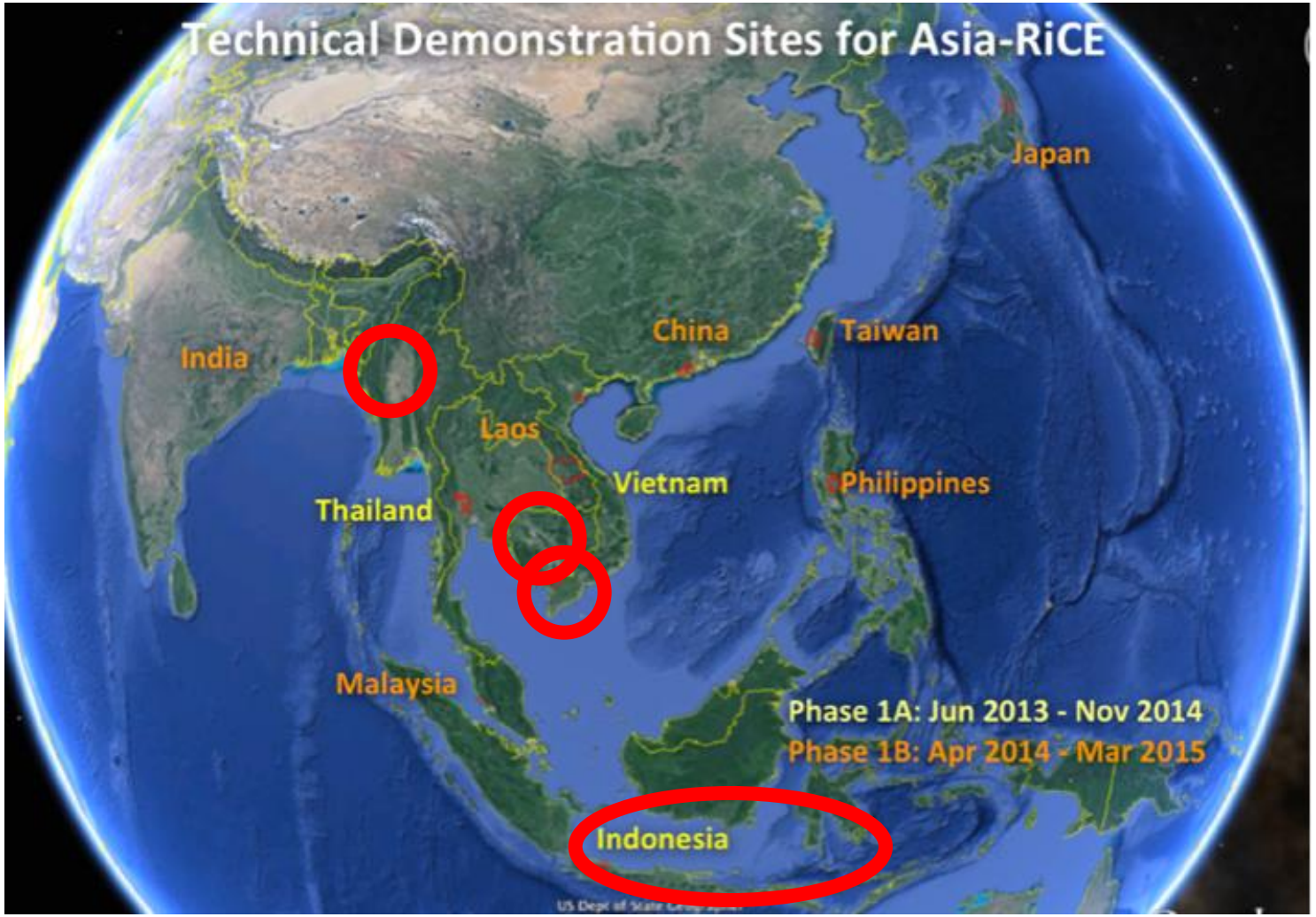
Asia-RiCE Work Plan http://www.asia-rice.org/files/workplan.pdf

Asia-RiCE Progress schedule



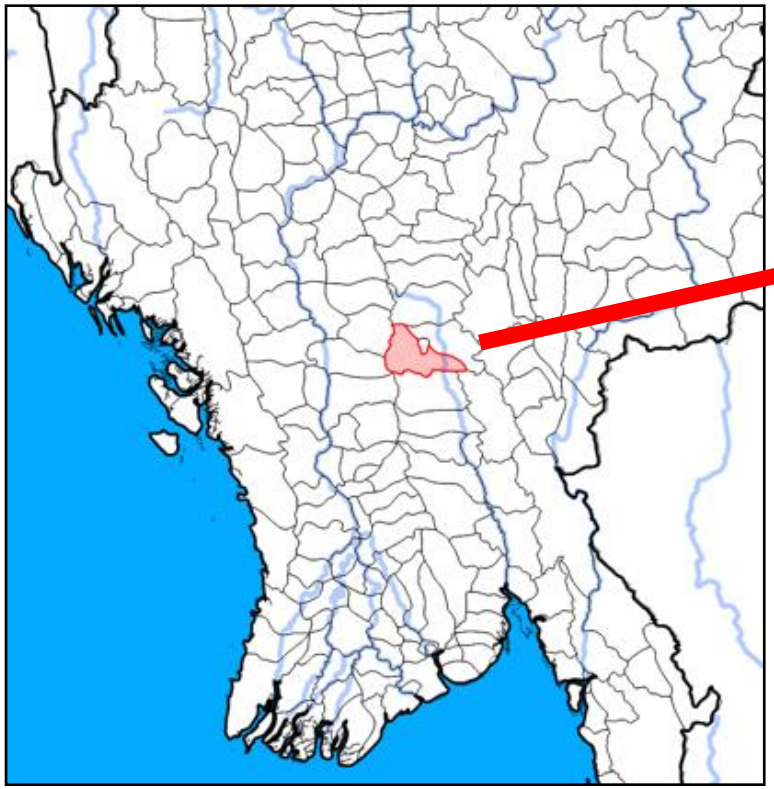
- SAFE (Space Applications for Environment) Project under APRSAF (Asia-Pacific Regional Space Agency Forum)
- ADB (Asian Development Bank) Project *related activity
- Individual activity by each country

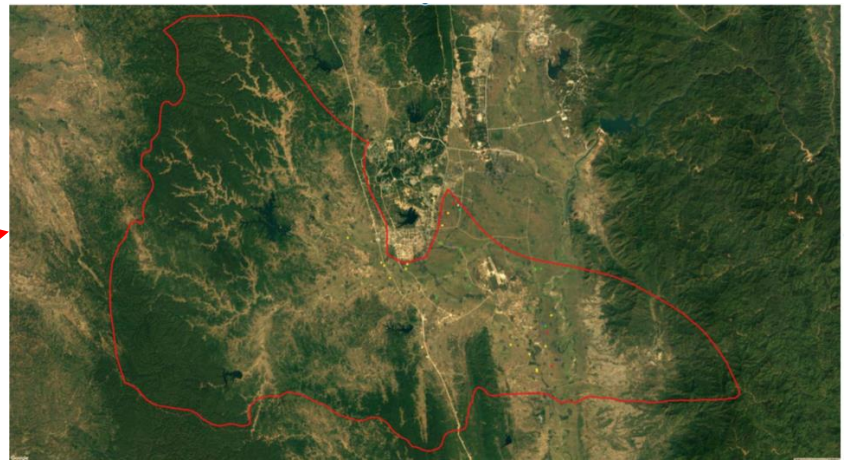
Asia-RiCE activities status in 2017



Status in Myanmar

Study Area





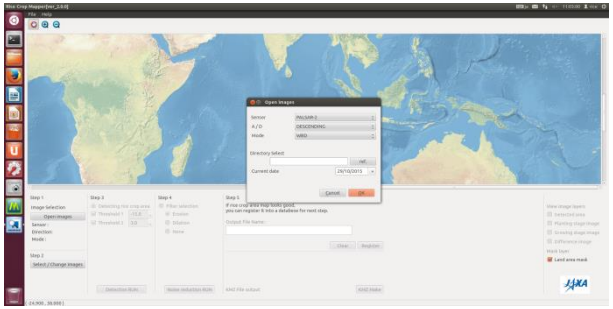
Lewe township

part of Nay Pyi Taw

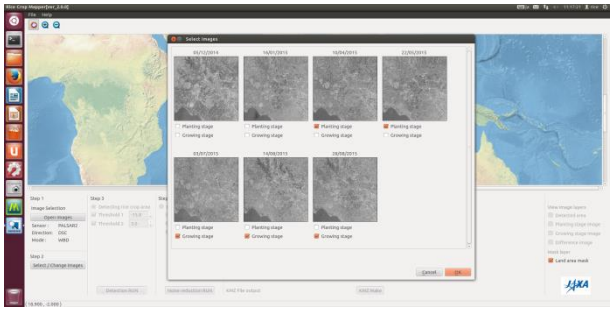
at the middle of Myanmar

INAHOR which is software for estimating rice planted area / production was used. The software was designed for a local officer so that they can get easily the information from PLSAR-2 data. The result can be obtained in only 5 steps.

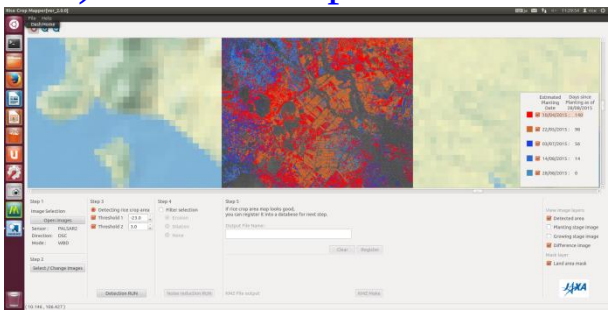
1) Select satellite data



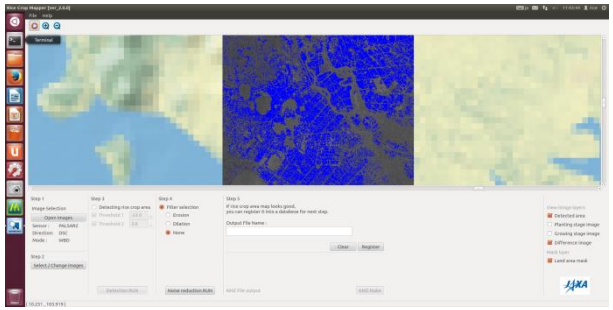
2) Select image data



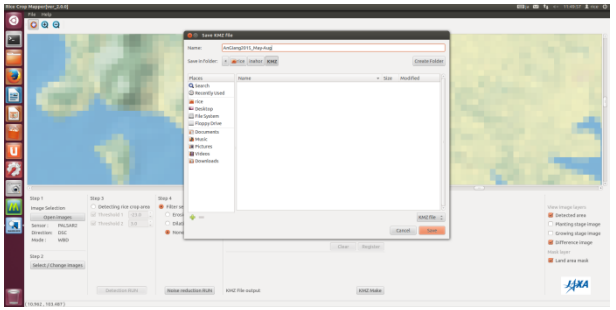
3) Detect rice planted area



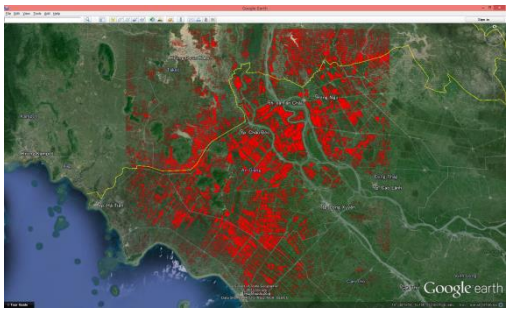
4) Binarization



5) Save the result



Export to KMZ



ALOS

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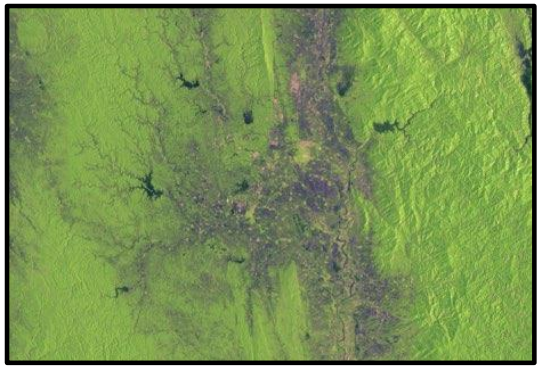
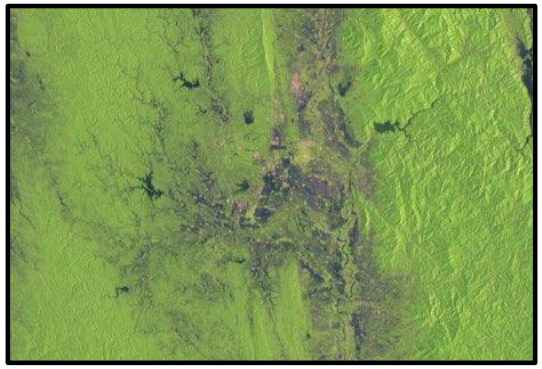
ALOS-2 Data Used for Mapping 2016 Monsoon Rice

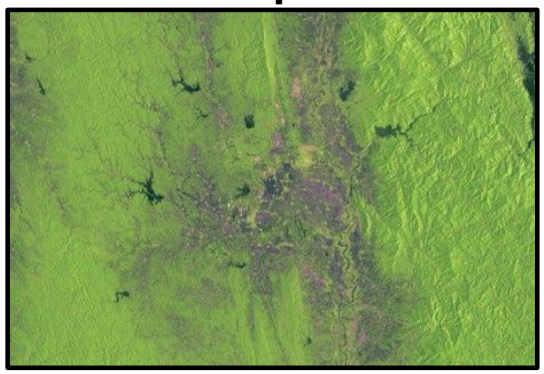
3rd Jul 2016



31th Jul 2016

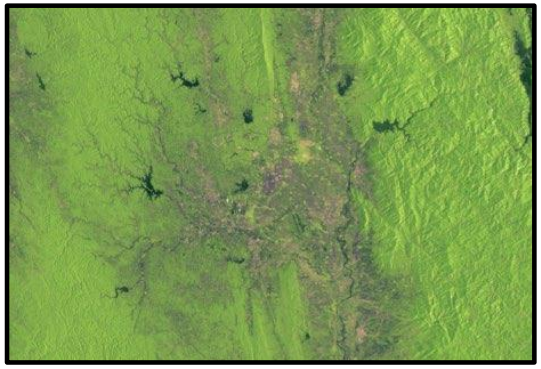


11th Sep 2016

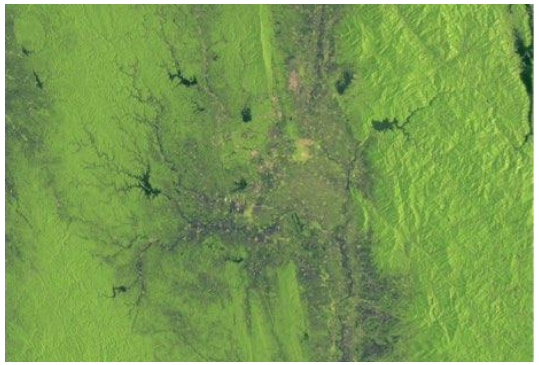


Planting Season Candidates

23rd Oct 2016



4th Dec 2016



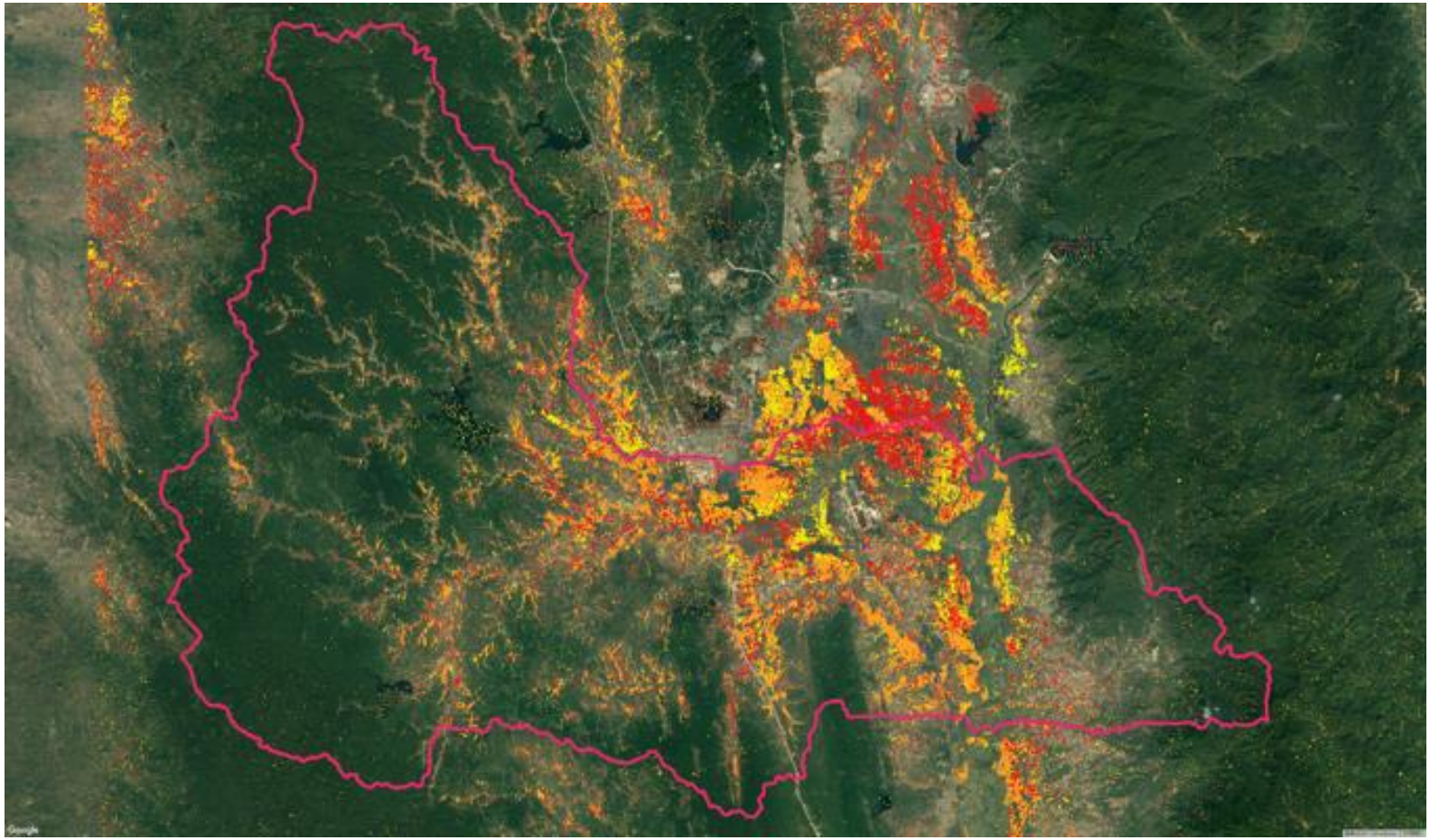
Growing Season Candidates

ALO-2 provides almost monthly SAR images

ALOS

K&C Initiative
An international science collaboration led by JAXA

Result of Rice-Plated Area Map on Google Earth

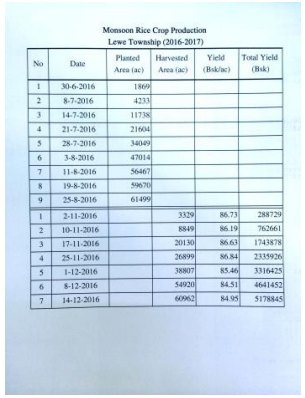


Estimated Planting Date

■ : 03/07/2016 ■ : 31/07/2016 ■ : 11/09/2016

Evaluation of the Result: Statistics

- INAHOR with ALOS-2 derived statistics was highly agree with the DALMS's official statistics.
- But, compensation of overestimation and underestimation areas was found.



Monsoon Rice Crop Production
Lewe Township (2016-2017)

No	Date	Planted Area (ac)	Harvested Area (ac)	Yield (Bsk/ac)	Total Yield (Bsk)
1	30-6-2016	1869			
2	8-7-2016	4233			
3	14-7-2016	11738			
4	21-7-2016	21604			
5	28-7-2016	34049			
6	3-8-2016	47014			
7	11-8-2016	56467			
8	19-8-2016	59670			
9	25-8-2016	61499			
1	2-11-2016		3329	86.73	288729
2	10-11-2016		8849	86.19	762661
3	17-11-2016		20130	86.63	1743878
4	25-11-2016		26899	86.84	2335926
5	1-12-2016		38807	85.46	3316425
6	8-12-2016		54920	84.51	4641452
7	14-12-2016		60962	84.95	5178845

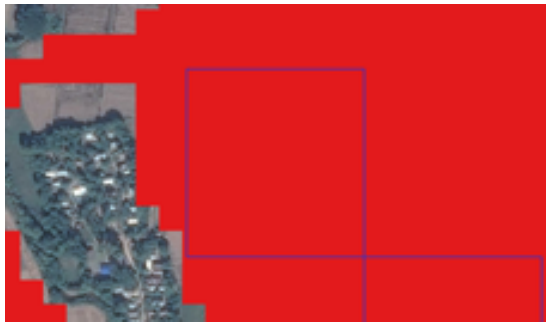
Monsoon rice of Lewe Township in 2016

	Rice-Planted Area (ha)	Rice-Planted Area (acre)
Official Statistics	-	**61,499**
INAHOR Results	25,227	**62,338**

Difference (INAHOR-Official) : 839 acre
Error Ratio (INAHOR/Official) : 101.4 %

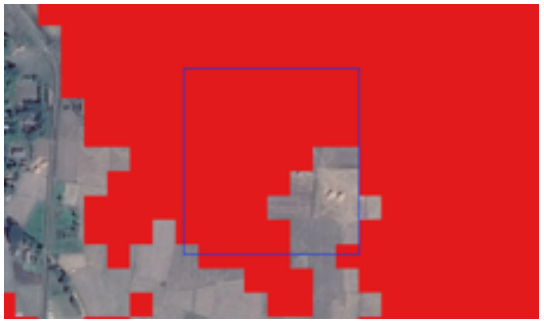
Evaluation of the Result: Field Survey Points

14 Points (200x200m)



(ID:53187)

(ID:96657)

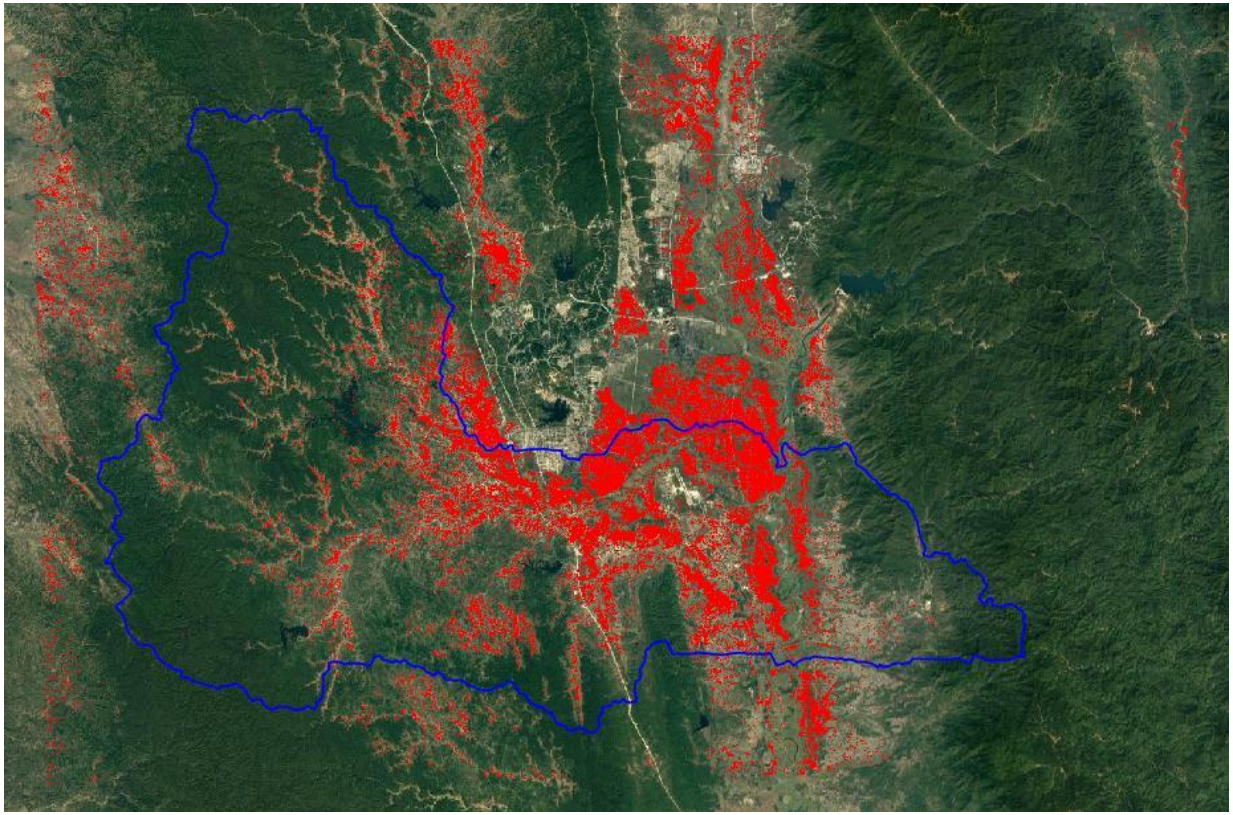


■:rice-planted area

Comparing with field survey data was also agree with the result.

Lewe township (2017)

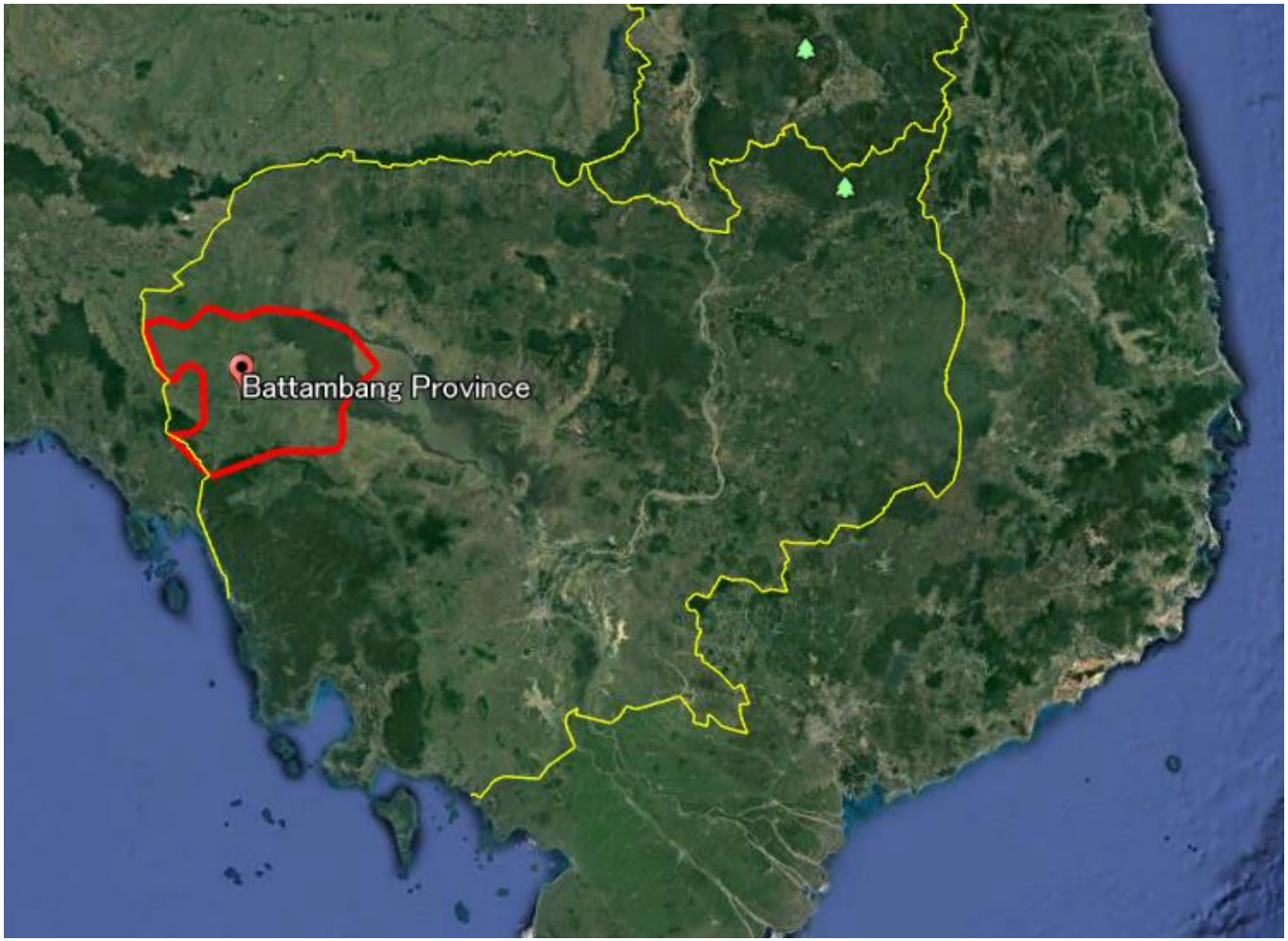
Rice planted area by INAHOR



[Total]
INAHOR: 24946.15 ha
Statistics: 24903.24 ha
INAHOR / Statistics: 1.002

Status in Cambodia

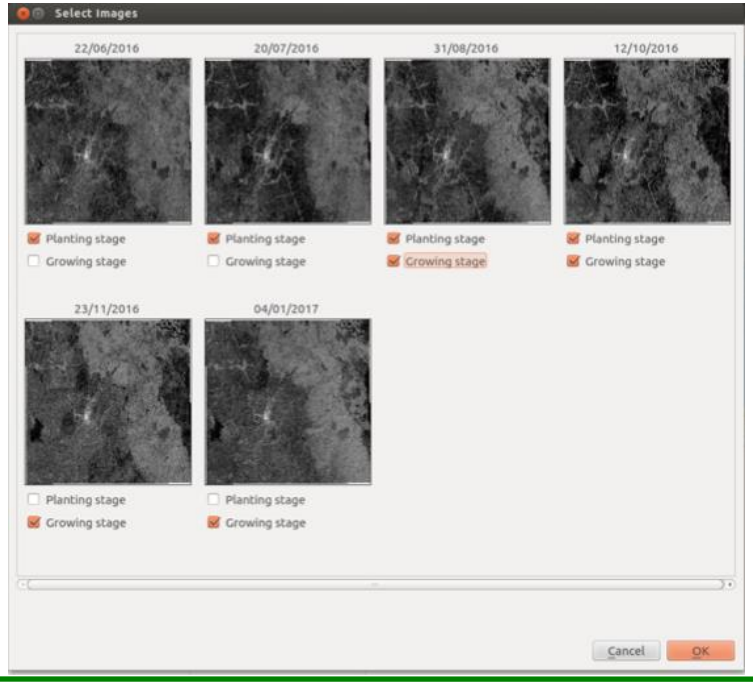
Study Area

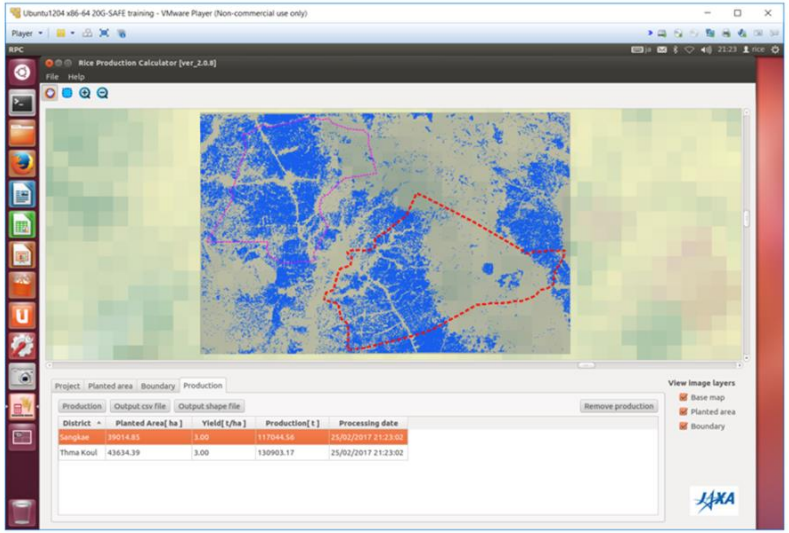


JAXA developed a software named INAHOR which can estimate rice planted area and production using satellite data, In order to standardize a methodology for monitoring rice using satellite data in Asian countries.

The main functions :

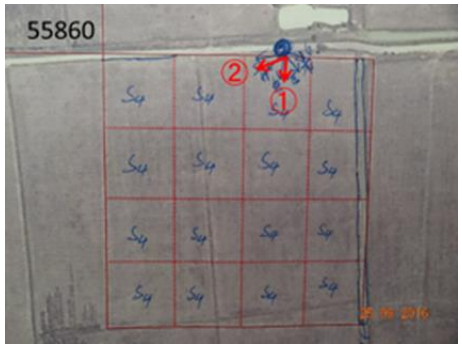
- Providing a rice planted area using **time-series ALOS-2 data**
- Providing a rice planted area and production (need yield information)

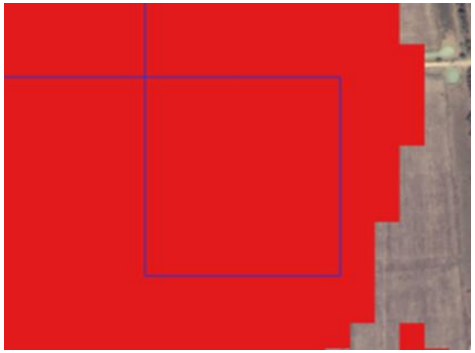




Validation Results of Rice Planted Area Estimated by INAHOR using ALOS-2 Data

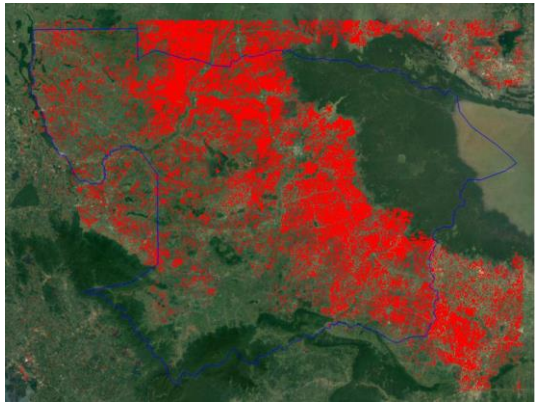
- Comparing with field survey data (200 x 200m: 12 points).
  - **good**.





- Comparing with official statistics in provincial level.
  - The error was 4.4 %

Next step : cross validation



Validation team in DPS

Validation
of reported value from local office using INAHOR result and functions

Re-report directive to local office

Re-survey by local office
(look-around, re-interview)

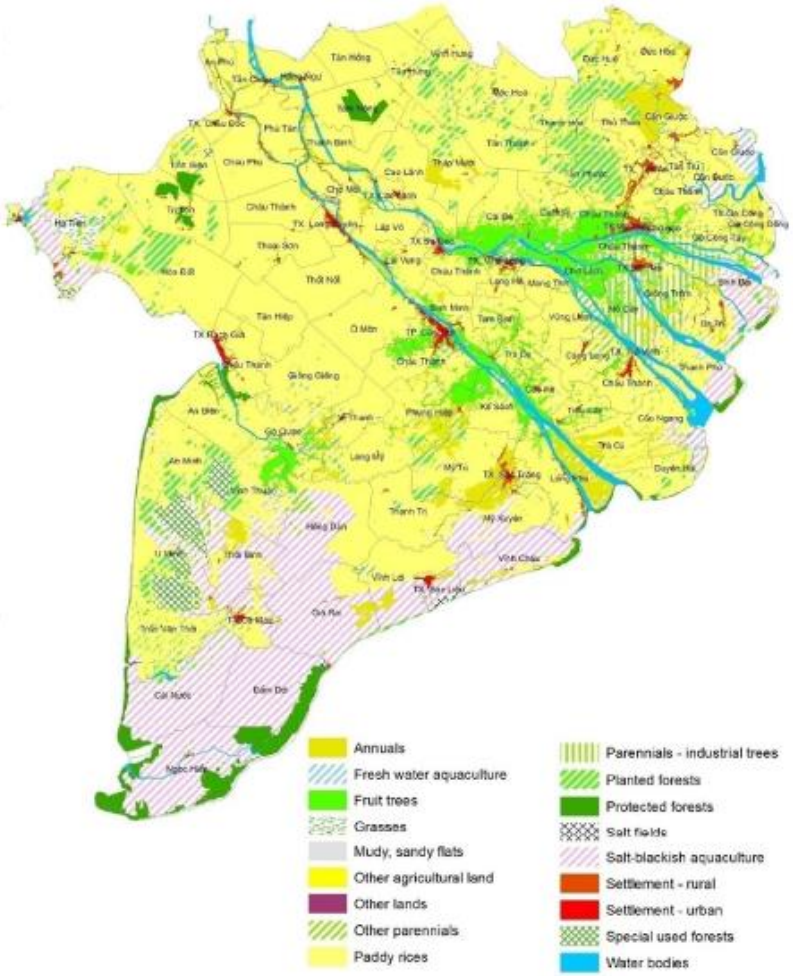
Correction of reported value

INAHOR Operation using ALOS2 Data

Status in Vietnam

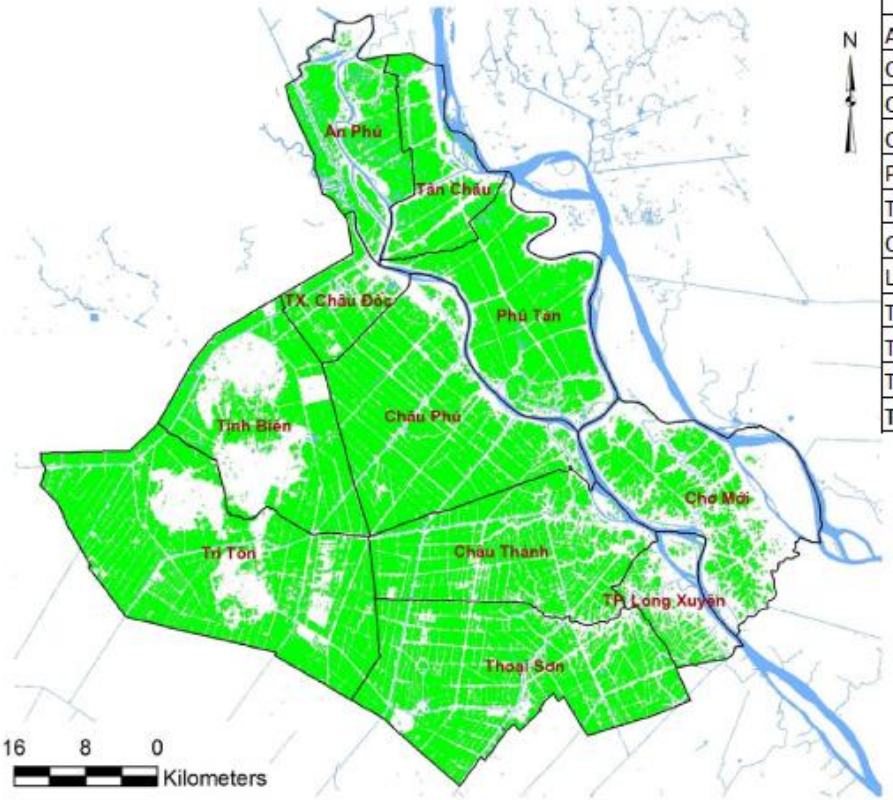
VNSC

Study Area



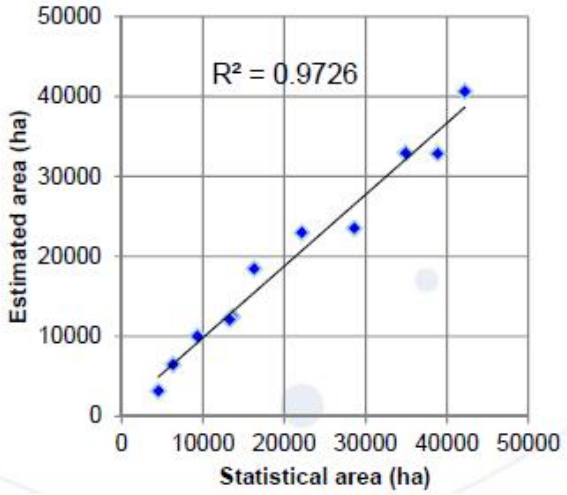
Mekong Delta, Vietnam

Data set: ALOS-2 at provincial scale



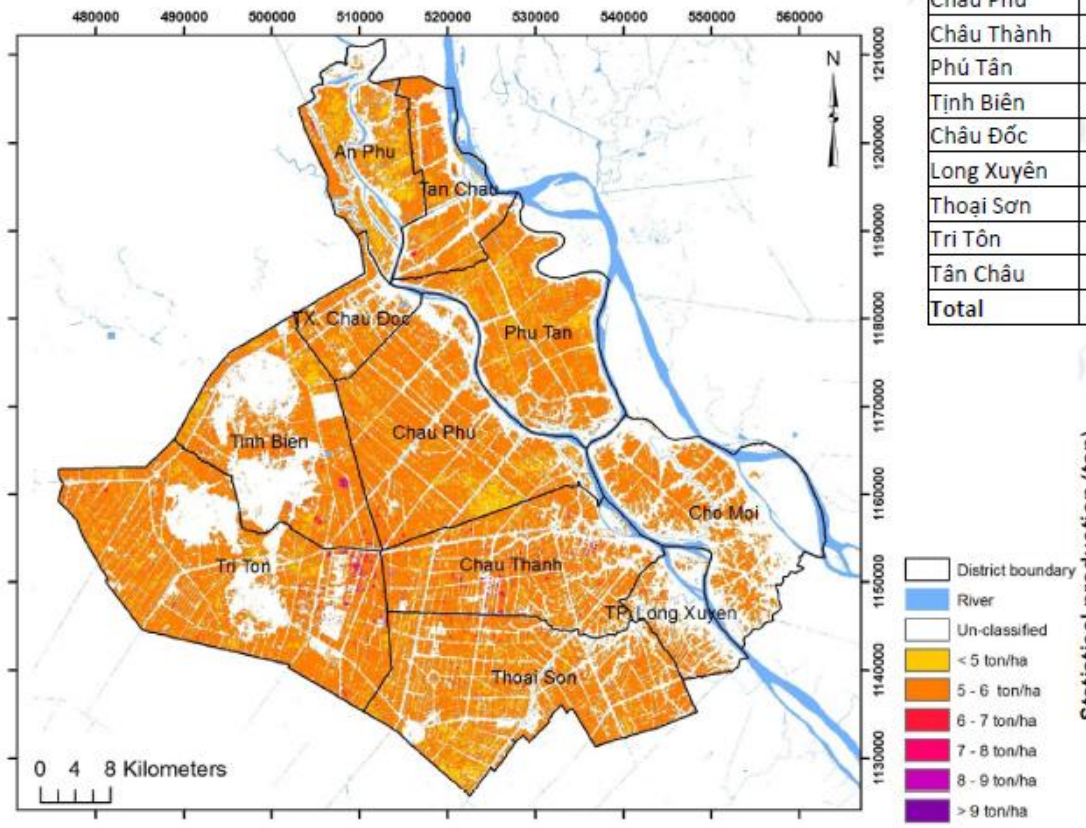
SA 2016 crop (using 5-date ALOS-2 HH image, 08 Apr, 20 May, 01Jul, 29Jul, 09 Sep)

District	Agency data (ha)	Estimated area (ha)	Percentage error (%)
An Phu	13640	12431	-8.9
Cho Moi	13304	12080	-9.2
Chau Phu	34940	32921	-5.8
Chau Thanh	28630	23507	-17.9
Phu Tan	22151	22962	3.7
Tinh Bien	16288	18441	13.2
Chau Doc	6315	6445	2.1
Long Xuyen	4518	3153	-30.2
Thoai Son	38882	32846	-15.5
Tri Ton	42210	40625	-3.8
Tan Chau	9321	10007	7.4
Total	**230199**	**215418**	**-6.4**

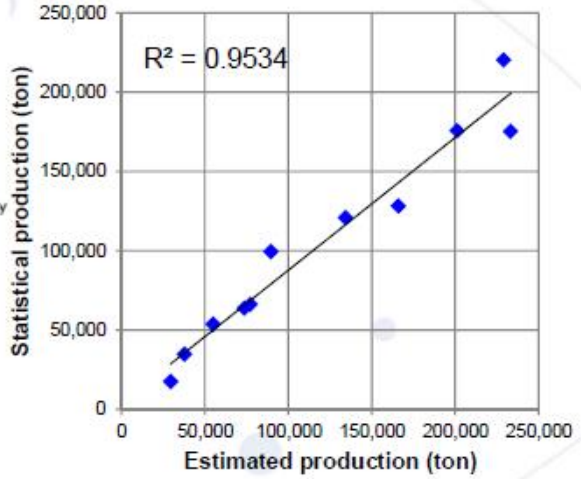


Data set: ALOS-2 at provincial scale

A distribution map of estimated rice yield of An Giang in SA 2016 crop using ALOS-2 data

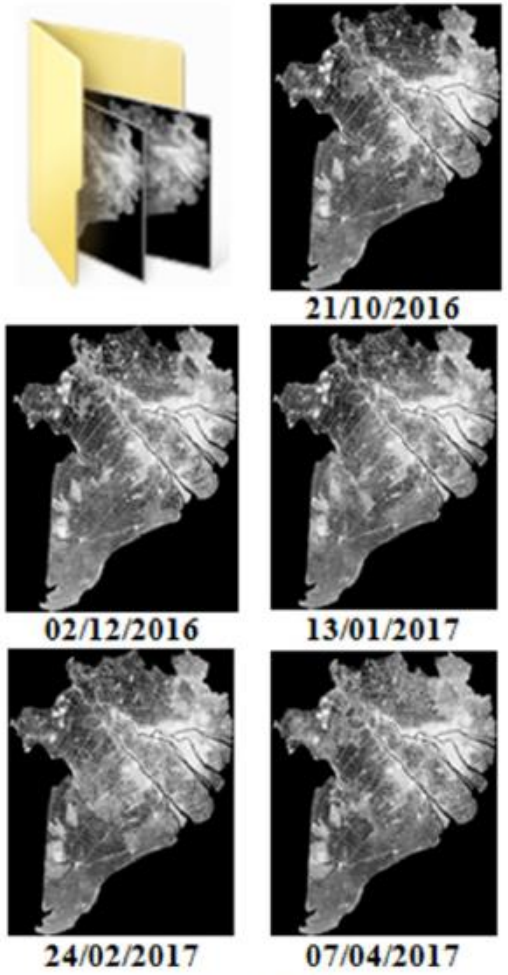


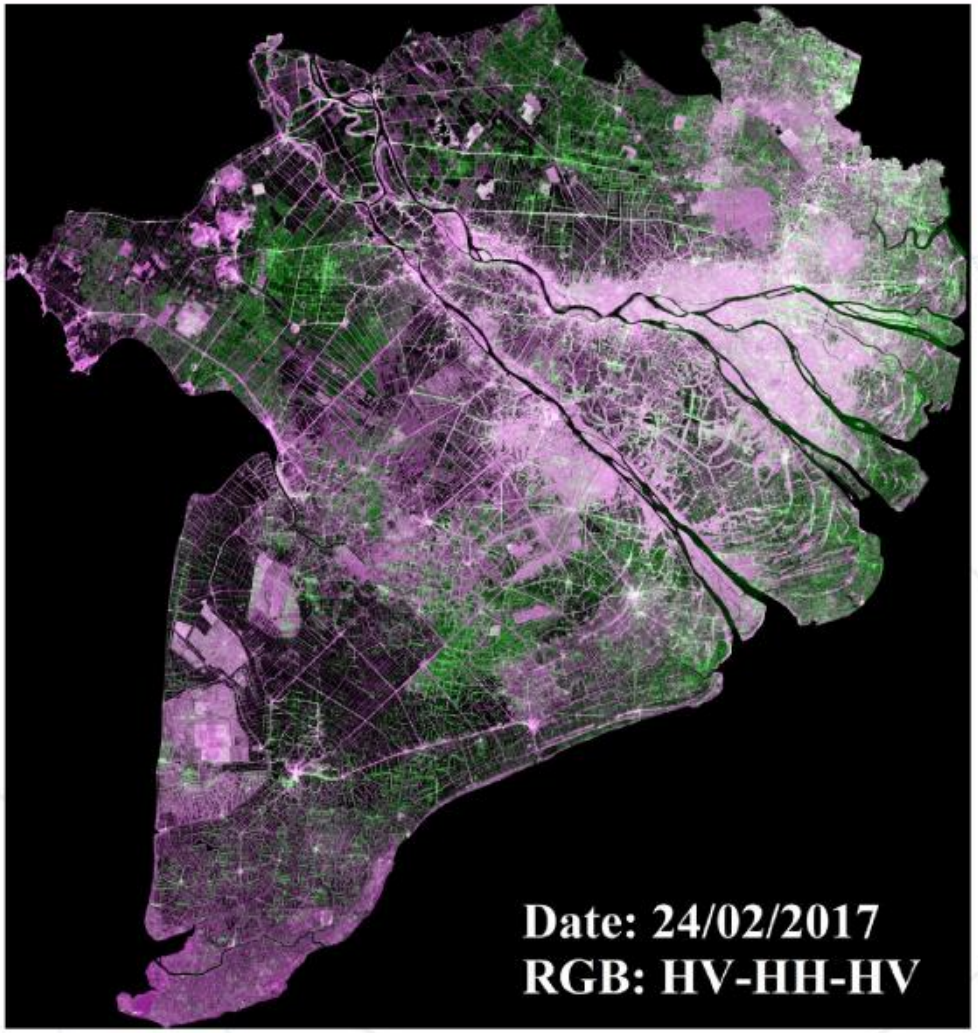
District	Agency data (ton)	Estimated production (ton)	Percentage error (%)
An Phú	73,656	63,717	-13.5
Chợ Mới	77,296	66,103	-14.5
Châu Phú	201,254	175,556	-12.8
Châu Thành	166,054	128,187	-22.8
Phú Tân	134,457	120,703	-10.2
Tịnh Biên	89,584	99,328	10.9
Châu Đốc	37,890	34,638	-8.6
Long Xuyên	29,503	17,422	-40.9
Thoại Sơn	233,292	175,277	-24.9
Tri Tôn	229,200	220,147	-3.9
Tân Châu	54,994	53,576	-2.6
Total	**1,325,946**	**1,154,655**	**-12.9**



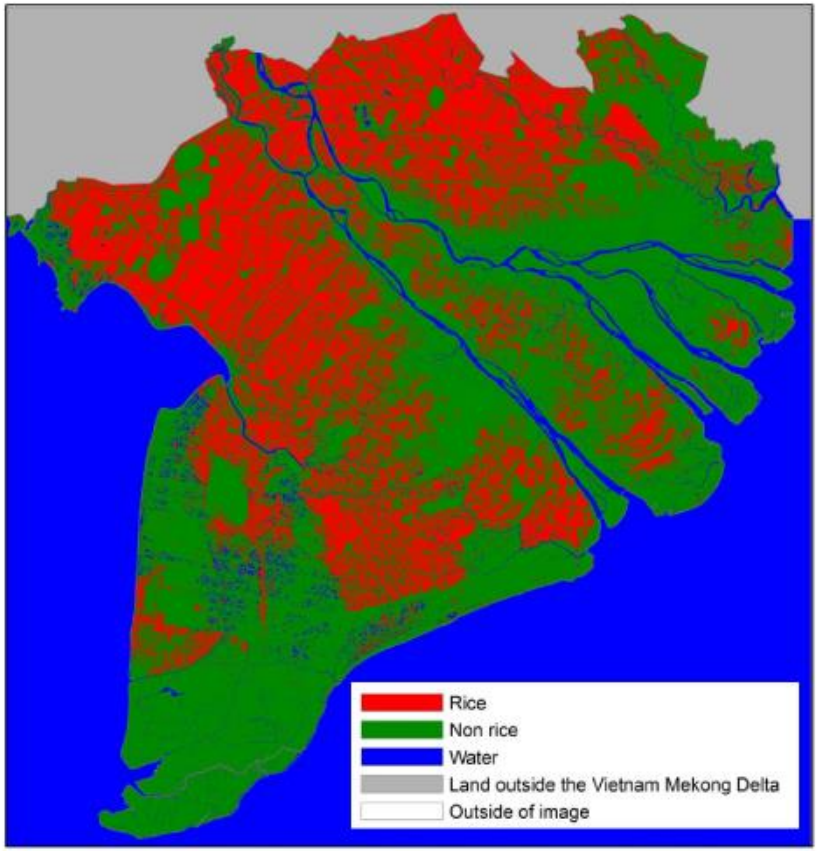
VNSC

Data set: ALOS-2 at regional scale





Data set: ALOS-2 at regional scale

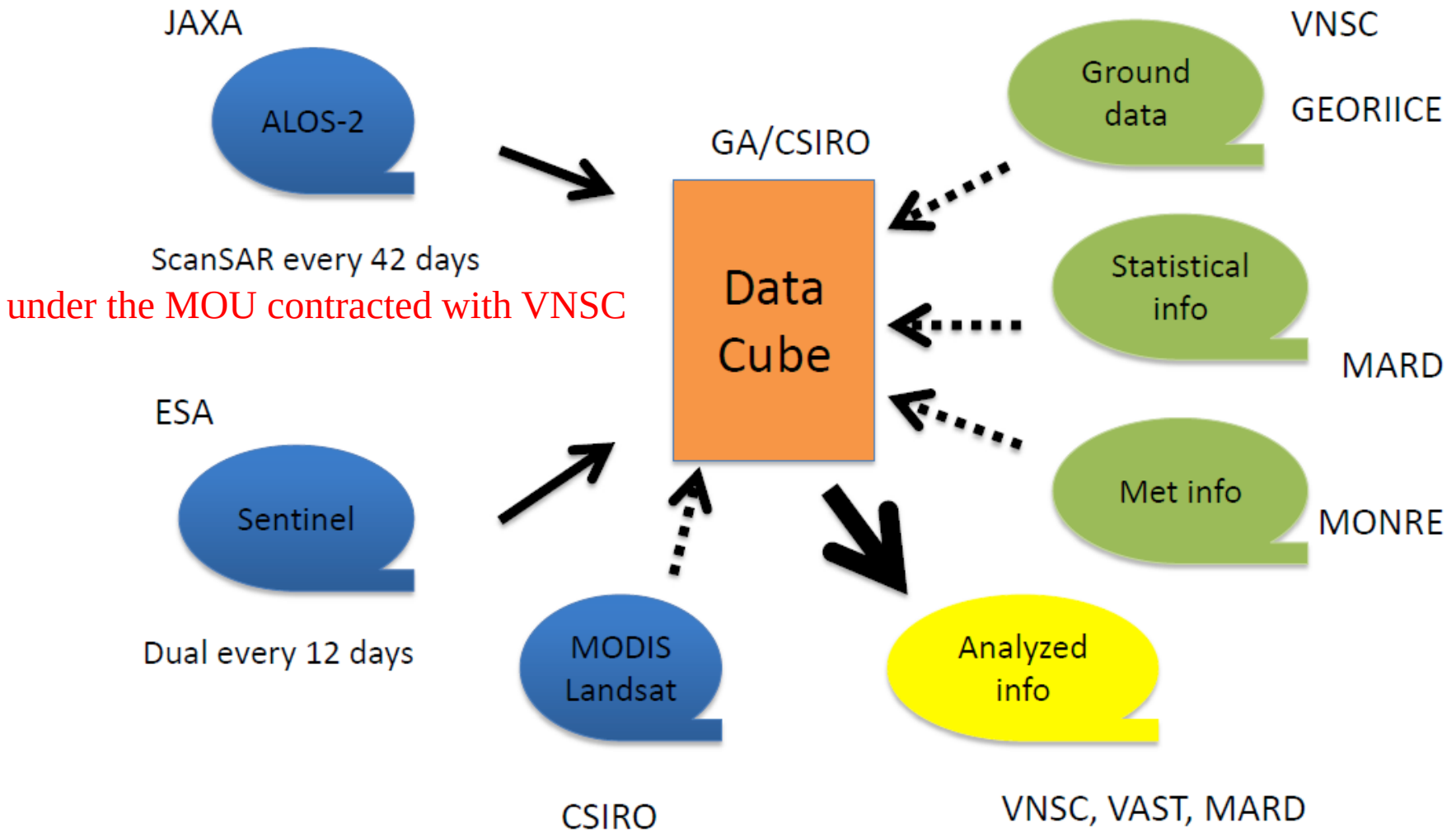


Map of WS Rice 2017 (ALOS-2)

Ground data (18-25/02/2017):
241 rice samples and
93 non-rice samples;

Ground truth Class	non-rice	rice	Total
non-rice	***89***	38	127
rice	4	***203***	207
Total	93	241	**334**
Overall Accuracy = 87%			
Kappa Coefficient = 0.72			

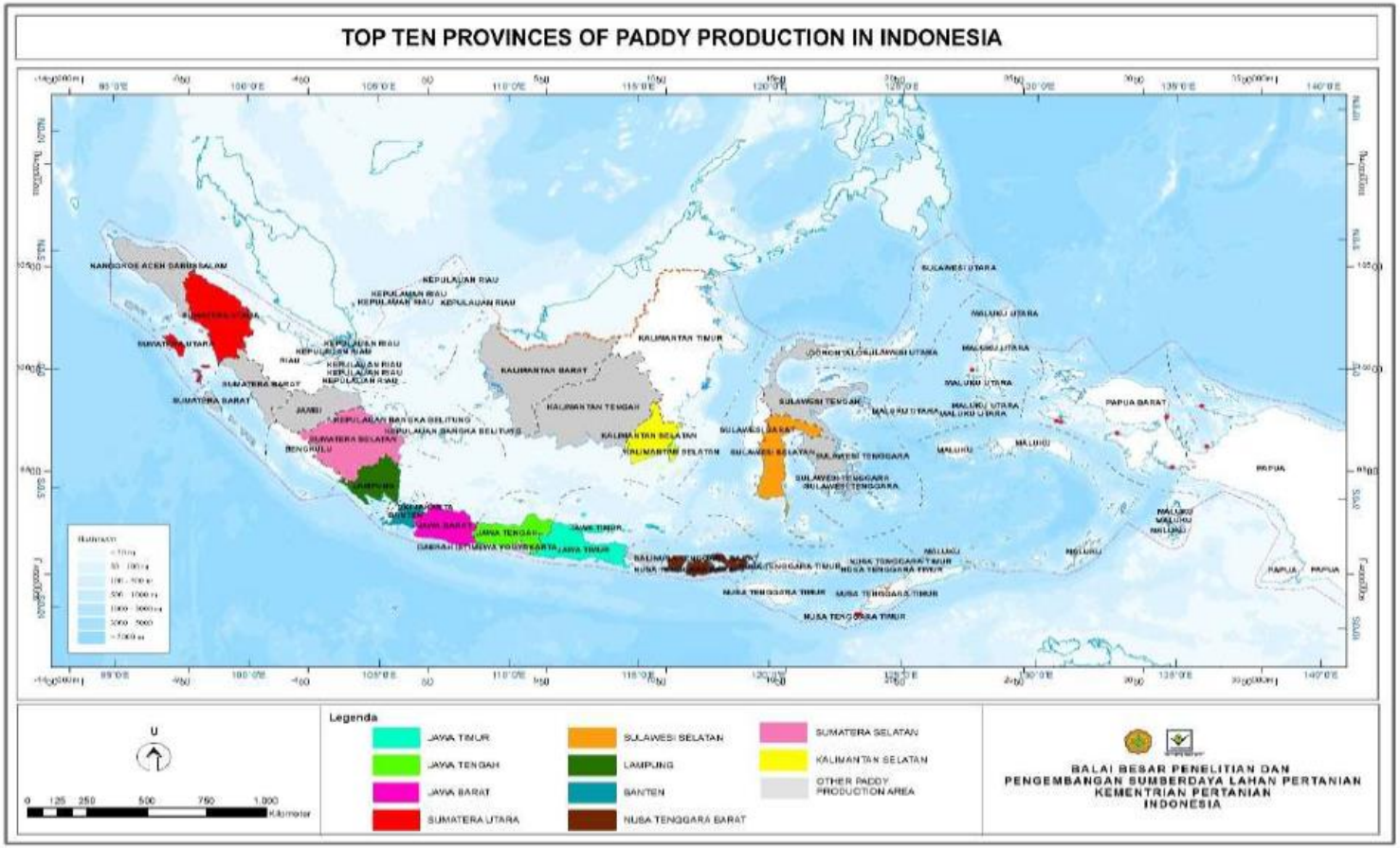
Vietnam Data Cube scheme



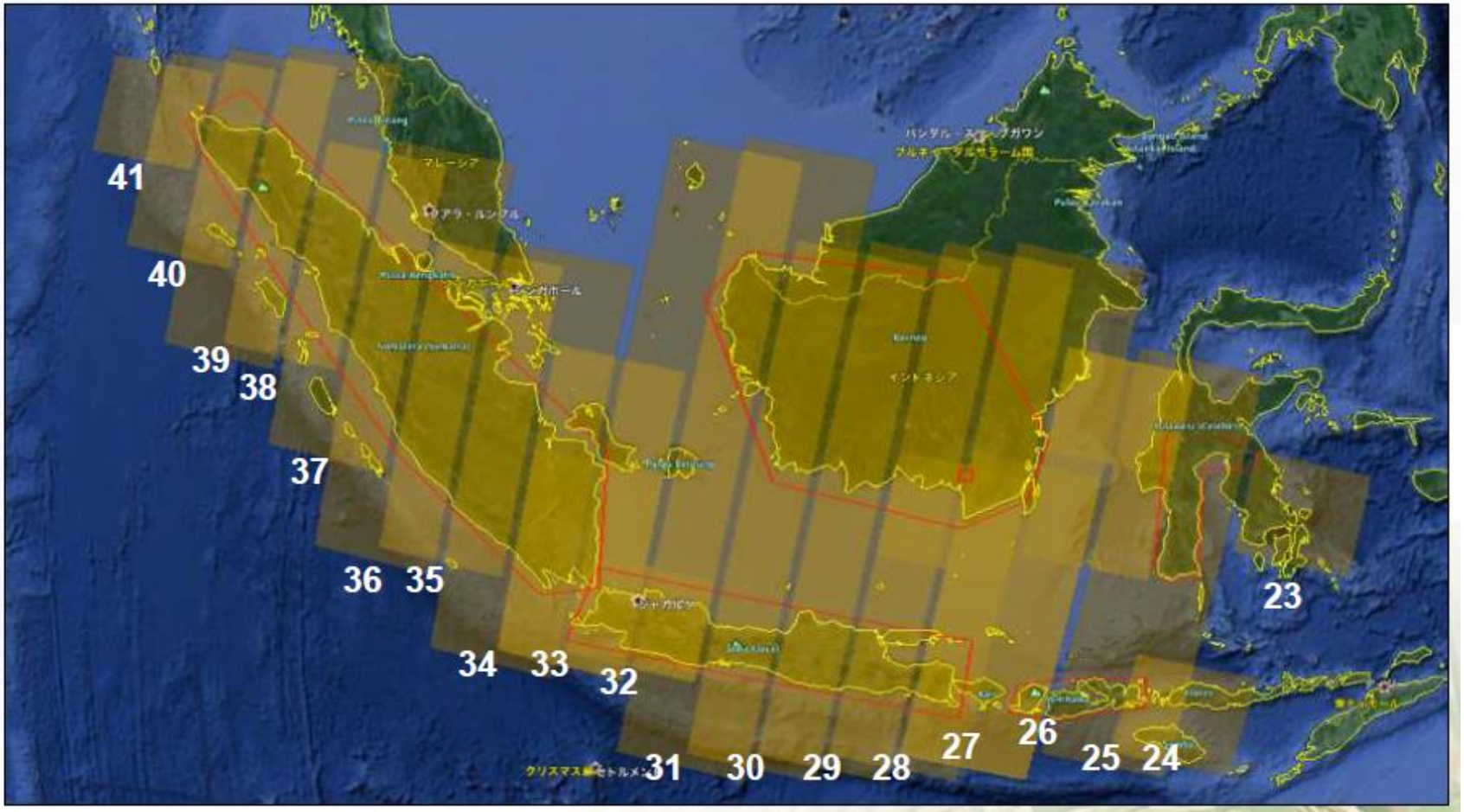
Status in Indonesia

Study Area

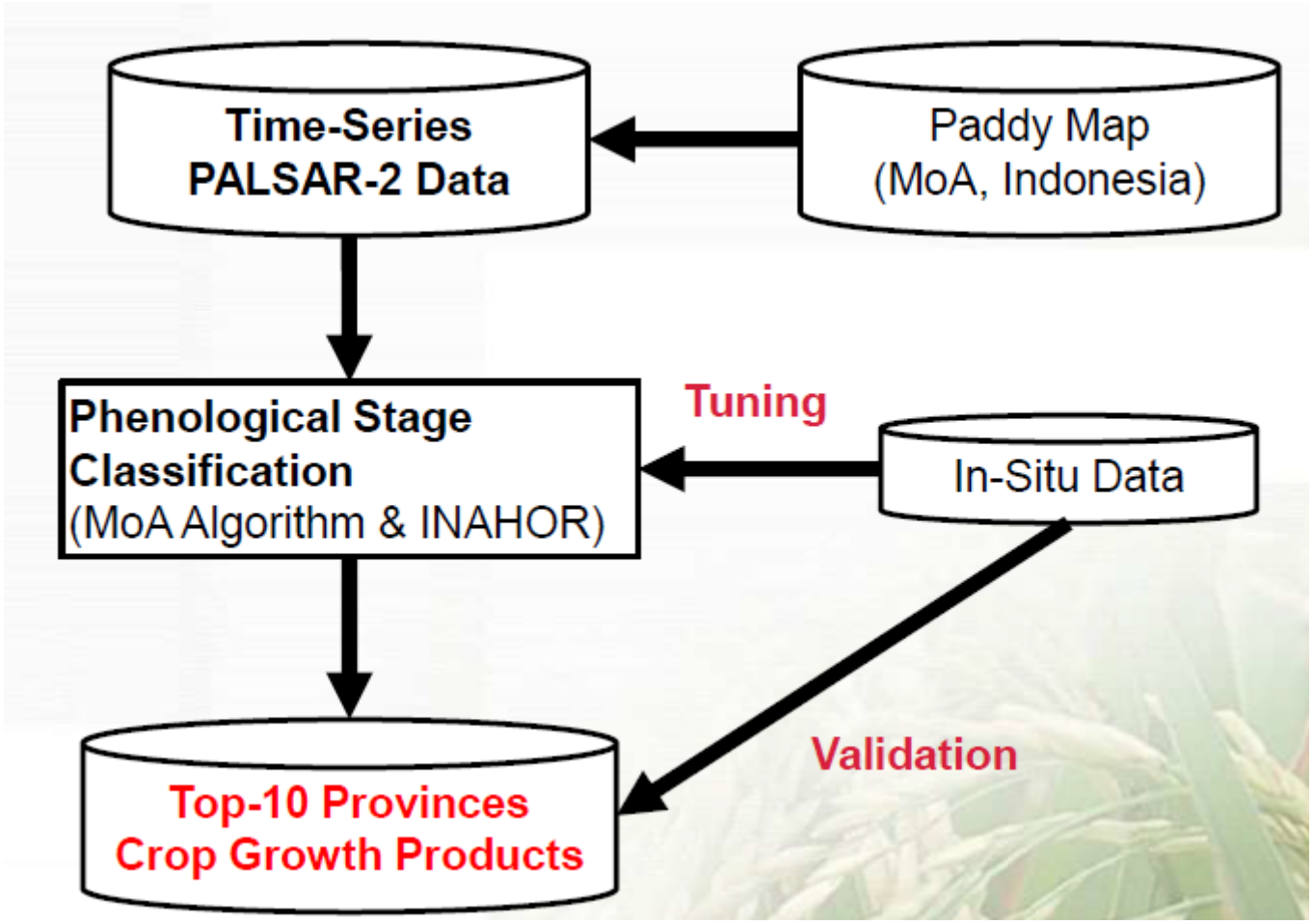
Selected 10 top provinces for upscaling of SAR modeling of paddy



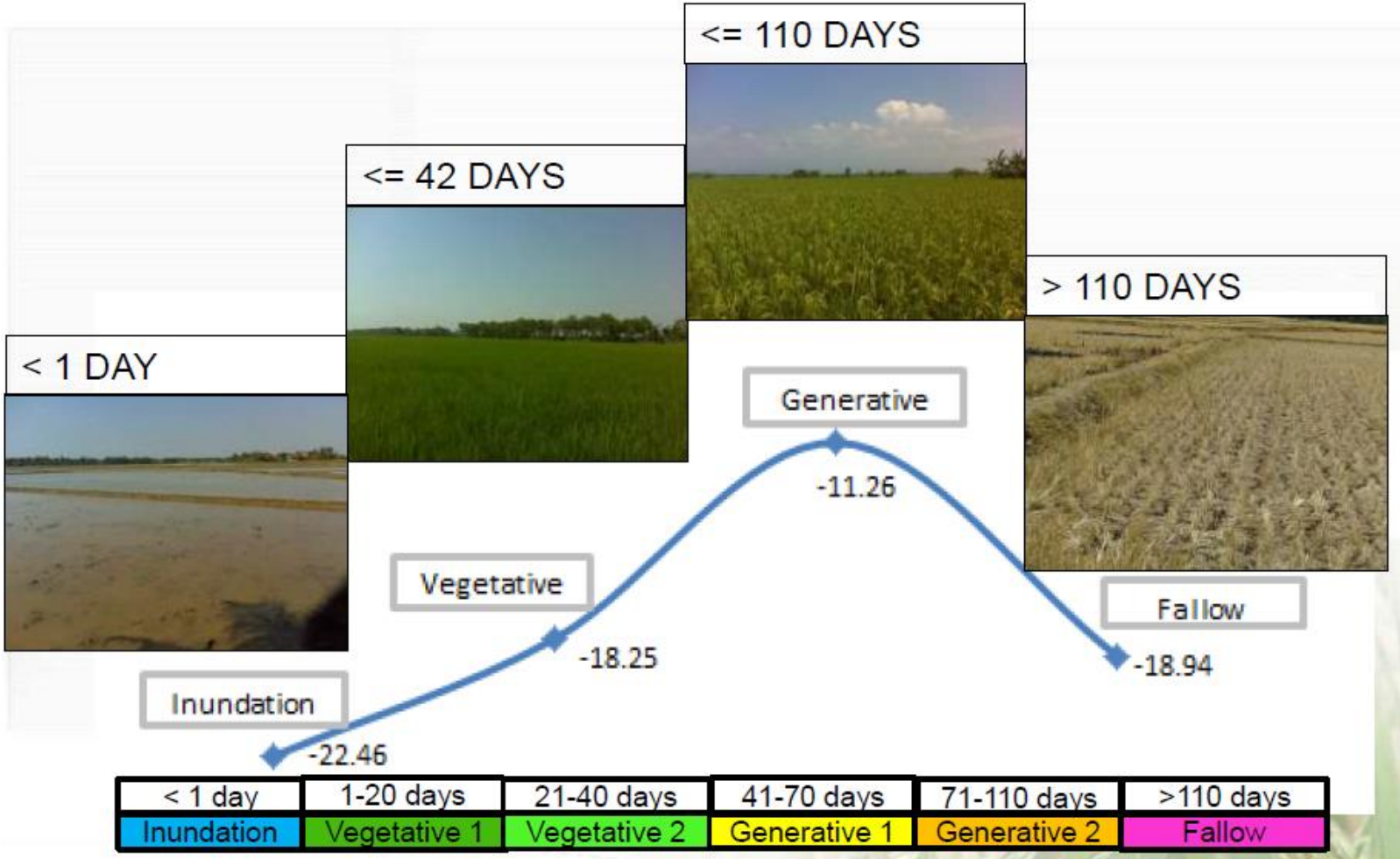
PALSAR-2 ScanSAR foot print over the studies area



Framework for Rice Monitoring

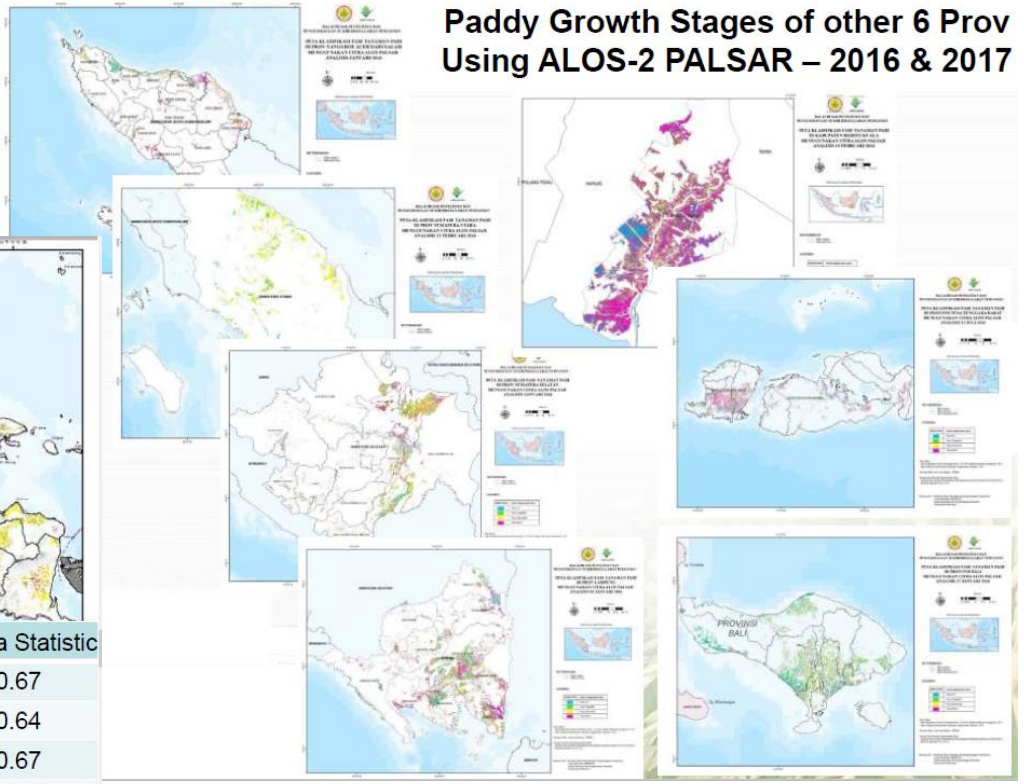


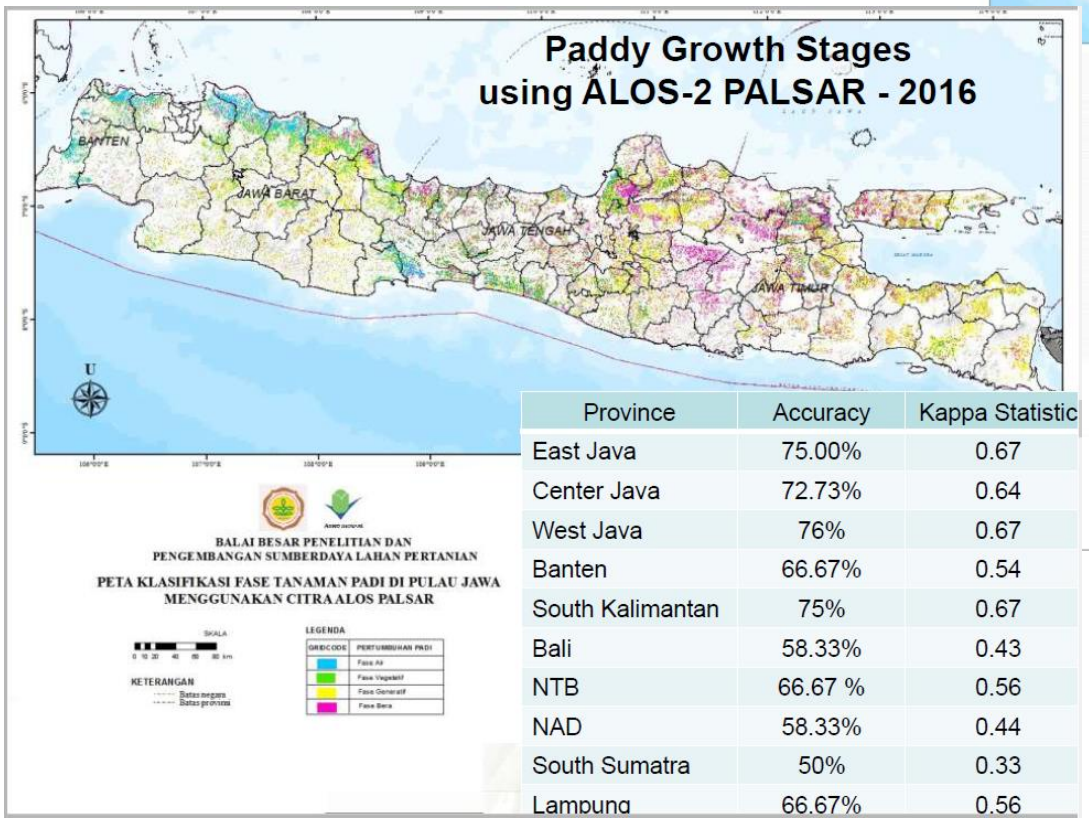
BACKSCATTER (HH) PROFILE OF ONE LIFE CYCLE OF PADDY



Source : IAARD

Paddy Growth Stages of other 6 Prov Using ALOS-2 PALSAR – 2016 & 2017





Province	Accuracy	Kappa Statistic
East Java	75.00%	0.67
Center Java	72.73%	0.64
West Java	76%	0.67
Banten	66.67%	0.54
South Kalimantan	75%	0.67
Bali	58.33%	0.43
NTB	66.67 %	0.56
NAD	58.33%	0.44
South Sumatra	50%	0.33
Lampung	66.67%	0.56

Crop Monitoring Information System
SI MANTAP

Pre & Soft Launching

Pre Launching (Sep 2017)

MANTAP AGRITECHNO

Soft Launching (21 Nov 2017)

Badan Penelitian dan Pengembangan Pertanian
Kementerian Pertanian
2011

1. **Standing Crop monitoring** :
   - Additional planting acreage
   - Estimation of monthly production (how much, where, when)
2. **Production facility control & management** (fertilizer, pesticide, seed, irrigation, agric. mechinery)
   - Estimation of production facility need
   - Mobilization of production facility
   - Distribution of production facility
3. **Irrigation channels monitoring & maintenance**:
   - Identification of damaged primer & secunder irrigation cannels
4. **Mobilization of Agric. products** :
   - Identification of surplus & deficit area
   - Mobilization product to supply deficit area from surplus area

JAXA and LAPAN contracted the MOU to archive and use ALOS-2 ScanSAR data in Indonesia

Summary

- In Myanmar and Cambodia, the verification phase in a provincial level has been finished and the next phase will be progressed, such as cross validation between the satellite based information and the official statistics information based on reporting system.

- In Vietnam and Indonesia, the verification phase in large scale region level has been finished and the next phase will be progressed, such as demonstration in whole country close to operational level.

PALSAR/PALSAR-2 data access

In Asia-RiCE demonstration site, most of ScanSAR data taken according to basic plan (9 times per year) was used for our verification activities.

At least 9 times per year is the expected basic observation plan as a minimum.