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On behalf of Asia-RiCE team
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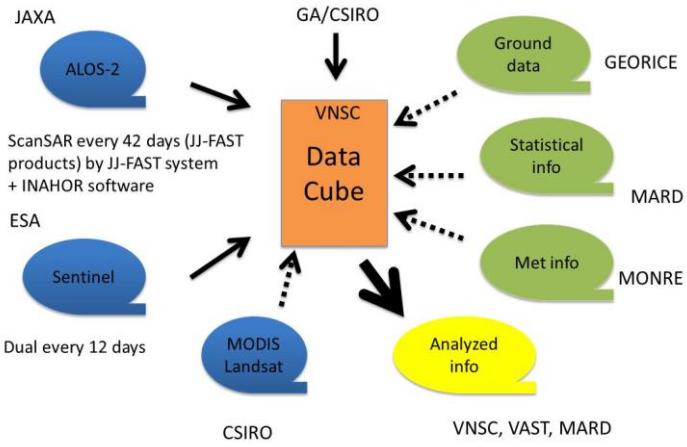
KC25@Tokyo

GEOGLAM AsiaRiCE (from demo to operation)

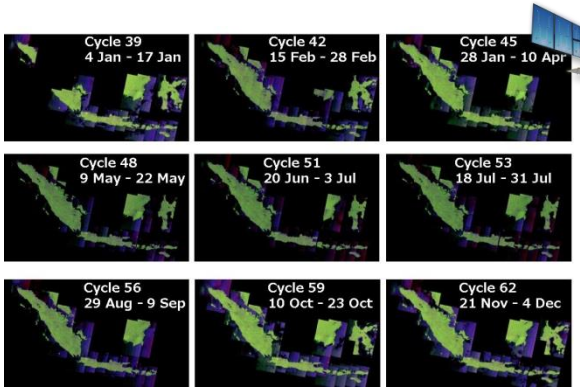
Asia-RiCE Crop Estimation and Monitoring
http://www.asia-rice.org

Asia-RiCE (Asia Rice Crop Estimation & Monitoring) program led by JAXA with CNES and more than 20 Asian Space agencies and Ministries of Agriculture with International organization such as ASEAN/AFSIS, UN/FAO, IRRI from 2013 (POC: Sobue.shinichi@jaxa.jp, ohyoshi.kei@jaxa.jp, Thuy.letoan@cesbio.cnes.fr

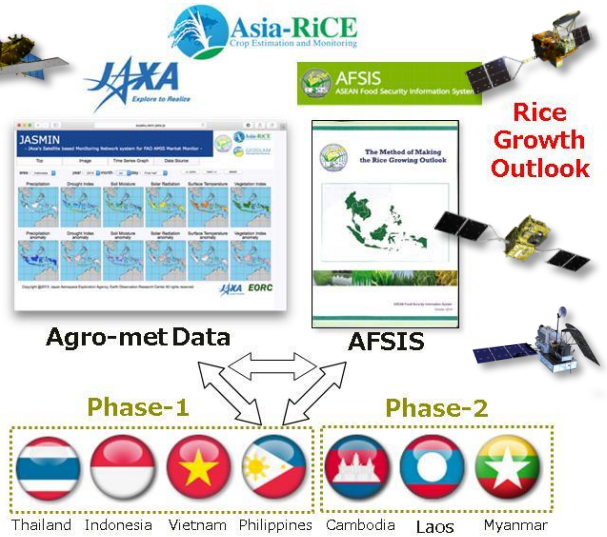
ID	Target Agricultural Products	Requirements of EO data for operational use
P1	**Rice Crop Area Estimates/Maps**	Wall-to-wall observation with SAR dual polarization with Opticals (week – bi-weekly – monthly) : Indonesia, Vietnam/Cambodia and Thailand/Lao projects
P2	**Crop Calendars/Crop Growth Status**	Mid/coarse resolution opitcal frequent observation (MODIS, GCOM-C, Landasat, Sentinel-2, etc.) with SARs weekly
P3	**Crop Damage Assessment**	Very High resolution SAR and Optical timely under international disasater charter, Sentinel Asia, etc.
P4	**Agro-meteorological Information Products**	Daily Mid/coarse resolution optical, passive microwaver and PR with geostatinary met sat frequent observation (MODIS, Sentinel, GCOM-C/W, GPM, Himawari, etc.)
P5	**Production Estimation and Forecasting**	Data fusion, data integration with ground base observation / statisitcal information and crop models



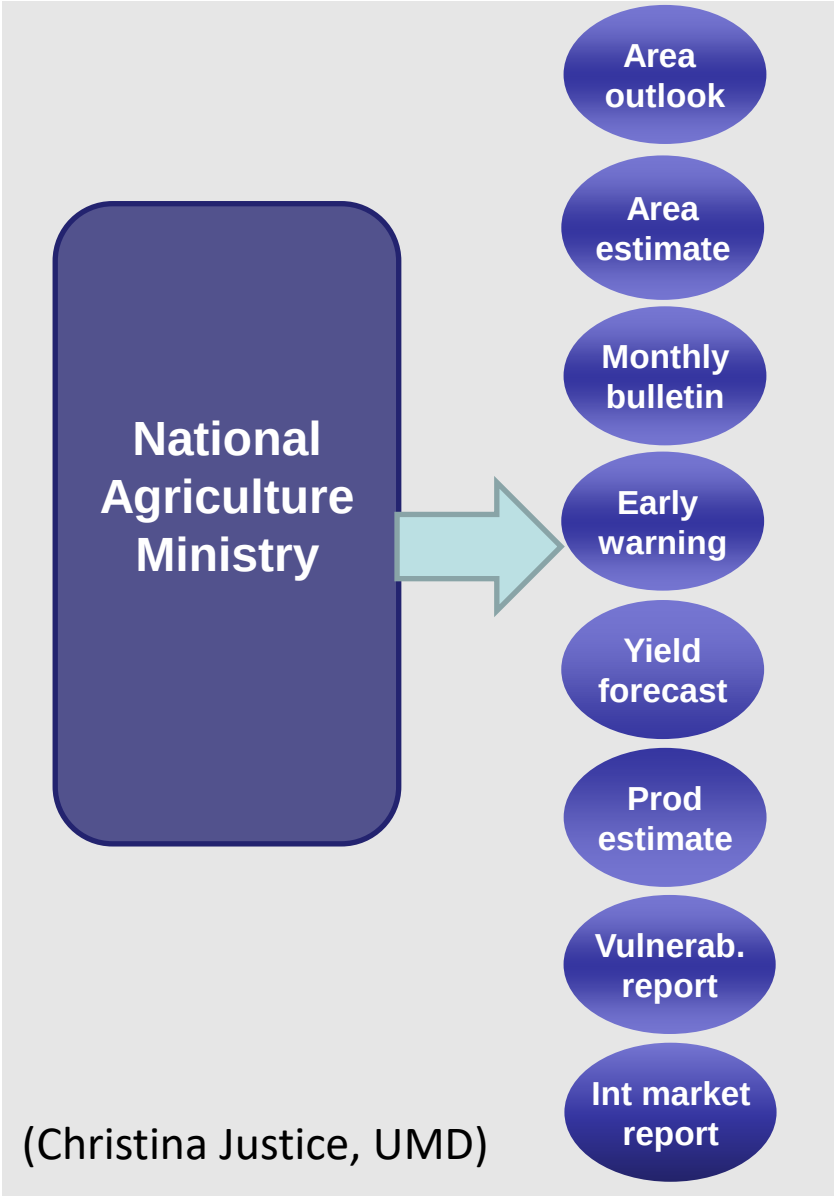
Vietnam Data Cube starting from GEOSS-AP (Hanoi, September) by VNSC/VAST with CEOS



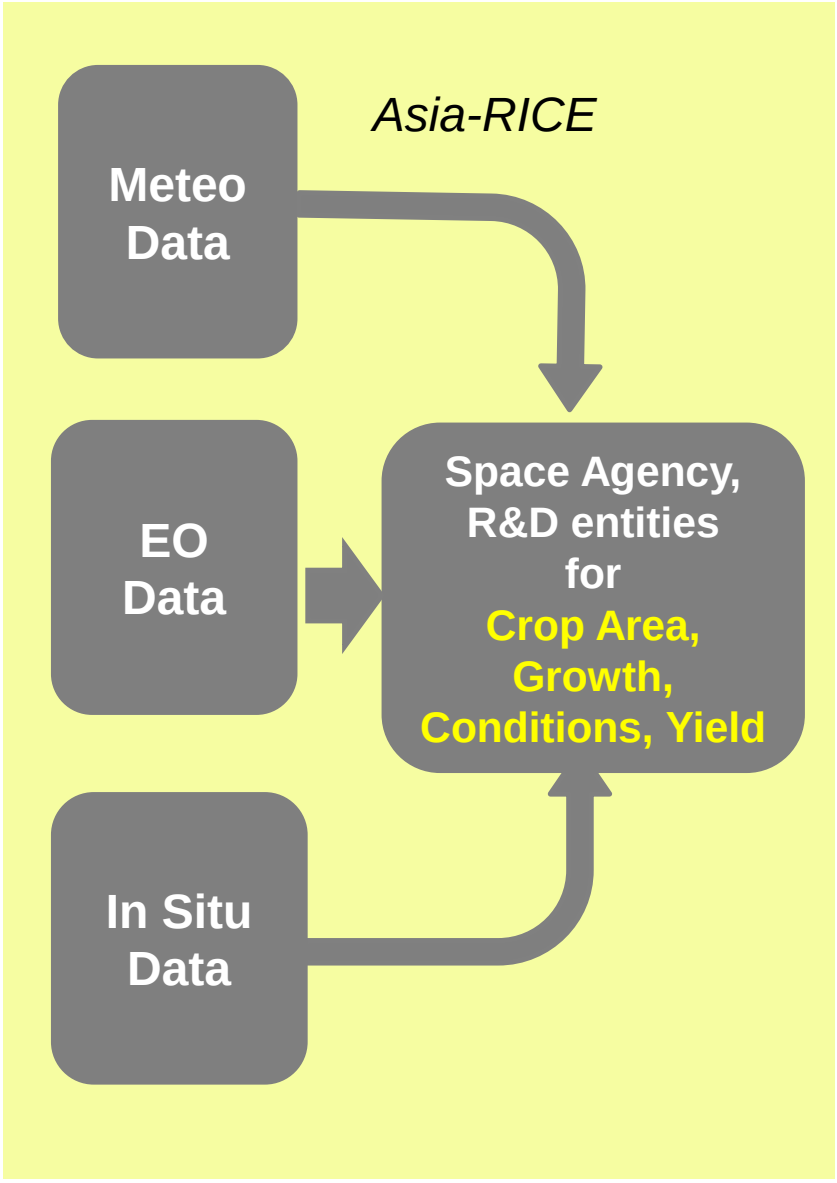
Time series observation by SAR for top 10 Indonesia main rice regions by ALOS-2 with MOA

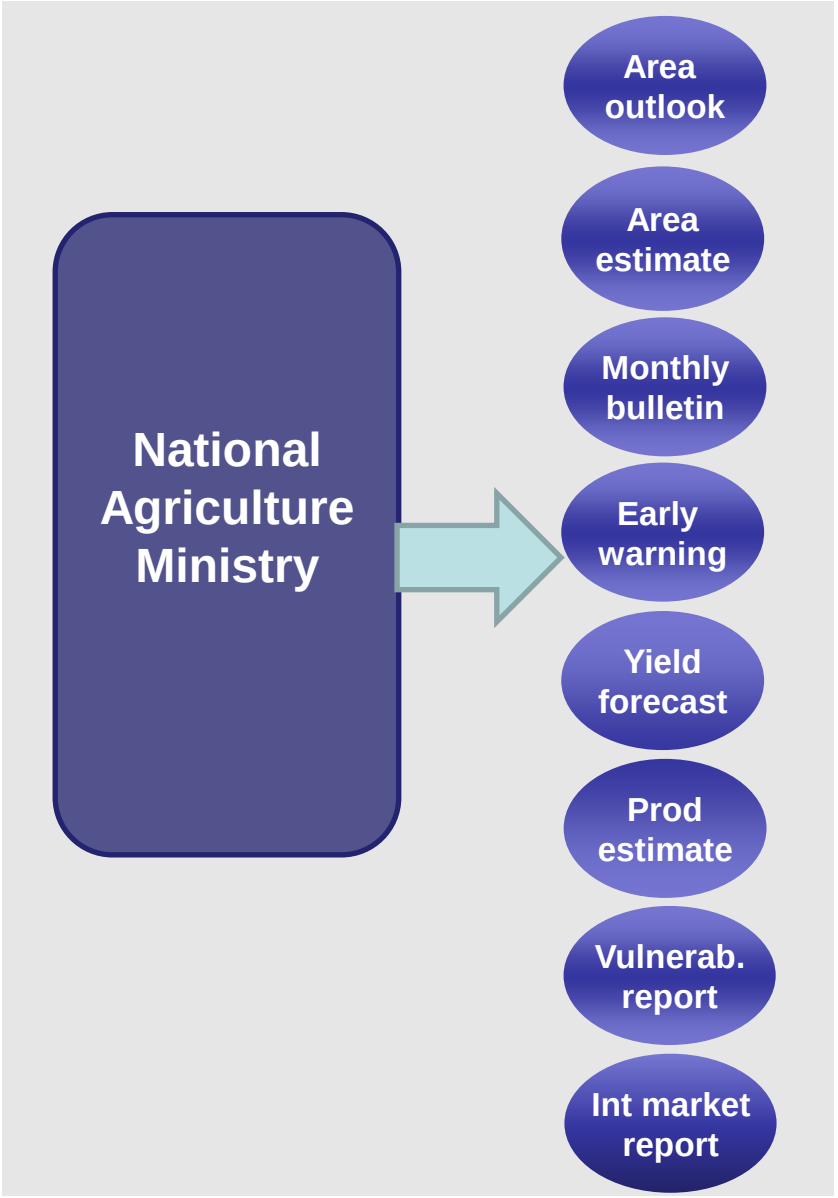


National Agricultural Monitoring



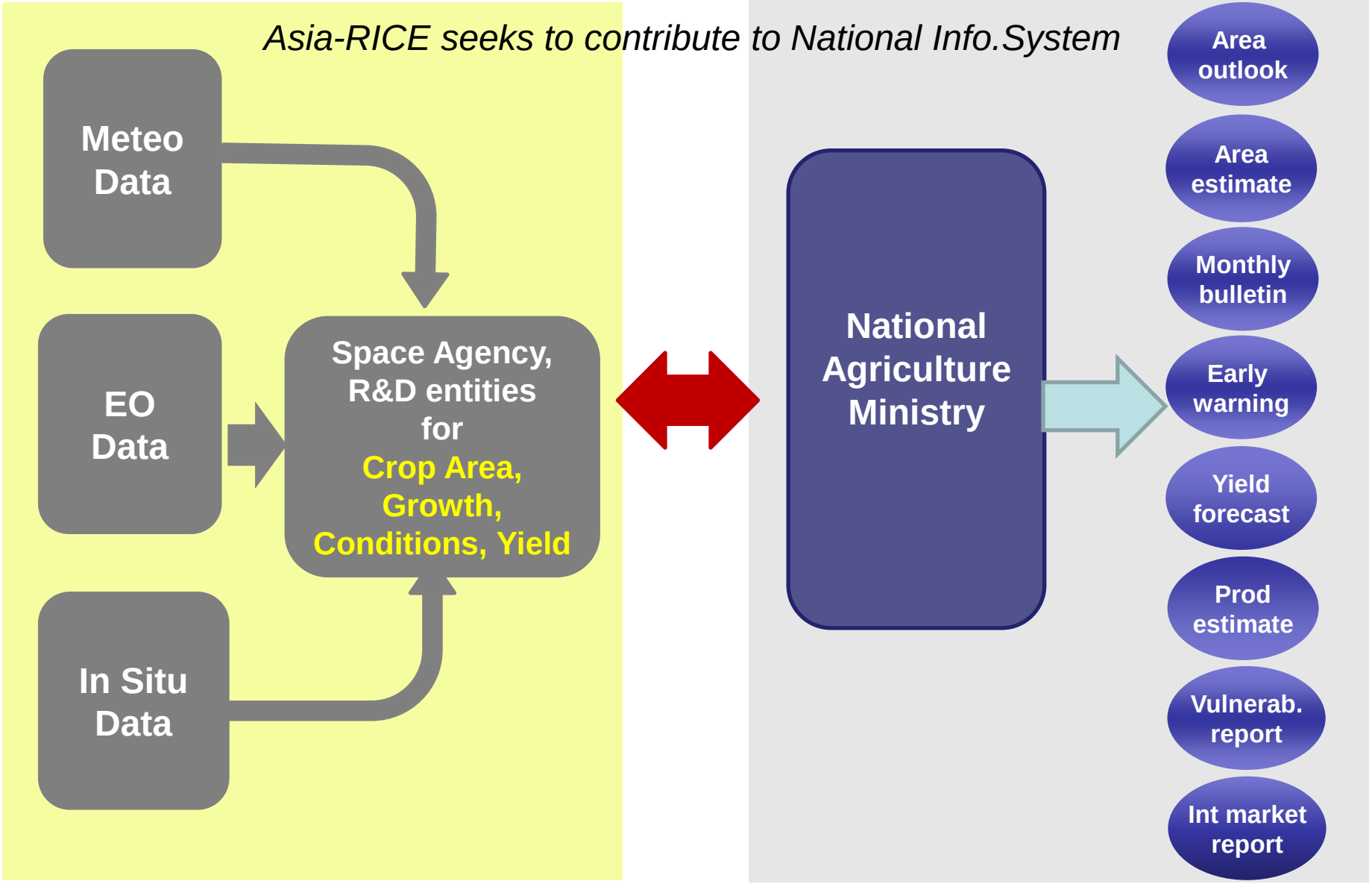
National Agricultural Monitoring





National Agricultural Monitoring

Asia-RICE seeks to contribute to National Info.System



ID	Target Agricultural Products	Asia-RICE Requirements of EO data for operational use
P1	**Rice Crop Area Estimates/Maps**	Wall-to-wall regional /national observation with SAR /Optical (bi-weekly, monthly) : Indonesia, Vietnam/Cambodia and Thailand/Lao, Myanmar
P2	**Crop Calendars/ Crop Growth Status**	Mid/coarse resolution optical observation (MODIS, GCOM-C, Landsat, Sentinel-2/3, etc.) with SARs weekly
P3	**Crop Damage Assessment**	VHR and HR SAR and Optical data timely under international disaster charter, Sentinel Asia, etc.
P4	**Agro-meteo Products**	Daily Mid/coarse resolution optical, passive microwave and MET sat observation (MODIS, Sentinel, GCOM-C/W, GPM, Himawari..)
P5	**Rice Production Estimation and Forecasting**	EO (and Met) Data and Products with In Situ data to be used in Statistical models and Agro-meteo crop growth models.

Asia-RiCE highlights

Research and Development Activities

1. Demonstration at Technical demonstration sites (TDS) (India, Japan, Malaysia, Philippine, Thailand , Tiwan (Chinese Taipei), Cambodia and Myanmar from 2016)
2. Demonstration at Regional/National scale: wall-to-wall Vietnam , and top 10 rice production provinces in Indonesia
   - APRSAF (Asia Pacific Regional Space Agency Forum) SAFE iniative with ALOS-2 and Inahor: Cambodia, Indonesia, Myanmar and Vietnam (Mekong)
   - ESA-GEORICE using Sentinel-1 for Vietnam
   - ADB project using ALOS-2 (with Inahor) for Lao, Philippine, Thailand and Vietnam (Red river)
3. On going research using SARs (L/X/C) and optical (S2/Landsat/Venus/Formosat) for Rice Yield estimate and Methane Emission at TDS and JECAM site(s)

Towards operational services

1. Start to set up pre-operational service for rice crop growing monitoring using ALOS-2 ScanSAR and Sentinel-1 and other satellites in Indonesia and Vietnam
2. For Vietnam, under the cooperation with CSIRO, GA and VNSC, JAXA integrates ALOS-2 ScanSAR data, and CNES-CESBIO integrates Sentinel-1 SAR ARD to CEOS Vietnam Data Cube for rice monitoring.

GEOGLAM
Global Agricultural Monitoring

Asia-RiCE
Crop Estimation and Monitoring

Rice Crop Mapping in Southeast Asia

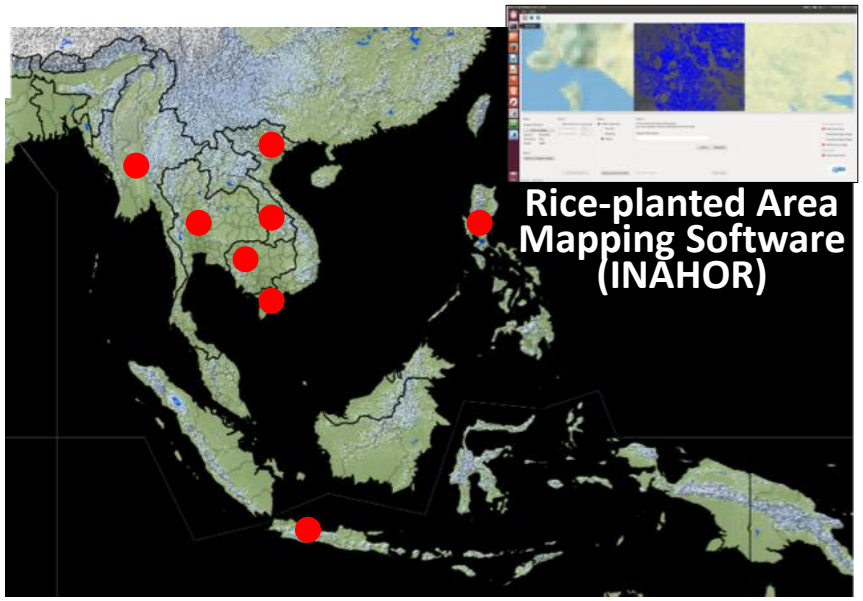
- ADB Technical Assistance project and SAFE project under the APRSAF have successfully demonstrated INAHOR using ALOS-2 with the mapping accuracy of 80-90% for the target provinces
- Scaling-up for major rice producing areas is currently demonstrated in Vietnam and Indonesia.

ADB | Japan Fund for Poverty Reduction | From the People of Japan

ADB TA Project

- Laos
- Thailand
- Vietnam (North)
- Philippines

[2014-2016]



SAFE

SAFE Project (Test site)

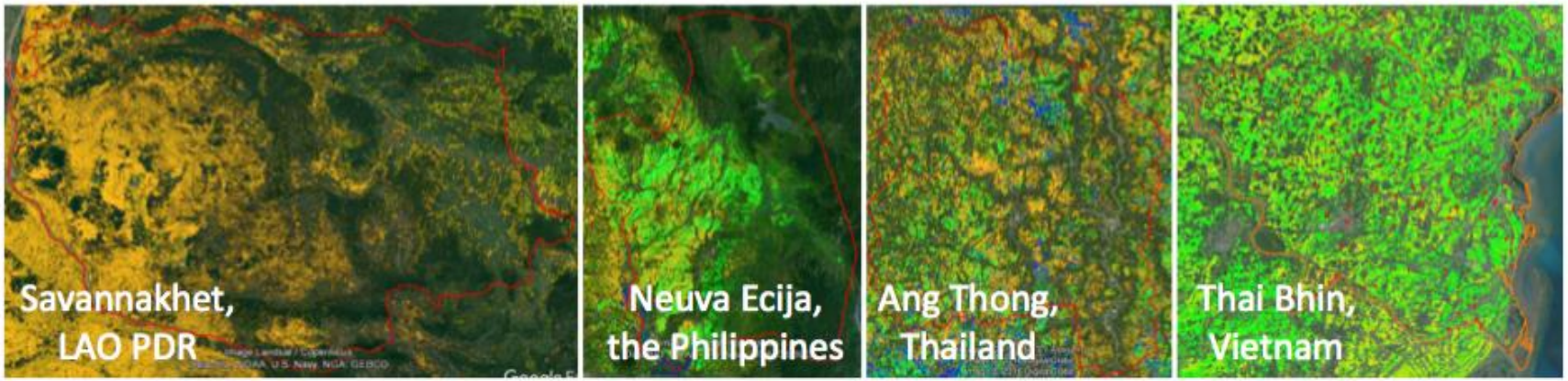
- Myanmar
- Cambodia

[2016-]

SAFE Project (Scaling-up)

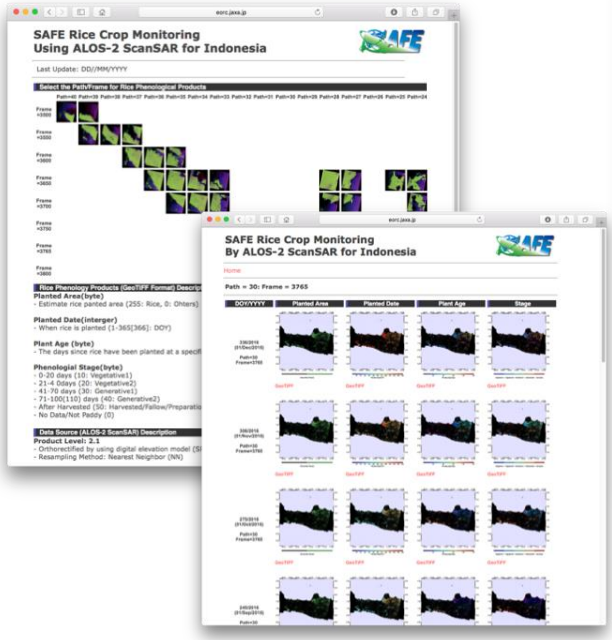
- Vietnam (Mekong Delta)
- Indonesia

[2014-]

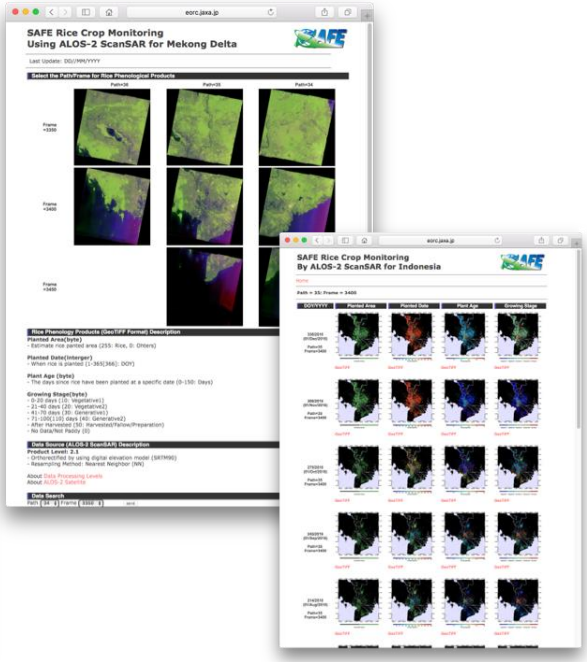


Rice Crop Monitoring System for Scaling-up

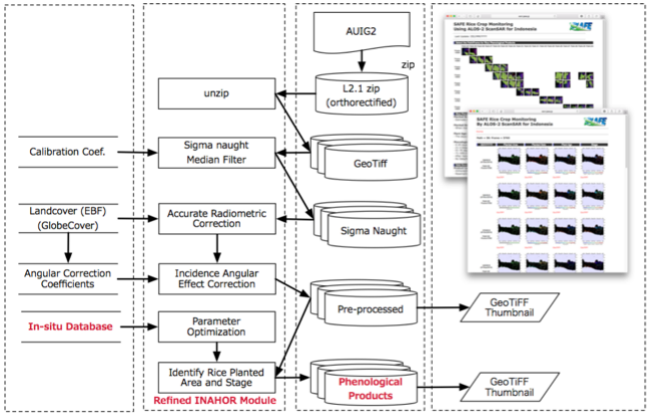
Indonesia

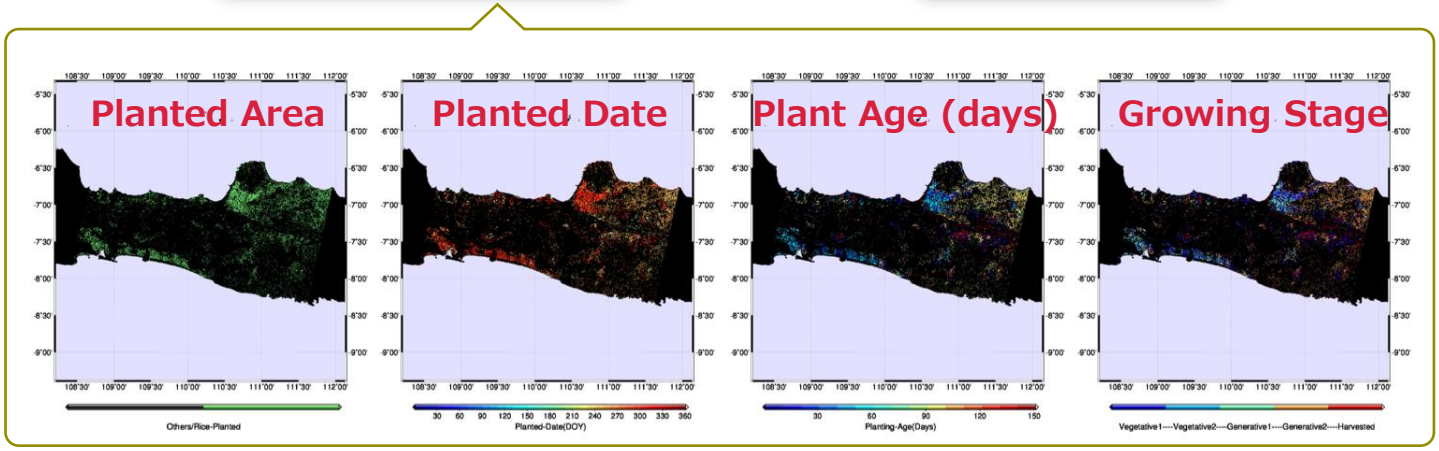


Mekong Delta

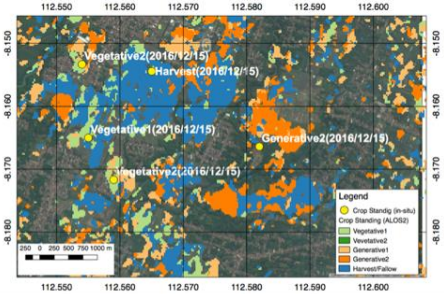


Data Processing Flow





Validation with in-situ data

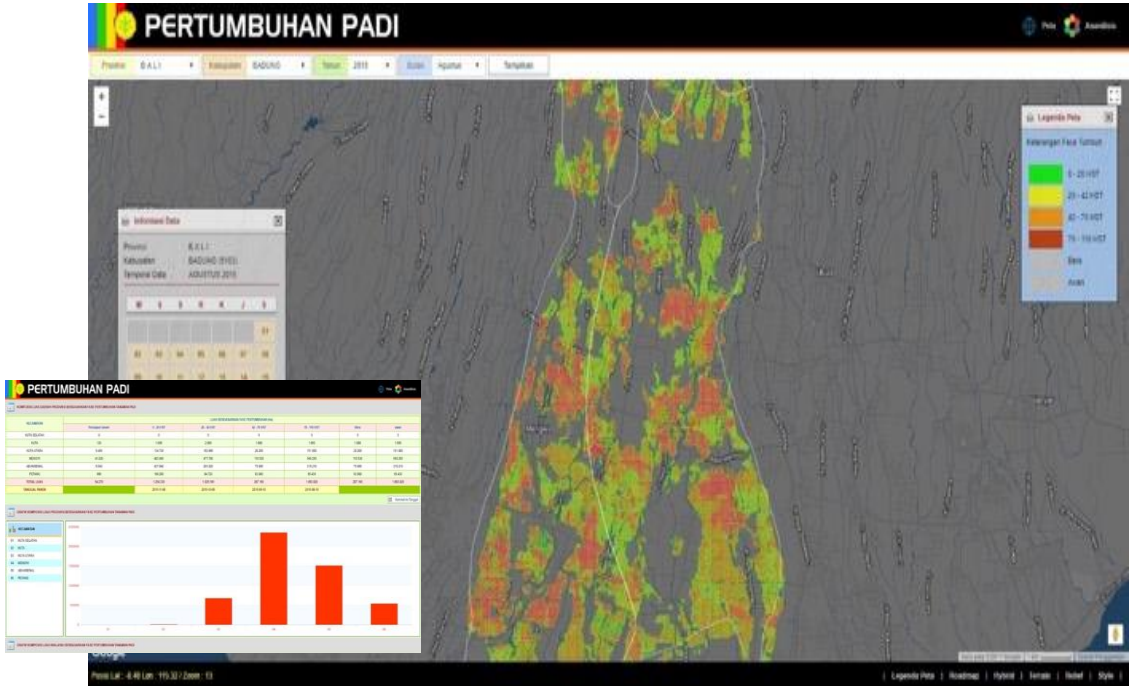


Demonstrating scaling-up monitoring for rice by multi-temporal SAR data.

Prototype Operational Rice Growth Monitoring System using SAR in Indonesia

The Indonesian Center for Agricultural Land Resources Research and Development (ICALRD), the Ministry of Agriculture (MoA) developed the prototype operational rice monitoring system using SAR (ALOS-2) data technically supported by the National Institute of Aeronautics and Space of Indonesia (LAPAN) and JAXA.

The system can be used for decision makers to plan agricultural production facilities (fertilizer, pesticide, irrigation, etc.).



Statistics

Rice planted area and growing stage

For the Improvement of accuracy, temporal and spatial resolution, integrated use of multi-frequency SAR and optical data should be investigated.

Vietnam Data Cube official release
6 March 2018, Hanoi

CEOS support over past 18 months

ODC deployment and capacity

- Software and training (SEO, CSIRO)
- Hardware and maintenance (IMSG)
- Strategic support (Symbios)

ARD preparation and transfer to VN

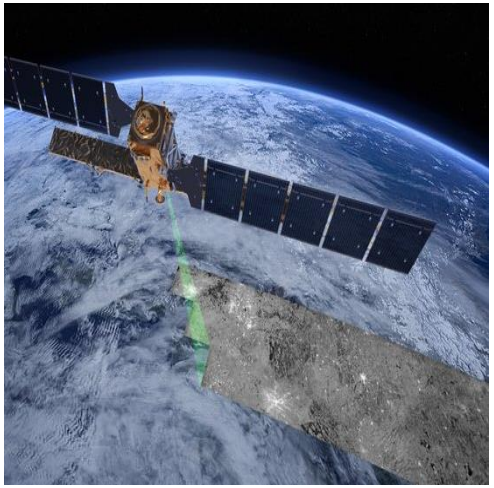
- Landsat (USGS, SEO)
- ALOS, PALSAR (JAXA/ RESTEC)
- Sentinel-1 (SEO, CSIRO, CNES/CESBIO)
- ASTER DEM (SEO)

International partners

- CEOS SEO, CSIRO
- USGS
- JAXA, RESTEC
- CNES, CESBIO

Application domains

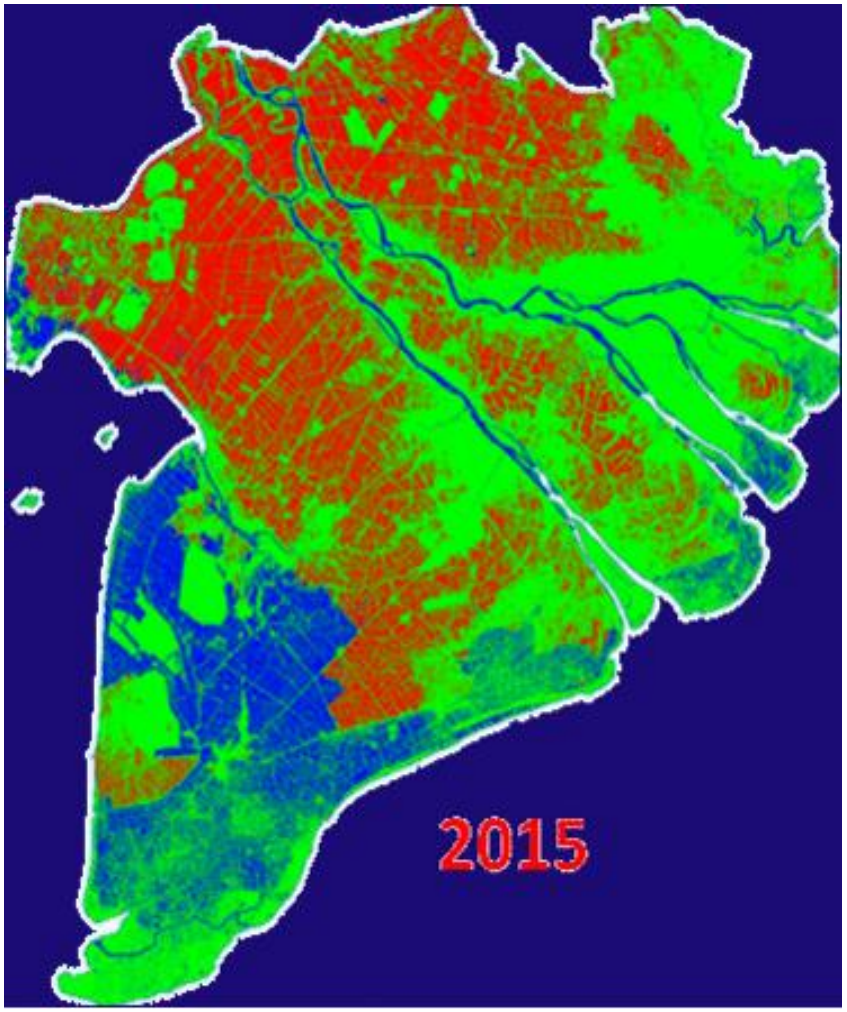
- Forests (GFOI)
- Rice (Asia-Rice, JAXA/RESTEC, CNES/CESBIO)
- Water extent and quality and mangroves (Mekong, MRC)



Sentinel-1 for Rice monitoring in Vietnam

C-Band SAR data continuity

- Repeat Cycle: 12 days, 6 days with 1A & 1B
- Multimode, resolution 5-20m, swath width up to 250-400 km
- Open and Free access of data
- Preprocessing tools and Analysis Ready Data (ARD) available



Effect of El Niño on rice crop cultivation, 2015-2016-2017 in the Mekong Delta

Rice Growth Outlooks for Crop Monitor using Agro-meteorological Information

Asia-RiCE continued its work with the ASEAN Food Security Information System (AFSIS) to provide rice growth outlooks using satellite derived agro-met information such as precipitation (GPM, Himawari etc.), NDVI, LST, and solar radiation (MODIS, GCOM-C), soil moisture (GCOM-W) to the GEOGLAM Crop Monitor for AMIS.

Integration of crop model and agro-met data are needed to provide more value-added information such as yield.

Agro-met Data

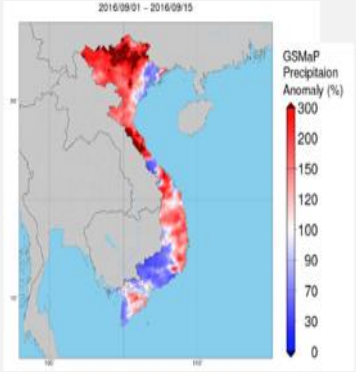
7 countries

Thailand Indonesia Vietnam Philippines Cambodia Laos Myanmar

Rice Growth Outlook

In the North, the seeding of autumn-winter rice (wet season rice) is completed. The sown area is around 1.1 million ha, accounting for 99.2% of the last year area. The weather in the North is not good for paddy due to storm and flood.

(example: Vietnam, Sep 2016)



Precipitation Anomaly (GSMaP)

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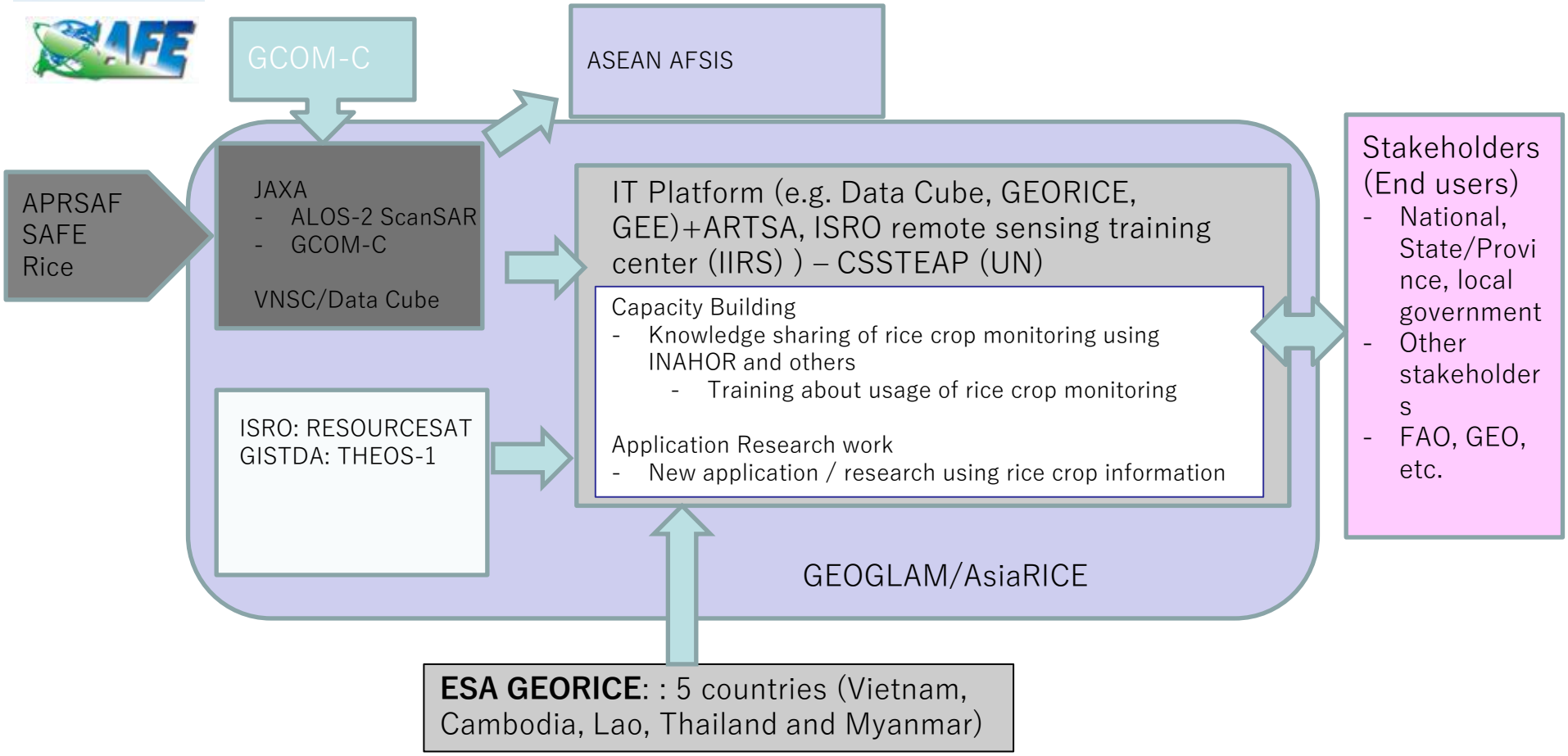
Asia-RiCE next step as phase 3

- Promote wall-to-wall rice crop monitoring with EO data through in situ data validation in cooperation with GEORICE, data cube, etc. together with Asia Rice team members and international donors
- Promote outcome / output application/research results and progress at international conference such as Living Planet Symposium, IGARSS, ACRS, etc.
- Promote the Open data cube in Vietnam, Cambodia, Chinese Taipei in cooperation with VNSC, GA, ESA/CNES, NSPO and JAXA
- Continue to promote rice crop outlook in Asia with the agro-met information from Japan (JASMIN) and India (MOSDAC)
- Conduct Research on
  - Time series SAR and Optical data to create ARD to Open data cube for rice crop monitoring.
  - Rice crop model for yield estimation
  - Methane emission from paddy field
- Standardize field survey for validation in national and regional scale (request to team member cooperation to do this with GEORICE)
- Promote data cube and other cloud base system with available data sources and tools (INAHOR and GEORICE)
- Research on the practicality and potential integration of operational system like as FASAL/India
- Capacity building with Asia in cooperation with available training centres such as ARTSA, IIRS, CSSTEAP

Asia-RiCE- APRSAF SAFE project for Rice Crop Monitoring



Asia Rice - APRSAF SAFE project for Agro-met to rice outlook