Asia-RiCE - GEOGLAM Regional Activity for rice crop monitoring and outlook -

SHIN-ICHI SOBUE

Asia-RiCE team co-lead For TG5

Earth Observations for Asia-Oceania

Report from TG5: Agriculture and Food Security

GEOGLAM

Asia-RiCE
Crop Estimation and Monitoring

26 October, 2018

Thuy Le Toan on behalf of the participants in TG5

1. The participants represent different communities: researchers on earth observations or decision-support systems, and national and international users whose targets are operational implementations.
2. Insightful interactions between participants have led to mutual learning about the present status, challenges and opportunities of what can be achieved.

The WG session comprises three parts:

1. **<u>Rice monitoring through satellite and ground-level observations</u>**
   Discussed rice mapping activities in Japan, Indonesia, Philippine, Vietnam, Thailand as well as the Mekong region.

2. **<u>Rice monitoring for regional food security and environment</u>**
   GEOGLAM/Asia-Rice discussed the up-scaling of rice monitoring activities for food security and agricultural management (province->national->region) and the impact of agriculture on environnent at the regional scale.

3. **<u>Rice Crop Outlook activities and crop yield estimation model</u>**
   GEOGLAM discussed the challenges and opportunities in GEOGLAM with regard to crop monitoring, crop yield forecast and assessment of crop damage, especially caused by water related disaster.

Sustainable Development Goals

Contribution to other SDGs: Asia-RiCE is related to SDGs 1, 3, 6, 10, 13 and 15 as well as SGD2, with direct effects on clean water, climate action, life on land, no poverty, and good health and well being.

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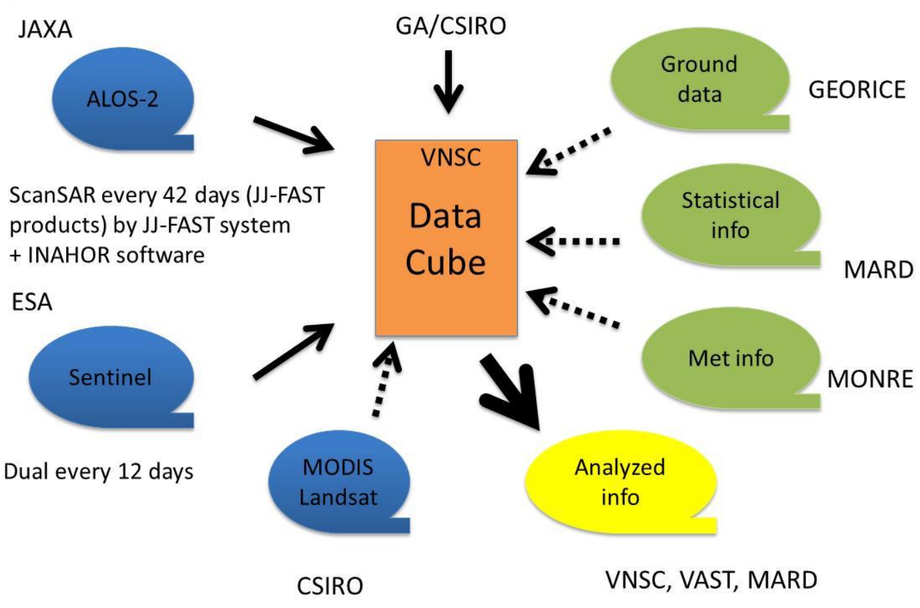
GEOGLAM Asia-RiCE

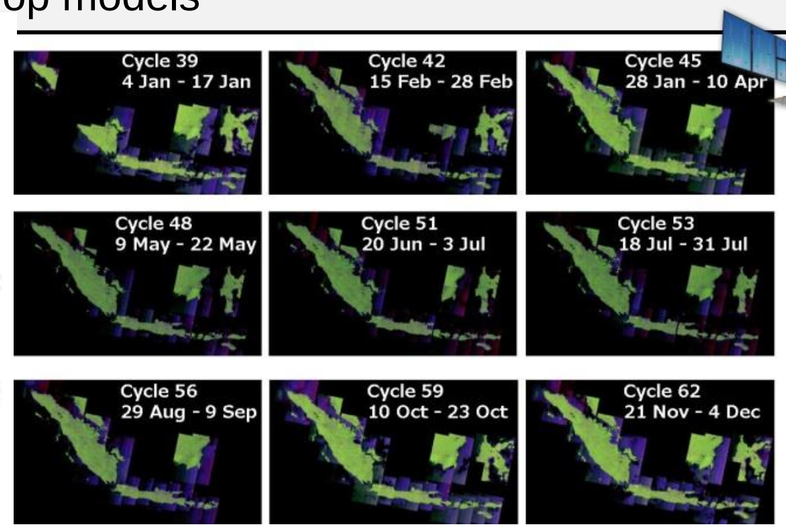
(From demo to operation)

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)

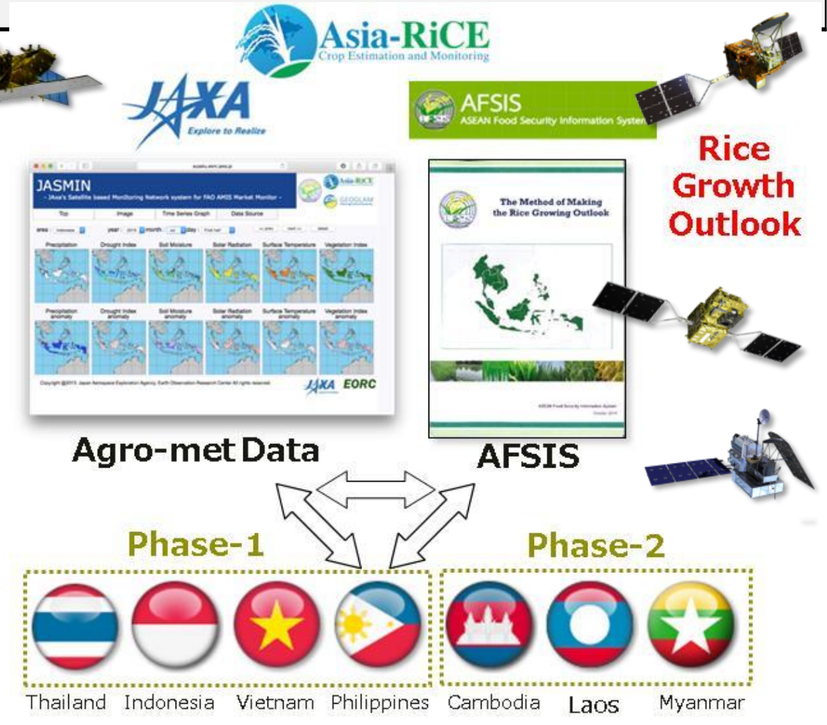
ID	Target Agricultural Products	Requirements of EO data for operational use
P1	**Rice Crop Area Estimates/Maps**	Wall-to-wall observation with SAR dual polarization with Opticals (week – bi-weekly - monthly) : Indonesia, Vietnam/Cambodia and Thailand/Lao projects
P2	**Crop Calendars/Crop Growth Status**	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 disaster charter, Sentinel Asia, etc.
P4	**Agro-meteorological Information Products**	Daily Mid/coarse resolution optical, passive microwave and PR with geostationary 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 / statistical information and crop models



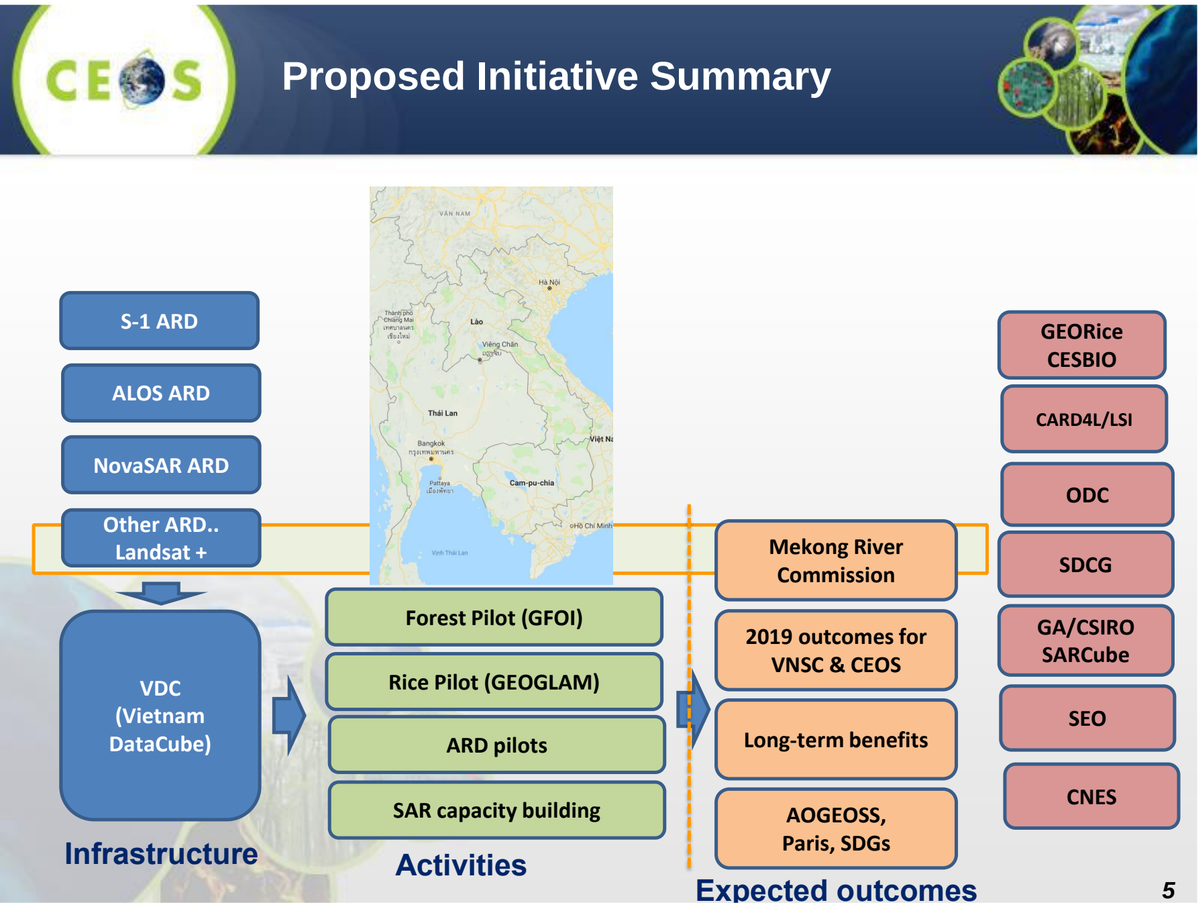
Vietnam Data Cube starting from GEOSS-AP (Hanoi, September) by VNSC/VAST with CEOS



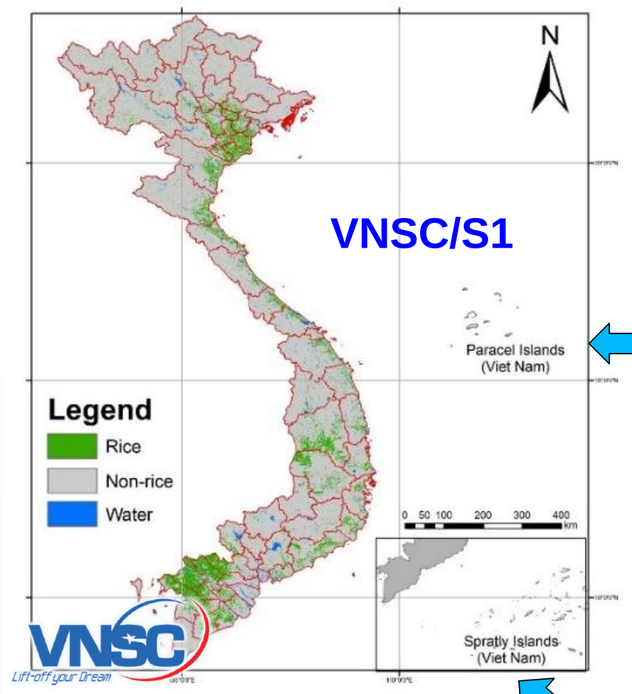
Time series observation by SAR for top 10 Indonesia main rice regions by ALOS-2 with MOA

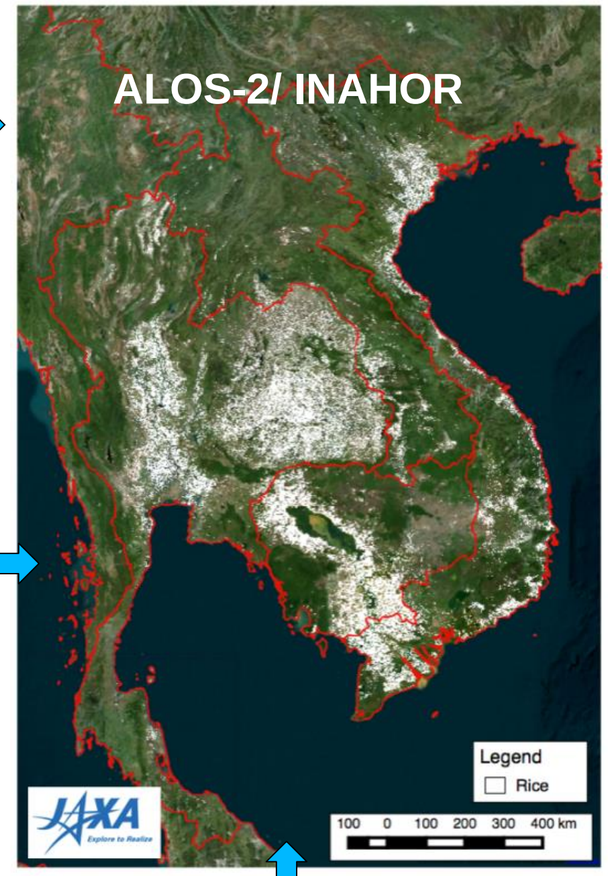


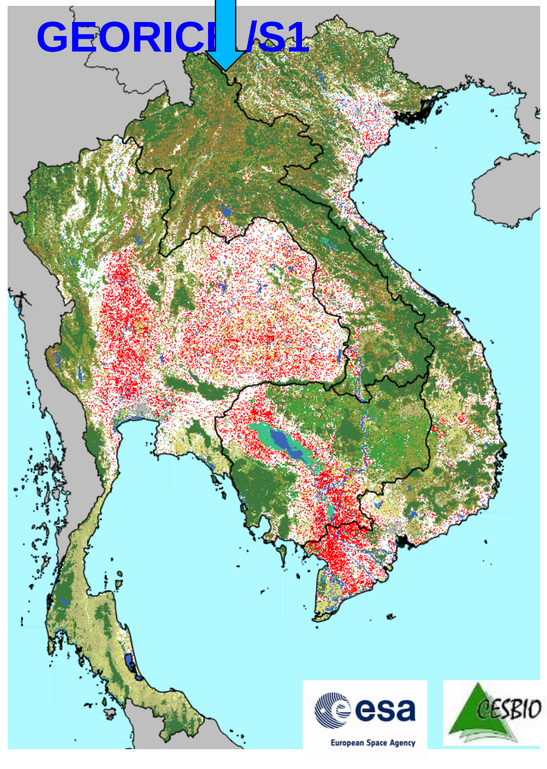
Mekong Rice Crop
- CEOS 2019 VNSC chair initiative -



Validated by Cambodia, Thai and Lao with available data







- Cross comparison among rice crop growth map of Mekong region by VNSC, JAXA and ESA/CESBIO (GEORICE) by ALOS-2 and S1 with In-situ

- Comparison (Multiple bilateral -> Sub regional data)
  - Vietnam by VNSC and MARD with ESA/CESBIO and JAXA
  - Thailand by GISTDA/NECTEC/LDD and JAXA with MOAC/OAE
  - Cambodia by MAF and JAXA
  - Laos by MAFF and JAXA

-> Mekong rice map comparison by VNSC, JAXA and ESA/CESBIO

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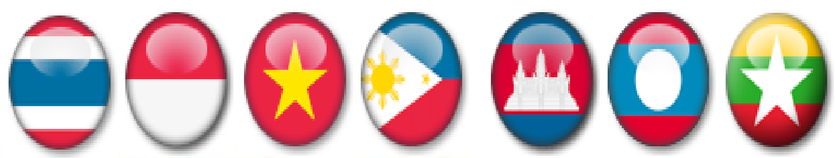
Rice Growth Outlooks for Crop Monitor using Agro-meteorological Information

- **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.**
- **By agromet project using Japan ASEAN integrated trust fund (JAIF) led by LAPAN and MOA, rice crop outlook capacity building to ASEAN member states has been implemented from May, 2018**

Agro-met Data

7 countries



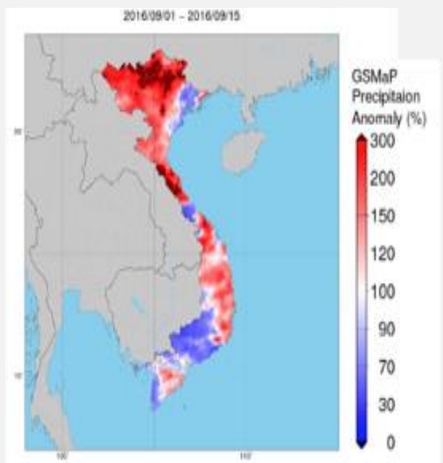
Thailand Indonesia VietnamPhilippinesCa

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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JAXA
Explore to Realize

http://www.asia-rice.org

Agromet Information Database System

- JASMIN provides satellite-based precipitation, drought index, solar radiation, land surface temperature, soil moisture, and vegetation index (update twice a month).
- These information are used to generate monthly rice growing outlook which is reported to FAO through GEOGLAM.

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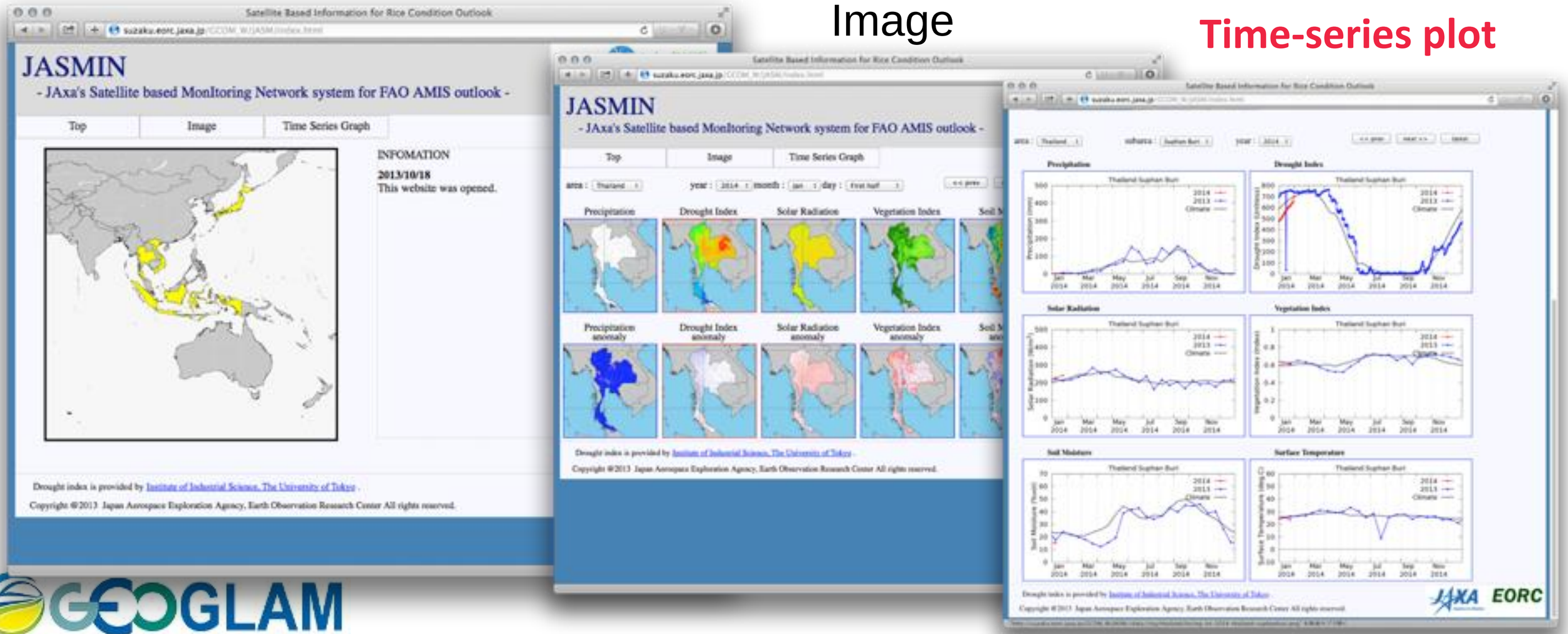
Image

Time-series plot



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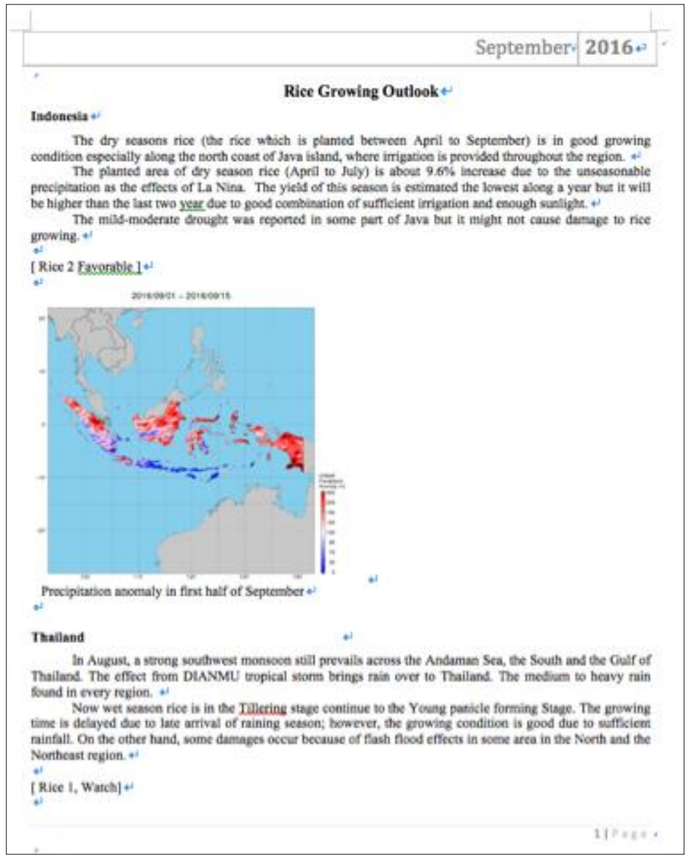
JAXA EORC

http://suzaku.eorc.jaxa.jp/JASM/index.html

[Oyoshi et al., JSPRS., 2016]

Example: Rice Growth Outlook in Vietnam

Rice Growth Outlook (September 2016)



September 2016

Rice Growing Outlook

Indonesia

The dry seasons rice (the rice which is planted between April to September) is in good growing condition especially along the north coast of Java island, where irrigation is provided throughout the region.

The planted area of dry season rice (April to July) is about 9.6% increase due to the unseasonable precipitation as the effects of La Nina. The yield of this season is estimated the lowest along a year but it will be higher than the last two year due to good combination of sufficient irrigation and enough sunlight.

The mild-moderate drought was reported in some part of Java but it might not cause damage to rice growing.

[Rice 2 Favorable]

2016/09/01 – 2016/09/15

Precipitation anomaly in first half of September

Thailand

In August, a strong southwest monsoon still prevails across the Andaman Sea, the South and the Gulf of Thailand. The effect from DIANMU tropical storm brings rain over to Thailand. The medium to heavy rain found in every region.

Now wet season rice is in the Tillering stage continue to the Young panicle forming Stage. The growing time is delayed due to late arrival of raining season; however, the growing condition is good due to sufficient rainfall. On the other hand, some damages occur because of flash flood effects in some area in the North and the Northeast region.

[Rice 1, Watch]

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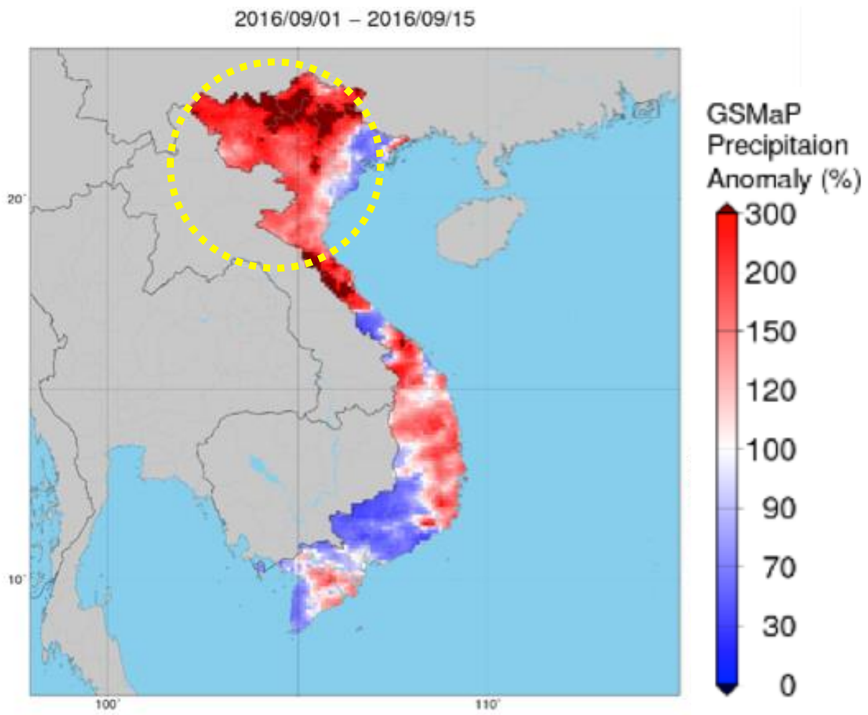
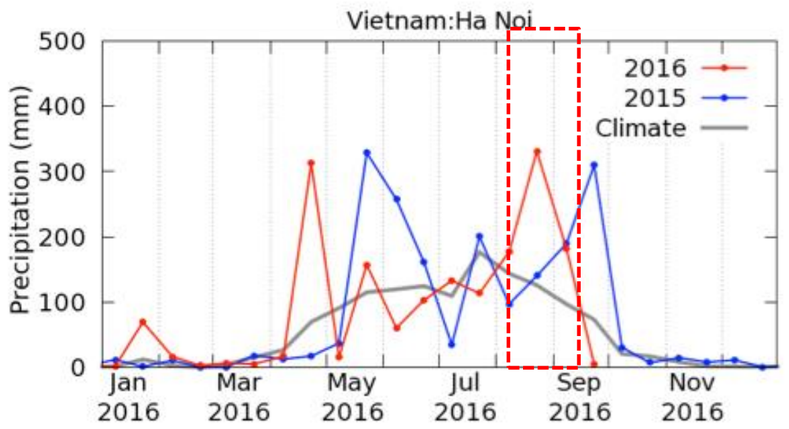


Precipitation anomaly in first half of September



Precipitation (Hanoi Province)

Vietnam

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.**

In the South, the summer-autumn rice enters a harvesting time. The harvested area is around 1.0 million ha …..

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Satellite derived agro-met information can support to judge rice growth.

APRSAF SAFE Agromet Project

Cross-Validation/Comparison and Improvements of Agromet data Application Research Work

Comparing Rainfall, Solar Radiation, LST, Drought Index etc.
developed by JAXA, ISRO, GISTDA.
New application / research using agro-met information.

MOSDAC/VEDAS

JASMIN

Drought Index
(SAFE Asset)

Drought Data

Common Study Area (Ex. Northern Thailand)

Cross Validation Comparison By multilateral collaboration

Data Application Sharing

Agromet Data & Products for Outlook

Capacity Building

Knowledge sharing of usage of agro-met information
Training about usage of agro-met information
(ISRO/GISTDA/JAXA)

Training

Supported by Japan-ASEAN Integration Fund

Science based information sharing derived from Earth Observation Satellites for agriculture management in the ASEAN Region
(2-year programme)

End Users / Stakeholders

National, State/Province, Local Governments, Private Companies

Global Agricultural Monitoring

Asia-RiCE Crop Estimation and Monitoring

http://www.asia-rice.org

Way Forward – AsiaRiCE

- Research has matured and access to satellites data (microwave and optical) derived information with ground based observation data and model makes operational monitoring feasible

- Way forward on
  - Continue capacity building of rice crop monitoring using available international donor or other resources (e.g. ASEAN fund, ADB, etc.)
  - Support CEOS2020 priority by ISRO and APRSAF SAFE project (rice crop project) from SE Asia to Asia (BIMTEC and beyond)
  - R&D for data fusion using SAR and optical sensors and Machine learning with LULCC projects
  - Cooperate with other related regional activities such as AOGEO (water related disaster resilience, GHG, etc.), UN ESCAP, Servir/Mekong, etc. with available plat form providers

- Challenge / Issue
  - Share applications to provide INFORMATION (not data or products) to end users for practical use (especially for microwave observation – current ARD is not enough and need ECV/EAV type information from EO)
  - Collect and share in-situ or compare among country level information under multiple bilateral cooperation
  - Time series big EO Data sharing (too much data and need to have enough Internet to Asian end users (last mile issue) v.s. information sharing (EAV/ECV)