

GEO-GLAM

Asia-RiCE: Rice Crop Estimation and Monitoring status

Shin-ichi Sobue

January 12, 2017

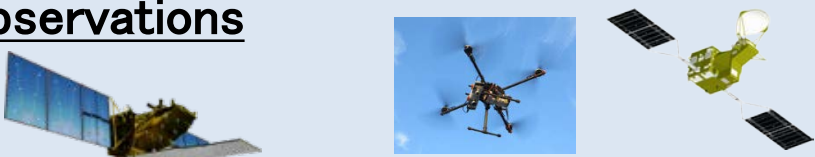
Agriculture and Food Security

Task 5 is GEOGLAM Asia RiCE crop team activity and ground based observation / field survey network in Asia for Agriculture and Food Security.



www.asia-rice.org

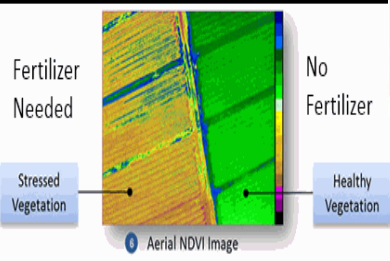
Observations



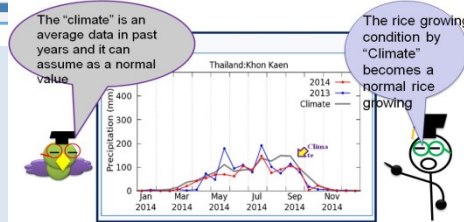
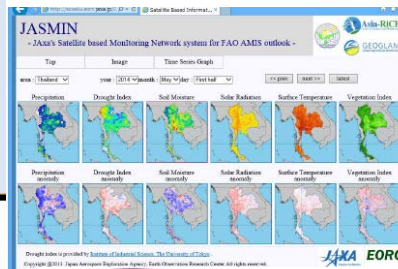
Remote sensing and field survey



Rice-plantd Area (INAHOR)



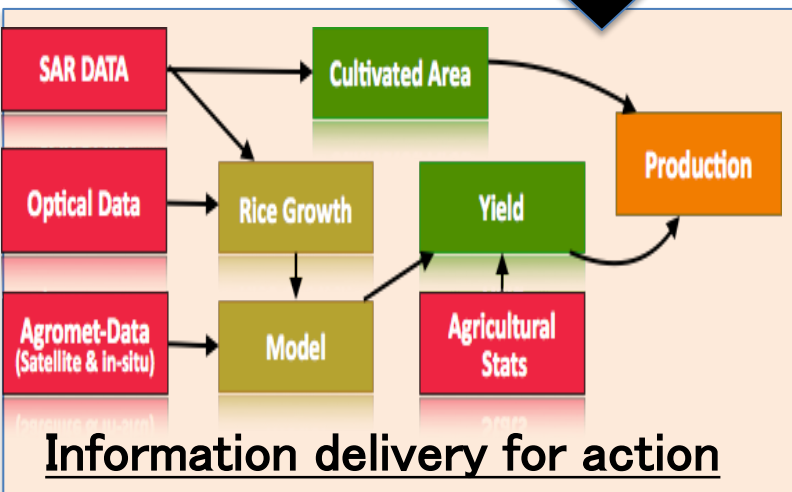
satellite agro-met information (JASMIN)



Publish "Market Monitor" (FAO)



Take action



| ID | Asia Rice Target Agricultural Products |
|----|--|
| P1 | Rice Crop Area Estimates/Maps |
| P2 | Crop Calendars/Crop Growth Status |
| P3 | Crop Damage Assessment |
| P4 | Agro-meteorological Information Products |
| P5 | Production Estimation and Forecasting |

Background of GEOGLAM/Asia-RiCE

- The **GEO GLAM** serves as a useful input for the **AMIS**. (four type of commodity crops – wheat, maize, **rice**, and soybeans)
- Since rice is the main commodity crop in Asia, Japan Aerospace Exploration Agency (JAXA) proposes and leads the Asian Rice Crop Estimation & Monitoring project (Asia-RiCE) for GEO GLAM.
- Asia-RiCE is a collaborative effort between a number of Asian organizations.



Asia-RiCE Home Page – www.asia-rice.org

Asia-RiCE
www.asia-rice.org/index.php




Home About Work Plan News/Events GEOGLAM Contacts Links



Rice is the staple food for more than half of humanity, with 90% of the world crop grown and consumed in Asia.

About

Asia-RiCE is the work of an ad hoc team of stakeholders with an interest in the development of an Asian Rice Crop Estimation & Monitoring (Asia-RiCE) component for the GEO Global Agricultural Monitoring (GEOGLAM) initiative.

Rice is the staple food for more than half of humanity - with 90% of the world crop grown and consumed in Asia.



World population, and therefore demand for food, has increased linearly over the last fifty years (+80M/year), and is projected to keep growing until around 2050 up to 9 billion inhabitants (United Nations Department of Economic and Social Affairs, Population Division 2004). This conjuncture is prone to create tensions in food markets that could lead to world food price crises, as in 2008 when the price of rice more than doubled in only seven months. In this context of price instability and threatened food security, tools to monitor rice production in real-time are highly needed by governments, traders and decision makers.

Accurate information is needed on the spatial distribution of rice fields, water resource management, risk occurrence and annual production projections. However, most agricultural surveys rely mainly on statistics based on limited ground samplings at which data are extrapolated on a national scale. Although the census can provide statistical estimates, slow and unsystematic collection of data can limit the ability to make timely decisions.

Moreover, rice agriculture is strongly linked to environmental issues, from water management to climate change. For these reasons, long term inter-annual monitoring is also required in order to study the production and cultural impacts of these factors. Satellite remote sensing can support this long term monitoring requirement at regional and global scales.

Objectives



Asia-RiCE describes a work plan for the definition and development of the Asia-RiCE component for GEOGLAM. The objectives are:

- To ensure that Asian countries receive the full potential benefits of GEOGLAM, and that they are suitably engaged and prepared to do so;
- To ensure that rice crop monitoring issues are given suitable priority and attention within the scope of the full GEOGLAM initiative, including in the development of the observing requirements; and
- To establish a framework for the coordination necessary to engage, manage and support the various stakeholders.

The regional activities suggested by the Asia-RiCE Work Plan will be consistent with and undertaken within the broader GEOGLAM Work Plan and there will be a number of interdependencies and interchanges between the two Plans.

Website provided by   GROUP ON EARTH OBSERVATIONS

Asia-RiCE
www.asia-rice.org/about.php

Home About Work Plan News/Events GEOGLAM Contacts Links

About

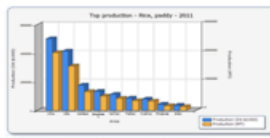
This work has been undertaken by an ad hoc team of stakeholders with an interest in the development of an Asia-RiCE Crop Estimation & Monitoring (Asia-RiCE) component for the GEO Global Agricultural Monitoring (GEOGLAM) initiative.

GEOGLAM aims to enhance agricultural production estimates through the use of Earth observations. It was developed in response to the G20 Agricultural Ministers' concern about reducing market volatility for the world's major crops. The initiative builds on recent advances in Earth observation technologies. These technologies have great potential to contribute to timely forecasts of crop production and early warnings of potentially significant harvest shortfalls.

Importance of Rice Crop Monitoring


Rice is the staple food for more than half of humanity - with 90% of the world crop grown and consumed in Asia. Global rice production has increased continuously in the last half-century, since the Green Revolution. In the same period, the use of chemical inputs, the introduction of modern high-yielding varieties with short growing cycles, and the increased access to machinery and irrigation systems have led to a linear growth of the crop yields (+0.05ton/ha/year) as well as to an increase of the number of crops per year (Food and Agriculture Organization of the United Nations 2009).

This higher cropping intensity (from single to double or triple crop) together with the conversion of non arable land to arable land have resulted in a drastic increase of rice harvested areas in the 60s and 70s (+1.4Mha/year) which slowed down in the 80s and 90s (+0.46Mha/year) and has tended to stabilize over the last ten years as a result of approaching the limits of land use and of cropping intensity, however there is a large inter-annual variability due to climatic conditions and socio-economic factors. As both the increase in yield and in planted areas will be facing limitations in the next decades, it is unlikely that rice production can keep increasing at the same rate.



Meanwhile, world population, and therefore demand for food, has increased linearly over the last fifty years (+80M/year), and is projected to keep growing until around 2050 up to 9 billion inhabitants (United Nations Department of Economic and Social Affairs, Population Division 2004). This conjuncture is prone to create tensions in food markets that could lead to world food price crises - as in 2008 when the price of rice more than doubled in only seven months - and eventually to famines. In this context of price instability and threatened food security, tools to monitor rice production in real-time are highly needed by governments, traders and decision makers.

Top rice producing countries by MT, 2010 (Source: FAOSTAT).
Click to enlarge.

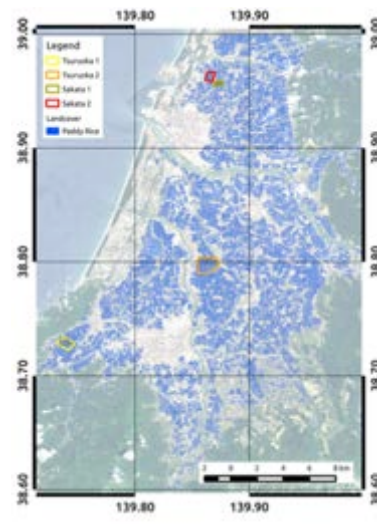


Accurate information is needed on the spatial distribution of rice fields, water resource management, risk occurrence and

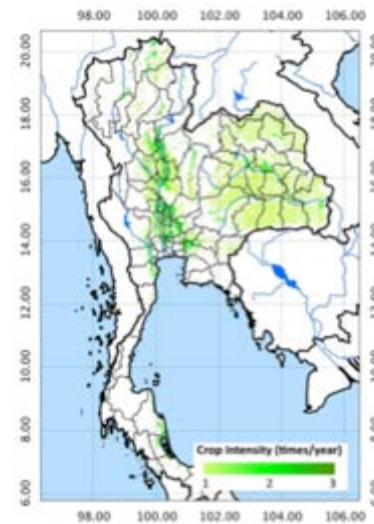
Asia-RiCE Target Agricultural Products

| 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 |

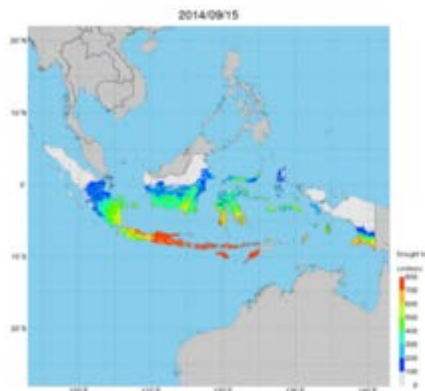
Example of Products



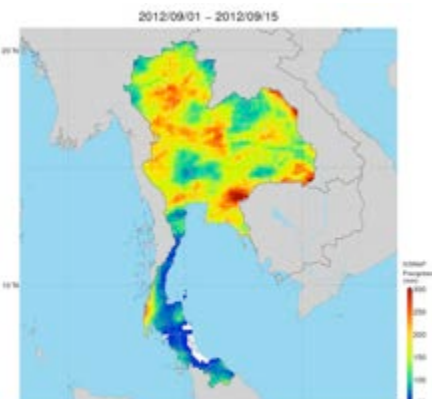
P1: Planted Area



P2: Crop Calendar



P3: Drought Warning



P4: Precipitation

- Rice Crop Area Estimates/Maps -

1. Content

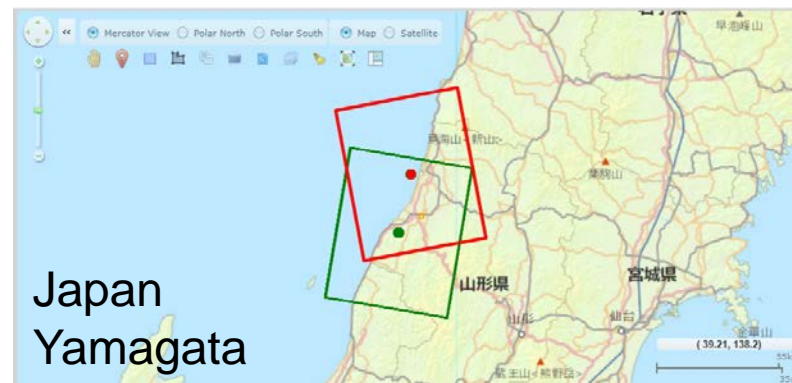
- Time series SAR data from multiple providers to estimate rice planted area, growing status, etc. (Indonesia, Vietnam, Thailand, Japan and others).
- NASA/CEOS SEO developed & tested a cloud computing SAR processing (INAHOR) platform for Indonesia
- GEORICE for Vietnam
- ADB project for 4 countries – rice crop area estimation Innovative Data Collection Methods for Agricultural and Rural Statistics results sharing finished by November 2016 with holding regional workshop

2. Target area and period

- **Phase 1 (from 2014).**
Technical demonstration sites (100x100km) in Asia countries & focus on development of provincial-level rice crop area estimations.
- **Phase 2 (from 2016).**
Wall-to-Wall: 1) Low mekong region – Vietnam and Cambodia, 2 9 Top 10 rice production provinces in Indonesia, Add new countries : Myanmar and Cambodia. JECAM coordination



PALSAR-2 observation area



Data distribution system for Asia-RiCE KC4

K&C4 ALOS-2 PALSAR2 Data Distribution System for Asia-RiCE



Description

This is an online **ALOS-2 PALSAR-2**, Japanese Synthetic Aperture Radar (SAR), data distribution system for implementing the **Asian Rice Crop Estimation and Monitoring (Asia-RiCE)** as a component of the **GEO Global Agricultural Monitoring (GEOGLAM)**. ALOS-2 data are provided by JAXA under the framework of **Kyoto & Carbon4 (K&C4) Initiative**.

Asia-RiCE Technical Demonstration Sites (Asia-RiCE TDS)



- Chinese Taipei
- India
- Indonesia
- Japan
- Lao P.D.R.
- Malaysia
- Philippines
- Thailand
- Vietnam_North
- Vietnam_South
- Argentina (GEOGLAM JECAM Site)

ALOS-2 Related Links

- ALOS Research and Application Project of JAXA/EORC
- Product/Data Format Info.
- Calibration Info.

- Since ALOS-2 account is provided for PI only, we have to distribute data to CI after getting the products by ALOS-2.
- We developed a web system to distribute PALSAR-2 data to CI.
- The system requires ID & password so that CI can't get other country's data.

Last update : September 03 2015 07:29:34

Managed by Earth Observation Research Center (EORC), Japan Aerospace Exploration Agency (JAXA)

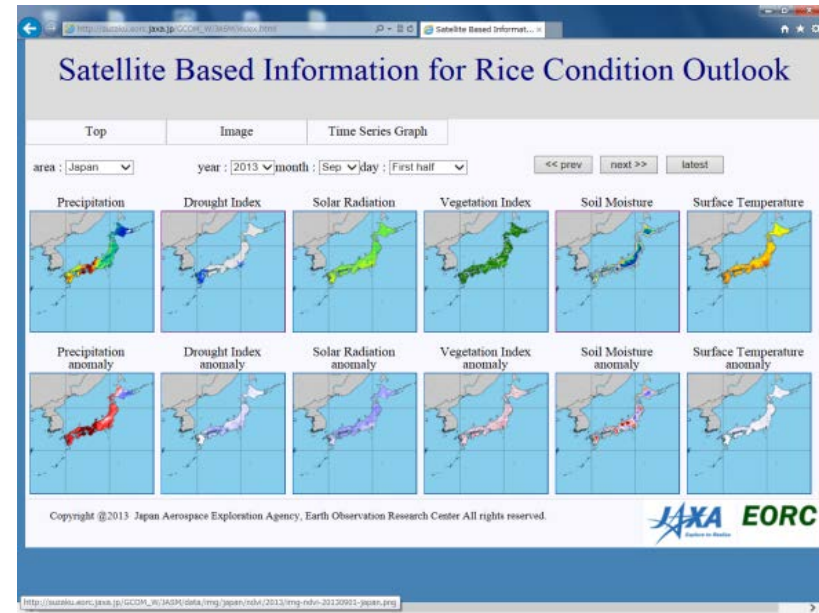
- Monthly rice crop outlook / Agro-meteorological Information Products -



Provision agro-meteorological information derived from satellites with NDVI

Worked with ASEAN food security information system (AFSIS) to provide crop condition overview information and outlooks for FAO AMIS through GEOGLAM

- The JAXA/RESTEC teams developed the JASMIN (agro-met information provision system for outlook) tools



- Monthly rice crop outlook / Agro-meteorological Information Products -

Environmental Factors

- Solar Radiation
- Temperature
- Rainfall
- (CO₂, O₂)

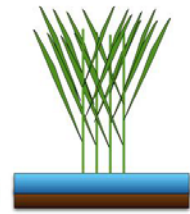
Nutrient Factors

- Nitrogen (N)
- Phosphorus (P)
- Kalium (K)
- (S, Mg, Fe etc.)

Environmental factors

Rice Growth

good ?



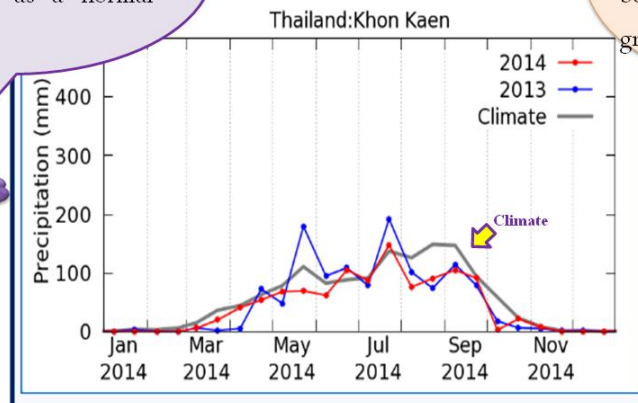
Rice Production

good ?



Time series graph

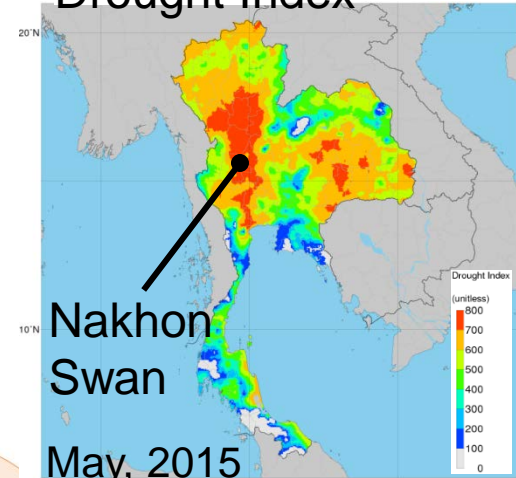
The "climate" is an average data in past years and it can assume as a normal value



The rice growing condition by "Climate" becomes a normal growing



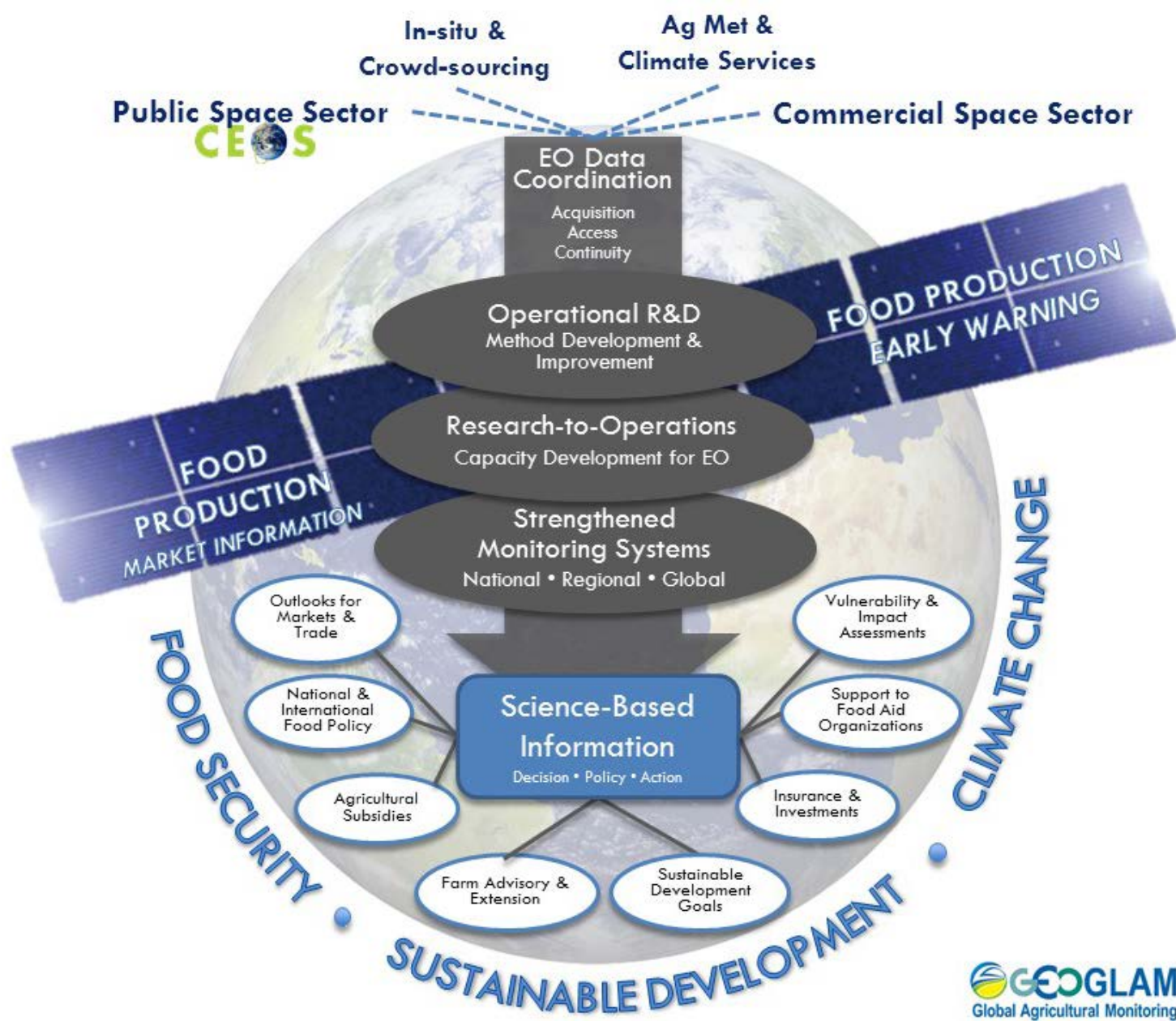
Drought Index



Asia-RiCE Strategic Issues

- Contribution to UN SDG2 through how and with who? Indicator (GEO-FAO->>>>) for end hunger, achieve food security and improved nutrition, and promote sustainable agriculture)
- **Secure observation, continued and easy data access:** Share observation / acquisition plan of multiple satellites at one site to conduct information validation for rice growing and production estimation (especially for wall-to-wall (whole country – country scale) starting from main crop area of Indonesia, Vietnam, and Thailand) in cooperation with CEOS
- **Need Support ICT environment with applications for data archive and processing**
- **Expand SDMS / cloud computing system to do practical use for end users such as Ministries of Agriculture -> in cooperation with CEOS Data Cube and Servir-Mekong**
- **Promote EO data and related information sharing** (especially ground base data and base line map such as LULCC / rice crop mask, rice crop calendar, etc.)
- **Promote cross validation** for outlook and rice crop growing and production estimation -> **Develop standard ground observation data collection method guideline**
- **Promote regional coordination** (need donor such as ADB, UN-ESCAP, MRC, CEOS, and GEO support, and contribution/endorsement from national monitoring systems)
- **Sustained institutional support to promote satellite data usage & validation** (many Asian countries are developing countries)

New Draft Organizational Framework for GEOGLAM



How GEOSS can / should contribute to SDGs

- **To understand current and future perspectives of food production and consumption**
- **To map current activities onto action items for SDGs**
- **To prioritize current activities for SDGs**
- **To discuss how agriculture related observations and data are important for SDGs**
- **Etc.**

SDG 2: End hunger, achieve the food security and improve nutrition, and promote sustainable agriculture.

- By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
- By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
- By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
- By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
- By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
- Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
- Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round
- Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility

Agri-GEOSS

AGRICULTURE THEMATIC COMMUNITY

- Support of the SDG 2: End hunger, achieve the food security and improve nutrition, and promote sustainable agriculture.
- Support the development of a Latin American Regional GEOGLAM.
- Greater collaboration between US and Canada on GEOGLAM activities.
- Enhance current GEOGLAM monitoring activities to better encompass the priorities of Latin America (e.g. regionally important crops).
 - Early Warning Crop Monitor (for countries-at-risk)
 - (eventually) Rangeland & Pasture Productivity (RAPP) Monitor
 - (eventually) full GEOGLAM Crop Monitor (all crops of national/regional importance)
- Continue to develop the Rangeland & Pasture Productivity (RAPP) sub-Initiative (www.geo-rapp.org)
 - Australian leadership; large focus on South America.
 - Further grow Community of Practice.
 - Seek participation of aquaculture and fisheries.