

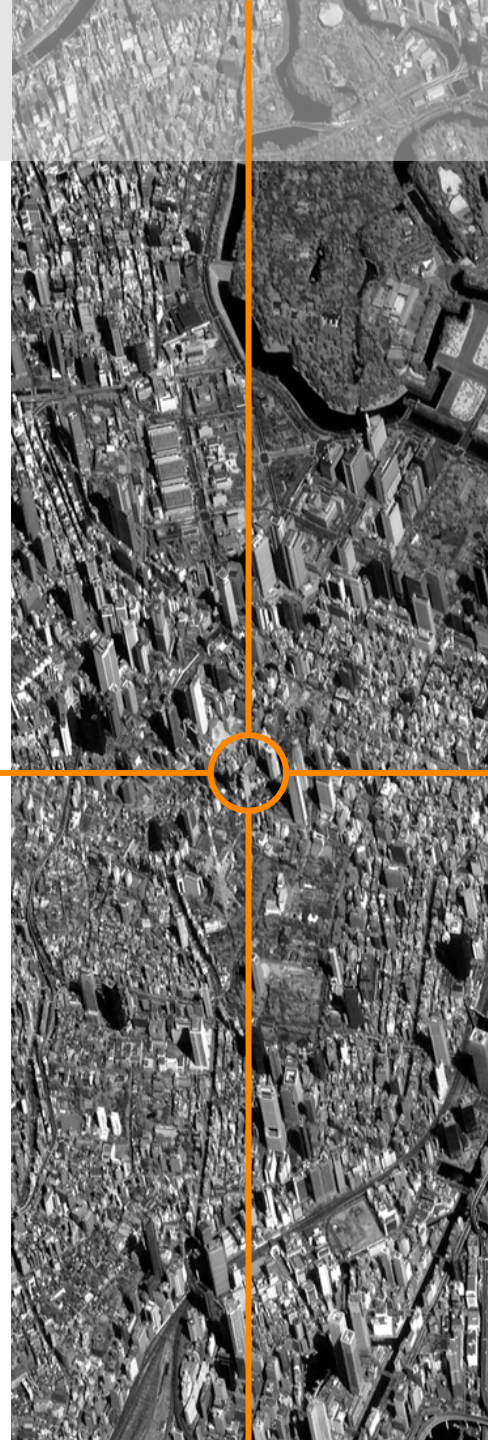
AFSIS rice growing outlook and JASMIN (Initiatives and projects using JAXA's agro-met services)

Tsugito Nagano

Deputy Manager

Solution Service Department I

Remote Sensing Technology Center of Japan

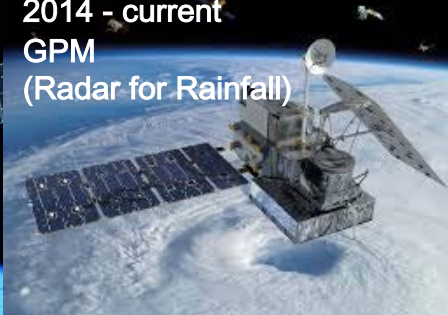


About RESTEC

2012- current
GCOM-W
(Radiometer for Water)



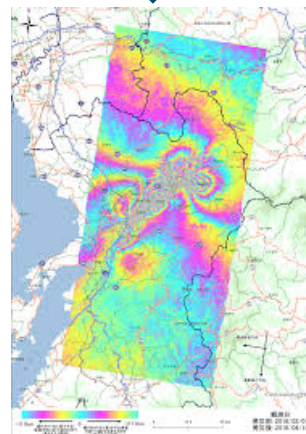
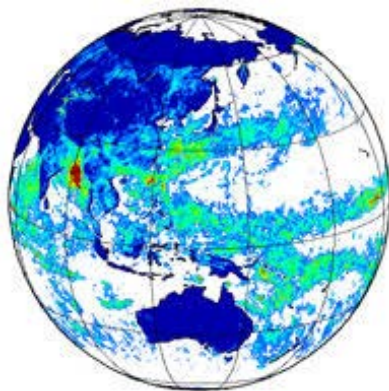
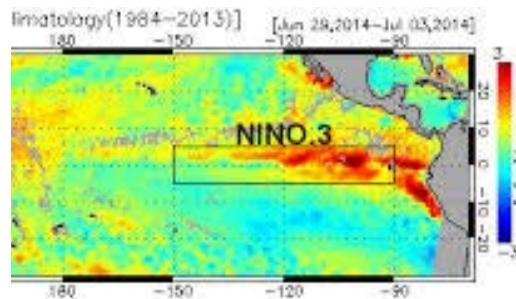
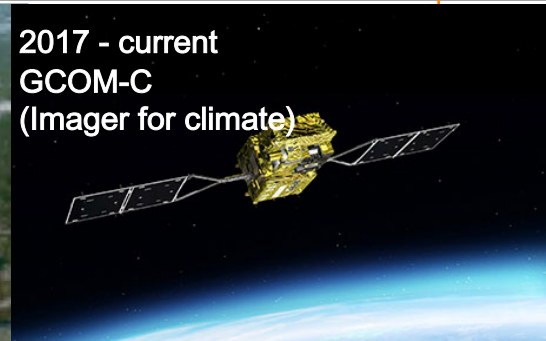
2014 - current
GPM
(Radar for Rainfall)



2014 - current
ALOS-2
(Radar for Land)



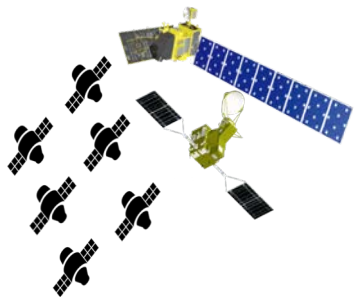
2017 - current
GCOM-C
(Imager for climate)



Remote Sensing Technology Center of Japan (RESTEC) works mainly for Japanese satellite missions entrusted by Japan Aerospace Exploration Agency (JAXA)

RESTEC develops algorithm, software and applications using remote sensing data.

Application Development for Farmer's poverty reduction



Products using Multiple Space Fleets

High-Temporal NDVI Info

Field Detection by SAR

High-Accurate Land Use Info

Agro-Met Information

Topographic Info using DEM

+

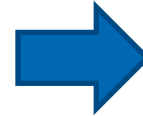
Computing Model

$f(x)$

AI

UAV

ICT+IoT



Statistics / Food Security

Farming Assist

Farmers Support (Finance)

Rice Growing Outlook activity in AFSIS



**Courtesy of Shoji Kimura,
ASEAN Food Security Information System
Advisor**

AFSIS

(ASEAN Food Security Information System)

as a subsidiary body under AMAF+3

13 member countries (10 ASEAN countries + China, Japan, Korea)

➤ Objective

To strengthen food security in the region through the systematic collection, analysis and dissemination of food security related information.

ASEAN+3 Minister Meeting on Agricultural and Forestry (AMAF+3)

ASEAN Food Security Information System (AFSIS)



AFSIS Board (Director General of ASEAN+3 countries)

AFSIS Focal Point

(Director of ASEAN+3 countries)

AFSIS Secretariat

Bangkok, Thailand

National Center by country

Development of Food Security Information in ASEAN

VISION

MISSION

Administrative activity

- DG -FP Meeting
- Management of training and workshop
- Annual Report
- Accounting
- Others

Development of Information network

- AFSIS Data base
- ACO Report
- EWI Report
- Others

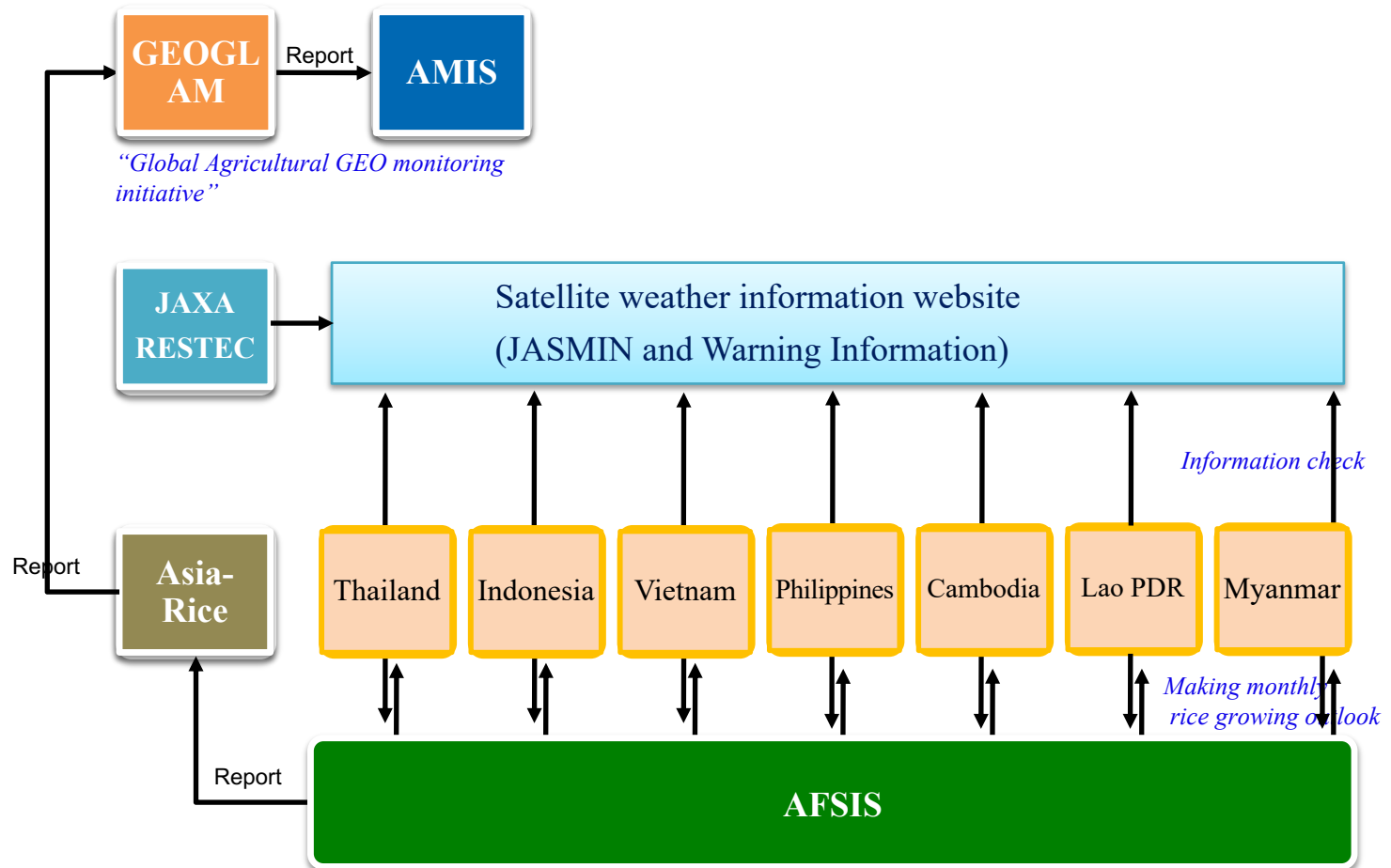
Development of Human capacity

- Training
- Mutual technical cooperation
- Seminar, Workshop
- Others

Development of Agricultural statistics research

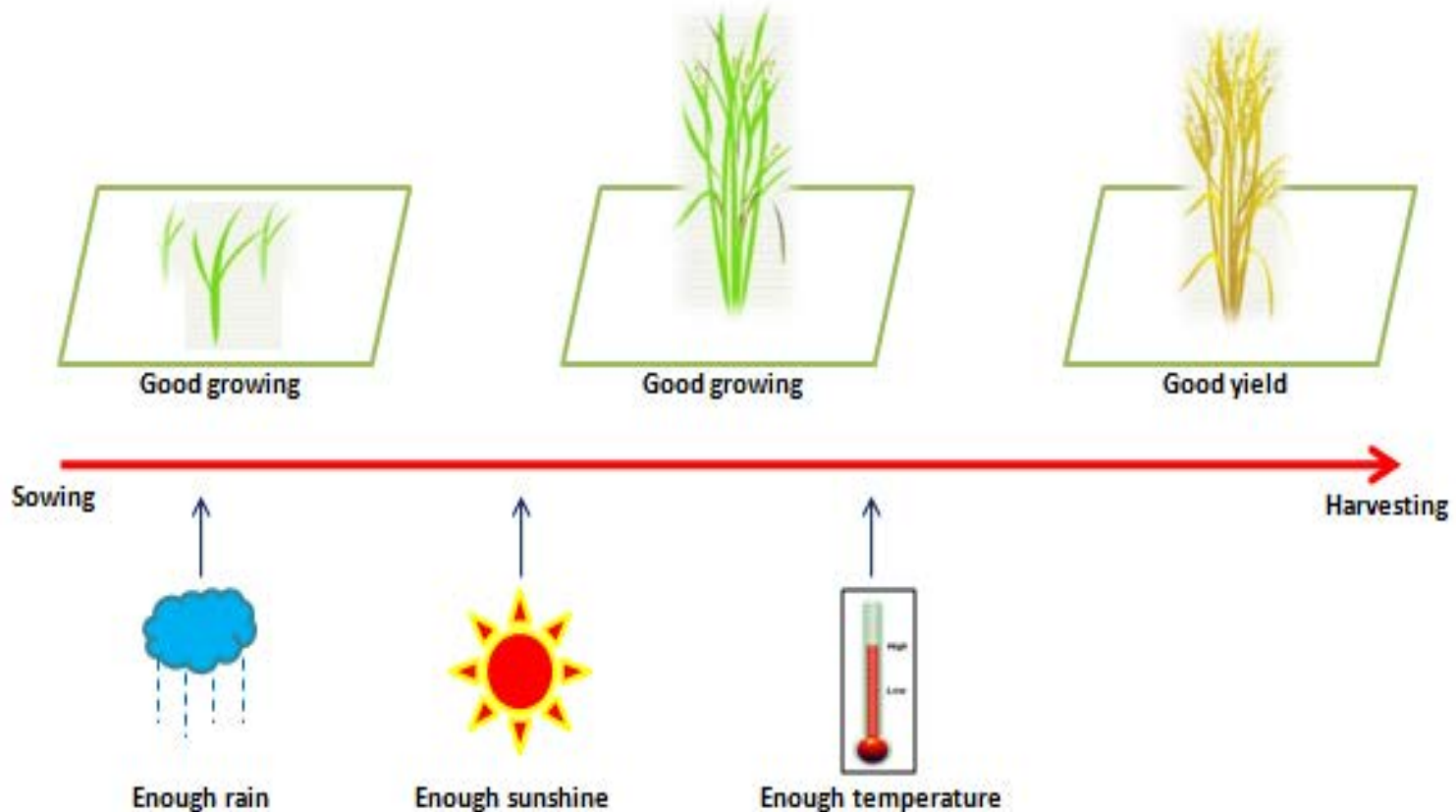
- ALIS
- Forecasting Model Information
- Rice growing outlook
- Others

Rice Growing Outlook activity



Rice Growing Outlook activity

The rice growing condition and rice damage condition have a causal connection with the weather condition in the past and present times.



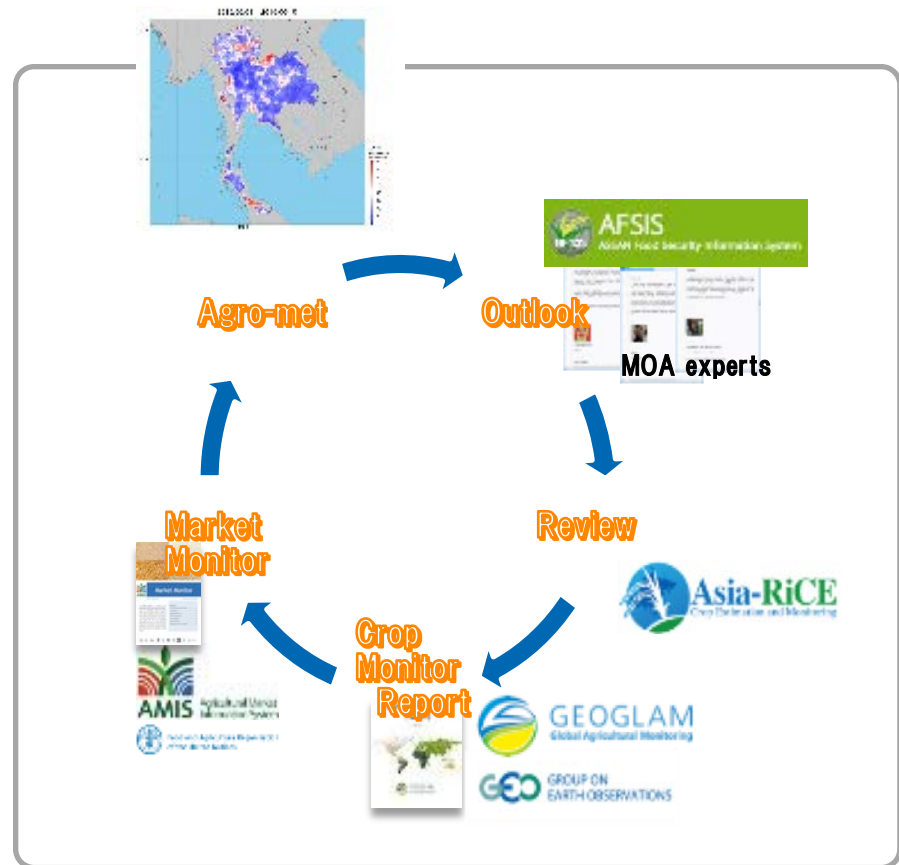
Contribution from space community : Rice Growing Outlook for G20/GEO GLAM

- On-going outlook activity under ASEAN framework in cooperation with Japan Aerospace Exploration Agency and AFSIS under G20/GEO GLAM (Global Agriculture Monitoring) initiative to contribute FAO AMIS (agriculture market information system) project.

To estimate rice crop production, we need the following level of crop calendar to estimate monthly outlook

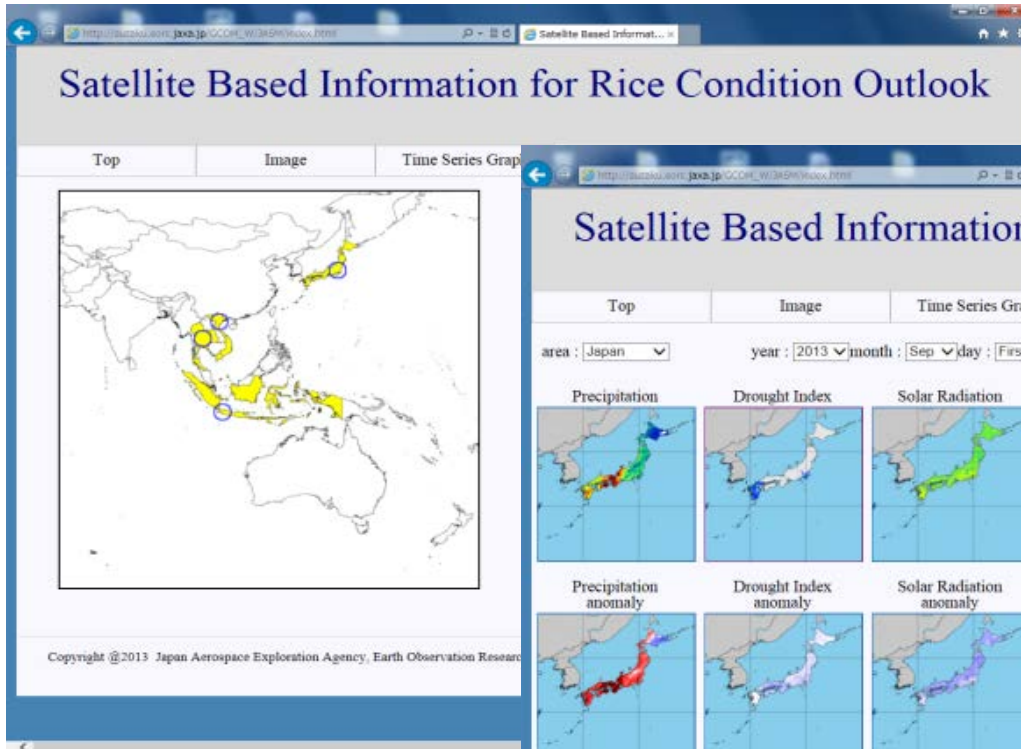
Interpret agro-met anomaly

E.g.
Drought -> negative impact to decrease production.



JASMIN – Data-distribution System for Rice Outlook

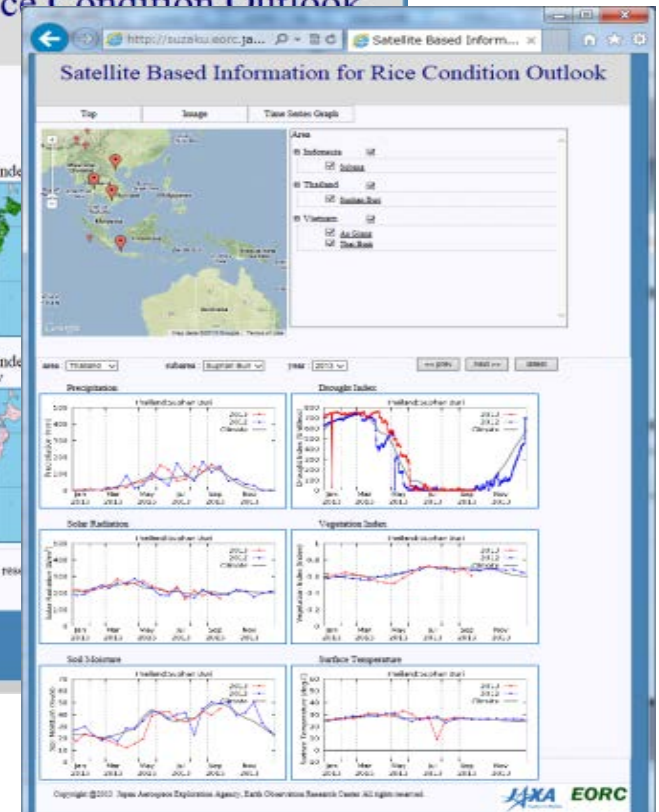
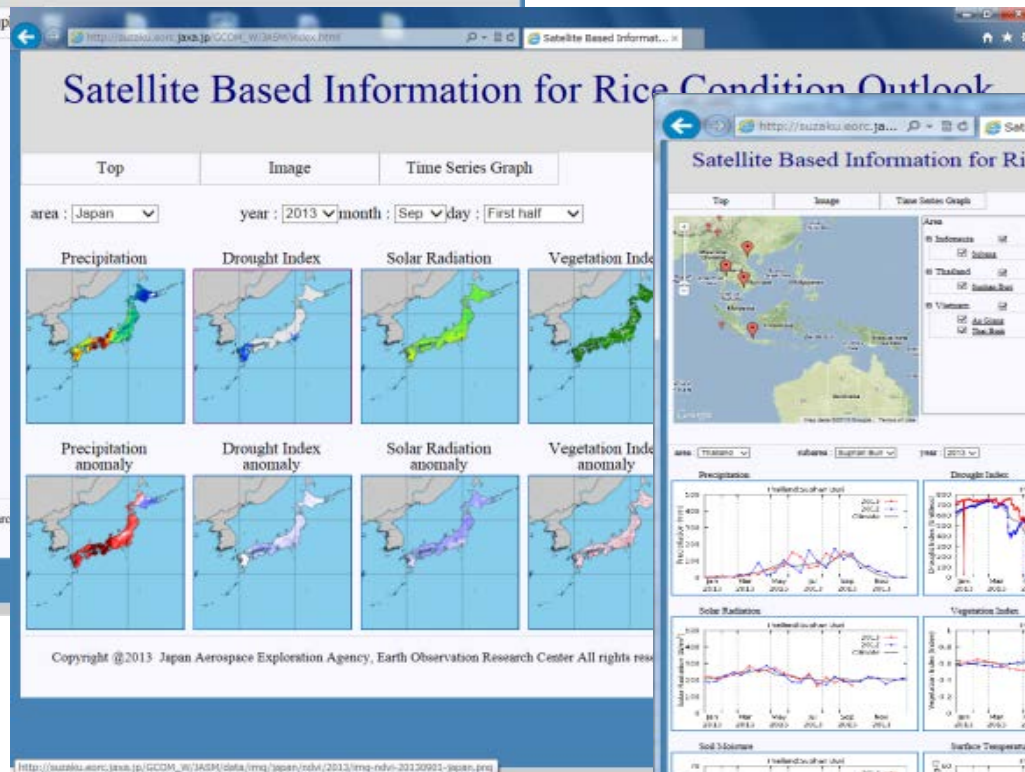
- Each data will be updated twice a month (15th, 31th day of month).
- Users can access and get latest data any time.



Top

Spatial Distribution

Time-Series



http://suzaku.eorc.jaxa.jp/GCOM_W/JASMI/index.html

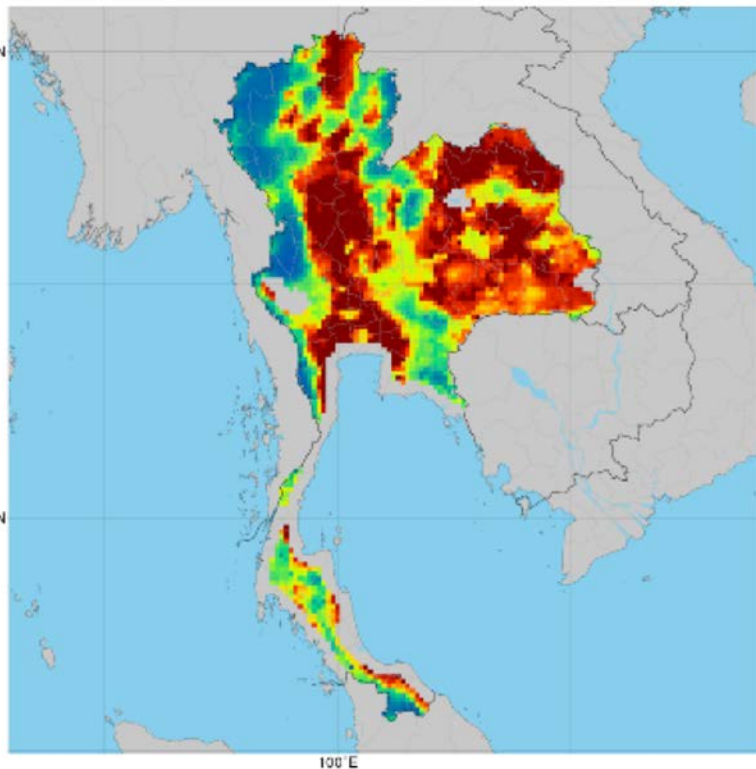
Assessment Source for Rice Growth Outlook

- Satellite observation provides “Current Condition” and “Anomaly” information and they are updated every 15 days (twice a month).

Parameters	Interval	Spatial Resolution	Data Period (anomaly calc.)	Satellite Data Source
Precipitation	Cumulative (15-day)	10 km	2002- (2002-2012)	GSMaP (GCOM-W1, TRMM, MTSAT etc.)
Solar Radiation	15-day Average	5 km	2007- (2007-2012)	MODIS
Land Surface Temperature	15-day Average	5 km	2002- (2002-2012)	MODIS
Soil Moisture	15-day Average	50 km	2009- (2002-2012)	AMSR-E, WINDSAT
Drought Index (by U-Tokyo)	15th /31[30]th day of month	10 km	2003- (2003-2012)	GSMaP, MTSAT
Vegetation Index	15th /31[30]th day of month	5 km	2002- (2009-2012)	MODIS

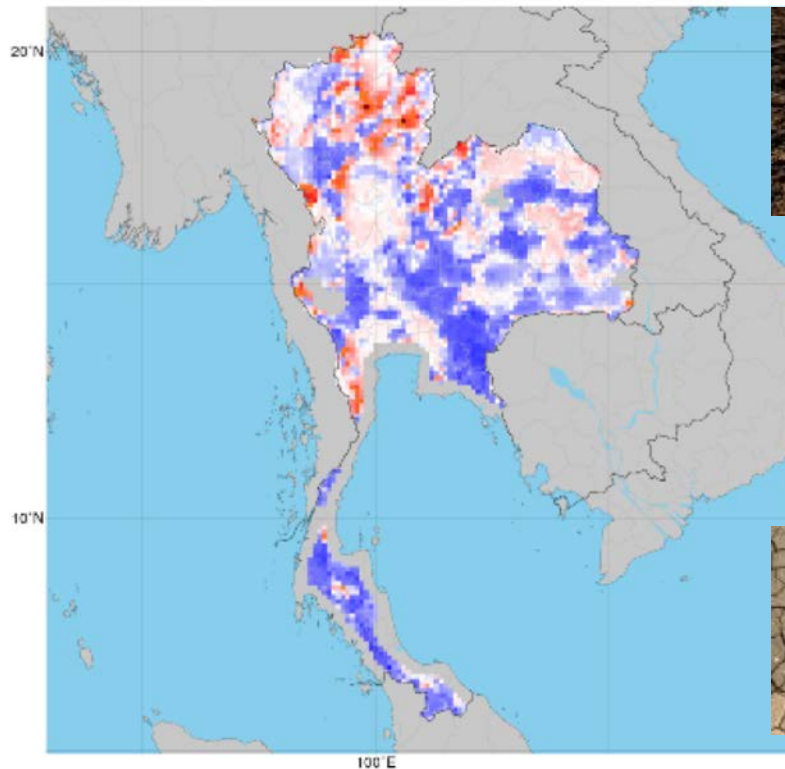
Current Condition

2013/09/01 – 2013/09/15



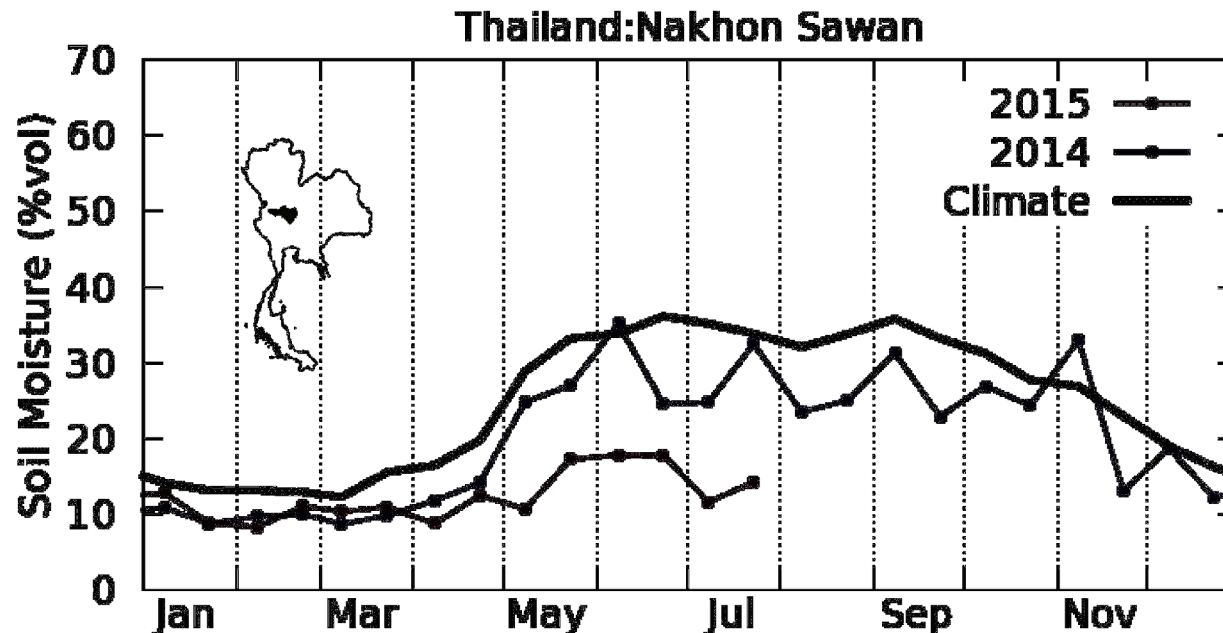
Anomaly

2013/09/01 – 2013/09/15



- System provides 15-day average
- Spatial resolution : 50km
- There is limitation in soil moisture derived from satellite data
 - Values are too high around water area and too low in the forest and mountain area

(c) Seasonal Change of Soil moisture (Nakhon Sawan, Thailand)



Thailand is experiencing the worst drought in decades. The left article is a citation from AFSIS Blogs.

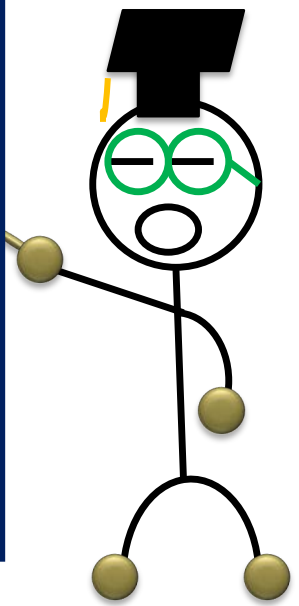
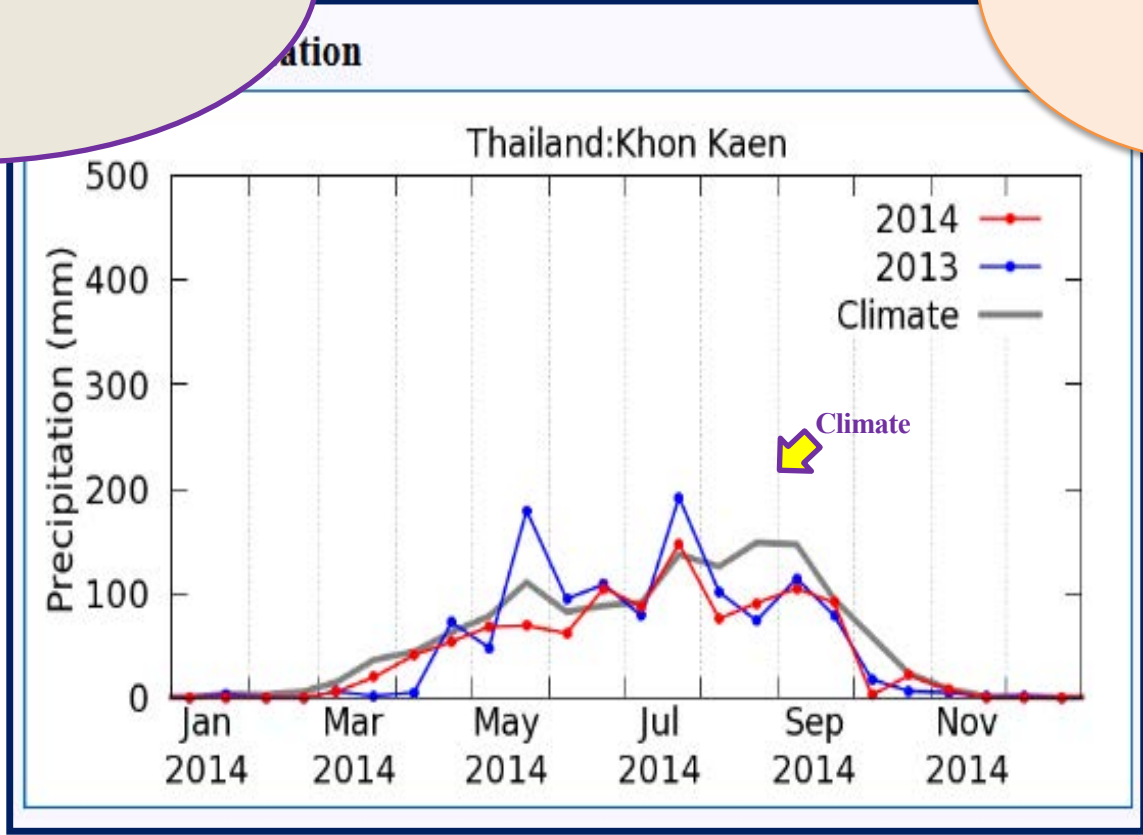
Figure (a) and (b) show distribution maps of soil moisture and its ratio to normal year. Figure (c) shows a time series graph of soil moisture in Nakhon Swan, Thailand. The red and gray lines mean lines of 2015 and normal year, respectively. A very dry condition is continued from the beginning of this year.

10. The way of looking at meteorological satellite data

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 rice growing



Courtesy of Mr.Kimura of AFSIS

Rice Growing Outlook as a part of AMIS Crop Monitor

<https://cropmonitor.org/index.php/2017/12/06/crop-monitor-for-amis-november-2017/>



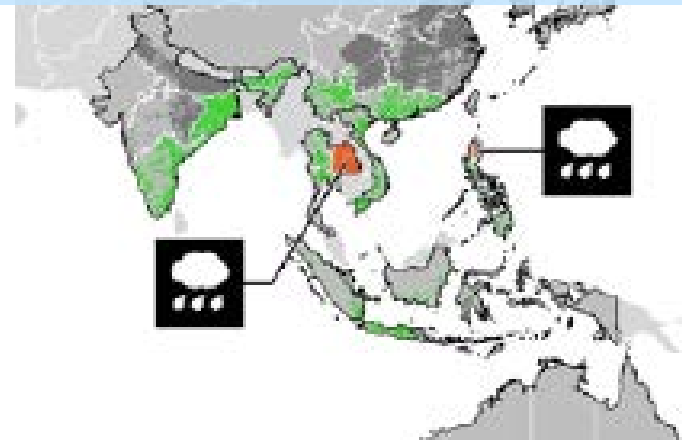
Crop Monitor for AMIS

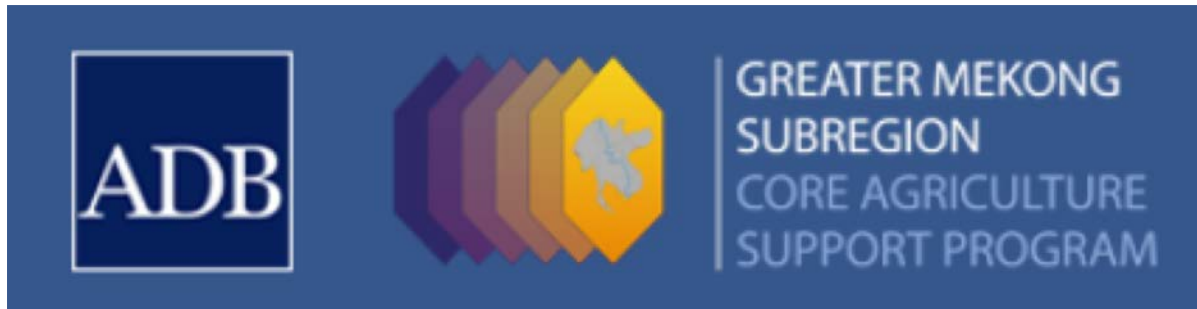
Overview:

By the end of November, conditions for the four AMIS crops remain mixed. Winter wheat in the northern hemisphere heads into dormancy under generally favourable conditions, while in the southern hemisphere, harvest conditions vary significantly. For maize, harvest wraps up in the northern hemisphere, and in the southern hemisphere conditions are favourable with only minor dryness in Argentina. For rice, conditions generally favourable in Southeast Asia, with exceptions in parts of Thailand and the Philippines. For soybeans, the season has ended in the northern hemisphere and in the southern hemisphere conditions are favourable in Brazil, while mixed for sowing in Argentina.

Rice: In Indonesia, conditions are favourable as harvest of dry-season rice enters the peak period, with expected higher yields than last year. Sowing of wet-season rice continues slowly, while producers are waiting for higher rainfall levels.

(Reported by ASEAN FOOD SECURITY INFORMATION SYSTEM)

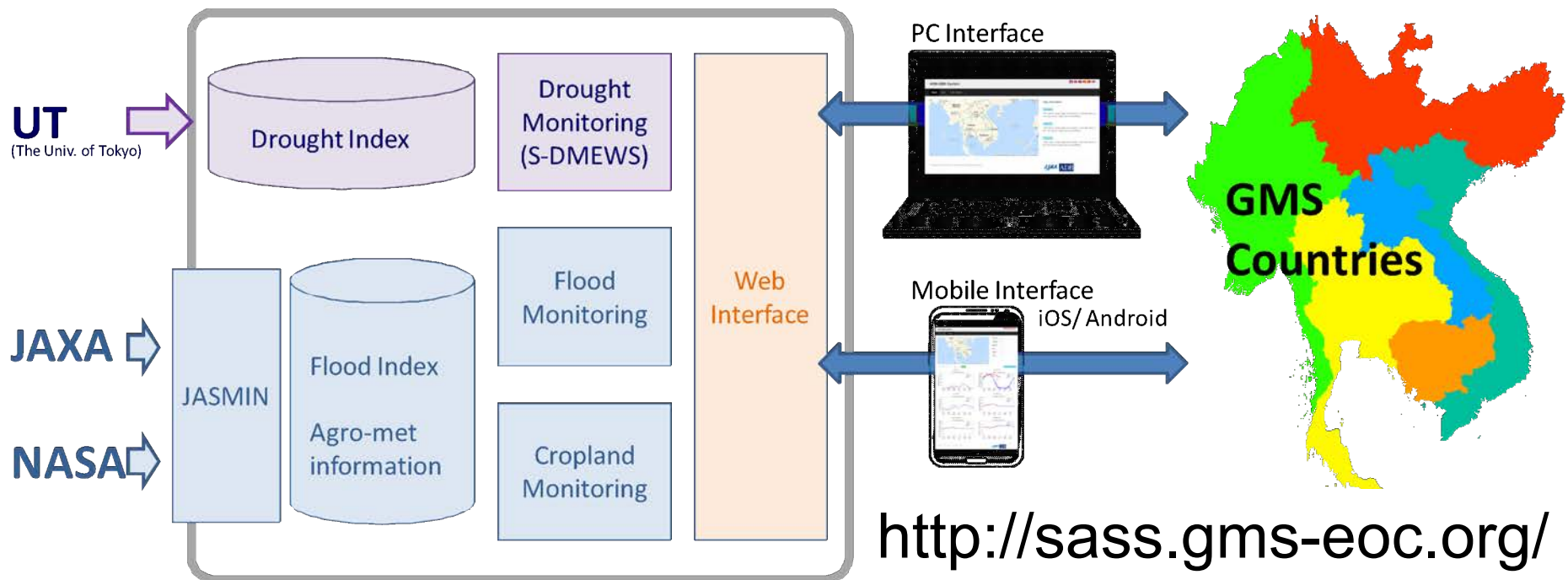




The project activities are as follows

- (i) Development of the satellite-based **rainfall anomaly warning** and **wide-area flood inundation monitoring** system for GMS and integration it to S-DMEWS
- (ii) Development of the satellite-based **agro-meteorological information** system for developing crop outlook in each GMS country
- (iii) Development of the **mobile phone application** for farmers to check satellite-based information for agriculture from abovementioned-system and S-DMEWS
- (iv) **Capacity development** of relevant agencies in GMS to apply the developed system
- (v) **Translation** of the developed system in the local languages

TA-6521 REG “Accelerating the Implementation of the Core Agriculture Support Program -Remote Sensing Consultant”



Concept of system architecture

TA-6521 REG "Accelerating the Implementation of the Core Agriculture Support Program -Remote Sensing Consultant"



@Myanmar



@Cambodia



@Lao PDR



@Viet Nam



@Thailand

Application Development for Farmer's poverty reduction



Products using Multiple Space Fleets

High-Temporal NDVI Info

Field Detection by SAR

High-Accurate Land Use Info

Agro-Met Information

Topographic Info using DEM

+

Computing Model

$f(x)$

AI

UAV

ICT+IoT



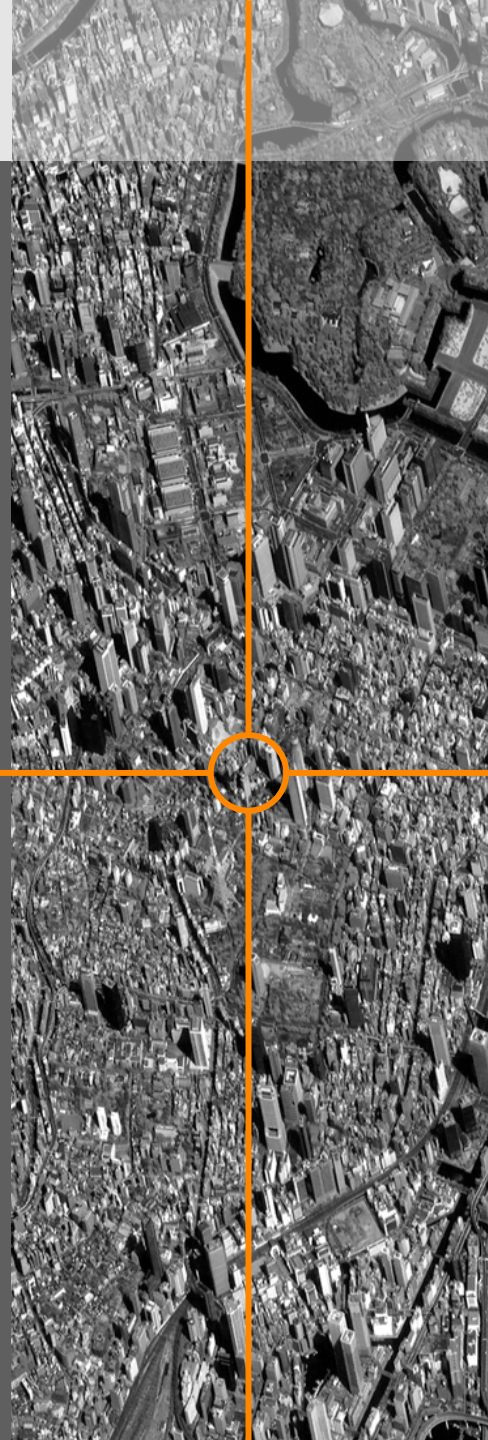
Statistics / Food Security

Farming Assist

Farmers Support (Finance)

For Insurance

Development of
“Weather Index Insurance”
in cooperation with SOMPO Group



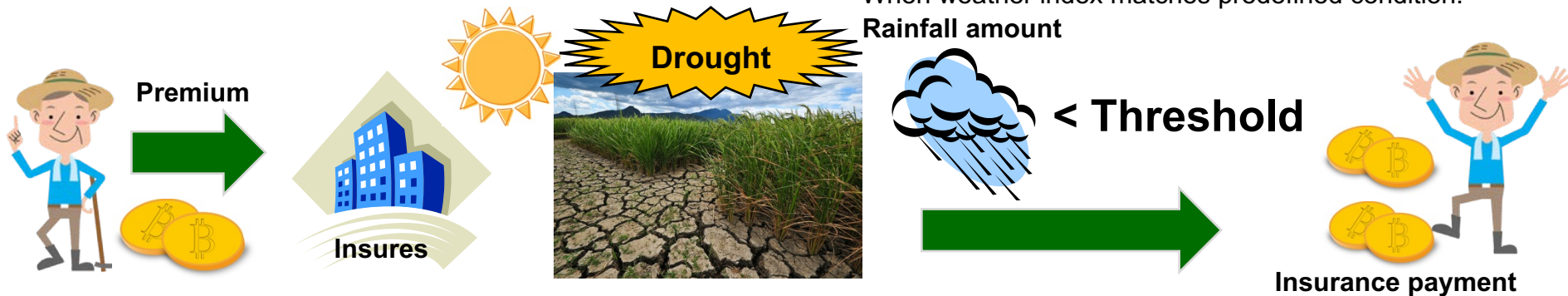
What is Weather Index Insurance?

“Weather Index Insurance (WII)”

- Compensates farmer’s loss due to extreme weather such as terrible rain and drought, based on predefined weather index.
- Compensation is made when weather index matches predefined condition.
- Loss investigation by insurance company is not required.

Insurance system (Case of WII against drought risk)

When weather index matches predefined condition.
Rainfall amount



Quick Cash in

Easy to Understand

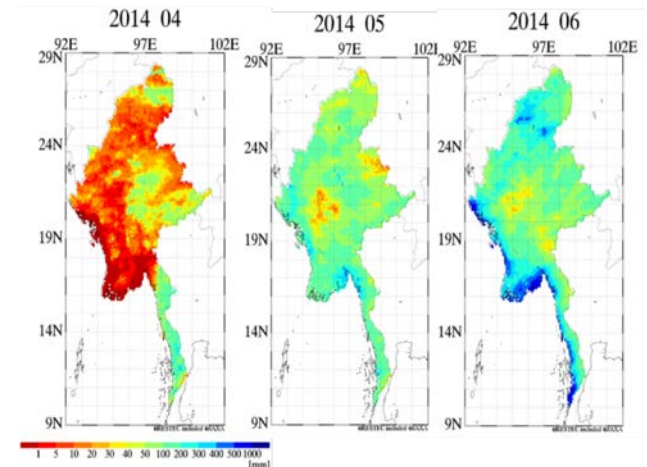
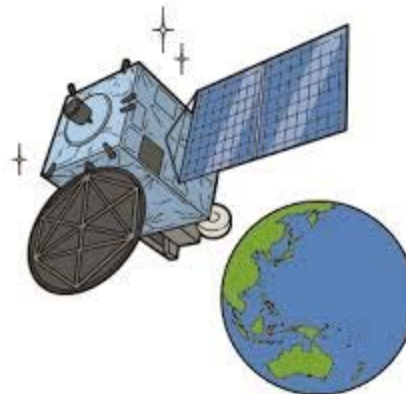
Simple and Efficient Solutions for Farmers!

New technology for Weather Index Insurance



SOMPO utilize data from satellite to measure rainfall amount

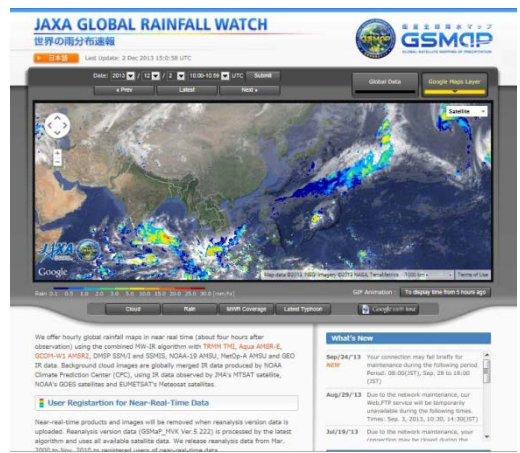
SOMPO utilize data from satellite provided by **Japan Aerospace Exploration Agency (JAXA)** with the cooperation and technology of **Remote Sensing Technology Center of Japan (RESTEC)** to develop **Weather Index Insurance in Myanmar**



Outline of Prototype Product for WIIM Project

Target Crop	Rice/Sesame
Target Area	Phase1: Central Dry Zone (CDZ) Phase2: Whole area of Myanmar
Target Risk	Drought/Flood
Insured	Farmers* *Borrowing money for farming operations from bank or micro finance institution.
Policy Period	Set by each division (based on each farming activity)
Index	Cumulative rainfall by GSMaP during Policy Period
Insurance Conditions	We design conditions that meet farmers' needs. (Relevant organizations' advices are appreciated.)
* Payout Amount	
* Premium Level (Probability of Covered Drought)	

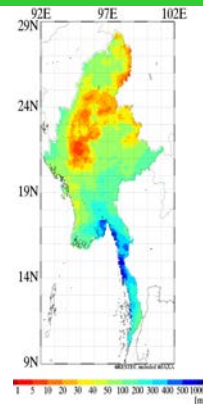
Image of GSMaP provided by JAXA



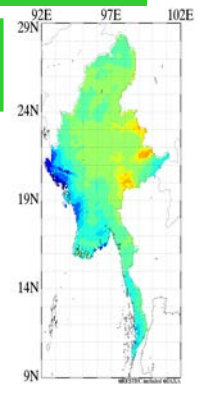
'Global Rainfall Map in Near-Real-Time (GSMaP_NRT) by JAXA Global Rainfall Watch' was produced and distributed by the Earth Observation Research Center, JAXA.
<http://sharaku.eorc.jaxa.jp/GSMaP/index.htm>

Image of rainfall calculated based on GSMaP

May 2005
Drought Year



May 2010
Normal Year




Product design

➤ Condition of prototype for rice farmers in XXXXX township

Policy Period (Observation Period)	4month in rainy season
Index	Cumulative Rainfall* during Observation Period (* Average value in XXXXX township)
Payout Condition	When index is below threshold
Threshold	X mm
Compensation	XXXXX kyat/acre
Premium	XXXXX kyat/acre (XXXX % of Loan principal*)

*Loan principal: XXXXXX kyat/acre

➤ Image of insurance payout

	Policy Period	Payout
Case1	No Drought Index > X mm	None
Case2	 Drought Index < X mm	XXXXX kyat/acre (XX% of Loan principal)

လယ်သမားများအတွက် စိုက်ပျိုးရေးအာမခံခံ ရာသီဥတု အညွှန်း အာမခံ

မြို့ပုံသုံးသပ်ချက်

- ကွန်ပက်တိုသည် မြန်မာနိုင်ငံမှ လယ်သမားများအတွက် ရာသီဥတုအညွှန်းအာမခံတစ်ခုအား ဖော်ဆောင်လျက် ရှိပါသည်။
- ဤအာမခံအား စိုက်ပျိုးချိန်အတွင်း မိုးခေါင်ခြင်း/ရေကြီးခြင်းများသောမူ ကာကွယ်ရန် ပြုလုပ်ပေးထားခြင်းဖြစ်သည်။
- စောင့်ကာလအတွင်းမှ အညွှန်းကိန်းသည် တစ်ကြိမ်သတ်မှတ်ထားသော အခြေအနေဖြင့် ကိုက်ညီသောအခါတွင် ပေးချေသွားပါမည်။

မုန်းမုန်းစိတ်ကူးထားသော အခြေအနေ

အညွှန်း - စိုက်ပျိုးချိန်အတွင်း ရွာသွန်းသော စုစုပေါင်း မိုးရေပမာဏ (ဥပမာ - ရွန်လ - စက်တင်ဘာလ)

တစ်ကြိမ်သတ်မှတ်ထားသော အခြေအနေ-

မိုးခေါင်ခြင်း

စိုက်ပျိုးချိန် အတွင်း ရွာသွန်းသော စုစုပေါင်း မိုးရေပမာဏမှာ ၂၀၀၀ မီလီမီတာ အောက်တွင် ရှိသည်။



ရေကြီးခြင်း

စိုက်ပျိုးချိန်အတွင်းရွာသွန်းသော စုစုပေါင်း မိုးရေပမာဏမှာ ၂၀၀၀ မီလီ မီတာအောက်တွင် ရှိသည်။



အာမခံပုံများ



အာမခံကြေး



ပုံမှန်ဖြစ်စဉ်



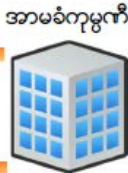
ငွေထုတ်ပေးခြင်း မရှိပါ

"ပြန်ရအမှတ်"(၂၀၀၀ မီလီမီတာ) > ရာသီဥတုအညွှန်း > "မိုးခေါင်ခြင်း"(၂၀၀၀ မီလီမီတာ)

မိုးခေါင်ခြင်းဖြစ်စဉ်



ငွေပေးချေသည်



ရာသီဥတုအညွှန်း < "မိုးခေါင်ခြင်း"အမှတ်"(၂၀၀၀ မီလီမီတာ)

ရေကြီးရေကျသောဖြစ်စဉ်



ငွေပေးချေသည်

ရာသီဥတုအညွှန်း > "ပြန်ရအမှတ်"(၂၀၀၀ မီလီမီတာ)

ပုံစံ

> ပုံစံ ၏ အခြေအနေ

အာမခံထားသော ငွေပမာဏ	တစ်ဧကလျှင် ၁၅၀၀၀ ကျပ် (ပေါ်စိုက်ပျိုးသည့်လယ်သမားများအတွက် MADB ၏ ချေးငွေ ငွေရင်း)
မူဝါဒသတ်မှတ်ချက် ကာလ	ရွန်လ - ဩဂုတ်လ
အကျုံးဝင်သည့် ဘေးအန္တရာယ်	မိုးခေါင်ခြင်း
အညွှန်း	မူဝါဒသတ်မှတ်ချက်ကာလအတွင်း တစ်စတစ်စများလာသောမိုးရေချိန်* *မြို့နယ်တွင်း ပျမ်းမျှတန်ဖိုး
အကျုံးဝင်သည့် မိုးခေါင်ခြင်း ဖြစ်နိုင်ခြေများ	1) ပုံမှန်မိုးခေါင်ခြင်း - 10%(တန်ဖိုးအမှန် 2.5%), 2) ဆိုးရွားစွာမိုးခေါင်ခြင်း - 7.5%
စံနှုန်း	1) ပုံမှန်မိုးခေါင်ခြင်း - 240mm, 2) ဆိုးရွားစွာမိုးခေါင်ခြင်း - 224mm
ထုတ်ပေးငွေ	1) ပုံမှန်မိုးခေါင်ခြင်း - SI ၏ 20% 2) ဆိုးရွားစွာမိုးခေါင်ခြင်း - SI ၏ 40%

> ထုတ်ပေးငွေနှင့် ပတ်သက်သောပုံ

	ရွန်	ဇူလိုင်	ဩဂုတ်	ထုတ်ပေးငွေ
အခြေအနေ ၁		> 240mm ပျက်စီးမှုမရှိ		0 ကျပ်
အခြေအနေ ၂	224mm <	< 240mm မိုးခေါင်ခြင်း		30,000 ကျပ်
အခြေအနေ ၃		< 224mm ဆိုးရွားစွာ မိုးခေါင်ခြင်း		60,000 ကျပ်

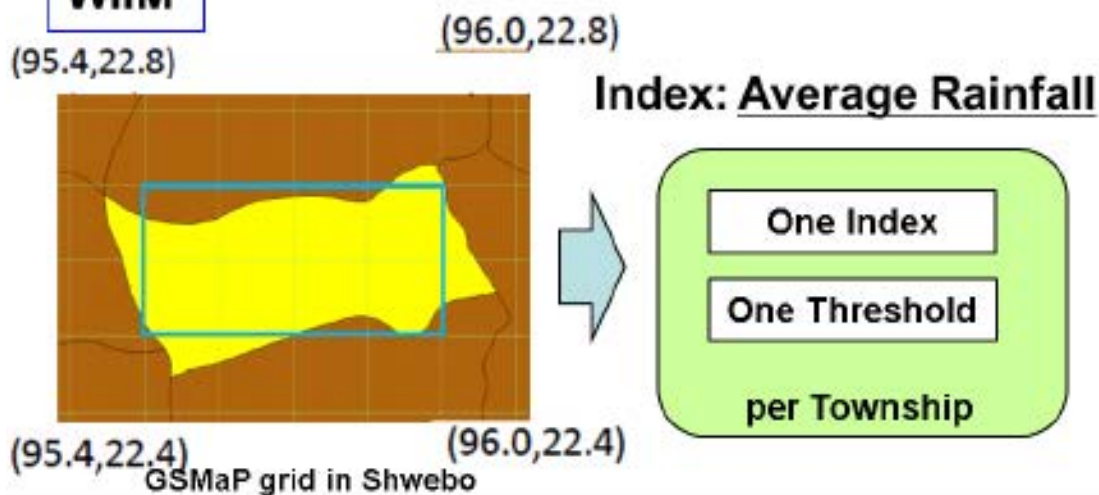
> ယခင်ထုတ်ပေးခဲ့သည့် ငွေပမာဏ

Year	Index (mm)	Payment (kyats/acre)
2000	213.3	60,000
2001	267.9	0
2002	460.1	0
2003	366.4	0
2004	424.6	0
2005	247.9	0
2006	536.5	0
2007	378.7	0
2008	344.2	0
2009	375.8	0
2010	344.8	0
2011	403.1	0
2012	231.4	30,000
2013	393.6	0
2014	290.9	0
2015	533.3	0
2016	542.6	0

အခြေအနေ ၁	ပျက်စီးမှုမရှိ	> 235mm	0 ကျပ်
အခြေအနေ ၂	< 240mm	ပထမမိုးခေါင်ခြင်း	30,000 ကျပ်
	ပျက်စီးမှုမရှိ	> 235mm	
အခြေအနေ ၃	> 240mm	ပျက်စီးမှုမရှိ	45,000 ကျပ်
	ဒုတိယမိုးခေါင်ခြင်း	< 235mm	
အခြေအနေ ၄	< 240mm	ပထမမိုးခေါင်ခြင်း	75,000 ကျပ်
	ဒုတိယမိုးခေါင်ခြင်း	< 235mm	

Challenging to apply “minimum” grid

WIIM



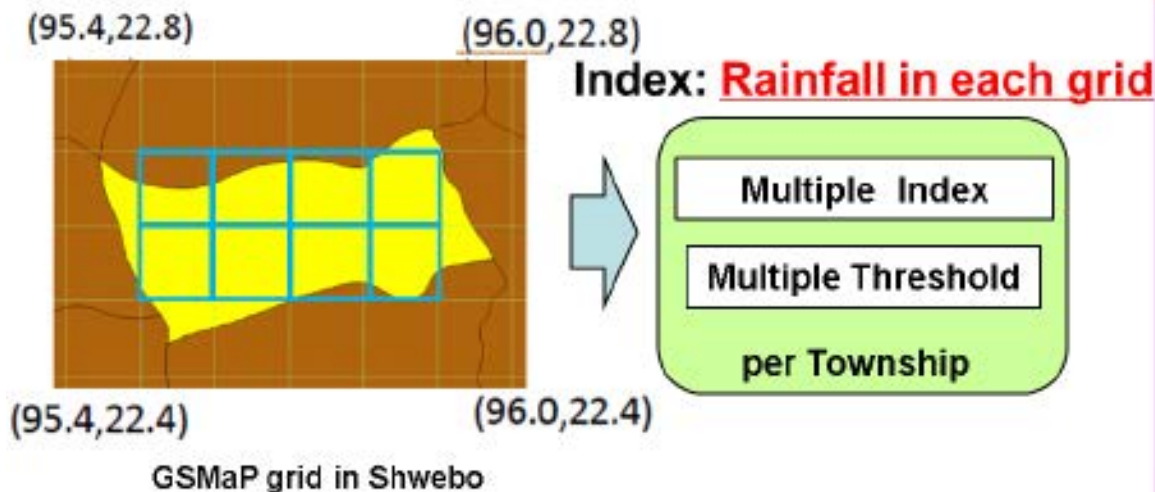
Advantages

- Easy to manage contracts
- Easy to understand for farmers

Disadvantages

- Hard to target topical drought risk

fine-WIIM



Advantages

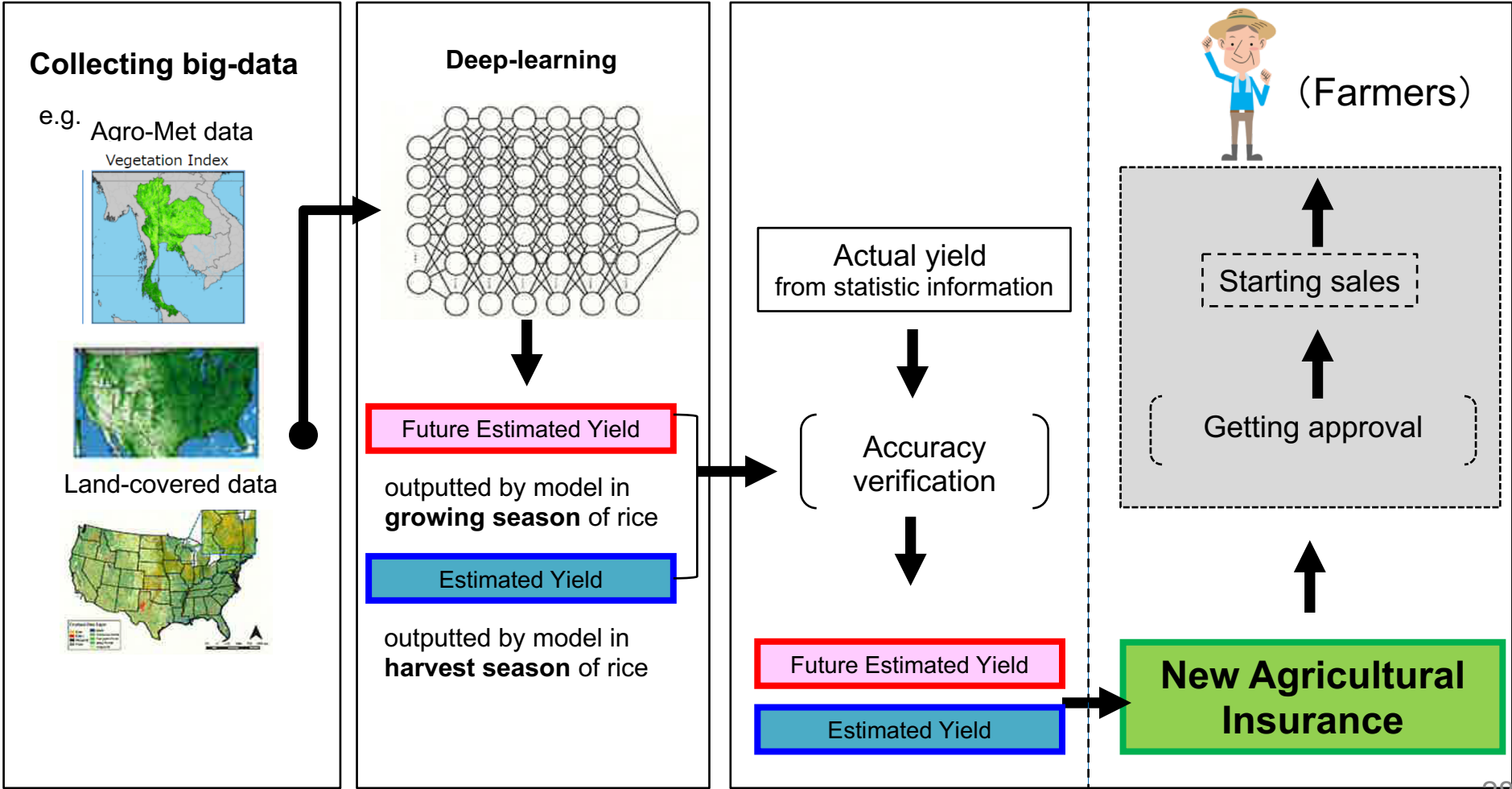
- Capable of targeting topical drought risk

Disadvantages

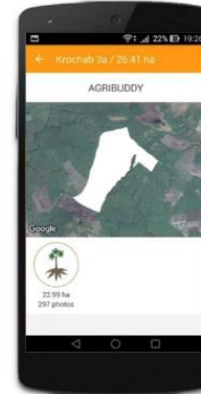
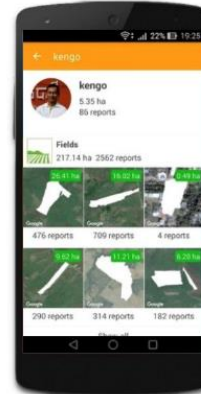
- Hard to manage contracts
- Hard to link between index grid and location of rice field

It's necessary to manage loan and insurance contracts on **IT system**.

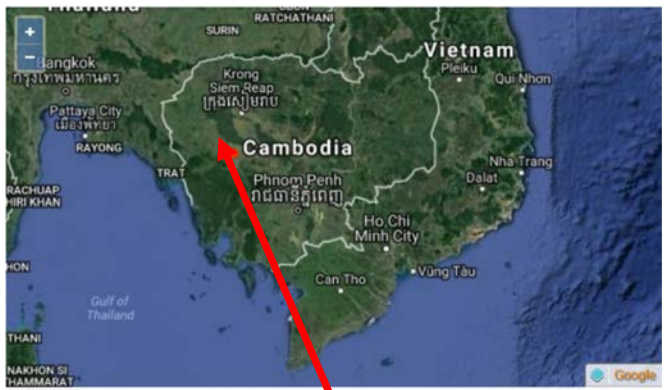
[Example] R&D to develop new insurance service using Agro-met (Cabinet Office, Government of Japan funding project JFY 2017@Thailand)



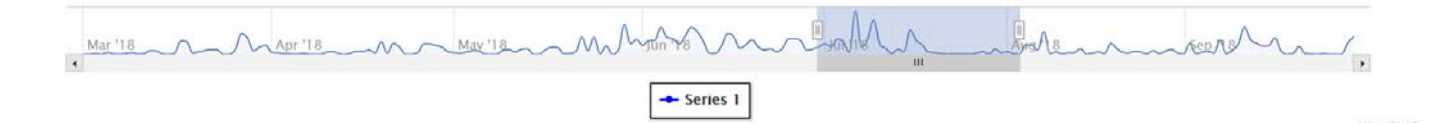
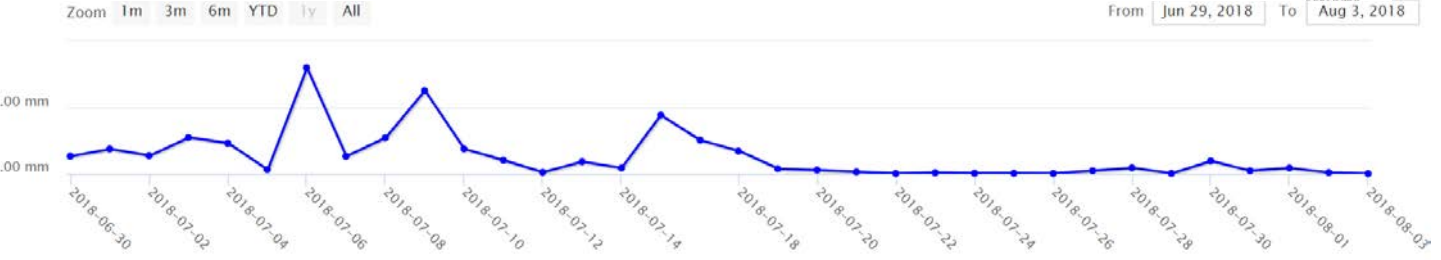
[Example] R&D to develop new insurance service using Agromet (Cambodia)



R&D to develop new insurance service using Agro-met @ Cambodia



Rainfall



Summary

- ✓ JAXA has been developing Satellite-based Agro-met Information systems such as JASMIN.
- ✓ JAXA and AFSIS collaborates to compose monthly rice growing outlook as a contribution to contribute FAO AMIS (agriculture market information system) project.
- ✓ RESTEC works as main contractor to develop systems and conduct activities using JAXA Agro-met data and applies experiences to other projects.