THE 8TH PLENARY MEETING OF UN-GGIM-AP

SPACE TECHNOLOGY FOR MONITORING HEALTH AND YIELD OF RICE

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OUTLINE

INTRODUCTION

Agriculture Monitoring

current state of space and geo-informatics technology for crop monitoring Flood and Drought Disaster

DISASTER MONITORING

Agricultural area : extremely exposed and vulnerable to natural disasters

AGRICULTURE SYSTEMATIC MONITORING

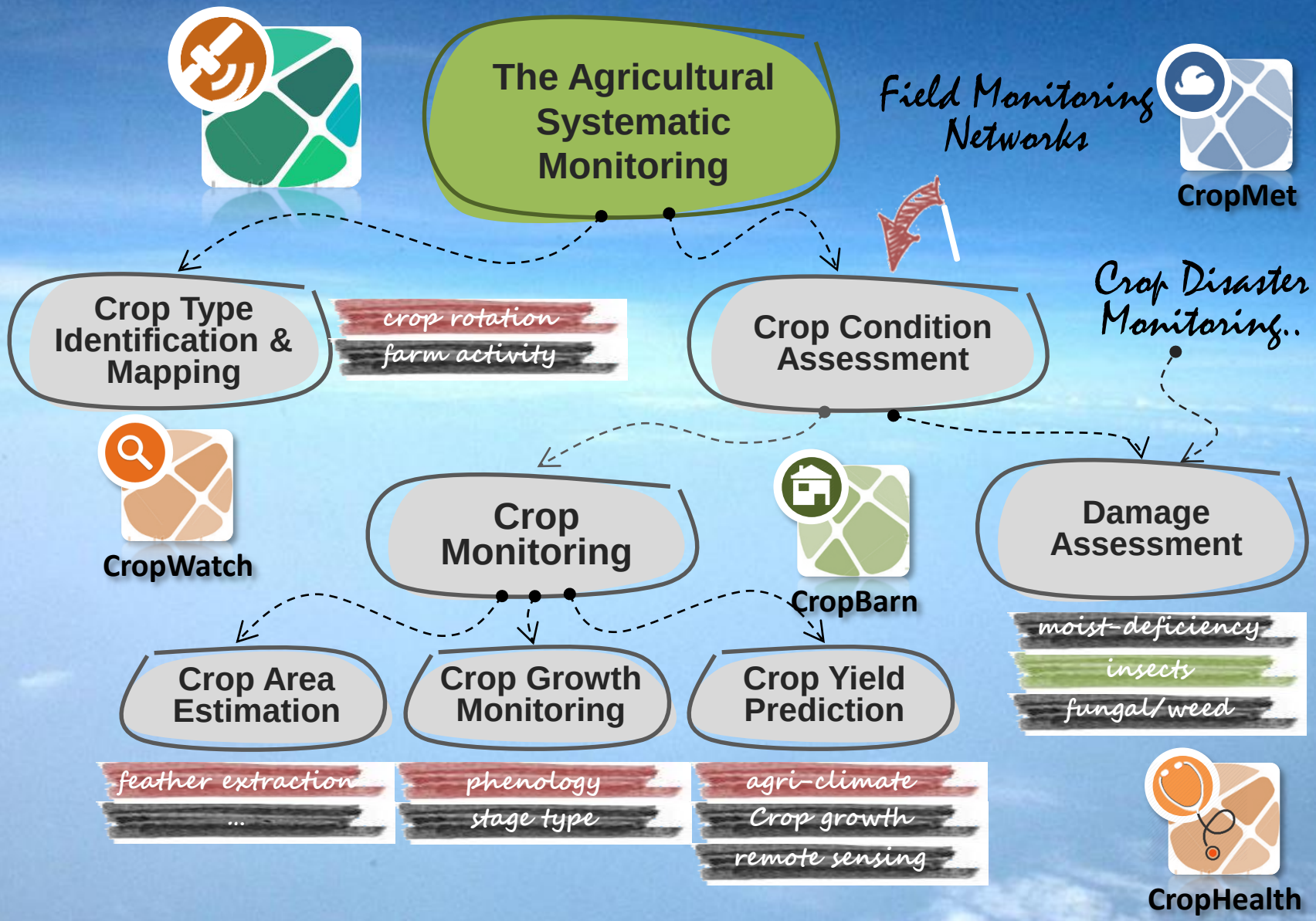
Crop Area Estimation

Weather and Climate

Crop Stress

Crop Yield Prediction

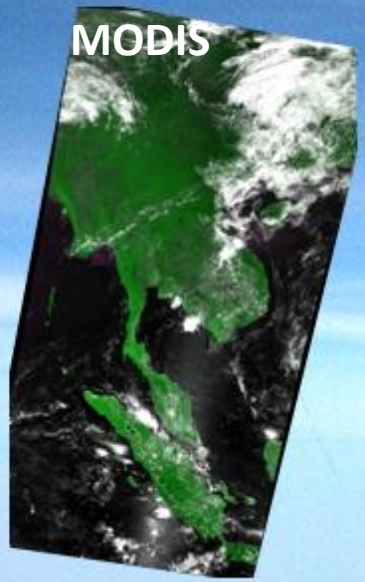
The Agricultural Systematic Monitoring



Several passive sensors and active onboard different satellites were used to monitor the crop areas every week

Optical Image

MODIS

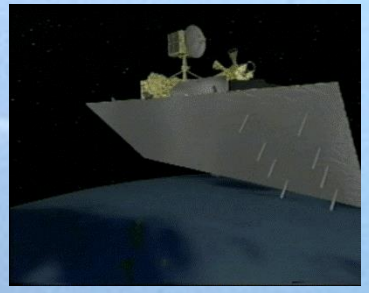


LANDSAT 7,8

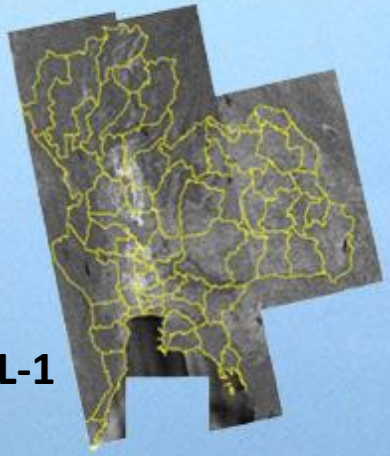
SENTINEL-2

THEOS

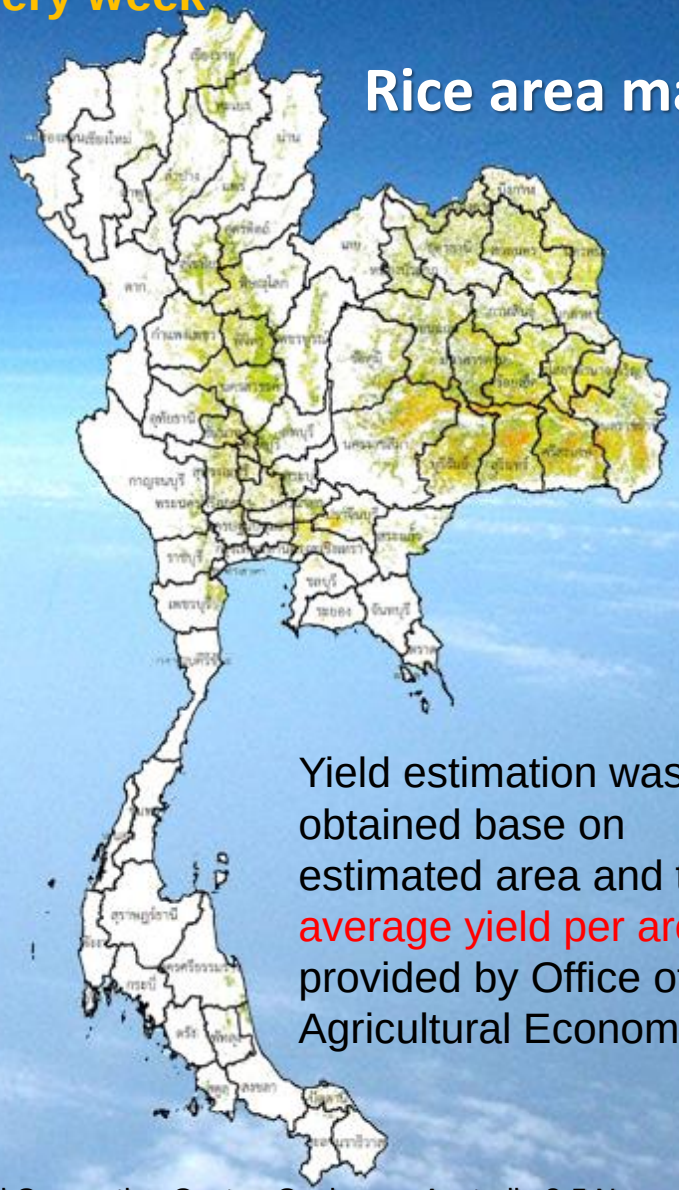
SAR Image



RADARSAT-2, SENTINEL-1

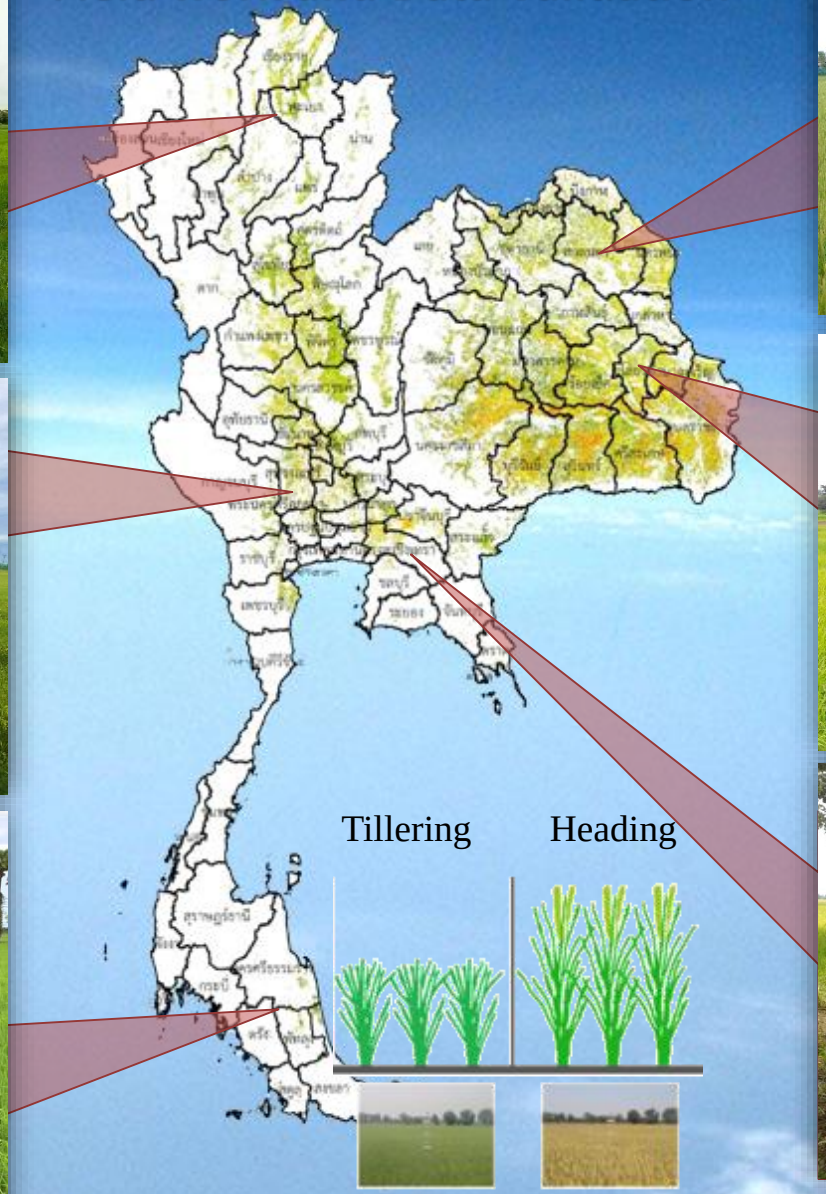


Rice area map



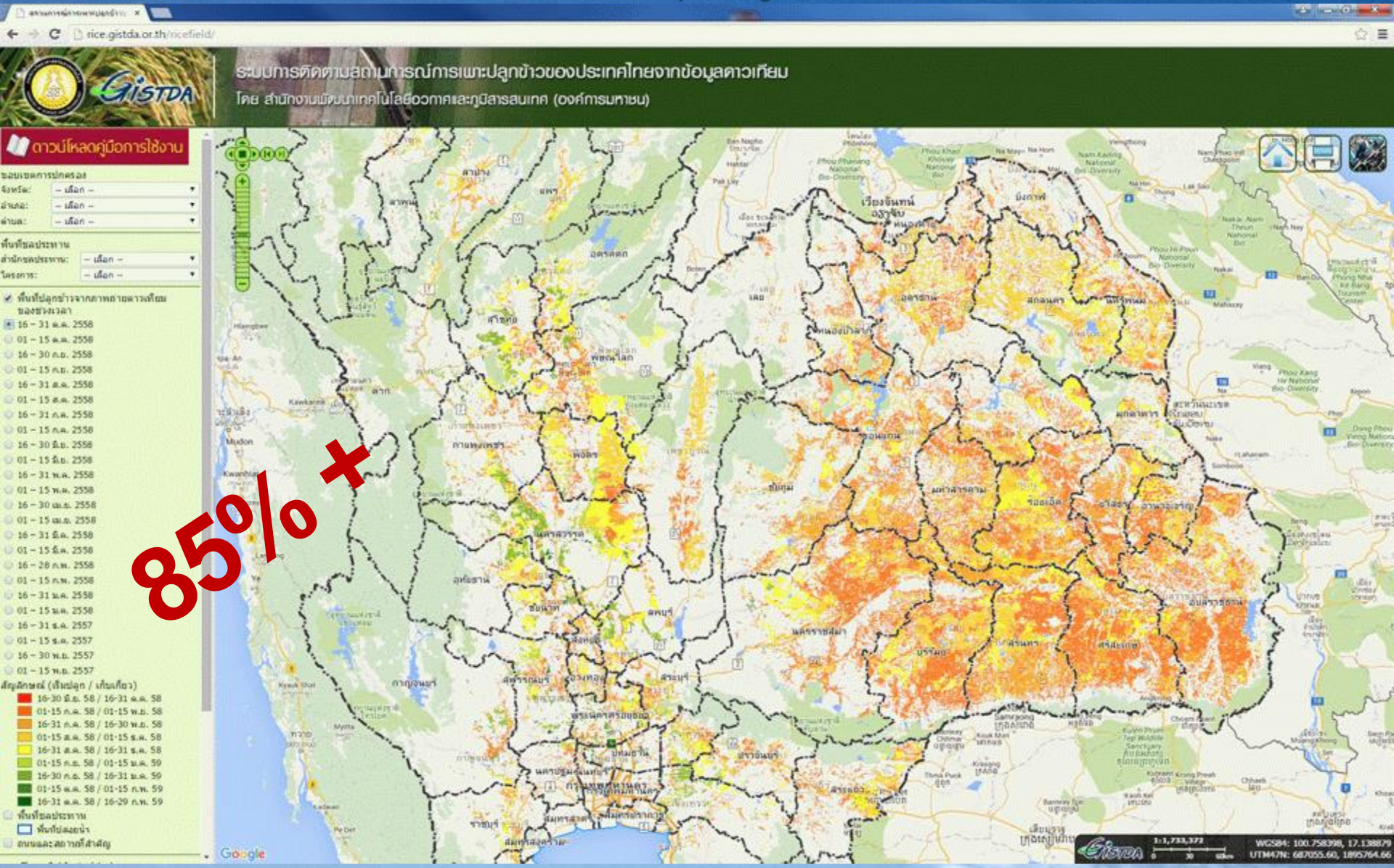
Yield estimation was obtained base on estimated area and the average yield per area provided by Office of Agricultural Economics

Field work and Data Validation



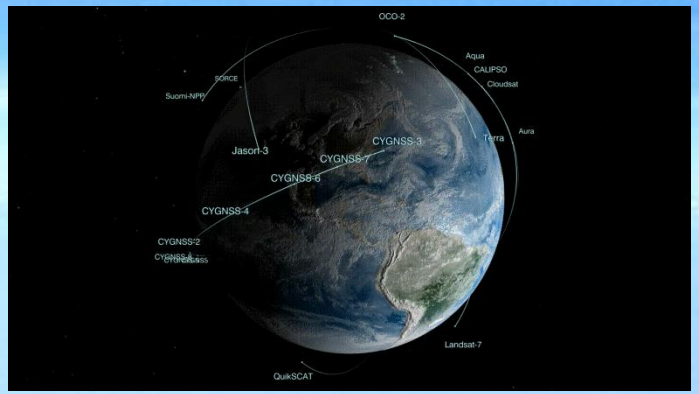
Rice Monitoring and Yield Estimating

http://rice.gistda.or.th

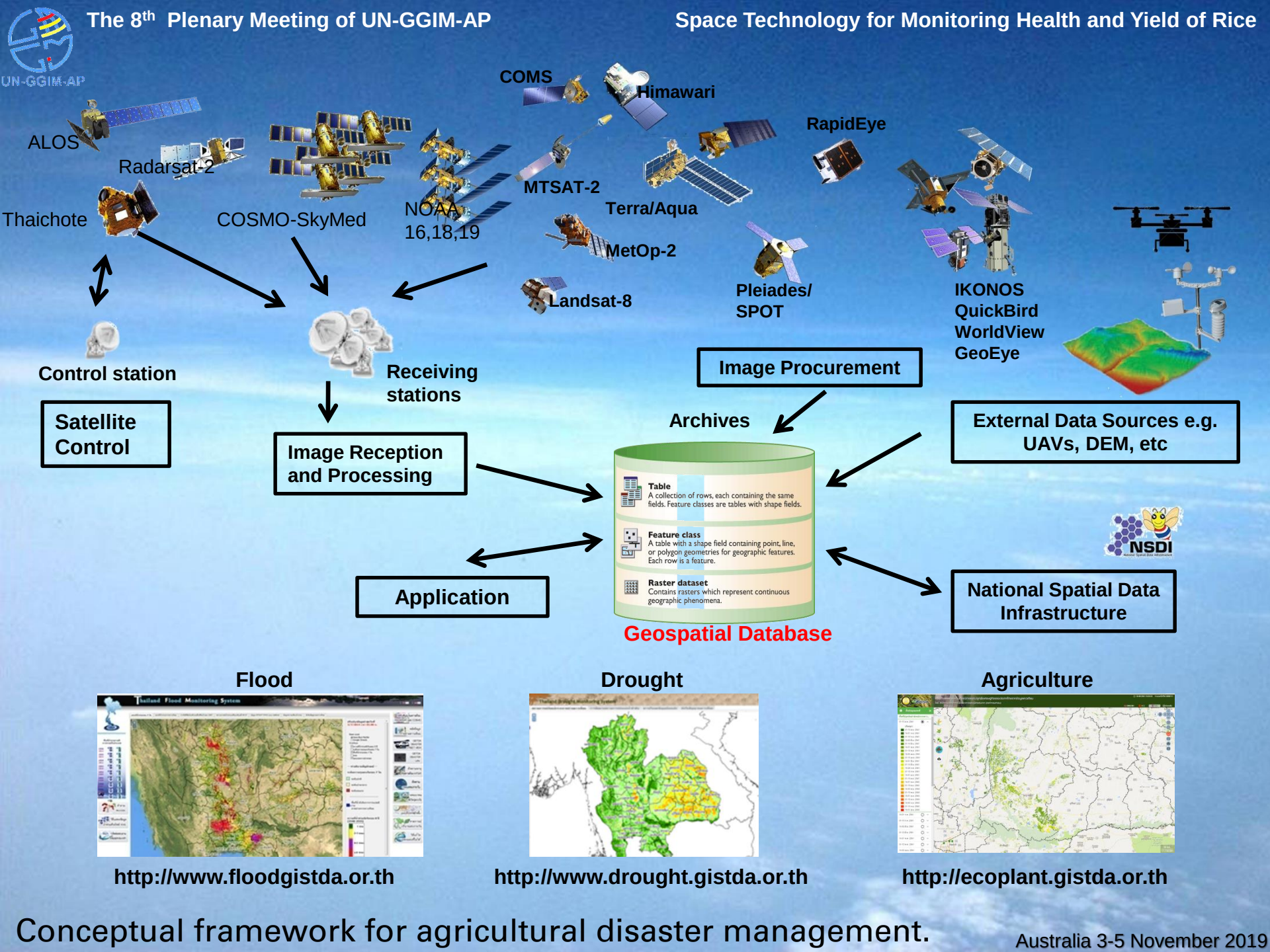


FLOOD AND DROUGHT DISASTER

Thailand, an agricultural country and one of the top rice exporters in the world, has been extremely exposed and vulnerable to natural disasters caused by hydro-meteorological hazards particularly floods and droughts



The amount of satellite missions carrying sensors that can be applied for flood and drought management has increased considerably and there is now a general consensus among space agencies and scientists to strengthen the support that satellites can offer for disaster monitoring and warning



Flood

http://www.floodgistda.or.th

Drought

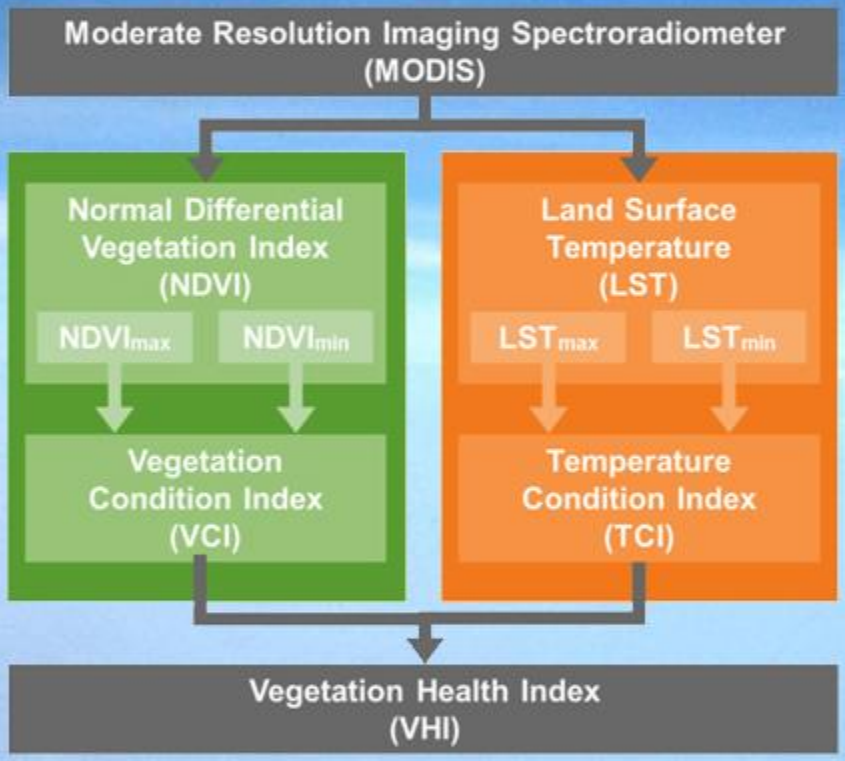
http://www.drought.gistda.or.th

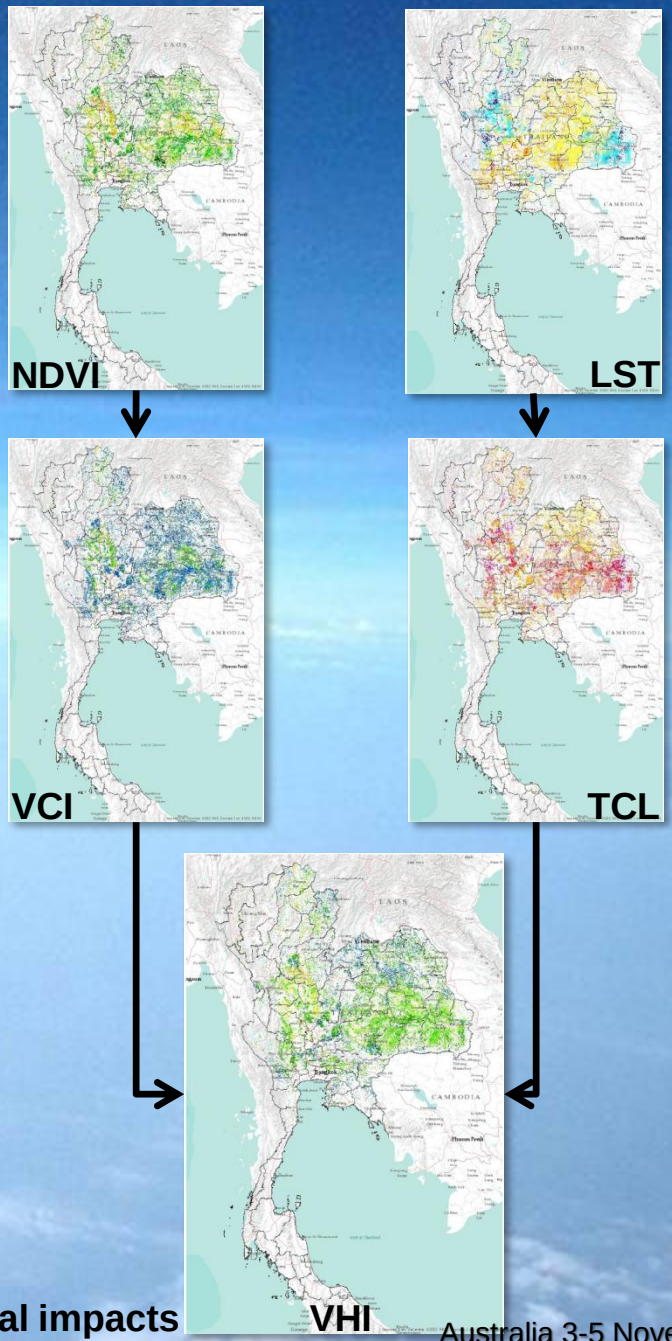
Agriculture

http://ecoplant.gistda.or.th

Conceptual framework for agricultural disaster management.

Early detection of regional drought, before it develops into a disaster, is very important

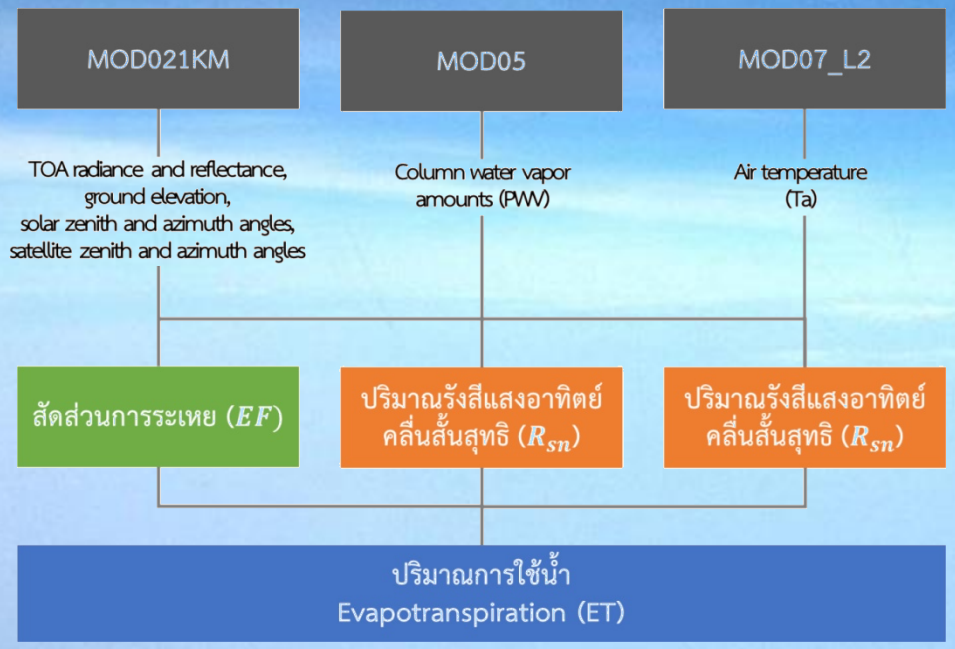


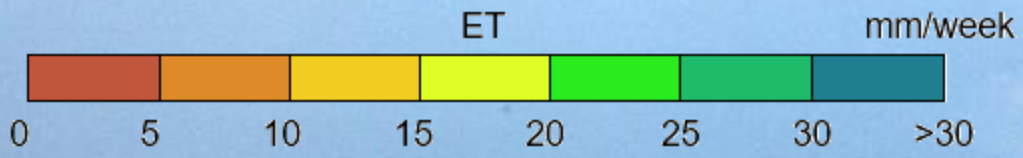


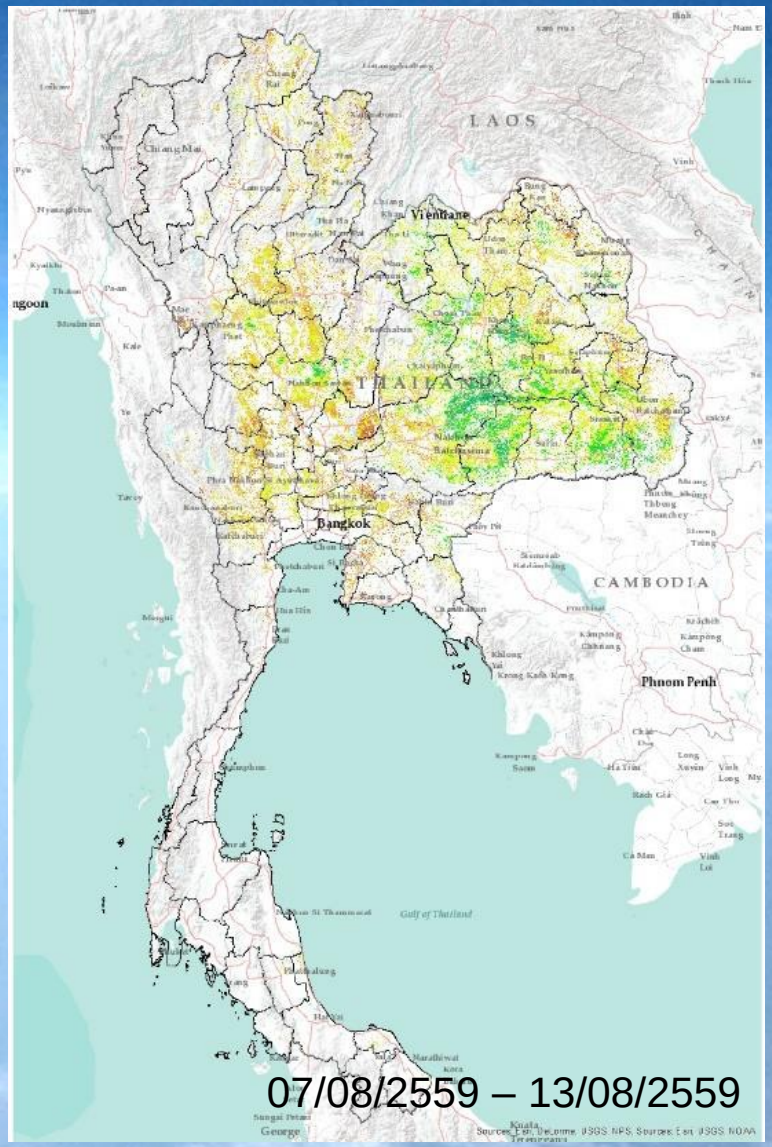
NDVI, VCI, and TCL are used to estimate the VHI. The VHI and all indices are calculated during the dry season on a weekly basis

The VHI monitors and identify drought-related agricultural impacts

Evapotranspiration



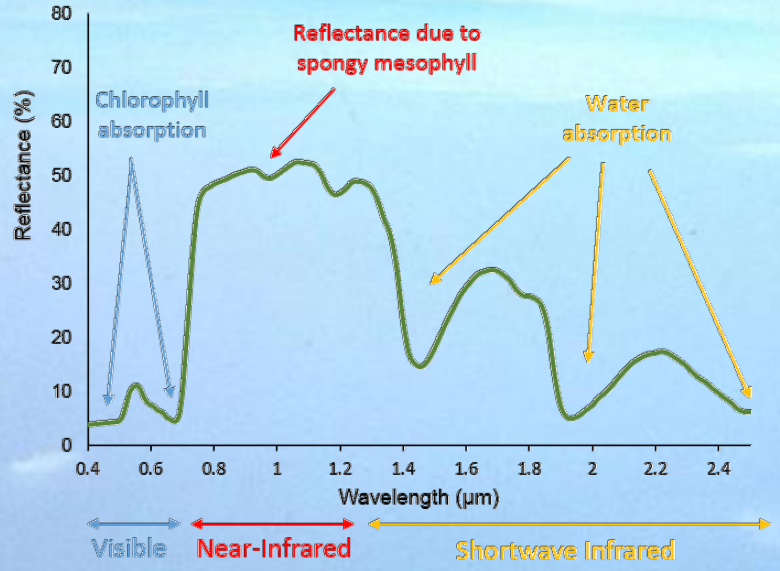


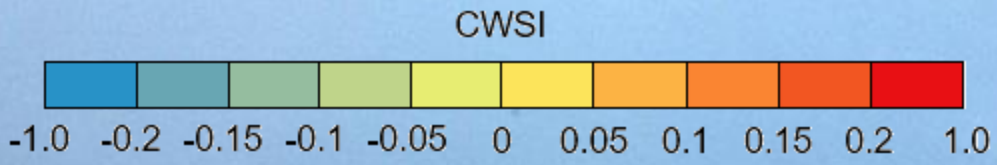


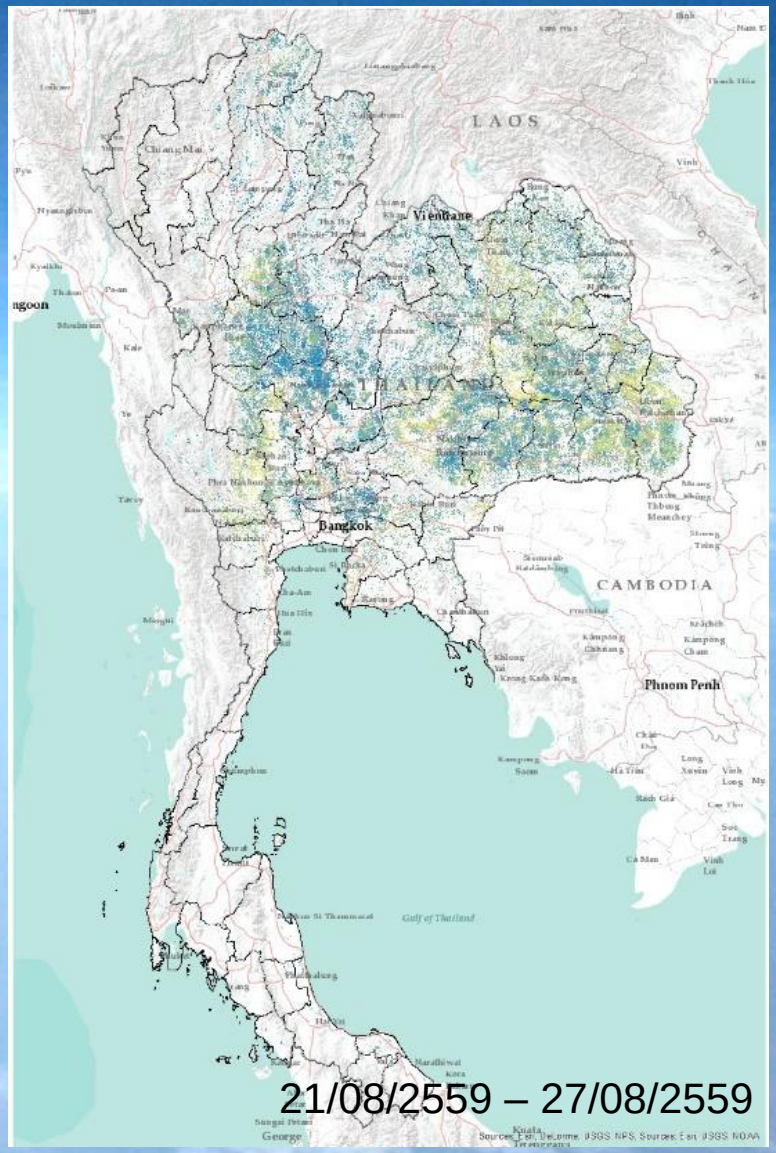
Crop Water Stress

Crop Water Stress Index (CWSI) has also been used for monitoring crop water stress.

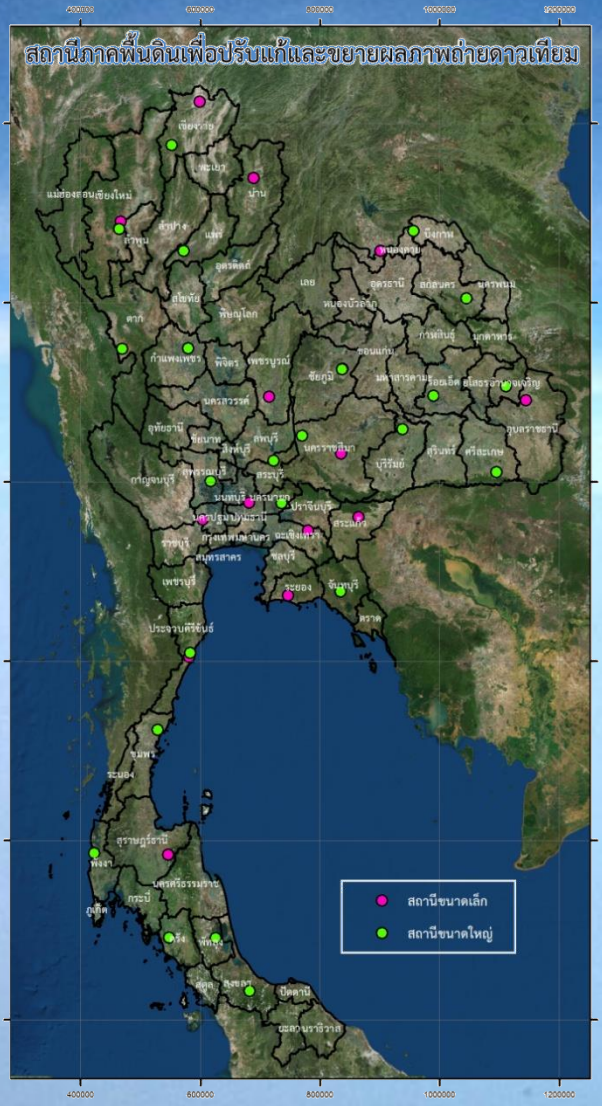
$$CWSI = \frac{(\rho_{SWIR} - \rho_{NIR})}{(\rho_{SWIR} + \rho_{NIR})}$$

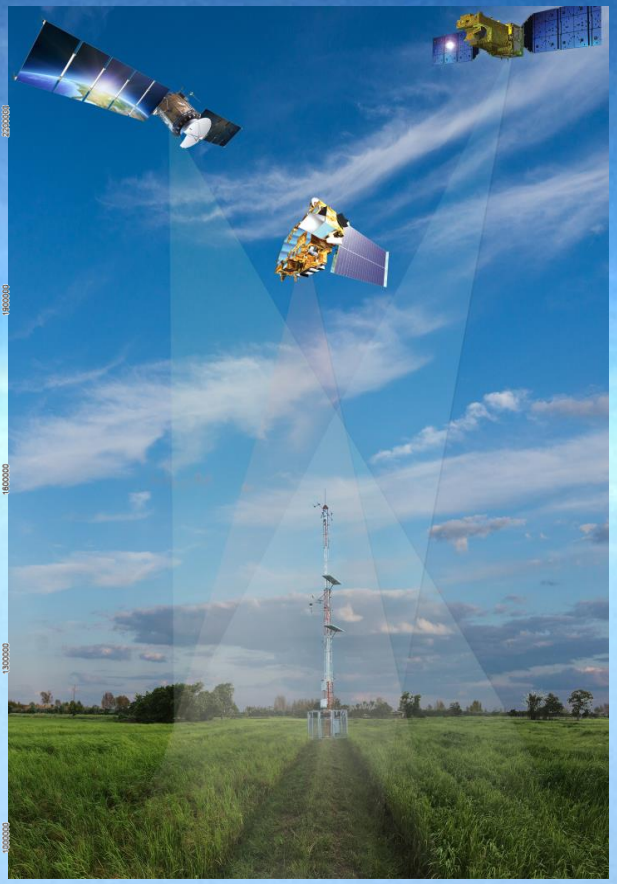


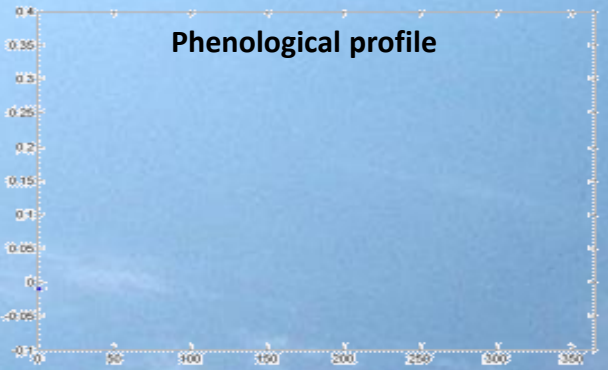




Ground Station : in-situ measurement







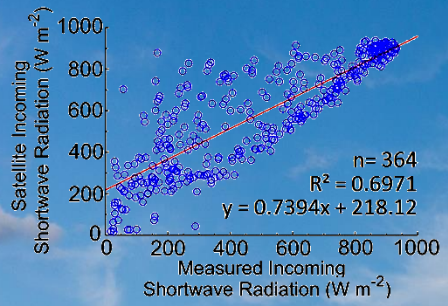
Developing the Phenology of Crop Field

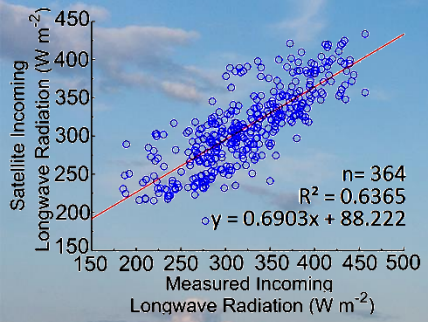
22 Stations

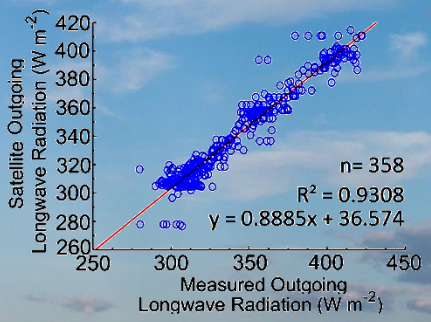
23 Stations

- 22 Stations 23 Stations

Comparison of satellite-derived atmospheric parameters to in-situ point observations



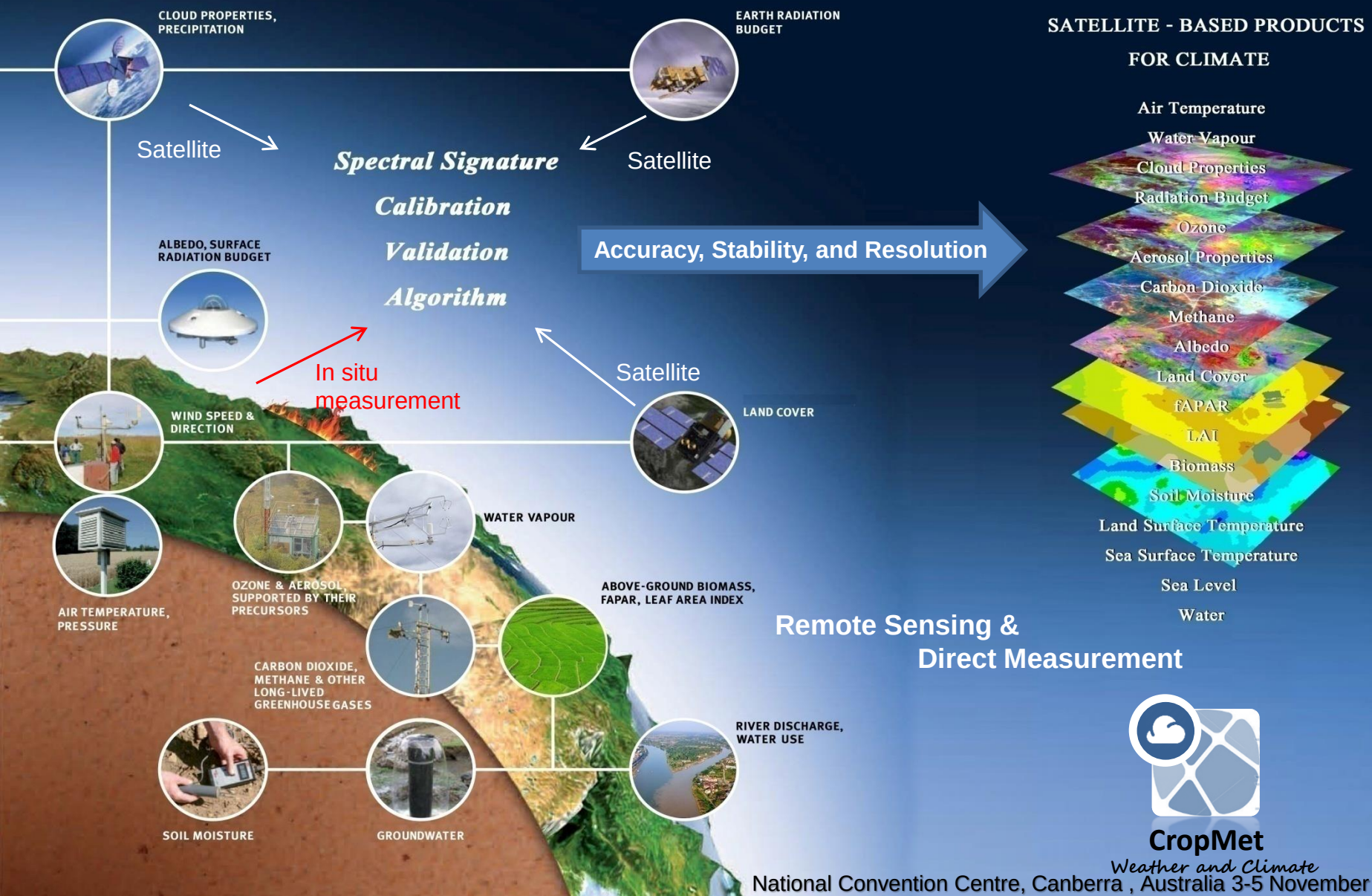




The agreement between satellite data and in-situ data was good enough to suggest that the parameters estimated from satellite sources are reliable.

- spectroradiometer
- 3-D sonic anemometer
- krypton hygrometer
- thermal infrared radiometer
- net radiometer
- solar radiation
- air temperature
- relative humidity
- water content profile probe
- rain gage
- wind speed and direction
- digital camera (2)

Satellite Climate/Weather Parameters



CropMet
Weather and Climate

Monitoring stresses in plants : from in situ measurement and space technology

EO provide a supplement to in-situ measurements by offering observations that are regularly, temporally, and spatially reliable

Policy, Decision Making

Visible

Red edge

Mid-Infrared

Near-Infrared

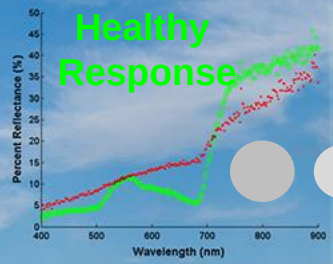
Thermal-Infrared

Evapotranspiration

Spatial analysis

Stresses in plants

Healthy Response



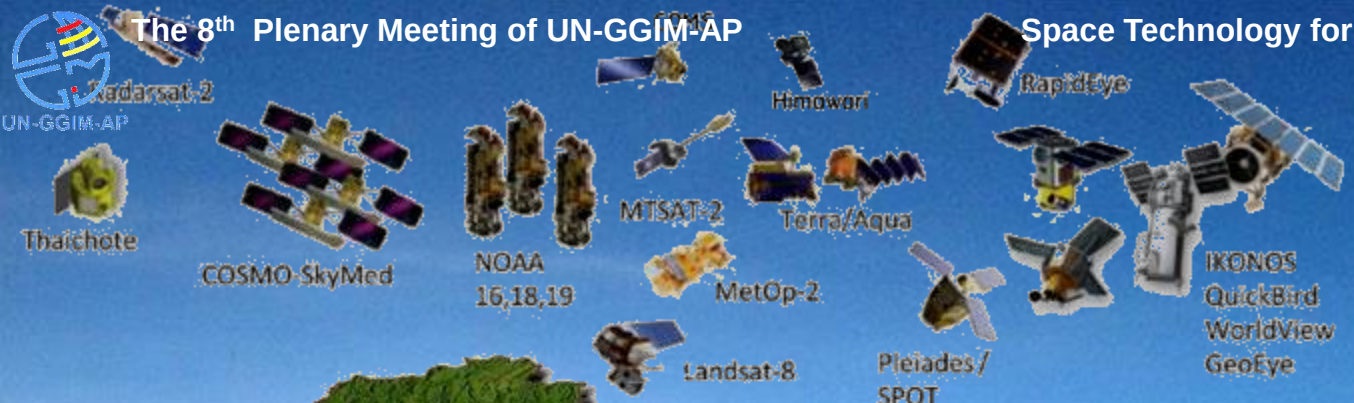
Stressed Response

Satellite-derived data is validated based on in-situ data

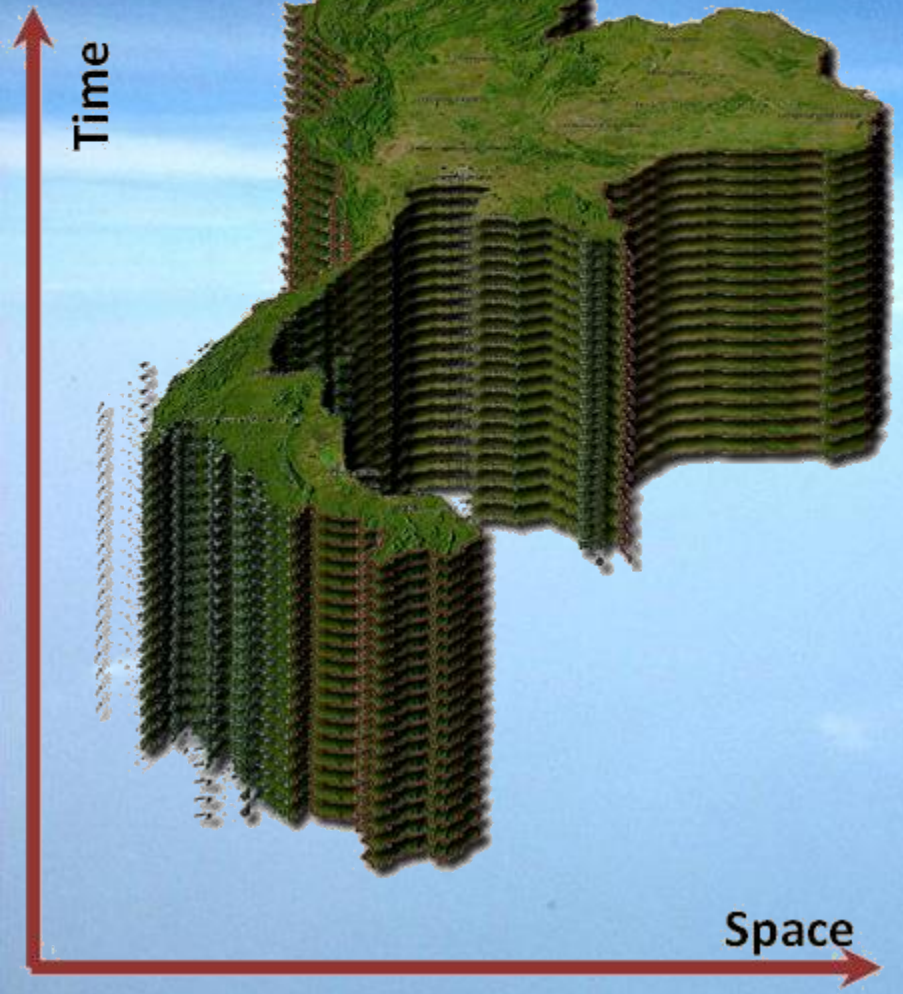
Stresses in plants

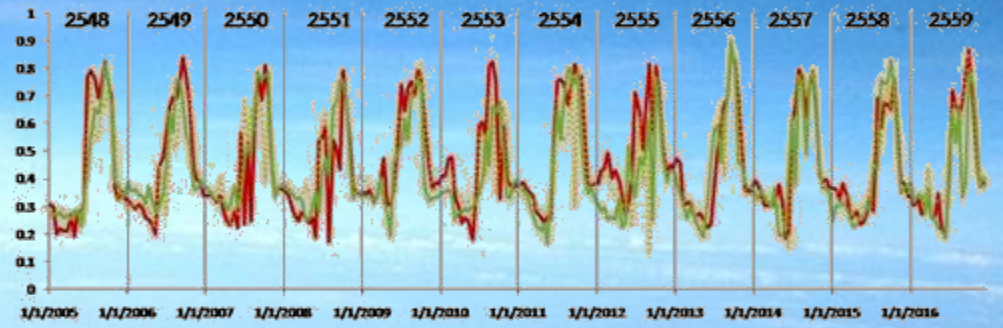
heat stress
water stress
cold stress

Farmer

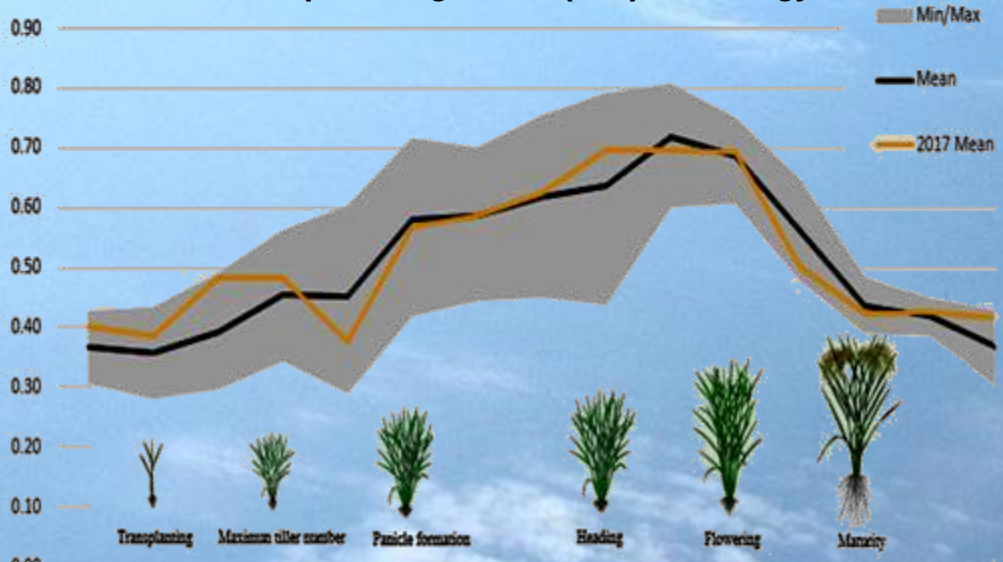


- Monitoring
  - Health
- Forecasting
  - Yield
- Warning





Temporal Vegetation (rice) Phenology



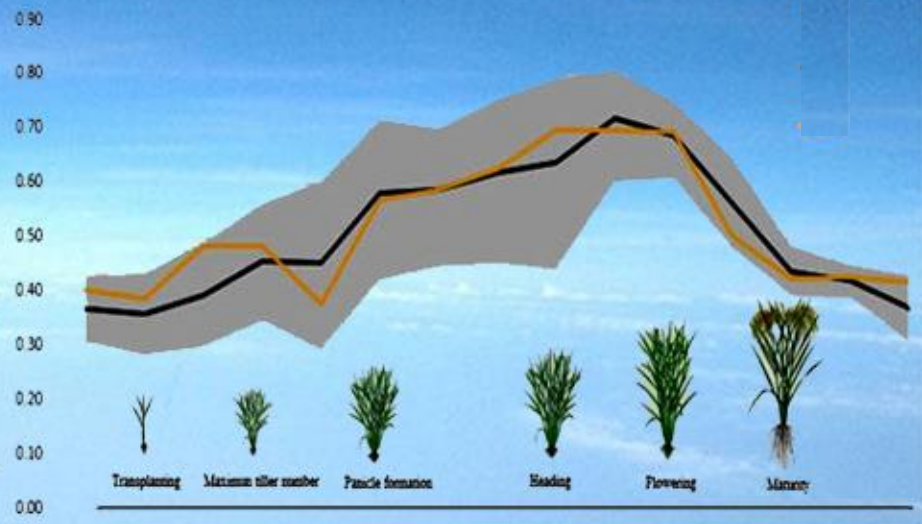
Crop Health Monitoring

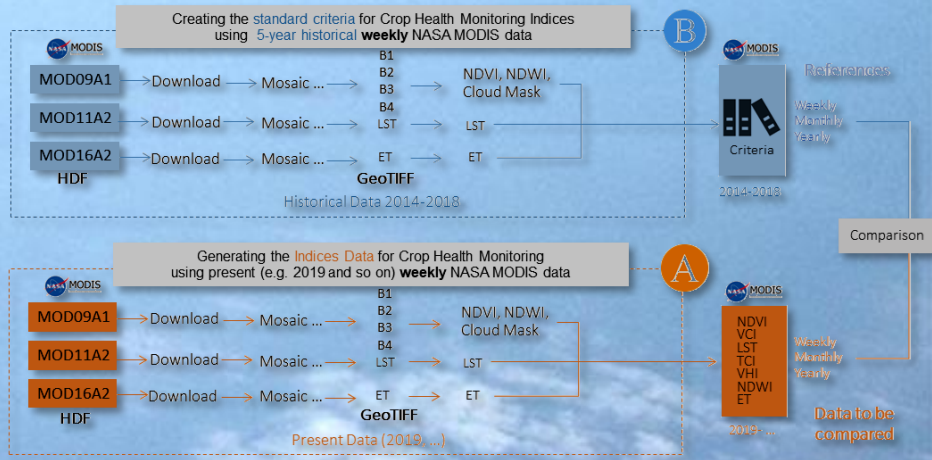
CropHealth
Crop Stress

Actual current rice growth status will compare to the 10 years average normal situation

Analyst every single pixel for the entire country updated weekly

Temporal Vegetation (rice) Phenology





Rice Yield Monitoring

Northern Thailand

Chiang Rai Province
Lampang Province

North Eastern Thailand

Surin Province
Roi Et Province

Rice Yield Sampling Sites

Central Thailand

Nakhon Sawan Province
Suphanburi Province

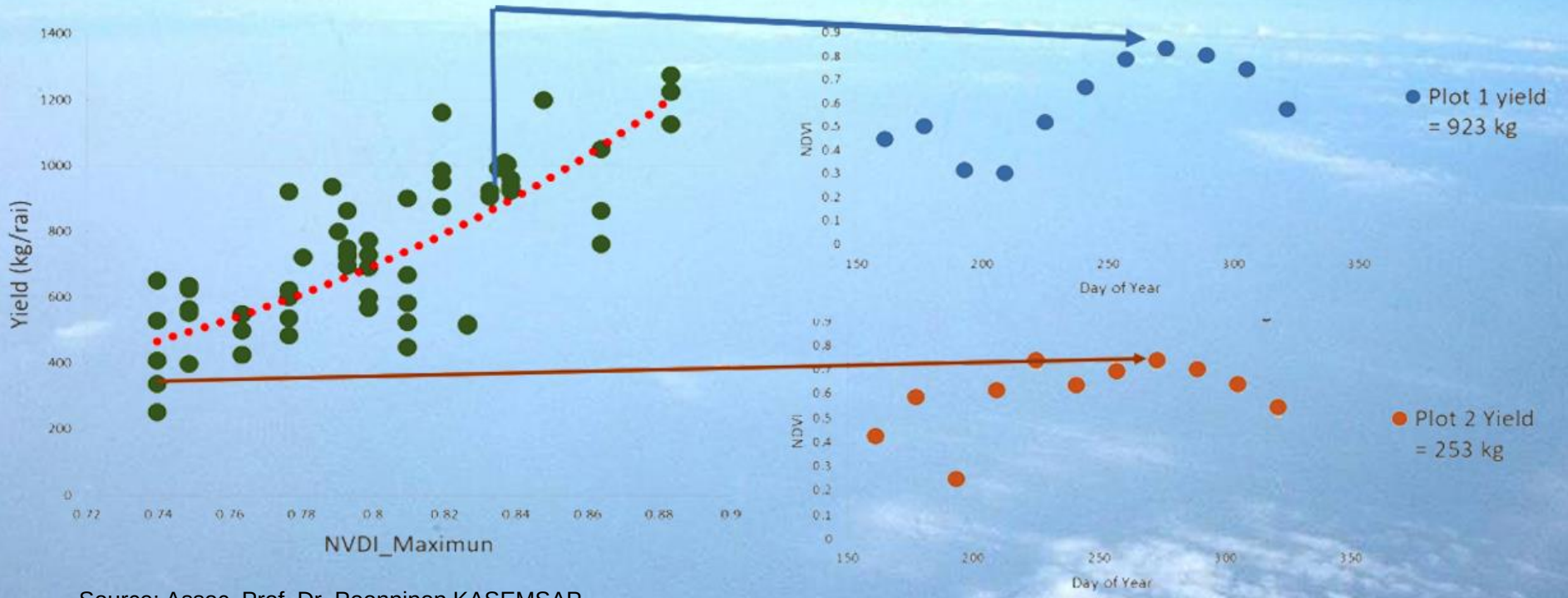
Southern Thailand

Phatthalung Province
Songkhla Province
Pattani Province

Rice Yield Monitoring/Estimation

CropBarn
Crop Yield Prediction

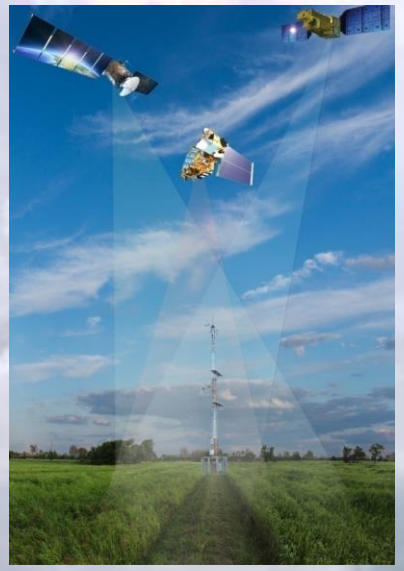
Rice Yield Monitoring



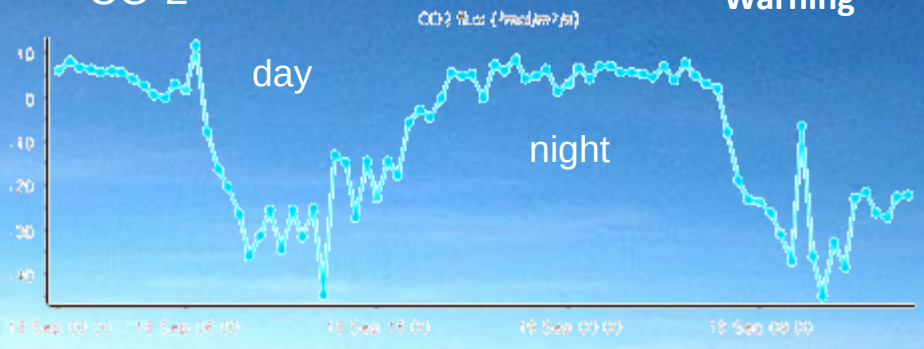
Source: Assoc. Prof. Dr. Poonpipop KASEMSAP

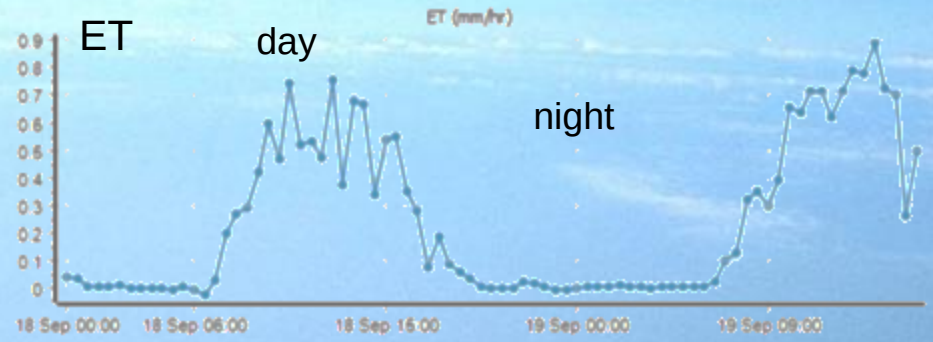
Measure photosynthesis flux

- Monitoring
  - Health
- Forecasting
  - Yield
- Warning



Eddy Covariance Tower





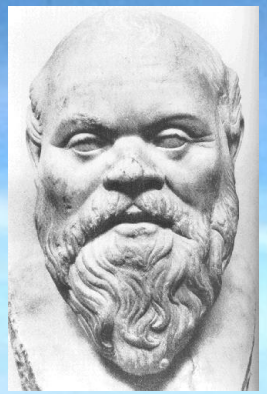
GOSAT
(Greenhouse gases Observing Satellite)

Orbiting Carbon Observatory-2 (OCO-2)

Orbiting Carbon Observatory-3 (OCO-3)

Source: Assoc. Prof. Dr. Poonpipop KASEMSAP

“Man must rise above the Earth—to the top of the atmosphere and beyond—for only thus will he fully understand the world in which he lives”



(Socrates 470 BC-399 BC)

Correct Interpretation!

“Man masters nature not by force but by understanding…..”

Jacob Bronowski

'If You Can't Measure It, You Can't Manage It’… You can't improve It”

Peter Drucker (father of management)

THANK YOU

GISTDA

Delivering Values From Space

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