Rice paddy monitoring in Thailand using Multi-Temporal SAR data

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Thailand's Important Agricultural products

Plantation	Rice	Cassava	Sugarcane	Rubber	Palm
Percentage of plantation area	53.85 %	5.68%	5.06%	12.51%	2.20%
Number of household involved	4,150,400	480,484	200,000	1,259,002	108,386
Market share	34.91 %	70%	9.61%	42.54%	0.99 %

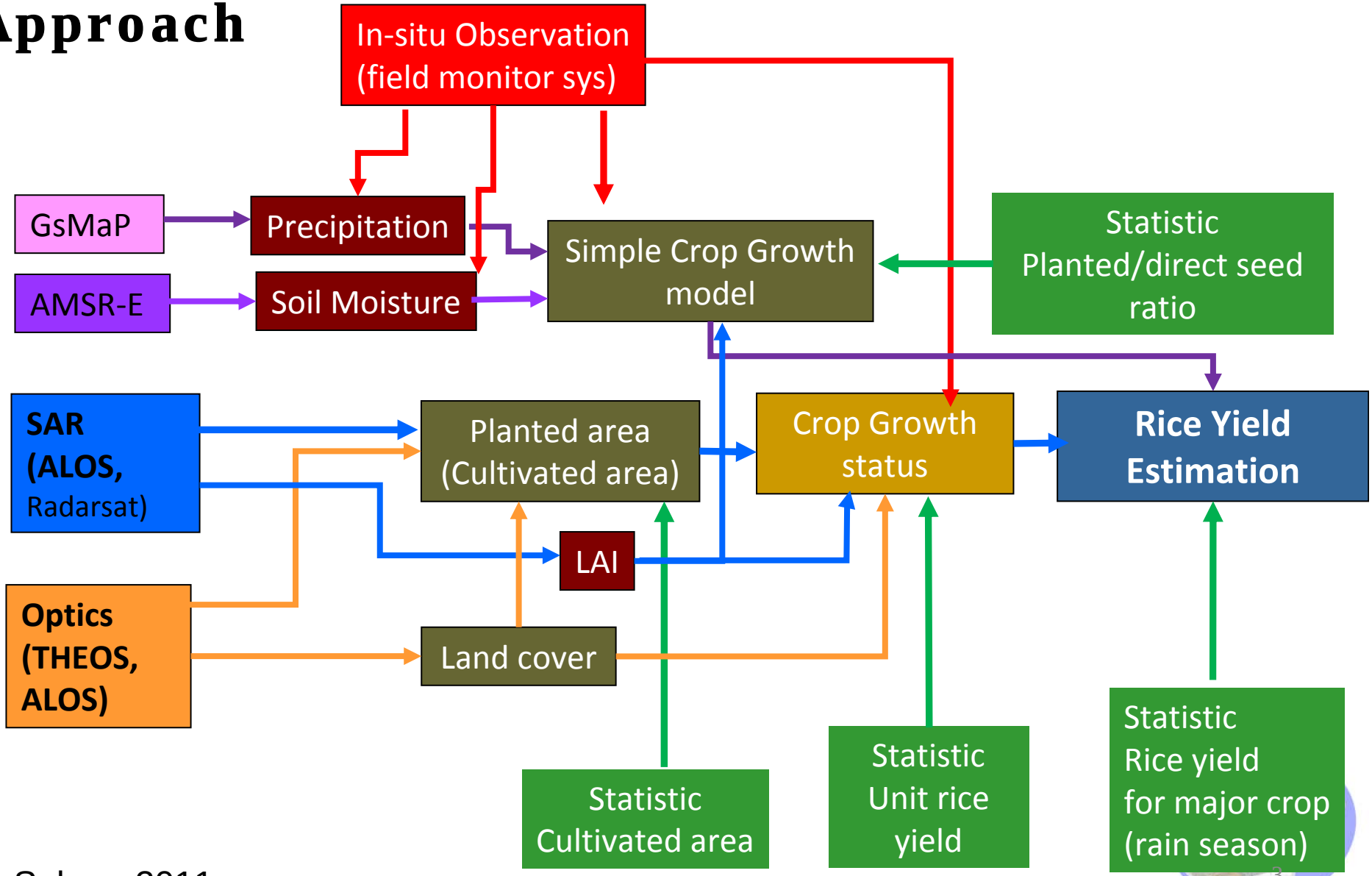
Office of Agricultural Economics, 2008

Emerging issues and challenges for Thais

- Fossil fuels will be reduced and may be exhausted in 50 to 60 years.
- World population may increase to 9 billion people in 40 years.
- Climate change

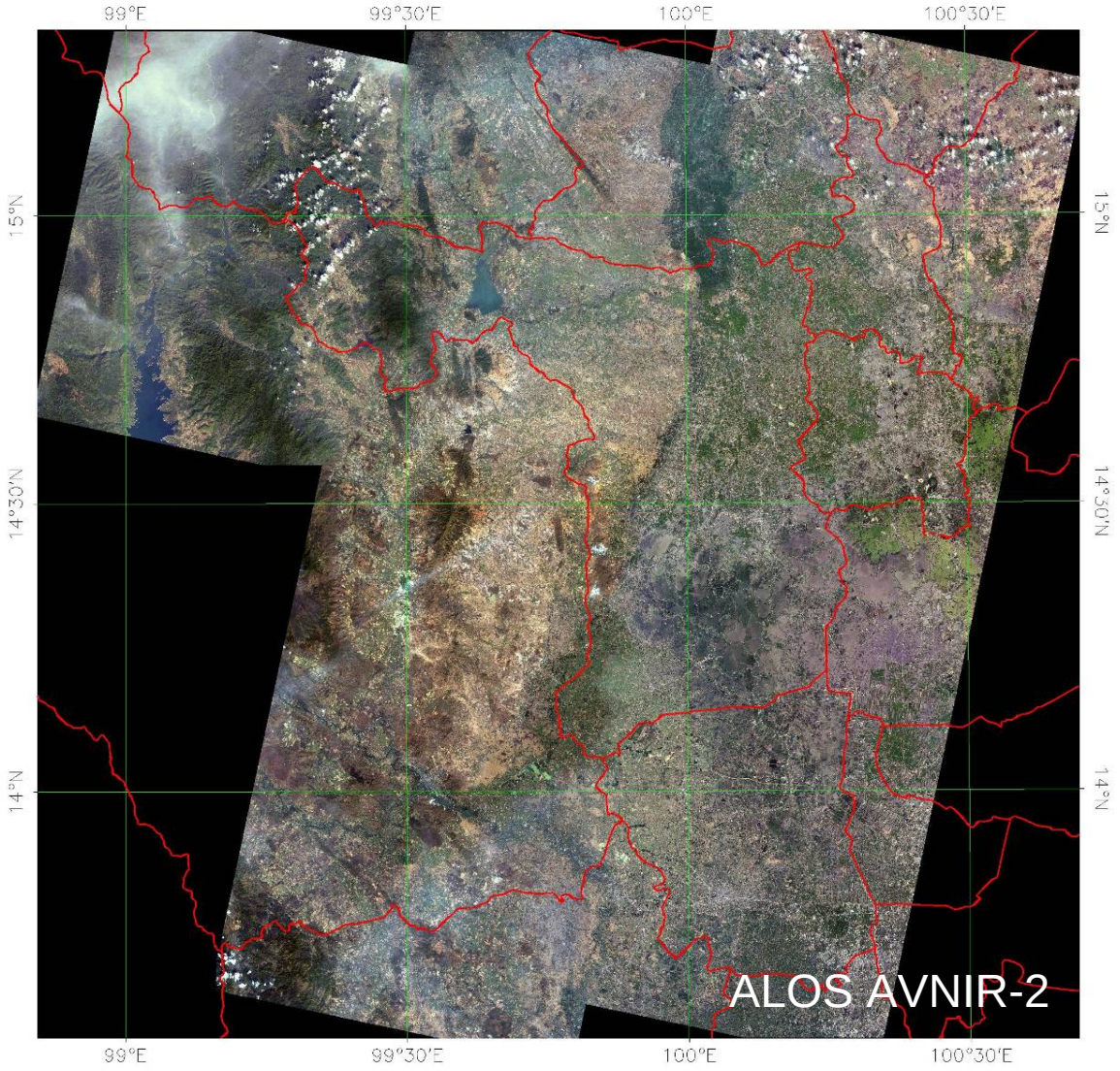
- Possible to use Remote sensing data as a monitoring tool

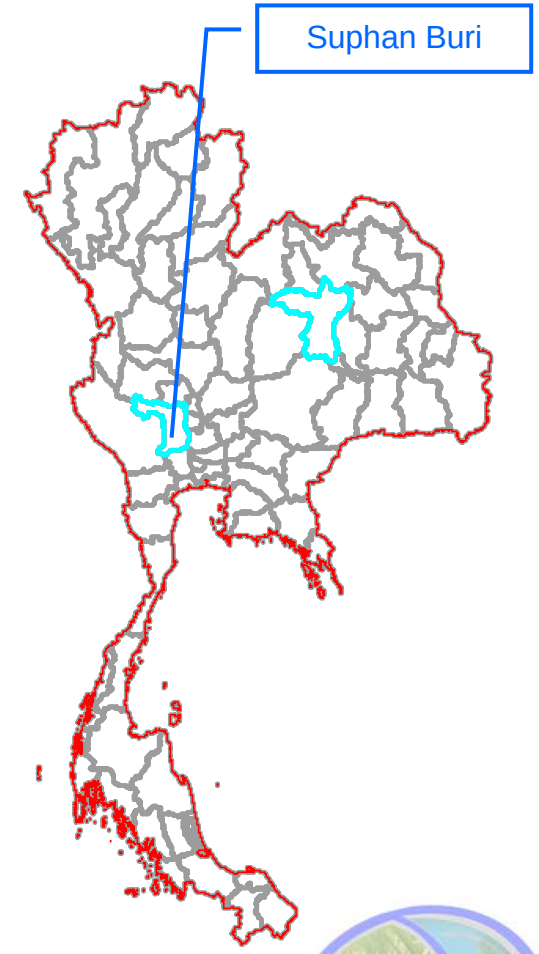
Approach



Sobue, 2011

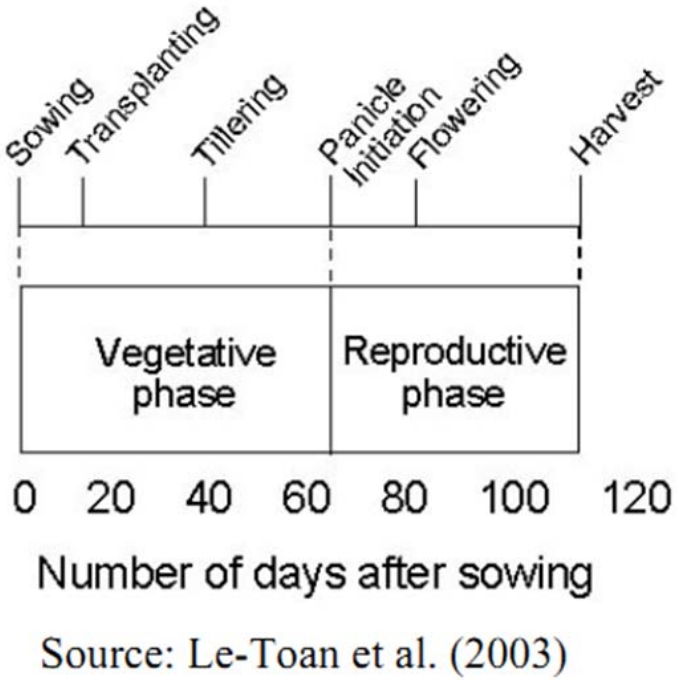
Rice monitoring in Suphan Buri province





Rice cropping systems in Suphan Buri

Rice growing stage (crop cycle length of 120 days)



Source: Le-Toan et al. (2003)

Rice crop system	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1 st crop	→			←	←						→	→
2 nd crop					→	→			←			

→ Seeding dates ← Harvesting dates

Rice growing stage

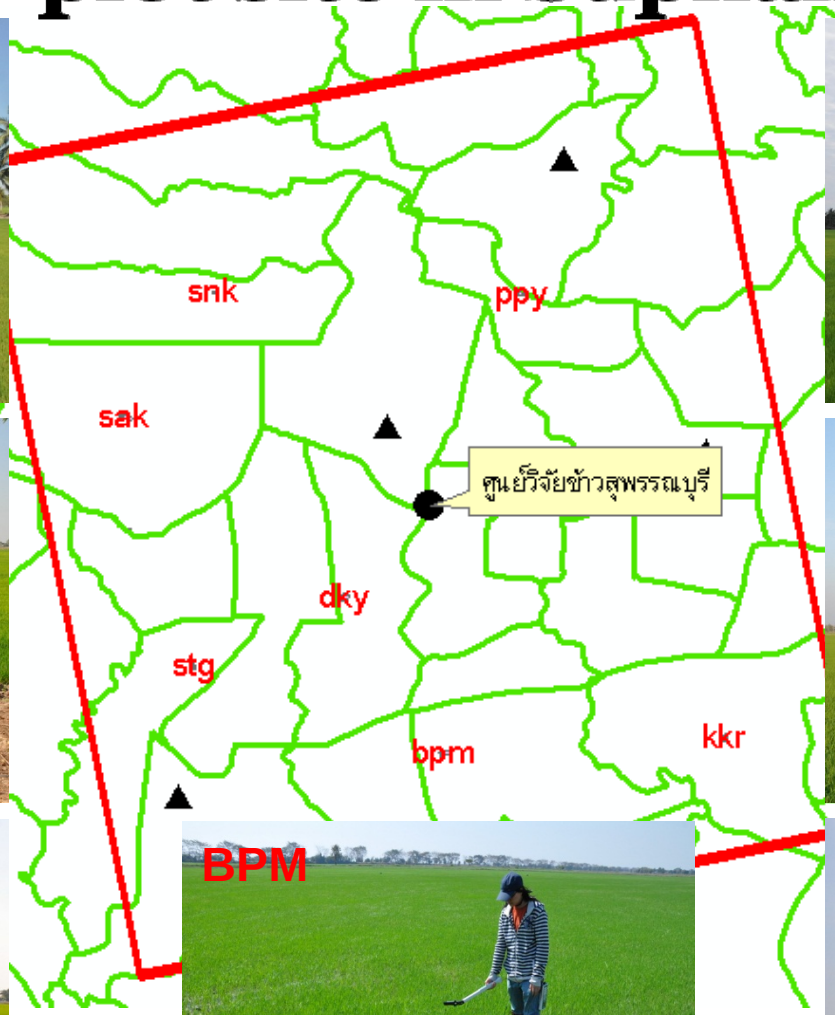
(a) Sowing–transplanting period

(b)Vegetative stage

(c) Reproductive stage

(d) Ripening stage

Paddy plot site in Suphan buri



Selected permanent sites

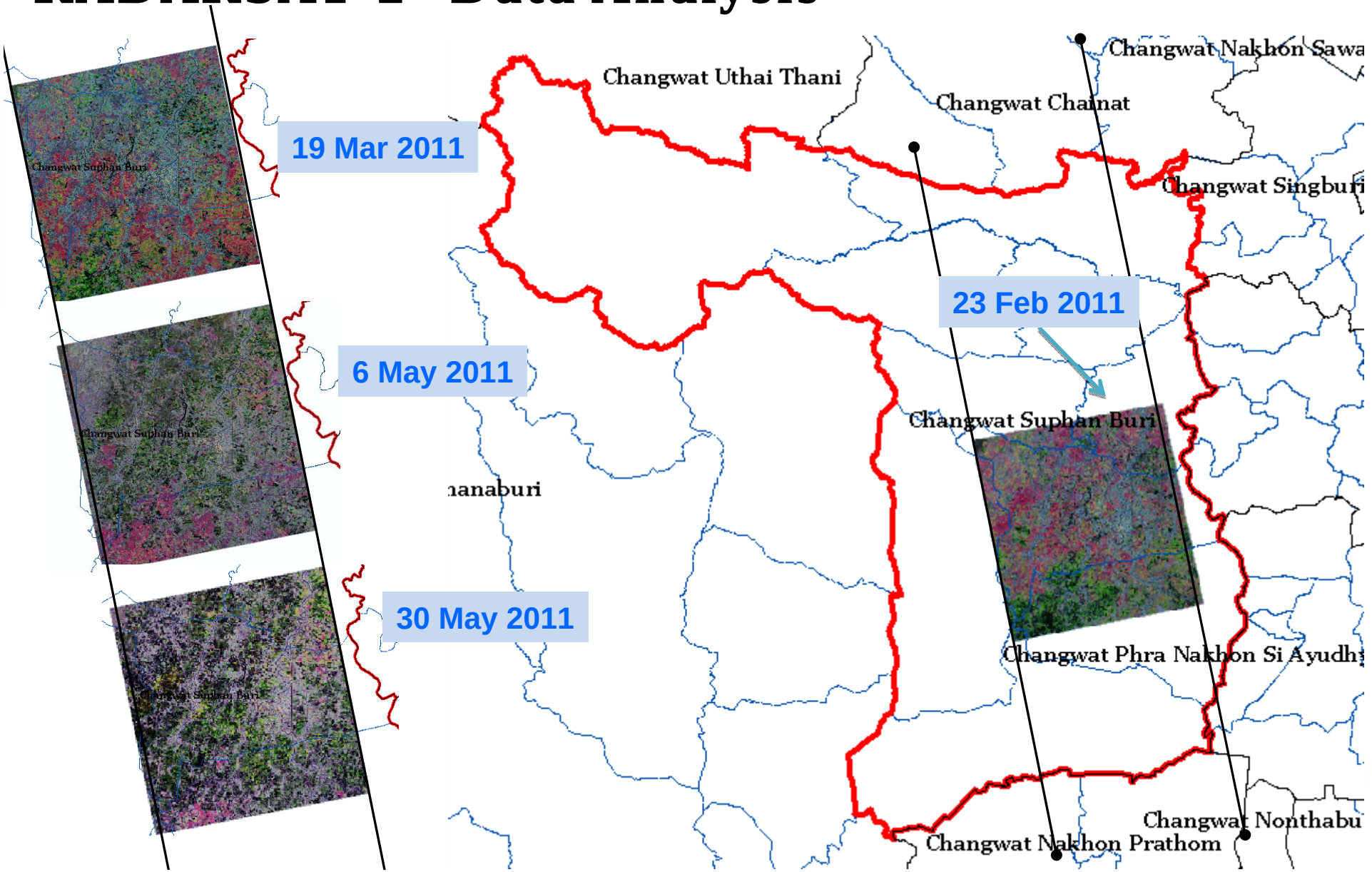
Location	Type	Sowing date	Area size (ha)
SNK	Pathumthani 80	28/11/2010	1.22
PPY	Pathumthani 80	2/12/2010	2.19
SAK	NA	5/12/2010	2.71
DKY	Phitsanulok 2	NA	4.58
STG	Pathumthani 80	5/12/2010	1.17
BPM	Pathumthani 80	7/01/2011	4.44
KKR	NA	10/01/2011	3.69

Calibration and Validation

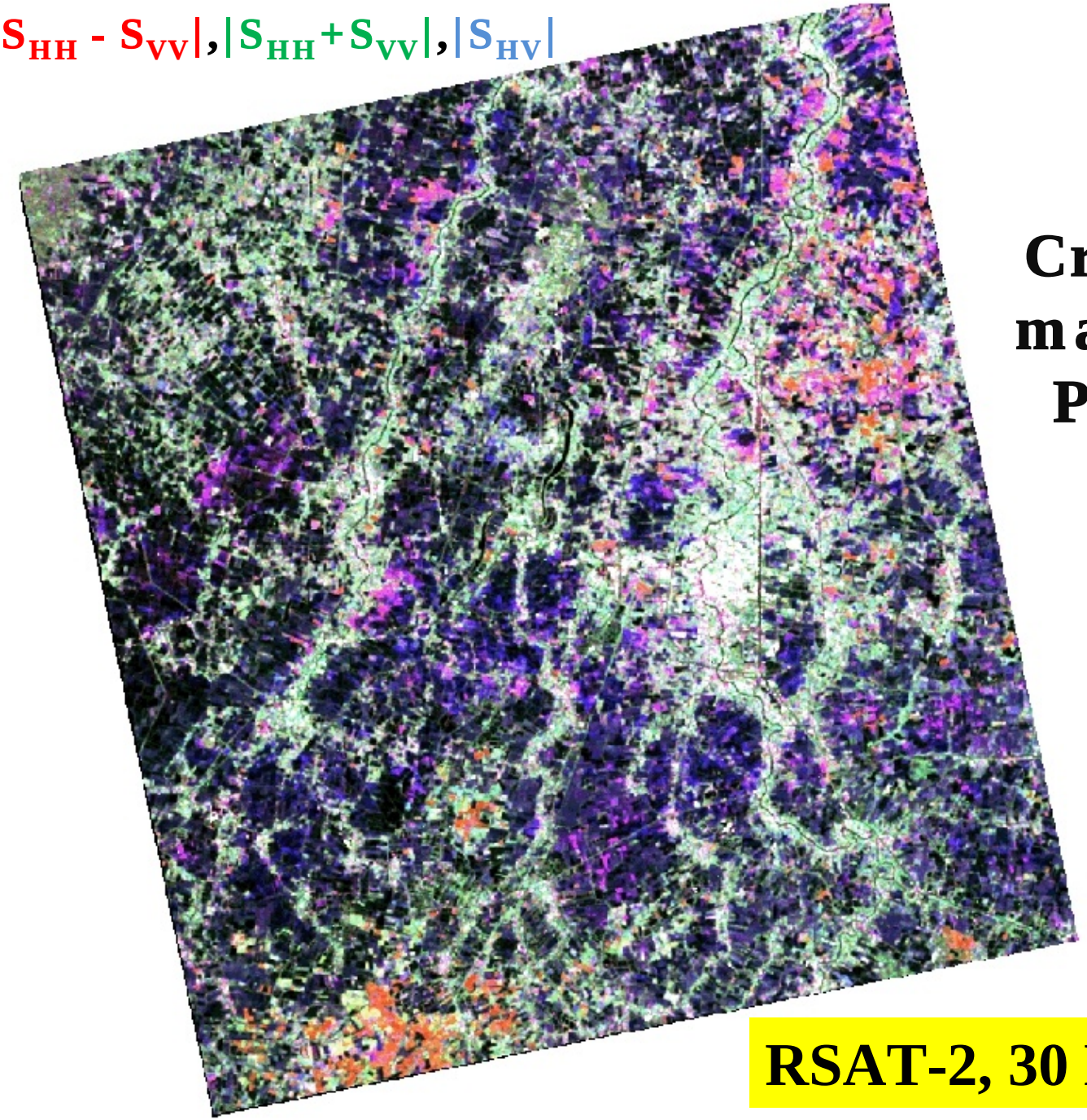
Field Measurement

- Field Spectrometer (ASD Field Spec 3)
- Leaf area index (LAI-2200)
- Chlorophyll (SPAD-502Plus)
- GPS (Garmin GPS)
- Density
- Height (cm)
- Field Photo
- soil sampling
- crop cutting
- every 2 weeks

RADARSAT-2 Data Analysis



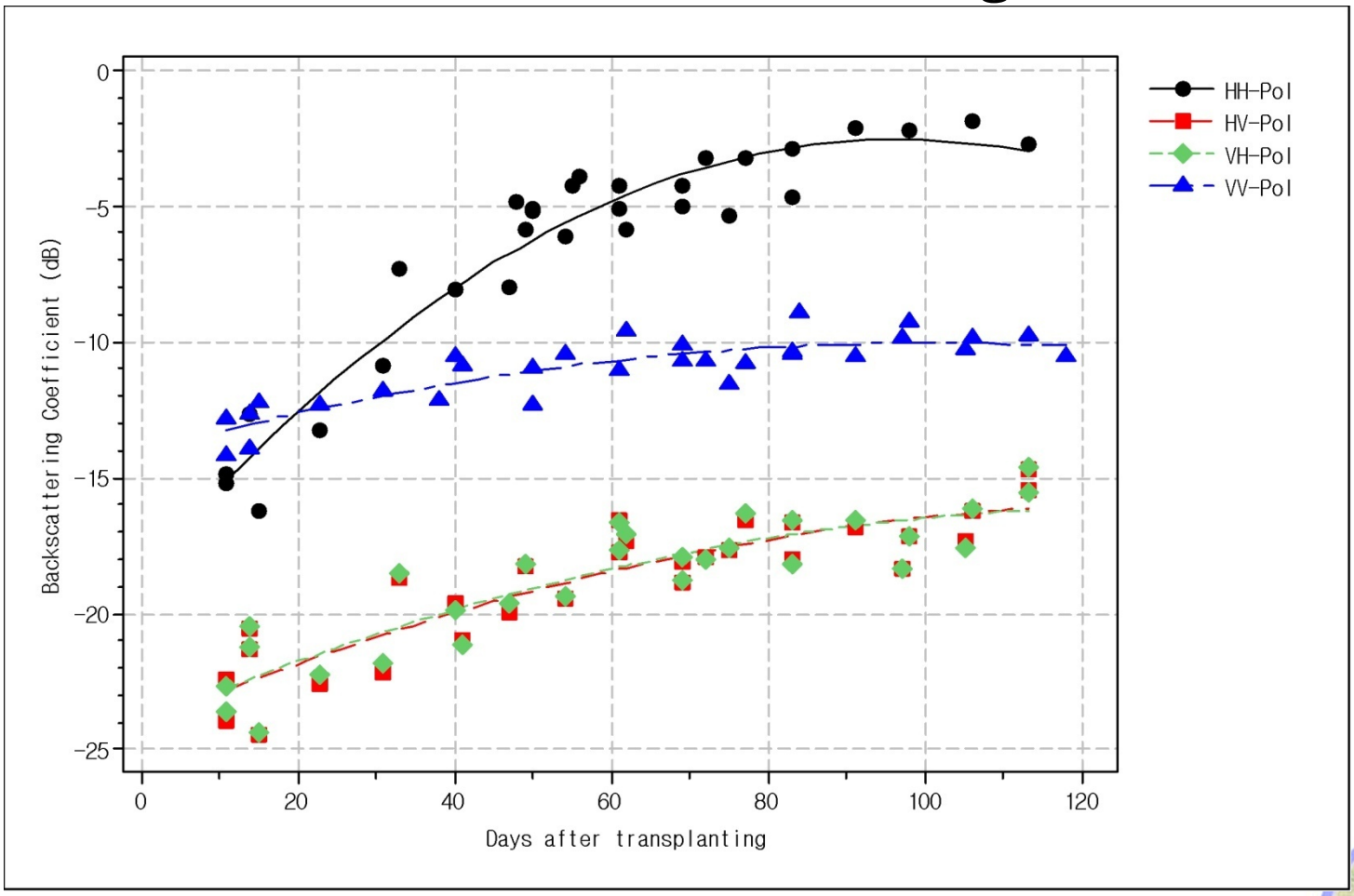
$|S_{HH} - S_{VV}|$,$|S_{HH}+S_{VV}|$,$|S_{HV}|$



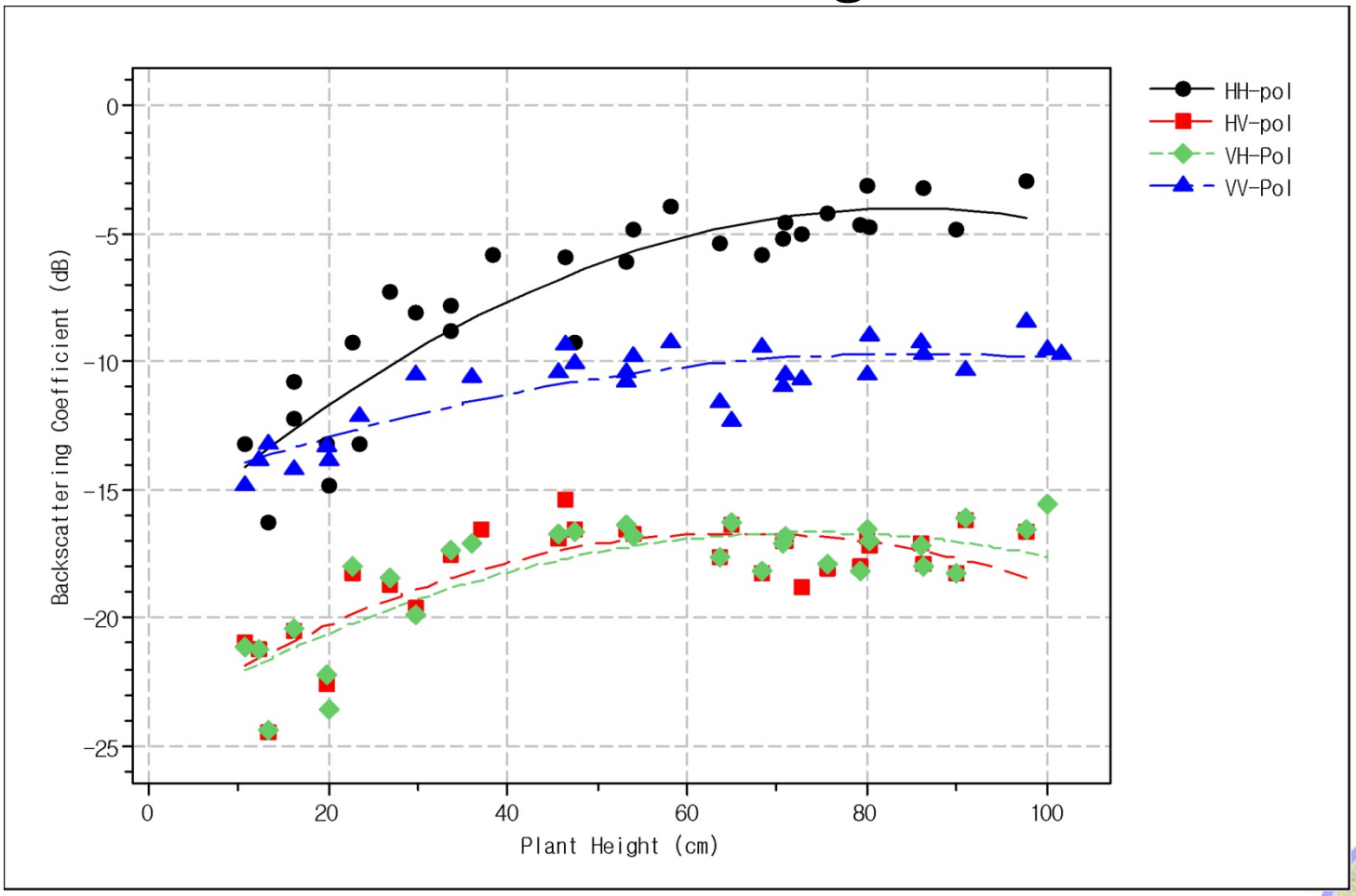
Crop and its management Phenology

RSAT-2, 30 May 2011

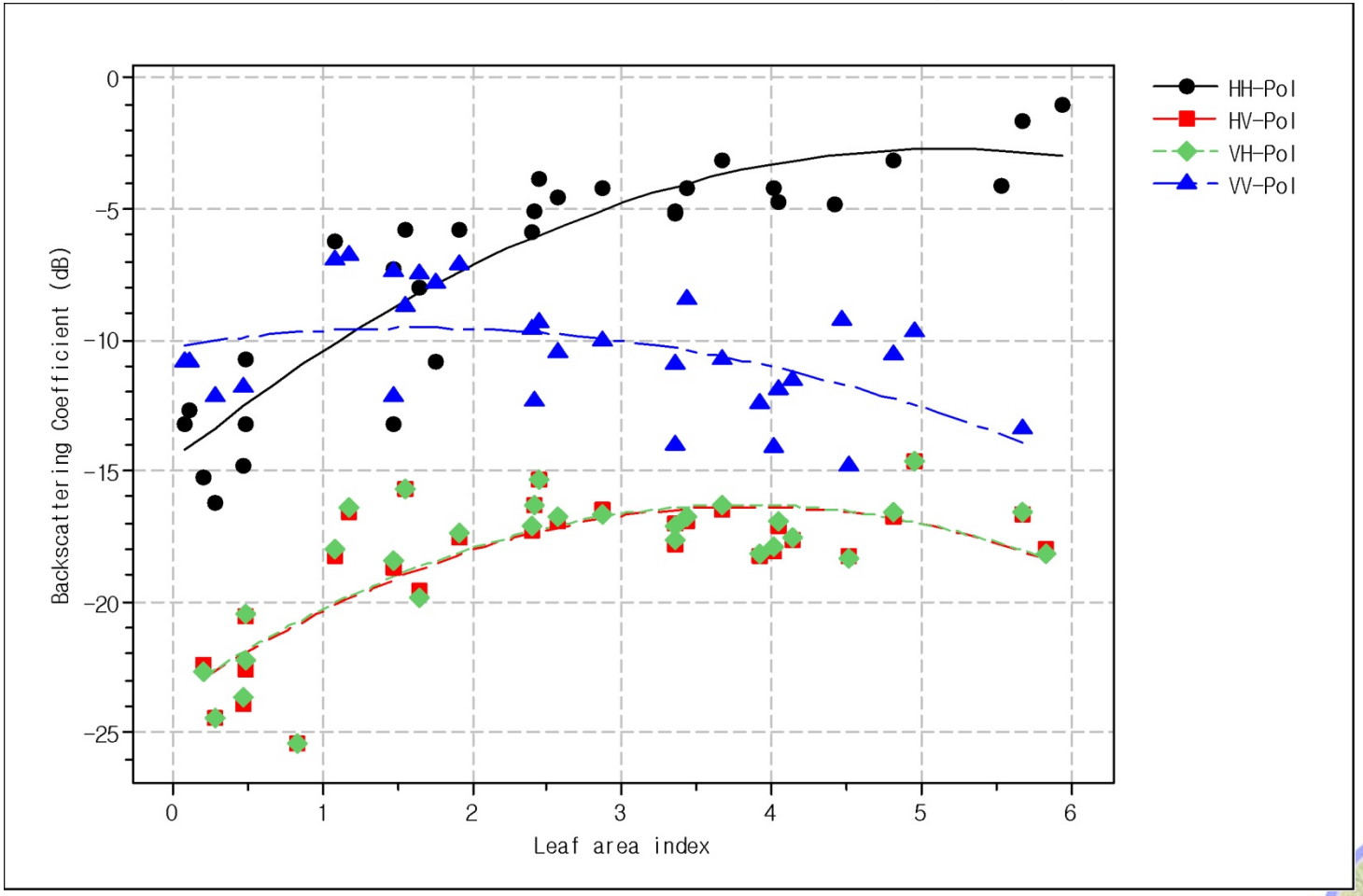
Correlation between backscatter coefficient (dB) and Date after sowing



Correlation between backscatter coefficient (dB) and Plant height



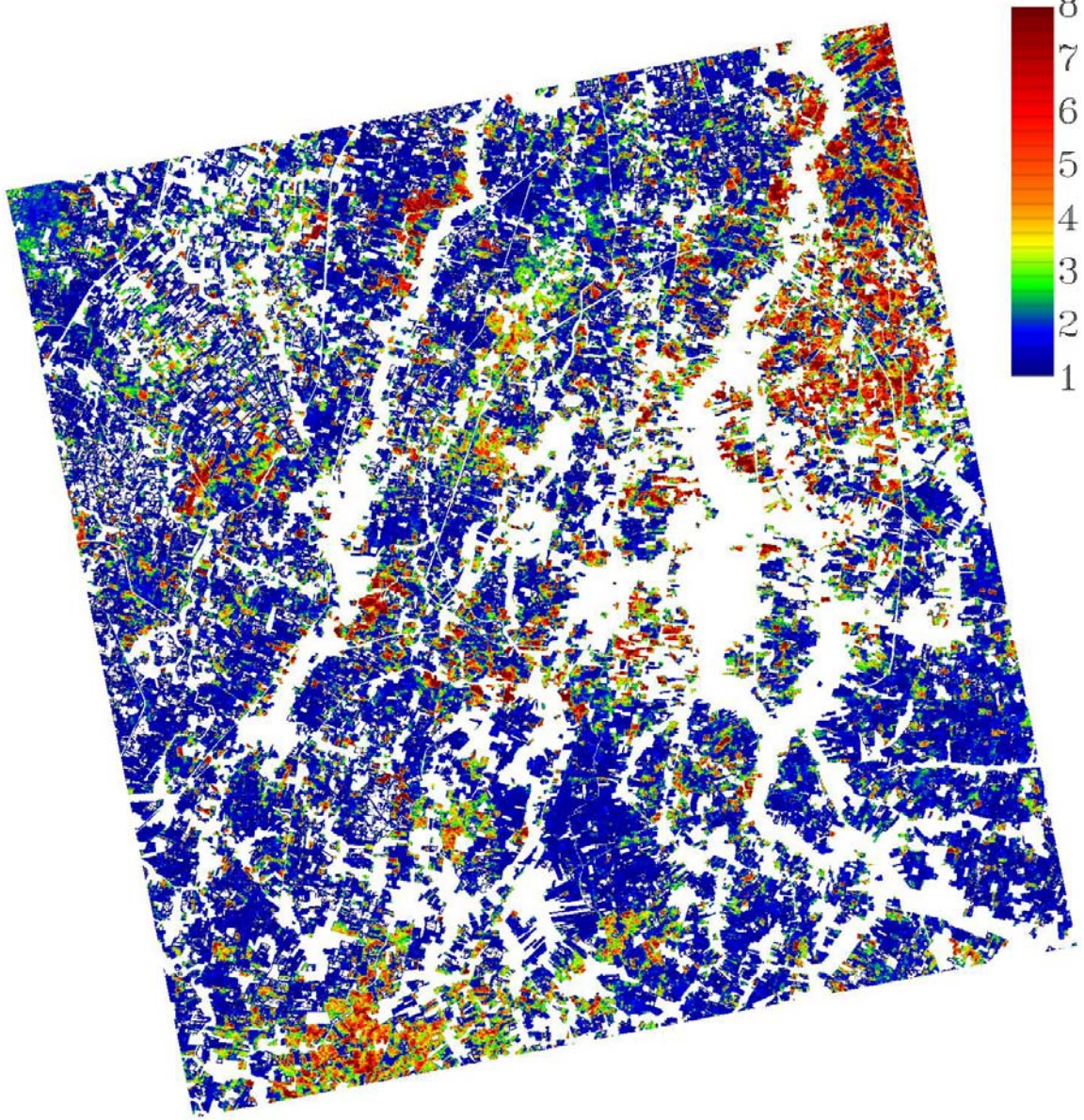
Correlation between backscatter coefficient (dB) and Leaf Area Index (LAI)



Correlation between backscatter coefficient (dB) and Leaf Area Index (LAI)

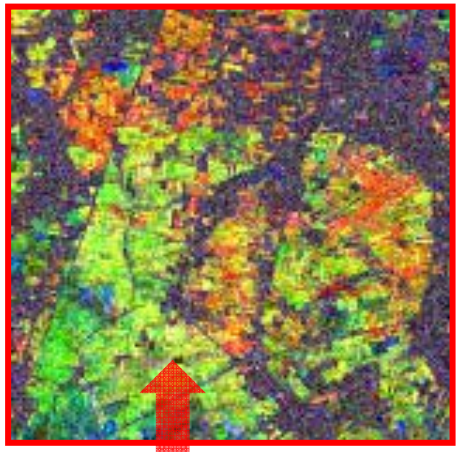
Mode	Model	r^2	SEOE
HH	$\sigma^0_{HH} = -1.010x^2 + 6.893x - 16.31$	0.735	2.140
HV	$\sigma^0_{HV} = -0.3938x^2 + 3.205x - 23.46$	0.514	2.061
VH	$\sigma^0_{VH} = -0.3905x^2 + 3.184x - 23.36$	0.515	2.048
VV	$\sigma^0_{VV} = -0.4355x^2 + 1.385x - 10.32$	0.363	1.945

Leaf area index on May 30, 2011



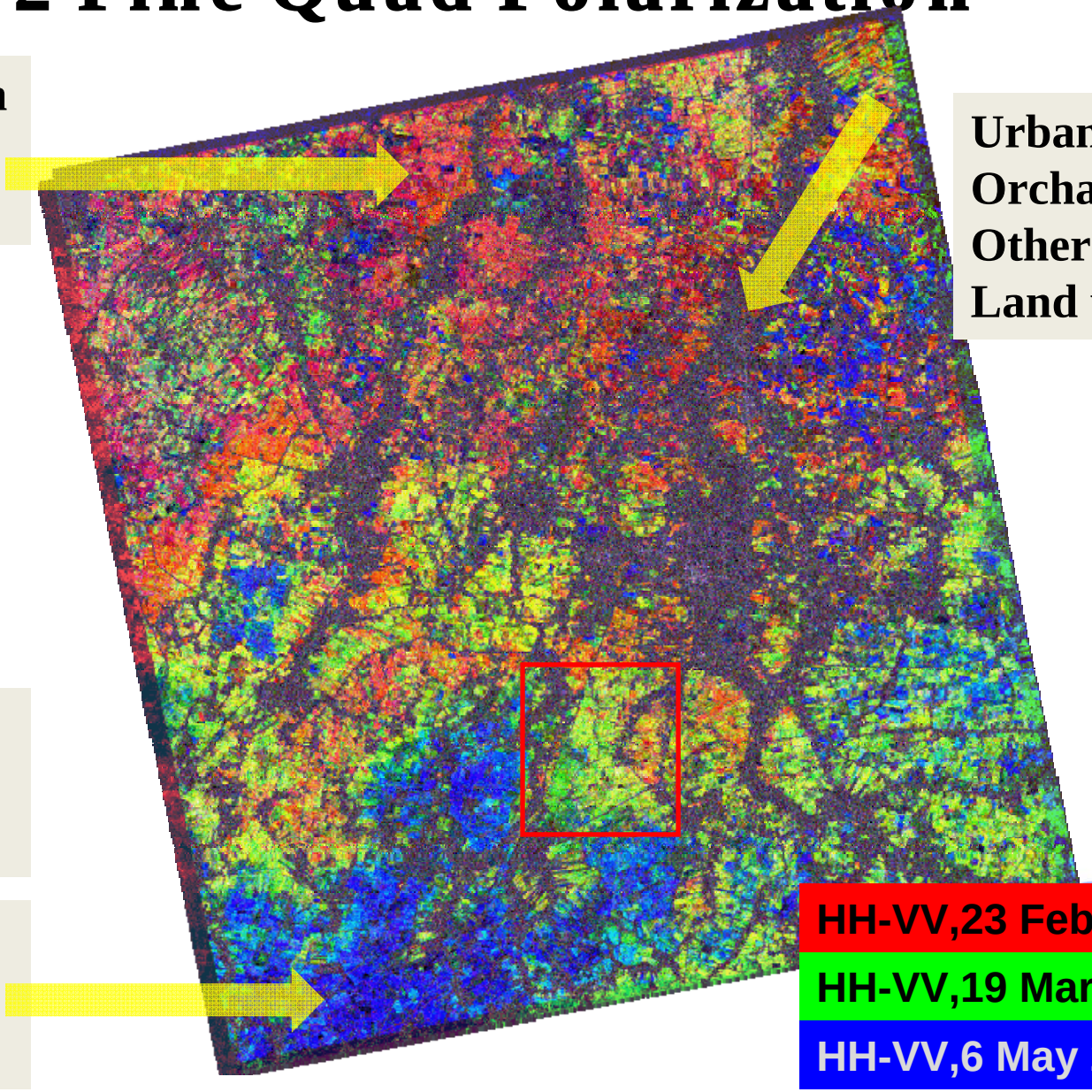
Radarsat-2 Fine Quad Polarization

Rice planting dates on December 2010 (Magenta color)



Rice planting dates on January 2011 (Yellow color)

Rice planting dates on February 2011 (Blue color)



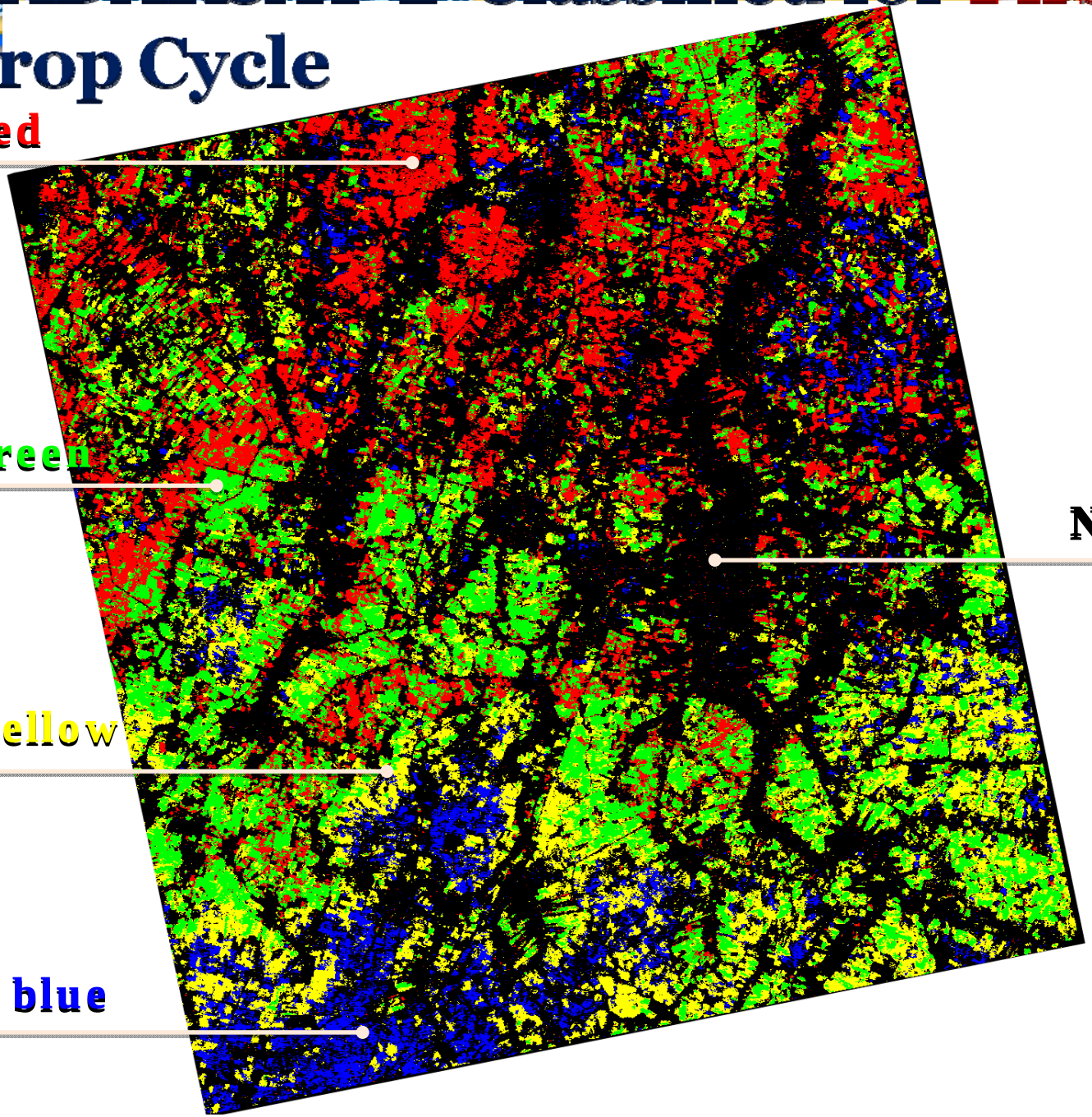
Urban, Orchard, Other Land use

HH-VV,23 Feb 2011

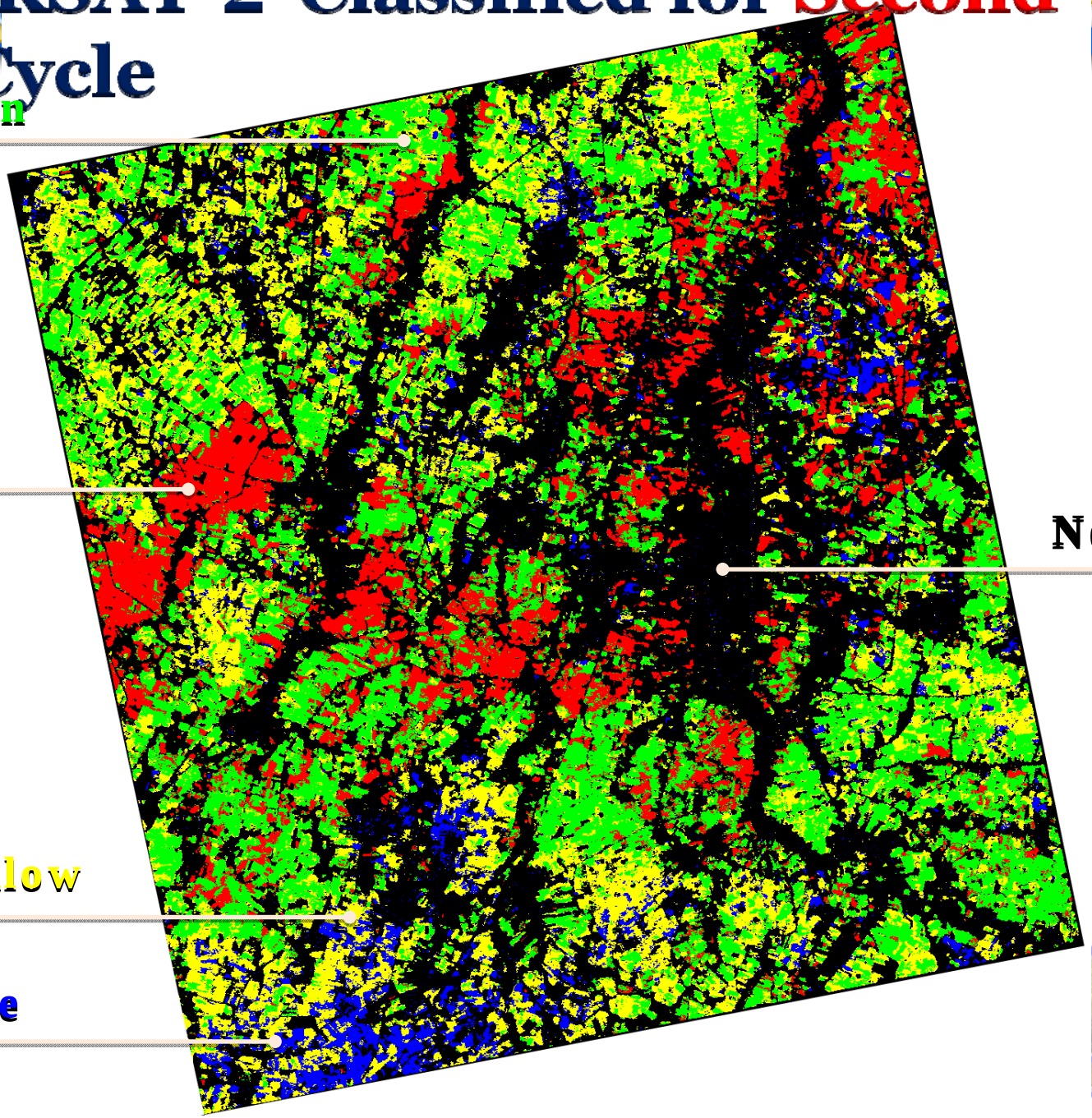
HH-VV,19 Mar 2011

HH-VV,6 May 2011

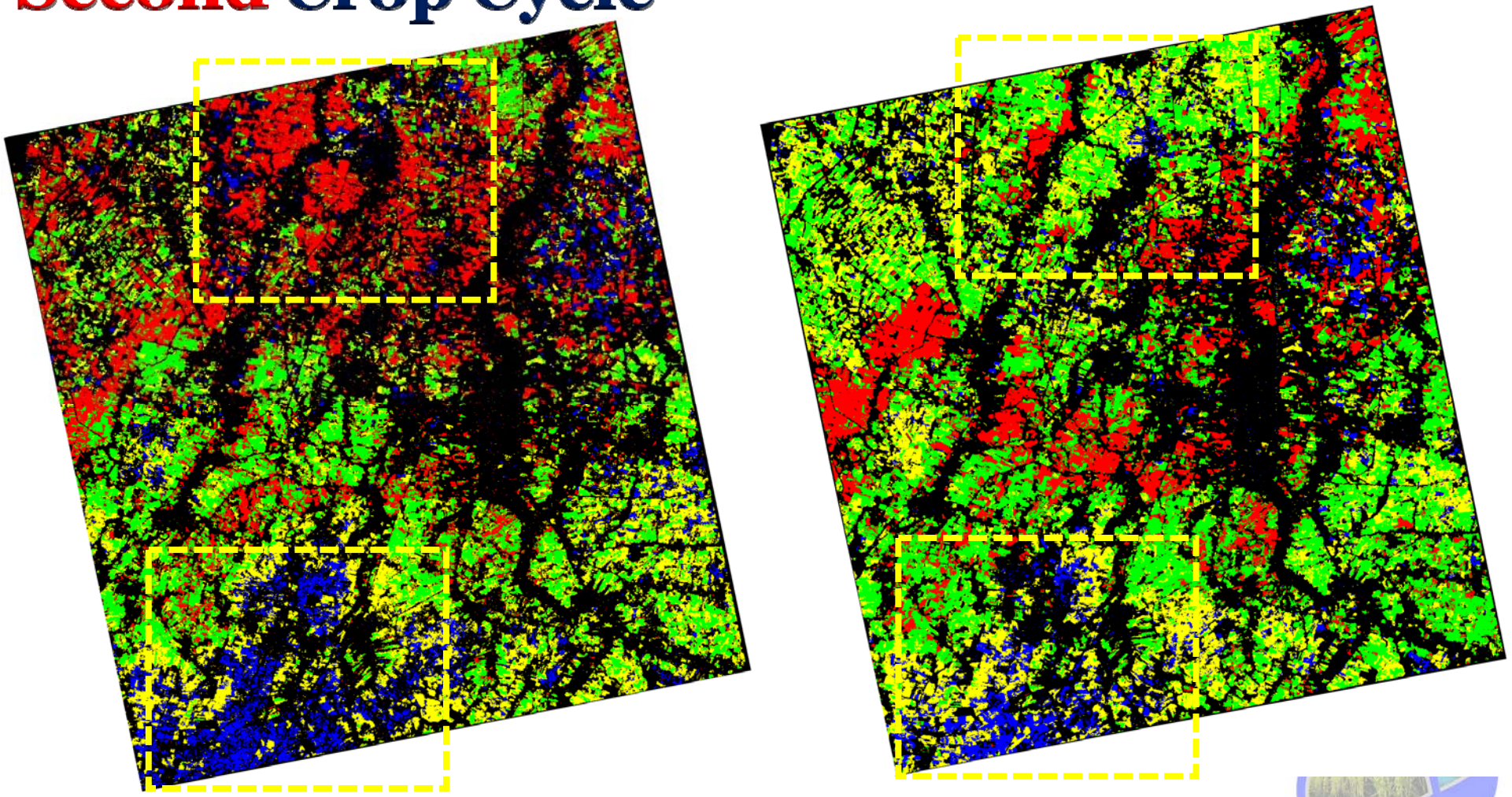
RADARSAT-2 Classified for First Crop Cycle



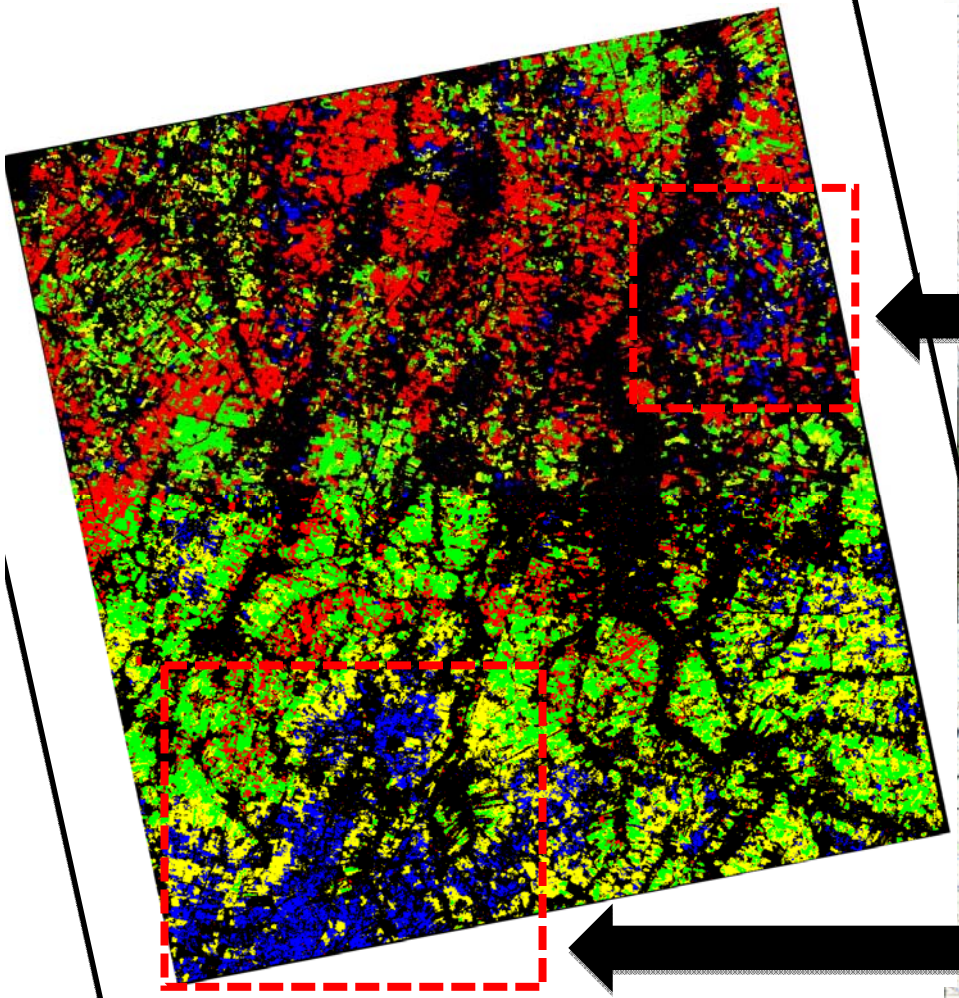
RADARSAT-2 Classified for Second Crop Cycle



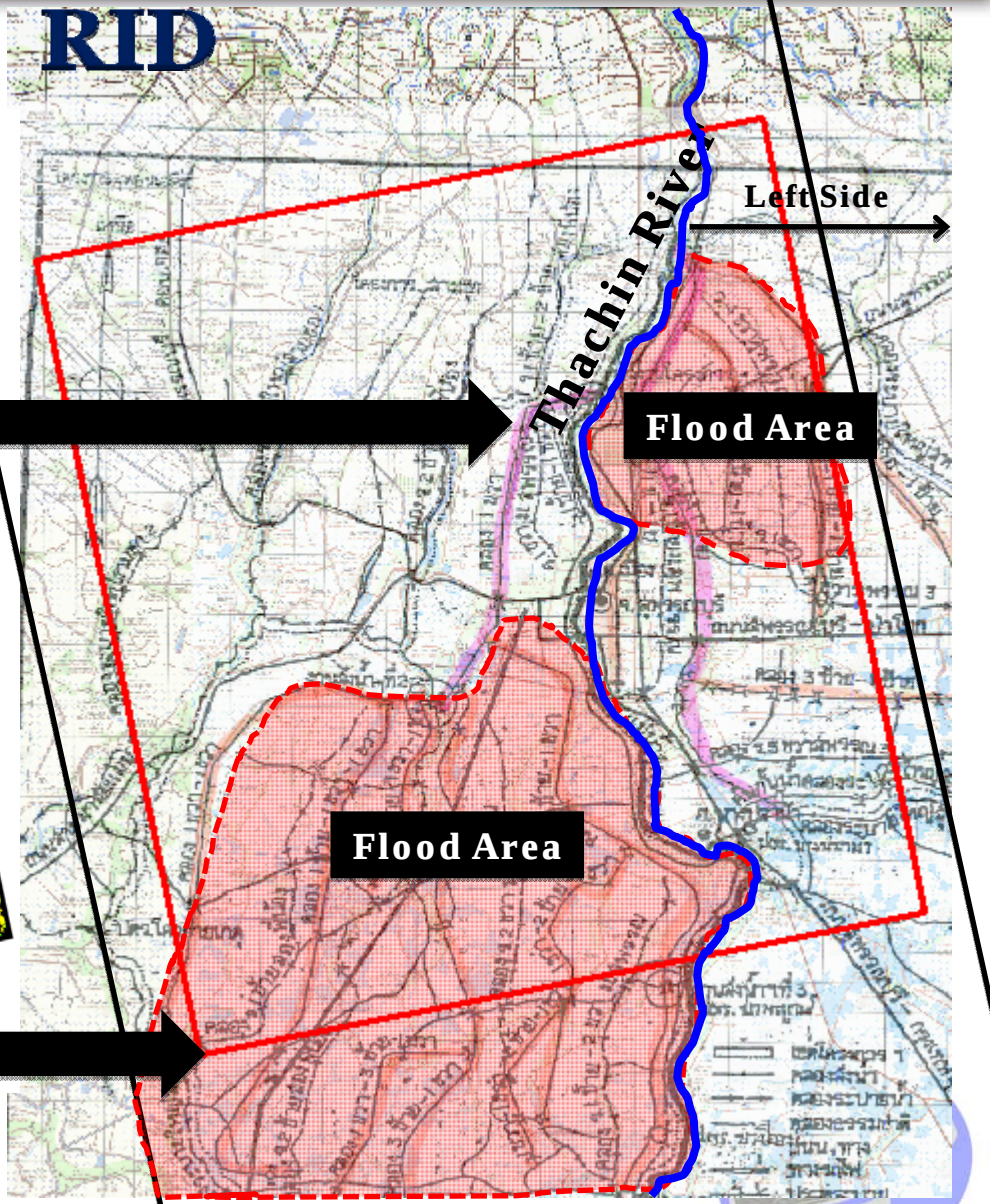
RADARSAT-2 Classified for First & Second Crop Cycle



RADARSAT-2 Classified



Irrigation data from RID



Field Measurement Plan in Suphan Buri

An Field Router was installed in Suphan Buri on June 14th.

- Temperature
- Amount of Insolation
- Amount of Rainfall
- Ground Temperature
- Quasi Real Time Photo

The University of Tokyo by Prof Mizoguchi

Field Measurement Plan in Suphan Buri

x-ability.jp/FieldRouter/vbox0039/

Thank you