JECAM Taiwan TARI site

JECAM/GEOGLAM Science Meeting

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Investigators:

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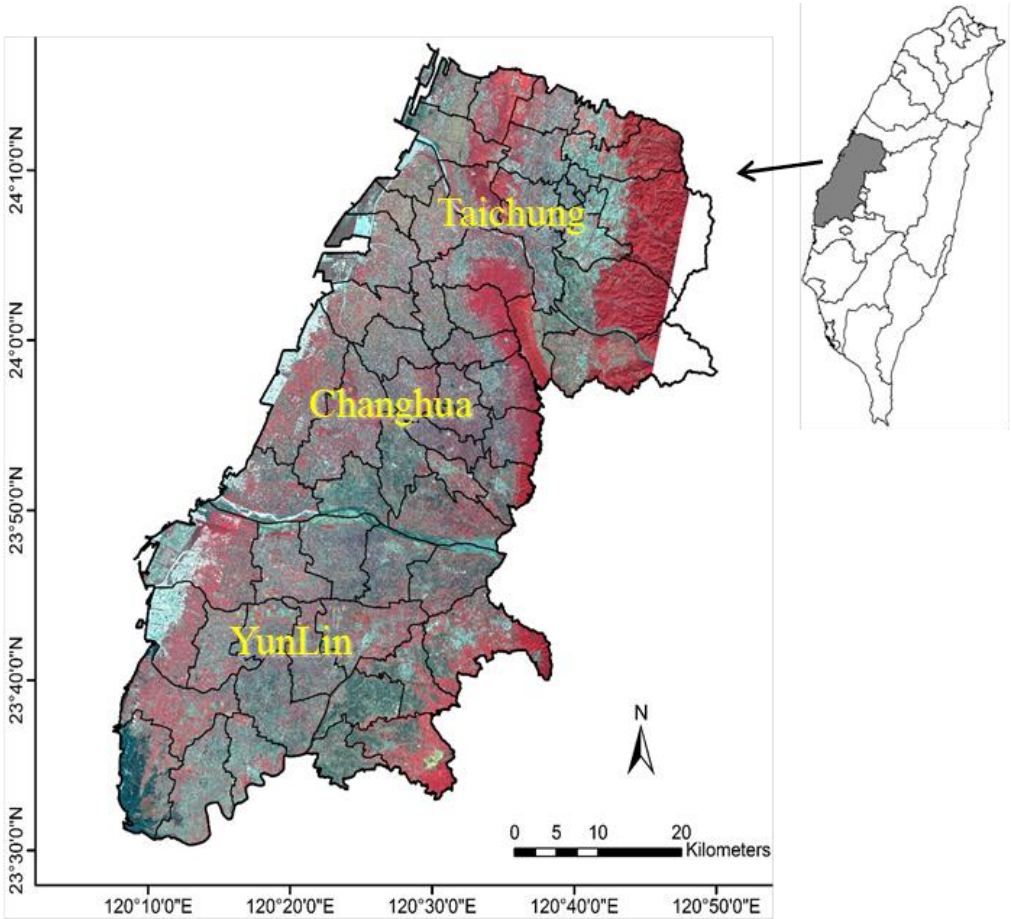
JECAM
Joint Experiment for Crop Assessment and Monitoring

GEO GROUP ON EARTH OBSERVATIONS

Site description



- **Area: 3,070 km^2**
- **64 townships**
- **Rice calendar:**
  - **1st crop: Feb – Jul**
  - **2nd crop: Jul – Dec**
- **Growing cycle: 110 – 130 days**

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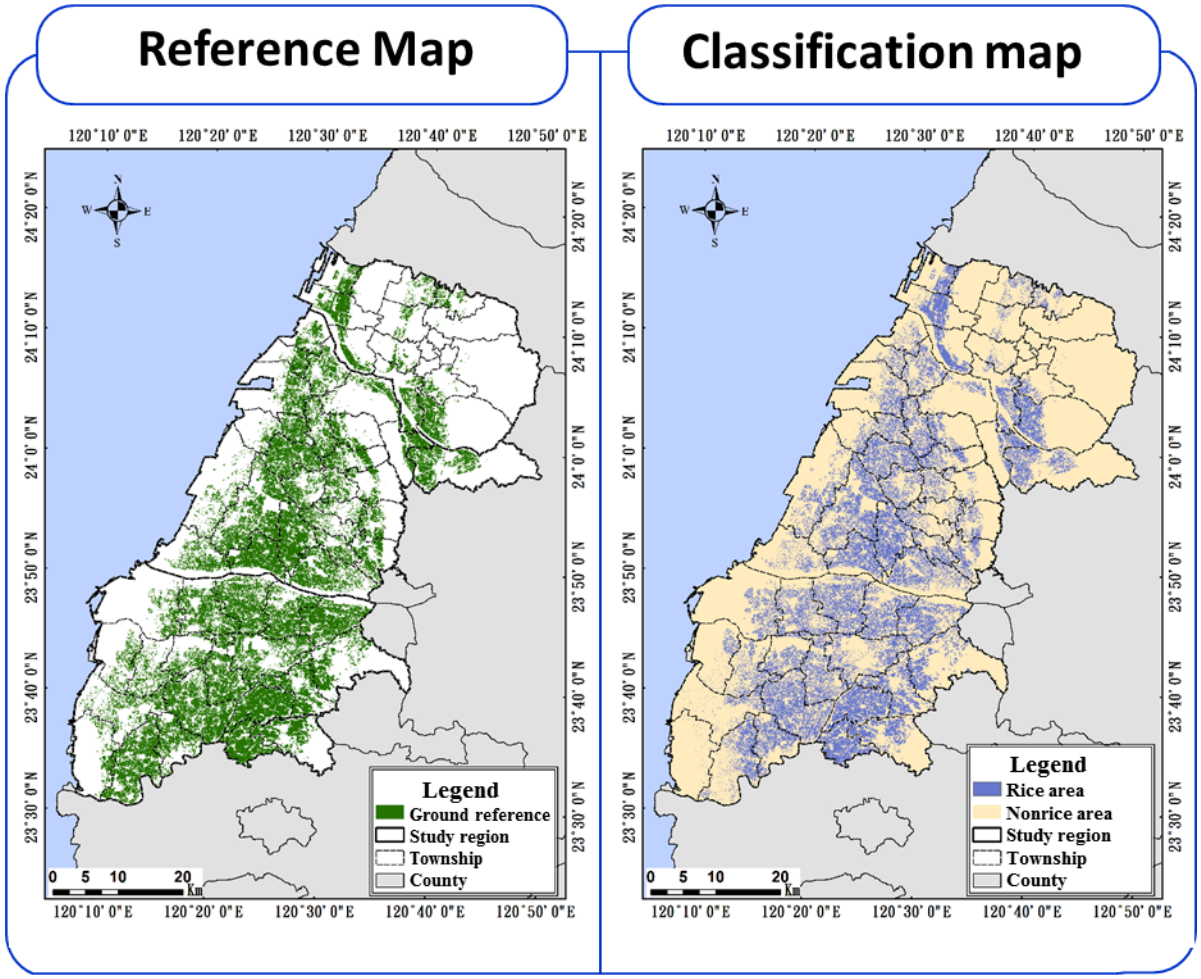
Site description

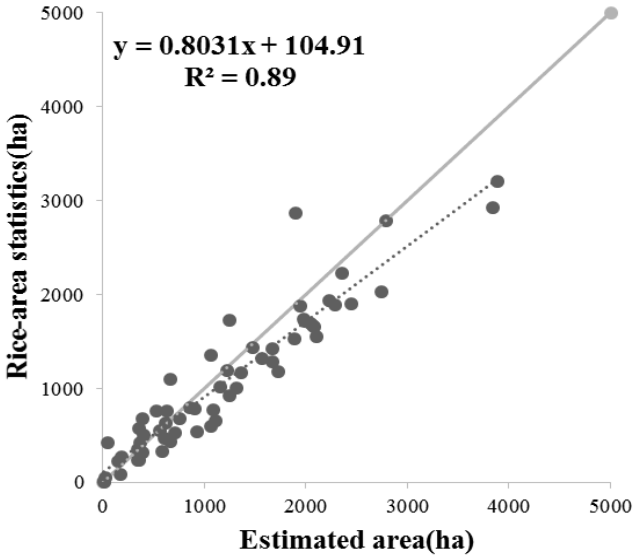
- Topography: Plain
- Soil type: Silt loam
- Drainage class/ irrigation: Moderate – imperfect
- Field size: 0.5 – 1.1 ha
- Climate: Subtropical monsoon / Typhoon/ Drought
- Agricultural method: Traditional farming

Crop identification and crop area estimation

- Aerial photo
  - Rice field
- Optical satellite image
  - FORMOSAT-2, SPOT, Landsat and so on.
- Data fusion
  - SPOT/MODIS, Landsat/ MODIS
- SAR
  - Radarsat-2 2014 (SOAR-JECAM Project)

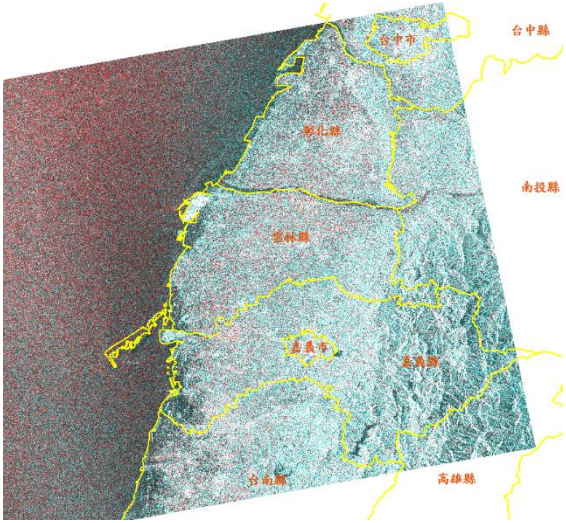
SVM classification result with Lansat 8/MODIS data fusion in 2013



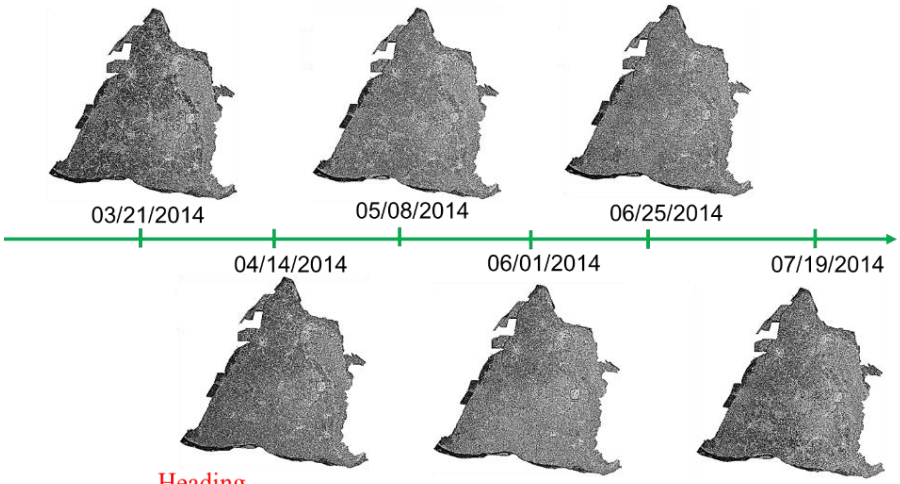


2013	Ground Reference		
	Rice	Non-rice	Total
First rice crop mapping results			
Rice	4,343	657	5,000
Non-rice	885	4,115	5,000
Total	5,228	4,772	10,000
P A (%)	86.86	82.30	
UA (%)	83.07	86.23	
OA (%)	84.58		
Kappa	0.69		

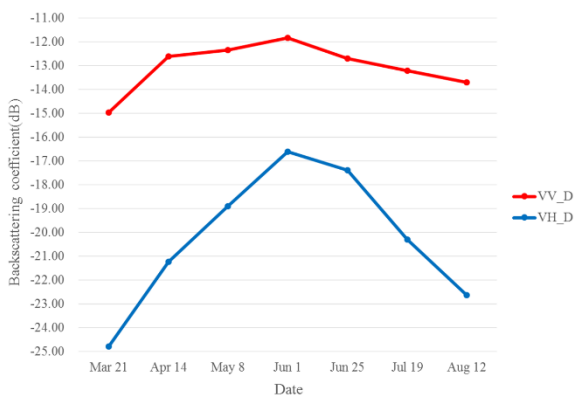
SAR data: Radarsat-2

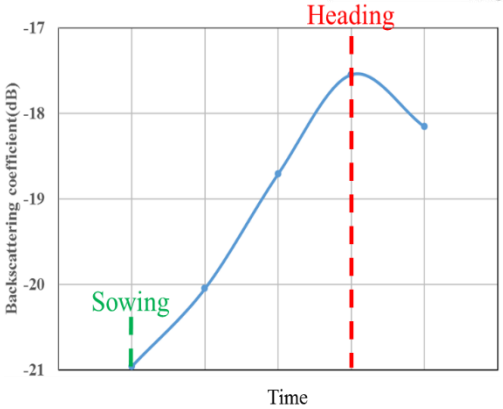


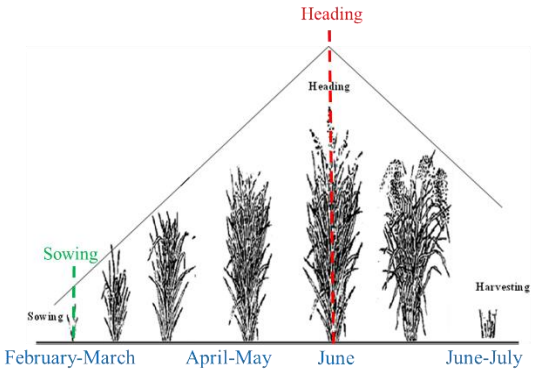
- Provided by SOAR-JECAM project
- 1 February ~ 15 October,2014
- Mode: VV + HV
- 1st rice cropping season (Feb.~ Jul.)
- Res. : 5 m



Rice backscattering characteristics







Normalized Difference Singma-0 Index

- NDSI (Normalized Difference Sigma-naught Index, σ_0) derives normalized different value of sigma-0 between two period images.
- The formula is as following and its value ranges from -1 to +1.

$$\mathrm{NDSI} = \frac{\sigma_0^{\mathrm{master}} - \sigma_0^{\mathrm{slave}}}{\sigma_0^{\mathrm{master}} + \sigma_0^{\mathrm{slave}}}$$

- Based on rice phenology and backscattering characteristic, the images of sowing (slave image) and heading stage (master image) are selected to calculate NDSI value.

$$NDSI = \frac{\sigma_0^{0601} - \sigma_0^{0321}}{\sigma_0^{0601} + \sigma_0^{0321}}$$

Threshold-based classification results of the 1st crop in 2014

Rice referenced map

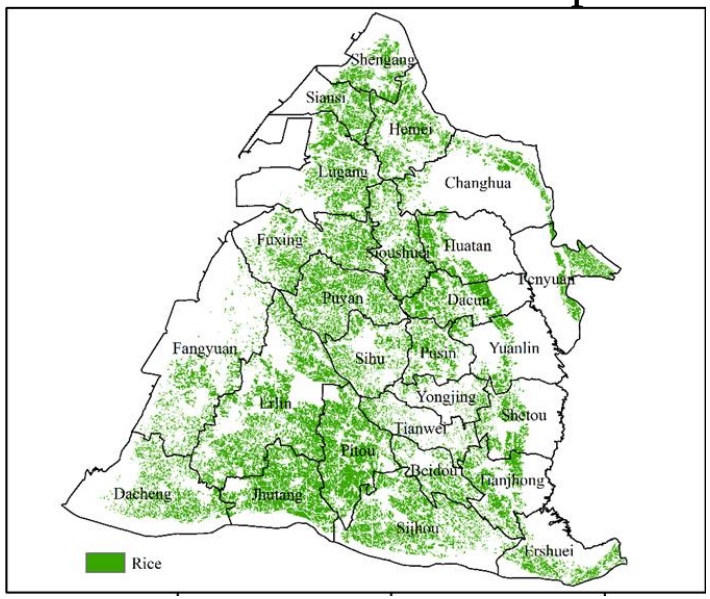
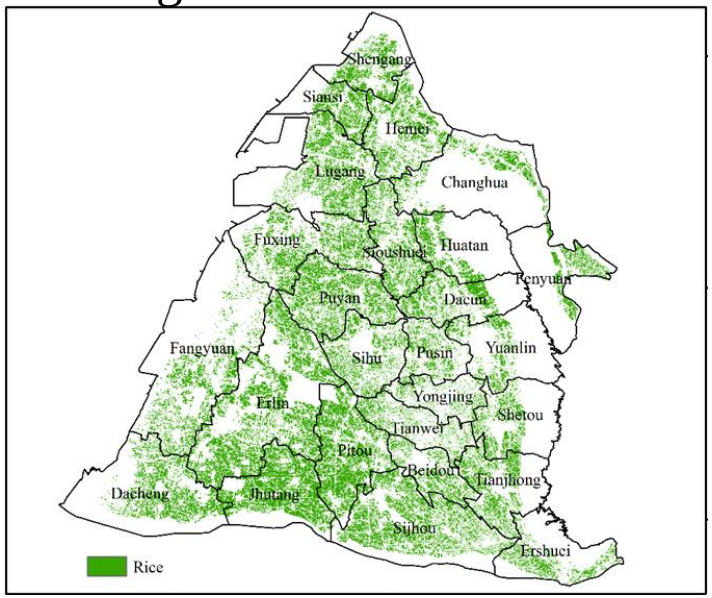
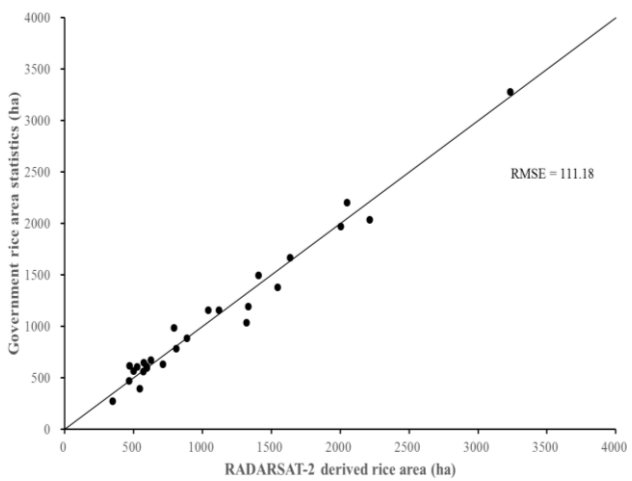


Image classification result

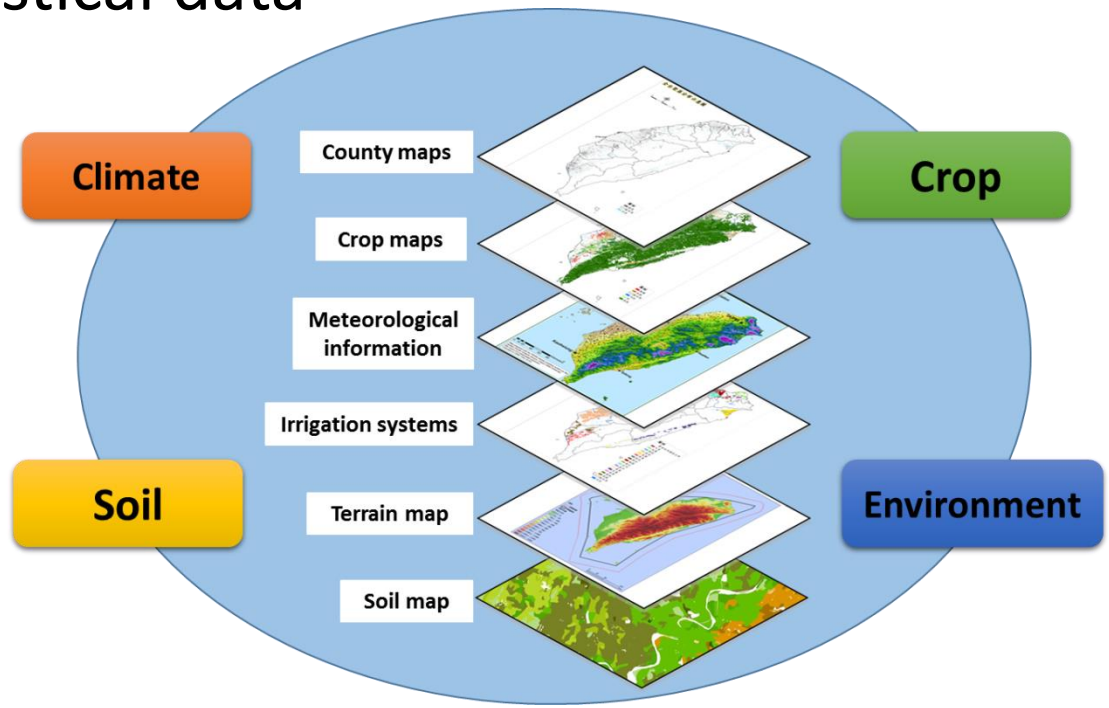




		Classification result		
		Rice	Non-rice	Total
Referenced data	rice	861	139	1000
	non-rice	106	894	1000
	total	967	1033	2000
Producer Accuracy (%)		86.1	89.3	
User Accuracy (%)		89.0	86.5	
Overall Accuracy (%)		87.7		
Kappa coefficient		0.75		

In situ Data

- Land cover map
- Soil database
- Government statistical data
- Yield sampling



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Record form

第　頁，共　頁

104 年農地土地覆蓋現地調查-記錄表

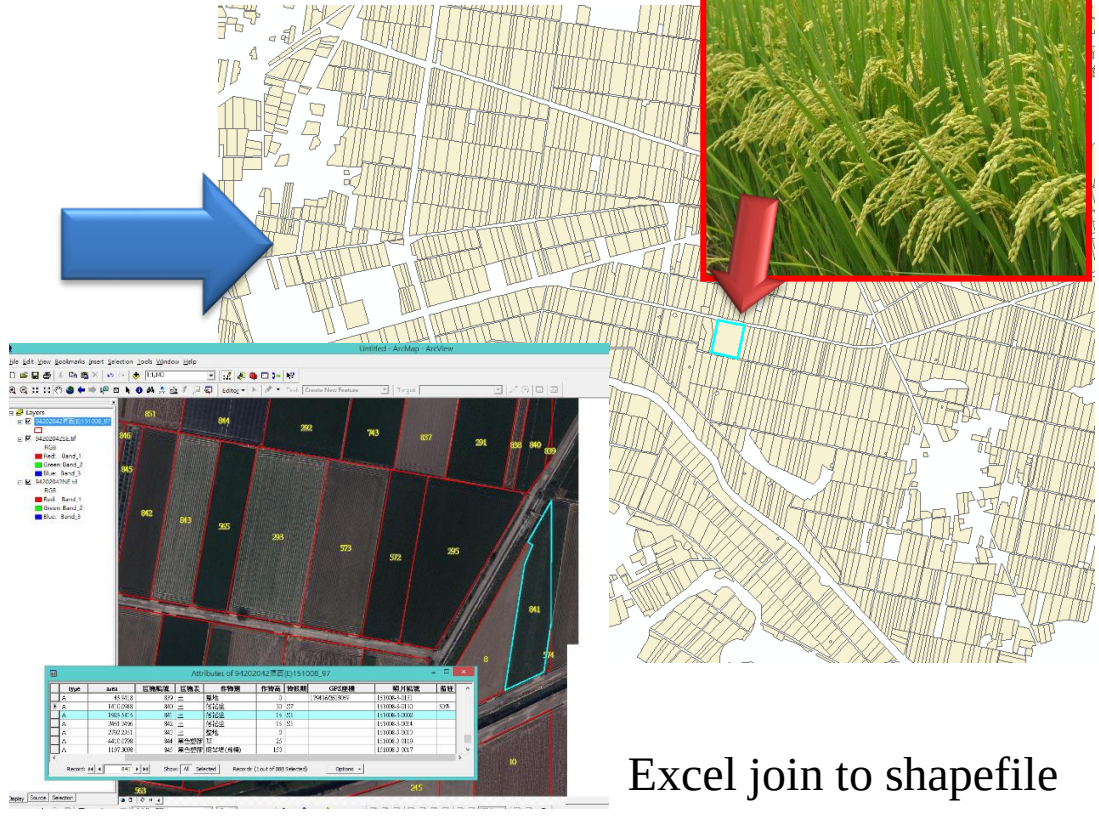
圖號圖名：　　調查日期：　　調查員：

區塊編號	區塊表面	作物別(利用情況)	作物高度	物候期	GPS 座標	照片編號	備註

record

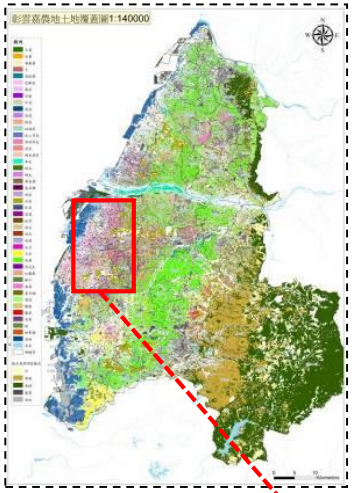
Microsoft Excel - 94202042 潭西(E)-土地覆蓋野外調查表

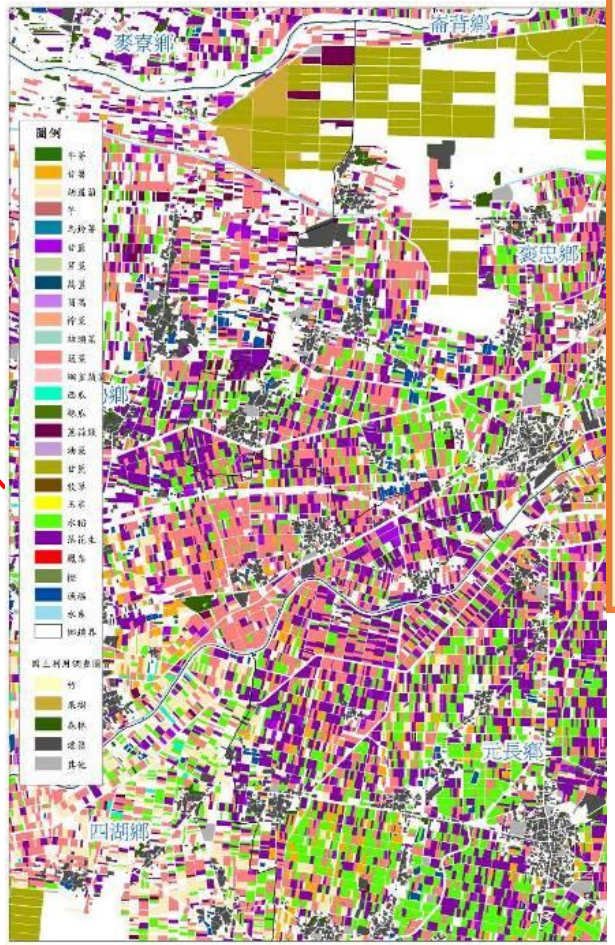
	A	B	C	D	E	F	G	H
1	區塊編號	區塊表面	作物別(利用情況)	作物高度(cm)	物候期(S)	GPS座標	照片編號	備註
2	574	土	落花生	15	S3	179405/2614844	151008-3-0001	
3	841	土	落花生	15	S3		151008-3-0002	
4	8	土	毛豆	25			151008-3-0003	
5	295	土	落花生	30	S7		151008-3-0004	
6	572	土	甘藷	15			151008-3-0005	
7	715	土	太陽麻	8			151008-3-0006	
8	276	土	整地	0			151008-3-0007	
9	573	土	落花生	15	S3		151008-3-0008	
10	293	土	整地	0			151008-3-0009	
11	277	土	太陽麻	10			151008-3-0010	
12	713	土	落花生	30	S7	179174/2614880	151008-3-0011	
13	565	土	草	10			151008-3-0012	
14	843	土	整地	0			151008-3-0013	
15	842	土	落花生	15	S3		151008-3-0014	
16	562	土	落花生	15	S3		151008-3-0015	
17	564	土	甘藷	15			151008-3-0016	
18	845	黑色塑膠布	樹苗場(肖楠)	150			151008-3-0017	
19	846	土	落花生	30	S7		151008-3-0018	
20	847	土	落花生	30	S7		151008-3-0019	
21	714	黑色塑膠布	樹苗場(台灣櫻)	160			151008-3-0020	
22	278	土	草	5		179057/2614901	151008-3-0021	
23	431	土	蒜	5			151008-3-0022	
24	424	土	落花生	30	S7		151008-3-0023	
25	411	土	毛豆	20			151008-3-0024	
26	852	土水	毛豆	20			151008-3-0025	
27	788	土	毛豆	20			151008-3-0026	
28	425	土	落花生	30	S7		151008-3-0027	
29	757	土	草	8			151008-3-0028	
30	853	土	毛豆	40			151008-3-0029	
31	645	土	毛豆	20			151008-3-0030	
32	426	土	蒜	8		178802/2614944	151008-3-0031	
33	429	土	落花生	30	S7		151008-3-0032	
34	433	土	毛豆	25			151008-3-0033	
35	410	土	落花生	30	S7		151008-3-0034	



Excel join to shapefile

Land cover map of the central-west part of Taiwan

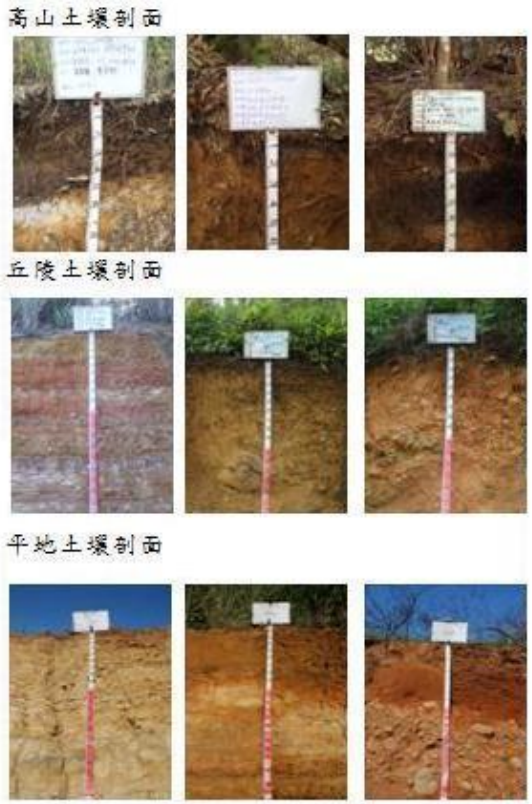


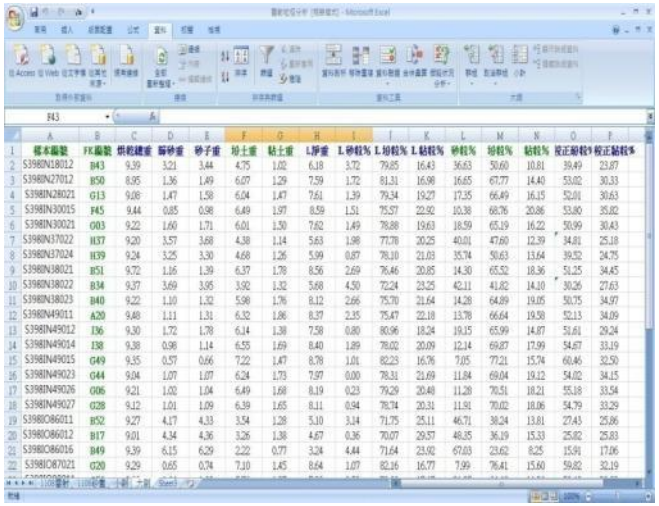


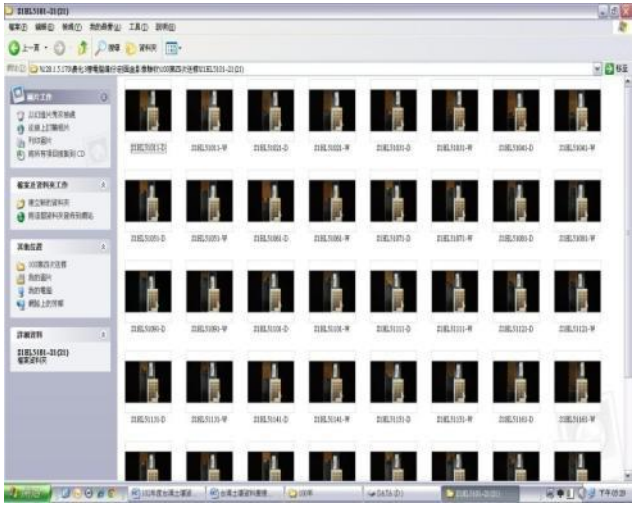
Soil database derived from soil survey programs

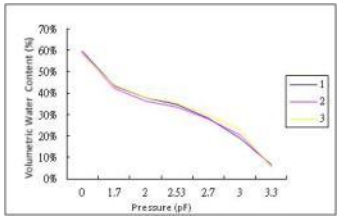






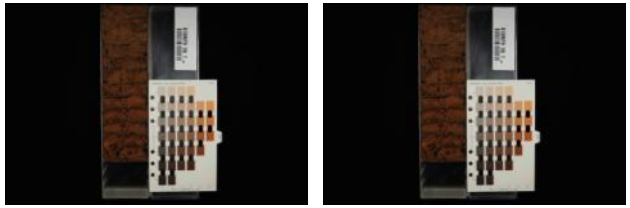






Characteristic Curve

Sand micro-photo



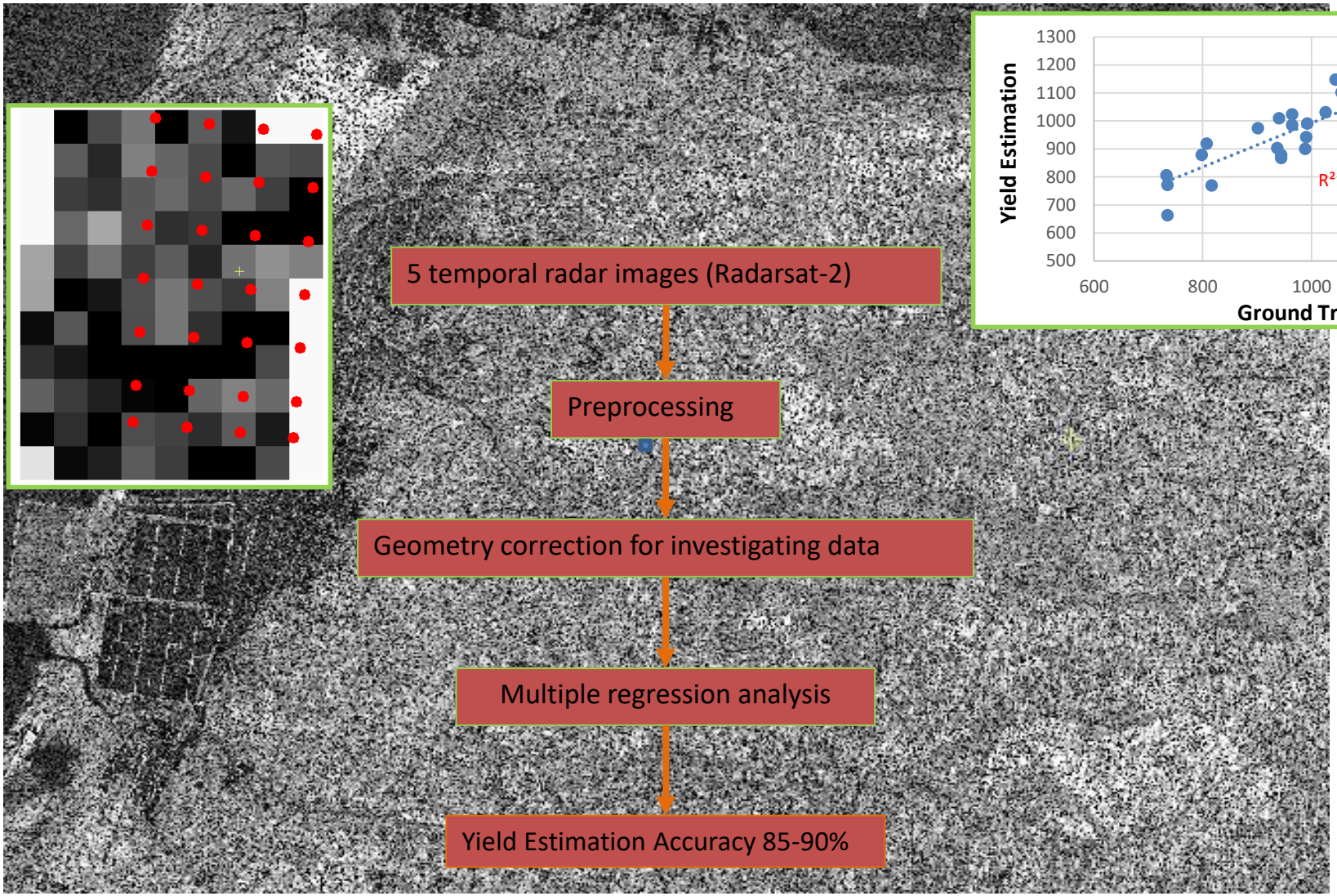
Wet/dry colour

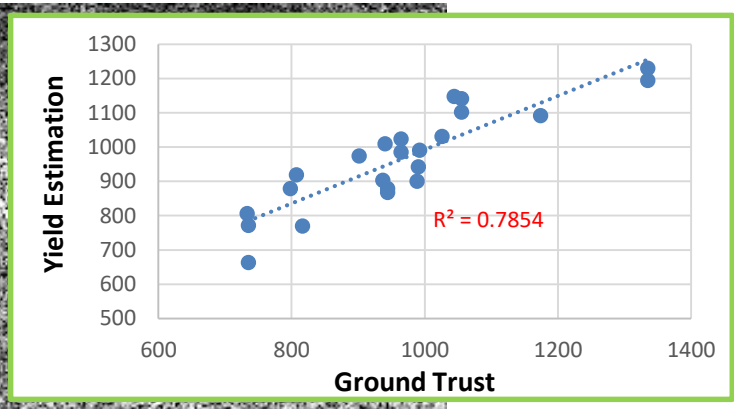
Yield survey

Sun Dried

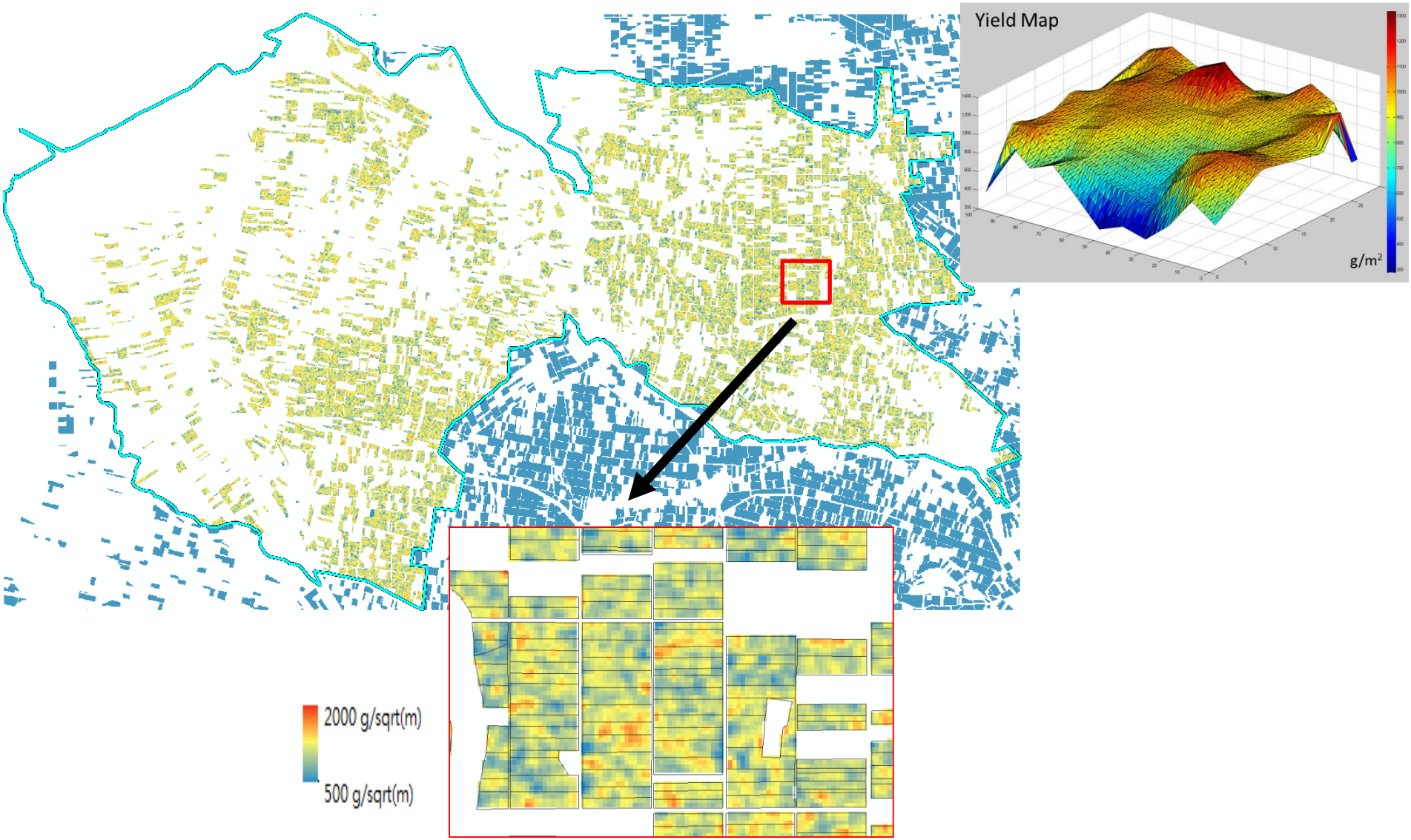
Sample DW
(ω<15%)

Prediction of paddy rice yield by multi-temporal radar images





Estimating the yield of a township



Research plan and collaboration

- Use UAV , VGIS (volunteer geographic information system) and IOT/sensor network to collect field data.
- Method validation.
- New data: ALOS 2, Sentinel 1 / 2
- Crop yield model comparison
- The methods are still improved for mapping other short-term crops.
- We have participated in a collaborative project with scientists from other study sites.

Thank you
for your attention