Philippine Rice Information System (PRiSM): Development and Operation

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Taichung, Taiwan

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INTRODUCTION

PRiSM collects data and generates rice production information using mobile technology, remote sensing, geographic information system, and crop modeling

- ✓ Applies ICT in Rice Agriculture as an operational on-line information system to deliver timely information

- ✓ Developed in 2013-2018 in collaboration with DA, PhilRice, and IRRI, with funding from DA-BAR

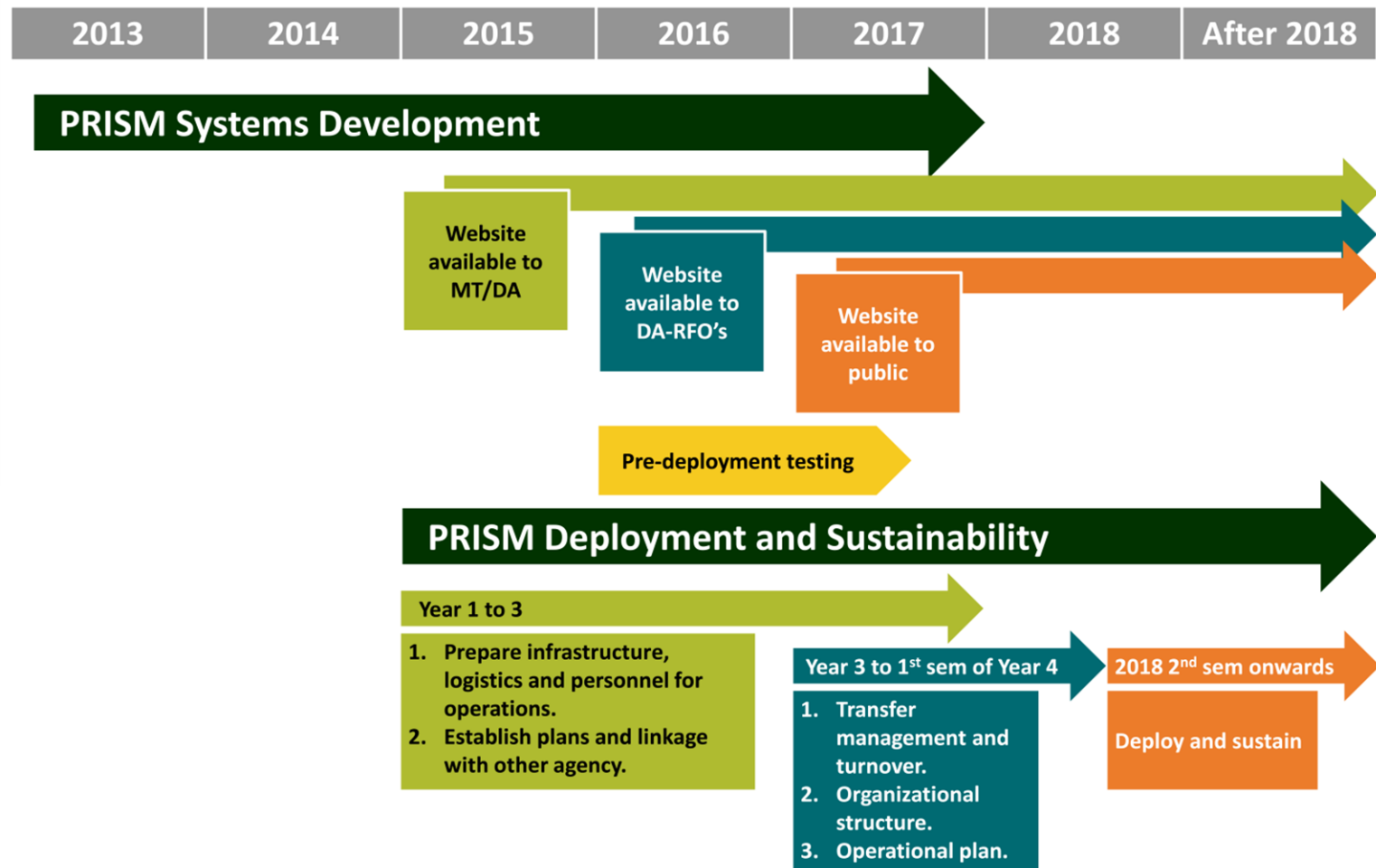- ✓ Rice Information System owned by the DA and operated by PhilRice

PRiSM OBJECTIVES

Develop and sustain a system to present accurate, timely and location-specific information on the status of rice crop in the Philippines for decision-makers and planners
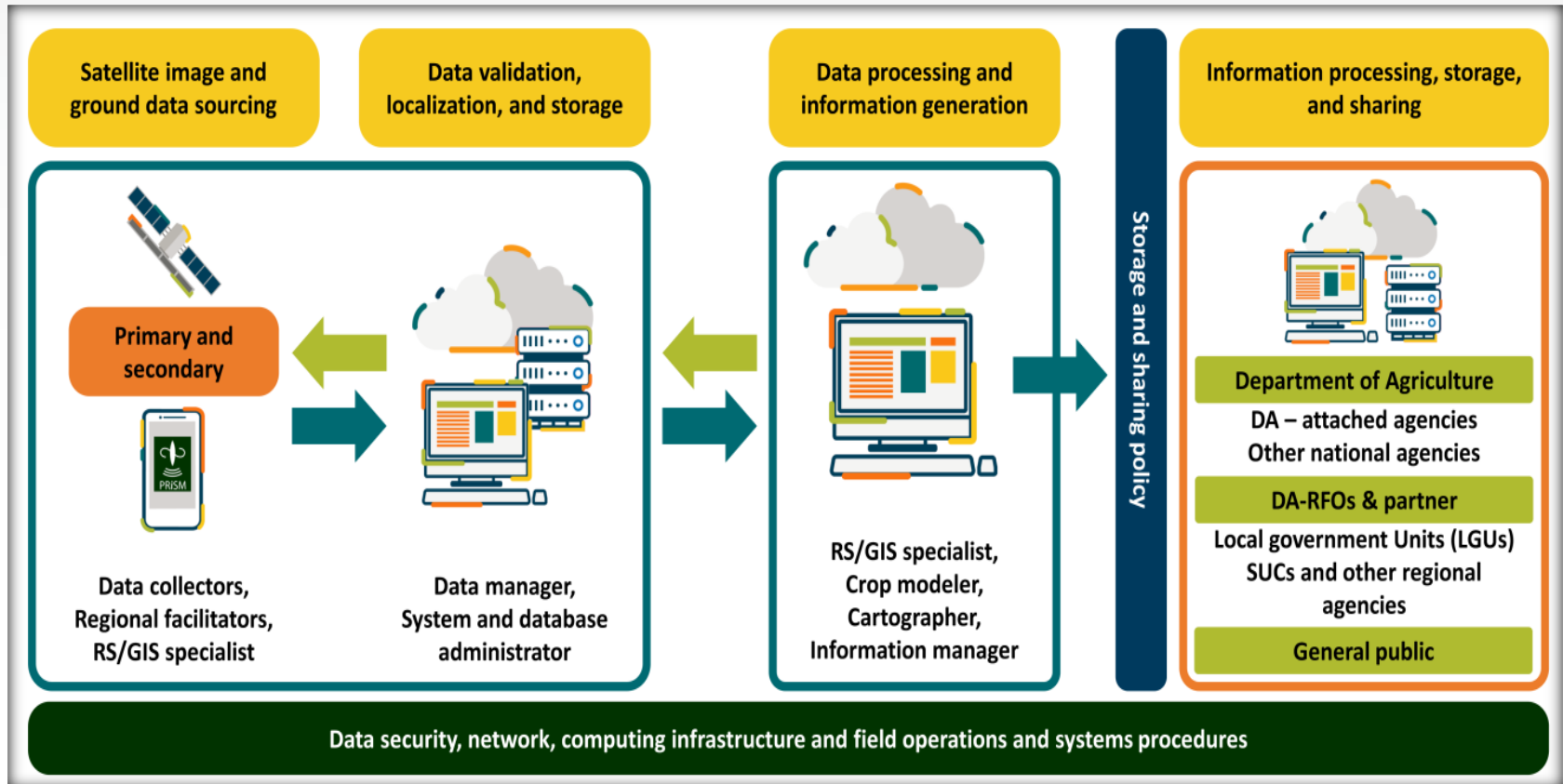
1. Establish and operate a PRISM unit with functional system infrastructure, network of collaborators and staff with necessary skills for the full operation

2. Enhance the capacity of local partners on rice mapping, yield estimation, and rice field monitoring

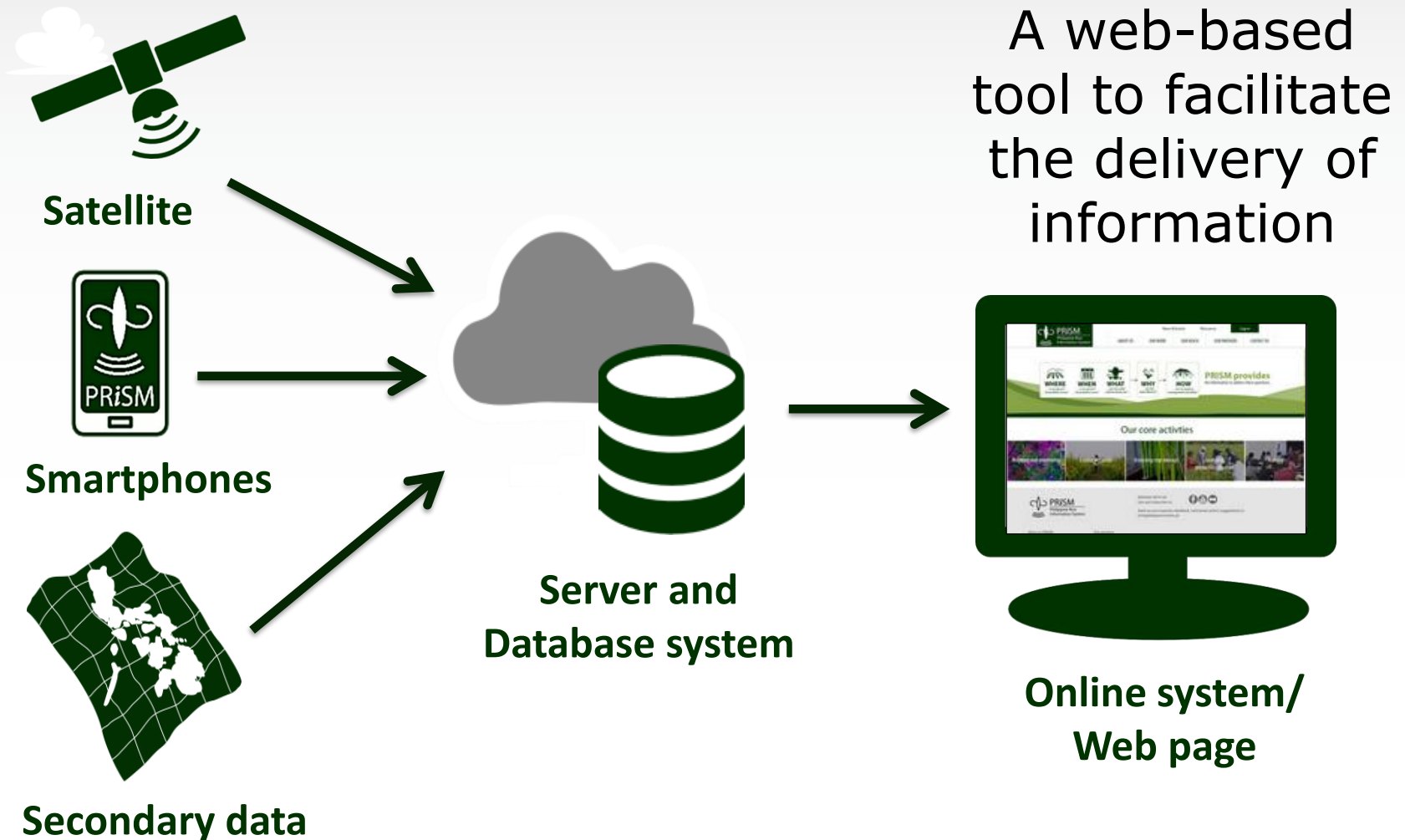3. Establish and maintain monitoring, feedback and information sharing for better delivery of services

DEVELOPMENTAL FRAMEWORK
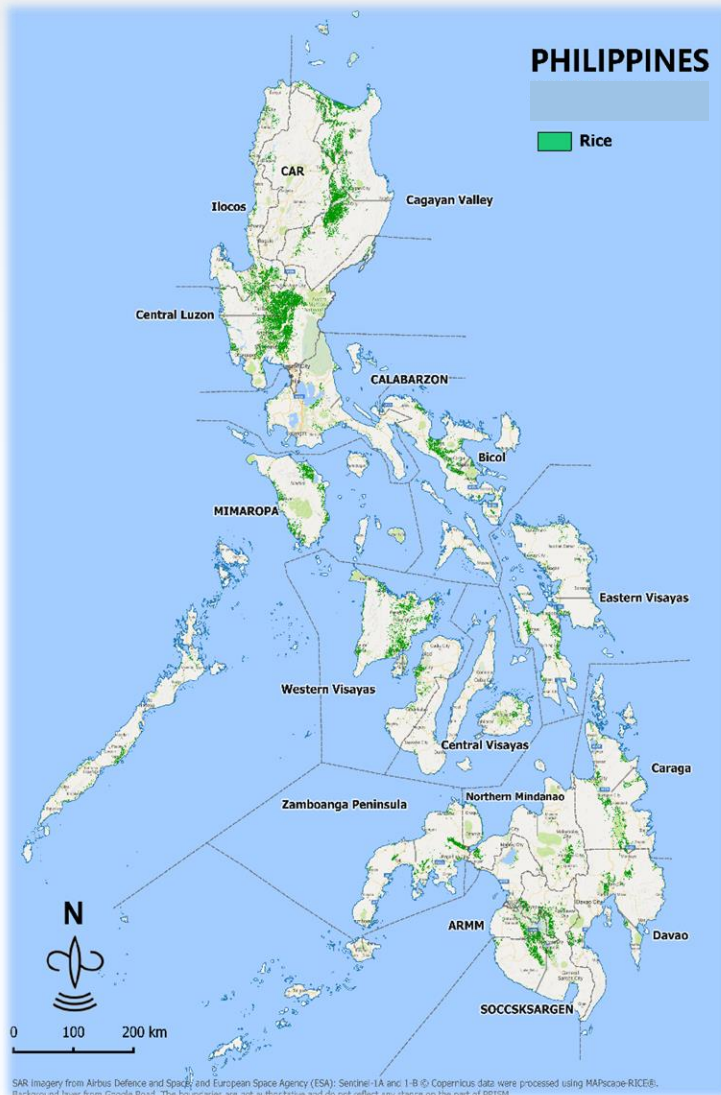## (Information System Infrastructure Development)

OPERATIONAL FRAMEWORK

INFRASTRUCTURE FRAMEWORK

Satellite

Smartphones

Secondary data

Server and
Database system

A web-based
tool to facilitate
the delivery of
information

Online system/
Web page

AREA OF OPERATION
(All Philippine Regions)

PHILIPPINES

■ Rice

Region	PhilRice Branch	Collaborator
Ilocos	Batac	DA-RFO 1
CAR	Batac, Isabela	DA-RFO CAR
Cagayan Valley	Isabela	DA-RFO 2
Central Luzon	CES	DA-RFO 3
CALABARZON	Los Baños	DA-RFO 4A
MIMAROPA	Los Baños	DA-RFO 4B
Bicol	Bicol	DA-RFO 5
Western Visayas	Negros	DA-RFO 6
Central Visayas	Negros	DA-RFO 7
Eastern Visayas	Bicol	DA-RFO 8
Zamboanga	Midsayap	DA-RFO 9
Northern Mindanao	Agusan	DA-RFO 10
Davao	Agusan	DA-RFO 11
SOCCSKSARGEN	Midsayap	DA-RFO 12
CARAGA	Agusan	DA-RFO 13
ARMM	Midsayap	DA-RFO ARMM

SAR imagery from Airbus Defence and Space and European Space Agency (ESA): Sentinel-1A and 1-B © Copernicus data were processed using MAPscape-RICE®. Background layer from Google Road. The boundaries are not authoritative and do not reflect any stance on the part of PRISM.

OPERATIONAL STRUCTURE
(Management)

PRISM Operation Management Team
(DA- Special Order 458)

Chair: DA *Usec. Ariel T. Cayanan*

Co-Chair:
DA Dir. Andrew B. Villacorta
DA-BAR Dir. Nicomedes P. Eleazar
PhilRice Dir. Sailila Abdula

Vice-chair:
Engr. Christopher V. Morales

Members:
DA-National Rice Program
Engr. Ronald Gregory V. Roces
Mr. Edmund Sana

PHILRICE
Dr. Eduardo Jimmy P. Quilang
Mr. Jovino de Dios

DA-FPCMD
Mr. Vener L. Dilig

DA-DRRMC
Ms. Lorna Belinda L. Calda

DA Operations Center
Ms. Zaida A. Manglicmot

DA-ICTS Head

Technical Consultant
IRRI
Dr. Alice G. Laborte
Ms. Jenny Raviz

Secretariat

DA-BAR
Mr. Raymond Patrick Cabrera
Mr. Jay Bermas

PHILRICE
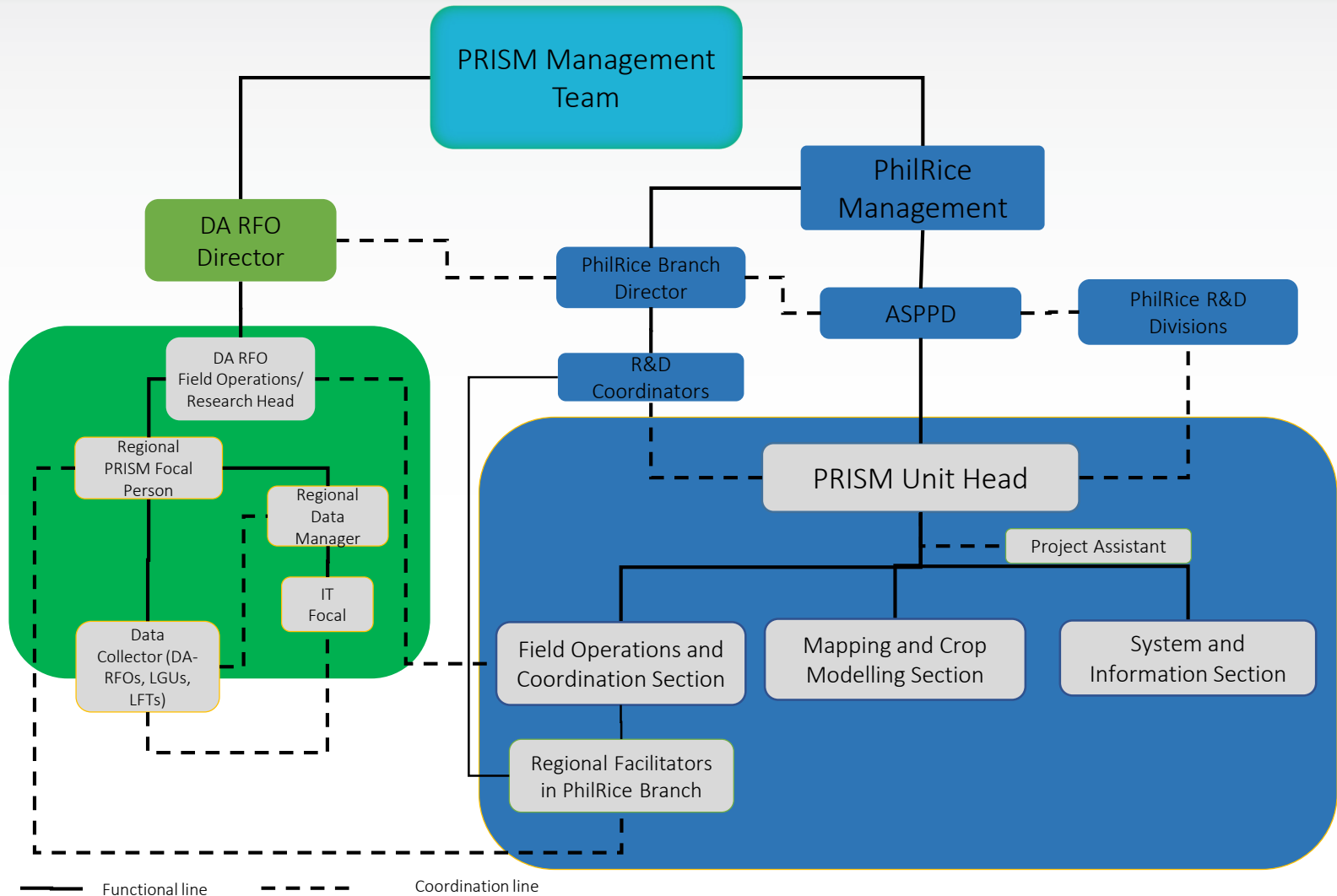*Eve Daphne Radam*
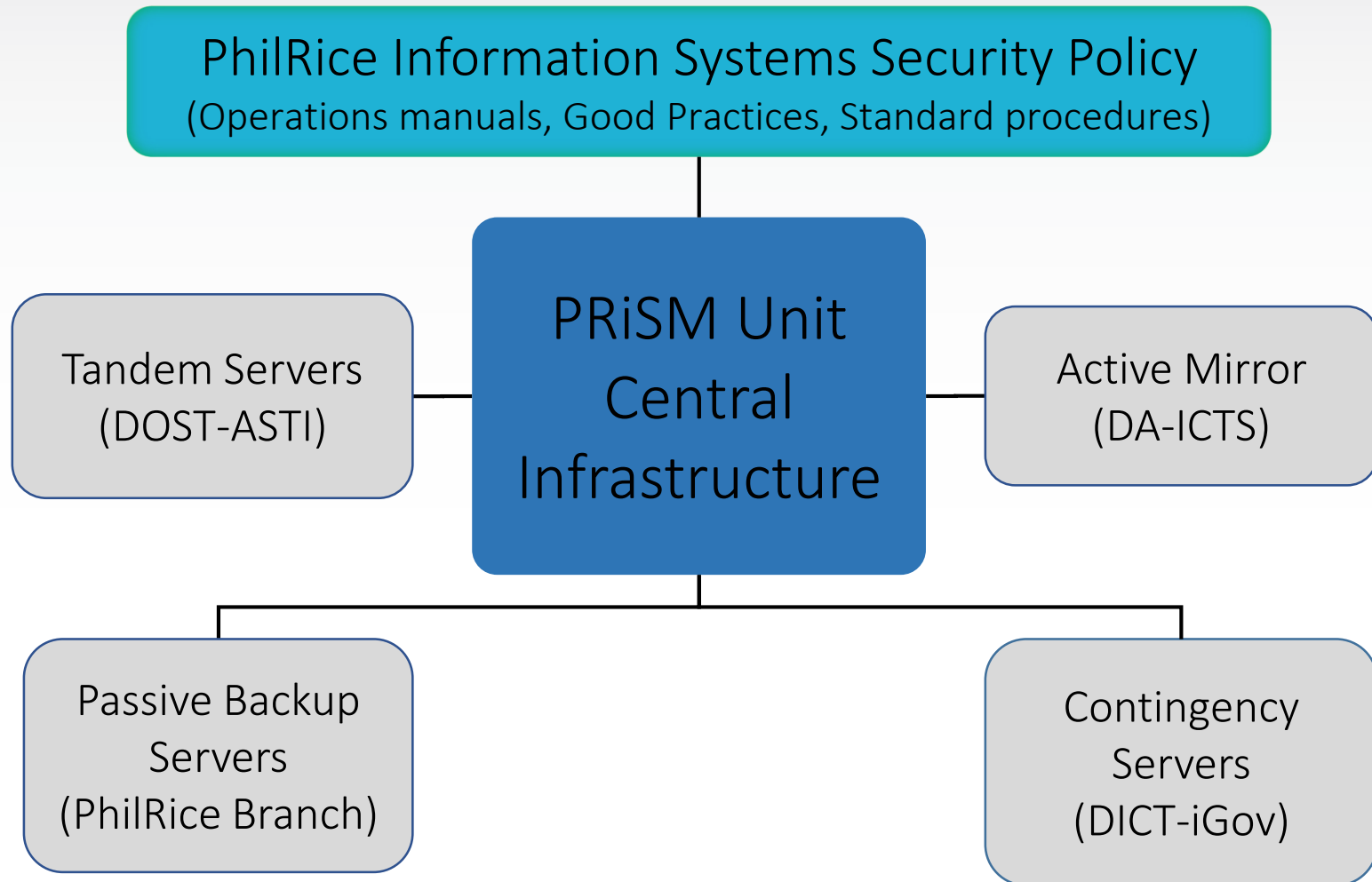*Darlynne Kaye Bumagat*

DA-FPOPD
Mr. Alvin G. Tallada

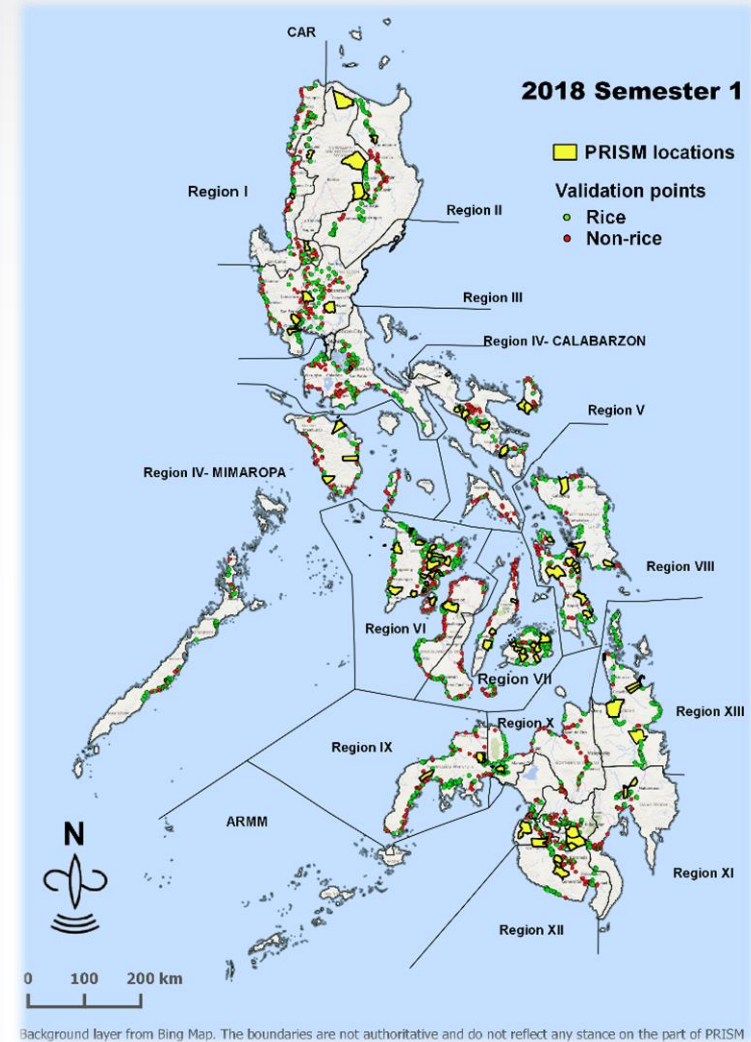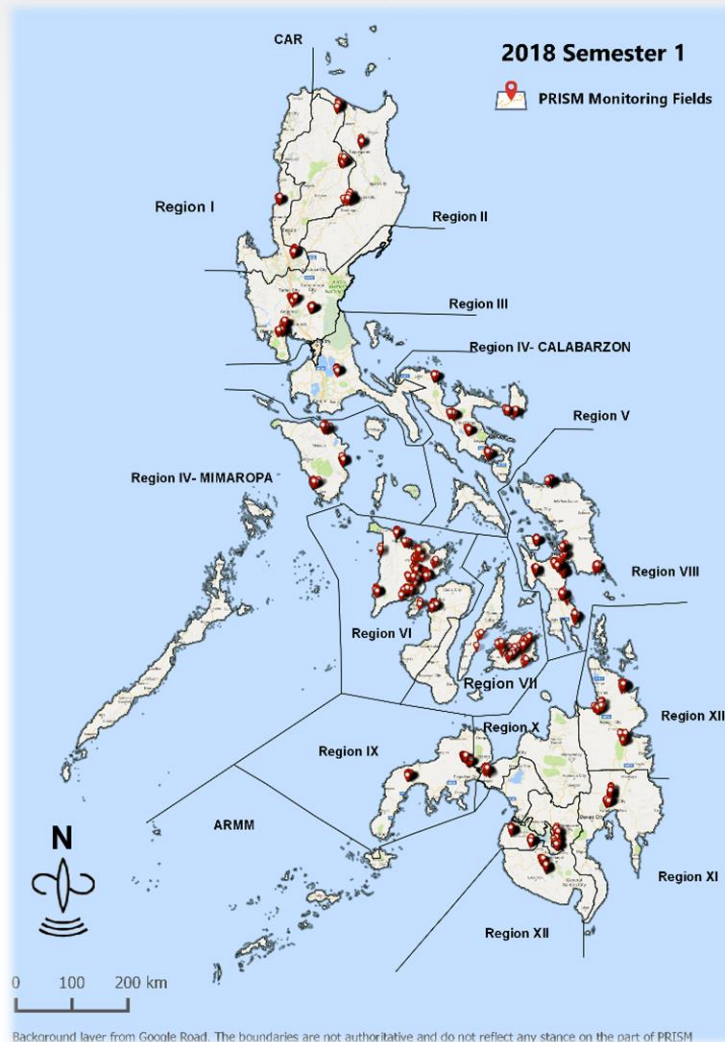# OPERATIONAL STRUCTURE
(Organizational)

BUSINESS CONTINUITY STRATEGY
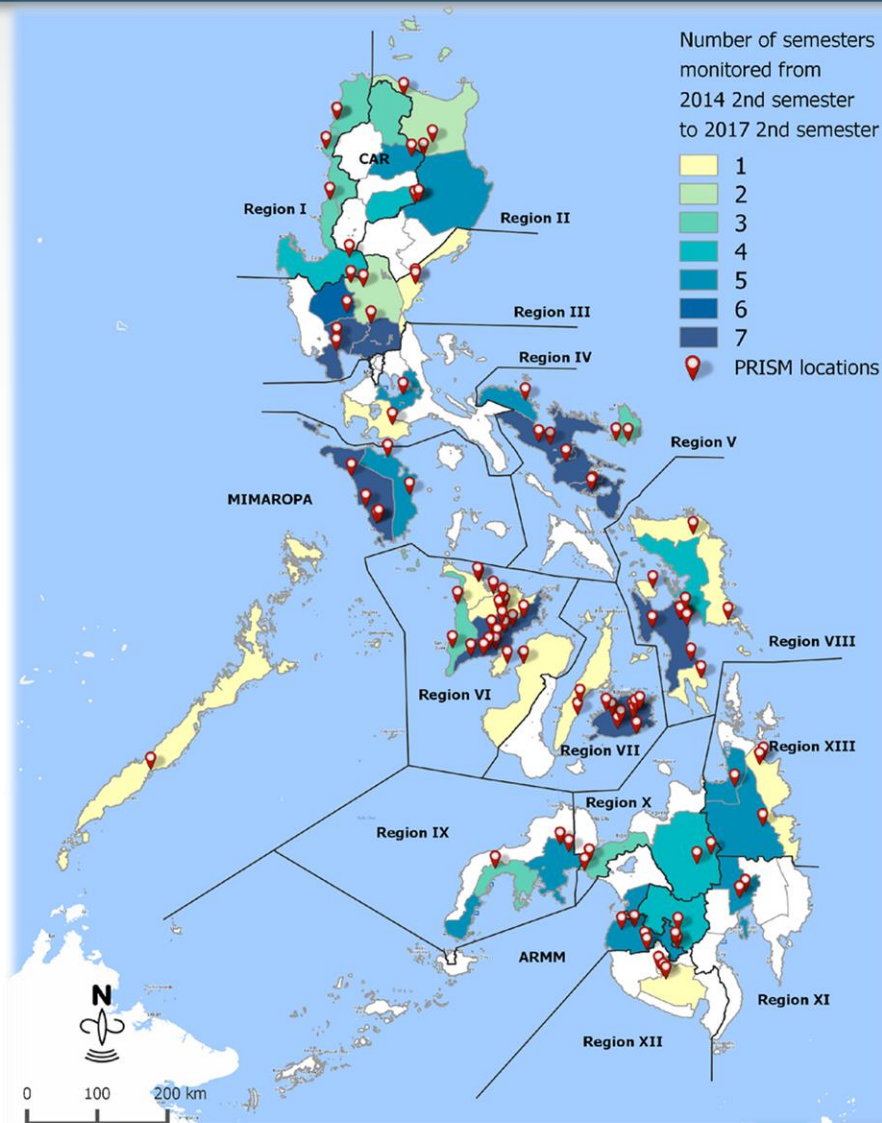## (Risk Management Framework)

ACTIVITIES AND RESULTS (Ground Data Collection)

Establishment and collection of data from Monitoring Fields and Validation Points
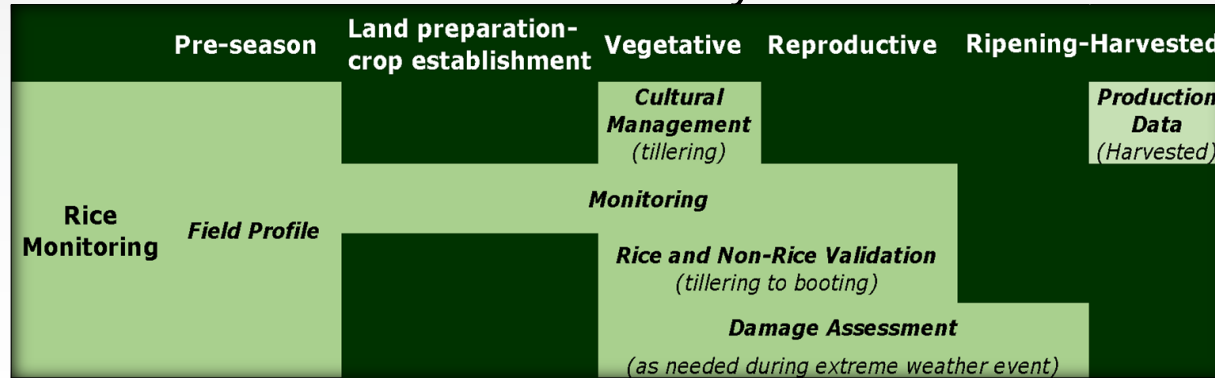
ACTIVITIES AND RESULTS (Ground Data Collection)

Year/Semester	Number of Farmer's Field
2014 2nd Sem	300
2015 1st Sem	260
2015 2nd Sem	780
2016 1st Sem	760
2016 2nd Sem	1,040
2017 1st Sem	960
2017 2nd Sem	1,370
2018 1st Sem	1,170

ACTIVITIES AND RESULTS
(Smartphone-based Field Surveys)
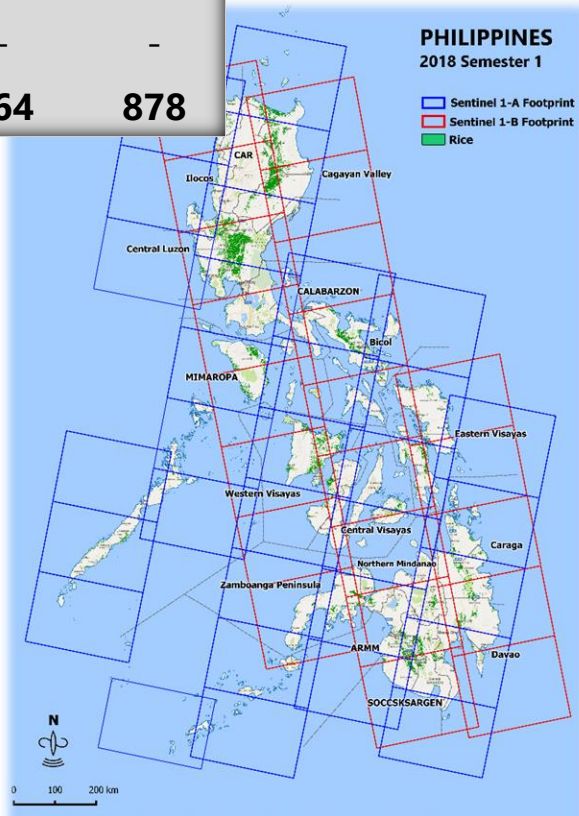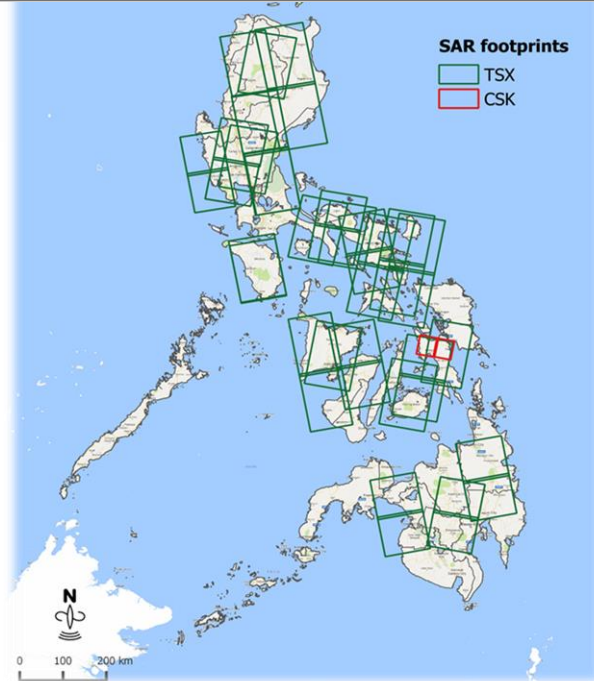

Field activities conducted every season

	Pre-season	Land preparation-crop establishment	Vegetative	Reproductive	Ripening-Harvested
Rice Monitoring	Field Profile		*Cultural Management (tillering)*		*Production Data (Harvested)*
			Monitoring		
			Rice and Non-Rice Validation (tillering to booting)		
			Damage Assessment (as needed during extreme weather event)		

Yearly Record of Field Data

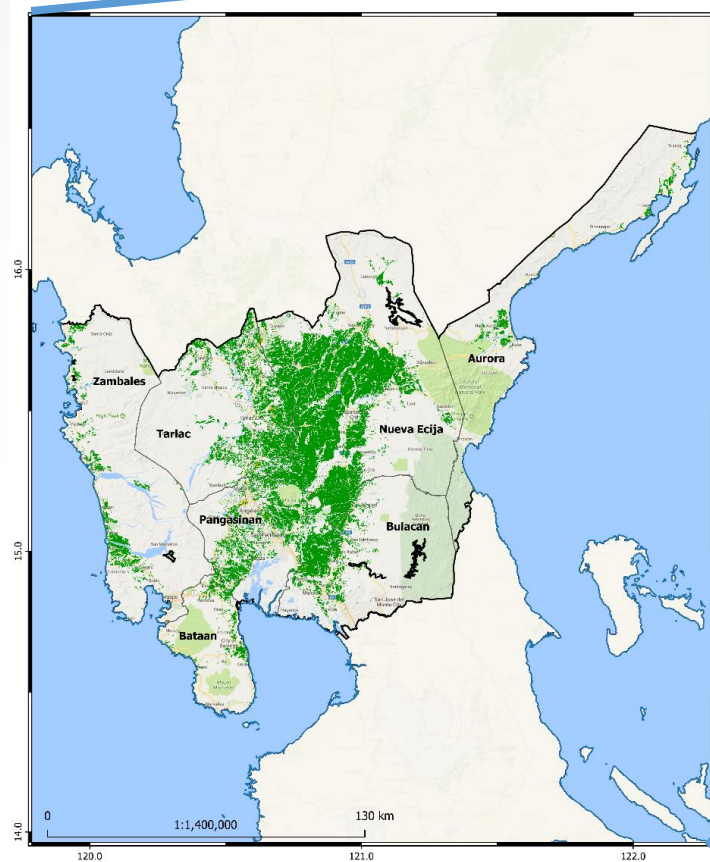|	2015	2016	2017	2018
No. of Farmer's Field	780	1,840	2,330	1,170
Field Profile	778	1,815	2,288	1,143
Cultural Management	604	1,633	2,010	1,045
Production Data	537	1,083	1,513	858
Monitoring	5,940	14,224	13,636	6,843
Rice and Non-Rice Validation Points	1,798	3,691	3,888	1,959
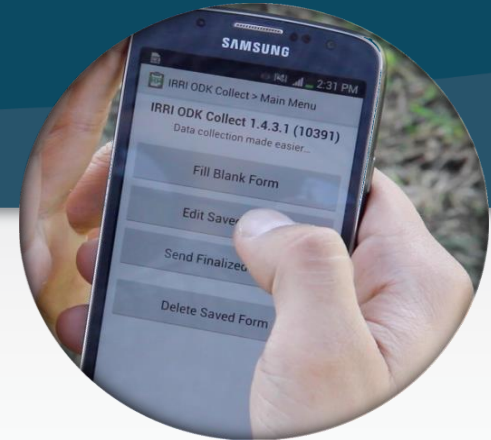
ACTIVITIES AND RESULTS (Acquisition of Satellite Data)

Data	2014	2015		2016		2017		2018
	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem
Sentinel 1	-	-	326	481	491	598	664	878
TerraSAR-X	105	67	315	437	344	54	-	-
CSK	15	-	-	-	-	-	-	-
Total	**120**	**67**	**641**	**918**	**835**	**652**	**664**	**878**

SAR footprints
TSX
CSK

PHILIPPINES
2018 Semester 1

Sentinel 1-A Footprint
Sentinel 1-B Footprint
Rice

ACTIVITIES AND RESULTS
(Generation of Rice Area Maps)

Mapped planted rice areas in the Philippines

ACTIVITIES AND RESULTS
(Derived Rice-cropped Area in 000 hectare)

	2015	2016		2017		2018
	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem
PHILIPPINES	**2,072**	**1,892**	**2,164**	**1,724**	**2,029**	**1,882**
CAR	64	58	58	38	52	38
Ilocos Region	227	155	180	112	184	109
Cagayan Valley	316	295	378	296	318	319
Central Luzon	422	401	423	324	396	359
CALABARZON	48	50	61	46	47	38
MIMAROPA	109	127	178	120	166	131
Bicol Region	125	132	102	132	145	124
Western Visayas	242	167	202	151	170	184
Central Visayas	51	43	53	33	26	35
Eastern Visayas	47	62	52	73	77	101
Zamboanga Peninsula	57	57	58	53	62	67
Northern Mindanao	68	60	66	56	59	52
Davao Region	46	46	51	50	50	57
SOCCSKSARGEN	134	129	174	130	151	133
CARAGA	59	61	65	60	67	91
ARMM	58	51	62	49	59	44

ACTIVITIES AND RESULTS
(Accuracy of derived rice-cropped area)

Region	2015 2nd Semester		2016 1st Semester		2016 2nd Semester		2017 1st Semester		2017 2nd Semester		2018 1st Semester	
	NP	OA (%)	NP	OA (%)	NP	OA (%)	NP	OA (%)	NP	OA (%)	NP	OA (%)
Philippines	**2223**	**85**	**2019**	**86**	**2173**	**85**	**1884**	**90**	**1971**	**89**	**1959**	**93**
CAR	157	85	96	81	122	80	99	86	108	80	120	93
Ilocos Region	166	89	120	86	170	82	120	88	120	86	120	90
Cagayan Valley	166	90	140	81	166	88	120	92	120	89	120	95
Central Luzon	126	90	132	91	144	92	120	92	120	88	120	93
CALABARZON	138	87	120	85	134	87	120	93	120	85	120	93
MIMAROPA	120	88	116	85	120	86	113	91	100	87	119	95
Bicol Region	124	85	111	86	100	86	101	91	128	94	113	93
Western Visayas	152	83	150	90	138	75	120	90	120	98	123	90
Central Visayas	126	86	130	87	132	83	120	94	120	78	121	94
Eastern Visayas	123	86	138	86	120	95	120	93	114	90	119	98
Zamboanga Peninsula	126	78	164	87	108	85	120	84	122	95	119	92
Northern Mindanao	128	79	126	86	123	89	54	85	108	85	100	89
Davao Region	148	83	120	93	124	92	114	88	120	98	119	98
SOCCSKSARGEN	134	81	128	88	148	84	120	88	122	93	123	94
Caraga	188	82	108	84	130	95	83	89	89	99	76	*96
ARMM	101	78	120	83	112	75	120	90	120	80	120	83
Negros Island					82	67	120	87	120	84	107	86

- Overall accuracy from 2015 to 2018 increased from 85% to 93%

- Region with overall accuracy less than 85% is highlighted in red font

Legend:
- ✓ NP - validation points
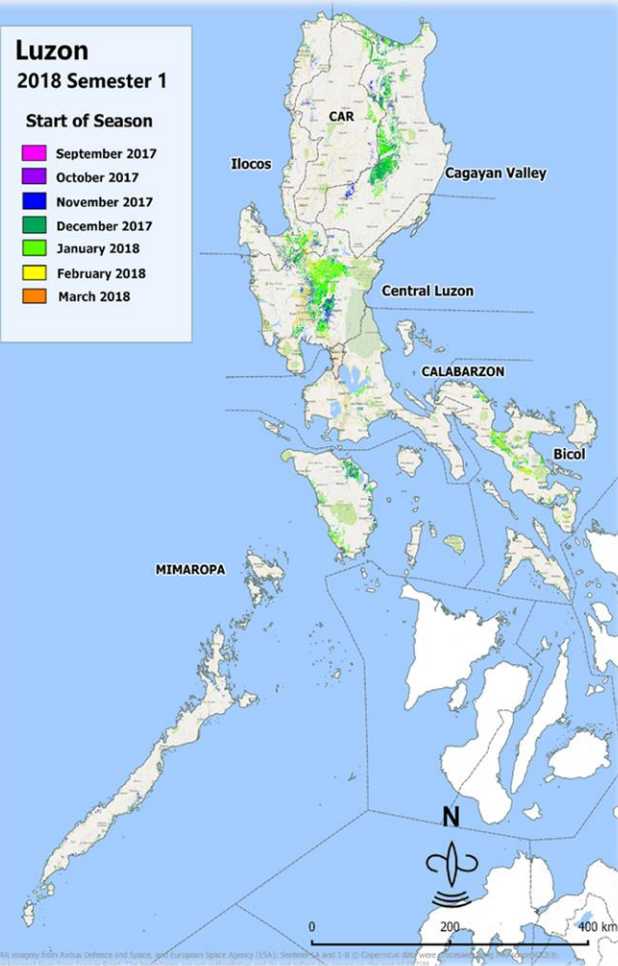- ✓ OA - overall accuracy
- ✓ *Not enough RNR points

ACTIVITIES AND RESULTS
(Generation of start of season maps)
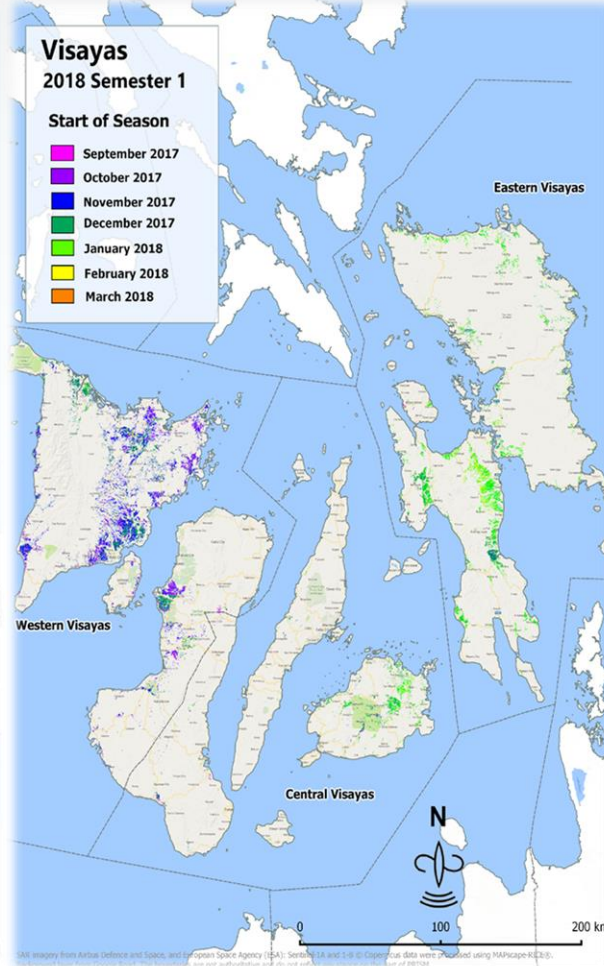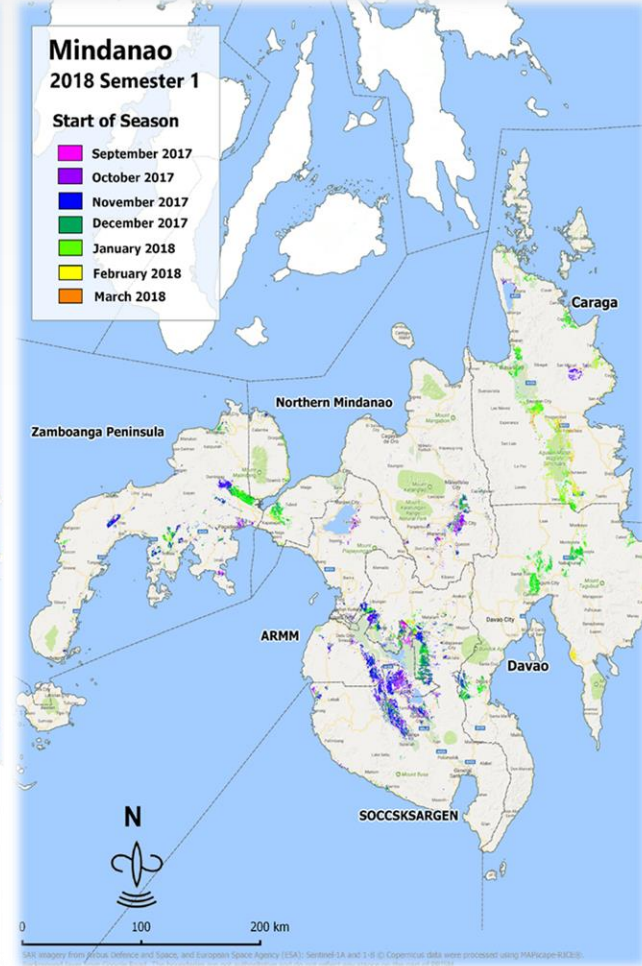
ACTIVITIES AND RESULTS (Yield Estimation)
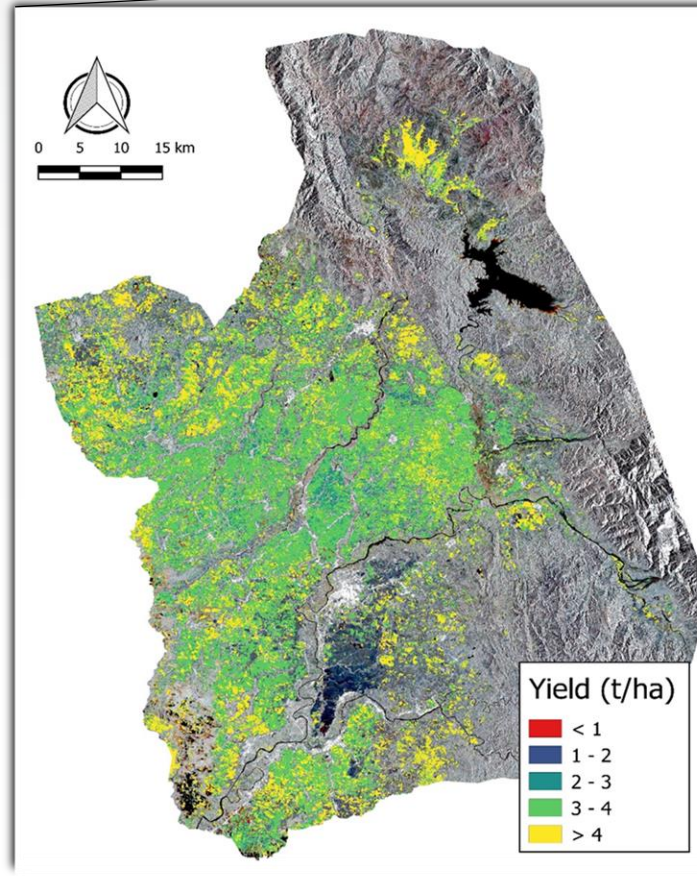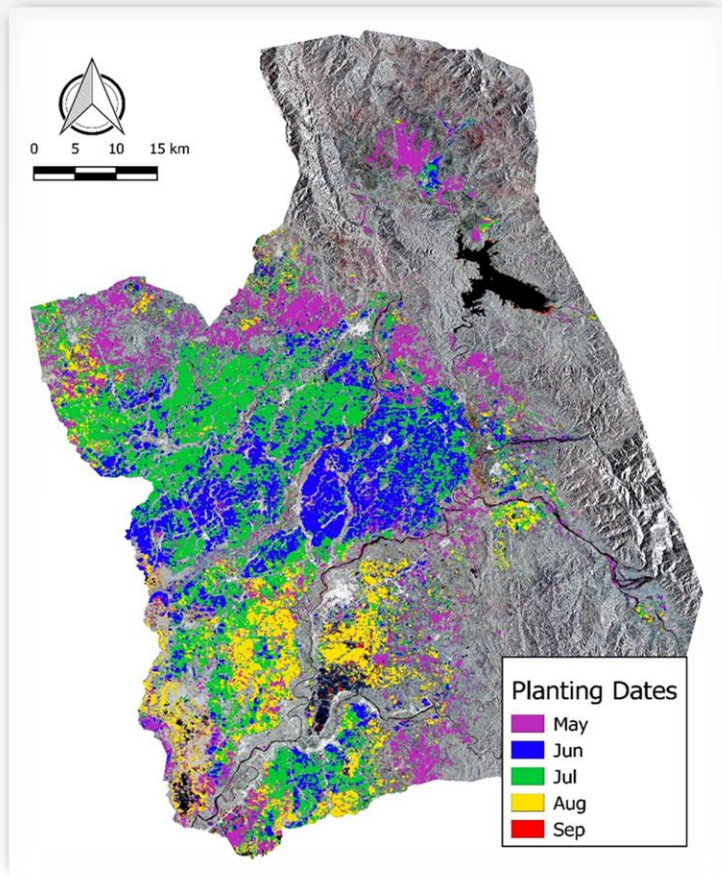
Maps of Nueva Ecija showing rice areas with their corresponding (a) planting dates and (b) simulated yields during the 2nd Semester cropping season 2017

ACTIVITIES AND RESULTS (Yield Estimates in t/ha)

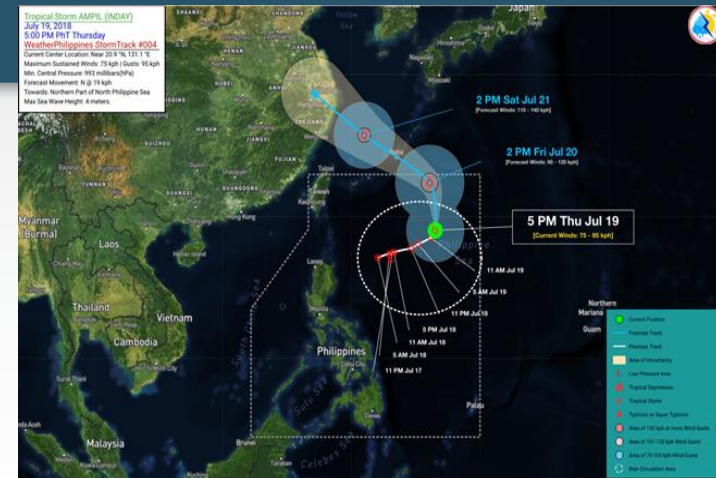|	2015	2016		2017		2018
	2nd Sem	1st Sem	2nd Sem	1st Sem	2nd Sem	1st Sem
PHILIPPINES	**4.51**	**4.03**	**4.27**	**4.28**	**3.51**	**4.18**
CAR	4.03	4.55	3.59	4.39	2.92	4.33
Ilocos Region	4.61	4.69	4.34	4.98	3.63	4.88
Cagayan Valley	4.85	4.84	4.47	4.57	3.48	4.56
Central Luzon	5.10	5.71	5.19	5.75	3.74	5.30
CALABARZON	3.93	4.43	3.74	4.53	3.29	3.92
MIMAROPA	4.23	4.21	4.01	3.94	3.60	4.09
Bicol Region	4.12	3.86	3.75	3.45	3.28	3.66
Western Visayas	3.77	3.00	3.72	3.45	3.47	3.02
Central Visayas	3.70	1.91	4.38	3.04	4.05	3.22
Eastern Visayas	4.54	3.94	3.96	3.63	3.83	3.62
Zamboanga Peninsula	-	3.30	3.68	3.23	3.47	4.10
Northern Mindanao	4.7	4.35	4.51	4.64	3.98	4.33
Davao Region	4.54	4.28	4.81	4.24	3.98	4.71
SOCCSKSARGEN	4.14	2.53	3.85	3.50	3.26	3.67
CARAGA	3.31	3.49	3.07	2.83	3.07	2.94
ARMM	2.65	1.72	2.91	2.86	2.61	2.67

ACTIVITIES AND RESULTS (Flood damage)
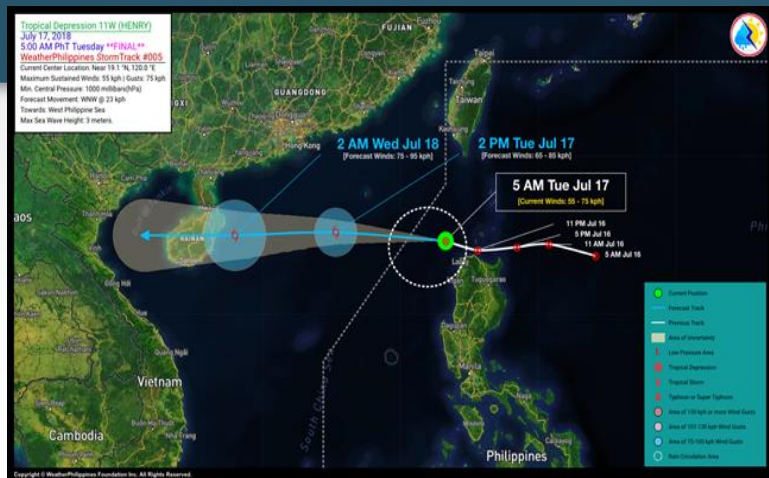
Track of tropical depression "Henry" as of 17 July 2018.
Source: https://weatherph.org/tropical_cyclone/2018-11w-05-f/

Track of Tropical Storm "Inday" as of 19 July 2018.
Source: https://weatherph.org/tropical_cyclone/2018-12w-04/

Estimates of flooded area, flooded rice area, and planted rice area as of July 8, 2018 in the 12 provinces in the country affected by tropical cyclones (Henry and Inday)

Province	Flooded area	Flooded rice area	Rice area planted
Pangasinan	2,838	286	37,461
Bataan	126	11	1,495
Bulacan	570	98	8,824
Nueva Ecija	**5,560**	**1,213**	**73,900**
Pampanga	1,161	314	19,187
Tarlac	2,306	622	31,882
Batangas	791	27	10,903
Laguna	856	64	12,988
Rizal	78	6	2,671
Occidental Mindoro	1,263	110	16,637
Aklan	916	240	3,200
Negros Occidental	1,110	110	19,335
ALL	**17,574**	**3,102**	**238,482**

2nd Semester, 2018
Region I - Ilocos Pangasinan

Legend:
- Flooded rice
- Other flooded areas
- Rice
- Persistent water

1:670,000   60 km

2nd Semester, 2018
Region III - Central Luzon Tarlac

Legend:
- Flooded rice
- Other flooded areas
- Rice
- Persistent water

1:500,000   40 km

Estimate of drought affected areas based on analysis of satellite image

Region	Province	Cropland affected (%)	Rice area affected (%)	PRISM estimate rice area (ha)	Rice area affected by drought (ha)
Region IX	Zamboanga del Norte	3.01	9.67	10,124	979
Region IX	Zamboanga del Sur	6.81	8.17	33,305	2,722
Region IX	Zamboanga Sibugay	7.55	13.63	13,170	1,795
Region X	Bukidnon	11.63	11.54	36,096	4,165
Region X	Camiguin	0.00	0.00	194	-
Region X	Lanao del Norte	4.14	8.62	16,751	1,444
Region X	Misamis Occidental	2.77	4.77	4,690	224
Region X	Misamis Oriental	5.14	9.55	1,836	175
Region XI	Compostela Valley	2.23	3.09	11,300	349
Region XI	Davao del Norte	7.01	2.02	16,896	341
Region XI	Davao del Sur	7.09	11.69	13,647	1,596
Region XI	Davao Oriental	6.26	14.11	3,855	544
Region XII	North Cotabato	13.61	11.62	52,386	6,086
Region XII	Sarangani	11.36	29.92	4,554	1,362
Region XII	South Cotabato	17.82	32.07	29,346	9,411
Region XII	Sultan Kudarat	13.74	23.87	42,542	10,154
Region XIII	Agusan del Norte	0.82	0.77	11,242	87
Region XIII	Agusan del Sur	0.76	0.89	32,354	288
Region XIII	Dinagat Islands	0.00	0.00	475	-
Region XIII	Surigao del Norte	0.65	0.51	5,946	30
Region XIII	Surigao del Sur	1.19	0.90	10,824	98
ARMM	Basilan	16.64	0.00	461	-
ARMM	Lanao del Sur	4.22	7.10	8,314	590
ARMM	Maguindanao	17.42	15.51	41,769	6,478
All				402,078	48,918

Figure 5. Validated map of cropland affected by drought in parts of Mindanao from January to March 2016 as detected through analysis of satellite imagery.
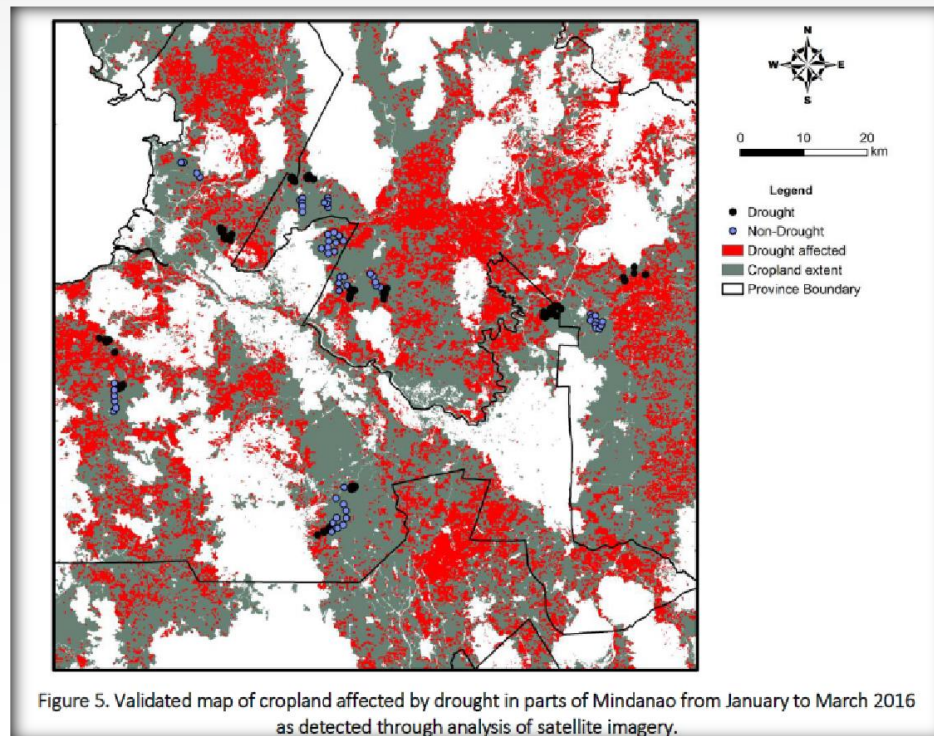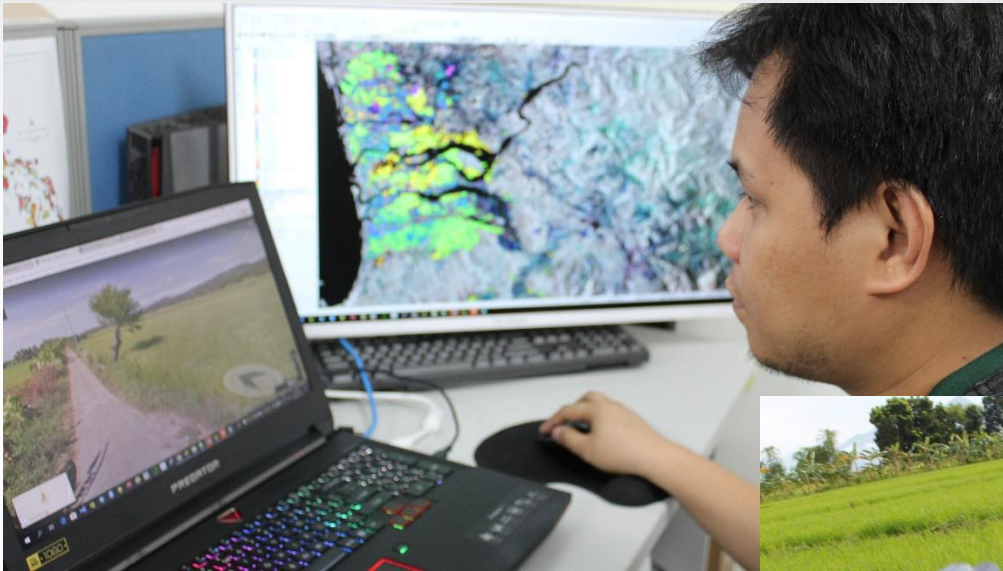
The drought that occurred between February to March 2016 affected 12% (48, 698 ha) of the total rice areas (402, 078 ha) in Mindanao Philippines
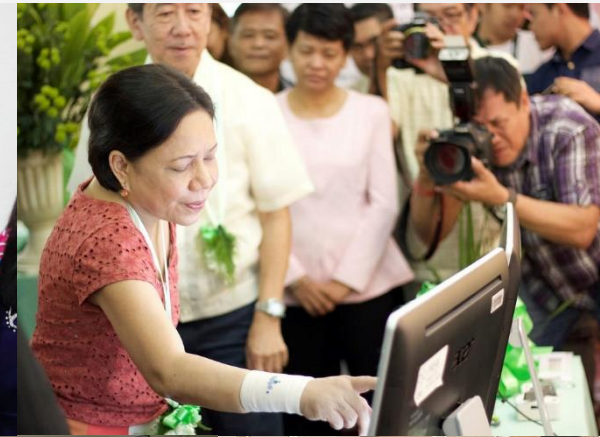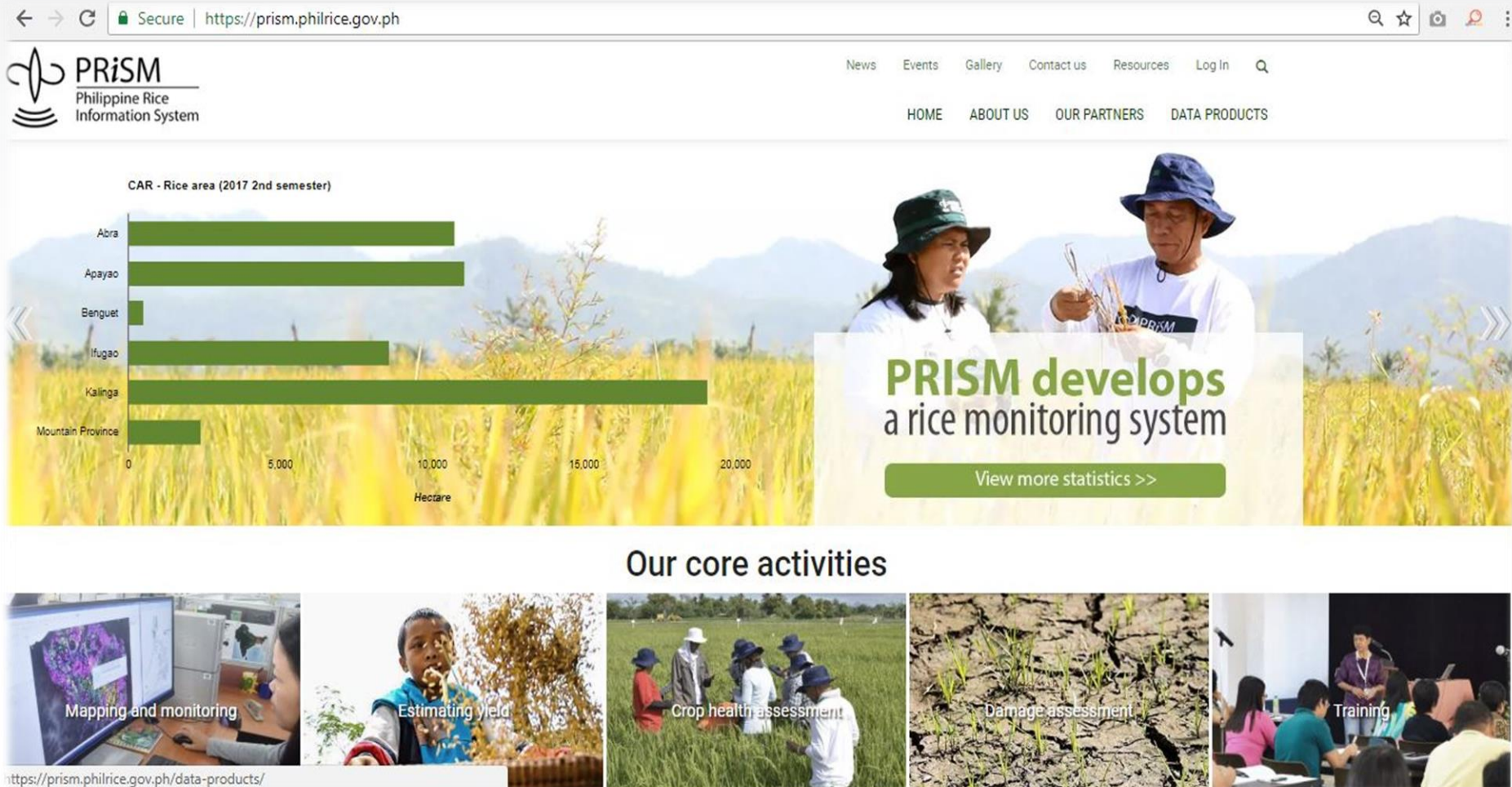
ACTIVITIES (Capacity enhancements)

ACTIVITIES (Output presentations and consultations)

INFORMATION STRATEGY
(Product delivery schedule)

PRISM Products	Coverage		Submission to DA	
	1st semester	2nd semester	1st semester	2nd semester
Planting dates	Every month	Every month	Every 10th of the month	Every 10th of the month
Rice area mid-season estimate	Sep 16-Jan 15	Mar 16- Jul 15	10th Feb	10th Aug
Rice area end-season estimate	Sep 16-Mar 15	Mar 16- Sep 15	10th May	10th Nov
Rice area at risk during flood	Region/s affected		1-3 days after receipt of request	
Flooded-rice area assessment	Region/s affected		within 10 days after receipt of request	
Rice area at risk during drought	Region/s affected		1-3 days after receipt of request	
Drought-damaged rice area	Region/s affected		within 10 days after receipt of request	

INFORMATION STRATEGY
(Creation and Distribution of IEC materials)

Releases of PRISM brochures containing information on General PRISM and semester accomplishments

PRISM is an operational rice information system that generates location-specific estimates on rice seasonality, area planted, yield, and rice areas at risk due to extreme weather events using state-of-the-art technologies.

PRISM is owned by the Department of Agriculture (DA) and is housed and operated at Philippine Rice Research Institute with the support of the DA Regional Field Offices.

"PRISM uses remote sensing, geographic information system (GIS), crop modeling, and smartphone-based surveys to provide reliable and timely estimates on rice areas, seasonality and yield."

PRISM ACTIVITIES

- Rice area mapping & monitoring
- Yield estimation
- Crop health assessment
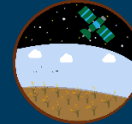- Damage assessment during typhoon, flood and drought
- Capacity building

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- www.flickr.com/photos/philippinericeinfo
- http://goo.gl/ZmtPOf

OUR PARTNERS

THE PRISM COMPONENTS

Rice Area Mapping & Monitoring

PRISM derives data on rice area, including planting date estimates, using high-resolution Synthetic Aperture Radar (SAR) images that can provide a continual source of information, regardless of weather conditions.

Yield Estimation

The yield estimates from the processed SAR images acquired on specific dates throughout the season are validated against crop cut experiments in all regions and compared against official statistics from the Philippine Statistical Authority.

Crop Health Assessment

Surveys of farmers' fields are conducted to characterize the production situation in the area; to assess injuries caused by diseases, animal pests, and weeds; and to quantify yield. Survey results are then used to produce information that will serve as the basis for stakeholders in prioritizing activities for pest management.
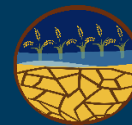
Damage Assessment

PRISM provides information on the extent of damaged rice areas and production loss. Hence, required interventions are immediately identified and rice production shortfalls are easily assessed. PRISM makes it possible to deliver rapid assessment over a wide area using remote sensing.

Capacity Building

PRISM holds series of training courses to improve the capacity of partner agencies in the country on rice monitoring, pest identification and crop health assessment, GIS mapping, and data management.

PRiSM
Philippine Rice Information System

Our Partners

www.riceinfo.ph

LESSONS LEARNED

- ✓ Be partners with the target user

- ✓ Regular meeting and communication

- ✓ Form a team of decision makers (Management Team)

- ✓ Get support from key policy makers

- ✓ Proper documentation and planning

- ✓ Keep all partners engaged and informed

- ✓ Ownership and transparency

SUMMARY

✓ Use of advanced technologies on rice monitoring and reporting with continual research and development further improved PRISM's processes, tools, and outputs

✓ Success is dependent on its manpower's skills, training experiences, and expertise

✓ Institutionalization of PRISM required collaboration with local partners in field operations, guidance from multi agency Management Team, and government programs and Policies

✓ Continuous strong collaboration and linkages with other institutions improved technical supports and capacitate PRISM to provide data products and services