

TRAVEL REPORT FORM

출장보고서

결 재	팀장	부서장	부서장	
	05/08 김광형	05/08 김형진	대결 05/08 유진호	
협 조				

I. Reporter 보고자

Department 소속	Position 직위(직급)	Name 성명	Travel Date 날짜	Note 비고
응용사업본부 사업기획팀	팀장 (선임연구원)	김광형	4월18일-21일	

II. Major Activities 주요업무 수행내용

1. Main Contents and Activities 주요내용 및 활동

“Strengthening APEC Cooperation on Food Security and Climate Change” Workshop
참석 및 발표

- 학회 장소 및 기간: Hanoi, Viet Nam, 19-21 April
- 목 적: APEC 회원국의 식량안보와 기후변화에 대응하기 위해 정보공유 및 협력을 위한 워크숍을 개최하고 이를 토대로 APEC Action Plan on Food Security and Climate Change을 수립하기 위함
- 구두발표 및 전문가 패널 토의 참여
("Climate Information Services in the APEC Region" Session)

2. Relevance to APEC Climate Center's Activities 결론 및 소감

- ‘Climate Information Services in the APEC Region’ 세션에서 “Climate Information Services in the APEC region” 제목으로 발표:
 - APCC의 기후정보 생산과 활용에 관한 다양한 produces소개, 특히 농업분야에서 기후정보를 활용한 사업에 대한 자세한 소개 및 APEC 지역에 대한 기후정보서비스가 지역의 식량안보와 기후변화 대응에 반드시 필요한 요소임을 강조함
- 파푸아뉴기니 공동사업 협의:
 - 파푸아뉴기니 National Fisheries Authority (NFA)의 Aquaculture & Inland Fisheries Unit, Manager인 Havini Vira와 기후정보 활용한 파푸아뉴기니 민물양식의 기후변화 대응시스템 개발에 관한 공동사업을 협의
 - 2018년 APEC미팅 개최국인 파푸아뉴기니와 공동사업을 추진함으로써 APCC의 APEC 지역

내 위상을 높이고 2018 APEC Climate Symposium 기회를 활용해 해당 사업의 소개 및 홍보가 가능함(장관급 미팅 의제로 활용 가능)

- 공동사업에 대한 Concept Note를 작성(APCC 유태우 박사)하여 파푸아뉴기니 NFA의 내부 검토 절차 진행 중

○ 본 APEC Program on Food Security and Climate Change사업(2017-2019)에서 기후정보서비스 분야에 APCC가 주도적으로 참여할 수 있는 계기 마련:

- 2017 APEC 장관급 미팅에 제출할 본 프로그램의 산출물인 Concrete Action Plans에서 기후정보서비스 분야에 대한 Input을 APCC에서 주도적으로 제시하는 것으로 의견이 모아짐. 이와 관련하여 6월말 쯤에 최종적으로 Action Plans을 결정하는 워크숍을 개최할 예정임

○ ASEAN-CRN 담당자인 Imelda Bacudo와 한아세안 기금사업에 대해 재 논의:

- 한아세안 기금사업의 지원이 가능한지 여부를 먼저 알아봐야 할 것이지만, ASEAN-CRN에서 원하는 기후정보활용에 대한 아세안국가의 역량강화프로그램을 APCC에서 담당하는 것이 가능할 것인지에 대한 내부적인 논의와 정보조사가 필요함

- 또한 독일정부 대외지원기관인 GIZ에서 ASEAN-CRN에 대한 지원이 2017에 종료됨에 따라 한아세안 기금을 활용한 ASEAN-CRN의 인수가 가능한지 또한 정보조사가 필요함

- 구체적인 협력안은 정보조사 결과를 바탕으로 APCC 내부검토가 필요

III. References 참고사항

(with attachment of any information or report in case of attendance of conferences, workshops and meetings) 학술대회, 워크숍, 회의 등 참석 시 관련 정보 및 문서 첨부

1. Presented and Collected Materials 주요 수집자료

2. Suggestions and Remarks 건의사항

Climate Information Service

- FARMER SMART STORY
- CLIMATE INFORMATION SERVICES TO BE CLIMATE-SMART

Kwang-Hyung Kim

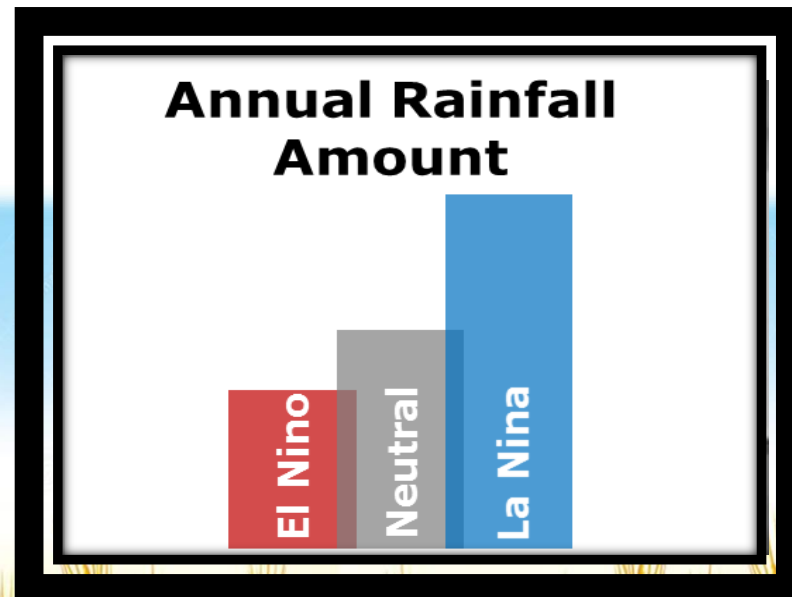
STRATEGIC PLANNING TEAM



Farmer Smart



- El Nino advisory
- Drier than normal



Wheat

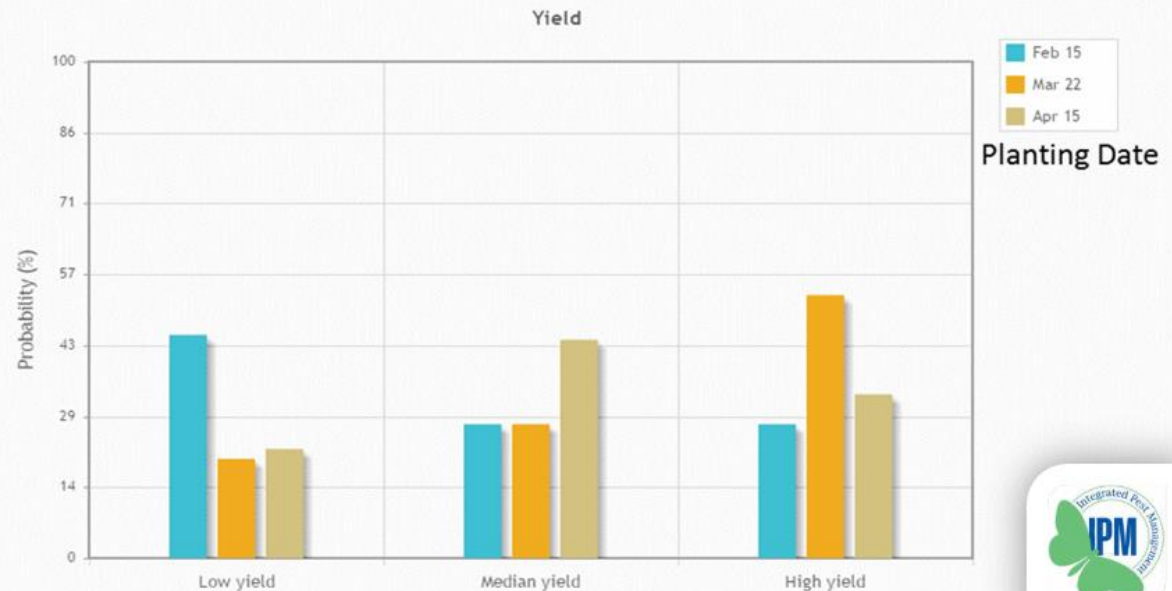
Farmer Smart



- El Nino advisory
- Drier than normal
- Decision-support tool : Selection of high-yield planting date and variety



Input Variety, Location, Seasonal climate forecast



Wheat



Farmer Smart

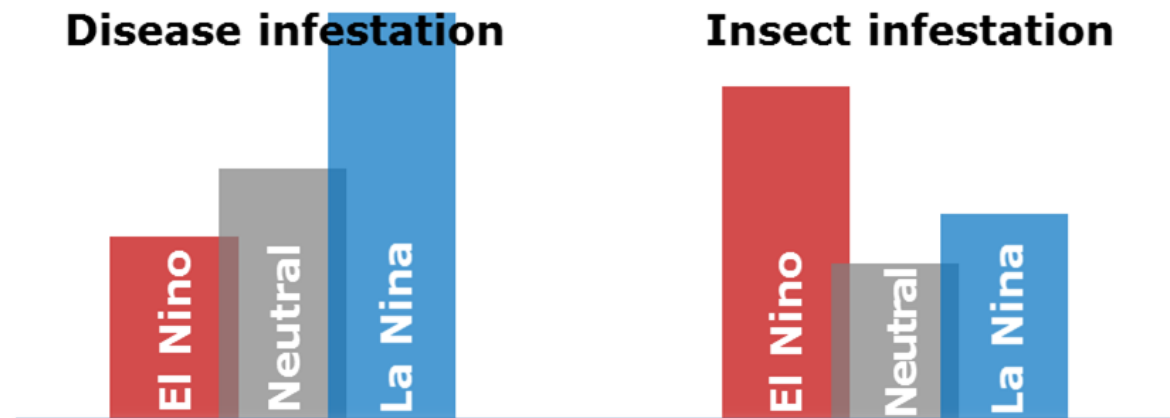


- El Niño advisory
- Drier than normal
- Decision-support tool : Selection of high-yield planting date and variety
- Insect infestation increases, thus cultivated *Underhill* for insect control

Pest infestation rate based on ENSO phases

Disease infestation

Insect infestation



Wheat

□ Managing tillage

Farmer Smart



- El Nino advisory
- Drier than normal
- Decision-support tool : Selection of high-yield planting date and variety
- Insect infestation increases, thus cultivated *Underhill* for insect control
- Minimum tillage to protect stored soil moisture



No-till Drill



Weather and Climate Forecasts

AgroMet Disaster Early Warning

	14 M	15 T	16 W	17 T	18 F	19 S	20 S
FROST	Red	Red	Yellow	Yellow	Green	Green	Green
	Light Green	Light Green	Light Green	Light Green	Green	Red	Red
	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green	Light Green
	Green	Green	Red	Yellow	Green	Green	Green

■ LOW
■ NONE

Nov 30 30. Nov 2. Dec

↑

- 1 day
7 Day
Seasonal

	Rainfall	Temp
Jan to Mar [Observed]		
May to Jul [Forecast]	77%	83%

Powdery Mildew : Risk transition

'First Leaf Emergence Date' to 'Now'

Pest/Disease Risk Forecast

Risk Score

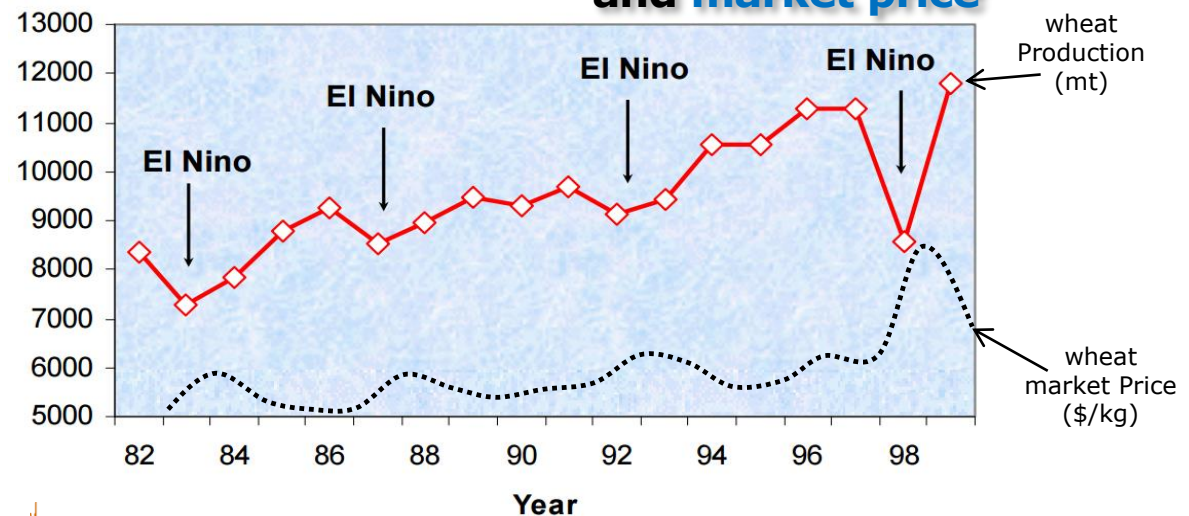
Farmer Smart



- El Nino advisory
- Drier than normal
- Decision-support tool : Selection of high-yield planting date and variety
- Insect infestation increases, thus cultivated *Underhill* for insect control
- Minimum tillage to protect stored soil moisture
- Informed farm management based on weather and climate information
- Did NOT forward sell hay, decided to harvest the actual wheat



Relation between climate and wheat production and market price



Market

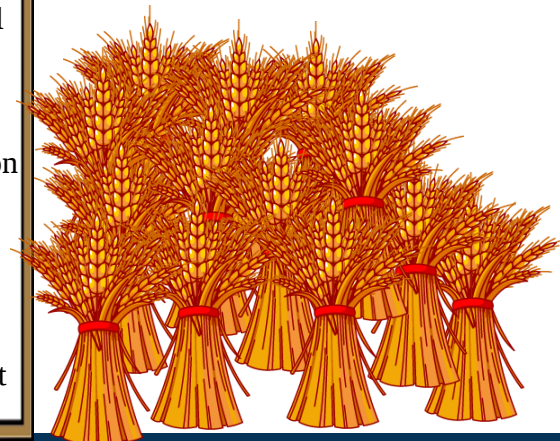
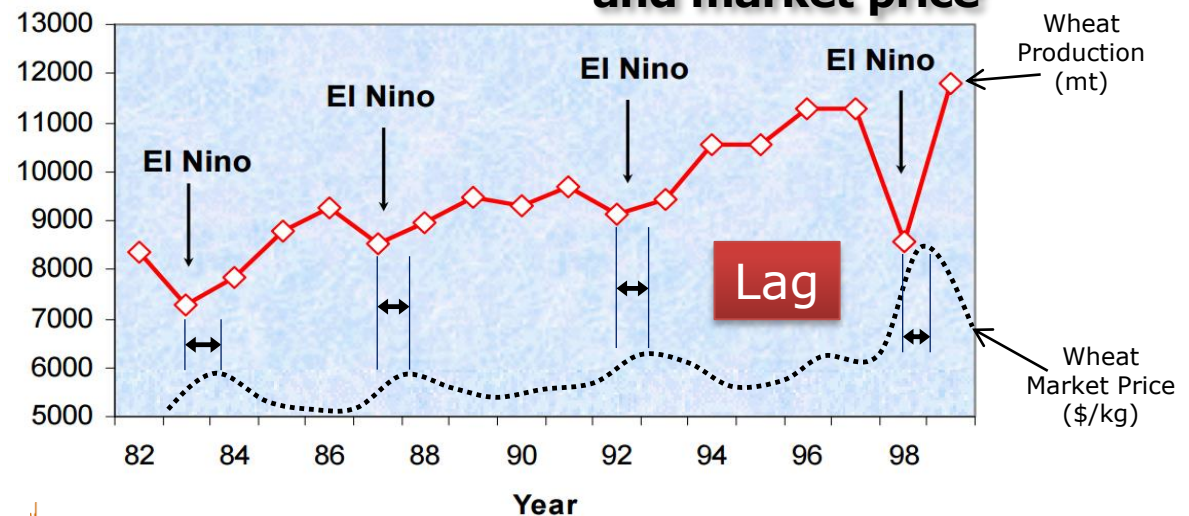
Farmer Smart



- El Nino advisory
- Drier than normal
- Decision-support tool : Selection of high-yield planting date and variety
- Insect infestation increases, thus cultivated *Underhill* for insect control
- Minimum tillage to protect stored soil moisture
- Informed farm management based on weather and climate information
- Did NOT forward sell hay, decided to harvest the actual wheat
- Sold a little for cash, but stored quite amount for higher priced market



Relation between climate and wheat production and market price



Market

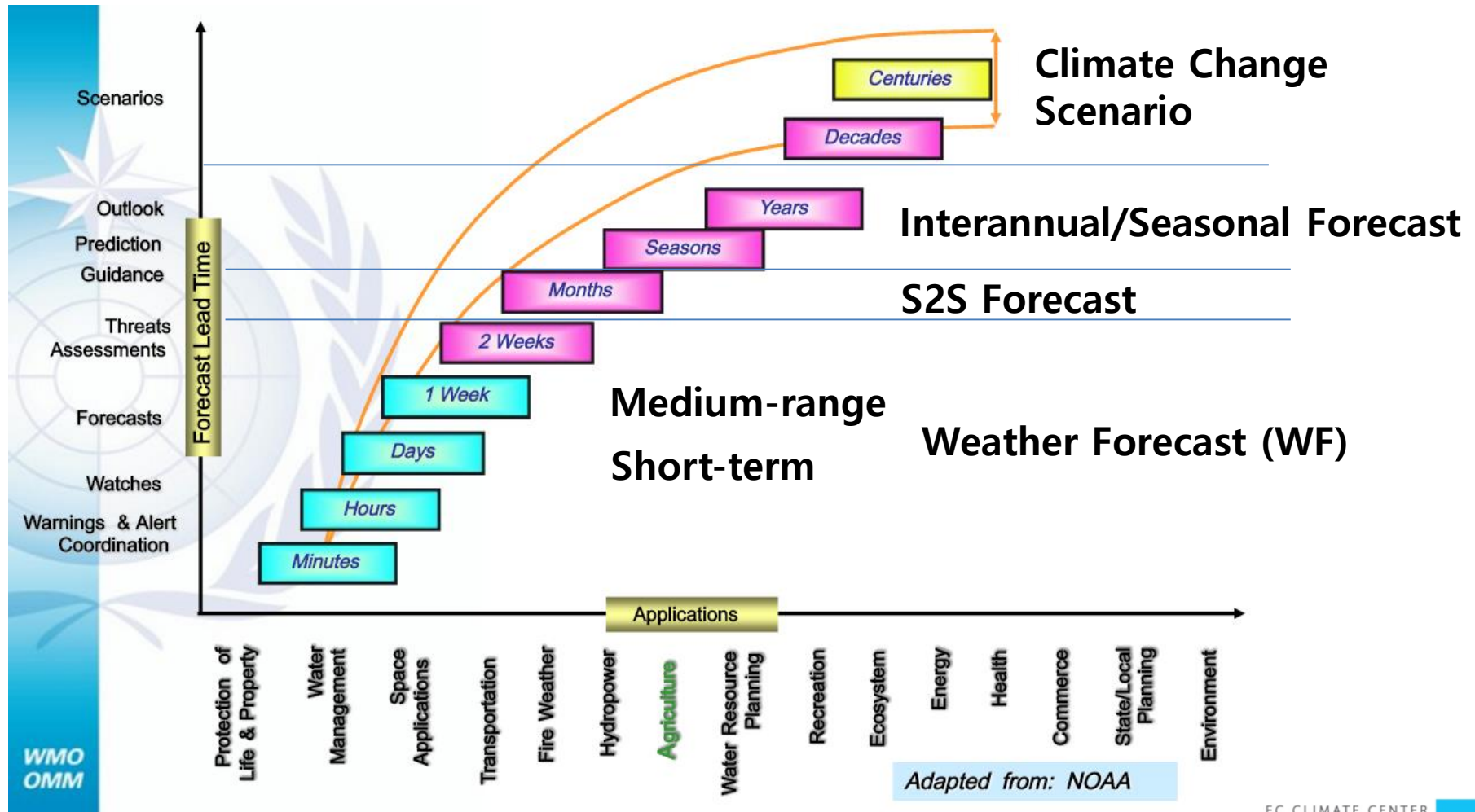
What needed to be climate-smart?

- 1. Tailored weather/climate information** (Observed, Forecasted)
 - Available, Accessible, Usable and Fairly Accurate
- 2. Agriculturally-relevant, translated information**
 - Crop Yield, Pest/Disease Risk, Market Price Predictions
 - Heat/Water Stress Index, AgroMet Index, Spray Index
 - Agro-Advisories, Early Warnings
- 3. Capacity building opportunity**
 - Climate Field School, Extension Meetings
 - National/Local Climate Outlook Forum
- 4. Success story**
 - 'Farmer Smart' (Champion Farmers)
 - Knowledge/Technology Sharing Platform
- 5. Institutional/governmental support**
 - Safety Net, Incentive, Policy, Market Access, Extension
 - Inter-Departmental Collaboration



Tailored weather/climate information

○ Weather/climate information **AVAILABLE**



(Source: <http://slideplayer.com/slide/1447561/>)

Tailored weather/climate information

○ Weather/climate information **AVAILABLE**

Seamless weather/climate information

Short term (1-3 days) forecast

- Decide whether to sow or not to sow
- Decide irrigation based on rainfall forecast
- Decide to harvest or not to harvest
- Management of labor and equipment
- Livestock protection from cold and heat
- Fertilizer and pesticide applications

Seasonal forecast (3-6 months)

- Cropping strategy for the season
- National planning on budget for relief and rehabilitation
- Government planning on response activities
- Estimating the likely crop production to plan importing food crops

Observation

- Historical, long-term data
- Monitoring and analysis
- Mostly from weather stations

Medium range (5-7 days) forecast

- Irrigate water during the dry period
- Planning of planting date

Climate change scenarios (>10 years)

- Land use planning
- Planning on cropping system and crop varieties
- Investing on building infrastructure

Tailored weather/climate information

○ Weather/climate information **ACCESSIBLE**

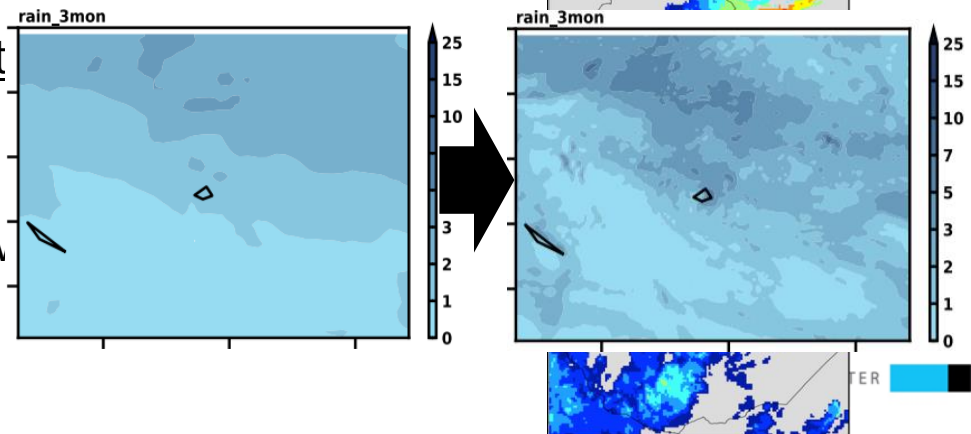
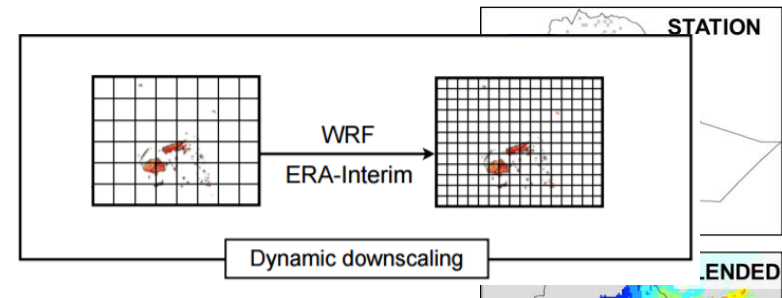
- Radio, TV, Newspaper, etc
- Web, mobile-based ICT services (email, text message, push-alarm)
- Face to face communication (meetings using comm. tools such as agro-advisory bulletin, weather/climate board)
- Historical and forecast meteorological data



Tailored weather/climate information

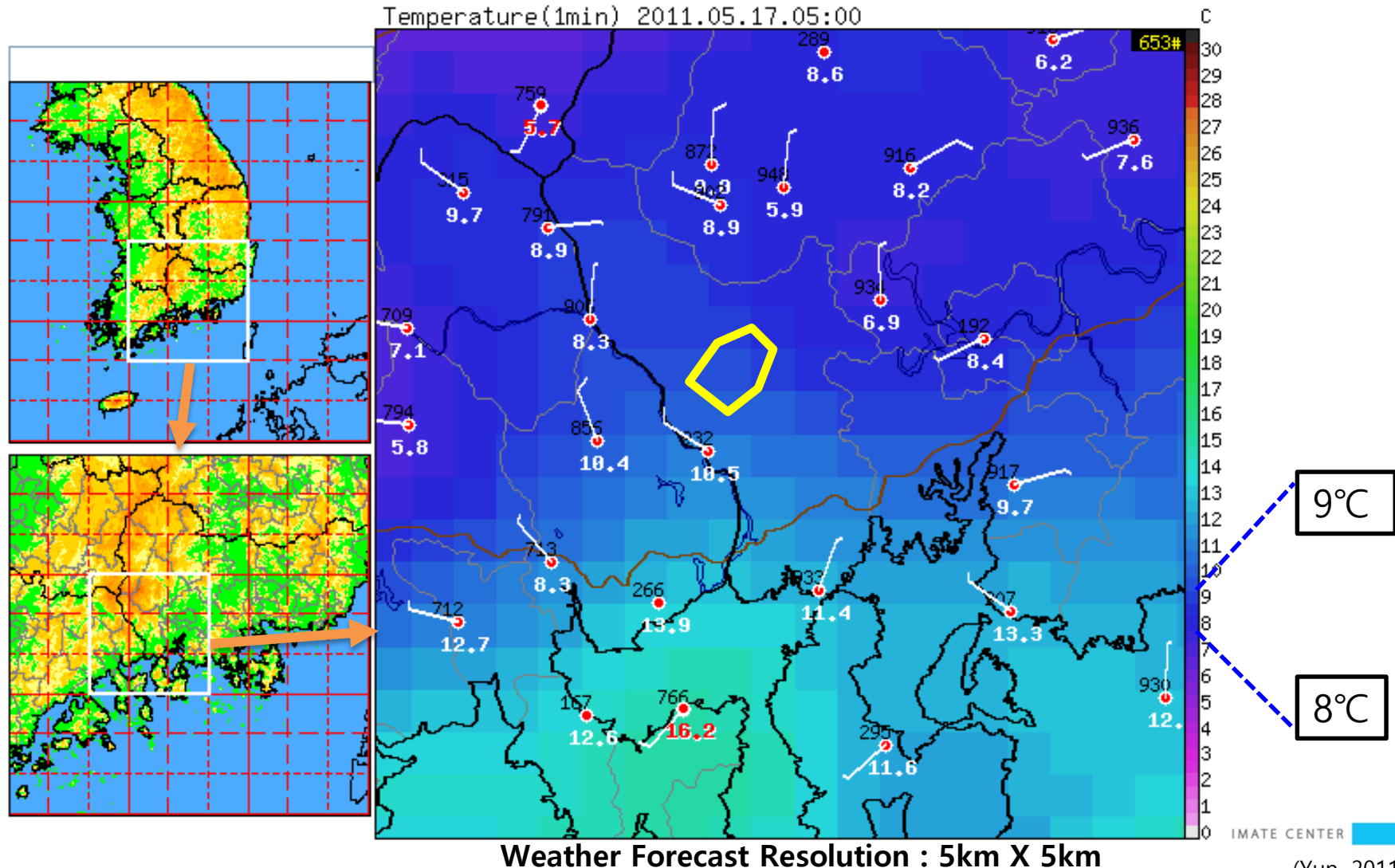
Weather/climate information **USABLE**

- Tailored information for agricultural use
 - Instead of 3-month average rainfall, **Season Onset, Cessation, Duration, Wet/Dry Spells, Extremes**
- Temporal, spatial downscaling to daily, local scales
 - Dynamical downscaling with WRF, Reanalysis, and satellite data (observation, ~1 km grid, >30 years)
 - ENACTS(Enhancing National Climate (observation, satellite + station, ~5
 - Statistical, dynamical, or hybrid downscaling for weather/climate forecast



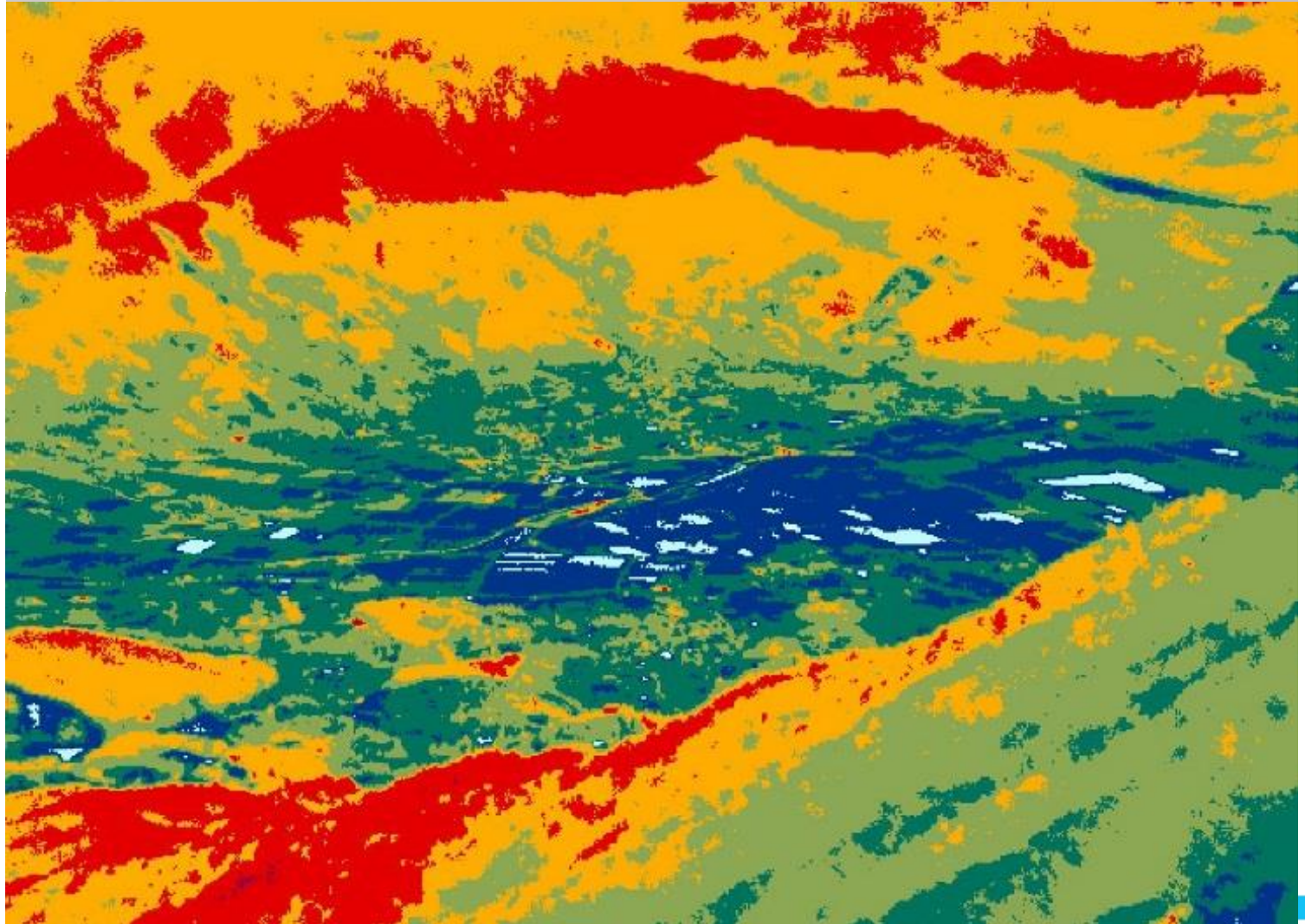
Tailored weather/climate information

○ Weather/climate information **USABLE**



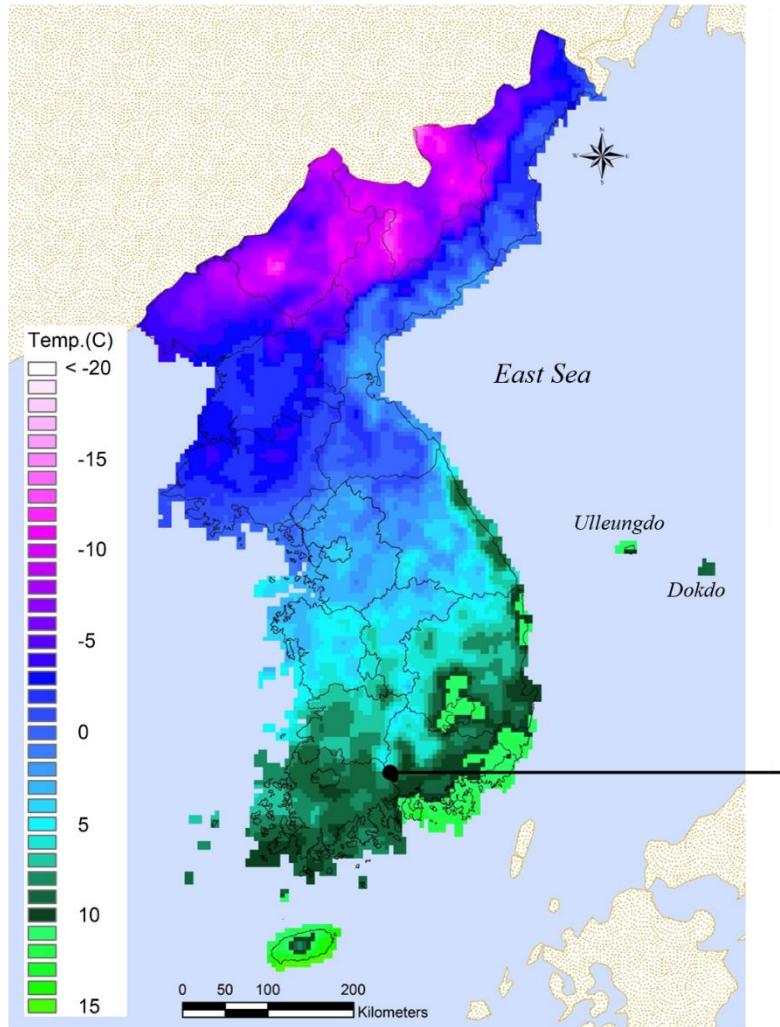
Tailored weather/climate information

○ Weather/climate information **USABLE**

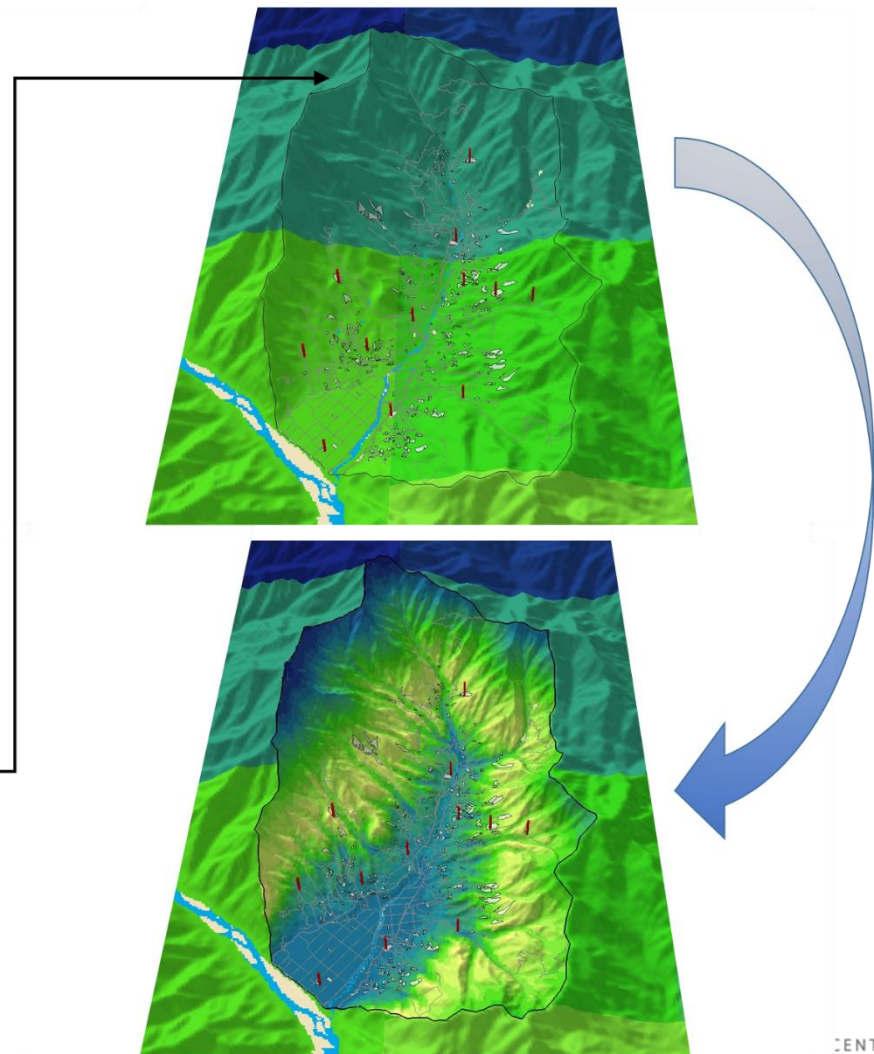


Tailored weather/climate information

○ Weather/climate information **USABLE**



Digital mesoscale forecast issued by KMA for the 2m air temperature at 0600 LST on 1 March 2013.



Tailored weather/climate information

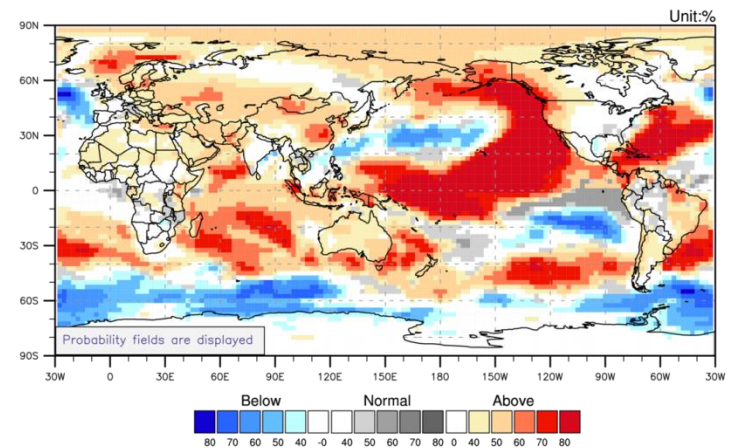
Weather/climate information **ACCURATE**

- APCC Multi-Model Ensemble (MME) Seasonal Forecast

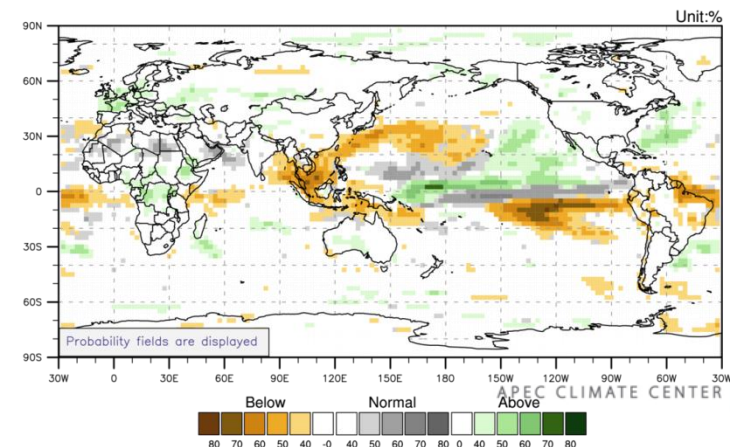


APCC has developed a climate prediction system based on a Multi-Model Ensemble (MME) technique, which collects seasonal forecast data from 17 institutes in 11 economies

Temperature at 2m for March-May 2015



Precipitation for March-May 2015



Tailored weather/climate information

Weather/climate information **ACCURATE**

- APCC Multi-Model Ensemble (MME) Seasonal Forecast
 - Prediction skill for monthly precipitation on the NorthEast region in Thailand

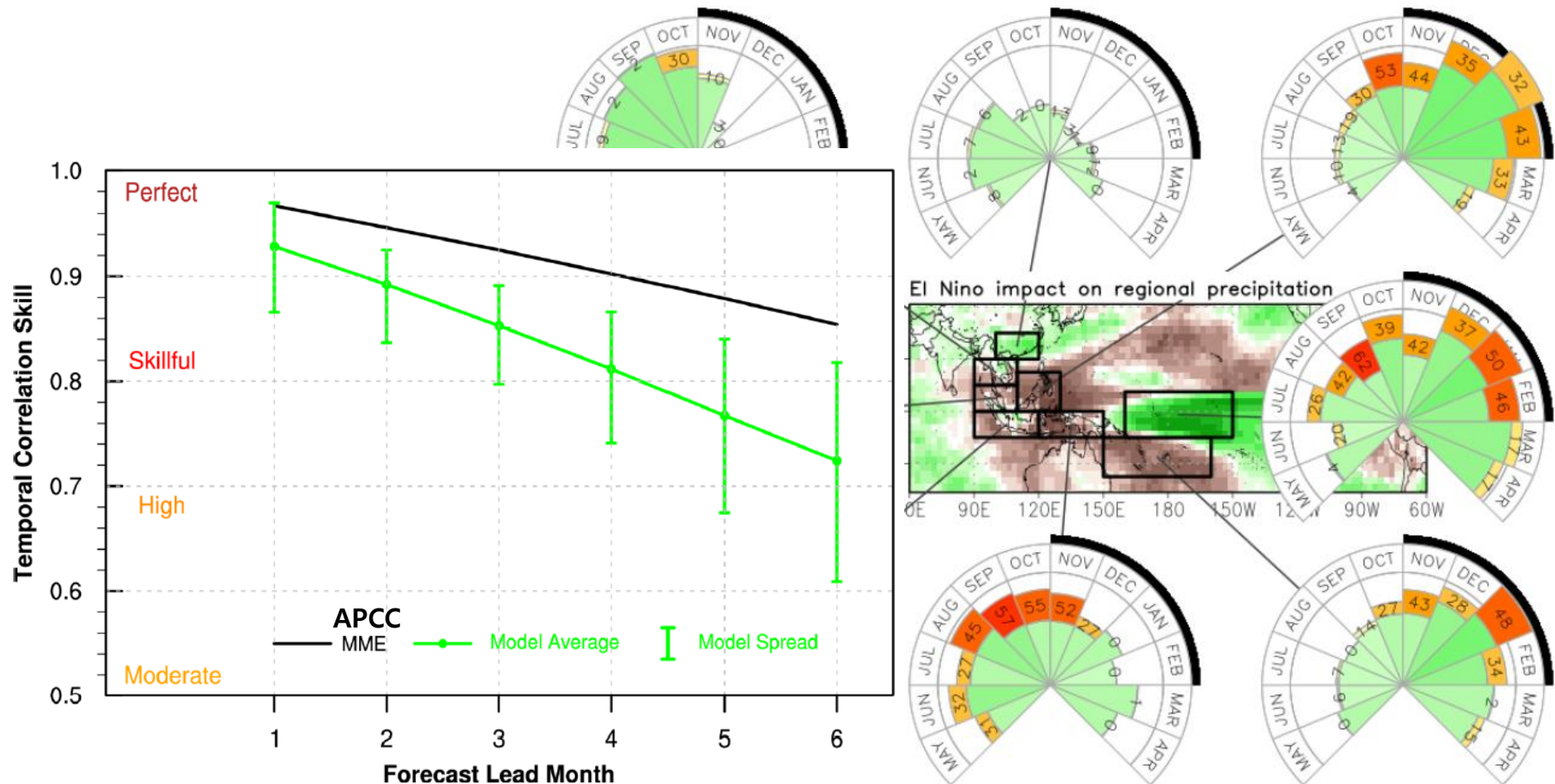


TCC	Lead Time											
	1-month		2-month		3-month		4-month		5-month		6-month	
	NCEP	MME	NCEP	MME	NCEP	MME	NCEP	MME	NCEP	MME	NCEP	MME
JAN		0.42		0.42								
FEB	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45	0.45		
MAR	0.48	0.48	0.48	0.48								
APR	0.44	0.72	0.69	0.72	0.42	0.70	0.46	0.70	0.45	0.64	0.45	0.65
MAY	0.42	0.60	0.42	0.57	0.42	0.53	0.42	0.52	0.42	0.49	0.44	0.44
JUN		0.44		0.44		0.44		0.44		0.44		0.44
JUL		0.62		0.40		0.40		0.40		0.40		
AUG		0.81		0.81		0.77		0.77		0.50		0.50
SEP												
OCT		0.43		0.43		0.43		0.43				
NOV		0.72		0.72		0.63		0.55		0.55		
DEC		0.40		0.40		0.40						

Tailored weather/climate information

Weather/climate information **ACCURATE**

- El Niño impact analysis and MME prediction skill

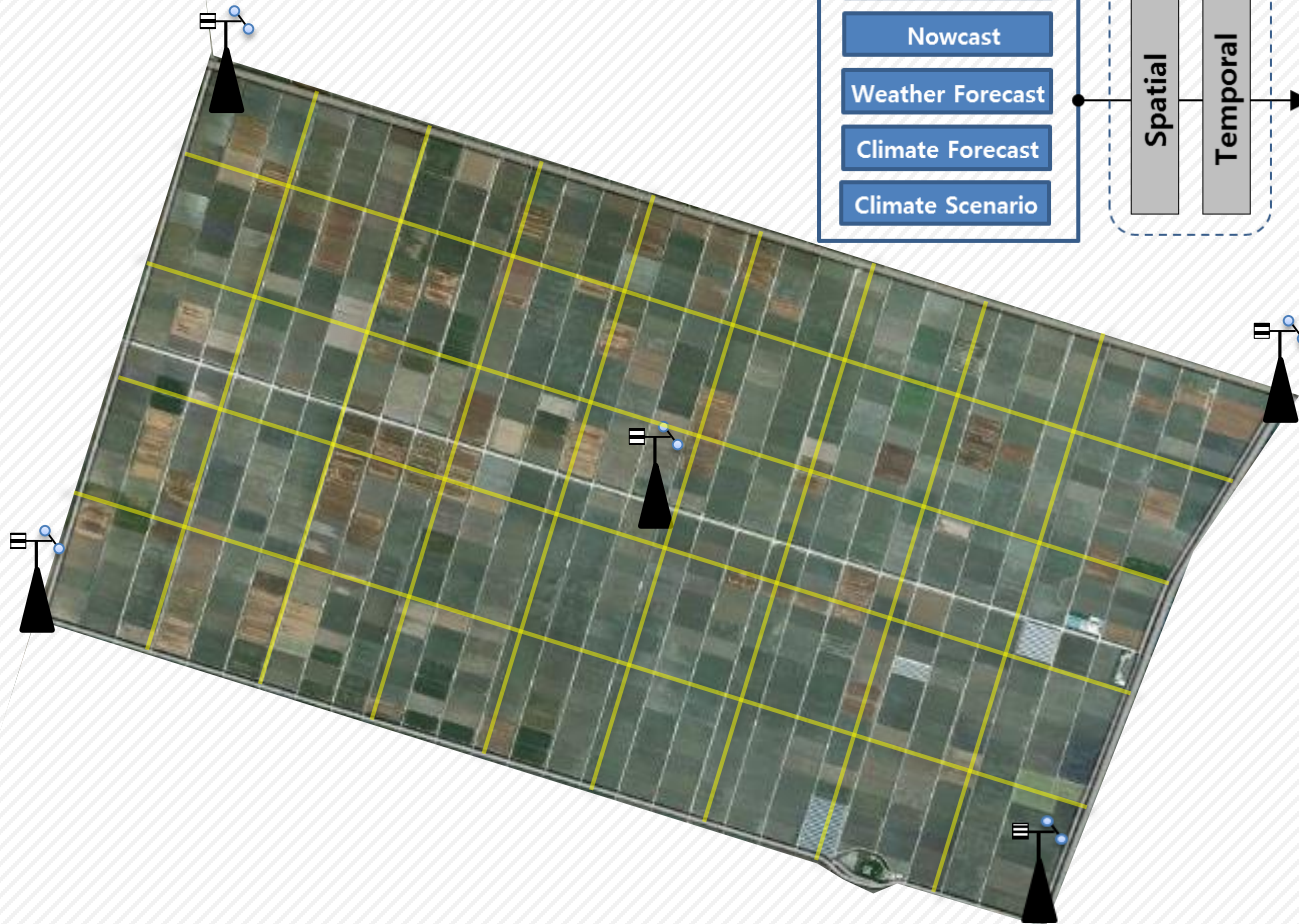


Agriculturally-relevant, translated information

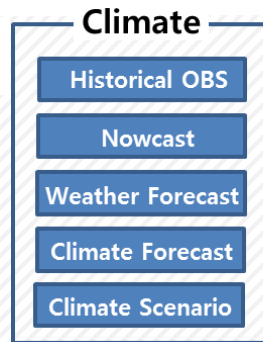
○ Climate Services for Agriculture

- AgroMet Station Network

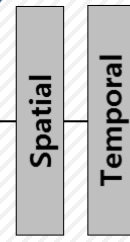
- Agro-Climate Modeling



Climate Information



Downscaling



Agricultural Information

Agro-Climate Modeling

**Crop
Pest
Water
Soil
Models**

Decision Making

Short-term
Mid-term
Long-term
Agricultural
Tactics
Strategies



Agriculturally-relevant, translated information

○ Climate Services for Agriculture

Tonga Climate Service for Agriculture (ToCSA)

The screenshot shows the ToCSA web interface. At the top, there is a 'Login' button and the 'ToCSA' logo. Below the logo, there are navigation links for 'Home', 'Weather Service', and 'AgroMet Service'. The main content area is titled 'Climate Smart Farming' and includes a 'Question' section with three questions: 'Which island group are you cropping in?', 'What crop are you growing?', and 'Which cropping phase of your crop?'. Below this is a 'Seasonal Rainfall Forecast for the next 3 months' section showing 'Dec to Feb : Normal (56 %)' with a downward arrow. The 'Crop' section shows 'Talo Tonga/Taro' with a downward arrow. The 'Cropping Phase' section shows 'Land Preparation' with a downward arrow. The 'Activity' section shows 'Planting Material'. At the bottom, there is a 'Recommendations' section with text about selecting suckers and stalks cut from the tops of harvested corms.

Web-based, mobile-compatible
Decision Support System

- Crop Yield Prediction (SCF-based)
- Weather/Climate Information
 - Historical and Forecast (WF&SCF) Data
- AgroMet Indices (SCF-based)
- Crop Disease Spray Planner
- Crop Management Simulator (SCF-based)
- Climate Smart Farming (SCF-based)
= traditional knowledge inventory
- Text message, push alarm, easy bulletin
- Farm Diary (data collection/analysis)

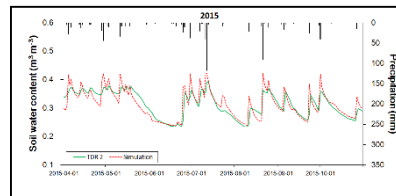
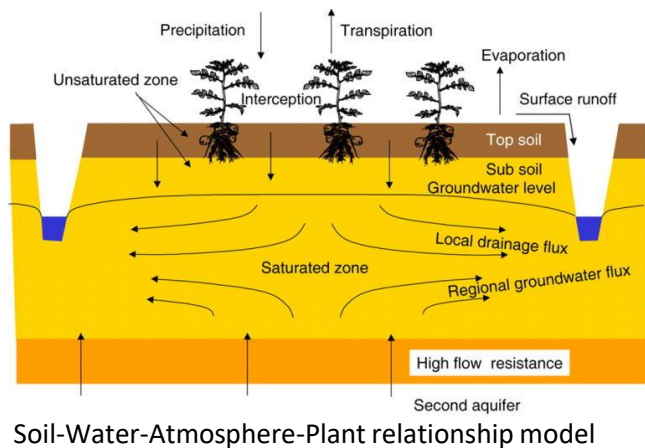
(<http://met.gov.to:2016>)



Agriculturally-relevant, translated information

○ Climate Services for Agriculture

- Climate smart irrigation using the crop water stress index



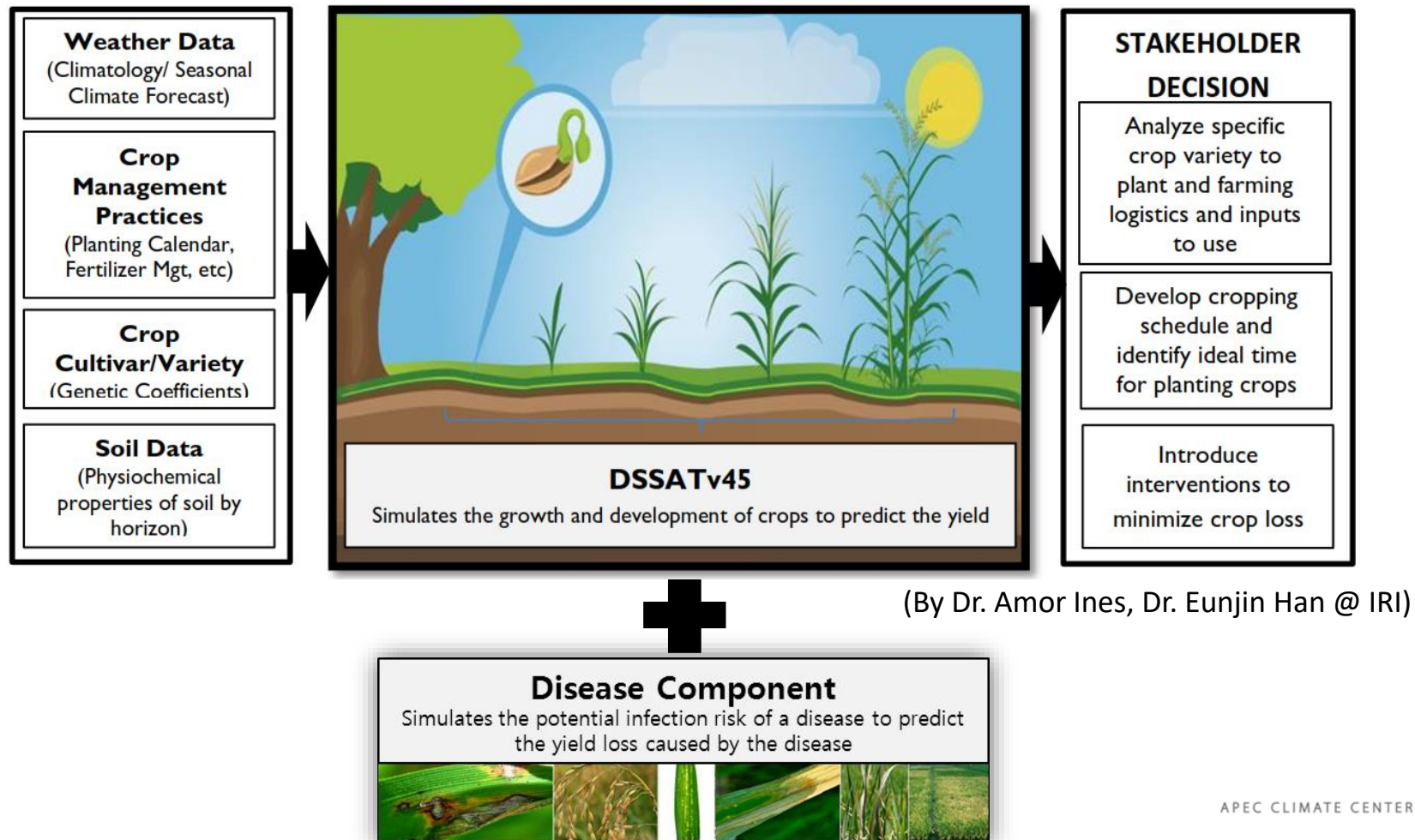
Crop water stress index
Forecast-based
irrigation management



Agriculturally-relevant, translated information

Seasonal Rice and Pest Outlook

Climate-Agriculture Model Decision Tools (CAMDT)

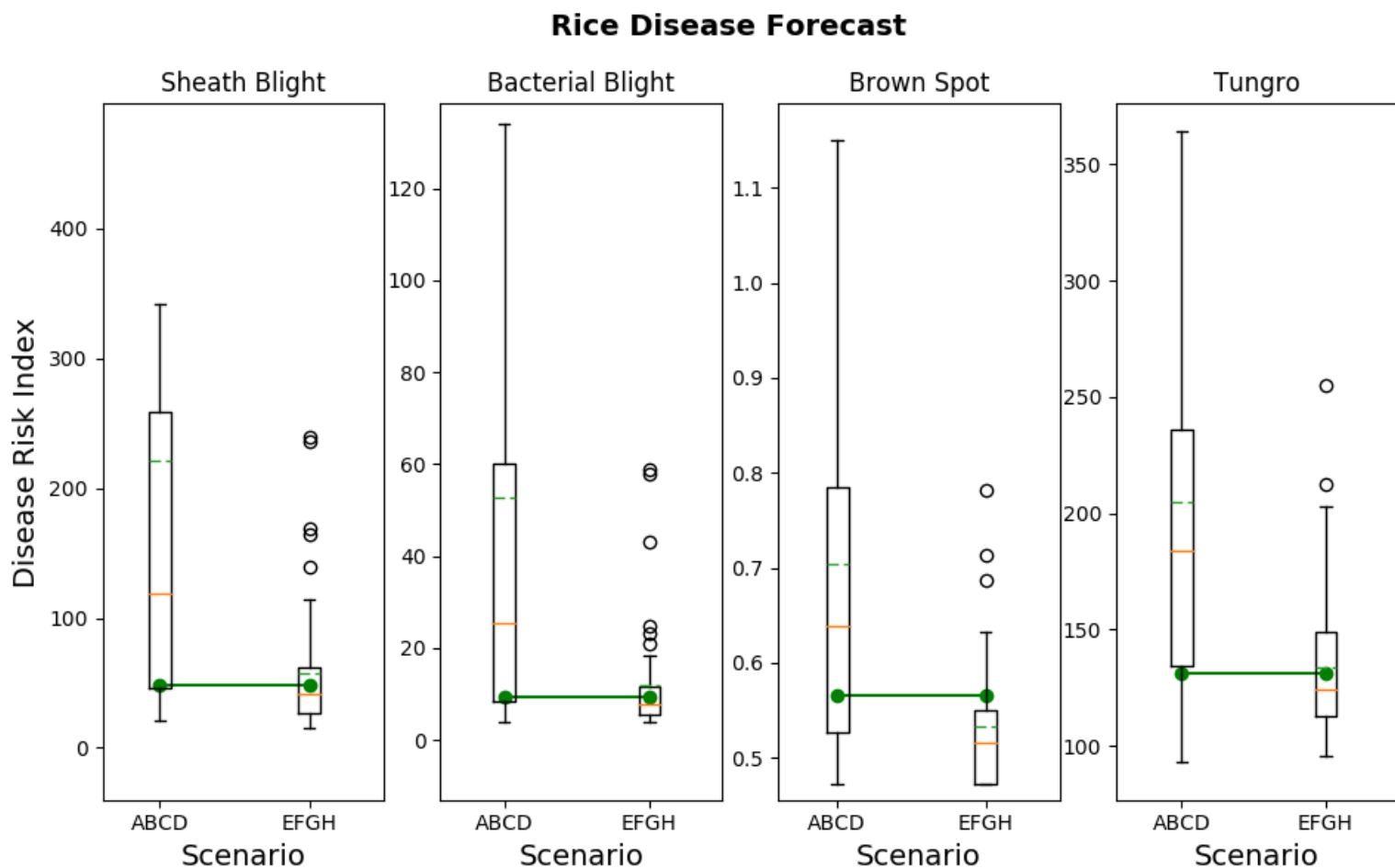




Agriculturally-relevant, translated information

● Seasonal Rice and Pest Outlook

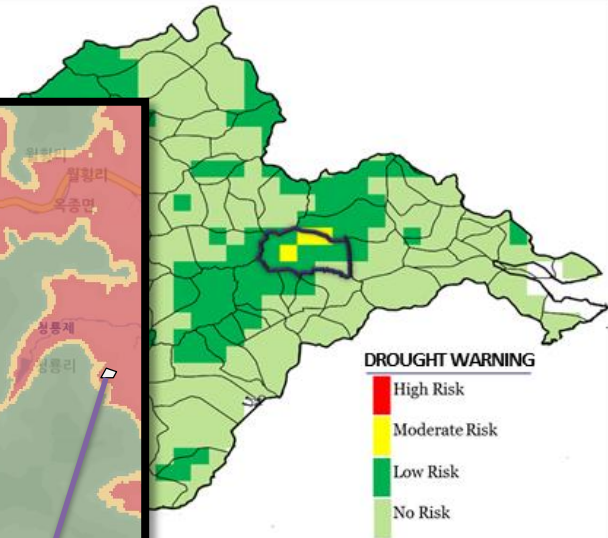
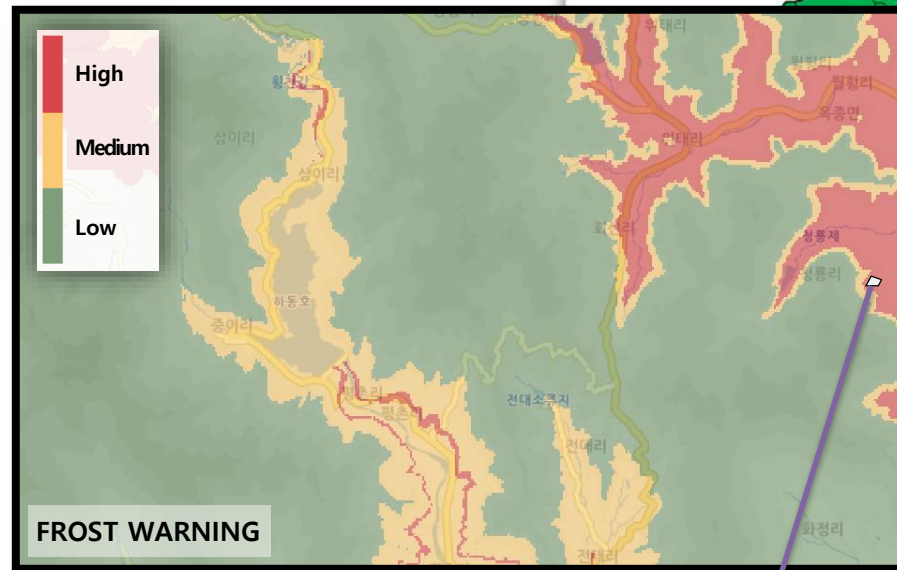
Climate-Agriculture Model Decision Tools (CAMDT)



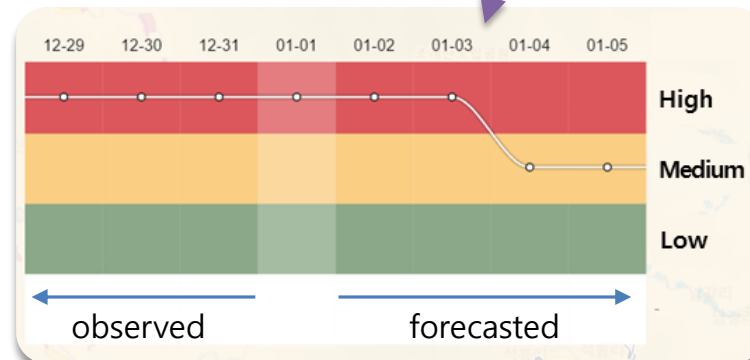
○ Early Warning for AgroMet Disasters

- AgroMet Disasters Warning

- Drought
- Flood
- Frost
- Freeze
- Heat
- Wind
- Sunburn



- Crop phenology
(growth stage)

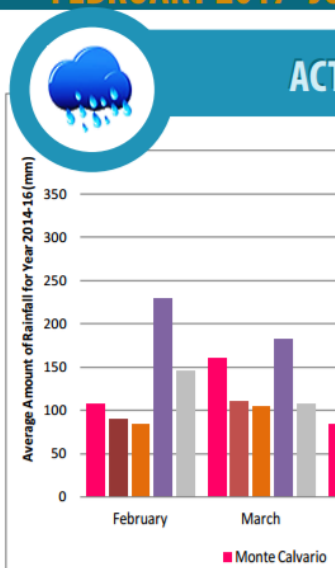


Agriculturally-relevant, translated information

○ Agro-Advisory

CLIMATE FORECAST AND EXTENSION ADVISORY

FEBRUARY 2017- JULY 2017 / CLEM 1-10 2017, DRY SEASON, DULI, CAMARINES SUR



Average Rainfall

The variability of rainfall within the rainfall collected through raingauges Sta. Cruz had the highest amount of Jun. Downward trend of the rainfall trend from May to Jul.

FORECAST 2017



EL NINO SOUTHERN (ENSO) & LA NINA W



The province of Cam may experience weaker with a 58% chance of reaching ENSO

RAINFALL FORECAST	RICE	OTHER CROPS	LIVESTOCK	FISHERIES
Below Normal	Repair water systems including leaks at the source and along the line Use early maturing/drought tolerant varieties.	Prepare a tank or pond near the crops for extra water Plant crops that are resilient to dry conditions: - Root crops such as cassava - Legumes like cowpea, winged bean and mungbean Plant indigenous cover crops or practice conservation fallow period and use mulch (plastic, rice straw, etc.) to improve soil fertility and conserve soil moisture	Provide drinking water to livestock: - Large ruminant, give daily water in the afternoon - Small ruminant, give water twice a day (noon/pm) Practice Cut and Carry to augment / supplement pasture grasses	Limit the numbers of fingerlings to avoid overcrowding specially on dry season. Also reduce the amount of feeds to avoid fish kill
Near Normal	Direct seeding is not recommended for places that can be easily flooded. The expected rains for February is favorable for land preparation especially for the upland and rainfed areas. Use early maturing/submergent tolerant varieties. Open drainage outlets to prevent water stagnation, transplant (or expect to use) older seedlings that may require closer planting distance due to the reduced ability to tiller.	Plant crops that can tolerate near normal rainfall: - Legumes like cowpea, winged bean, mungbean and other crops like okra and squash Store food and next year seed in a secure and air tight container to avoid pest Plant local cover crops during fallow period. Use mulch (plastic, hay, others) to preserve humidity and fertility of soil and to avoid erosion on sloping areas.	Improve housing design using insulation materials to cushion effects of changing temperature Be alert on diseases and infections. Be ready to use medicines, vitamins and minerals and vaccination of the animals. Keep animals confined. Practice cut and carry.	Construct higher dikes and reinforce cages to prevent wash-outs
Above Normal	Apply just the required amount of fertilizer to prevent lodging and pest and disease occurrence. To avoid loss of PH (or acidity) of the soil use FBD, RPC and VTDs. Use transplanting of seedling that'll need closer distance on planting to compensate if unable to use tiller.	Practice Integrated Pest Management (IPM), to prevent spread of diseases and infections and other pests (example; snails, fungal infections and others.)	Create silage for both small and big ruminants.	

Capacity Building Opportunity

○ Farmer Field School, Extension Meetings, NCOF



Tonga Farmer Field School

- Face-to-face comm.
 - knowledge exchange
 - training of trainers
- Working with local NGOs and champion farmers
- Inter-departmental collaboration



Capacity Building Opportunity

● Young Scientist Support Program, Special Trainings

- Young Scientist Support Program
 - 3-month-training
 - 10~20 trainees invited each year from different sectors
- Specialized training programs
 - 1-week-training
 - For climate information service in agriculture and water management





Holistic Approach for Climate Information Service in Agriculture

Tonga AgroMet Project - Improving agricultural productivity through ensuring data availability and enhancing agro-climate services

Climate Information Services

- Tonga Meteorological Service: historical weather data, nowcast, weather & seasonal climate forecasts
- Installation of agro-met station
- Delivery: radio, TV, smartphone
- National Climate Outlook Forum

Climate Smart Technologies

- Agromet index-based crop phenology/ yield prediction
- Crop pest spray tools
- ICT technologies for data collection & analysis & display
- Crop model development

Tonga Agricultural Community

Agricultural Development Plan

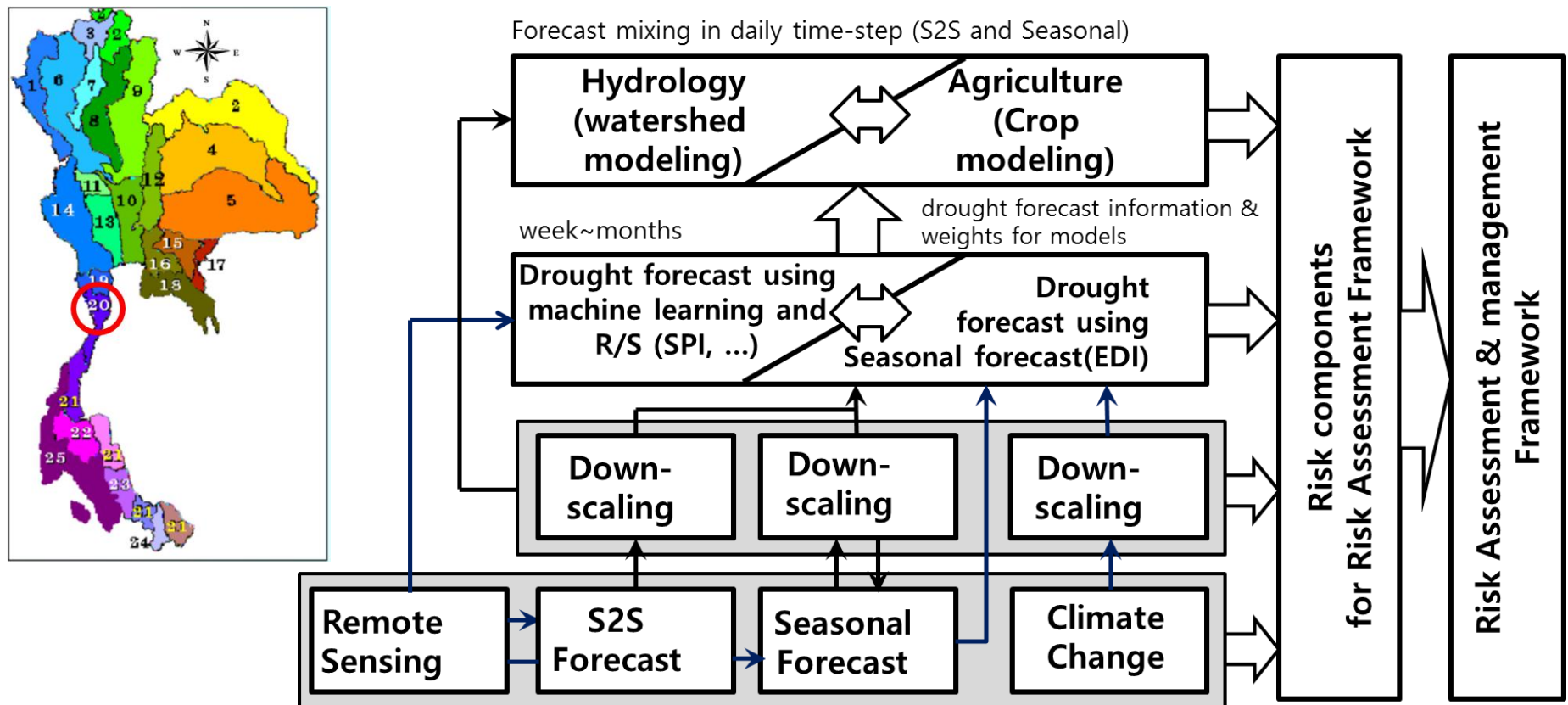
- National adaptation plan (2016-20)
- Cooperation with local NGOs for community level adaptation strategy

Local Knowledge and Institutions

- Establish AgroMet Working Group
- Capacity building for extension, NGOs, commercial farmers
- Farmer Field School (IFAD, Nishi Farm)
- Traditional knowledge and information sharing

Holistic Approach for Climate Information Service in Agriculture

Thailand Agri-Water Project - Utilization of multi-range climate information for risk assessment on agriculture-water resources





Take-home questions for CIS

National and subnational

- What are the climate parameters you use in agriculture sector?
- How do you make use of the climate data for decision making in agriculture operations?
- How climate information are used to plan, take decisions and carry out actions at national, subnational, farm level?

Regional

- What are regional cooperation activities exists in terms of tools, framework, capacity building activities, to mainstream the Climate Information Service in Agriculture Sector?





What action plans for CIS?

Establish a regional knowledge exchange and learning platform for CIS utilizing existing technical expert institutes in the APEC region

- Each institute takes a leading role of hosting the regional knowledge sharing and learning center for the APEC economies
- Each institute will arrange experts and expertise required for the knowledge sharing and learning on the specific area assigned to them
- By collaborating with other existing regional networks, initiatives, or institutes

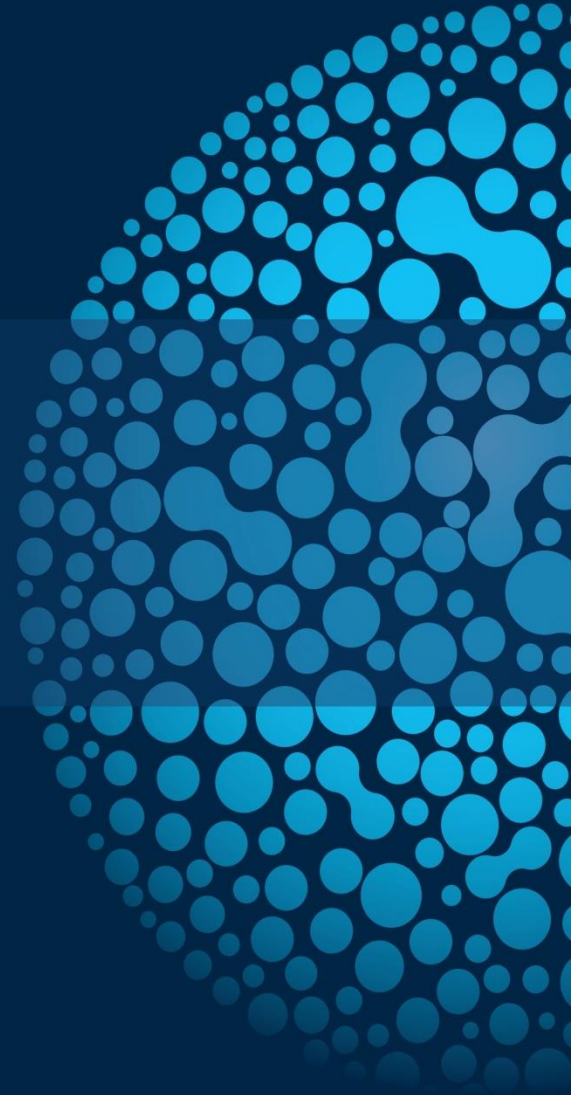
Regional R&D program on urgent technical issues on CIS

- To address common technical problems raised by most economies
- To scale up or out best technologies and practices to other areas or economies by proper customization

Thank-you

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Effective Climate Information Services for Agriculture in ASEAN

An ASEAN-CRN Knowledge Exchange Event to Increase Climate Resilience in ASEAN

21-23 MARCH 2017 | LAPU-LAPU CITY, CEBU, PHILIPPINES

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Effective Climate Information Services for Agriculture in ASEAN

An ASEAN-CRN Knowledge Exchange Event to Increase Climate Resilience in ASEAN

Aimed to generate actionable learnings and collaboration which participants can use to promote the effective provision of CIS for agriculture in ASEAN, through:

- bringing together policy makers, scientists, practitioners, and private companies engaged in the development and delivery of CIS for agriculture in ASEAN;
- exchanging experiences and knowledge on effective CIS in AMS;



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Aimed to generate actionable learnings and collaboration which participants can use to promote the effective provision of CIS for agriculture in ASEAN, through:

- identifying policy interventions and institutional frameworks for increasing investment in technologies and management systems to support CIS for agriculture; and,
- identifying activities for regional collaboration.



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Key results: important opportunities & challenges

- Difficult to provide actionable information (often only climate info)
- Institutional arrangements challenging (Met and Ag separate)
- Advisory often not crop specific and difficult to use
- Lack of capacities (downscaling, seasonal forecast, etc.)
- Often scarce data for good quality CIS products



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Key results: important opportunities & challenges

- Good pilots but challenges to get to scale (field schools, etc.)
- Communication formats not always appropriate, multiple channels needed
- ICT solutions are becoming increasingly important and promising
- Big potential for crowd sourcing and big data approaches



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Effective Climate Information Services for Agriculture in ASEAN

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Key results: areas for regional collaboration

	ASEAN/ Regional level	K H	ID	L A	MM	PH	TH	V N
KH			Seasonal development of cropping calendar				Agro-climate information for agricultural water management	
ID						Crop insurance	Crop modelling (training and application)	
LA			Utilization of Android mobile applications for agricultural use		Capacity building activities from experts on hydro-meteorology	Trainings and capacity building activities from PAGASA	Sharing of lessons and experiences on the linkages with agencies with a single command system	

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Key results: areas for regional collaboration

	ASEAN/ Regional level	K H	ID	LA	M M	PH	T H	VN
MM				Strengthening capacity of hydro-meteorology staff through trainings		Technical assistance from PAGASA to strengthen capacities of hydro-meteorology staff through trainings		Upgrading of mobile services for agriculture use
PH	World Meteorological Organization Regional Climate Centers (WMO-RCCs) Climate Monitoring – ENSO, IOD, monsoon, etc. Standardization of the language of disaster (AHA Center) Data warehouse with ASMC ASEAN Regional Risk Insurance Facility (GCF proposal)		Crop pest forecasting					

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Key results: areas for regional collaboration

	ASEAN/ Regional level	K H	ID	L A	M M	PH	TH	V N
TH	ASEAN CIS Knowledge and Expert Advisory Hub Narrowing the gap between the CIS data rich and poor AMS		Crop pest forecasting			Training on agro-meteorology center		
V N						Training on agro-meteorology center		
						Collaborate with PH and TH on a training program for agriculture extension workers on the provincial level to interpret CIS for agro-advisory development		