문서번호 APCC-출장-18-0660(2018-07-09)

결재	선임연구원	팀장	부서장	원장직무대행
	07/05 전종안	07/08 이우섭	07/09 유진호	07/09 유진호
협조				

TRAVEL REPORT FORM
출장보고서

I. Travel Overview 출장개요

1. Traveler(s) 출장자

Department 소속	Position 직위(직급)	Name 성명	Note 비고
기후사업본부	선임연구원	전종안, 김대하	

2. Travel Period 출장기간
2018/6/24-28

3. Occasion and destination 행사 및 출장지
NAFRI (Vientiane, Laos)

II. Major Activities 주요업무 수행내용

1. Main Contents and Activities 주요내용 및 활동

○ ARMS for Laos 최종발표
일시: 2018/6/25
장소: NAFRI meeting room
참가인원: 17명 (NAFRI, DMH)

○ 모바일 웹시스템 (CREAMS) 서버 설치 및 서버관리자 교육
일시: 2018/6/25-27
장소: NAFRI ICT Server Room

○ 모바일 웹시스템 (CREAMS) 서버 이전행사 및 사용교육
일시: 2018/6/25-26
장소: NAFRI meeting room
참가인원: 17명 (NAFRI, DMH) including the Deputy Director General of the NAFRI (Dr. Khamphone Moulamai), 서버 관리 담당자 (Mr. Phonepaseuth Vongsipasom)

○ 모바일 웹서비스 지속운영위한 교육 (6/26-27)
일시: 2018/6/26-27
장소: NAFRI meeting room

참가인원: 17명 (NAFRI, DMH)
CREAMS 운영담당자: Mr. Khanthavy Souliyaviongsa

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

○ Domain Name Server (DNS) 등록
- 지난 출장에서(APCC-출장-18-0412)IP address (202.123.179.228)외에 도메인 네임등록에 매년 100USD 정도 필요하며, 이를 APCC에 요구하였으나, NAFRI 자체 지속운영관리 목적에 부합하지 않을 것으로 판단하여 거절한바 있음.
- 따라서, APCC는 도메인 네임 없이 IP address만으로 CREAMS 서버 유지 하려 하였음 (IP address는 숫자로 되어 있어서, 기억하기 어려워, CREAMS 방문이나 사용에 제한적일 수 밖에 없음).
- 그러나 NAFRI는 실제 CREAMS 서버 시연을 보고 자체 비용으로 도메인 네임을 DNS에 등록함.
- 이는 NAFRI가 CREAMS 의 DNS에 등록에 따른 비용을 자체 부담함을 의미하므로, NAFRI의 CREAMS에 대한 적극적 자체 운영/관리 의지를 의미함.

○ 서버 관리 담당자 (Mr. Phonepaseuth Vongsipasom)/CREAMS 운영담당자: Mr. Khanthavy Souliyaviongsa 지정
- 서버 관리 담당자는 실제 CREAMS 사용교육에 참여할 필요는 없었으나, 25-27 모두 해당 교육에 참여하였음. CREAMS에 대한 관심과 함께, 책임있는 CREAMS 서버 관리가 기대됨
- CREAMS 운영담당자는 자체 시스템 운영을 통하여 2018년 6월 결과를 CREAMS 서버에 자체 업로드 하여, 현재 2018년 6월 까지 서비스 되고 있음
- CREAMS 운영담당자와 매월 15일에 semi-operational 운영하기로 합의 하였음. 7월 15일에 2018년 7월 결과 서비스 기대 됨.

○ CREAMS의 지속 운영 및 관리 기대
- NAFRI 부청장 (Deputy Director General)의 CREAMS 이전식에 참석
- DNS NAFRI 자체 부담 등록
- ICT 의 자체 서버 관리
- NAFRI의 자체 CREAMS 운영

3. Suggestions and Remarks 건의사항

○ 위의 교육으로 CREAMS 운영담당자는 CREAMS를 현재 수준으로 자체 운영이 가능하나, CREAMS의 Laos 전 지역 확대, Cultivar 확대 적용, 다양한 Treatment를 통한 적절한 기후위험관리를 위해서, NAFRI의 CREAMS 운영담당자가 CREAMS와 작물모형 연계에 대한 다양한 응용능력이 필요함.
○ APCC의 YSSP 프로그램등을 통해 CREAMS를 다양하게 응용하여 확대 적용할 수 있도록 CREAMS 운영담당자의 역량 강화 필요

III. References (Presented and Collected Materials) 주요 수집자료

(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

APEC 기후센터-라오스 농업 프로젝트 최종워크숍 결과보고(안)

【 2018. 7월 기후분석팀 / 대외협력실 】

❑ 워크숍 개요

❍ 행사개요

- 주 제 : 「몬순 변동 기반 벼 재배 의사결정 지원체계 구축」 최종워크숍
- 기 간 : 2018. 6. 25(월) ~ 27(수) <3일간>
- 장 소 : 라오스 비엔티엔 NAFRI 사무실
- 주 최 : APEC기후센터(APCC), 라오스 NAFRI

※ NAFRI : National Agriculture and Forestry Research Institute

- 참가자 : 라오스 NAFRI 프로젝트 주요 관계자 및 실무진 13명

※ APCC 참가자 : 라오스 프로젝트 팀 2명(전종안, 김대하)

❍ 추진배경 및 목적

- 과 업 명 : 몬순 변동 기반 벼 재배 의사결정 지원체계 구축 (*Agriculture Risk Management Support for rain-fed lowland rice in Lao PDR*)
- 추진배경

· 라오스 농림부의 천수답 기후위험관리에 대한 수요에 대응하기 위해 IRI와 국제공동연구를 수행 ('17년)

· 라오스 NAFRI (National Agriculture and Forestry Research Institute)가 기후예측정보와 작물모형 활용 의사결정 지원체계 개발 요청('17년)

· 시범 서버설치, 시그널 테스트 및 모바일웹 UI시안 협의 등 현지조사 및 회의실시 ('18년 5월)

· ‘18년, 사업수행 및 프로젝트 완료(‘18년 6월)

- 추진목적

· 프로젝트의 최종성과물을 라오스 정부에 공유하여 프로젝트 결과물의 지속적인 활용을 위한 Ownership 전달. 이를 위한 프로젝트 결과물(Climate-RElated Agricultural-risk Management System, CREAMS)의 원활한 현업화를 위한 **사용자 교육워크숍** 실시

· 기후예측정보와 작물모형 활용을 통해 NAFRI의 라오스 대상지역별 벼생산성 전망과 최적관리방안을 위한 **의사결정을 지원**

· 라오스 농림부 및 NAFRI 등 관계자들에게 APCC 프로젝트 성과물과 협력에 대한 **인식도 제고**

❍ 워크숍 주요내용

- 최종워크숍 추진 및 Handover 서명식을 통한 연구결과 공유 및 전달

- 모바일 웹 시스템 (CREAMS, http://creams.nafri.org.la/home) 서버 이전 및 실무진 역량강화 교육

	
시스템 수여 서명식 개최	모바일 웹 시스템(CREAMS)

❑ 프로그램 구성

날 짜	시 간	주 요 내 용
6. 25(월)	오전	**라오스 NAFRI 미팅** - CREAMS 운영을 위한 서버 설치 및 시범운영 - 프로젝트 성과물 사전 설명 및 피드백 논의
	오후	**라오스 농업 프로젝트 최종워크숍** - 프로젝트 연구결과 공유 - 라오스 기후-농업위험관리시스템(CREAMS) 시연 - CREAMS 수여식(Handover Agreement Signing)
6. 26(화)	종일	**사용자 교육워크숍 I** - NAFRI 및 DMH 대상 작물모형 Complexity 기반 Multi-stage approach 소개 / Conditional Weather Generator 활용 / AquaCrop / CERES-Rice 응용 교육
6. 27(수)	종일	**사용자 교육워크숍 II** - 모바일웹서비스 담당자 AquaCrop / CERES-Rice 맞춤형 교육 및 응용실습

❑ 워크숍 주요내용 [※세부 내용은 첨부된 발표파일 참고]

❍ 최종워크숍

- NAFRI와 DMH(Department of Meteorology and Hydrology, 라오스 기상청)를 대상으로 2017년 12월에 제공했던 작물모형 기초부분 실습과 작물모형 응용 실습
  - · AquaCrop활용하여 작물의 잠재생산량 추정
  - · CERES-Rice활용하여 시비량 영향 평가
- NAFRI ICT에 모바일 웹서비스를 위한 서버를 공식 이전하고 제대로 설치할 수 있도록 NAFRI 담당자와 함께 지원하고, 모바일 웹서비스 사용교육 지원

❍ 사용자 교육워크숍

- 서버관리 담당자(Mr. Phonepaseuth Vongsipasom)와 CREAMS 운영 담당자(Mr. Khanthavy Souliyaviongsa) 의 모바일 웹시스템 관리·운영 교육
- 서버이전 이후 담당자 스스로 운영할 수 있도록 모바일 웹서비스 담당자 (Khanthavy Soulivavongsa)를 위한 맞춤형 교육
  - · 작물모형의 Complexity 기반 Multi-stage approach 소개
  - · APCC MME 계절예측자료기반 Conditional Weather Generator 활용
  - · Synthetic Weather와 AquaCrop 활용 최적 이앙기 추정
  - · Synthetic Weather와 CERES-Rice를 활용하여 Tercile정보를 제공하는 Crop Outlook 생산

❑ 최종워크숍 참가자 명단

APCC NAFRI

Agriculture Risk Management Support: Final Workshop for Climate-REted Agricultural-risk Management System

25 June 2018

National Agriculture and Forestry Research Institute

#	Name	Organization	Position	Telephone	Email	Signature
1	Jong Ahn Chun	APCC	Research fellow	+82-51-745-3957	jochun@apcc21.org	[signature]
2	Daeha Kim	APCC	Research fellow	+82-10-9370-1159	d.kim@apcc21.org	[signature]
3	Dr THAVONE INTHAVONG	RCRA/NAFRI	Dir of RCRA	+856202353645	i_thavone@yahoo.	[signature]
4	Mr Soukhsadachanh	—	Technical staff	+856 20222469 93	[illegible]@yahoo.com	[signature]
5	Mr. Chanseng Phongpachith	ARCR-NAFRI	DD	5540-7379	chanseng2011@gmail	[signature]
6	Mr Khanthavy Souliyavongsa	ARCRA	Technical	59894677	khanthavys@gmail.com	[signature]
7	Mr. SomSOUK BOUPHAPHONE	RCRA	Technical	55149222	sophaphone.se@gmail.com	[signature]

#	Name	Organization	Position	Telephone	Email	Signature
8	Ms. Phonealoun CHANTHABOUASONE	RCRA	Technical	96961703	P.l.chbs@gmail.com	[signature]
9	Ms. Phanlana CHANTHAVONG	RCRA	Technical	99506329	Pik1987@hotmail.co.th	[signature]
10	Mr Thonglam phounkhamoun	RCRA	Technical	99372690	thonglam.@gmail.com	[signature]
11	Ms Chanphasouk Phiaiathounhoun	RCRA	Technical	95333174	[illegible]@gmail.com	[signature]
12	Mr. Phonevilay Sinavong	RCRA	Researcher	222 89863	Lanaysinavong@gmail.com	[signature]
13	Ms Channy Nouanephaly	RCRA		58548661		[signature]
14	Mr. Soukkanh Keovouvanh	NAFRI	Head of planning & Cooperation Division	55603443	Skeovouvanh	[signature]
15	JAEBUM LEE	CUUVA		+82 10 8824 2040	jaylee@cuuva.com	[signature]
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APCC Agriculture Risk Management Support: Final workshop for CREAMS
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❑ 사용자 교육워크숍 참가자 명단

APCC NAFRI

Agriculture Risk Management Support: Training Workshop for Climate-REted Agricultural-risk Management System

26 - 27 June 2018

National Agriculture and Forestry Research Institute

#	Name	Organization	Position	Telephone	Email	Signature (26 June)	Signature (27 June)
1	Jong Ahn Chun	APCC	Research Fellow	+82-51-745-3957	jachun@apcc21.org		
2	Daeha Kim	APCC	Research Fellow	+82-10-4370-1159	dkim@apcc21.org		
3	Mr. Khanthavy	RCRA	Technical	8562059894677	khantavyss@gmail.com		
4	Mr. Somsouk	RCRA	Technical	55149422	bouphaphone.s@gmail.com		
5	Mr. Chanseng Phongpachith	RCRA	Senior Research	856-20 5540-7379	chanseng2011@gmail.com		
6	Mr. Soulideth PIENPANYA	GIS	Technical	856-20 22411114	soulideth.76@gmail.com		
7	Ms. Manivanh	RCRA	Technical	55689969	Manivanh.pp@gmail		
8	Thonglam Phouankhamoum	RCRA	Technical	99372598	thonglam8425@gmail.com		
9	Ms Champhasouk Phialathounhouan	RCRA	Technical staff	95333172	[illegible]		
10	Ms. Phonealoun CHANTHABOUASONE	RCRA	—	96961703	[illegible]@gmail.com		
11	Ms Dalivanh SAMONTRY	—	—	55529923	sdalivanh@gmail.com		
12	Mr. Phonepaseuth Vongsapasom	CIC	Deputy Director (Acting)	29946755	Phonepaseuth1981@gmail.com		
13	Ms. Khaemeuy CHAO	DMH	Technical staff	29450585	Khaemeuy@gmail.com		
14	Ms Phamlany CHANVANG	RCRA	Technical	99506349	Pik1981@hotmail.co.th		
15	Dr THAVONE Inthavong	RCRA	Director	23536456	i.thavone@yahoo.com		
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APCC Agriculture Risk Management Support: Training workshop for CREAMS
26-27 June, 2018 – Vientiane, Laos

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❑ 워크숍 세부 일정표

Time	Item	Person
Day 1 [June 25, 2018]		
09:00 - 12:00	Installment of the server for CREAMS & test the server	Mr. Jaebeom Lee (CUUVA)
12:00 - 13:00	Lunch	
13:00 - 13:05	Opening Address from the APEC Climate Center	Dr. Jong Ahn Chun(APCC)
13:05 - 13:10	Welcome Address from MAF	
13:10 - 13:15	Welcome Address from NAFRI	
13:15 - 13:20	Group Photo	
13:20 - 14:00	Presentation on Research Outcomes and Showcase of CREAMS	Dr. Jong Ahn Chun(APCC)
14:00 - 15:00	Discussion on detailed project outcomes and Feedback from NAFRI	Dr. Jong Ahn Chun / Dr. Daeha Kim (APCC)
15:00 - 15:10	CREAMS Handover Ceremony	Dr. Jong Ahn Chun (APCC) Dr. Thavone Inthavone (NAFRI)
15:10 - 15:15	Closing Address from NAFRI	Dr. Thavone Inthavone (NAFRI)
Day 2 [June 26, 2018]		
09:00 - 10:00	Introduction to Conditional Weather Generator and its application	Dr. Daeha Kim(APCC)
10:00 - 11:00	Introduction to AquaCrop Model and its application I	Dr. Daeha Kim(APCC)
11:00 - 12:00	Introduction to AquaCrop Model and its application II	Dr. Daeha Kim(APCC)
12:00 - 12:30	Q&A Session	
12:30 - 13:30	Lunch	
13:30 - 15:00	Introduction to CERES-Rice Model and its application I	Dr. Jong Ahn Chun(APCC)
15:00 - 16:30	Introduction to CERES-Rice Model and its application II	Dr. Jong Ahn Chun(APCC)
16:30 - 17:00	Q&A Session	

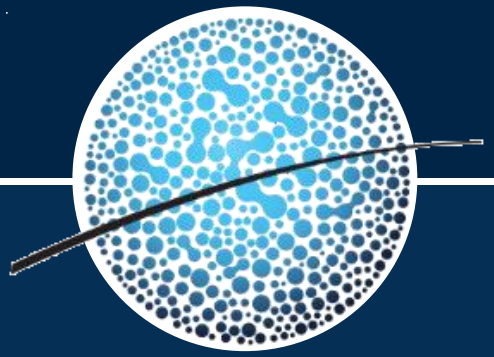
Day 3 [June 27, 2018]		
09:00 - 10:30	Introduction to AquaCrop Model for CREAMS	Dr. Daeha Kim(APCC)
10:30 - 12:00	Introduction to CERES-Rice Model for CREAMS	Dr. Jong Ahn Chun(APCC)
12:00 - 12:30	Q&A and Discussion	
12:30 - 14:00	Lunch	
14:00 - 16:00	Hands-on session for CREAMS, using AquaCrop Model	Dr. Daeha Kim(APCC)
16:00 - 17:00	Hands-on session for CREAMS, using CERES-Rice Model	Dr. Jong Ahn Chun(APCC)
17:00 - 17:30	User Feedback and Q&A Session	

Agriculture Risk Management Support for rain-fed lowland rice in Lao PDR

(Project acronym: ARMS for Laos)

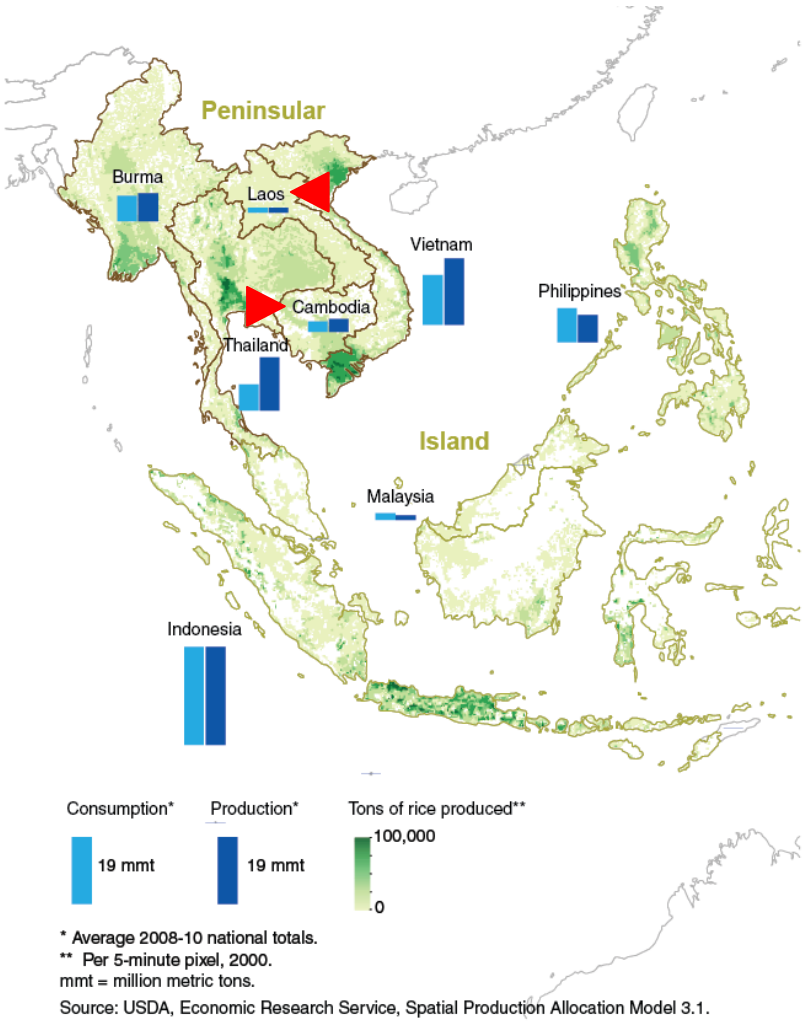
Jong Ahn Chun*, Daeha Kim

APCC APEC CLIMATE CENTER



Introduction

Southeast Asia



- **Southeast Asia**
  - One of the regions deemed particularly vulnerable to climate change
  - Already being affected by climate change
- **Rice is one of the most important staple food crop in Southeast Asia**
  - Approx. 557 million people (IRRI, 2006; Manzanilla et al., 2011)
  - The adverse impacts of climate change on rice production systems have been increasing.
- **The possible impacts of climate change on rice production in Asian countries have been assessed through a number of modeling studies.**

Publications from the Cambodia Project

- Li, S., Q. Wang, and J.A. Chun*. 2017. Impact Assessment of Climate Change on Rice Productivity in the Indochinese Peninsula using a Regional-scale Crop Model, *International* ***Journal of Climatology***, doi:10.1002/joc.5072
- Wang, Q., J.A. Chun*, W-S. Lee, S. Li, and V. Seng. 2017. Shifting Planting Dates and Fertilizer Application Rates as Climate Change Adaptation Strategies for Two Rice Cultivars in Cambodia. *Journal of Climate Change Research*, 8(3), 187–199. doi: http://dx.doi.org/10.15531/KSCCR2017.8.3.187
- Chun, J.A.*, S. Li, Q. Wang, W.-S. Lee, E.-J. Lee, N. Horstmann, H. Park, T. Veasna, L. Vanndy, K. Pros, and S. Vang. 2016. Assessing Rice Productivity and Adaptation Strategies for Southeast Asia under Climate Change through Multi-Scale Crop Modeling, ***Agricultural Systems*** 143, 14-21.
- Lee, W.-S., J.A. Chun, and K. Kang*. 2014. Development and Application of GIS-based PRISM Integration through a Plugin Approach. ***Journal of Hydrology*** 513, 58–67.

BOOK CHAPTER

- Chun, J.A., C. Aikins, D. Kim*, S. Li, W. Lee, and E.-J. Lee. 2018. Impacts of Climate change on Crop Production in Southeast Asia. Hasanuzzaman, M., M. Fujita, H. Oku, and T. Islam (Eds.) Plant Tolerance to Environmental Stress: Role of Exogenous Phytoprotectants, CRC Press, **Tayler & Francis Group** (Forthcoming).

ARMS for Laos

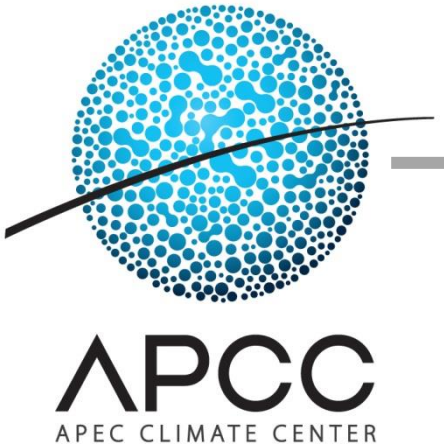
Project framework

Department of Meteorology and Hydrology

National Agriculture and Forestry Research Institute

Seasonal Forecast

APCC-KREI Collaboration



KAPEX

Korean **A**gricultural **P**olicy **Ex**periences for Food Security

Adaptation strategies through crop modeling

Socioeconomic impacts of climate change on the agricultural sector of Laos

Climate Change

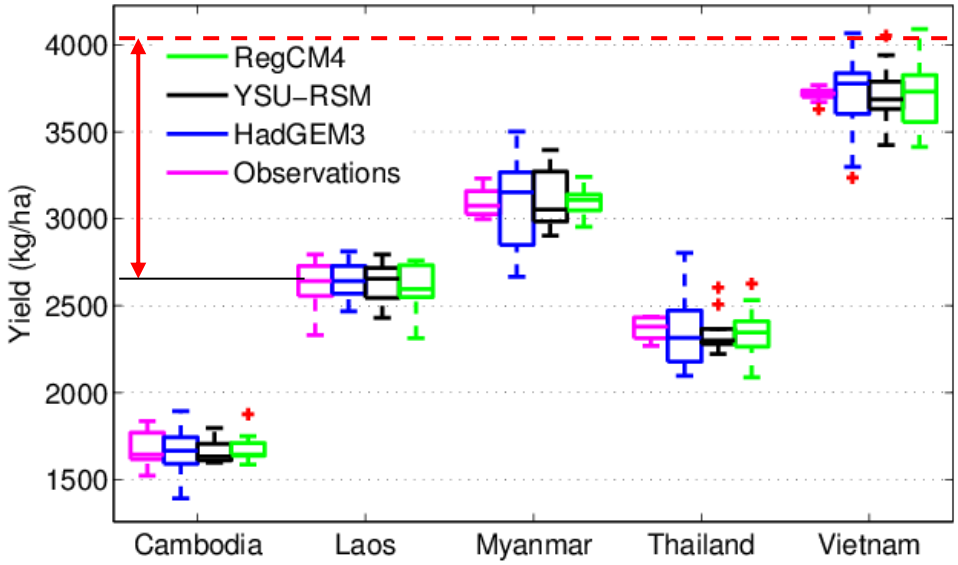
Lao PDR

- **Lao PDR is a land-locked country**
- **Area = 236 800 km²**
- **70 % of the country is mountainous**
- **Border with 5 countries**
  - North: China and Myanmar
  - South: Cambodia
  - East: Vietnam
  - West: Thailand
- **Administrative divisions: 17 provinces and 1 Vientiane Capital**
- **Population: 6.7 million, 2014**
- **Consists of 49 different ethnic group**

Agriculture in Lao PDR

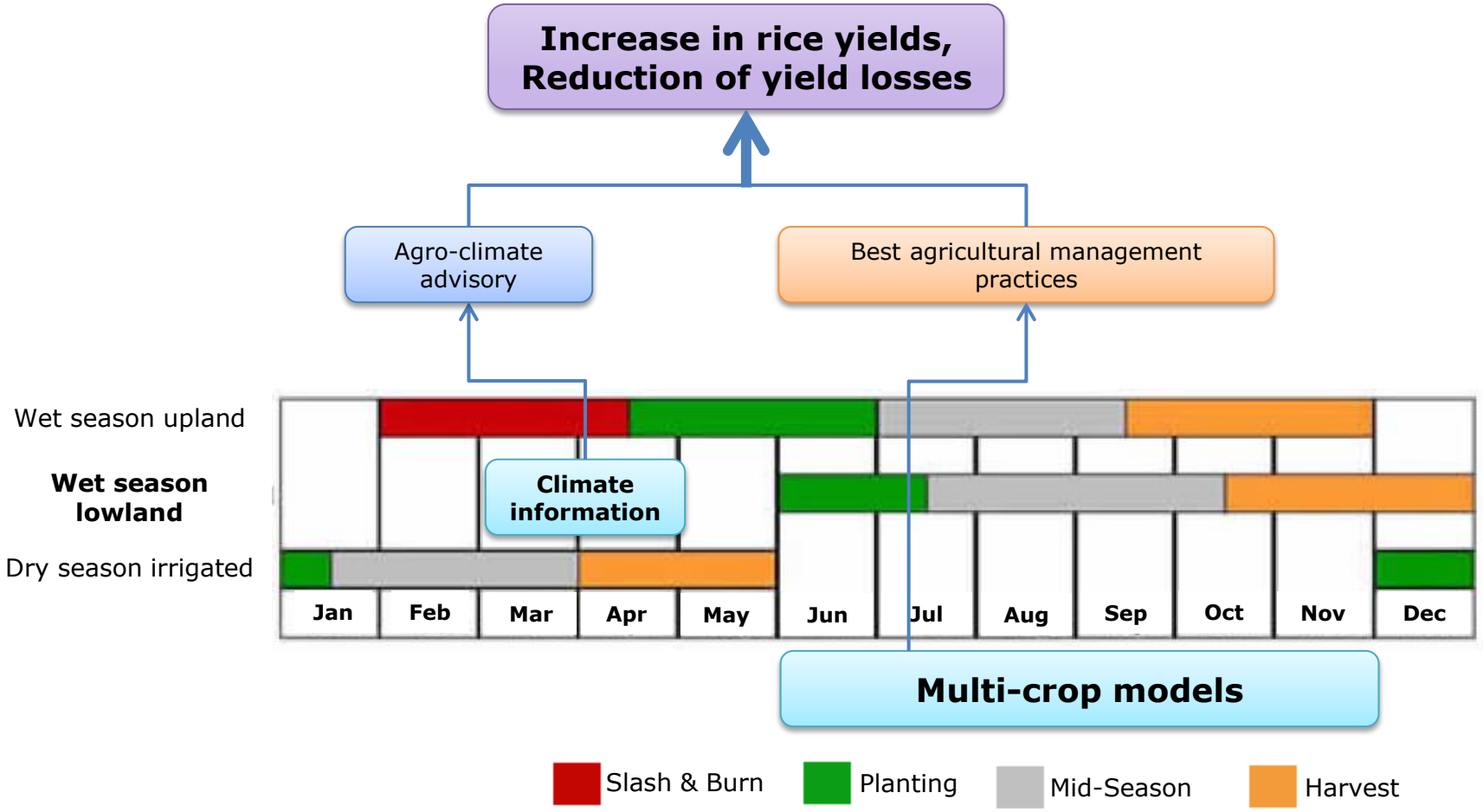
- **Arable area: at least 5 million ha (about 21%)**
- **Cultivated area : 850 000 ~ 900 000 ha (17% of arable area, less than 4 % of the total area)**
- **Rice : about 80% of cultivated area (1989-90 growing season)**
  - 422 000 ha of lowland wet rice and 223 000 ha of upland rice
- **Agriculture sector: 65% of GDP in 1980 to about 61% in 1989 and further decreasing to between 53 and 57% in 1991**
- **Paddy rice production decreased in 1987-88 and 1991-92 due to drought**
  - Cut annual yields by nearly one-third (in 1987-88)

Validation of GLAM-Rice at the National-Level



Comparison of the simulated and observed average country-level rice yields for the baseline period (1991–2000)

Agro-climate outlook

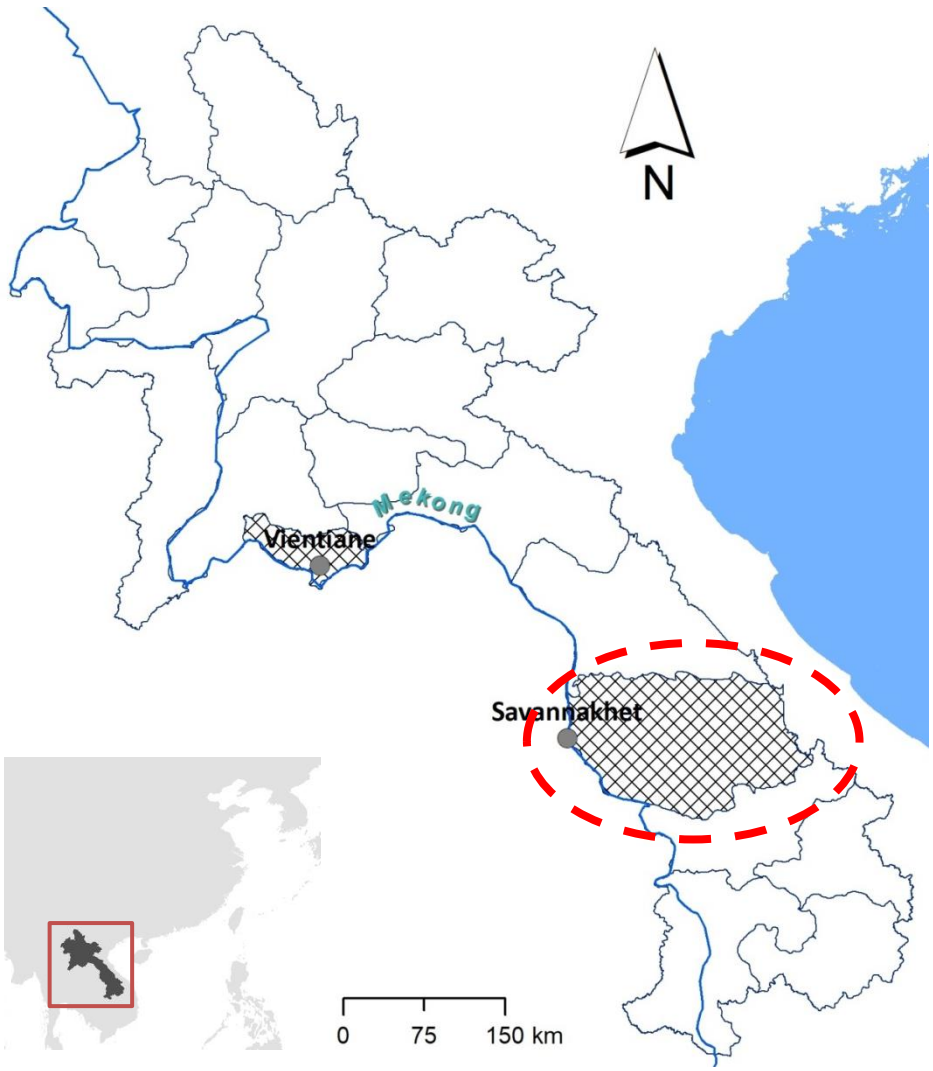


Objectives

- To propose a **multi-stage research approach** based on the complexity of crop models
- To **semi-operational activities** for **seasonal crop outlook** for Savannakhet in Laos using the approach
- To develop a **mobile application** for agro-climate advisory based on **APCC MME seasonal forecasts** (CUUVA)
- To **build capacity** of human resources at relevant institutes (DMH and NAFRI) for a sustainable management of the proposed system in this program

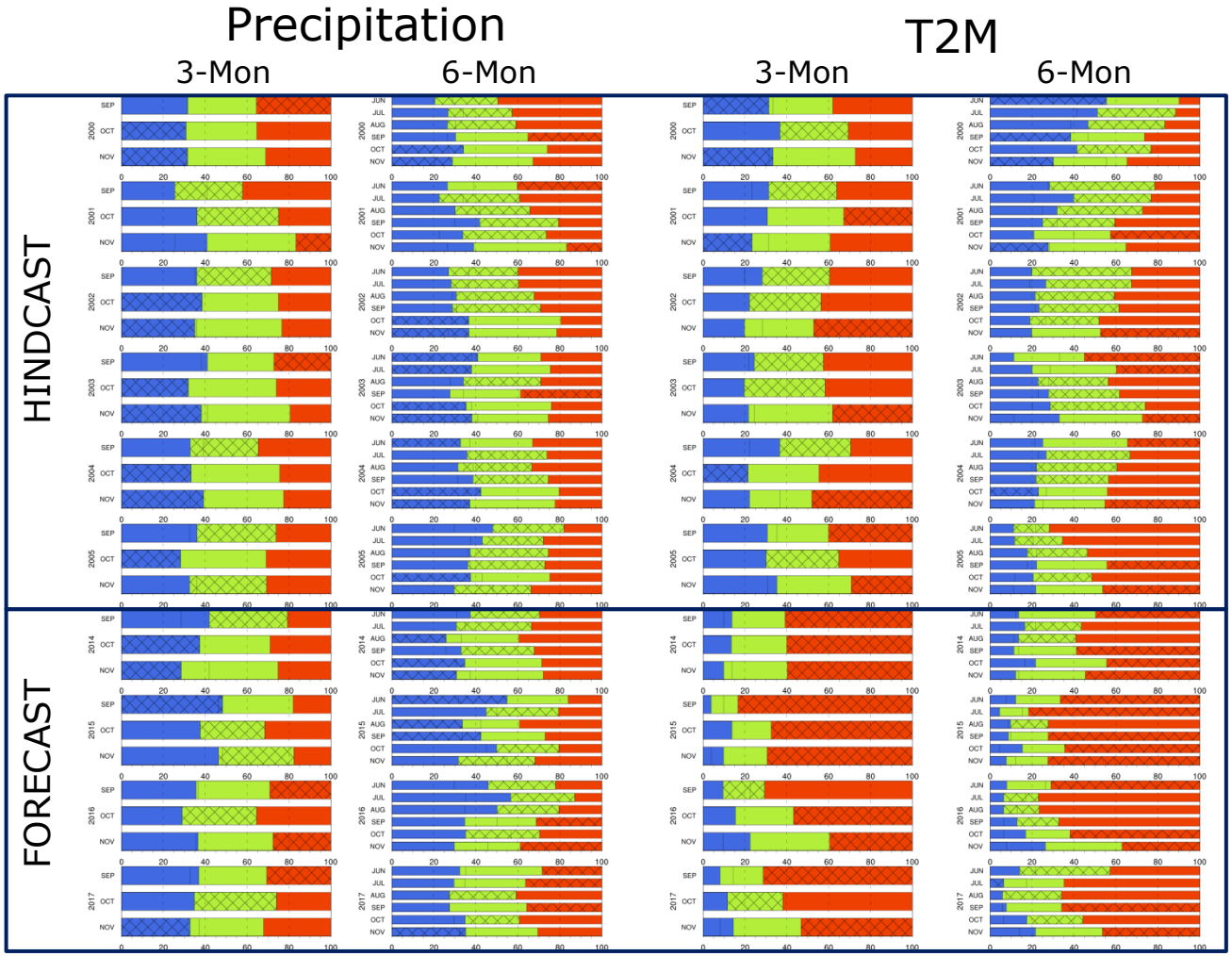
Materials and Methods

Study Region



- **Focus on rain-fed lowland rice farming areas in Savannakhet Province**
- **The Savannakhet Province accounted for 23% of total lowland rice areas in the country as of 2004**
  - The largest portion compared to other provinces
- **Wet season (May-Oct), highest rainfall in Aug**
- **Chronic drought has been the major risk for rain-fed lowland rice farming in the wet season in the Savannakhet Province (Inthavong et al., 2012)**
  - Studies on the impact of water availability and soil characteristics in the past

APCC MME Seasonal Forecasts



- APCC HINDCAST
  - Period : 1983-2005
- APCC FORECAST
  - Period : 2014~
- Spatial Resolution
  - 2.5degree x 2.5degree
- Legends
  - RED:Above Normal
  - GREEN: Near Normal
  - BLUE: Below Normal
  - Hatched pattern: Actual observation status
- Station:Savannakhet

Lowland Rice Yield by Provinces

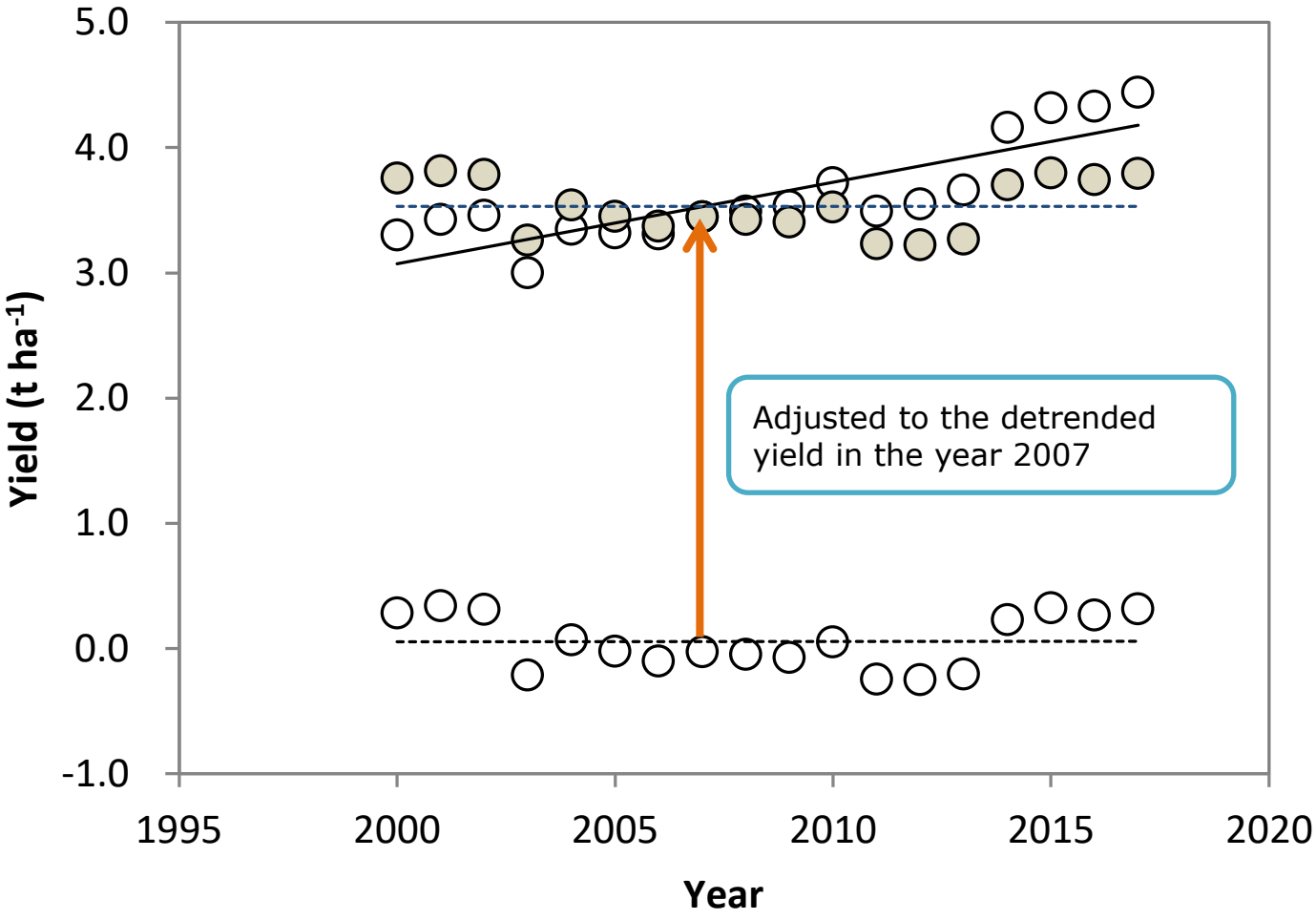
6-month APCC MME datasets

6-month APCC MME datasets

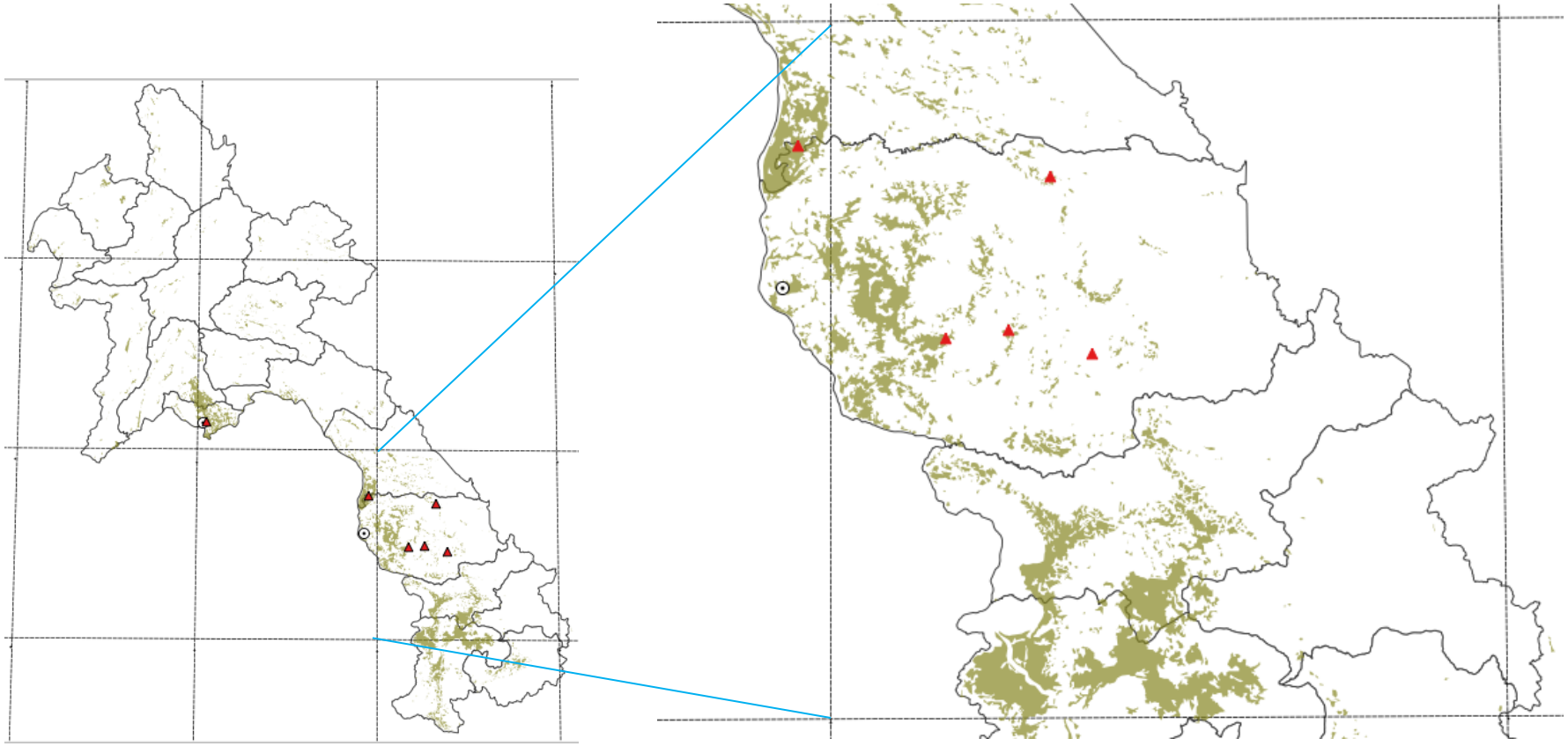
Provinces	a	b	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Vientiane Capital	0.0671	-130.63	3.40	3.83	4.00	3.60	3.73	3.87	3.80	4.12	4.11	4.14	4.33	4.27	4.35	4.54	4.70	4.70	4.56	4.53
Phongsaly	0.1092	-215.05	3.21	3.20	3.31	3.40	4.10	3.72	4.37	4.46	3.98	4.43	4.25	4.55	4.66	4.80	4.92	4.95	4.94	4.86
Luangnamtha	0.0746	-145.85	3.24	3.70	3.70	3.00	3.62	3.75	3.88	3.88	3.90	3.88	4.15	4.50	4.39	4.45	4.47	4.43	4.54	4.31
Oudomxay	0.0822	-161.11	3.29	3.20	3.70	3.44	3.80	4.02	3.44	4.18	4.28	4.73	3.97	4.49	4.17	4.57	4.40	4.68	4.56	4.64
Bokeo	0.0893	-175.05	3.19	3.50	3.40	3.50	3.92	4.13	4.18	4.25	4.56	4.39	4.58	4.43	4.45	4.57	4.51	4.59	4.89	4.89
Lluangprabang	0.0865	-169.64	3.30	3.44	3.70	3.50	3.72	3.77	3.80	4.00	3.83	4.28	4.47	4.28	4.10	4.30	4.39	4.82	4.85	4.86
Huaphanh	0.0751	-146.48	3.20	3.20	4.00	3.86	4.45	4.62	4.60	4.09	4.17	4.96	4.34	4.70	4.60	4.81	4.45	4.67	4.78	4.89
Xayabury	0.091	-178.54	3.24	3.21	3.50	3.70	4.00	4.34	3.88	3.94	4.29	4.07	4.46	4.37	4.45	4.65	4.69	4.74	4.79	4.83
Xiengkhuang	0.079	-154.87	3.20	3.56	3.40	3.20	3.22	3.80	3.64	3.42	3.89	3.99	4.01	4.13	4.21	4.39	4.18	4.46	4.43	4.45
Vientiane	0.0761	-148.62	3.25	4.09	4.10	3.36	3.97	3.96	3.90	4.14	4.33	4.35	4.33	4.46	4.43	4.63	4.74	4.93	4.70	4.78
Borikhamxay	0.0534	-103.49	3.20	3.15	3.37	3.20	3.80	4.04	3.72	3.74	3.35	3.90	3.79	3.67	3.70	3.91	4.35	4.10	4.12	4.14
Khammuane	0.085	-167.22	3.25	2.75	3.06	3.14	2.71	3.42	3.06	3.24	3.22	3.13	3.43	3.29	3.39	3.69	4.40	4.24	4.25	4.45
Savannakhet	**0.0651**	**-127.18**	**3.30**	**3.43**	**3.46**	**3.00**	**3.35**	**3.32**	**3.31**	**3.45**	**3.49**	**3.53**	**3.72**	**3.49**	**3.55**	**3.66**	**4.16**	**4.32**	**4.33**	**4.44**
Saravane	0.0685	-133.95	3.24	3.01	3.30	3.30	3.32	3.60	3.44	3.80	4.22	3.47	3.27	3.54	3.42	3.68	4.30	4.63	4.68	4.00
Sekong	0.0732	-143.41	3.16	3.30	3.30	3.20	3.60	3.51	3.38	3.42	3.69	3.35	3.17	2.97	3.90	4.15	4.40	4.38	4.37	4.52
Champasack	0.0953	-187.73	3.25	2.97	3.10	2.98	3.13	3.42	3.26	3.18	3.46	3.68	2.77	4.09	4.38	3.91	4.21	4.51	4.47	4.49
Attapeu	0.0179	-32.919	3.16	3.10	3.20	3.10	2.50	3.38	2.48	2.98	3.02	2.27	2.53	2.94	3.02	2.98	3.70	3.09	3.88	3.07
Xaysomboon	0.0436	-84.087	3.20	3.22	2.97	3.00	3.19	3.15	3.37	3.42	3.46	3.51	3.55	3.59	3.64	3.68	4.25	3.46	3.63	3.66

(t/ha)

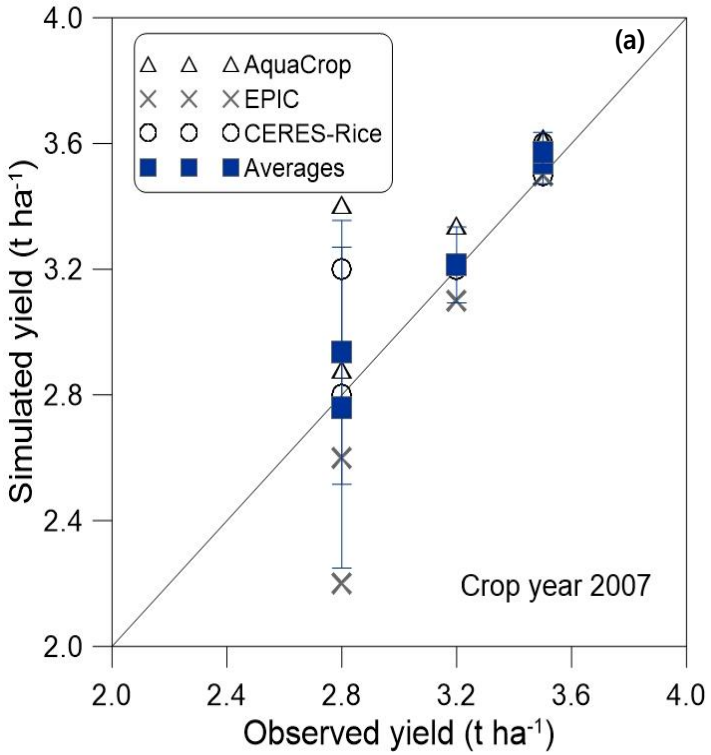
Detrended rice yield in Savannakhet

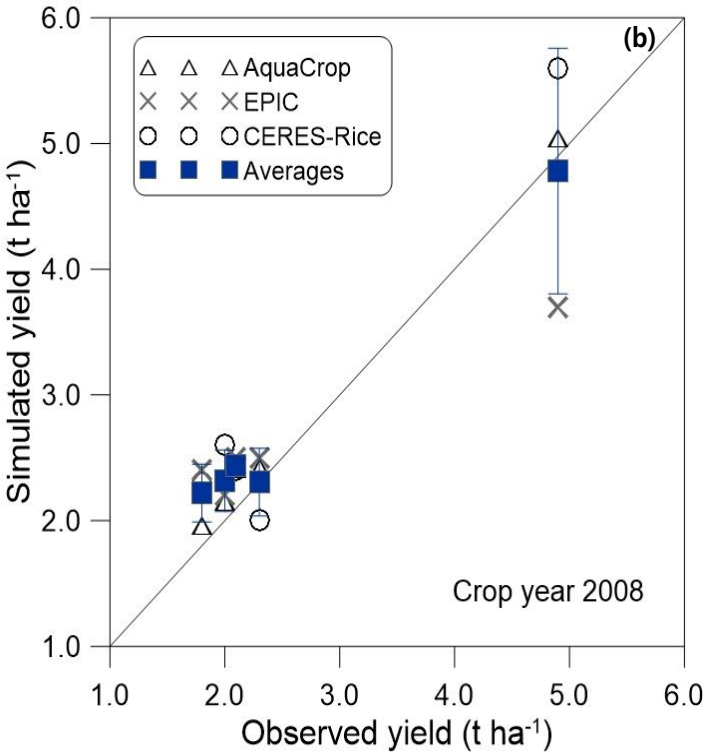


Simulation locations

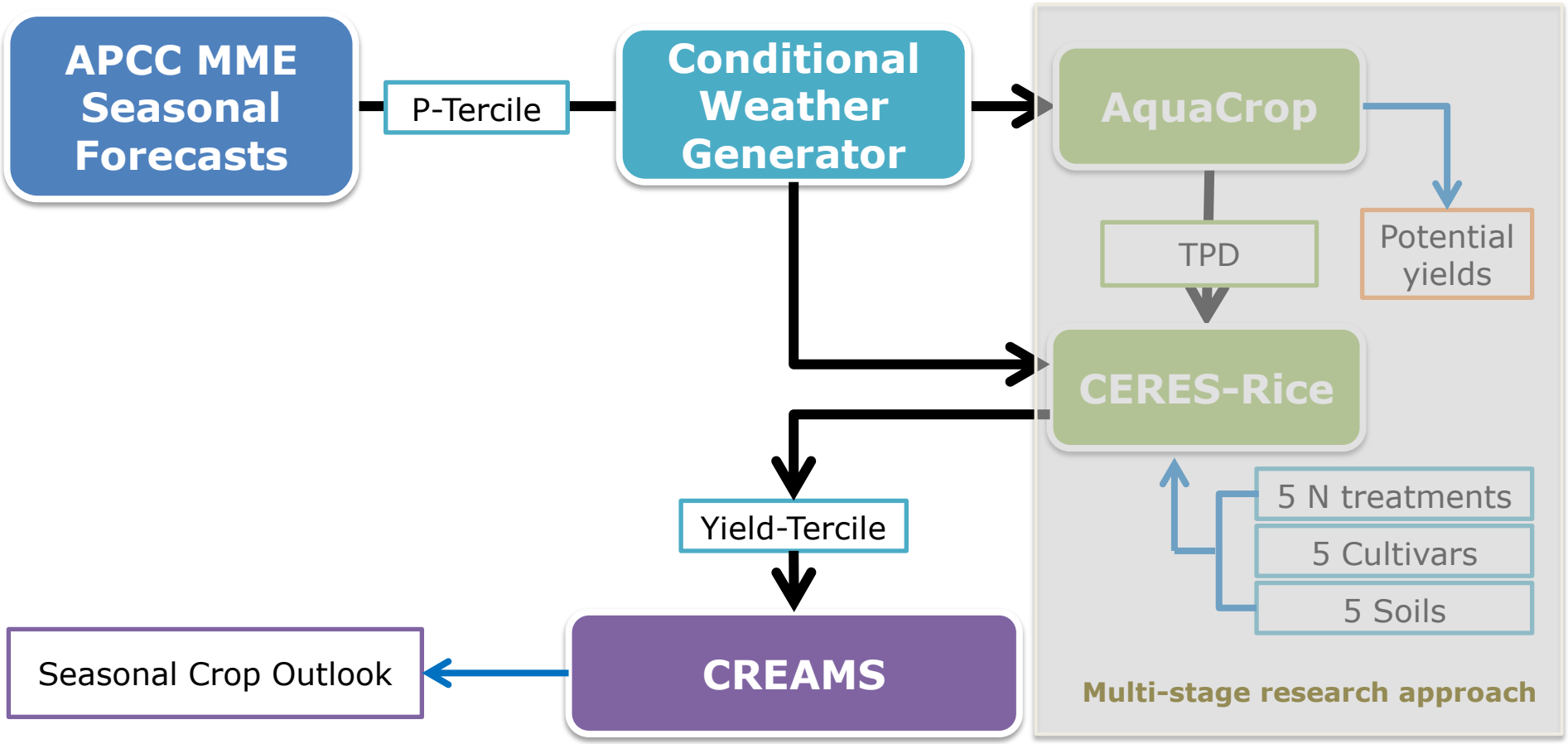


Observed and simulated rice yields (a) in 2007 and (b) in 2008





General research strategy



Conditional Weather Generator

- **A weather generator based on bootstrapping (Apipattanavis et al., 2007)**

NASA Power project: 1984–2017

Resampling observations with terciles → **Conditional sampling**

Three states: dry (<0.3mm), wet, extreme wet (≥ p80)

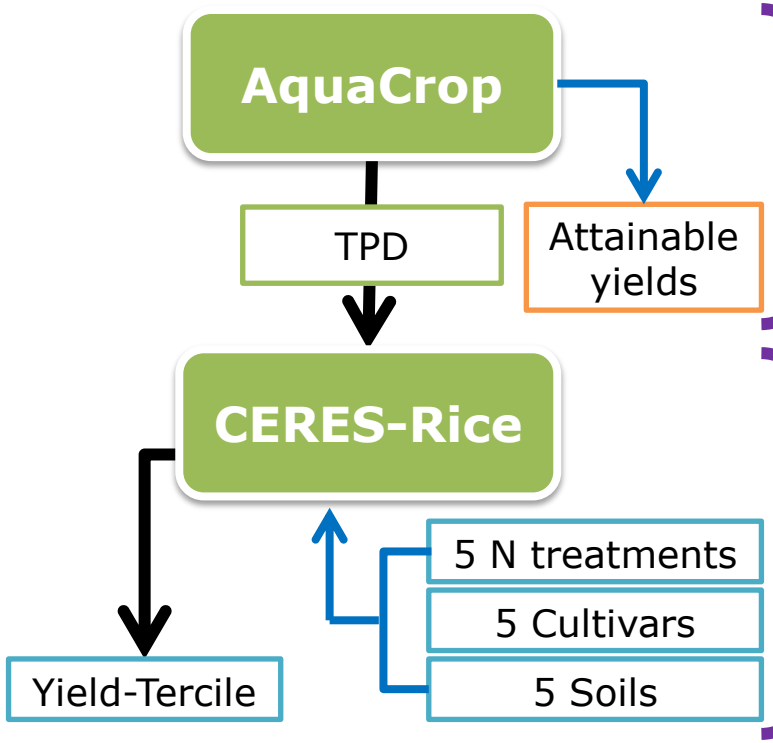
Finding transition probabilities and generating occurrences → **Three-state, first-order Markov chain**

Collecting k nearest neighbors with 14-day moving windows → **k-NN resampling**

Generating weathers from the collections with kernel functions → **Random generation**

Multi-stage research approach

Based on model's complexity

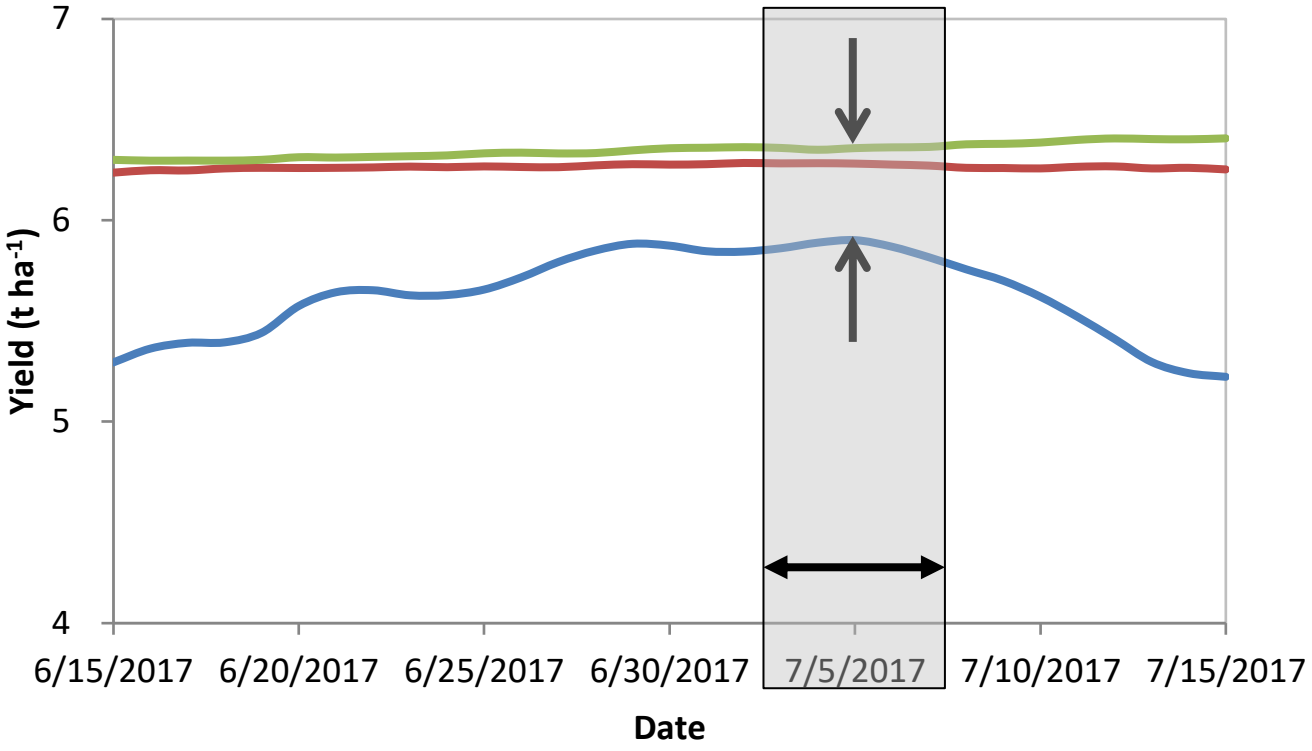


- Conventional transplanting date: July/1
- Shifting the transplanting date by one day until June/15 and July/15
- 100 simulations for each transplanting date
- Identifying "best" transplanting date
- Estimating attainable yields under the seasonal forecasts

- 25 treatments
  - "Best" transplanting date
  - TDK1, RD10, RD4, Kodeo, TSN2
  - 10, 30, 60, 90, and 150 kg-N/ha (Urea)
  - 100 simulations for a seasonal forecast
- Water/N stress indices at growth stages
- Yield tercile-based categorical probabilities

Results and Discussion

Recommended TPD

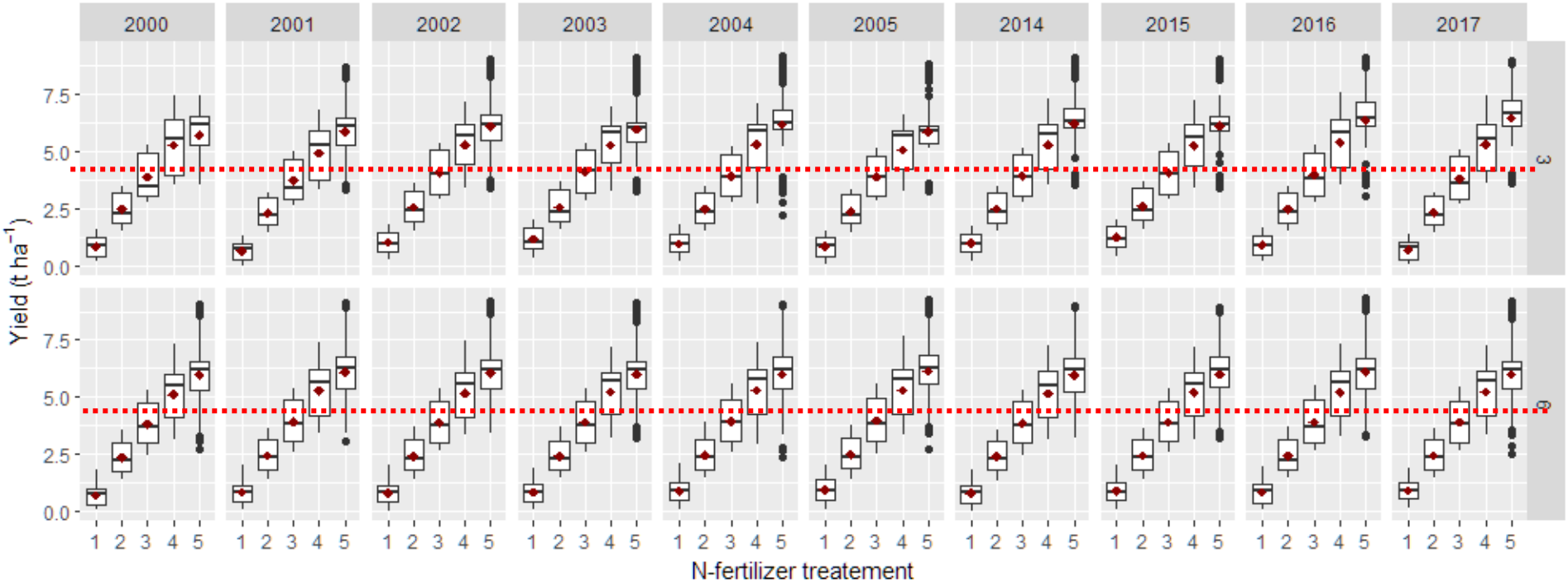


Recommended TPD

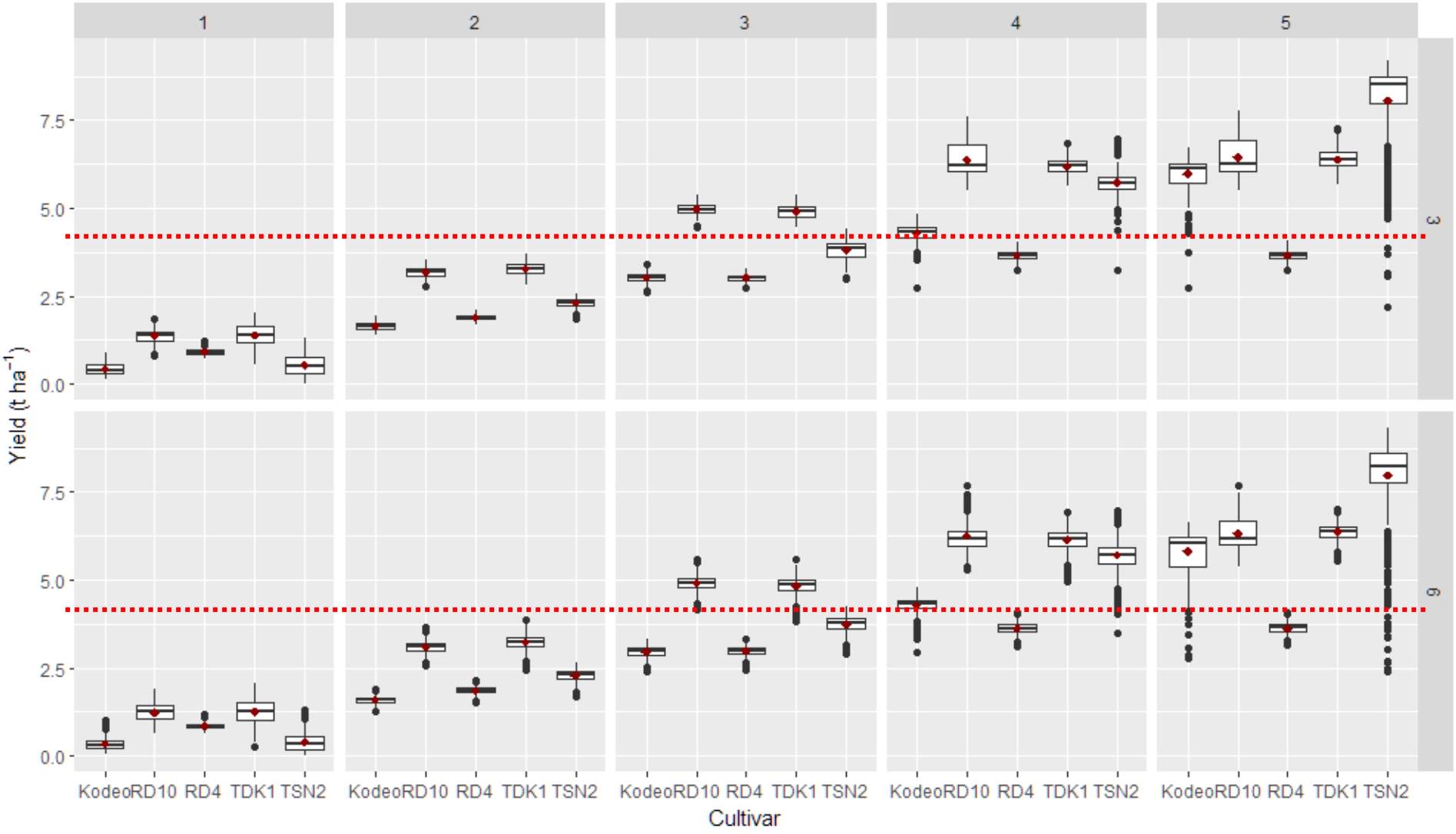
Year	Y0.025	Y0.50	Y0.975	Y0.975-Y0.025	MinRiskDate
2000	6.1	6.3	6.3	0.2	6/30/2000
2001	5.6	6.3	6.4	0.7	6/27/2001
2002	6.0	6.3	6.4	0.4	6/29/2002
2003	5.8	6.3	6.4	0.5	6/28/2003
2004	5.8	6.3	6.3	0.6	7/4/2004
2005	6.0	6.3	6.4	0.4	6/29/2005
2014	5.8	6.3	6.4	0.6	7/3/2014
2015	5.6	6.3	6.4	0.7	7/5/2015
2016	5.6	6.2	6.3	0.7	6/20/2016
2017	5.9	6.3	6.4	0.5	7/5/2017
Average	5.8	6.3	6.4	0.5	
SD	0.17	0.02	0.02	0.17	

Yield estimates from MME

- **Grouped by N treatment**

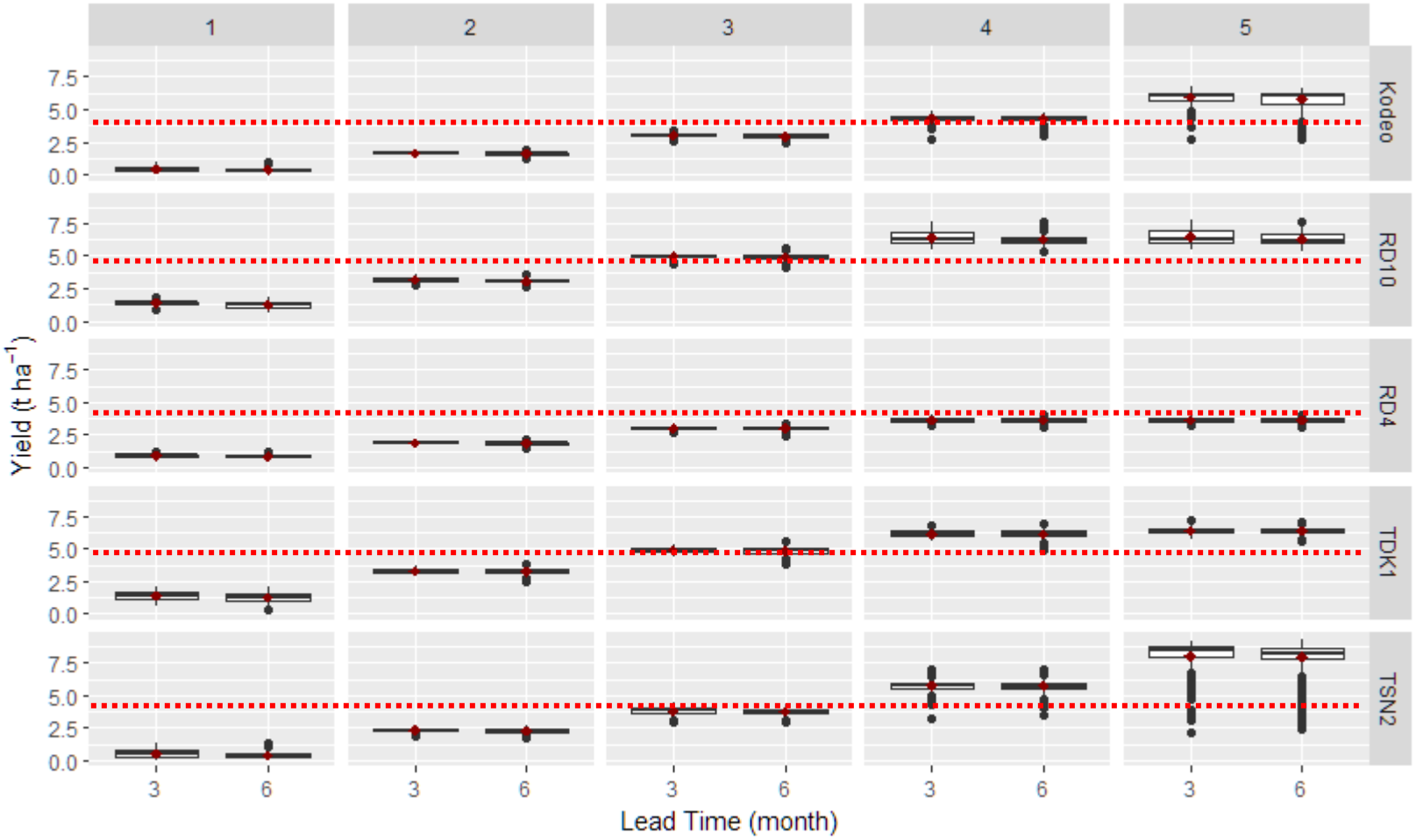


Yield estimates from MME (Grouped by cultivar)



Yield estimates from MME

- **Grouped by Lead Time**



Observed vs. Simulated

Lead Time (month)	YYYY	Count	Qauntile(2) (%)	Obs	Pred
3	2000	240	48	A	A
		255	52		
	2001	267	54	A	B
		228	46		
	2002	198	40	A	A
		297	60		
	2003	198	40	B	A
		297	60		
	2004	199	40	A	A
		296	60		
	2005	198	40	B	A
		297	60		
	2014	198	40	A	A
		297	60		
	2015	198	40	A	A
		297	60		
	2016	198	40	A	A
		297	60		
	2017	208	42	A	A
		287	58		

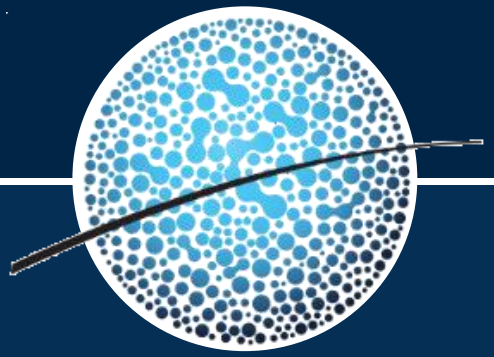
Observed vs. Simulated

Lead Time (month)	YYYY	Count	Qauntile(2) (%)	Obs	Pred
6	2000	216	44	A	A
		279	56		
	2001	207	42	A	A
		288	58		
	2002	207	42	A	A
		288	58		
	2003	207	42	B	A
		288	58		
	2004	203	41	A	A
		292	59		
	2005	202	41	B	A
		293	59		
	2014	214	43	A	A
		281	57		
	2015	211	43	A	A
		284	57		
	2016	218	44	A	A
		277	56		
	2017	205	41	A	A
		290	59		

CREAMS Training

AquaCrop and CERES-Rice Model Training Seminar

- Date: 2017/12/12
- Location: NAFRI (Vientiane, Laos)
- Participants: About 20
- AquaCrop modeling (Dr. Daeha Kim)
- CERES-Rice modeling (Dr. Jong Ahn Chun)



Conclusions

Conclusions

- **The semi-operational climate-related agricultural risk management has promise as a tool in reducing seasonal variability of rice yields.**
- **Sustainable operation and management are expected for the CREAMS through the tailoring training workshop to the system administrator.**
- **Further work is recommended on surveying and collecting rice yields and managements in the whole country.**


Thank you
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