



**Asia-Pacific  
Economic Cooperation**

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## **Thailand Rice Production and Rice Research and Development on Climate Change**

Submitted by: Thailand



**Workshop on Strengthening APEC Cooperation on  
Food Security and Climate Change  
Ha Noi, Viet Nam  
19-21 April 2017**

## THAILAND RICE PRODUCTION AND RICE R&D ON CLIMATE CHANGE

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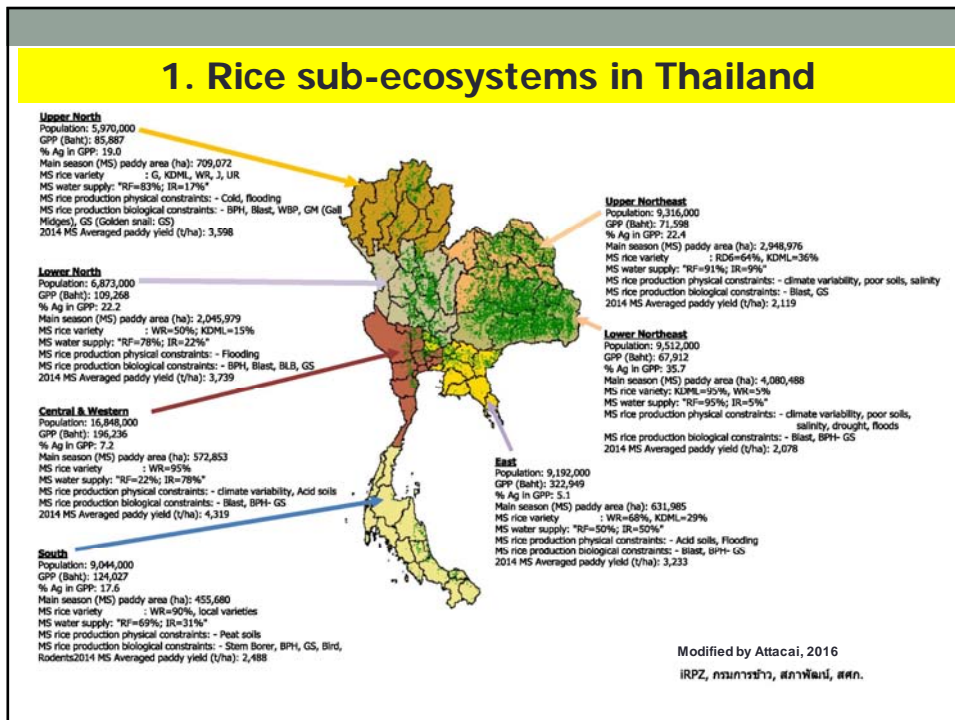
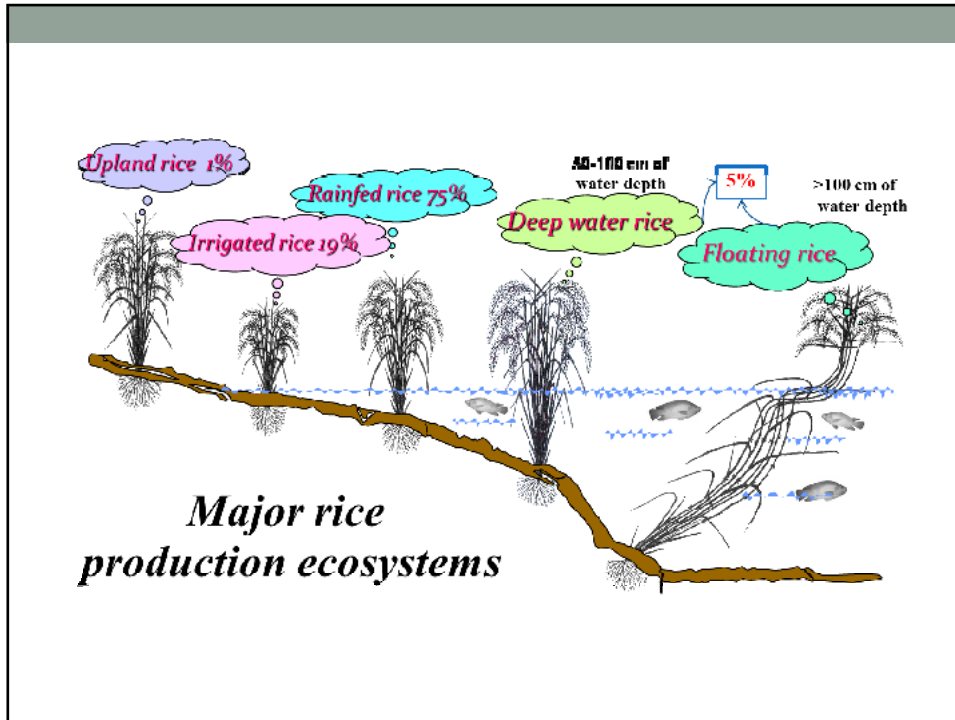
**Boondit Varinruk**

Rice Department, MOAC, Thailand

Workshop: **Strengthening APEC Cooperation on Food Security and Climate Change**  
Panel discussion: Implement policies, best practice, technology development, and  
capacity building on rice  
Venue: **Hilton Hanoi Opera Hotel, Hanoi, Viet Nam, 19-21 April 2017**

### Contents :

1. Rice sub-ecosystems in Thailand
2. Rice cropping calendar
3. Adaptation of rice cultivation technology (1990 vs. 2015)
4. 2017/18 domestic rice production plan & projects
5. Thailand Rice Department (TRD) R&D on GHGs (CH<sub>4</sub>)

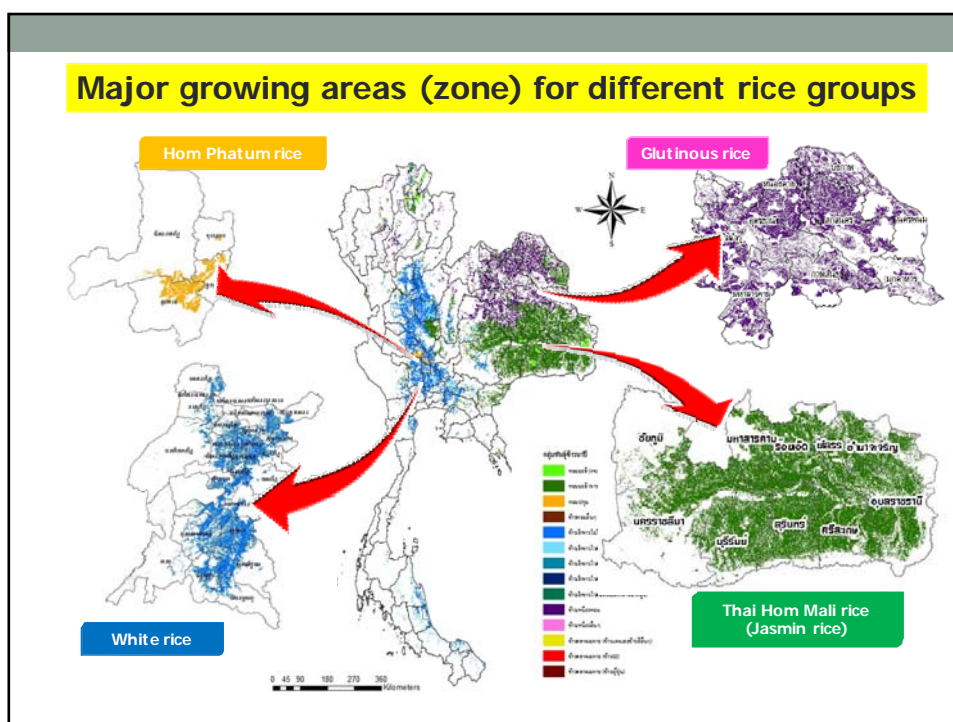


### Information on 7 rice sub-ecosystems

Data	U-N	L-N	C/W	E	U-NE	L-NE	S
1. Population	5,970,000	6,873,000	16,848,000	9,192,000	9,316,000	9,512,000	9,044,000
2. GPP (USD) *	2,489	3,167	5,688	9,361	2,075	1,968	3,595
3. % Ag. In GPP	19.0	22.2	7.2	5.1	22.4	35.7	17.6
4. MS paddy area (ha)	709,072	2,045,979	572,853	631,985	2,948,976	4,080,488	455,680
5. MS rice variety groups <sup>1/</sup>	G, HML, WR, J, UR	WR= 50% HML= 50%	WR = 95%	WR=68% HML=29%	RD6=64% HML=36%	HML=95% WR=5%	WR=90%, Local var.
6. MS water supply <sup>2/</sup>	RF=83% IR=17%	RF=78% IR=22%	RF=22% <b>IR=78%</b>	RF=50% IR=50%	RF=91% IR=9%	RF=95% IR=5%	RF=69% IR=31%
7. Rice physical constraints	Cold, flooding	Flooding	Climate variability, Acid soil	Acid soil, flooding	Climate variability, poor soils, salinity,	Climate variability, poor soils, salinity, drought, flood	Peat soils
8. Rice biological constraints <sup>3/</sup>	BPH, BI, GM, GS	BPH, BI, GS	BI, BPH,GS	BI, BPH, GS	BI, GS	BI, BPH, GS	Stem borer, BPH,GS, bird
9. 2014 MS average paddy yield (t/ha)	3.598	3.739	4.319	3.233	2.119	2.078	2.488

MS=Main season  
<sup>1/</sup> G=glutinous rice, HML=Hom Mali rice, WR=White rice, J=Japonica rice, UR=Upland rice  
<sup>2/</sup> RF=Rallied area, IR=Irrigated area  
<sup>3/</sup> BPH=Brown plant hopper, BI=Blast, GM=Gall midge, GS=Golden apple snail

\* exchange rate: 34.50 Bht/ 1 USD

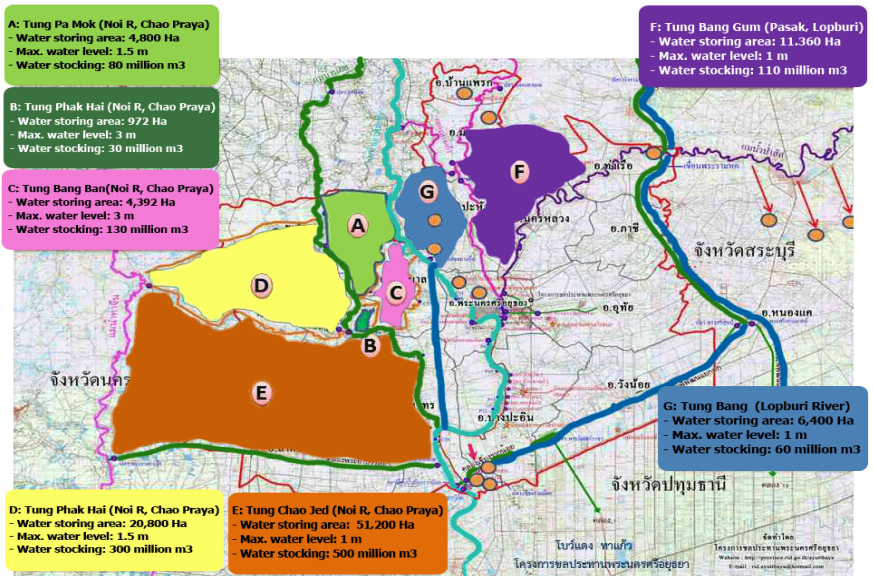


## 2. Thailand's rice cropping calendar 2016/17

Region	Flooding condition	Season	Ecosystem	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Upper North	Non-flood	Wet	Rainfed/Irrigated					←	←	←	←	←	←	←	←
		Dry	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
Lower North	Non-flood	Wet	Rainfed/Irrigated						←	←	←	←	←	←	←
		Dry-1	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
	Dry-2	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	←
	Flood	Dry-1	Partial irrigated	←	←	←	←	←	←	←	←	←	←	←	←
Dry-2		Partial irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
Central/ West	Non-flood	Wet	Irrigated						←	←	←	←	←	←	←
		Dry-1	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
	Dry-2	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	←
	Flood	All time	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
Dry-1		Partial irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
East	Flood	Wet*	Deep water/Floating	←	←	←	←	←	←	←	←	←	←	←	←
		Dry-1	Deep water/Floating	←	←	←	←	←	←	←	←	←	←	←	←
Dry-2		Deep water/Floating	←	←	←	←	←	←	←	←	←	←	←	←	
Non-flood	Wet	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
	Dry-1	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
Dry-2	Irrigated	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
	Irrigated	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←	
North-east	Non-flood	Wet	Rainfed/Irrigated					←	←	←	←	←	←	←	←
		Dry	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
South	Non-flood	Wet	Rainfed/Irrigated	←	←	←	←	←	←	←	←	←	←	←	←
		Dry	Irrigated	←	←	←	←	←	←	←	←	←	←	←	←

Boondit Varinruk, Bureau of Expert, RD: 7Apr.2015

### Lowland rice field in Ayudhaya, Central plain: Water storage during Sep.15 – Nov.15



### 3. Adaptation of Rice Cultivation Technology in Thailand:

#### 1. Upland rice/Highland rice ecosystem

Location	Items	1990 practices	2015 practices	Adapted to _
Northern - Highland <i>(Ethnic group: Hill tribes)</i>	1. Cultivation pattern	Upland rice	Lowland terrace rice	- Natural resource cons. policy
	2. Planting method	Dry-seeded in dry land (slope area)	- Transplanting rice in wet puddle land - Dry-seeded rice (fb. submergence)	- Socio-economic (better living) - Urbanization
	3. Planting time	April-May	May- July	- Infra-structure
	4. Water use efficiency	Low	Medium	(good road, electricity)
	5. Rice variety	Traditional cultivars	- Traditional Cultivars - Local improve varieties	
	6. Photo-sensitivity	Sensitive	- Sensitive - Non-sensitive	
	7. Labor use	High	Medium-High	
	8. Mechanization	Low	Low	

#### 1. Upland rice/Highland rice ecosystem



## 2. Rainfed lowland rice ecosystem

Location	Items	1990 practices	2015 practices	Adapted to_
- Northeastern	1. Cultivation pattern	Rainfed lowland rice	Rainfed lowland rice	- Industrialization
- Northern	2. Planting method	Transplanting in wet puddle land	- Dry-seeded rice in dry land - Transplanting (w/ local water supply)	- Socio-economic
- Southern				- Labor shortage
	3. Planting time (except S.)	June-August	May- June	- Climate change
	4. Water use efficiency	Medium	Medium-High	- Production cost
	5. Rice variety	- Traditional c. - Local improved v.	- Local improve v. - Modern improved v. - Pest/Unfavorable cond. resistance	
	6. Photo-sensitivity	Sensitive	- Sensitive - Non-sensitive	
	7. Labor use	Medium-High	Low	
	8. Mechanization	Low	Medium-High	

## 2. Rainfed lowland rice ecosystem



### 3. Irrigated lowland rice ecosystem

Location	Items	1990 practices	2015 practices	Adapted to_
- Lower Northern	1. Cultivation pattern	Irrigated lowland rice	Irrigated lowland rice	- Irrigation system
- Central plain	2. Planting method	Wet seeded in wet puddle land	- Wet-seeded in wet puddle land - Transplanting machine in wet-puddle land	- Production cost
- Western	3. Planting time	@ Wet season- 1 <sup>st</sup> Dry season - 2 <sup>nd</sup> Dry season @ Year round	- August-December-May  - 12 months	- Industrialization - Labor shortage - Climate change?
	4. Water use efficiency	High	- High (w/ irrigation system) - Low (w/o irrigation water < CC) < AWD	
	5. Rice variety	- Modern improved v.	- Modern improved v. - Pest resistance - Hybrid rice	
	6. Photo-sensitivity	Non-sensitive	- Non-sensitive - Short duration	
	7. Labor use	Low	Low	
	8. Mechanization	Medium-High	High	

### 3. Irrigated lowland rice ecosystem

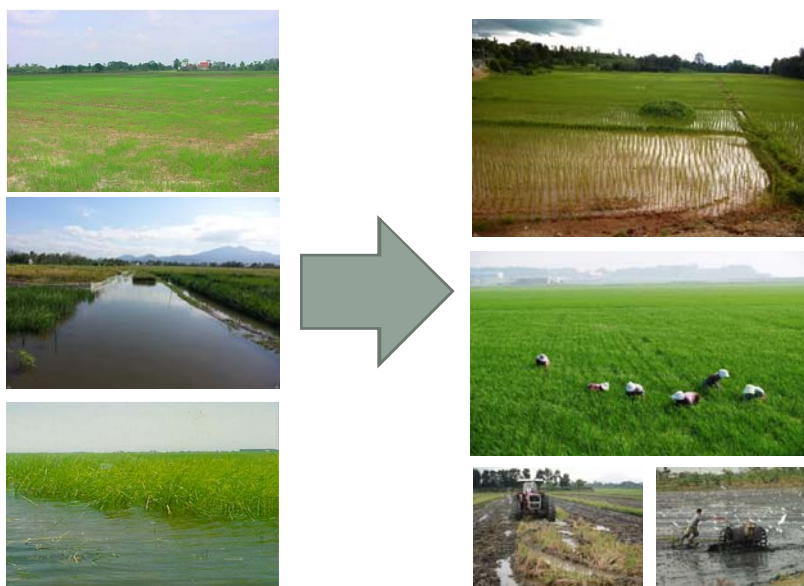




#### 4. Deep water rice/Floating rice ecosystem

Location	Items	1990 practices	2015 practices	Adapted to_
- Eastern - Central plain (Riverside lowland)	1. Cultivation pattern	Deep water/Floating rice	Irrigated lowland rice	- Dam construction > water regime change
	2. Planting method	Dry-seeded in dry land	- Wet-seeded in wet puddle land - Transplanting machine in wet- puddle land	- Climate change - Industrialization (Eastern economic corridor: EEC)
	3. Cropping duration	May-December (Deep-water rice c.)	@ May-August (before flood) @ December-March (after flood)	- Labor shortage - Production cost
	4. Water use efficiency	Low	- Medium-High	
	5. Rice variety	- Traditional c.	- Modern improved v.	
	6. Photo-sensitivity	Sensitive	- Non-sensitive - Short duration	
	7. Labor use	Medium-high	Low	
	8. Mechanization	Low	High	

#### 4. Deep water rice/Floating rice ecosystem



## 4. Domestic rice production plan

### 2017/18 Rice demand: (Unit: million tons of paddy)

Rice group	Export		Domestic consumpt.	Food Industry	Seed	Total new rice demand	Production target
	Stock R	New R					
1. Hom Mali rice <sup>1/</sup>	1.23	2.87	3.05	0.08	0.38	6.38	9.46
2. Hom Pathum <sup>2/</sup>	0.06	0.12	0.81	0.00	0.07	1.00	1.00
3. White rice	3.32	7.46	2.03	2.21	0.50	12.20	12.20
4. Glutinous rice	0.14	0.32	5.97	0.11	0.32	6.72	6.72
5. Others	0.00	0.00	0.11	0.00	0.01	0.12	0.12
<b>Total</b>	<b>4.75</b>	<b>10.77</b>	<b>11.97</b>	<b>2.40</b>	<b>1.28</b>	<b>26.42</b>	<b>29.50</b>

<sup>1/</sup> Jasmine rice  
<sup>2/</sup> Fragrant rice

Feb.20,2017

## 2017/18 Rice production target

Rice group	2017/18 Demand (m ton)	First crop season		Second crop season		Total		Average yield (tons/ha)
		Area (m ha)	Production (m ton)	Area (m ha)	Production (m ton)	Area (m ha)	Production (m ton)	
THML	9.46	4.315	9.46	-	-	4.315	9.46	2.39
HPT	1.00	0.526	0.92	0.688	0.08	0.234	1.00	4.28
WR	12.20	2.274	7.97	1.014	4.23	3.288	12.20	3.71
GR	6.72	2.533	5.87	0.250	0.85	2.782	6.72	2.41
Others	0.12	0.051	0.12	-	-	0.051	0.12	2.35
<b>Total</b>	<b>29.50</b>	<b>9.389</b>	<b>24.34</b>	<b>1.282</b>	<b>5.16</b>	<b>10.670</b>	<b>29.50</b>	<b>2.76</b>

THML = Thai Hom Mali rice (Jasmine rice)  
HPT = Hom Pathum Thani rice (Fragrant rice)  
WR = White rice  
GR = Glutinous rice  
Others = Niche market rice: Organic rice, Color rice, etc.

April 11, 2017

## Domestic projects in rice production:

1. Balancing rice demand and supply:  
*completed rice production and marketing administration program*
2. Zoning by Agri-map: soil suitability > rice  
*S1, S2, S3 = remain paddy area*  
*N = change to other crops/activities: maize, sugarcane, fruits, aquaculture, livestock, sericulture, soybean, green manure crops, multiple-cropping, integrated agriculture*
3. Irrigation system and water distribution: *dry season*
2. Promotion of large agricultural plantation: *rice industrial, intensive farming*
2. Supporting of new good seeds: *Thai Hom Mali rice production*
3. Promotion on organic rice production: *160,000 ha (2017-2022)*
4. Promotion of Thai Hom Mali rice utilization: *to increase demand*

## 5. TRD R&D on GHGs (CH<sub>4</sub>)

- 1994-2000: Prachin Buri Rice Research Center (PCR-RRC) in cooperation with IRRI and UNDP conducted an experiment on methane emission from paddy field, resulted as:
  - Deep water rice emitted **60-170** kg CH<sub>4</sub>/ha/crop season
  - Irrigated rice emitted **16-40** kg CH<sub>4</sub>/ha/crop season.
- Thailand average CH<sub>4</sub> emission from rice field is **241** mg m<sup>2</sup> d, which vary among rice varieties, locations/ecosystems, crop seasons, and management practices.
- Methane emission from rice different rice ecosystems:
  - Upland rice (SMG-RRC) absorbed back **1.1** kg CH<sub>4</sub>/ha/season
  - Rainfed rice (UBN-RRC)/TR emitted **533** kg CH<sub>4</sub>/ha/season
  - Irrigated rice (PCR-RRC)/cont. submerged emitted **271** kg CH<sub>4</sub>/ha/season
  - Irrigated rice (PTT-RRC)/AWD emitted **53** kg CH<sub>4</sub>/ha/season.

## 6. TRD R&D on NH<sub>4</sub> (Cont.)

- ❑ Carbon footprint analysis: **1** kg of paddy rice produced **5.79** kg CO<sub>2</sub> equivalent of GHGs.
- ❑ 2015-2016 in 7 experiments across the economy resulted as:
  - Alternated wetting and drying (**AWD**) can reduced **8-13% of CH<sub>4</sub>** from the paddy field (**186 > 130-155** mg m<sup>2</sup> d).
  - Application of **ammonium sulfate** instead of urea fertilizer, showed a trend to reduced CH<sub>4</sub> (**150 > 110** mg m<sup>2</sup> d).
- ❑ On-going researches:
  - Study on CH<sub>4</sub> and N<sub>2</sub>O emission from different *rice varieties* and different *fertilizers application*.
  - Influence of *straw managements* to GHGs emission.

## 6. TRD R&D on NH<sub>4</sub> (Cont.)

- ❑ 2015-2016: The “**climate smart agriculture (CSA) model for rice**” was developed by RD in cooperation with BRIA and GIZ.
- ❑ 2016-2017: The Rice CSA models are now testing and modifying in 2 locations:
  - Rainfed ecosystem – Ubon Rachthani Province*
  - Irrigated area – Nakorn Sawan/ Chi Nat Provinces.*
- ❑ 2017: OAE and MOAC agencies develop The 3<sup>rd</sup> draft of “**2017-2021 climate change strategic plan for the agricultural sector**”.

**Thank you**

