

# Classification of the Rainfed Areas for the Water Development Projects in Thailand

23 January 2019

**Supapap Patsinghasanee (PhD) \* (1)**

Senior Professional Civil Engineer

(1) Department of Water Resources, Bangkok, Thailand

(2) HZ University of Applied Sciences, Vlissingen, The Netherlands

Jeerapong Laonamsai (1)

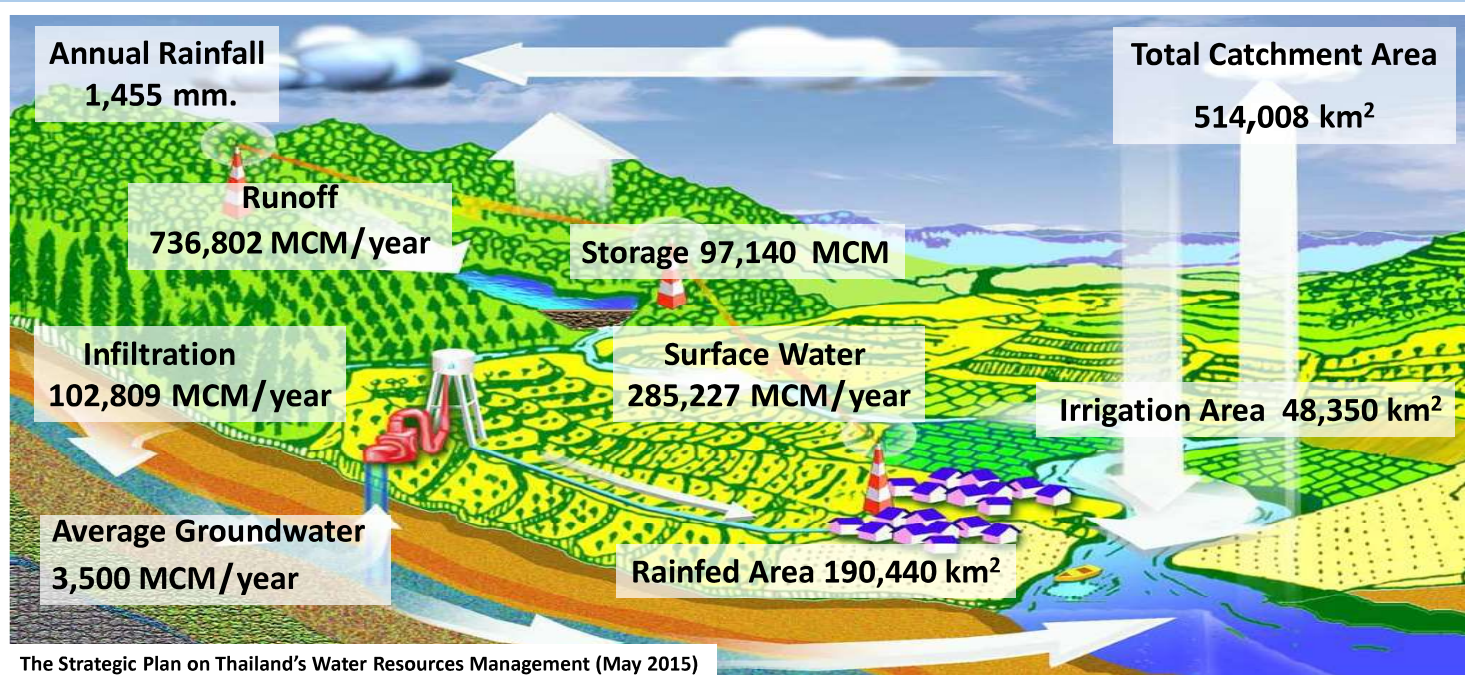
Kalyanee Suwanprasert (1)

Mongkol Lakmuang (1)

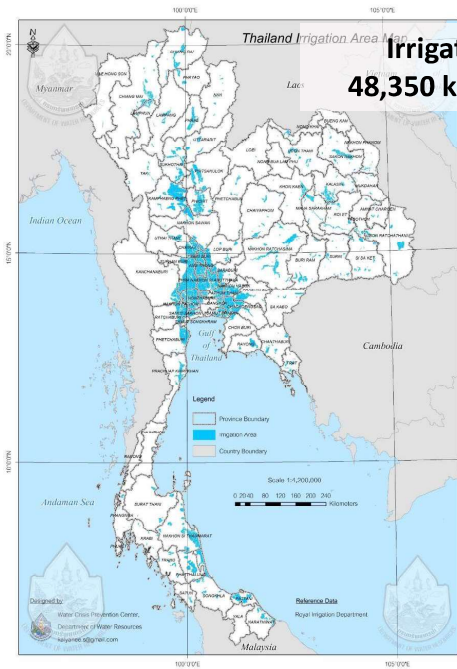
Ronnaklit Parasirisakul (2)

Ratda Patsinghasanee (1)

## (1) Introductions: Hydrological Cycle in Thailand

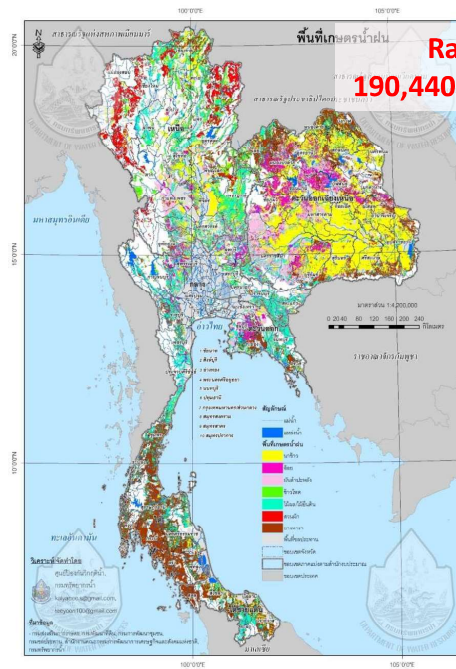


# (1) Introductions: Agricultural Areas (238,790 km<sup>2</sup>)



**Irrigation Area**  
48,350 km<sup>2</sup> (20%)

- ☐ Water supply by large and medium reservoirs.
- ☐ Managed by irrigation systems and structures.
- ☐ Low risk in water shortage.

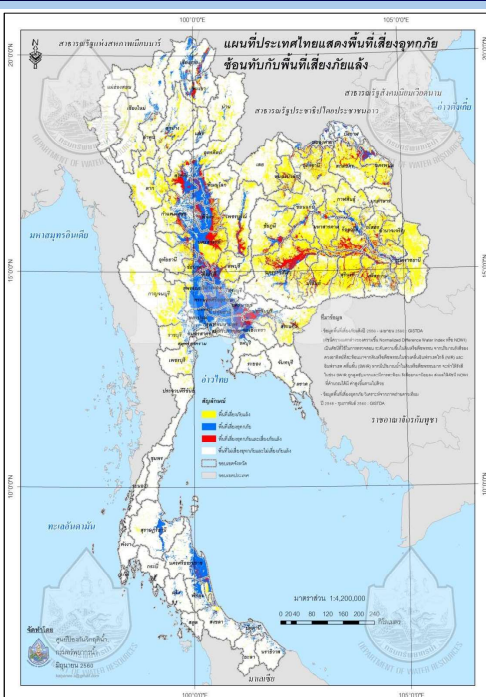


**Rainfed Area**  
190,440 km<sup>2</sup> (80%)

- ☐ Water supply by small reservoirs and waterbodies.
- ☐ Lack of irrigation systems and structures.
- ☐ High risk in water shortage.

The Strategic Plan on Thailand's Water Resources Management (May 2015)

# (1) Introductions: Flood & Drought Risk Areas

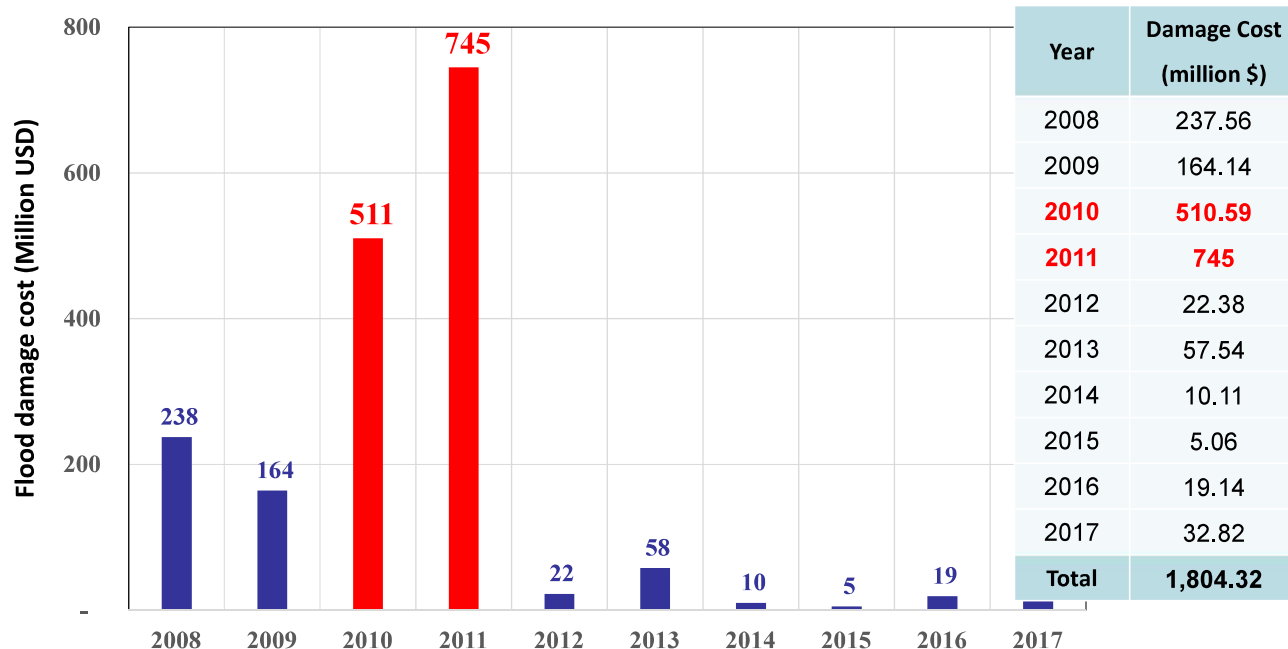


## Flood & Drought Risk Areas (km<sup>2</sup>)

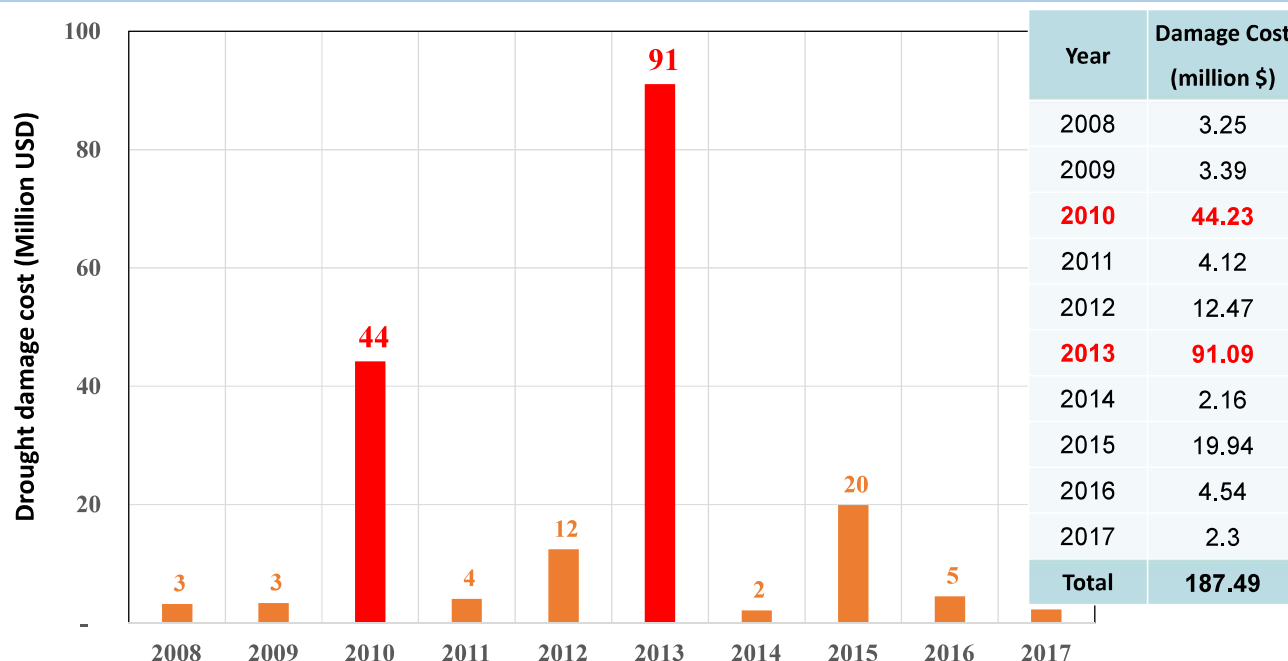
Drought	Flood	Drought & Flood	Total
101,300 (58%)	48,100 (28%)	23,900 (14%)	173,300



## (1) Introductions: Flood damage cost



## (1) Introductions: Drought damage cost





## (2) Objectives:

- ❑ To analyze, classify and prioritize the potential of rainfed agriculture areas based on land-use, household income, revenue structures, water resources risk areas, specific economic zones and household locations.
- ❑ To plan & implement the solar-powered irrigation system in the potential areas for providing environmentally sustainable and reliable access to water.



Page 7

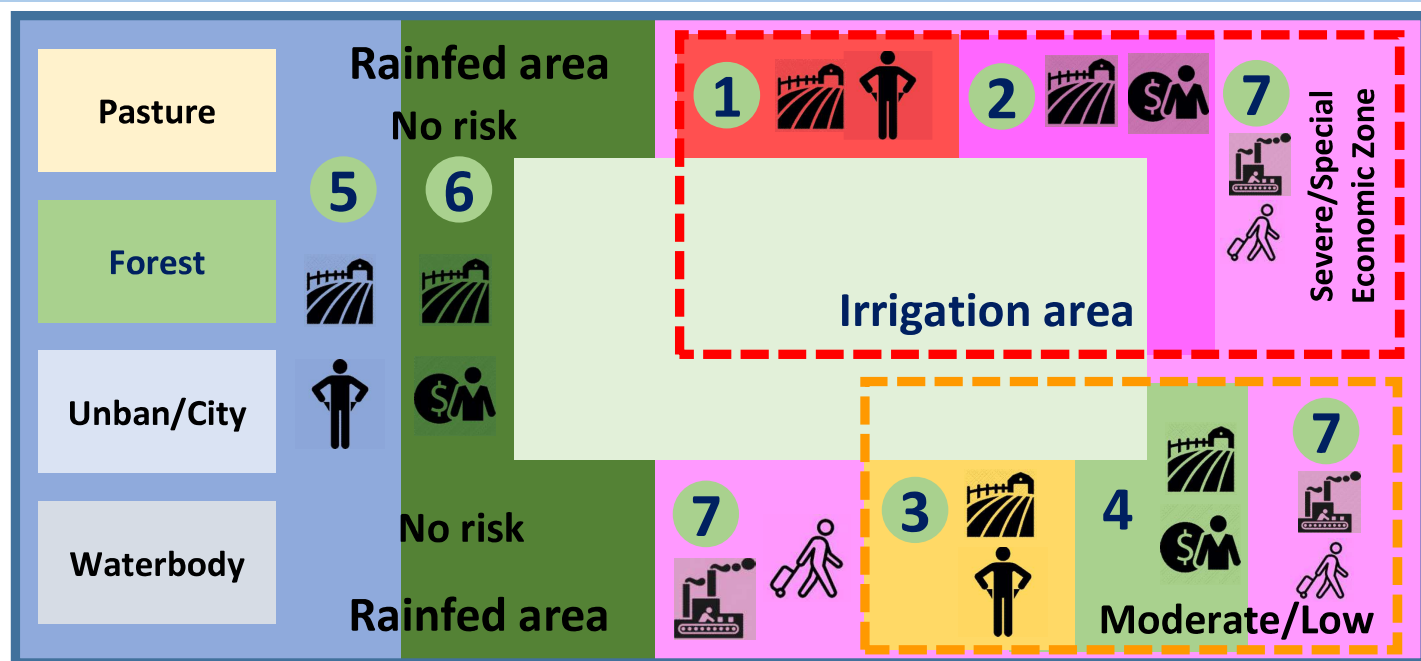
## (3) Methodology: Data collection

- Land-use (Land Development Department, 2015)
- Irrigation areas (Royal Irrigation Department, 2016)
- Water resources area-based management (Department of Water Resources (2017) & Office of National Water Resources (2018))
- Personal income in the village level (Community Development Department, 2015)
- Personal income in the provincial level (Office of the National Economic and Social Development Board, 2017)
- Number of households (National Statistical Office, 2017)
- Household location (The Geo-Informatics and Space Technology Development Agency (Public Organization), 2017)



Page 8

### (3) Methodology: Spatial analysis



Page 9

### (3) Methodology: Spatial analysis

Types	Risk levels	Income	Revenue structure
1	severe areas/special economic zones	< poverty line	Agriculture
2	severe areas/special economic zones	> poverty line	Agriculture
3	moderate/low risk areas	< poverty line	Agriculture
4	moderate/low risk areas	> poverty line	Agriculture
5	normal areas	< poverty line	Agriculture
6	normal areas	> poverty line	Agriculture
7	Other areas	-	Industry/service

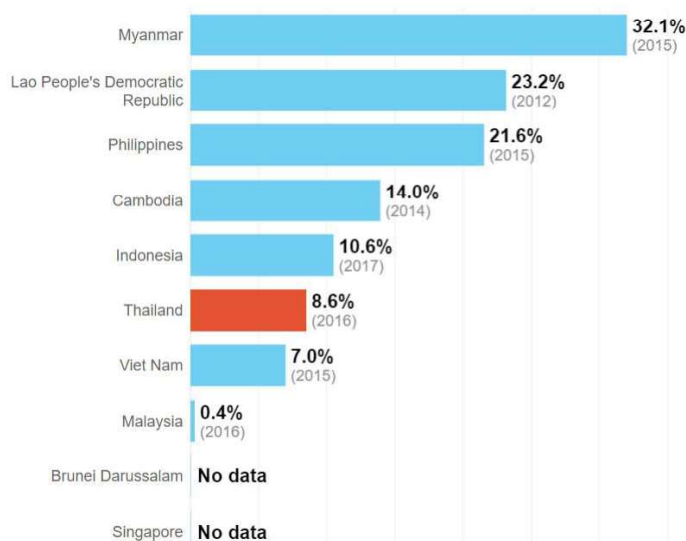


Thailand's poverty line is \$1,000 per year. (Office of the National Economic and Social Development Board, 2017)

Page 10

### (3) Methodology: Poverty line

Share of Population below the National Poverty Line (%)

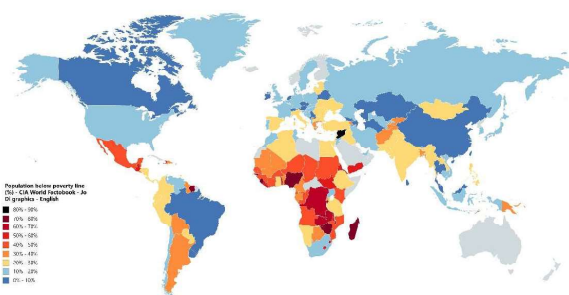


Source: Asian Development Bank. *Basic Statistics 2018*

Poverty at the International Poverty Line of \$1.90/day (in 2011 PPP)

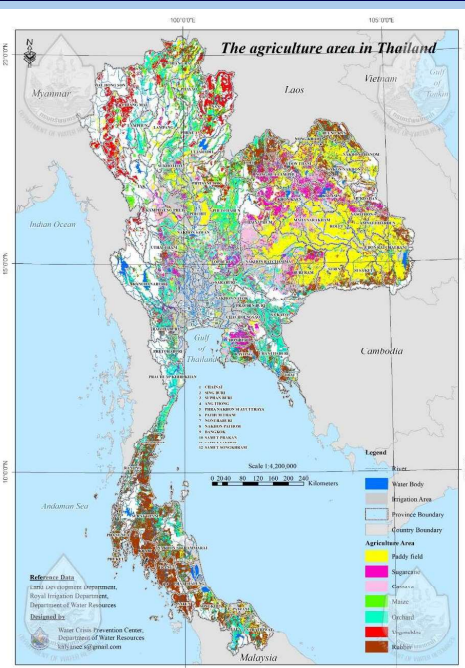
(World bank, Sept. 19, 2018)

Region	Headcount ratio (%)		No. poor (millions)	
	2013	2015	2013	2015
East Asia and Pacific	3.6	2.3	73.1	47.2
Europe and Central Asia	1.6	1.5	7.7	7.1
Latin America and the Caribbean	4.6	4.1	28.0	25.9
Middle East and North Africa	2.6	5.0	9.5	18.6
South Asia	16.2	12.4	274.5	216.4
Sub-Saharan Africa	42.5	41.1	405.1	413.3
World Total	11.2	10.0	804.2	735.9



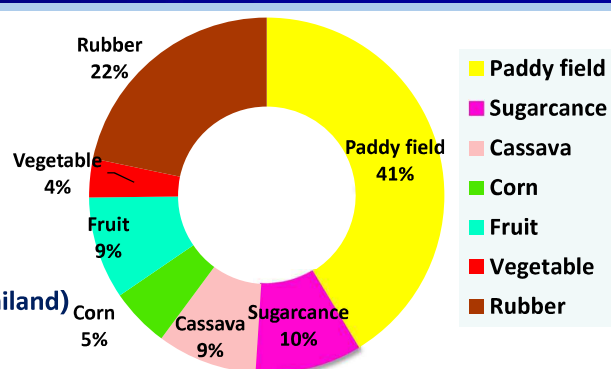
Page 11

### (4) Results: Rainfed agriculture area



- ❖ Paddy field 79,000 km<sup>2</sup>.
- ❖ Sugarcane 18,300 km<sup>2</sup>.
- ❖ Cassava 17,300 km<sup>2</sup>.
- ❖ Corn 10,200 km<sup>2</sup>.
- ❖ Fruit 17,780 km<sup>2</sup>.
- ❖ Vegetable 6,680 km<sup>2</sup>.
- ❖ Rubber 41,180 km<sup>2</sup>.

Total 190,440 km<sup>2</sup>. (37% of Thailand)

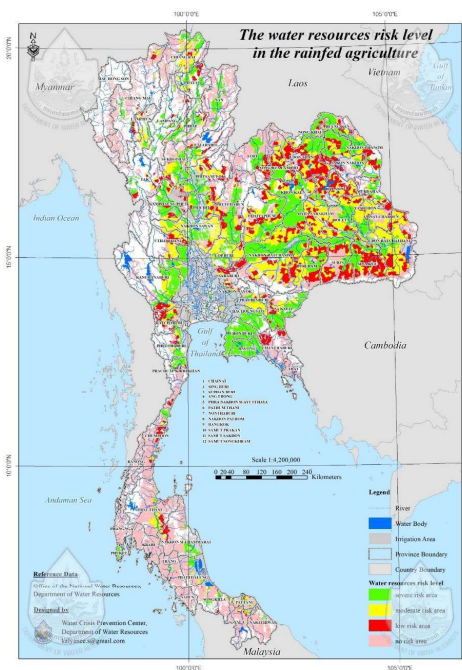


Regions	Paddy	Sugarcane	Cassava	Corn	Fruit	Vegetable	Rubber	Total
North	13,216	2,816	2,944	7,328	4,064	5,584	1,520	37,472
Central	4,224	4,656	2,800	928	5,600	864	912	19,984
East	1,088	1,600	1,856	128	3,280	-	3,184	11,136
Northeast	59,152	9,280	9,744	1,856	2,304	224	9,120	91,680
South	512	-	-	-	1,600	32	19,552	21,696
Deep South	592	-	-	-	912	-	6,960	8,464
<b>Total</b>	<b>79,000</b>	<b>18,300</b>	<b>17,300</b>	<b>10,200</b>	<b>17,780</b>	<b>6,680</b>	<b>41,180</b>	<b>190,440</b>

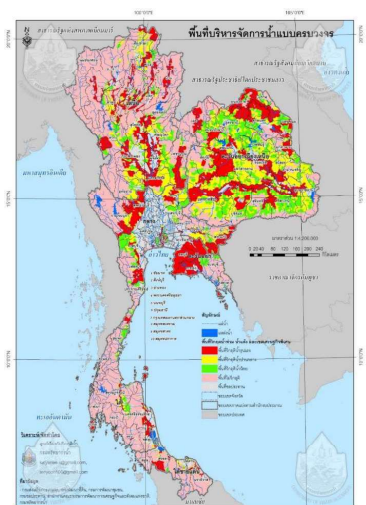
Page 12



## (4) Results: Risk level in rainfed agriculture area

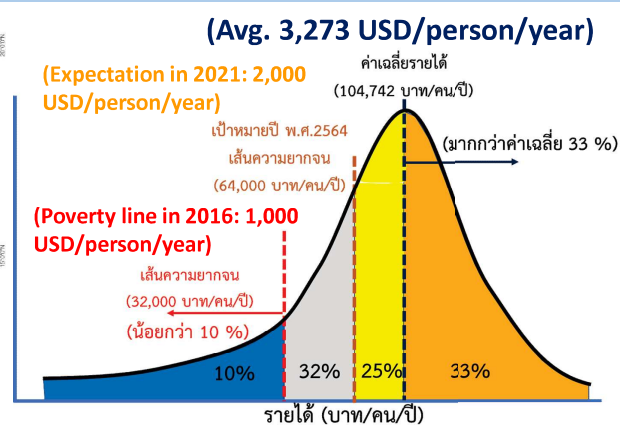
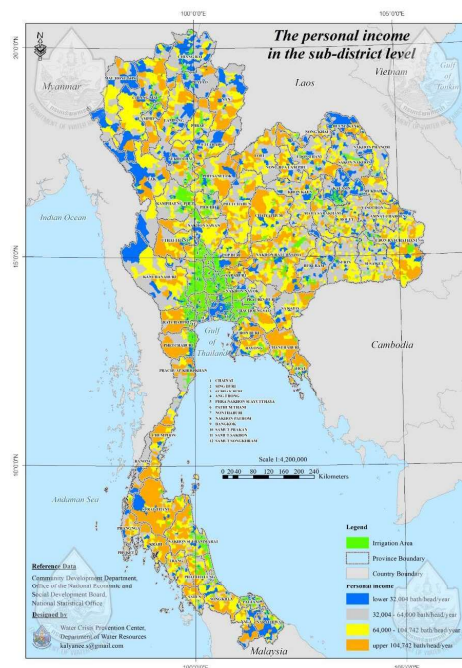


Risk Area (km <sup>2</sup> )				Total
Severe/ Special Economic Zone	Moderate	Low	No Risk	
53,760 (28%)	39,810 (21%)	30,640 (16%)	66,230 (35%)	190,440



Page 13

## (4) Results: Annual personal income distribution



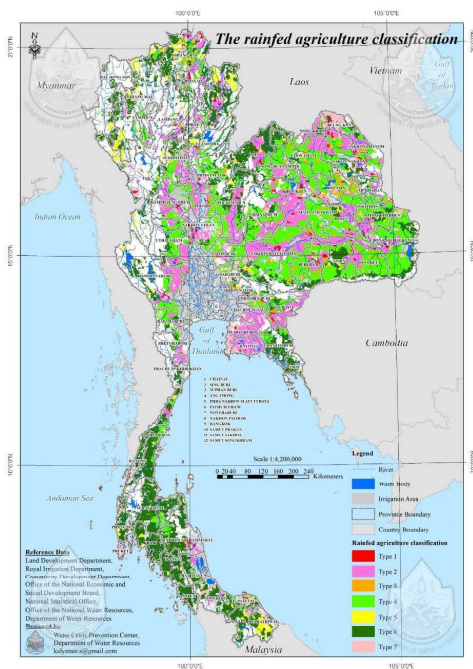
- ❑ Farming household: 7.60 million households
- ❑ Poverty line: \$83.3 person/month
- ❑ Annual income below poverty line: 2.12 million households / 5.85 million people

Household in Thailand 2017  
(21.3 million households)

Regionals	Household	Farmer's household	> Poverty line	< Poverty line
North	3.81	1.75	3.06	0.75
Central	7.16	0.25	7.11	0.05
East	1.96	0.31	1.58	0.37
Northeast	5.68	4.25	4.93	0.75
South	1.71	0.68	1.63	0.08
Deep south	1.01	0.35	0.89	0.12
Total	21.33	7.60 (36%)	19.20 (90%)	2.12 (10%)

Page 14

## (4) Results: Rainfed agriculture classification



Regionals	Area (km <sup>2</sup> )						
	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Type 7
North	896	9,920	912	10,736	2,048	11,776	1,184
Central	512	6,272	480	6,208	480	3,856	2,176
East	64	5,088	16	640	128	3,088	2,112
Northeast	1,664	23,088	3,328	42,624	1,040	14,848	5,088
South	112	896	64	1,600	656	17,568	800
Deep South	16	352	48	224	1,216	5,760	848
<b>Total</b>	<b>3,264</b>	<b>45,616</b>	<b>4,848</b>	<b>62,032</b>	<b>5,568</b>	<b>56,896</b>	<b>12,208</b>
	(2%)	(24%)	(3%)	(33%)	(3%)	(29%)	(6%)
	<b>Severe/ Special Economic Zone (26%)</b>		<b>Moderate/Low (36%)</b>		<b>No risk (32%)</b>		<b>Others (6%)</b>

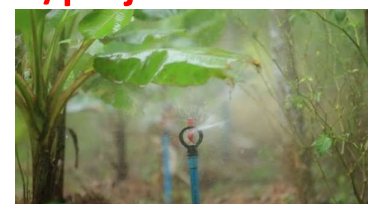
## (5) Discussion: Solar-powered irrigation system (SIS)



### Specification of SIS:

- ❑ The water body with capacity larger than 30,000 m<sup>3</sup>.
- ❑ The water pumping station with capacity 100 m<sup>3</sup>/day (Pumped water to the tower tank and distributed by gravity) and 5 horse power (4 kWatt).
- ❑ The solar power with capacity 300 watts.

**Cost = 56,250 - 62,500 USD/project**





## (5) Discussion: Solar-powered irrigation system (SIS)

### Expected outcomes:

- ☐ Covered area 64,000 m<sup>2</sup>/project.
- ☐ Covered household 25 households/project (70 people/project).
- ☐ Increased annual income 1,560 USD/household.
- ☐ Main products are vegetables (Chinese morning glory, holy basil, celery, coriander, red pepper, lemon grass, and peppermint).

*“Eliminating extreme poverty by 2030 is the first of the 17 Sustainable Development Goals adopted by the United Nation in 2015”*



Page 17

## (5) Discussion: Solar-powered irrigation system (Urgent Plan)



	Year				Total
	2017-2018	2019	2020	2021	
Projects	79	1,193	1,165	1,045	3,482
Budget (Million USD)	5.2	74.5	72.8	65.3	217.8

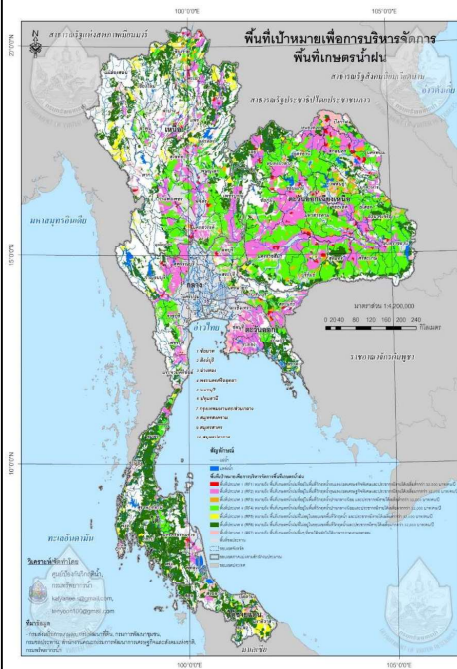
### Expected outcomes:

- ☐ Covered area 224 km<sup>2</sup>
- ☐ Covered household 85,600 households
- ☐ Increased water capacity 122 million m<sup>3</sup>



Page 18

## (5) Discussion: Solar-powered irrigation system (Long-term Plan)



**20 years plan: 2017-2037**

**Goal: increased the annual income in the rainfed agriculture area  
[Covered the households with the annual income below  
poverty line (2.12 million households)]**

- ☐ **18,100 Projects**
- ☐ **Covered area 1,160 sq.km.**
- ☐ **Increased water capacity 635 million m<sup>3</sup>**
- ☐ **Budget 1,130 million USD**



Page 19

## (6) Conclusion:

- ☐ **The rainfed agriculture areas were defined into 7 types.**
- ☐ **Type 1 to 5 are the key areas for Thailand to carry out target poverty alleviation.**
- ☐ **The solar-powered irrigation system has played an important role in ensuring national food security, high-quality crop varieties, automate machines, water efficiency, pollution control and agriculture waste recycling.**

Page 20



# Thank You

