

Cooperation Project R³⁺ for Sustainable Management of Natural Resources and Agricultural Production A Case Study of Phetchaburi River Basin





Philosophy in water management of His Majesty King Bhumibol Adulyadej.

1. Royal Rainmaking Operation

2. Forest Management

3. Check Dam

4. Protection Soil Erosion by Vetiver

5. Reservoir on slope area

6. Reservoir Management

7. New Theory Agriculture

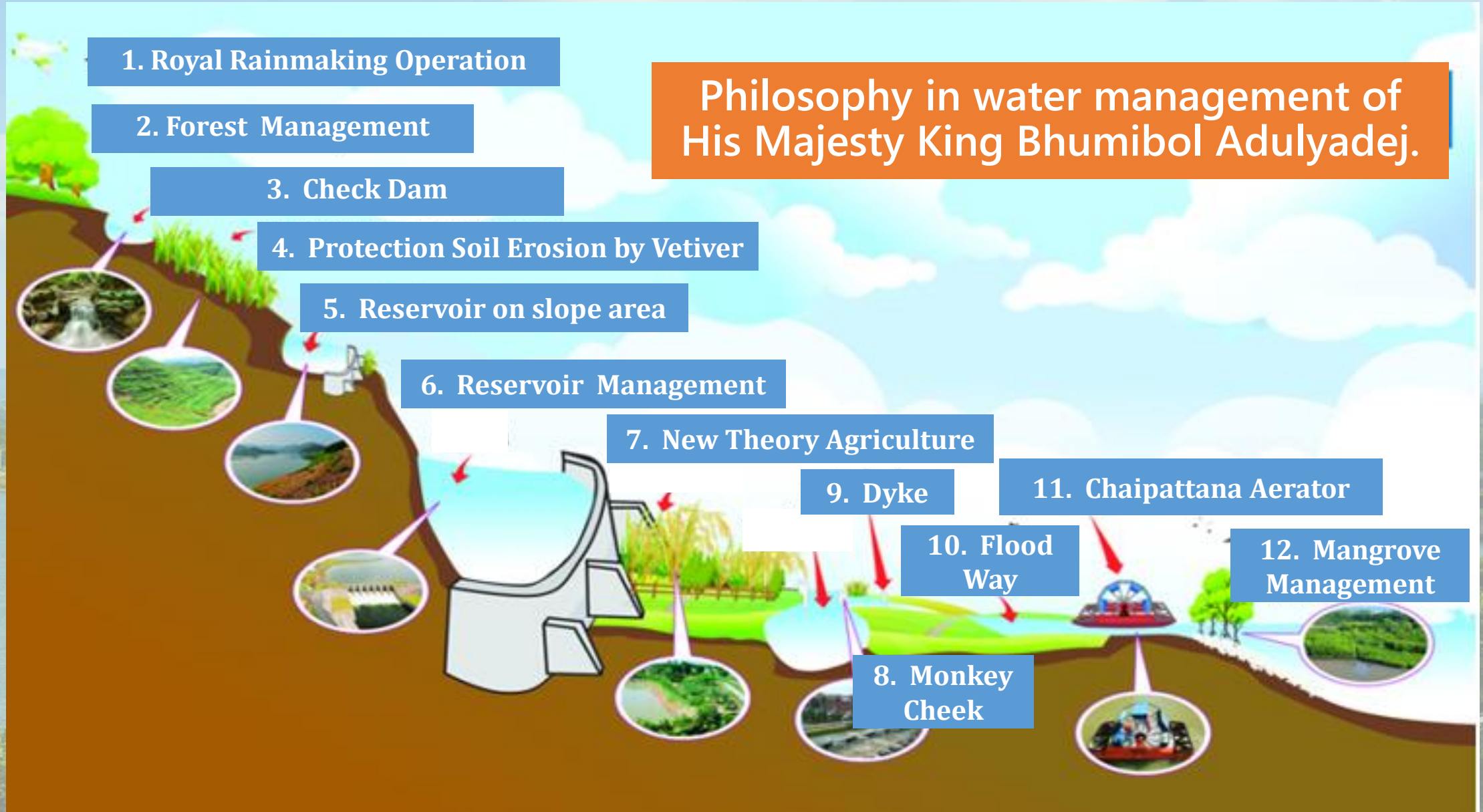
9. Dyke

11. Chaipattana Aerator

10. Flood Way

12. Mangrove Management

8. Monkey Cheek





Timeline of Cooperation Project



2016

Cooperation Project R²
for Integrated Water
Management
A Case Study of Pa Sak
Jolasid Reservoir



2017

Cooperation Project R³
for Integrated Water and
Forestry Management
A Case Study of
Phetchaburi River Basin



2018

Cooperation Project R³⁺
for Sustainable
Management of Natural
Resources and
Agricultural Production
A Case Study of
Phetchaburi River Basin

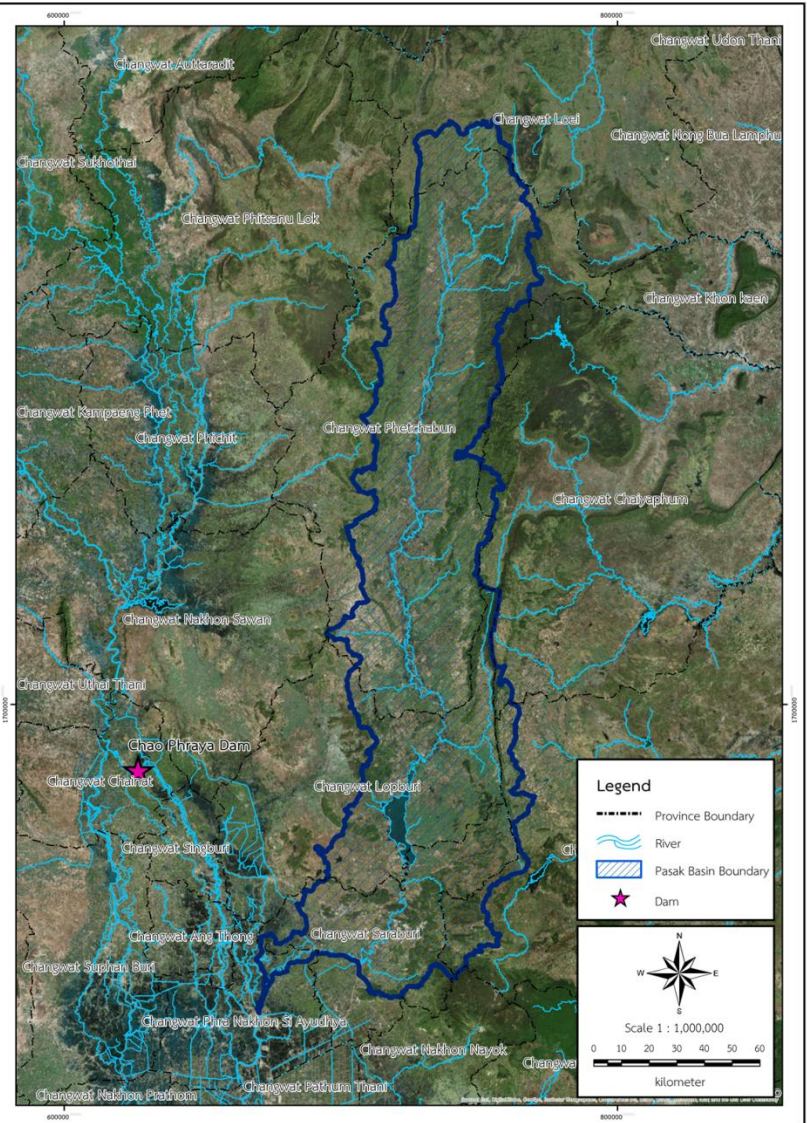


Cooperation Project R² for Integrated Water Management



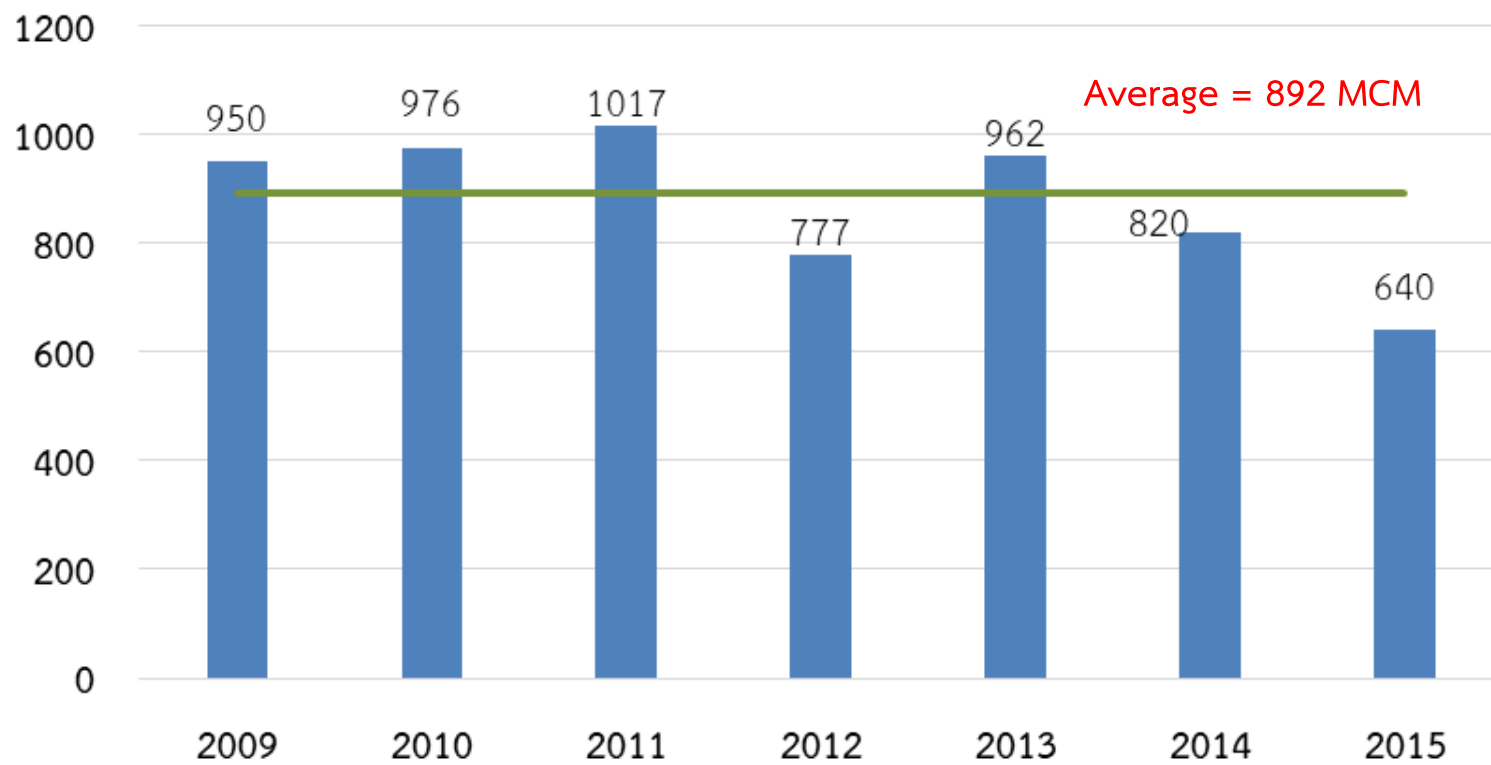
A Case Study of Pasak Jolasid Reservoir

Boundary of The Pasak Basin Area Map



Problem Situation

Pa Sak Jolasid Reservoir Water Storage





Cooperation Project R² for Integrated Water Management



A Case Study of Pasak Jolasid Reservoir

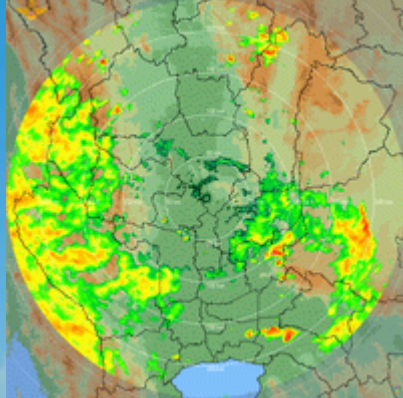
Objectives

- Increasing Water Storage
- Monitoring and Estimate Inflow to the Pasak Reservoir
- Integrated Water Management and Rain Making Operation Plan

Royal Irrigation Department

Royal Rainmaking and Agriculture Aviation Department





Radar Data

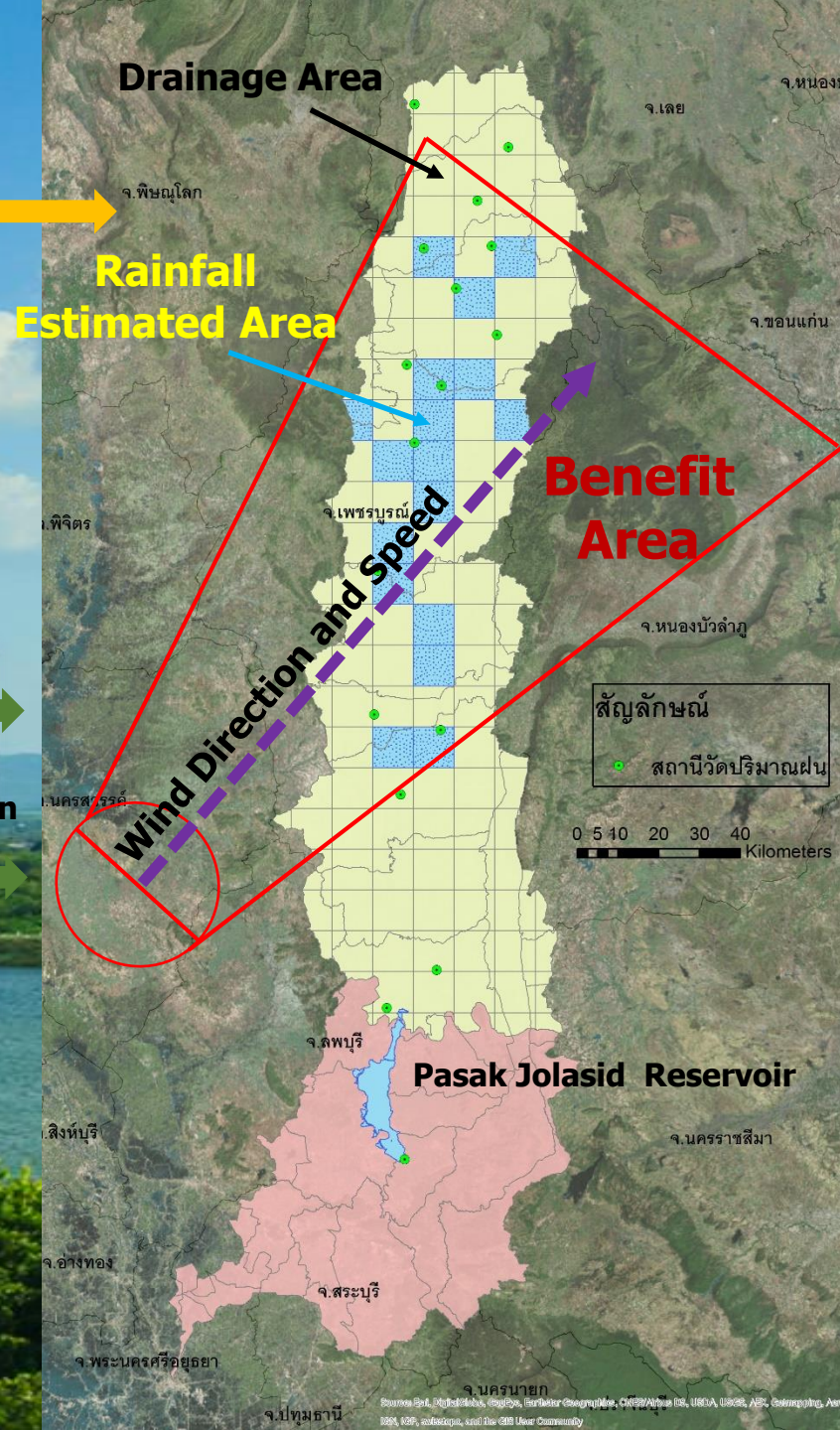
Rainfall Observation



Rainmaking Operation



Takhli Radar Station



Method

1. Rainfall Estimation by Radar Observation With Z-R Relationship

2. Rational Formula Method

$$Q = 0.278ciA$$

Q = Maximum Inflow (cms)

C = Runoff Coefficient

i = Rain Intensity (mm./hr)

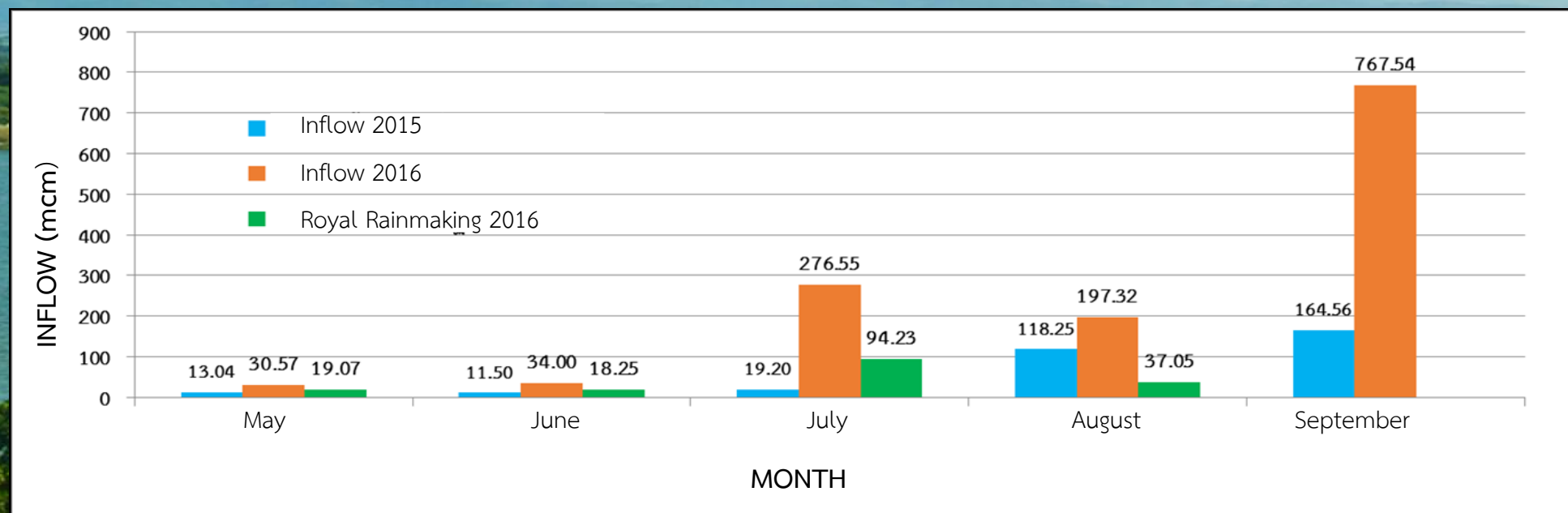
A = Drainage Area (km²)

Result of Cooperation Project R² for Integrated Water Management

A Case Study of Pasak Jolasid Reservoir in 2016



Month	INFLOW (mcm)	Royal Rainmaking Inflow (mcm)	Percentage
May 2016	30.57	19.07	62.38
June 2016	34.00	18.25	52.29
July 2016	276.55	94.23	34.04
August 2016	197.32	37.05	18.79
September 2016	767.54	-	-
Total	1,305.98	168.60	12.91





Cooperation Project R² for Integrated Water Management



A Case Study of Pasak Jolasid Reservoir

After Action

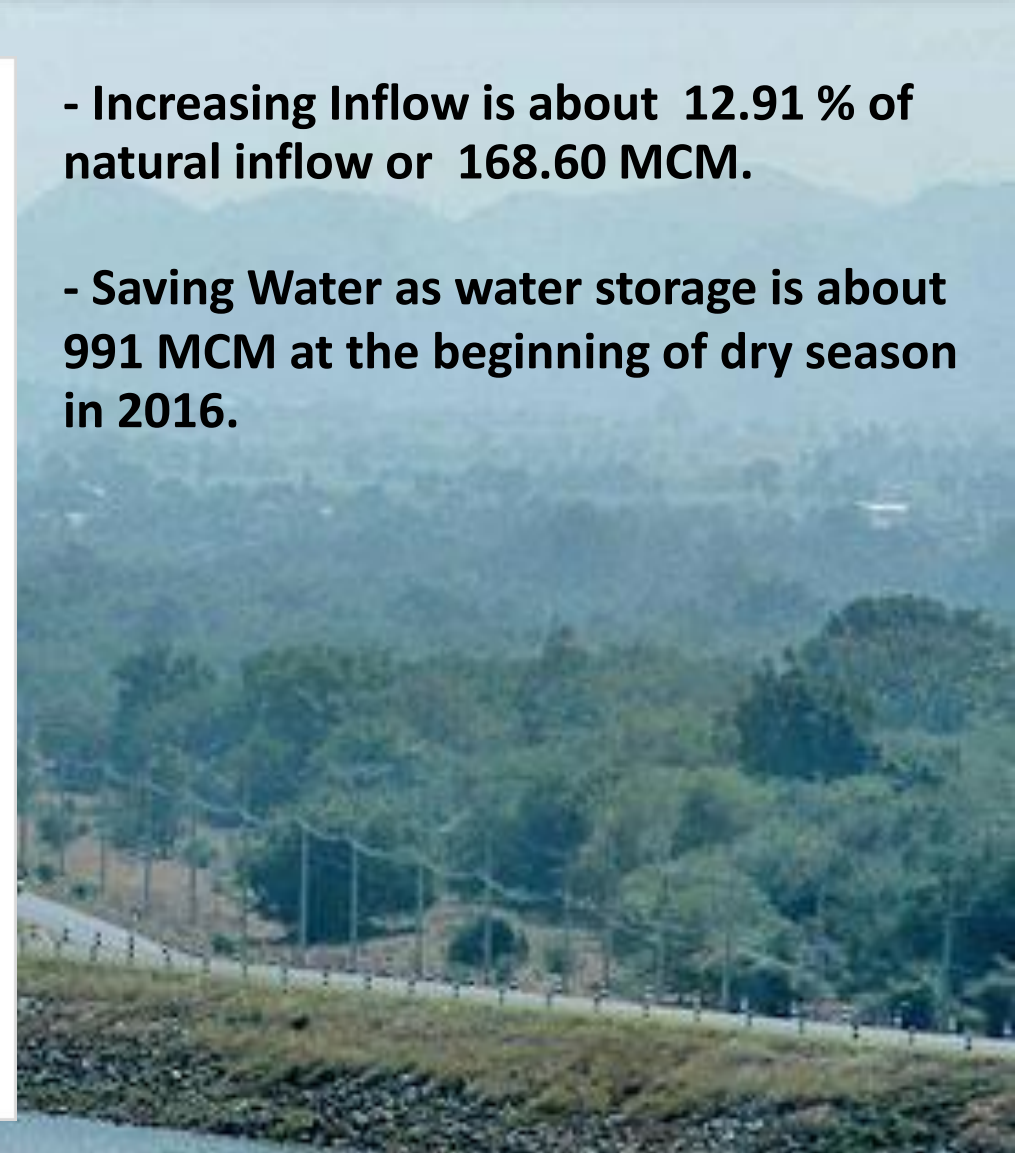
Pa Sak Jolasid Reservoir Water Storage

Water Storage (MCM)



- Increasing Inflow is about 12.91 % of natural inflow or 168.60 MCM.

- Saving Water as water storage is about 991 MCM at the beginning of dry season in 2016.





Cooperation Project R³ for Integrated Water and Forestry Management

A Case Study of Phetchaburi River Basin



Cooperation Project R³ for Integrated Water and Forestry Management A Case Study of Phetchaburi River Basin

Objectives



- Increasing Water Storage of Kaeng Krachan Reservoir
- Monitoring and Estimate Inflow to the Pasak Reservoir
- Integrated Water Management and Rain Making Operation Plan
- Increasing Forest Area and Natural Water Storage

Royal Irrigation Department

Royal Rainmaking and Agriculture Aviation Department

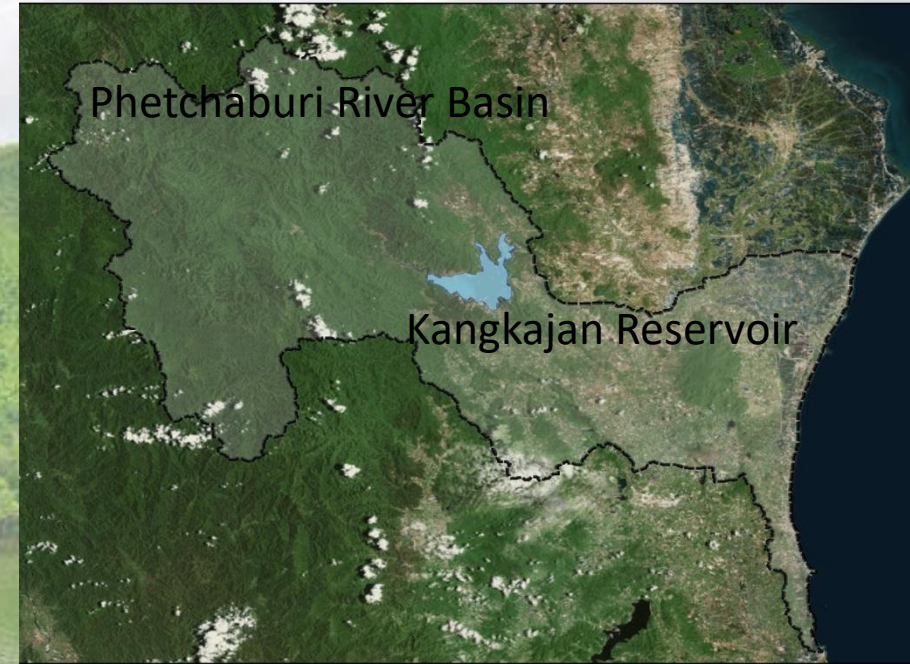
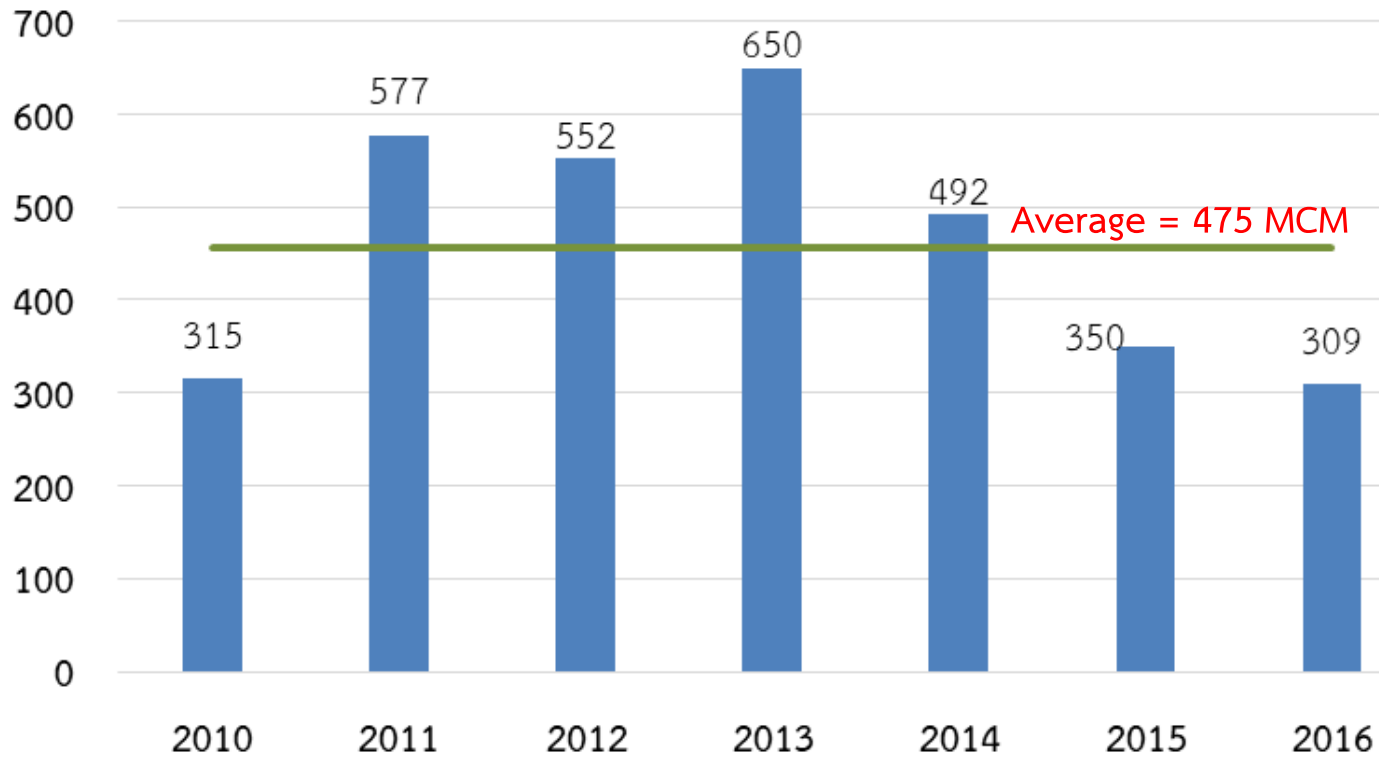
Royal Forest



Cooperation Project R³ for Integrated Water and Forestry Management A Case Study of Phetchaburi River Basin

Problem Situation

Kangkajan Reservoir Water Storage



Result of Cooperation Project R³ : Inflow

Month	INFLOW (mcm)	Royal Rainmaking Inflow (mcm)	Percentage
March	43.01	12.45	28.94
April	34.47	5.68	16.47
May	29.74	2.73	8.95
June	25.28	--	--
July	59.92	--	--
August	92.49	3.24	3.50
September	71.16	16.70	23.46
October	93.98	21.51	22.88
Total	450.05	62.31	13.84

Result of Cooperation Project R³ : Water in Agricultural Field

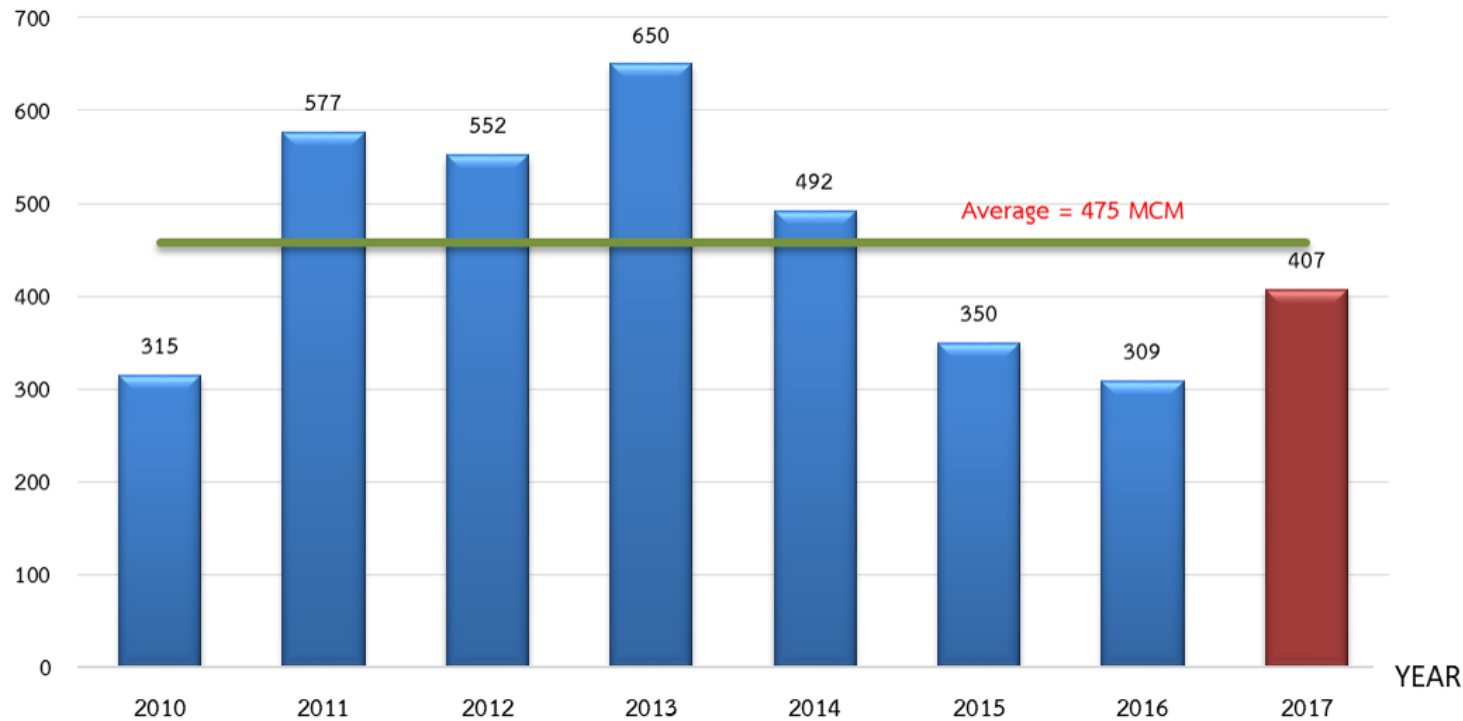
Month	Rainfall (mm./Day)			Benefit Area		Water in Field MCM	Day of Rainmaking Operation
	Max.	Min.	Average.	Km ²	Million Rai		
March	8.92	0.12	2.07	5,200	3.25	3.29	13
April	9.91	0.3	2.60	1,700	1.06	1.43	7
May	15.78	6.6	10.03	2,300	2.2	3.78	3
June	-	-	-	-	-	-	-
July	-	-	-	-	-	-	-
August	51.11	0.76	11.36	6,300	2.92	8.47	8
September	20.57	0.3	8.11	24,200	15.12	13.64	11
October	41.92	0.45	6.69	19,200	12.00	27.56	19
Total						58.18	61

Cooperation Project R³ for Integrated Water and Forestry Management A Case Study of Phetchaburi River Basin

After Action

Kangkajan Reservoir Water Storage

Water Storage (MCM)



- Increasing Inflow is about 13.84 % of natural inflow or 62.31 MCM.

- Saving Water as water storage is about 407 MCM at the beginning of dry season in 2017.

- Saving Water Release to irrigation agricultural area in downstream is about 32.89 MCM or 15.41% of water release plan during August – October in 2017.



Tree Planting Activities of Cooperation Project R³



Month	Number of Trees
May	14,250
June	48,650
July	48,500
August	48,600
September	40,000
Total	200,000



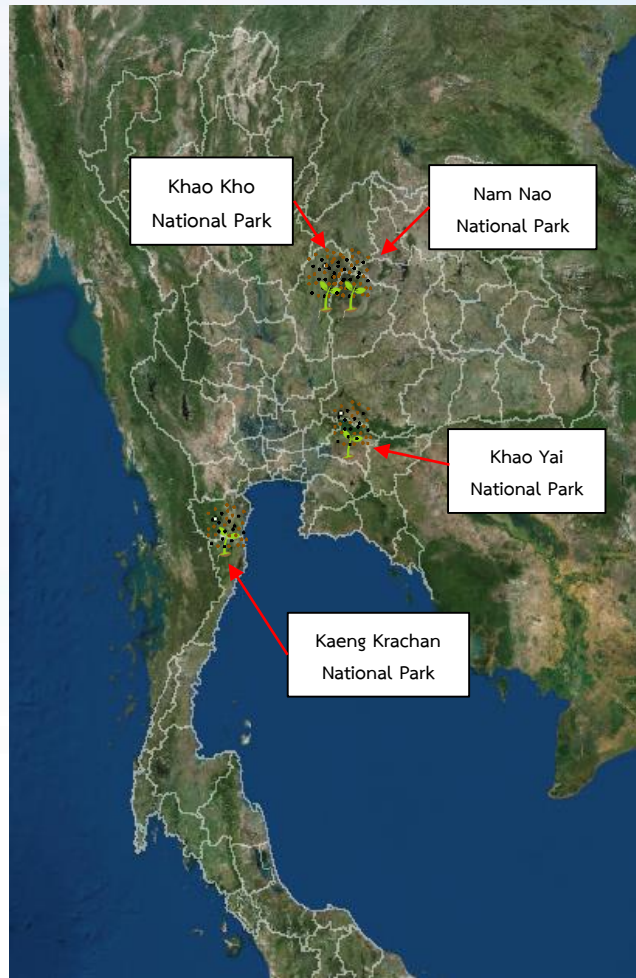


Aerial Reforestation Project



Royal Rainmaking and Agriculture Aviation Department uses aerial reforestation to boost forest regeneration.

Aerial reforestation is a technique used to quickly plant large numbers of new trees. Local tree seeds are mixed with soil and shaped into small balls called seed bombs. The seed bombs are dropped from airplanes over deteriorated forests



Khao Yai National Park



Nam Nao National Park

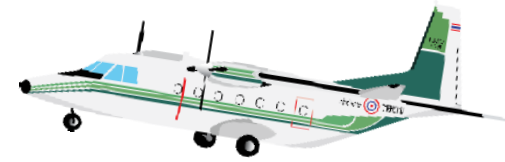
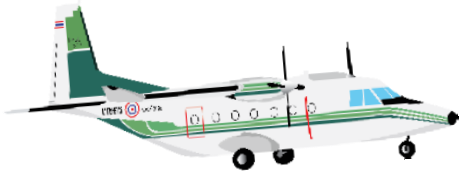


Kaeng Krachan National Park



Khao Kho National Park





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Conceptual Framework

1. Water, Soil and Forest Management

ACTIVITIES:
Forest Conservation
Reforestation
Rain Making Operation
Irrigation Water Management
Soil Conservation
Ground Water Development

2. Increasing Agricultural Production

ACTIVITIES:
Agricultural Promotion
Fishery Promotion
Live Stock Promotion
Rice field Promotion

3. Empowerment for Communities

ACTIVITIES:
Cooperative Development
Promote of Household Accounts
Agricultural Product Marketing
Community Market



Cooperation Agencies

1. Ministry of Agriculture and Cooperatives
2. 10 Agencies such as Ministry of Defense, Ministry of Natural Resources and Environment, Ministry of the Interior and University etc.
3. Private Organizations and Public People (Royal Rainmaking Volunteers, Water users groups and Others Agricultural Volunteers)

Output

1. Guideline of Sustainable Management of Natural Resources and Agricultural Production
2. Efficiency Plan for Rainmaking Operation that consistent with water management plan, soil conservation and Forest management.
3. Short term and Long term Natural Resources Management Plan
4. High benefit of Agricultural Production that balancing with limitation of Natural Resources.



Thank You For Your Attention