WATER RETENTION MANAGEMENT IN LOWLANDS OF CHAO PHRAYA DELTA

Thanet Somboon[1]

ABSTARCT

The Chao Phraya Delta is one of the most important deltas in the central part of Thailand. Flooding in lowland is a common natural phenomenon in the Chao Phraya Delta typically occurring between August and December. Flood control is important in the lower part of the river basin because of the risk of largescale damage to public and private property. The Chao Phraya Delta, about 1.9 million hectares are natural lowland or floodplain. In rainy season or in flood period, there are 50 percent of natural lowland can become flooded. Other lowland areas are protected by dikes. The main natural causes of flood are heavy rainfalls, excess capacity of the river capacity and hightides. Lowland areas can reduce the impact of flooding and protect economic areas.

Most of natural lowland areas are paddy fields which often face flooding in the wet season, especially in the lower Chao Phraya Delta. Flooding in the Chao Phraya Delta causes most of paddy field in lowland areas to suffer damage before harvest. Frequently, farmers have no chance for income.

In 2017, The Ministry of Agriculture and Cooperatives has a policy to reduce the effects of flooding in both urban areas and agricultural areas. By arranging the planting system and using the lowland area as a temporary water storage area during the flood season. Royal Irrigation Department (RID) and related agencies have jointly implemented the Lowland water Management Project in the Chao Phraya Delta to solve this problem officially.

Step of work consisted of 1) Before wet season, RID will evaluate the water resources in order to best predict the flood period; 2) Set up a water management model that is consistent with the amount of water for flood mitigation; 3)The bringing forward the crop calendar by one month, the farmers can harvest their crops before flooded; 4) Prepare the lowland area for water retention after rice harvesting; 5) Most of the areas of water retention are lowland and agricultural in close proximity to the Chao Phraya River; 6) Deliver excess water from Chao Phraya River to lowland area using an irrigation system; and 7) Excess water will be retained in paddy field for one month to reduce peak of flood, after that a excess water will be released.

Success in operation in 2017; There were 12 selected lowland areas about 183,984 hectares in Chao Phraya Delta which is to be used for flood mitigation and there are 1,500 million cubic meters of water can be stored for 15 – 45 days before being drained through the irrigation system. Operation period from September 25, 2017 to December 15, 2017. Cultivation of rice in the next season in lowland area can start earlier than other areas. Farmers have more income from rice and fishing. All cultivated areas in this project are harvested before flood period.

Keywords: Lowland Management, arranging the planting system,water retention,Irrigation Syatem

[1] Senior Expert on Hydrology, Royal Irrigation Department, 811 Samsan Road, Dusit District, Bangkok, Thailand, 10300.; E-mail: Thanet47@yahoo.com

1. INTRODUCTION

The Chao Phraya Basin is considered the most important basin in Thailand for several reasons. The basin covers an area of 15.9 million hectare, corresponding to 30% of Thailand's land surface area. It stretches from the slightly elevated northern plains to the low alluvial plains where the river flows into the Gulf of Thailand. it includes the capital and largest city of Bangkok, which is located at the delta of the Chao Phraya River. The climate of Thailand is under the influence of the seasonal monsoon winds. Due to the Asian summer monsoon, rainfall distribution over the basin varies significantly between the rainy (May to October) and dry (November to April) seasons, ranging between 1,000 mm in the northeast region and up to 2,000 mm in the southeast region. Mean rainfall during the rainy season accounts for about 90% of mean annual rainfall in the Chao Phraya Basin.

The Chao Phraya Basin can be divided into 8 sub-basins: Ping, Wang, Yom, Nan, Sakae Krang, Pasak, Tha Chin, Chao Phraya main stream. The headwaters of the Chao Phraya River originate in the northern part of the country and consist of four tributaries: Ping, Wang, Yom and Nan rivers. In the downstream part, the Chao Phraya River splits into four channels of which Chao Phraya passes through Bangkok.

Floods are a regular feature of the Chao Phraya Basin causing significant economic losses. Floods have been aggravated by a number of factors: decline in flood retention areas and the confinement of flood plains due to increasing development, the rapid urbanisation in the vicinity of the river and the intensification of agricultural practices. The Thai government controls floods through the construction of multi-purpose reservoirs, dikes (diversions) and other flood control infrastructures, which are expensive for the country and can still fail. This containment strategy has managed to reduce the impact of flooding.Flooding in lowland is a common natural phenomenon in the Chao Phraya River Basin typically occurring between August and December.Flood control is important in the lower part of the river basin because of the risk of largescale damage to public and private property.In lower Chao Phraya River Basin, about 1.9 million hectares are natural lowland or floodplain.In rainy season or in flood period, 50 percent of natural lowland can become flooded. Other lowland areas are protected by dikes. The main natural causes of flood are heavy rainfalls, excess capacity of the river capacity and hightides.

The most common man-made causes in Thailand are deforestation, uncoordinated urban development, and destruction of flood embankments.Lowland areas can reduce the impact of flooding and protect economic areas. Most of natural lowland areas are paddy fields which often face flooding in the wet season, especially in lower the Chao Phraya River Basin. Flooding in the Chao Phraya River Basin causes most of paddy field in lowland areas to be suffer damage before harvest. Frequently, farmers have no chance for income.No relevant government agencies pay attention to this issue, because they take it to be a natural occurrence in these areas.

The Royal Irrigation Department (RID) is a key stakeholder in the Chao Phraya basin, and is responsible for the irrigation planning, and planning dry and wet seasons water allocation together with the Electricity Generating Authority of Thailand (EGAT).

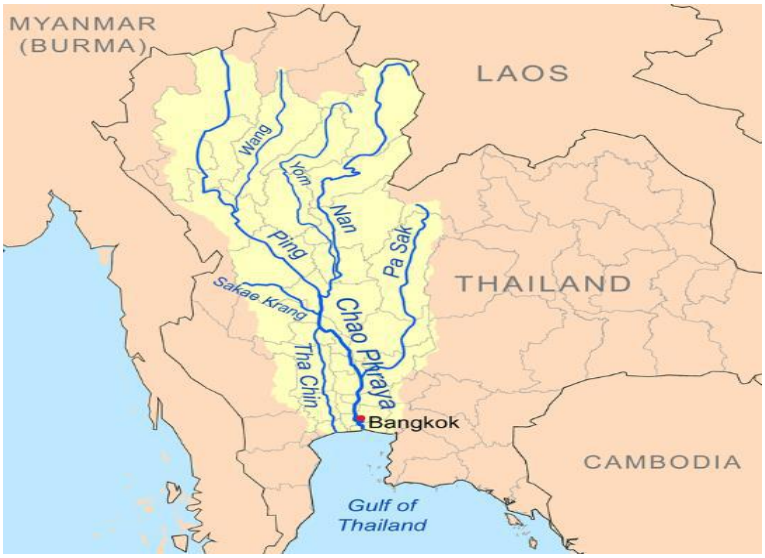

Figure 1. Map of the Chao Phraya River basin

Source : Wikipedia 2019

2. STEP FOR WORKS

The concept of Lowland Management as : at normal stage is the land use for cultivation in dry season, but flooding in wet season. The conclusion of step for work is as follow :

1) Royal Irrigation Department (RID) and related agencies have jointly implemented the Lowland Water Management Project in the Chao Phraya River Basin area to solve this problem officially.Before wet season, RID will evaluate the water resources in order to best predict the flood period.
2) Set up a water management model that is consistent with the amount of water for flood mitigation.
3) By bringing forward the crop calendar by one month, the farmers can harvest their crops before flooded.
4) Prepare the lowland area for water retention after rice harvesting.
5) Most of the areas of water retention are lowland and agricultural in close proximity to the Chao Phraya River.
6) Deliver excess water from Chao Phraya River to lowland area using an irrigation system.
7) Excess water will be retained in paddy field for one month to reduce peak of flood, after that a excess water will be released. Set up action plan.
8) RID and related agencies, create awareness of the action plan to the farmers who will be affected.
9) Prepare all the relevant information and cooperate with the integration of relevant agencies.
10) Find a way to subsidize for damage and lack of farmer usefulness.
11) Proceed with the action plan, collect information and solve problems.
12) Evaluation and Conclusion

3. ACTION PLAN AND ACTIVITIES

3.1 Action Plan

Water management in the lowlands of the Chao Phraya basin in 2017, It is difficult but necessary to estimate the flooding.RID and related agencies have a meeting to select lowland areas for water management during the flood season.Select the lowland areas most suitable for water retention.The results of the meeting have summarized the criteria for choosing lowland areas in irrigated areas for 7 criterias as;

1) A lowland area is field with frequent flooding
2) There are enough water sources to support the postponement of growing rice.
3) Have the ability to transport water through irrigation systems / canal systems that can be controlled.
4) It is an enclosed space to store water and have clear boundaries.The data can be supported for the calculation of the amount of water that can be retained in lowland areas and reduce the impact of flood.
5) There is a way to drain water in and out.
6) Water storage must have control levels that do not affect communities and transportation routes.
7) Create community participation on water management in lowland areas.Farmers and local government offices cooperate or participate in integrated water management.

In 2017, there were 12 selected lowland areas located in the Chao Phraya Delta as shown in Figure 2 and details of each area as shown in Table 1 .For flood mitigation,1,500 million cubic meters of water can be stored for 15 – 45 days before being drained through the irrigation system. Water management into lowland areas have not affected the urban area and transportation system in that area (Try to manage water level in the fields, without affecting urban settlement and highway)The schedule of this project started from September 1, 2017 to December 31, 2017

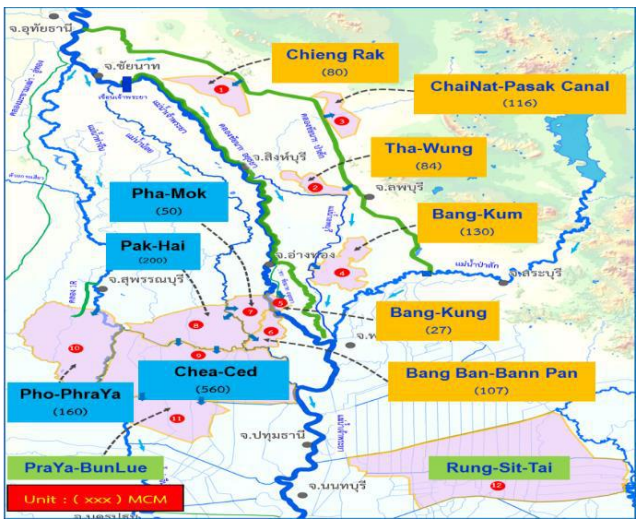

Figure 2. Map of Lowland Area of the Chao Phraya Delta in 2017

Table 1. Lowland Area of the Chao Phraya Delta in 2017

N0.	Name of Lowland	Area (Ha)	Water Retention (MCM)
1	Chieng Rak	6,128	80
2	ChaiNat-Pasak Canal	7,312	84
3	Tha-Wung	11,629	116
4	Bang-Kum	13,280	130
5	Bang-Kung	2,720	27
6	Bang Ban-Ban Pan	5,352	107
7	Pha-Mok	3,337	50
8	Pak-Hai	19,981	200
9	Chea-ced	56,000	560
10	Pho-Phraya	26,776	160
11	Phraya-Bunlue	15,279	*
12	Rung-Sit-Tai	16,190	*
Sum		183,984	1,514

The area covers 12 fields, receiving water namly Chiang Rak ,Chai Nat - Pa SakCanal, Tha-Wung, Bang-Kum,Bang-Kung,Pha-Mok , Pak-Hai, Bang-Ban, Chao-Chet, Pho- Phraya,Phraya-Borluea and Rangsit- Tai.However,there are 2 fields such as Phraya-Borluea and Rang-sit-Tai will be fields that does not retain water. In such areas, there are irrigation systems and natural canals in the period to accelerate drainage through the area into the gulf of Thailand.

The area is located in the 11 provinces of the central region of the country (Nakhon Sawan, Chai Nat, Lop Buri, Saraburi, Sing Buri, Ang Thong, Suphan Buri, Phra Nakhon Si Ayutthaya, Pathum Thani, Nonthaburi and Nakhon Pathom)

3.2 ACTIVITIES

Water management to support the cultivation of major riceby 12 lowland areas in Chao Phraya basin was started in the end of 2016. General Chatchai Sarikalaya ,which as the Minister of Ministry of Agriculture and Cooperatives at that time, has ordered the Royal Irrigation Department and related agencies to integrate the implementation of the civil state model to reduce flood. He presented the policis and operational guidelines with an important principle as “In lowland areas ,Start of planting rice 1 month earlier and harvesting before the flood season. This the lowland areas will be used to store water during the flood season”

The all activities can be concluded step of work by following time period as:

1) September 20,2016, the Minister of Agriculture and Cooperatives gave a policy to the Royal Irrigation Department and related agencies. To adjust the planting calendar in the lowland area faster by planting in April and harvested to be completed before August. The objective are to reduce the risk that before causing damage to agricultural areas and fields are the water receiving area during the flood season
2) March 31,2017, Start public relations and create awareness for the people, farmers and related agencies, which began operations in the upper area of

the Chao Phraya River Basin, namely Thung Bang-Rakam, Phitsanulok Province by planting in April 2017

3) May 1, 2017 Start the water management and crop cultivation in the rainy season of 2017 consisted of;

The upper area of the Chao Phraya River Basin as Bang-Rakam Field, The boundary area is 42,400 hectares.The starting of supply water for rice cultivation on April 1, 2019, the high area of 307,200 hectares will be used mainly for rainwater cultivation. In this regard, the announcement of the entry into the rainy season of the Thai Meteorological Department is mainly

The lower area of the Chao Phraya River Basin consists of a lowland area of 184,000 hectares, starting to send water for rice cultivation. On May 1, 2019, the high area of 683,200 hectares will be used to cultivate using rainwater as the main. In this regard, the announcement of the entry into the rainy season of the Thai Meteorological Department is mainly.

4) August 1, 2017, start receiving water into the fields of Bang Rakam To reduce the flooding problems that occur in the upper Chao Phraya River Basin (Yom river Basin)

5) September 25, 2017, began to receive water into the lowlands of the 12 fields of the Chao Phraya Delta. The objective is to reduce the flooding that occurred in the lower Chao Phraya River Basin and reduce impacts due to flooding from the upper part of the basin, that will affect Bangkok and urban communities

6) November 1, 2017, Entering into the dry season management of irrigation areas in 2017/2018 by starting to drain water from lowland areas that operation from 1 November 2017 to January 2018. Nevertheless, Drainage will not drain all waterfrom the lowlands, Some water was still remaining in the area costing for farmers to prepare for conversion, and the plant can be cultivated on time based on the agreement between the government and farmers who sacrifice paddy fields into water storage areas during the flood season.

7) December 2017, Summary of performance and obstacles,RID report to the Minister of MOAC.Start to study for the implementation of water management practices in lowland areas to extend the results in other areas

4. SUCCESS FACTORS IN PROJECT IMPLEMENTATION

1) The Water delivery to the cultivation area which in Delta area must begin to supply water into the system from mid-April. To allow farmers to start cultivation from 1 May 2017 to be able to harvest by August 2017 before the flood season in September 2017

2) During the rainy season, there must be protection against flooding in the areaby controlling the water level in the area to be appropriate, not to flood the agricultural area and the traffic route; Farmers can use daily life as usual.

3) After harvesting, the temporary retention area will be used to support drainage.

4) Mutual integration from many government sectors and people in the operation area cooperate very well and achieve the objectives of the project. All activities besed on plan and period.

5) Public relations from government agencies and Public participation.

6) Project implementation guidelines are in line with guidelines for enforcing laws, regulations, measures and policies from the government.

7) The Effective use of the existing irrigation systems and natural river systems.

In 2018 and 2019, according to the policy of Mr. Krisada Bunraj, Minister of MOAC is assign RID to continue the old policy and to expand additional results in the project area. The operation area was expanded by 117,000 rai in Bang Rakam, Phitsanulok Province. In 2017, Bang Rakam field is the original 42,400 hectare and was expaned as 61,120 hectare in 2018. The capable of supporting water was increased from 400 million cubic meters to 550 million cubic meters. For delivering water to lowland areas, the 12 lowlands in Chao Phraya Delta will begin to deliver water from 1 May 2018 onwards. The RID plans to allocate water at the beginning of the season before the rainy season arrives in May 2018, approximately 351 million cubic meters. After that, the rain water will be used mainly and irrigation water will be used to supplement the rainy season

5. SUMMARY AND RECOMMENDATIONS FOR OPERATION

5.1 Summary

The Lowland Management in Chao Phraya Delta,there are 10 lowland areas are used for flood mitigation and 2 loawland area are used for accelerate drainage through the area into the gulf of Thailand. The operation period was start from September 25, 2017 to December 15, 2017. The cultivation rice in the next season in lowland area can start earlier than other areas.Farmers have more income from rice and fishing. Whatever there are at least 20 percent of urban areas and highways were impacted. Performance in 2017 have a guideline for extending the results in other lowland areas is appropriate. All cultivated areas in this project are harvested before flood period.

From the success of postponing rice planting in recent years Enabling farmers to harvest rice immediately before the flood season have extra income from fishing and most importantly, creating abundance for the area. In addition, it helps to prevent and alleviate floods in urban areas along the banks of the Chao Phraya River Until Bangkok and its vicinity Including the success of the integration between various government agencies in order to solve the problems of the people.The 12 lowland area are water retarding area during the flood season which can be storage than 1,500 million cubic meters.

Obstacle and problem for operation as: 1) Most of lowland cultivated areas are not harvesting at the same time, due to different of planting time, so we can not delivery water into the field as scheduled.2) When the lowland areas are flooded, most of irrigation system can not operate.3) Some households and highways in low location are flooded and 4) Some areas cultivated rice continuously, then farmers can deny flood.

5.2 Recommendations for Operation

Summary of recommendations for the Management of lowland areas in irrigated areas to postpone the planting of rice in 2017 can be devided in two suggestionsare as follows;

1) Policy suggestions :

- The project is a project aimed at promoting and supporting the problem solving of floods and developing water management systematically and efficiently. Therefore, the long-term action plan must be defined to be clear and possible continuously. The outcome of the project are to make the project more successful and used as a model for solving problems and developing in other areas
- Should increase public relations activities and promote participation between the government and the public, such as clearing boundary retentionareas and inform the scope and publicize to the public and the people have a thorough understanding of the project operation

2) Operational unitSuggestions:

- Government agencies involved in speeding up the repair of roads and roadways of the village which to be able to use it quickly. Public and private agencies engaged in road improvement by raising the road level to prevent flooding of roads,the roads can be used for traffic during the flooding. In addition, the pipeline, Irrigation building and water obstaclesshould be improved.
- Government agencies have subsidy in household expenses (allowance) or career promotion during the period of flooding and inability to supplement occupations.
- The government supports and promotes increasing rice price
- Department of Fisheries promote fishery occupations such as fish release, fish product processing.In addition, the relevant laws shold be improved for the period in the promotion of fishery careers in order not to be illegal.

6. REFERENCES

Flood and Drought Management Tool Project, 2014. Chao Phraya Basin Stakeholder Summary Report

Wikipedia 2019 (Accessed on May 1, 2019).Available at: https://en.wikipedia.org/wiki/Chao_Phraya_River#/media/File:Chaophrayarivermap.png