

## Applying Prone Fields for Flood Management in Chao Phraya River Basin

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### ABSTRACT

Flood problems in the Chao Phraya River Basin cover the central area of the Thailand in 22 provinces, including Bangkok. Most of the areas, rice paddy including industrial and residential areas, invent dramatically agricultural values and economic growth of the country. Therefore, an idea to propose 13 potential lowlands was developed as flood-prone fields, consisting of Bang Rakam field in the upper and other 12 lower Chao Phraya fields. The concept is to allow the 13 prone fields to be able to store some parts of the water by diverting 1,454 million m<sup>3</sup> into the fields, meanwhile this amount of water cannot be drained into the existing drainage system during flooding season. To maintain the water level when the normal drainage system is over its capacity, diverting the exceeding water into the prone fields is an effective approach. Thus, farmers are required to modify their cropping patterns to harvest crop production before diverting the exceeded water to flood-prone fields. However, it is necessary to assess the gaps for the improvement of the new holistic management system.

There are two main factors cause floods in the Chao Phraya River Basin. One factor is the characteristic of the low terrain of more than 224,000 ha (1.4 million rai). Another factor is amount of rainfall influenced by monsoons during rainy season each year. Not only a systematic idea of keeping water retention in the flood prone fields to reduce the amount of water in the Chao Phraya River Basin, but also not to affect farmers in the flooded fields severely. Flood compensation payment has been adopted by the Royal Irrigation Department (RID). The compensation for damaged rice does not cover all expenses paid by the farmers. Hence, RID has proposed to shift the start crop calendar earlier in which it started around May to June normally, while the harvesting period began from late August to September. However, starting the crop season in April instead of the original plan causes a new problem, insufficient water storage to encourage the farmers in the fields to change.

Using flood prone fields has been proposed to solve flood problem in the Chao Phraya River Basin since 2017. These 13 fields provide full capacities of more than 1.9 billion m<sup>3</sup>. Moreover, they are capable of storing the inflow mass of water diverting through regulating gates, canals and irrigation systems. To illustrate, the upper Chao Phraya River Basin, Bang Rakam fields in Phitsanulok and Sukhothai provinces, cover 42,400 ha (0.265 million rai) which it can retain 400 million m<sup>3</sup> of water. Bang Kung

and Chao Chet fields, for example, are the two of 12 flood-prone fields in the Lower Chao Phraya River Basin from Nakhon Sawan province downwards. Lastly, there is also a drainage plan to divert this bulk of flood from the northern region downwards from Nakhon Sawan to the sea via irrigation systems such as canals, rivers, and regulating gates. This combination of flood-prone fields together with irrigation systems can reduce the water level in the Chao Phraya River.

The Chao Phraya River Basin Management Plan in the dry season of 2021, it was found that the water storage was not enough to supply water for 12 lower Chao Phraya fields, covering an area of 184,000 ha (1.15 million rai). Flood plain situation in 2021, according to the plan, the flood-prone fields were expected to hold 1,200 million m<sup>3</sup> of water by start draining in late November 2021. However, an influence of the monsoon and depression "Tien Mu" (24-25 Sept. 21) together with storm "Kompasu" (14-15 Oct. 21) brought the intensity of rainfall 1,100-1,200 mm, equivalent to the average rainfall of the whole year in 2020. In comparison, this amount of rainfall was equivariant to the average rainfall of 1.098 mm/year of the Pa Sak Basin. The rainfall during these couple weeks exceeded the capacity of the existing flooding control infrastructure and management. Evidently, the potential of the Pasak River can usually support water volume of about 800 m<sup>3</sup>/sec, but in 2021 the Pasak River system was used to drain the amount of 1,207 m<sup>3</sup>/sec. However, numbers of rice fields could not be harvested during the flooding period. Then, two major protests pursued. The first protest was to open the water regulating gates draining to Bang Kung field, a prone-field in Chao Phraya River basin, while it was already receiving water beyond its capacity. Another protest was to open the regulating gates to lower flood level in Chao Chet prone field. These two events of conflicts were examples of flooding management issues in crisis. The relevant government agencies should take carefully the conflicts of affected people between upper and lower prone fields into consideration.

In conclusion, there are three lessons from flood-prone fields management in 2021 for improvement as follows; 1) Amount of water storage is guaranteed. Enough water supply can performed by diverting from another reservoir and supplying to the 13 fields via a closed water supply system to start planting in late dry season of April. 2) Negotiation is required with community leaders between the upper and lower fields to optimize the equality. Participatory process is a key success to ensure the understanding of community leaders about crisis management strategies. 3) The compensation criteria should be reviewed to reflect the real cost. The compensation rate, at 251.5 USD per ha (1,331 THB per rai), does not cover the investment cost. This amount of money is not sufficient to incentivize the farmers to agree with benefit sharing scheme. The recommendations from the flooding event of Chao Phraya River Basin in 2021 can be very challenging. Although they may not come true in the near future, the relevant agencies should study the feasibility of these recommendations further soon for adaptation and resilience to climate change.

**Keywords**—Flood-prone Fields, Bang Rakam, Flood impacts

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