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WATER UTILIZATION IN CHAO-PHRAYA IRRIGATION PROJECT, THAILAND

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1. INTRODUCTION

Thailand is an agricultural country having rice as main crop. Nearly 90% of total water resource is used in irrigation agriculture. Due to rapid increase in water use in different sectors such as domestic as well as industrial water use and irrigation in the Chao Phraya basin, tendency of water shortage in dry seasons have been experienced in the last few years. Consequently chronic situation of water shortage and environmental hazards could arise due to improper management of water use activities. Hence, proper water management is necessary to optimize the water resources utilization and prevent social and environmental hazards. A mathematical simulation model, which was developed by the Acres International Ltd. has been modified and used in this study to optimize the cropping area in the dry season.

2. PROJECT DESCRIPTION

The Chao Phraya river basin is the largest river basin in Thailand (Fig. 1) with a total drainage area of 178,000 km2 (17.8 million ha), which is one third of the country area. The headwater region of the basin is in the north, in which the main tributaries of the Chao Phraya river originates, namely : Ping, Wang, Yom and Nan. They merge to become the Chao Phraya river at Nakhon Sawan.
In the Chao Phraya river basin, there are two major irrigation projects, namely, the Chao Phraya irrigation project which covers a command area of 1.25 million ha and the Phitsanulok irrigation project which covers a command area of 96,000 ha. The Chao-Phraya irrigation project is further divided into Upper Chao Phraya, East bank and West bank projects having command area 0.69 million ha, 0.38 million ha and 0.18 million ha respectively. Out of total command area in grater Chao Phraya irrigation project nearly 88% is under the wet season rice cultivation, while the dry season crops vary from 8% to 40%.

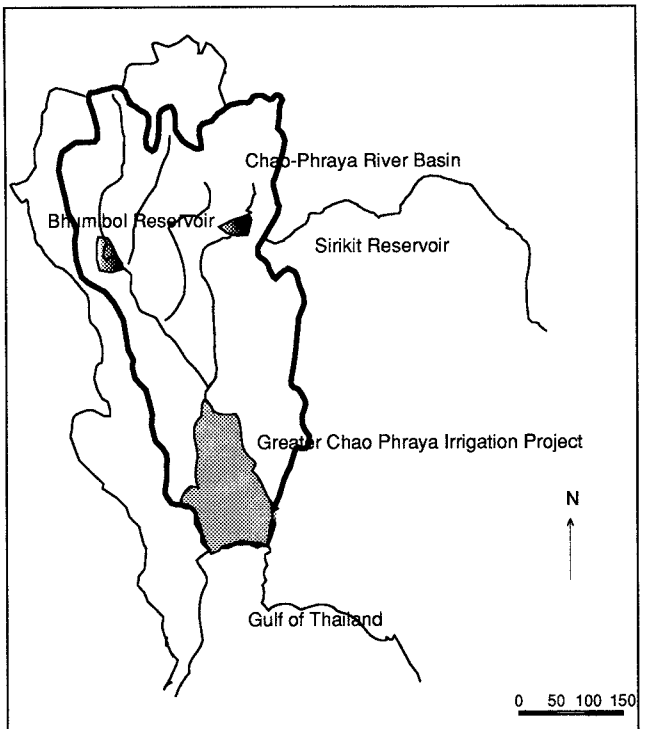

Fig. 1: Chao-Phraya River Basin and Chao-Phraya Irrigation Project

3. WATER USES IN DIFFERENT SECTORS

The water uses in domestic as well as urban water supply and industrial water supply in Chao phraya irrigation project is shown in the Table 1.

Table 1: Domestic and Industrial Water Use in MCM/month .

Location	*Domestic-Rural*	*Domestic-Bangkok*	*Industrial*	*Total*
Chao-Phraya Irrigation Project	20	140	2.25	162.25

The water uses in irrigation agriculture is dominant in the Chao Phraya irrigation project. Out of the total command area of 1.25 million ha nearly 1.09 million ha is under cultivation of the wet season rice. The total wet season water requirement is nearly 3000 MCM. Out of this, nearly 700 MCM water is supplied by the Meklong river basin to the West bank project. During the dry season the total crop area varies from 0.1 to 0.5 million ha. Consequently the water requirement varies from 1925 MCM to 5175 MCM.

4. SYSTEM SIMULATION MODEL

The ACRES model (Acres,1978), which comprises three major mathematical modules, namely Irrigation Demand Model, Summation Model and System Simulation Model, has been used to optimize the water resources in the Chao-Phraya river basin. The simulations were carried out for more than twenty years. To optimize the water resources, the cropping area of the dry season crops have been optimized and all other water requirements, such as, wet season crops water requirements, domestic, industrial and salt intrusion water requirements have been fixed as constrain. The cropping area of the different crops have been decided by maximizing the benefit from different crops constrained by the maximum area of each crop type, which was decided by the field data and consultation of different officials. Fig. 2 shows the simulated result of available volume of the water at the end of Nov. in the Bhumibol and Sirikit reservoirs and the maximum permissible area of the dry season crops in the following season.

5. CONCLUSIONS

(1) The overall efficiency used by the Royal Irrigation Department, Thailand, is much higher than the actual efficiency because the return flow coming from the upper area has not been taken into consideration in the calculation of the efficiency.
(2) On an average, 5500 MCM volume of water is required for the annual domestic and the industrial water supply, navigation, salt intrusion control, rice and perennial crop farming. Therefore, 5500 MCM of water should be reserved in the Bhumibol and the Sirikit reservoirs to fight against drought.
(3) The year in which the rainfall is above the average value i.e., 1234.8 mm, the cropping intensity for that year is nearly 140%.
(4) The actual dry season rice area is found to have a weak correlation (Fig. 2) with the volume of water available in the Bhumibol and Sirikit reservoirs. This indicates that farmers are not cooperating with Royal Irrigation Department.

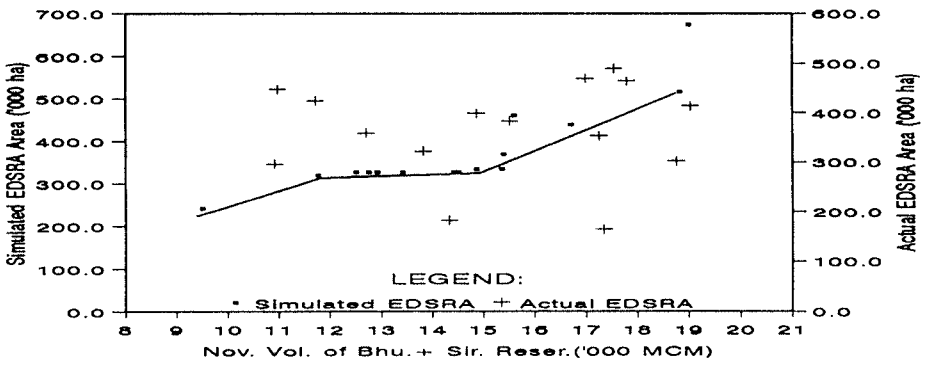

Fig. 2 : The Comparison between Actual Dry Season Rice Area and Equivalent Dry Season Rice Area with the Nov. end volume of the Bhumibol and Sirikit Reservoirs.

6. REFERENCES

ACRES INTERNATIONAL LIMITED (1979), Chao Phraya - Mae Klong Basin Study: Phase 1 Main Report and Appendices A-F, Niagara Falls, Canada.

JHA, R. N. (1993), Optimum Irrigation Water Utilization of the Chao Phraya and Mae Klong River Basins, Thailand, Master Thesis, Asian Institute of Technology, Bangkok, Thailand.