Development of the Floodplain of the Mekong River for Paddy Rice Cultivation
稲作のためのメコン河氾濫原の開発

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The Tonle Sap Great Lake and the Mekong River of Cambodia have great potential for promotion of economy. They have a huge floodplain suitable for rice-based farming system and potential water resources for farming. In this research, Batheay irrigation system, located in the floodplain of the Tonle Sap River and the Mekong River (Figure 1), will be studied as a model site for the future development of the floodplain of the Tonle Sap Great Lake and the Mekong River. We attempt to study water management of the Batheay irrigation system by analyzing water use in the irrigation system and uncover effectiveness of the system. This study will play a vital role in the study of the Tonle Sap Great Lake system in our future research.

Batheay Irrigation System

The Batheay reservoir receives water directly from floodwater of the Mekong. It functions as both a reservoir and a paddy field. In wet season, dike around the Batheay reservoir prevents floodwater from entering the reservoir and rainy season rice is grown inside the reservoir. After harvesting, gates around the reservoir are opened to receive floodwater and the water is stored for cultivating dry season rice outside the reservoir. Maximum storage volume of the reservoir is 19,000,000 m^3 with 750 ha of area. The irrigation system allows a total area of rice production of 1,713 ha yearly, in which 713 ha are inside the reservoir (rainy season rice) and 1,000 ha outside the dike (dry season rice). Average yield is around 3.5 ton/ha.

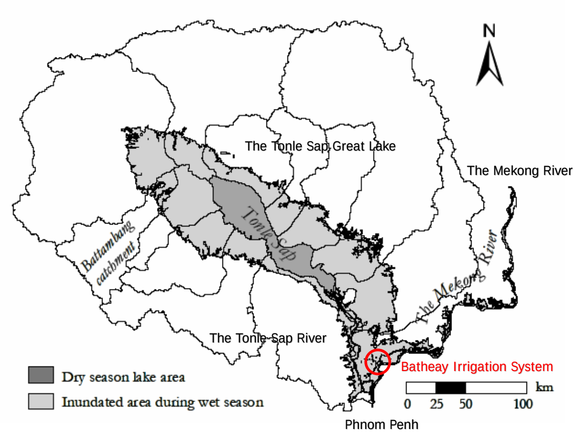

Figure 1: Catchment and floodplain of the Tonle Sap Great Lake and the Mekong River (source: WUP-FIN/MRCs)

The irrigation system was initiated in Pol Pot regime. After the regime, it was almost completely damaged due to lack of maintenance, management and construction technique. The system had been left unused until the intervention of PRASAC (Programme d’Appui Au Secteur Agricole Au Cambodge). From 1996 to 2002, PRASAC provided fund for rehabilitating the system and formed a water user association. There are two main gate structures and eight supplying structures. The two gates are used as intake structures during the flooding season and as supplying structures during dry season.

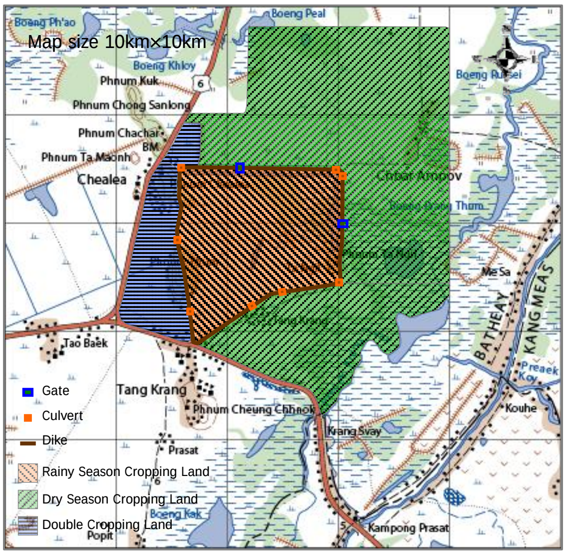

Figure 2: Command area of the Batheay irrigation system

Cropping Pattern of the System

Two kinds of rice, rainy season rice and dry season rice, are grown in command area of the Batheay reservoir. The cultivation patterns and time of growing of these rice varieties are described below:

Rainy Season Rice: Rainy season rice is grown inside the Batheay reservoir from May to September (Figure 2). Precipitation is a main water source for this type of rice.

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Dry Season Rice: Dry season rice is grown outside the reservoir from December/January to March/April. In western area of the reservoir, rice can be grown twice a year as that area is not flooded in wet season (Figure 2).

Methodology

As there is no hydrological and meteorological data of the Batheay irrigation system, water level loggers were installed at each structure around the reservoir (Figure 2) and weather station will be set up in the command area of the system. Water level in the Batheay reservoir is monitored hourly from mid-December 2005. Based on this data, the outflow from the reservoir is derived. Infiltration is not taken into account and lake evaporation is 77% of the pan evaporation. As evaporation data is not available in the study area, data from nearby area is used instead. Also, precipitation data is not available. In Cambodia, it rarely rains in dry season. So it is assumed there is no rain during the calculation period (18 December 2005 to 10 March 2006). Finally, outflow of the Batheay reservoir is computed by the following steps: (1) Estimate the daily increment of reservoir volume by using the variation of water level of the reservoir, (2) Estimate the daily increment of capacity based on loss by lake evaporation, (3) Calculate outflow from the difference of the two terms.

Results and Discussion

According to the analysis of daily water level in the reservoir of the Batheay irrigation system and daily outflow from the reservoir, water level in the reservoir is found decreasing 14 cm daily in general (Figure 3.c), average daily outflow is 77,074 m^3/day (Figure 3.e), total outflow is 6.4 million cubic meter (MCM) and total outflow with lake evaporation is 8.6 MCM during the computation period.

These results may contain errors resulting from the limitation of available data. The total outflow found 8.6 MCM is low compared with the maximum storage volume of the reservoir about 19 MCM. We think one of the reasons is that the reservoir was not empty up, which means there is water in some parts of the reservoir. Another reason is that the water level data were logged from the middle of growing period resulting in incomplete computation.

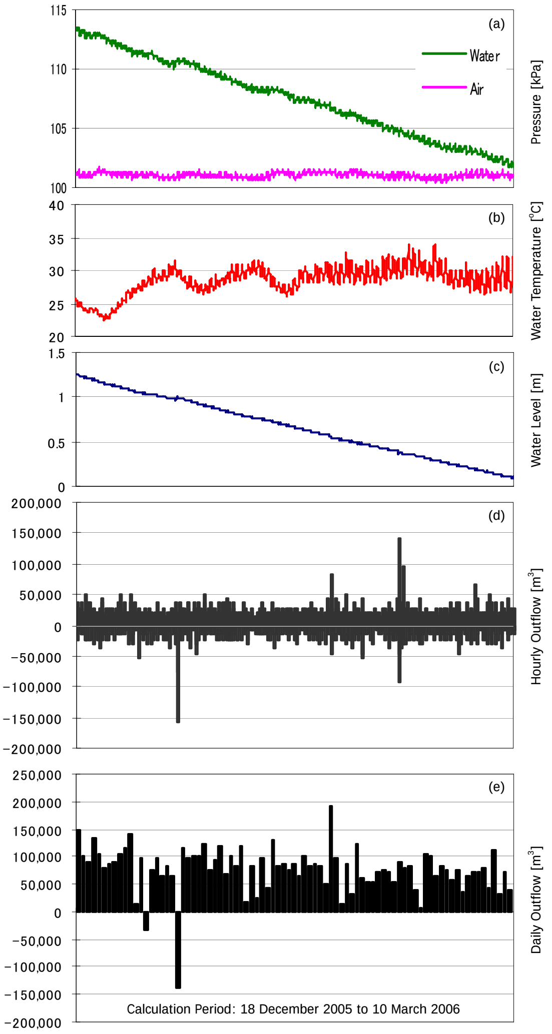

Figure 3: (a) hourly air and water pressure, (b) hourly water temperature, (c) hourly water level in the reservoir, (d) hourly outflow from the reservoir, (e) daily outflow from the reservoir

Conclusions and Application

With the Batheay reservoir irrigation system, farmer can grow rice twice a year, rainy season rice and dry season rice. Without this system, rice cannot be grown in both rainy season (flood) and dry season (shortage of water). As located in the floodplain, the system could take benefits not only from floodwater, but also fish and sediment.

The system can be developed in floodplain of a lake or a river where flood level ranges from 2 to 3 m and flooding time is around 3 to 4 months.

Future Plan

As discussed in Section "Results and Discussion", availability of data to use in this research is still very limited. As future work, the hydrological data will be continued monitoring and meteorological station will be installed in the command area of the system. Next, collected and measured data will be classified and analyzed. Then a water balance model from the reservoir to paddy field with a graphical user interface will be developed.

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