

カンボジア・メコンデルタの水文環境と農業形態 Hydrological environment and cropping types in Mekong Delta, Cambodia

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Introduction The hydrological feature of the Mekong Delta in the Cambodian territory is characterized by vast and deep flood inundation in the flood season. The maximum inundation depth, which is corresponding to difference between the highest and the lowest water levels of the main rivers in a year, presents as big as 7 to 10 m. This distinct phenomenon is caused by the typical monsoon climate and its location of the upper delta, where natural levees are developed well with higher elevation from the back-marsh zones.

The Delta is, of course, the most productive and important land for agriculture. The conditions for agriculture are not so favorable, however. Most of the land is deeply submerged with too much water in the flood season, but to contrast, the land becomes dried up easily after recession of the flood and suffers water shortage in dry season. Thus, these conditions have been serious constraints to the agricultural cropping there. If the constraints are alleviated by some water control measures, increase in the agricultural production based on enhancement of degree of freedom of cropping types can be highly promising.

Although full control of flood inundation will be quite difficult, construction of control gates on the streams and small embankments in the flood plain is considered as the feasible water control measures (semi-control of flood) for delaying the beginning of flood inundation and accelerating its recession. The embankments may be useful also for storing water as irrigation water source for the dry season. This report discusses possible effects of these water control measures on the agricultural cropping and necessary approaches to evaluate those effects.

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Agriculture on the flood plain Micro-landforms of the flood plain determine, for the respective places, the depth and the period of inundation on the flood season and availability of water in the dry season. What kind of cropping type stands at a certain place is dependent on the inundation condition and water availability there. Figure 1 presents a conceptual sketch of the land form types of the flood plain. Different cropping types observed there are summarized as Table 1.

Most of the farmlands in the flood plain except the natural levee zone are paddy fields where single rice cropping is practiced in the rainy season (rainfed or floating rice) or the post-flood season (recession rice). From the interviews to the farmers, it is recognized that they have strong interest in double rice cropping, though it can be found currently only in the very small parts due to the water scarcity in the dry season. If irrigation water sources for planting of pre-monsoon rice are secured by some means, rice production there can be increased drastically. Although they begin to utilize swamp water with mobile pumps, water shortage often happens even for irrigation for

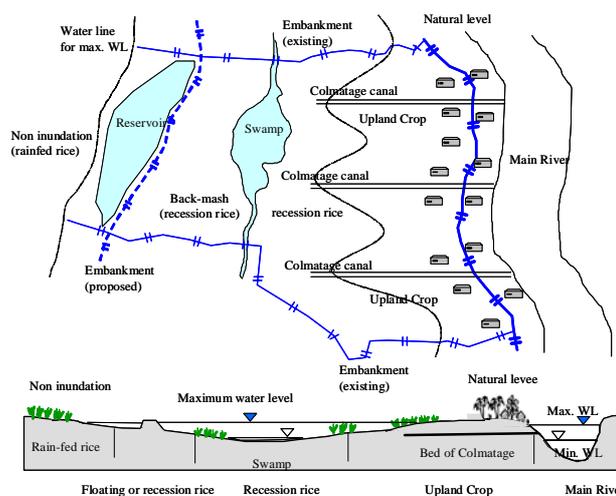


Figure 1 Conceptual sketch of a unit floodplain

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Table 1 Basic cropping types on the flood plain

| Landform type | Inundation | Cropping type | Cropping period | Irrigation water source | Crops, Varieties |
|-------------------------------|------------|--|------------------------------|-------------------------|---|
| Non-inundated plain | No | Rainfed rice | July – Dec. | No | Local varieties |
| Transition zone to back-marsh | <1 ~ 2 m | Floating rice (deep water rice) | July – Dec. | No | Local varieties |
| Back-marsh | 2 ~ 8 m | Recession rice | Nov. ~ Jan.– March ~ May | Swamp, reservoir | HYV |
| | | Double cropping (Recession + Premonsoon) | Nov. – March, Apr. – Aug. | Swamp | HYV |
| Natural levee | 0 ~ 2 m | Upland crops | | Colmatage, tubewell | Vegetables, sugarcane, groundnuts, papaya |

recession rice in the current situation.

The natural levee zone, formed by fertile soil sedimentation brought by the flood water, is providing favorable land for upland crops. This zone is usually non-inundated, or even though submerged, inundation is shallow and short. In addition, access to water is not bad. In recent years, the farmers are getting water from tubewells or colmatage canals by using pumps for irrigating various crops in the dry season. Thus, the natural levee zone is the quite precious land where crops can be planted almost all the year.

The colmatage is the very unique system in this region. A colmatage canal, excavated to cut across the natural levee, draws flood water from the main river into the back-marsh. Sediments contained in the flood water are deposited on the back-slope of the natural levee. It brings natural fertility and also raises the elevation there. As such, the colmatage has been contributing to increase the fertile natural levee land. Besides this function, the colmatage canals are utilized for irrigation along with the spread of pump usage. Meanwhile, the colmatage accelerates flood inundation on the back-marsh. Since too early start of inundation must be avoided for securing the degree of freedom of cropping in the back-marsh, control gates at the entrances of the colmatage canals will be necessary in the future.

Possible measures for semi-control of flood inundation For realizing the land and water condition for double rice cropping, alleviation of the constraints of inundation and water shortage is required. For this purposes, construction of control gates and embankments will be effective. Control gates at the entrances of the colmatage canals and at the upstream border of the channel flowing into the unit back-marsh will be desired for delaying the start of inundation. In addition, if another control gate is constructed at the exit of the swamp or at the downstream border, it can work for prolonging the period of available water in the swamp, which will be precious irrigation water source for the surrounding area in the dry season. Embankments near the edge of the back-marsh will be useful both for delaying the start of inundation and for storing water against flood recession. Although some part of the upper zone of the embankment will be under water, the rest can be planted with recession rice and pre-monsoon rice depending on water availability. The stored water will irrigate recession rice and pre-monsoon rice in the back-marsh. For utilizing the colmatage canals for irrigation in dry season, relatively big size pumps must be installed at the entrances of the canals. The water of the colmatage canals will be used for irrigating both upland crops on the natural levees and paddy fields in the back-marsh.

Research needs

- (1) Modeling analysis of flood inundation processes: To identify the depth and the period of inundation at a specific place, and to clarify the effects of water control measures on inundation.
- (2) Investigation on current and future cropping systems in the back-marsh zone: To identify possible improvement of cropping systems based on the farmers' intentions and to predict the effects of the water control measures on agricultural production.
- (3) Investigation on colmatage system: To identify the ways of utilization of the colmatage system maintaining its traditional multi-functions.