

In the Precision Irrigation Model of Paddy Field - A Case Study in Chang-hua, Taiwan

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Recently Taiwan falls into the decennial big draught, water conservation becomes the hot spot topic more than ever. The agricultural water demand in Taiwan is more than 70% of total yearly water usage. Among this 70% water resource, irrigation water is the largest. It is about 63-65% of yearly water usage. In a drought period, other industries often transpose the water resource from agricultural water. Especially, the difference of seasonal rainfall pattern in Taiwan is very obvious, couple with climate change, will enhance significant difference between drought and waterlogging period. Therefore, to make agricultural water usage in the field more efficiently and upgrade the operation accuracy of irrigation systems would bring about proper irrigation to the crops and ensure the yield in the drought.

The objective of this research was investigated the influence between water demand of fields and water resource allocation. In this study, the water balance equation was involved into Vensim model to calculate the water needs of field. The study field located on the basin of Tzu-Tsai-Pi channel, irrigation system in Chang-hua, Taiwan. The preliminary result found that with the precision irrigation water providing policy, the study area could save about 48% irrigation water as the water allocation was based on the demand of fields. The result will be further tested in the field as a verification, and would be helpful for the water resource efficiency. The water balance can be represented with elements as Field storage, Rainfall, Inflow to the system, Evaporation and actual crop Evapotranspiration, Field overflow, vertical Percolation, and lateral seepage Inflow. In the study, field storage is regarded as the sum of the height of soil water content and the water depth above the soil surface. The model was applied to estimated irrigation water requirement. After comparing with the irrigation plan of the first crop season (the drought period in Taiwan) in 2013, the study found about 48% irrigated water can be further saved as a precision irrigation.

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