



Application of SWAT Model Coupled with Maximum Entropy Method to Simulate Irrigation Water Allocation

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The issue of water resources deficit is currently a major issue facing Taiwan. According to reports in previous years by Water Resources Agency, agricultural water accounts for about 70% of the total water consumption in a year, and irrigation water accounts for up to 90% of the agricultural water. It can be seen that irrigation water accounts for a large proportion of the total water resources. Currently, the supply-oriented approach to allocate irrigation water often results in waste of irrigation water because of imbalances between supply and demand.

In this research, the SWAT model (Soil and Water Assessment Tool) was used to simulate the hydrological process. By inputting weather data, the effects of different land use, soil and crops on hydrological processes were predicted. Irrigation water requirements can be simulated simultaneously via model calculation. Furthermore, SWAT-CUP (SWAT Calibration and Uncertainty Programs) was used to perform sensitivity analysis, calibration and validation to find out the most influential parameters on the estimation, which significantly enhance the estimated accuracy of predictions.

Due to the uncertainties of the research data, the true probability distribution of this random data could not be fully determined. Also, it was hard to make reasonable judgements in this uncertain situation. For this reason, the approach adopted to allocate irrigation water is maximum entropy method. The principle of the maximum entropy method is to keep all the uncertainties of the estimation process so as to keep the estimation results as objective as possible. The constraints of the spatial allocation of irrigation water included the conservation of mass, irrigation canal capacity, water delivery efficiency, and so on. This research aimed to simulate the irrigation water allocation and fully grasp the supply and demand of irrigation water in order to save unnecessary waste of irrigation water and increase the available water resources in Taiwan.

Keywords: SWAT, SWAT-CUP, maximum entropy method, irrigation water allocation