



A study of application of MFLN accurate simulation and computing the irrigation water yield

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Under the situation of the rapid global climate change, heavy rains, floods, droughts and other extreme events are more likely to happen than before. The world countries are now paying special attention to water resource management issue because it is affected by climate change. In Taiwan, the allocation of water resources is mainly used for industrial, agricultural and domestic purposes; agricultural water use accounts for 75% of total water use. When droughts occur, deploying agricultural water to meet other water needs is often the first approach. However, to effectively obtain irrigation water requirement, it is necessary to compute the existing amount of irrigation water through an accurate estimation method in order to appropriately allocate water for industrial or domestic water uses. This study is conducted at Wan-Dan pumping station, Pingtung County in southern Taiwan, using a precise instrument Acoustic Digital Current Meter (ADC) to measure the velocity profiles of irrigation water yield at the pumping station. It also employs the model constructed by Multi-layer functional link network (MFLN) to accurately simulate the velocity profiles in order to precisely compute the irrigation water yield of the pumping station. MFLN is one of the artificial neural network analysis models; it is also the modified form of Backpropagation Network (BPN). The network structure of MFLN principally is to add logarithmic and exponential input parameters and output parameters in the input layer and output layer so as to improve the network learning ability. This study carries out 13 different discharge in total. The results of the study show that the MFLN model is capable to effectively simulate and compute the velocity profile of each measurement and that its simulated and estimated irrigation water yield is very accurate. As a consequence, the MFLN method can be effectively applied to simulate and compute the irrigation water yield, and the results of this study can also be applied to simulate and compute the irrigation water yield at other irrigation pumping stations with the aim of effectively controlling the agricultural irrigation water requirement.

Keywords: Acoustic Digital Current Meter, Discharge, Multi-layer functional link network, Velocity profile.