Investigate Sustainable Development for Micro-hydropower Generation of Water-food-energy Nexus of Irrigated Agriculture

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Micro-hydropower is necessary renewable energy to provide baseload, and it has the advantages of sustainable development and reduction of greenhouse gas emissions. There is an interrelationship between irrigation water and energy from micro-hydropower with the development of micro-hydropower in agricultural irrigation systems; furthermore, it will affect the effectiveness of micro-hydropower, which is set up in agricultural irrigation systems. In a previous study, Li et al. (2019) developed a model called the AWEFSM (Agricultural Water-Energy-Food Sustainable Management) model. The model can be used to estimate the water demand from the different types of crops and the yield. However, the study did not analyze the correlation between the water requirement of crops and renewable energy. Therefore, the purpose of this study is to use the AWEFSM model to investigate the relationship between irrigation water, electricity generated by micro-hydropower, and irrigation area in the agricultural irrigation system.

The Taiwanese orographic condition is rugged and abundant with water resources. In recent years, the development of micro-hydropower has been emphasized. Especially the Zhuoshui River watershed, which has a large watershed area and a well-developed agricultural irrigation system. Hence, the study builds a micro-hydropower generation system in Linnei channel and the south connecting channel of the Zhuoshuixi river watershed in the middle of Taiwan, and collect channel background information, irrigated area, crop species and yield, and electricity production by micro-hydropower. Use the AWEFSM model to investigate the interrelation between the generated energy and irrigation water after setting up micro-hydropower in water-energy-food nexus.

Keywords: Micro-hydropower, Water-energy-food Nexus, Irrigation Channel

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