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Simulation of crop growth and water saving irrigation scenarios for lettuce crop in tropical monsoon climate of Cambodia

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Setting up water-saving irrigation strategies is a major challenge for farmers in order to adapt to climate change and to improve water use efficiency for their productions. Effective irrigation in vegetable production like lettuce is required due to its sensitivity in water shortage. Crop growth models, such as AquaCrop, play an important role to explore and provide such irrigation strategies within various environmental conditions and taking into account agronomic practices. The objectives of this study were (i) to parameterize AquaCrop model for lettuce (Lactuca sativa var. crispa L.) using data from farmers' fields in Cambodia and (ii) assess the impact two distinct irrigation simulation scenarios under two contrasted soil types under tropical monsoon climatic condition using AquaCrop. We used field observations of biomass and canopy cover during growing season of 2017 to adjust the crop growth parameters of the model. Results showed that the simulated canopy cover (CC) and aboveground biomass (BM) were satisfactory with the measured CC and BM with an overall root mean square error (RMSE) of <0.8% and < 0.01 ton/ha respectively. The results confirmed the ability of AquaCrop to correctly simulate lettuce growth. The irrigation scenario analysis shows that deficit irrigation can result in a slightly improved water productivity (WP) of 0.55 kg/m3 and irrigation levels (IL) of 75mm for sandy soil, compared to full irrigation (WP=0.54 kg/m3, IL=76mm), and no improved WP and IL in loamy soil.

Keywords: Crop growth, Lettuce, AquaCrop, Water saving, Water productivity, Deficit irrigation