Performance of Hydrus -1D Model for Simulating Water Movement in Paddy Field Under Alternate Wetting & Drying Irrigation Technique

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The application of Alternate wetting and drying (AWD) irrigation in paddy rice cultivation requires optimal soil moisture in the root zone for rice to maximize the water use without affecting the yields. However, determining the optimal soil moisture level with AWD practice experimentally is quiet challenging and requires time. Also, little work is known on the relationship of irrigation scheduling based on matric potential, soil moisture and water level. Numerical modelling is a fast and accurate means for determining the optimal safe soil moisture.
In this study, pot experiments were conducted on rice crop during the summer season (June to September) of 2021, under greenhouse conditions comprising soils from lowland area. Four irrigation treatments, including continuous flooding (CF) as control and severly, moderate and mild conditions were considered. Each treatment was replicated three times. The irrigation applications were controlled by the 5, 10 and 15 cm water levels that matched AWD conditions and were observed manually and recorded daily. The matric potential and water moisture condition were monitored using the tensiometer and soil moisture sensors installed at the specified depths. We compared HYDRUS-1D simulations with the AWD practice's experimental data and optimized the operational parameters. System-dependant boundary conditions, which initiates irrigation whenever the water level drops below the determined locations were considered.
The results show that the HYDRUS -1D model can be used to predict matric heads and soil moisture conditions in paddy fields compared with experimental data. These can be used to optimize irrigation conditions and water amounts applied under AWD practice to increase water use efficiency.

Keywords: Alternate wetting and drying, Matric potential, Water balance

