

Simulation of Soil Moisture between Two Drain Pipes in Paddy Fields by HYDRUS-2D Model

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Abstract

Evaluation of soil moisture transfer between two subsurface drains and water drainage from the roots is very important. In this regard, application of conservation of mass equations by HYDRUS-2D software, in addition to reducing costs, could speed up access to the results. In this study, a subsurface drainage systems with drain depth of 0.9 m, drain spacing of 30 m, and groundwater depth of 50 cm was studied during one growing season of canola in paddy fields located in Sari region. Soil profile was considered from the surface to a depth of two meters and six layers of soil were defined. Soil saturated hydraulic conductivity (K) for each of the 6 layers of the soil was calculated by Piezometric method and using Kirkham equation. The K values for the surface layer down to the layer at the depth of 2 m were, respectively, 0.8, 0.11, 0.29, 0.16, 0.38 and 0.083 m/day. Other input parameters of HYDRUS-2D model were measured every day including precipitation, water table depth, and soil moisture. Observed data and simulated water tables between the two drain pipes were compared and the model was calibrated in saturated period. The performance of the model was evaluated by statistical approaches considering root mean square error (RMSE), the coefficient of determination (R^2), the average deviation (AD) percent error (PE) and the modeling efficiency (EF), which were 0.0214 cm^3/cm^3 , 0.932, 0.0407 cm^3/cm^3 , 0.079, and 0.525, respectively. The results showed that simulation was considerably satisfactory.

Keywords: Canola, Kirkham equation, Richard's equation, Soil hydraulic conductivity

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