Estimation of drain spacing using artificial neural network and fuzzy logic

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Drainage is practicing in the world since ancient times to reduce the soil water and increase the productivity of crops. The correct design of the system can help the sustainability of the environment and reduces the negative of over drain of the soils.

In this research two different approaches, artificial neural network (ANN) and ANFIS, were used to estimate the drain spacing for steady and unsteady. The developed models were trained and tested using results obtained from theoretical and laboratory data. Since the equations are nonlinear, it is not possible to solve them directly and it is necessary to use trial and error methods along with different monographs for different conditions. Therefore, ANN and ANFIS was used to estimate the drain spacing. Several topologies with different membership functions, hidden layers, number of neurons, etc have been tested and the best topology with higher R2 and less RMSE was selected as optimum model. In addition, the ability of two models in estimating the drain spacing was shown using field data. The RMSE for ANN model in steady state condition was 0.042 m and for ANFIS it was 0.020 m. For unsteady state condition, the RMSEs were 0.036 and 0.020 for ANN and ANFIS, respectively. In general, both methods could compute the drain spacing with similar accuracy and both can be used effectively in field of agricultural drainage.