

Artificial Neural Network Based Approach in Prediction of Potential Water Pollution Across Different Land-Use Patterns

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Abstract : Considerable relations has recently been given to the environmental hazardous caused by agricultural chemicals such as excess fertilizers. In this study, a neural network approach was investigated in the prediction of potential nitrate pollution across different land-use patterns by using a feedforward multilayered computer model of artificial neural network (ANN) with proper training. Periodical concentrations of some anions, especially nitrate (NO₃-), and cations were also detected in drainage waters collected from the drain pipes placed in irrigated tomato field, unirrigated wheat field, fallow and pasture lands. The soil samples were collected from the irrigated tomato field and unirrigated wheat field on a grid system with 20 m x 20 m intervals. Site specific nitrate concentrations in the soil samples were measured for ANN based simulation of nitrate leaching potential from the land profiles. In the application of ANN model, a multi layered feedforward was evaluated, and data sets regarding with training, validation and testing containing the measured soil nitrate values were estimated based on spatial variability. As a result of the testing values, while the optimal structures of 2-15-1 was obtained (R²= 0.96, P < 0.01) for unirrigated field, the optimal structures of 2-10-1 was obtained (R²= 0.96, P < 0.01) for irrigated field. The results showed that the ANN model could be successfully used in prediction of the potential leaching levels of nitrate, based on different land use patterns. However, for the most suitable results, the model should be calibrated by training according to different NN structures depending on site specific soil parameters and varied agricultural managements.

Keywords : artificial intelligence, ANN, drainage water, nitrate pollution

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