Runoff and sediment yield prediction for Chambal basin using artificial neural network and regression analysis

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ABSTRACT

Assessment and inventory on soil erosion hazard are essential for formulation of effective soil conservation plans of a watershed for sustainable development. The modern information technology tools like artificial neural network (ANN) and traditional methods like multiple linear regression analysis with easily available hydrologic parameters can provide a more accurate and practical prediction of runoff and sediment yield. In the first ANN model the neural network was trained with catchment area and annual rainfall as input and estimated runoff as the desired output. The best ANN architecture was selected on the basis of mean absolute error, mean square error and maximum correlation coefficient. The ANN architecture 3-4-1 (three four and one neurons in the input, hidden and output layers respectively) was found best in training and testing. In the second ANN model network were trained with catchment area and annual rainfall as input and estimated sediment yield as the desired output. The ANN architecture 3-6-1 was found as best in this case. Same data set, which was used in ANN, was used for developing multiple regression (MREG) models and also for validation. The results compare the prediction of runoff and sediment yield through multiple regression equations and ANN method. Performance evaluation analysis indicated that prediction ability of artificial neural network model is better than multiple non linear regression model.

Key words: Regression, Neural network, Runoff, Sediment yield