

SIMULATION OF SOIL MOISTURE REGIME AND YIELD IN THE CROPPED FIELDS

by

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Department of Civil Engineering

Submitted
in fulfilment of the requirements of the degree of Doctor of Philosophy
to the



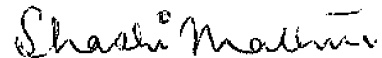
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Certificate

This is to certify that the thesis entitled, "**Simulation of Soil Moisture Regime and Yield in the Cropped Fields**" being submitted by **Rakesh Kumar Gupta** to the Indian Institute of Technology, Delhi for the award of the degree of **Doctor of Philosophy** is a bonafide record of research work carried out by him under my supervision and guidance. The thesis work, in my opinion, has reached the requisite standard fulfilling the requirement for the degree of the **Doctor of Philosophy**.

The results contained in this thesis have not been submitted, in part or full, to any other University or Institute for the award of any degree or diploma



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(Rakesh Kumar Gupta)

Abstract

The plant growth and crop yield are closely related to soil water than any other meteorological parameter, hence estimation of soil water status is a very important component of crop modelling. The present study is conducted in two parts. In the first part of the study, a soil-water flow model is developed to predict water uptake by wheat crop during its growth season. In the second part of the study, the soil hydraulic conductivity is determined by applying the Artificial Neural Network technique. The rainfed wheat crop yield is then determined using the Radial Basis function network and the model is validated using field data. A two dimensional equation for flow through saturated-unsaturated porous media is coupled with a sink term for water uptake by plant roots and solved numerically to compute the spatial and temporal variations of moisture content in the flow domain and the water uptake by roots of wheat crop. The role of ANN's in estimation and prediction of the hydraulic conductivity of soil and crop yield has also been examined. A Radial Basis Function. (RBF) network is used to estimate the hydraulic conductivity and the rainfed wheat yield. The values of the hydraulic conductivity estimated by ANN are then compared with those obtained by a multi-linear regression analysis. The values obtained by the RBF network gave better results as compared to those by the multi-linear regression analysis. Later, a RBF network is also developed to predict the yield of wheat. The results are compared with the actual yield. The comparison of results show that ANN performs satisfactorily and could be a method which can be used for predicting yield of crops.

2.4.1	Model Without Considering the Extraction Term:	60
2.4.2	Model Considering the Extraction Term	69
Chapter 3	Estimation of Hydraulic conductivity and Crop yield Using Neural Networks	
3.1	Hydraulic conductivity	89
3.1.1	Introduction	89
3.1.2	Review of Literature	90
3.1.3	Methodology	95
3.1.4	Results and Discussion	104
3.2	Estimation of Wheat Crop Yield	109
3.2.1	Review of Literature	109
3.2.2	Methodology	114
3.2.3	Results and Discussion	115
Chapter 4	Summary and Conclusions	
4.1	Summary	119
4.2	Conclusions	122
	References	123
Appendix 1	Details of Root Growth Functions	139
Appendix 2	Regression Used for Estimation of Hydraulic Conductivity	143