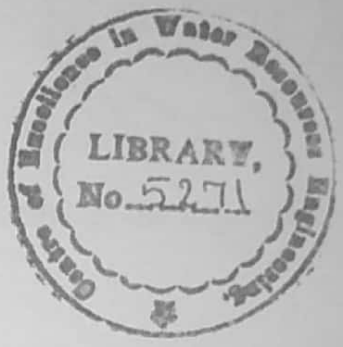
THESIS

SIMULATION OF SOIL WATER FLOW IN THE UNSATURATED ZONE USING SWATRE MODEL FOR OPTIMAL WATER TABLE REGIME



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For the Degree of:

MASTER OF PHILOSOPHY

IN

HYDROLOGY

CENTER OF EXCELLENCE IN WATER RESOURCES ENGINEERING

UNIVERSITY OF ENGINEERING AND TECHNOLOGY

LAHORE, PAKISTAN.

1995

ABSTRACT

The most of cropped area in pakistan is irrigated. Due to excess irrigation the problem of waterlogging and salinity has occurred. To control this problem there is need of optimal drainage design. For a best drainage design the optimal water table regime is required. For an optimal water table regime the soil hydraulic properties needs to be studied.

For the soil moisture and salt movement in the unsaturated zone transient flow models (i.e., SWATRE) are used extensively. Transient one dimensional model SWATRE was used for simulating soil water flow in the unsaturated zone with drainage design incorporation. The model was calibrated for FESS area. The calibration was done for wheat season only. For model calibration and simulations a lot of input data is required. The soil hydraulic properties and bare soil evaporation was determined and then used as input data in SWATRE model.

The simulations were done for 12 year period to develop a better drainage design criteria by having an optimal water table regime. The model was tested with no drainage option., the results showed that most of the time the crop remains under stress due to too wet conditions. Then model was run for different drainage combinations in

terms of drain spacing, S, and depth to the drain below ground surface, B. The final result showed that only combination three(S = 230 m and B = 300 cm) gave rather better results.

The SWATRE model was also used to analyze the affects of water management options. The different management options (i.e., Controlled irrigation and/or Controlled drainage) were introduced to get best drainage design combination in term of optimal water table regime and optimal crop growth. With irrigation management option it resulted that the combination 5 (S= 460 m and B= 250 cm) gives as best results as combination 3 (S=230 m, B= 300 cm) without management options. The increased drain spacing with management options will result in substantial reduction of drainage project costs. The management options also result in better soil water regime in the soil profile. So it was concluded that by introducing management option crop growth was increased and drainage project cost was decreased in term of increased drain spacing.

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