

PREFACE

A prime requirement for successfully irrigated agriculture is the development and maintenance of a soil zone in which the moisture oxygen salt balance is favourable for plant growth. Plant requires both moisture and oxygen to live. The soil moisture deficiency is abated through irrigation and the oxygen deficiency is done away with by providing drainage facilities in the agriculture field. The proper balance between soil moisture and oxygen is maintained to a considerable extent by providing adequate drainage. A simple but comprehensive definition of adequate drainage is the removal of excess water and salt from the soil at a rate which will permit normal plant growth. Drainage can be either natural or artificial. Most lands have some natural surface and sub-surface drainage. When natural drainage is inadequate to handle the water reaching the land by either natural or artificial means, manmade or artificial drainage is required. Artificial drainage can supplement existing natural drainage systems. In humid area where salt movement into the root zone is not a problem, shallow, closely spaced drains provide a rapid lowering of the water table. In arid irrigated areas, the water table is usually at greater depth and starts rising as a result of rains and early irrigations. This rising watertable can be saline and if allowed to permeate into the root zone, will affect both seed germination and plant growth.

This manual describes in detail the surface and subsurface drainage systems, parameters needed for design of surface drainage and subsurface drainage systems and laboratory and field investigations needed for design. Application of unit hydrograph technique for estimation of design flood, derivation of design unit hydrograph, estimation of direct runoff from storm rainfall by SCS method and time area method of discharge estimation have been described. For subsurface drainage system, a case study of Indira Gandhi Nahar Pariyojna, Stage II at RD 838' has been taken up. The objective is to reclaim the water logged area and to prevent further water logging near RD 838' of Indira Gandhi Nahar. The study area lies on the left bank of main canal at a distance of about 130 kms. from Bikaner and about 30 kms. from Bajju town. The command area development, Bikaner has provided all the pertinent data required for the study. Based on the in-situ hydraulic conductivity of the soils of the first and second layer and particle size distribution, subsurface drainage has been designed.

A chapter has been devoted to leaching of salts. A model has been developed using Green & Ampt infiltration equations. When irrigation water having low salt concentration is applied to soil system for leaching, the solute movement from different layers have been determined using salt balance approach. The time required to fill the different layers have been estimated from

initiation of the infiltration. The variation of salt concentration with time and depth have been estimated. Break through curves have also been presented for different layers.

The draft document was presented at a Workshop held on Feb. 28-March 1st, 1995 organised by National Institute of Hydrology at Roorkee. Twenty two participants from various Central and State Govt. organisations/institutions have taken active part in two days workshop. The discussions provided valuable contributions to the subject. The draft report was also circulated to Central Water Commission, New Delhi and to Dr Bharat Singh, former Vice-Chancellor, University of Roorkee, Roorkee. The valuable suggestions received from them is greatly acknowledged.

This report is prepared by Dr.G.C.Mishra, Sc.'F', Dr.B.Soni, Sc.'E' and Sri R.D.Singh, Sc.'E' of the Institute. Dr.Sudhir Kumar, Sc.'C', Sri Vijay Kumar, Sc.'B', were associated in the design of sub surface drainage system for IGNP at RD 838'. Sri S.L.Srivastava and Sri Sanjay Mittal have conducted the field and laboratory work for measurement of saturated hydraulic conductivity. The help and technical support provided by the IGNP Staff is greatly acknowledged.



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