DRAINMOD REFERENCE REPORT

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Conservation
Service**

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National
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Texas

Drainmod

Reference Report

Methods for Design and Evaluation of Drainage-Water Management Systems for Soils with High Water Tables.

This report was prepared for the U. S. Department of Agriculture, Soil Conservation Service, by Dr. R. W. Skaggs, Professor, North Carolina State University, Raleigh, North Carolina.

PREFACE

This report was prepared for the Soil Conservation Service, United States Department of Agriculture. The purpose is to provide a guide for developing a computer simulation model for drainage - water management systems on high water table soils. The model and related methodologies presented herein were developed to facilitate the design and analysis for these systems. The methods can be used to evaluate the long-term performance of systems for surface and subsurface drainage, subirrigation, controlled drainage, and waste water application to artificially drained soils.

The materials presented in this report are based primarily on research conducted in the Biological and Agricultural Engineering Department at North Carolina State University to develop and test a water management simulation model. The methods draw heavily on the drainage and hydrology literature, and results of recent and ongoing research from several locations are utilized in the material presented. In many cases, approximate methods were favored over the so-called exact approach in the model development because of large differences in computational and input data requirements. The philosophy of the model development was to assemble the linkage between various components of the system, allowing the specifics to be incorporated as subroutines so that they can readily be modified as better methods are developed.

The report contains a detailed description of each component of the model. When possible, alternative methods for treating individual components are presented. Input data requirements are discussed and sources for the data identified. Numerous examples are given to demonstrate the application of the model and associated methodologies for design and evaluation of water management systems. The report also contains the results of sensitivity tests to determine the effect of errors in the input data on predicted design parameters. The subjects of subirrigation and seepage losses are considered in separate chapters in the report. Results of recent research to test the validity of the model were reviewed in detail and are presented as an appendix to this report. Model predictions were compared with field measurements from past drainage studies conducted in three states in addition to the specific work in North Carolina for testing the model. In general, predicted results were in good agreement with field observations and the model is judged to be suitable for application to field scale problems.

The model was developed and tested for use in humid regions. Although research to test, and, if necessary, modify the model for irrigated agriculture in semi-arid climates is currently being conducted, its application should be confined to humid regions at the present time. The methods presented herein were developed for field-sized units with parallel subsurface drains (relief drains). Lateral seepage due to a sloping landscape is not considered as an integral part of the model. This limits application of DRAINMOD to fields with slopes of less than about 5 percent. Freezing conditions are not considered in the model so its application at the present time is confined to periods when the soil is not frozen.

A concentrated effort was made to include all materials needed for development and utilization of a computer simulation model for water management systems on high water table soils. Although the resulting report is somewhat lengthy, I believe that it can be used to accomplish the stated objective.

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