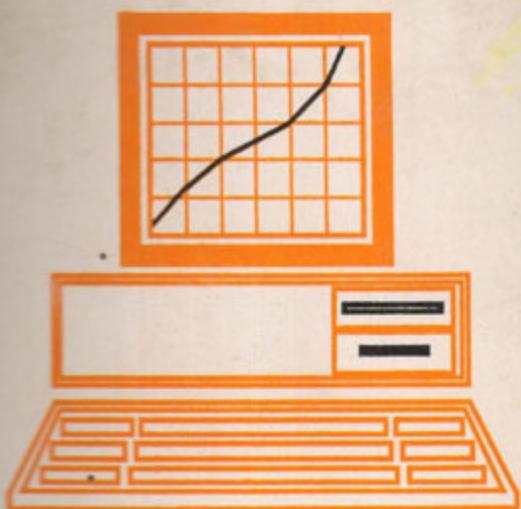


COMPUTER PROGRAMS PACKAGE FOR SOIL PHYSICS



S.K. JALOTA & ROMESH KHERA

USERS' MANUAL

**COMPUTER
PROGRAMS PACKAGE
FOR
Soil Physics**

By

S.K. Jalota Romesh Khera



**Agrotech Publishing Academy
Udaipur - 313002**

Published by :

Mrs. Geeta Soman
Agrotech Publishing Academy
1-G-24 Sector-5, (Gratri Nagar)
Hiran Magri
Udaipur – 313002 (INDIA)
Phone – (0294) 484135

First Edition 2001

© 2001 Authours
All rights Reserved

ISBN : 81-85680-41-8

Typeset by :

Dayal Computers
25, Bohraganeshji,
Udaipur - 313001

Printed at :

Printline
H-8/5, Malviyanagar,
New Delhi - 110017

Contents

Part I

Soil Physical Properties

- I *Introduction*, 1
- II *Operation*, 3
- III *Governing Equations*, 9
- IV *Input data format and examples of input and output*

State Properties, 19

- Particle density*, 19
 - Pycnometer, 19
 - Soil moisture gauge, 19
 - Submersion, 20
- Bulk density*, 20
 - Weighing bottle, 20
 - Clod saturation, 21
 - Core method, 21
 - Scoop, 22
 - Clod coating, 22
- Porosity and pore size distribution*, 24
 - By calculations, 24
 - Water desorption, 24
 - Mercury intrusion, 25
- Aggregate size analysis*, 26
 - Wet sieving, 25
- Particle size analysis*, 26
 - Hydrometer, 26
- Modulus of rupture*, 28

Soil Hydraulic Properties, 28

- Soil water content*, 28
 - Gravimetric, 28
 - Neutron probe, 29
 - Tensiometer, 30
 - Psychrometer, 30
 - Soil moisture gauge, 31

- Saturated hydraulic conductivity*, 32
 - Constant water head, 32
 - Falling head, 33
 - Auger hole, 33
 - Piezometer, 34
 - Shallow well pumpin, 34
 - Inverted auger hole, 35
- Unsaturated hydraulic conductivity*
 - Arya *et al*, 36
 - Bruce and Klute, 37
 - Campbell *et al*, 38
 - Doering, 39
 - Flocker *et al*, 40
 - Gardner, 41
 - Millington and Quirk, 42
 - Instantaneous profile, 43
 - Unit gradient, 44
- Infiltration*,
 - Ring infiltrometer, 44
 - Volume balance, 45
 - Inflow out flow, 47

Soil Aeration Properties

- Air permeability*, 48
- Gasometer, 48
- Oxygen diffusion rate, 49
- Platinum electrode, 49

Soil Thermal Properties

- Soil temperature*, 50
 - Thermocouple, 50
- Specific heat*, 50
 - Calorimeter, 50
- Thermal conductivity*, 51
 - Thermal probe, 51
- Thermal diffusivity*, 51
- Heat flux*, 52
 - Heat flux plate, 52

Solute Movement 53

- Diffusion coefficient*, 53
- Diffusion cell, 53

Dispersion coefficient, 53
Azoomgher et al, 53

Part II

Soil Hydraulic Processes

I Introduction, 59

II Governing equations, 61

III Input data format and examples of input and output, 65

Infiltration, 61

Green and Ampt Model, 61
Kostiakov model, 61
Horton model, 61
Phillip model, 61

Evaporation, 62

Evaporation from bare soil, 62

Control conditions, 62
Solution of flow equations, 62
Modified square root-time, 62
Potential evaporation based modified model, 62
Gardner model, 63
Gardner and Hillel model, 63
Ritchie model, 63
Boeston and Stroosnijder model, 63

Field conditions, 63

Zero flux plane method, 63
Idso et al method, 64
Jackson et al method, 64
water balance method, 64

Evaporation from residue covered soils, 64

Residue used as mulch in soil columns, 64
undercut soil in soil columns, 65
Residue-mulch under field conditions, 65
Residue-mix under field conditions, 83
Residue-undercut soil field conditions, 86

Evaporation from tilled soil, 89

involving liquid and vapour flow, 89
involving vapour flow only, 89
A model for field conditions, 89

Drainage, 92

Richard's *et al*, 92

Annexure I, 95

List of example input data files, 95
contained in the floppy disk, 95

PART - I

SOIL PHYSICAL PROPERTIES

INTRODUCTION

Soil is a medium for plant growth. Its suitability depends not only upon quantity-intensity relation of nutrients, the *chemical fertility*, and absence of toxicity but also upon the state and mobility of water, air and thermal regime, the *physical fertility*. Both the attributes are essential for overall soil productivity. The physical fertility is defined, quantified and optimized by manipulating the physical properties/processes of soil. These properties/processes are evaluated many a times by one or the other method suitable to the researcher. With the advent of computer era, scientific advancement in the subjects has become simulation intensive in all fields of science. Like wise in soil science too a number of physical processes are being simulated, wherein calculations are tedious, time consuming and mistakes are often made. To check this, a package of computer programs named 'SPIF' has been developed which computes different soil physical parameters viz., state, water retention and transmission properties, soil aeration, and thermal properties, and nutrient diffusion and dispersion and the physical processes namely infiltration, evaporation and drainage using data collected by different methods.

The solutions of the methods/models have been written in Fortran language and compiled. The program package is very simple to run on an IBM compatible PC/PC-XT/PC-AT and PENTIUMS as it is menu based and interactive. To facilitate the use of this package a users' manual has been prepared. This has four chapters in part-I (Soil Physical Properties) and three chapters in part-II (Soil Physical Processes). In part-I, chapter 1 is introduction. Installation and operation of the software are given in chapter 2. Chapter 3 comprises of the governing equations used for calculations of the physical parameters. In chapter 4, input data format and examples of input and output files for soil physical properties are given. In part-II, chapter 1 is introduction. Governing equations for the physical processes are given in chapter 2. Chapter 3 contains input data format and examples of input and output files for hydraulic processes to help the users to run their own data with confidence. Along with the manual the programs package is provided on a floppy diskette which contains execution files and example input data files.

This software will be very useful to modelers, researchers and students working in the field of soil physics, agronomy, soil water engineering for evaluating physical parameters/processes.

II

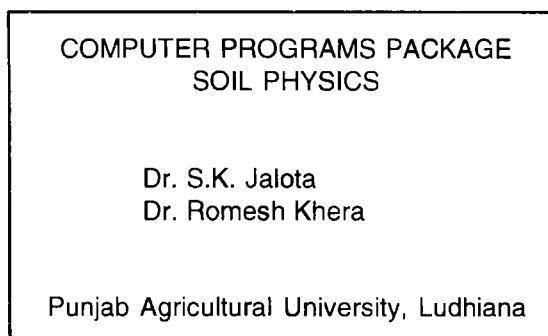
OPERATION

II.1 Operation

- a) To execute the package from the floppy, perform the following steps.
 1. Power on and boot up the system.
 2. Insert the programs package floppy in floppy drive and change the default drive to floppy drive (A or B) having the program disk.
 3. At the DOS prompt type SPIF1 and press 'Enter'.
 4. Follow the instructions displayed on the screen.

- b) To execute the package from the hard disc perform following steps.
 1. Power on and boot up the system.
 2. Create a directory SPIF on 'C' drive
 2. Change the default directory to SPIF.
 3. Copy the program execution files from the floppy disk on 'C' drive
 4. At the DOS prompt type SPIF1 and press 'Enter'
 4. Follow the instructions displayed on the screen.

The display on screen will be

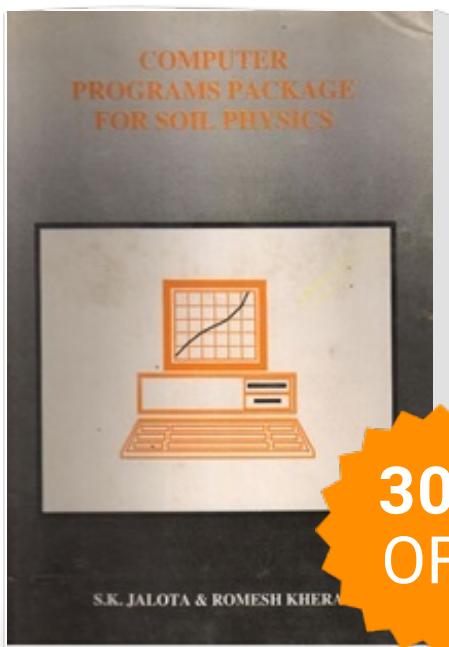


Note : Please see Users' manual for data input

Press "Enter" to continue

The next display will be as follows

Programmes Package for Soil Physics



30%
OFF

Publisher : Agrotech
Publications

ISBN : 9788185680415

Author : SK Jalota

Type the URL : <http://www.kopykitab.com/product/6944>



Get this eBook