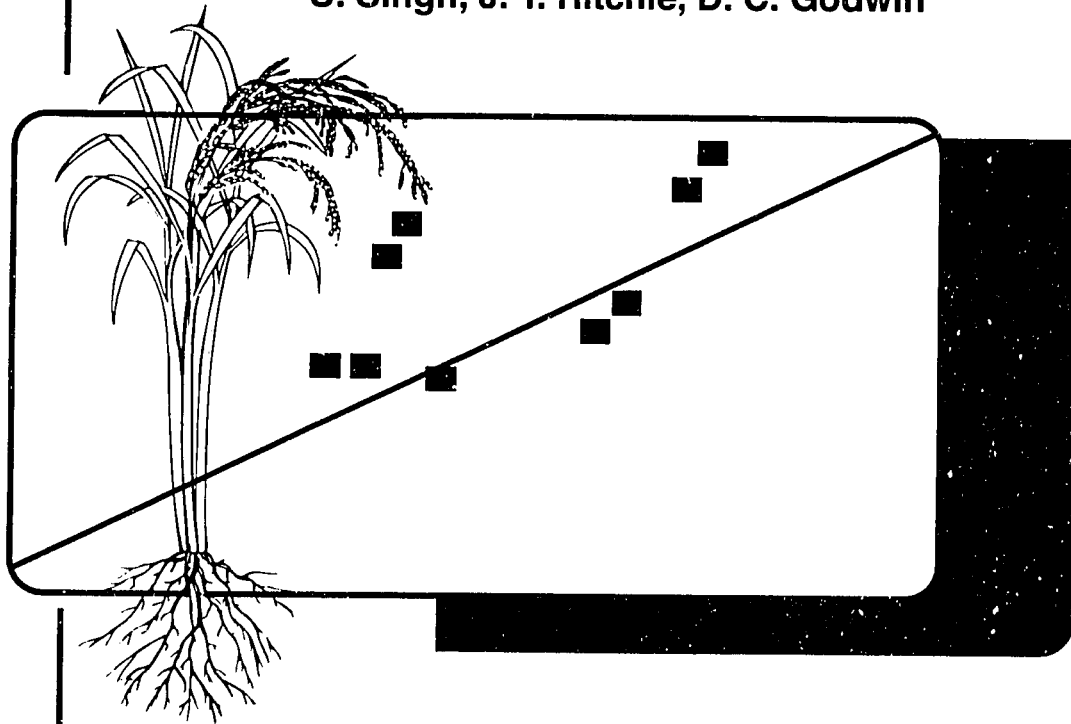


A User's Guide to CERES Rice - V2.10

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- Files in "1a. CERES RICE V2.10 Source Code" diskette.
- Files in "2. CERES RICE V2.10 DATA" diskette.
- Files in "3. CERES RICE V2.10 INPUT" diskette.
- Files in "4. CERES RICE V2.10 GRAPHICS" diskette.
- File "RIEXP.DIR"
- File "IRPI0112.W85" (for the first 30 days only).
- File "WTH.DIR"
- File "SPROFILE.RI2"
- File "IRPL8501.RI8"
- File "IRPL8501.RI0"
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CHAPTER 1

Model Overview

CERES RICE V2.10 is a process-oriented, management-level model of rice (*Oryza sativa* L.) crop growth and development that also simulates soil water balance and nitrogen balance associated with the growth of rice under both upland and lowland conditions. The model is capable of simulating crop establishment from dry sowing, pregerminated seeding to transplanting. It is a daily-incrementing, user-friendly, menu-driven model written and compiled in Microsoft FORTRAN V4.01 and QuickBASIC V4.0. It may be run on an IBM or IBM-compatible microcomputer with a floppy-disk or a hard-disk system. A version of the model can also be run on the Vax system. It has been developed by an interdisciplinary team of scientists from Michigan State University, the International Fertilizer Development Center (IFDC), and the University of Hawaii. Dr. Joe T. Ritchie of Michigan State University has coordinated the development. The current version of the model was primarily developed by the modelers at IFDC (Godwin and Singh, 1991; Godwin et al., 1990; Buresh et al., 1991). Model development has been an ongoing process since 1985. An earlier version of the model has been described by Ritchie et al. (1987). A more complete documentation of the current version of the model is in preparation. Additional information on testing and applications of the model has been cited in Singh et al. (1991) and Jintrawet (1991).

The model uses a minimum of readily available weather, soil, and variety-specific genetic inputs. To simulate rice growth, development, and yield the model takes into account the following processes:

- Crop development, especially as it is affected by genotype and weather. The model simulates the effects of photoperiod and temperature on the timing of panicle initiation and the duration of each major growth stage. Provision has been made within the model to calculate an effect of transplanting shock on crop duration.
- Extension growth of leaves, stems, and roots.
- Biomass accumulation and partitioning, especially as phenological development affects the development and growth of vegetative and reproductive organs.
- Water balance that simulates the daily evaporation, runoff, percolation, and crop water uptake under fully irrigated conditions, rainfed conditions with intermittent flooding and drying, and fully upland conditions where the soil is never flooded.
- Soil nitrogen transformations associated with mineralization/immobilization, urea hydrolysis, nitrification, denitrification, ammonia volatilization, losses of N associated with runoff and percolation, and uptake and utilization of N by the crop.

In recent years, the International Benchmark Sites Network for Agrotechnology Transfer (IBSNAT)¹ project has incorporated crop models into its program for international agrotechnology transfer. This

1. IBSNAT is a program of the U.S. Agency for International Development implemented by the University of Hawaii, under Contract No. AID/DAN-4054-A-00-70-81-00.

project uses models of several different crops, which has required the adoption of a standard format for inputs and outputs from the models. CERES RICE V2.10 is a member of a family of models that use the minimum data set as specified by IBSNAT (1988) and the input and output structures described in Technical Report 5 (IBSNAT, 1990 VI.1). Other members of the CERES family are MAIZE, SORGHUM, PEARL MILLET, BARLEY, and WHEAT. The adoption of standardized model inputs and outputs has also led to the incorporation of a graphics package developed at the University of Florida (Jones et al., 1988). This graphics package facilitates interpretation of model outputs.

CERES RICE V2.10 has all the features of other CERES models. However, it differs from previously documented CERES models in the following areas:

1. The number of model input files and output files have been increased. CERES RICE has an additional input file for floodwater and transplanting data - file 0 (e.g., IRPL8501.RI0). The number of output files have been increased by two - NBAL.OUT for comparing nitrogen balance at the beginning and end of simulation, and file OUT6.RI for floodwater chemistry output.
2. Additional procedures for simulating water balance under flooded conditions have been included.
3. The capacity to determine water filled pore space or oxygen deficiency has been added.
4. Bulk density function has been modified to account for changes in bulk density as a result of soil puddling and settling.
5. The model is sensitive to fluctuating watertable depths.
6. Soil nitrogen transformation procedures have been modified to handle transformations under fully upland conditions, fully flooded, and intermittent wetting and drying conditions.
7. As well as monitoring N changes in soil layers the model deals with two additional compartments - floodwater and oxidized thin layer under flooded conditions.
8. The capacity to simulate ammonia volatilization losses has been added.
9. Modifications to the genetics file input to accommodate the wide range of temperature sensitivities exhibited by rice cultivars.

CHAPTER 2

System Components

The CERES RICE package consists of three main components.

Program and Data diskettes provide the following options (see Chapters 5, 6, and 10):

1. Single-year simulation.
2. Multiple-year simulation.
3. Sensitivity analysis (see Chapter 11).
4. Display of detailed model output on the screen.

Simulation Model

The Graphics diskette allows the following model outputs to be plotted on the screen and thus facilitates interpretation of these outputs (see Chapters 7 and 10).

1. Crop variables.
2. Weather and soil variables.
3. Soil and plant nitrogen variables.
4. Harvest variables.

Graphics Program

The Input Editor may be used to create input files for the model (see Chapter 9).

Inputs Program

CERES RICE V2.10 can be run in either a stand-alone mode or as a component of the Decision Support System for Agrotechnology Transfer (DSSAT). The DSSAT can be obtained from the IBSNAT Project, University of Hawaii.

CHAPTER 3

System Requirements

CERES RICE V2.10 was developed using an IBM AT microcomputer, DOS 3.2, Microsoft² FORTRAN V4.01, and Microsoft Quick BASIC V4.0. The model runs fastest on AT-equivalent machines with an 80287 or 80387 coprocessor and a clock speed of 8 MHz or faster, and with all input and output files and executable code located on a hard-disk drive. The model also runs on an IBM or IBM-compatible personal computer that uses a dual floppy disk drive and has a minimum memory capacity of 256K. However, this configuration has some limitations.

Both the FORTRAN and BASIC section of the CERES RICE model require DOS version 2.0 or higher. The graphics display component requires a personal computer (PC) with a graphics adapter (IBM Color Graphics Adapter [CGA] or Enhanced Graphics Adapter [EGA] or equivalent) and color or monochrome graphics monitor with either a CGA or EGA screen resolution. The graphics section of the model will not operate with a Hercules graphics card. If the graphics display option is not required, the model will operate effectively on PC's that do not have graphics adapters.

A 256K system has enough memory for approximately five runs per session. If the user exceeds this capacity, the system will come to a halt in the graphics portion while reading the output files generated by the model. If the system aborts because of insufficient memory, the user must reboot the system.

When a dual floppy disk system is used, the amount of storage on the diskettes is limited. The user must allow room on drive B: (Data Disk) for the output files created by the model and a work file for graphics display. The size of the files depends upon the number of runs and the total number of days simulated in the output files. Options exist in the model to reduce output frequency, which will in turn reduce the size of output files created by the model. A dual-floppy system can accommodate about ten simulation runs in each session when output frequency is to 7 days. This is a default setting; with more frequent output, fewer runs can be accommodated. If the user exceeds the amount of space available on the diskette, the graphics program will give an error "NOT ENOUGH SPACE FOR RANDOM WORK FILE."

The CERES RICE model will run on all IBM PC's, XT's, AT's, and true compatibles. We have successfully run CERES RICE on the IBM PC, IBM XT, IBM AT, IBM PS/2, COMPAQ, Toshiba, Multitech, Zenith, Cordata PC 400, and Bentley microcomputers that meet the minimum requirements described above.

2. Microsoft Corporation, 10700 Northup Way, Bellevue, WA 98004.

CHAPTER 4

Getting Started

CERES RICE V2.10 is supplied on five floppy diskettes: (1) Program, (1a.) Source Code, (2) Data, (3) Input Editor, and (4) Graphics. A directory of each of these diskettes is provided in Tables 1, 2, 3, 4, and 5, respectively. Before proceeding further, insert the diskettes, one by one, into drive A: to obtain the directories. If all the directories match the ones in Tables 1-5, you may proceed. If there are differences, such as missing files, please contact the suppliers of the model before continuing.

An install program is included to help you install CERES RICE V2.10 on your computer. If you are using a dual-floppy disk drive, the install program will require you to copy the following five floppy diskettes: 1. CERES RICE V2.10 PROGRAM, 2. CERES RICE V2.10 DATA, 3. CERES RICE V2.10 INPUT, 4. CERES RICE V2.10 GRAPHICS, and 1a. CERES RICE V2.10 SOURCE CODE onto **five** formatted diskettes. All diskettes are supplied with write-protect tabs so the model will not run with the disks you received. This is to protect your original diskettes in case your execution copies are lost or damaged in some way. Please label your copied diskettes the same as the original diskettes. If you plan to run CERES RICE from the diskettes, then the Program, Input, and Graphics diskettes must contain the system file COMMAND.COM. If you run CERES RICE from your hard disk, you will not have to create these system diskettes. The step-by-step procedures for installing CERES RICE to run on floppy diskettes and on hard-disk systems are given in Chapters 5 and 6, respectively.

When your microcomputer is booted (first turned on or when DOS is loaded), a file called CONFIG.SYS is used to establish the characteristics of the computer.

The file CONFIG.SYS should have the following three lines:

```
DEVICE = ANSI.SYS
FILES = 20 (or more)
BREAK = ON
```

This is an important file, and the model will not run unless it is on your system disk (floppy or hard disk). The install program will create this file for you or, if it already exists, modify it to include the above statements. ***If these changes to your CONFIG.SYS file will conflict with other application programs, you can enter these statements at the DOS level before running the model. An unmodified version of your CONFIG.SYS file will be in CONFIG.OLD.***

In summary, if you plan to use a two-diskette system to run CERES RICE, you should follow the steps in Chapter 5 and your copy of floppy diskettes No. 1, 3, and 4 (Program, Input, and Graphics) should contain the following files in addition to the ones supplied to you: COMMAND.COM and ANSI.SYS and, for the Graphics diskette, GRAPHICS.COM. If you use a hard-disk system to run CERES RICE, these files should be on your hard disk with your operating system.

CHAPTER 5

Running CERES RICE on a Two-Diskette System

To run CERES RICE on a two-diskette system, three of the five diskettes must be system diskettes; that is, they must first be formatted with the /S option (see below). Then, you must copy ANSI.SYS from your DOS diskette to each of these three diskettes (Nos. 1, 3, and 4). You must also copy GRAPHICS.COM from your DOS diskette, to the fourth diskette (labeled "4. CERES RICE V2.10 GRAPHICS").

You need a total of five blank diskettes. Follow this step-by-step procedure for formatting your diskettes and installing the CERES RICE model:

1. Insert your DOS system diskette (Version 2.0 or higher) into drive A:. Turn on the power to start the system.
2. Insert a blank diskette (No. 1) into drive B:.
3. Enter:
FORMAT B:/S
N (In response to "Format another (Y/N)?")
COPY A:ANSI.SYS B:
4. Remove the diskette from drive B: after formatting is complete.
5. Label the new diskette from drive B: "**1. CERES RICE V2.10 PROGRAM.**"
6. Insert a blank diskette (No. 2) into drive B:.
7. Enter:
FORMAT B:
N (In response to "Format another (Y/N)?")
8. Remove the diskette from drive B: after formatting is complete and label it "**2. CERES RICE V2.10 DATA.**"
9. Insert a blank diskette (No. 3) into drive B:.
10. Enter:
FORMAT B:/S
N (In response to "Format another (Y/N)?")
COPY A:ANSI.SYS B:
11. Remove the diskette from drive B: after formatting is complete.
12. Label the diskette from drive B: "**3. CERES RICE V2.10 INPUTS.**"
13. Insert a blank diskette (No. 4) into drive B:.
14. Enter:
FORMAT B:/S
N (In response to "Format another (Y/N)?")
COPY A:GRAPHICS.COM B:
COPY A:ANSI.SYS B:
15. Remove the diskette from drive B: after formatting is complete.
16. Label the diskette from drive B: "**4. CERES RICE V2.10 GRAPHICS .**"

17. Insert a blank diskette (No. 5) into drive B:.

18. Enter:

FORMAT B:

N (In response to "Format another (Y/N)?")

19. Label the diskette from drive B: "**1a. CERES RICE V2.10 SOURCE.**"

To install CERES RICE, complete the following steps:

1. Insert the provided "**1. CERES RICE V2.10 PROGRAM**" diskette (No. 1) into drive A:.
2. Enter:
A:RIINS
3. Follow the autoinstall procedure on the screen.

To run CERES RICE V2.10 using the copies you have created:

1. Insert "**1. CERES RICE V2.10 PROGRAM**" diskette into drive A: and "**2. CERES RICE V2.10 DATA**" diskette into drive B:.
2. Turn on the power to the computer or reboot the system by pressing and holding the <CTRL> and <ALT> keys and then pressing the key and releasing them all.
3. To start the CERES RICE program, enter:

HELPRI

or

MRI1

4. After the simulation is finished, you will be prompted to replace the Program disk (No. 1) with the Graphics disk (No. 4) to run the graphics section of the model. Press any key to continue.

You will be prompted to select items from screen menus to simulate rice growth and yield. An example run is included in Chapter 10.

Should use of the source code be desired, insert the original source diskette in drive A: and the blank formatted diskette (labeled **CERES RICE V2.10 SOURCE CODE**) in drive B: and enter:

COPY A:\SOURCE*. * B:

CHAPTER 6

Running CERES RICE on a Hard-Disk System

If you plan to use the CERES RICE model as part of IBSNAT's DSSAT package, please refer to the install procedure in the DSSAT User's Guide (IBSNAT, 1989). The step-by-step procedure for setting up the stand-alone version of the model on your hard disk is as follows:

1. Start the system. If the system power is off, turn on the power. If the system is on, press and hold the <CTRL> and <ALT> keys, then press key, and then release them all to reboot the system.
2. Insert the provided "**1. CERES RICE V2.10 PROGRAM**" diskette (No. 1) into drive A:.
3. Enter:

A:RIINS

4. Follow the autoinstall procedure on the screen.
Note: The install program will modify your CONFIG.SYS file. It will save the unmodified version in CONFIG.OLD.

After installing the model in subdirectory RICE, you are ready to run the model by simply entering HELPRI or RICE. After this, whenever you start the computer to run the model, use the following steps:

1. Turn on the computer.
2. Enter:

HELPRI

You will be prompted to select items from screen menus to simulate rice growth and yield. An example run is included in Chapter 10.

CHAPTER 7

System Setup for CERES RICE Graphics

The first time the RICE graphics are run, the system will prompt you to enter your system setup. The computer will ask the following questions:

1. **"The drive and path of graphics program?"**

If you are on a two-floppy disk system, enter: "A:".

If you are on a hard-disk drive system, enter "C:" or appropriate drive and pathname \RICE.

2. **"Which data drive contains the selected data?"**

If you are on a two-disk drive system, enter: "B:".

If you are on a hard-disk drive system, enter: "C:" or the appropriate drive.

3. **"Enter graphics option:"**

Set your monitor type and graphics adapter card as follows. Note: The graphics section will not work on a system with a HERCULES graphics card.

Graphics Options Available

[1] - CGA-LOW - 320 x 200 pixels, 3-color graph

[2] - CGA-HIGH - 640 x 200 pixels, monochrome graph (HERCULES NOT AVAILABLE)

[3] - EGA-LOW - 640 x 200 pixels, 6-color graph, requires EGA

[4] - EGA-MED - 640 x 350 pixels, 3-color graph, requires EGA

[5] - EGA-HIGH - 640 x 350 pixels, 6-color graph, requires EGA & 128 video memory

Enter the graphics option appropriate to your setup and preferences. The greater the number of pixels, the higher the resolution on the screen:

CGA is Color Graphics Adapter or regular color graphics;

EGA is Enhanced Graphics Adapter or higher resolution graphics.

If you enter the wrong option for your graphics setup, the program will abort. You can reset your graphics definitions by deleting file "SETUP.FLE" from either the Graphics disk (No. 4) or your hard disk (see Chapter 8). This file will be recreated when you repeat steps 1 and 2.

4. **"Would you like to save disk drive and graphics option for future runs (Y/N)?"**

If you answer "Y" to this question, you will not be asked the system setup questions again and a file "SETUP.FLE" will be created. If you answer "N" to this question, the program will repeat the system setup questions each time the graphics option is run. To change the system setup after you have answered "Y" to the setup question, delete the file "SETUP.FLE".

CHAPTER 8

Problems

Many types of microcomputers are available, and we have not been able to test the simulation model CERES RICE V2.10 on all systems. If the model does not work after you have created your floppies, please check the instructions given in Chapters 5 and 6. Most probably, the original disks will not run on your system because they do not include the required system files. Make sure that your "Program disk," "Input disk," and "Graphics disk" have a COMMAND.COM file. Make sure that you have at least 256K of memory available and that you do not have any resident programs which use additional memory. Go through the copying/install process once more to check that you followed all the instructions correctly. If your system is "IBM compatible," please inform the authors about your problems. Make a copy of your error message and clearly describe the type of system you have: brand name, model type, amount of memory, video display, graphics card, printer, type and version of operating system, and any other information that can help us determine your problems.

If the model executes but aborts during the real-time running process, reboot the system and start again. If the same error occurs, try to choose a different experiment and treatment for the next run. If the model continues to abort, please make a screen dump of the error message, follow the above instructions, and contact the authors.

If the model operates correctly but the graphics section does not work, check to see that you have a graphics board in your system. To be able to plot the results to the screen, a color graphics or monochrome (not HERCULES) graphics board is needed. Follow the instructions given above and if the same error continues, contact the authors.

Possible errors which could occur:

1. You are using the wrong operating system.
2. Your machine is not a true "IBM-compatible" microcomputer.
3. Not enough memory is available to execute the model section of CERES RICE.
4. No CONFIG.SYS file is defined in your system.
5. Not enough disk space is available on either your floppy disk or your hard disk to run the model.
6. Not enough memory is available to execute the graphics section of CERES RICE.
7. No graphics card is present in your microcomputer.
8. You have a HERCULES graphics card.
9. You used the wrong setup when you first defined your system in the graphics section of the model (see Chapter 7).
10. Your program disk is not placed in disk drive A:, and your data disk is not placed in disk drive B:.
11. Some files are missing on your disks; in this case, check your original disks or request another set of original disks from the authors.

If any of the errors mentioned above occur during the execution of the program, please reread the instructions in the user's manual. We would like to know of any problems or errors that might occur as you run the model.

CHAPTER 9

Procedures to Add New Experiments for Simulation

There are three ways that input data files can be created for running CERES RICE V2.10. The recommended procedure is to create the files directly from the IBSNAT minimum data set after the experimental data have been entered (IBSNAT, 1988, 1986b). (Contact IBSNAT³ directly for software for minimum data set entry and data retrieval for the crop simulation models.) The files can also be created (a) by using a text editor (word processor) on the PC or (b) interactively by using the INPUT program supplied. The formats for the files (Files 1-9 and Files A and B) are documented in Technical Report No. 5 (IBSNAT, 1990 VI.I), and an additional file—file 0, required by the rice model is documented in Appendix A. The IBSNAT Data Base Management system (DBMS) is a powerful system that provides the user with other applications in addition to the creation of files for these crop models. IBSNAT's DBMS program also provides the capacity for recording all experimental details (by plot), some statistical analysis, and plotting of experimental results.

Single-Year Manual Creation of Files

In creating each of the files indicated below, refer to IBSNAT Technical Report 5 (IBSNAT, 1990 VI.I) for the formats. The new files must use these formats or they will not work correctly.

1. Add a 4-line entry to file RIEXP.DIR to indicate to CERES RICE that a new experiment is available for simulation (see Table 6 where an example is highlighted).
2. If the experiment was performed in a new weather year or site, create a new weather data file (i.e., IRPI0112.W85; see Table 7) and add one entry to file WTH.DIR to indicate its availability (see Table 8 where an example of a possible new entry is highlighted). For further details on naming your new weather data file, refer to IBSNAT (1990 VI.I). Make sure weather data are available for the whole range of days for which you want to run your simulation because the model requires daily weather data. It checks for missing and negative data entries (for solar radiation and rainfall, and temperature only if -99) and will give the user a warning if the data do not match the required input formats.
3. If a new soil type is used, add a new set of data to file SPROFILE.RI2 (see Table 9). If the data for the soil at the experimental site are already in SPROFILE.RI2, then there is no need to add the soil again. The soils should each have a unique number in the file. IBSNAT has developed a special soil data entry program (IBSNAT, 1989) to generate the parameters required for a particular soil type. The minimum characteristics needed are soil series name, soil family name, % sand, % silt, % clay, % organic carbon, % stoniness, wet bulk density, and pH for each horizon. These

3. IBSNAT Project, Department of Agronomy and Soil Science, College of Tropical Agriculture and Human Resources, University of Hawaii, 2500 Dole Street, Krauss Hall 22, Honolulu, Hawaii 96822.

data can be obtained from the Soil Conservation Service (SCS) database in Lincoln, Nebraska (contact the authors of the model or IBSNAT to check whether your particular soil type is available), your local or state SCS representative, or your local soil laboratory. *Note: The soils used by the rice model (soil numbers 15 upwards) have an additional variable at the end of line 2 of each soil—the CEC of the surface layer.*

4. Create file _____.RI8 with a two-line entry for management variables for each treatment. If there are five treatments, then there are 10 lines in this file. The file name designated by _____ should have eight characters and be named according to IBSNAT (1990 VI.1). For example, IRPL8501 is FILE8 for institute "IR", site "PL", year "85", and experiment "01" (Table 10).
5. Create file _____.RI0 only if lowland flooded rice (IIRR > 5 in file 8) growth is simulated. The first line entry for each treatment is for management variables dealing with transplanting date, plant population, seed age, etc. (Appendix A). On the following lines floodwater and water-table data, both terminated by a "-1" are entered (Appendix A). See example file IRPL8501.RI0 (Table 11).
6. Create file _____.RI6 with all irrigation events for each treatment (Table 12). The last entry for each treatment is -1 for Julian day (IBSNAT, 1990 VI.1).
7. Create file _____.RI5 with initial soil water, nitrate, ammonium, and pH data for each treatment (Table 13). The last entry for each treatment is -1. *Note: If a sensitivity analysis is run and soil type is changed during simulation, the initial condition values will need to come from the soil profile data, not from FILE5. The number of soil layers and their thicknesses must be exactly the same as those in the soil data file SPROFILE.RI2 for that soil; otherwise the model will abort and will give you an error message.*
8. Create file _____.RI7 with all nitrogen fertilizer application dates, amounts, depths or incorporation, type of N fertilizer and method of incorporation (IBSNAT, 1988, Appendix A) for each treatment (Table 14). The last entry for each treatment is -1 for Julian day (IBSNAT, 1990 VI.1).
9. Create file _____.RI4 with a one-line entry for amount of straw residue, depth of straw incorporation, C:N ratio of straw, and amount of root residue for each treatment (Table 15). The last entry for each treatment is -1 for Julian day (IBSNAT, 1990 VI.1).
10. If there is a new cultivar, create genetic coefficient data and input into GENETICS.RI9 (Table 16). The GENETICS.RI9 data file on diskette No. 2 contains coefficients for over twenty cultivars.
11. For field comparisons, put treatment final yield data (averages) in file _____.RIA, two lines per treatment (Table 17). The following field-measured variables are entered in file _____.RIA:
 - a. grain yield with 15.5% moisture (kg/ha);
 - b. grain dry weight (g/m²);
 - c. number of grains per m² (#/m²);
 - d. number of panicles per m² (#/m²);
 - e. maximum LAI measured during the growing season (m²/m²);
 - f. total aboveground dry biomass at harvest (kg/ha);

- g. straw dry weight at harvest (kg/ha);
- h. heading date (day of the year);
- i. physiological maturity date (day of the year);
- j. grain nitrogen percent;
- k. total nitrogen uptake (kg N/ha);
- l. straw nitrogen uptake (kg N/ha); and
- m. grain nitrogen uptake (kg N/ha).

Follow the format of the example shown in Table 17 to enter data.

11. For graphical time-series analysis, put seasonal replicated growth and other measurements in file _____.RIB. An example of this file is on the Data disk, No. 2, in file IRPL8501.RIB (see Table 18). The order and the type of variables for file _____.RIB are given in the GLABEL.DAT file (Table 19). The first line defines the ID codes for institute, site, experiment number, year, and treatment. The explanation of these codes is given in IBSNAT Technical Report No. 5 (IBSNAT, 1990 VI.1).

The second line of each entry defines the growth variables that are present in the file. The numbers used in file _____.RIB should correspond to the numbers of the variables as defined in file GLABEL.DAT (Table 19). The first number on this second line defines the total number of field-measured variables defined in file _____.RIB, excluding the first column which is the day of the year. This variable is fixed, whereas the others can vary depending upon the type of data collected during the growth analysis experiment.

The following lines contain the experimental data, starting with the day of the year in the first column. Always keep at least two spaces between each column and align the data below the first input line.

After you have entered all experimental data for a particular treatment, enter a "-1" on the next line. Repeat the same setup for the other treatments of your experiment. Likewise, to graph soil water or nitrogen-related observations create _____.RIC and _____.RID, respectively. The order and type of variables for _____.RIC are given in GLABEL2.DAT (Table 20) and for _____.RID in GLABEL3.DAT (Table 21). More information is given in IBSNAT Technical Report 5.

After the files have been created, you can run CERES RICE for your experiment. The titles of your experiment and treatments will appear in the appropriate experiment and treatment selection menus when you run the model. The weather, soil, management, and cultivar data pertinent to your experiment can also be accessed via various menus which appear as you run the model. It is important to check that the variety code and the soil code you have selected are appropriate for your experiment. Errors will result if you attempt to select non-existing varieties or soils.

Sometimes the simulation model will be unable to predict your field-measured data, and the graphics representation will show a poor fit to the data points. This lack of correspondence might result from several factors, including the use of a cultivar that is not defined in file GENETICS.R19, a soil type that is not defined in file SPROFILE.R12, or an experiment or set of treatments that cannot be simulated by the model because the options (e.g., some fertility effects) are not available.

Data Entry with INPUTS Program

The INPUTS program enables you to interactively enter data from the keyboard into the appropriate files. The program is menu-driven and has an online help facility. In addition, the program incorporates a procedure for estimating inputs when the input values are not directly attainable. This estimation facility is available only for variables related to soil water and soil fertility. The INPUTS program can be used to edit existing files as well as to create new files.

For a description of the structure and format of the inputs, refer to IBSNAT Technical Report 5 (IBSNAT, 1990 VI.1) and Appendix A. The online help facility provides definitions of model inputs and guidelines for appropriate values to use.

1. Insert a blank formatted diskette into drive B: (dual floppy system) or drive A: (hard-disk system) and access the INPUTS program by either loading the appropriate diskette (disk No. 3) into drive A: or by running it directly from the hard disk.
2. Type INPUTS and follow the instructions provided by the program. At any point, if you supply an input value that is out of range, the program will make an audible "beep" and request new input values. You can get help on most variables by typing in any non-numeric character (A to Z, ? @ * & etc., with the exception of L and /). The program will respond by displaying a short help message and then prompt for new input values. If you mistype a character in a numeric field, the program will automatically display the help screen. When you have completed data entry for a file, the program will display the data you have entered on the screen and then allow you to edit these data, move to another section of data entry, or exit the program. If you make a mistake entering one data item, continue entering data until you reach the end of the file and then access the menus to change the erroneous values.
3. For weather data (FILE1) enter an appropriate file name, using the convention described in IBSNAT Technical Report 5 (IBSNAT, 1990 VI.1), and then follow the menus. Procedures are incorporated for converting some ASCII files containing daily weather data to the appropriate format. Facilities for unit conversion are also provided.
4. Enter the appropriate codes for identification of your institute, experiment site, treatment, and year of the experiment.
5. Follow the menus for entry of treatment-specific data into each of FILES 4 through 8, and file 0 if necessary.
6. If necessary, add additional soil profile data to FILE2. If you do not have all the data requested, procedures are provided within the program to estimate them from standard soil profile descriptions.

7. If necessary, add additional cultivars to FILE9 using the menu provided.
8. Update the experiment directory file.
9. Update the weather directory file.
10. Use the VALIDATE procedure to check that all inputs are present.
11. Exit the program and copy your data files to the appropriate diskettes or directories.

Multiple-Year

The data inputs and setup for the multiple-year runs are almost identical to those for the single-year runs.

1. First ensure that FILES 2 through 7 contain the data for the treatment(s) you wish to simulate. Follow the instructions for these files as above.
2. For FILE8 ---.RI8, you must add all the entries as described earlier plus a code number indicating the number of years to be simulated. This number (MULTYR) should be added at the end of the second line of data for each multiple-year treatment. The number of years can occupy a total of four spaces but must include at least one blank space before the number. An example with 3 years' (high-lighted) simulation is shown for IRPL8002.RI8 in Table 22.
3. For multiple-year runs, there must be at least MULTYR years of daily weather present. All of these weather data can be contained in one large file with one corresponding entry in the weather directory file (WTH.DIR) and with the file name specified in the experiment directory file (RIEXP.DIR). Alternatively, smaller weather files, each with 1 year's data, can be used. In this case the name of the first weather file in the sequence must be entered into both RIEXP.DIR and WTH.DIR. When the model comes to the end of the first file, it will automatically look for the next year's weather data in your current disk directory. It is, however, a good practice to enter all the weather file names into the WTH.DIR file to provide a ready reference as to which weather data sets are available. If you wish to simulate crops for which planting dates are toward the end of the year, so that the crop growth period spans calendar years, you must ensure that there is sufficient weather data present for the last crop to reach the end of its growing period.

Suppose, for example, that a multiple-year simulation were to commence in 1959 and run for 20 years. You could set up either a large file with 20 years of weather data, e.g., IRPL0112.W59, or 20 smaller files, e.g.,

```
IRPL0112.W59
IRPL0112.W60
.....
.....
IRPL0112.W78.
```

In the latter case, only IRPL0112.W59 would need to be entered into the RIEXP.DIR and WTH.DIR files.

CHAPTER 10

Example Simulation

The examples that follow are designed to demonstrate the model operation for single-year simulation, multiple-treatment run, and multiple-year simulation. The users should compare their simulation results with the screen output results presented here. The single-year example run was made by selecting the first experiment (IRRI, PILA JAN 85 urease inhibitors) and the fifth treatment in that experiment (60 kg N as urea [2/3 18DT 1/3 38DT]). Remember that to have the graphs which are displayed on the screen printed to your printer you need to have the file GRAPHICS.COM on your disk and an IBM-compatible printer appropriately connected to your PC. To run the model, type **HELPRI** and follow the onscreen menu as illustrated below. The action required by the user is highlighted thus **█** in the following presentation. When you run the model, the highlighting will not appear.

Computer Sample Screen

CERES RICE MODEL VERSION 2.10

OPTIONS:

1. Run the rice model. Type "MRI1".
2. Input data to be used with the model.
Type "INPUT".
3. Graph the results of the model run.
If you want a hard copy of the graphs,
run GRAPHICS.COM before running the graph.
To graph results, type "GRAPH".

Computer Sample Screen

Welcome to the C E R E S R I C E model Version
2.10 for upland and lowland rice.
Version 2.10 incorporates new menu structure
and support for multi-year and multi-treatment runs.
Version 2.10 also provides output support for IBSNAT
graphics and DSSAT Strategy Application.

Press <ENTER> key to continue

Single-Year Simulation

The first screen presented is the main screen showing experiments available for simulation. In the example on diskette, the first four experiments are for single-year crop simulation and the fifth entry is a multiple-year experiment. The following references will provide more information on these experiments: Experiment No. 1 and No. 2 (Padilla et al., 1986); Experiment No. 3 (Jintrawet, 1991); Experiments No. 4 and No. 5 (Ritchie et al., 1987).

Select Experiment 1:

Type "1" and press the <ENTER> key.

Computer Sample Screen

LIST OF EXPERIMENTS TO BE SIMULATED	INST. ID	SITE ID	EXPT. NO	YEAR
1) IRRI, PILA JAN 85 UREASE INHIBITORS	IR	PL	01	1985
2) IRRI, 1986 Urea Appl. STUDY	IR	MZ	01	1986
3) Effects of appl. N & envir. on rice	DT	SP	02	1985
4) IRRI, LOS BANOS, IRRIG. & N STUDY, 1980	IR	PI	01	1980
5) IRRIG. & N STUDY :MULTIYR CHIANGMAI	IR	PI	01	1980
1) <==== CURRENT EXPERIMENT SELECTION.				
<----- INPUT NEW SELECTION or				
<----- Press <ENTER> key to view the list again.				
1				

The next screen shows the treatments available for the selected experiment. In this example there are ten treatments: 2 "irrigations" (drained and irrigated) x 5 N rates. If "treatment 11" is chosen, then all ten treatments for the experiment will be simulated without any further keyboard input.

Select treatment No. 5:

Type "5" and press the <ENTER> key.

Computer Sample Screen

TRT NO.	IRRI, PILA JAN 85 UREASE INHIBITORS	INST. ID	SITE ID	EXPT. NO	YEAR
1)	Control 0 N	IR	PL	01	1985
2)	Control 0 N (drained)	IR	PL	01	1985
3)	30 kg N as urea (2/3 18DT 1/3 38DT)	IR	PL	01	1985
4)	30 kg N as urea (2/3 18DT 1/3 38DT) Drain	IR	PL	01	1985
5)	60 kg N as urea (2/3 18DT 1/3 38DT)	IR	PL	01	1985
6)	60 kg N as urea (2/3 18DT 1/3 38DT) Drain	IR	PL	01	1985
7)	90 kg N as urea (2/3 18DT 1/3 38DT)	IR	PL	01	1985
8)	90 kg N as urea (2/3 18DT 1/3 38DT) Drain	IR	PL	01	1985
9)	120 kg N as urea (2/3 18DT 1/3 38DT)	IR	PL	01	1985
10)	120 kg N as urea (2/3 18DT 1/3 38DT) Drain	IR	PL	01	1985
11)	Run all treatments without keyboard inputs				
1) <==== CURRENT TREATMENT SELECTION.					
<----- NEW SELECTION?					
5					

The third-level menu allows you to choose one of three options:

- Option 0. Perform simulation in normal manner, i.e., using the input data.
- Option 1. Alter the output frequency from weekly to user-specified interval, the shortest interval being daily.
- Option 2. Perform sensitivity analysis of selected input variables.

Select "Run Simulation:"

Type "0" and press the <ENTER> key.

Next, you can type in a title or identifier for the current run and press the <ENTER> key. This identifier can be up to 18 characters long. On the other hand, you may skip typing in the run identifier by simply pressing the <ENTER> key.

To get a display of observed and simulated results:

Type "Y" (for yes) and press the <ENTER> key.

Computer Sample Screen

RUN-TIME OPTIONS?

- 0) RUN SIMULATION
- 1) SELECT SIMULATION OUTPUT FREQUENCY
- 2) MODIFY SELECTED MODEL VARIABLES INTERACTIVELY.

<=== CHOICE? [DEFAULT = 0]

0

<=== TYPE THE RUN IDENTIFIER (18 character max.), <ENTER> FOR NONE.

demo

Do you want post harvest comparison with observed data
displayed on the screen (Y/N) ?

Y

The next two simulation screens echo the inputs. The first input screen presents brief descriptions of the experiment, treatment, weather station and year of weather data, soil type, and varietal characteristics are given. The varietal characteristics or genetic-specific constants provide a 1-8 scale to quantitatively describe: Juvenile phase coefficient (P1), critical photoperiod (P2O), photoperiodism coefficient (P2R), grain filling duration coefficient (P5), spikelet number coefficient (G1), single grain weight (G2), tillering coefficient (G3), and temperature tolerance coefficient (G4). For detailed description refer to Chapter 12 of the User's Guide and ATNews 7 (1988).

Computer Sample Screen

RUN 1 OUTPUT SUMMARY

INST_ID :IR SITE_ID: PL EXPT_NO: 01 YEAR : 1985 TRT_NO: 5

EXP. :IRRI, PILA JAN 85 UREASE INHIBITORS 15N

TRT. :60 kg N as urea (2/3 18DT 1/3 38DT)

WEATHER:1985 PILA, LAGUNA

SOIL :ANDAQUEPTIC HAPLAQUOLL

VARIETY :IR 58

PLANTING:TRANSPLANTED SIMULATION BEGINS AT TRANSPLANTING

IRRIGATED TO BUND HEIGHT OF 20. mm. - TRANSPLANTED

PLANT POPULATION = 25.00 HILLS PER SQ METER

3.0 PLANTS PER HILL

LATITUDE = 14.2 , SOWING DEPTH = 2. CM

GENETIC SPECIFIC CONSTANTS P1 = 460.00

P2O = 13.5

P2R = 5.00

P5 = 420.00

G1 = 60.0

G2 = .0250

G3 = 1.00

G4 = 1.00

Please press <ENTER> key to continue.

The input values for soil water and soil nitrogen variables are given on the second input screen.

The units for SOIL ALBEDO (reflectivity coefficient) are dimensionless, U (stage 1 soil evaporation) is in mm, SWCON (profile drainage coefficient) is in cm day^{-1} , and RUNOFF CURVE NO. is dimensionless.

The lower limit for plant-extractable soil water (LO LIM), the drained upper limit (UP LIM), saturated soil water content (SAT SW), initial soil water content (IN SW), and plant-extractable soil water content ($\text{EXT SW} = \text{UP LIM} - \text{LO LIM}$) are expressed in cm^3 soil water cm^{-3} soil for each layer and the total (T) soil water for the profile for each of the above variables is expressed in cm. WR (root preference factor) is dimensionless, and NO3 and NH4 (mg/kg or ppm) are KCl-extractable initial soil $\text{NO}_3\text{-N}$ and $\text{NH}_4\text{-N}$. The total for the profile is expressed as kg N/ha.

Computer Sample Screen

SOIL PROFILE DATA [PEDON: PILA LOWLAND]

SOIL ALBEDO= .13 U= 7.5 SWCON= .00 RUNOFF CURVE NO.= 87.0

DEPTH-CM	LO LIM	UP LIM	SAT SW	EXT SW	IN SW	WR	NO3	NH4
0.- 5.	.289	.415	.700	.126	.700	1.000	.3	12.7
5.- 20.	.289	.415	.650	.126	.650	.850	.3	12.7
20.- 35.	.289	.415	.600	.126	.600	.200	.3	3.2
35.- 50.	.289	.415	.600	.126	.600	.050	.3	3.2
T 0.- 50	14.5	20.8	31.3	6.3	31.3		1.*	30.*

* NOTE: Units are in kg / hectare.

FERTILIZER INPUTS

DAY OF YEAR	KG/HA	DEPTH	SOURCE	METHOD
53	40.00	1.00	UREA	1
73	20.00	1.00	UREA	1

Please press <ENTER> key to continue.

The last input echoed (from the second input screen) before the simulation begins includes fertilizer application date(s), amount applied (kg N/ha), depth of application (cm), and type(s) of fertilizer.

The computer screen below gives a summary of crop development, growth, N status of the plant, soil water status, and indices of water and nitrogen stresses at different stages of the crop's phasic development.

Computer Sample Screen

DATE	CDTT	PHENOLOGICAL STAGE	BIOM	LAI	NUPTK	N%	FLOOD	RAIN+IRR	PESW
4 FEB	352.	TRANSPLANTING	7.	.14	2.9	3.96	0.	21.	17.
22 FEB	679.	END JUVENILE	20.	.42	8.4	4.22	35.	192.	16.
2 MAR	819.	PANICLE INITIATION	107.	1.96	50.8	4.73	40.	233.	16.
5 APR	1414.	HEADING	650.	4.75	99.0	1.52	44.	303.	16.
13 APR	1567.	BEGIN GRAIN FILL	816.	3.67	102.1	1.25	40.	320.	16.
2 MAY	1929.	END MAIN GR. FILL	1002.	1.49	35.5	.35	37.	369.	16.
4 MAY	1973.	END TILL. GR. FILL	1002.	.90	33.4	.33	41.	382.	16.
5 MAY	1995.	PHYSIOL. MATURITY	1002.	.90	33.4	.33	51.	382.	16.

FILL GRAINS= 283. POTL GRAINS= 317. UNFILL GR.= 34.

YIELD (KG/HA)= 6169. N UPTAKE (KG N/HA)= 110. FINAL GPSM= 21223. GRN WT. (mg) = 25.

ISTAGE	CSD1	CSD2	CNSD1	CNSD2	STAGE OF GROWTH
1	.00	.00	.00	.00	EMERGENCE - END JUVENI
2	.00	.00	.00	.00	END JUVENIL - PANICLE IN
3	.00	.00	.36	.51	PANICLE INIT - END LF GROW
4	.00	.00	.15	.29	END LF GRTH - BEGIN GRAIN
5	.00	.00	.48	.64	BEG GRAIN FILL - PHYS MATU

* NOTE: In the above table, 0.0 represents minimum stress and 1.0 represents maximum stress for water (CSD) and nitrogen (CNSD) respectively,
Press <ENTER> key to continue.

CDTT:	daily thermal time accumulator for the growing season (C);
PHENOLOGICAL STAGE:	various development stages of rice crop;
BIOM, g m ⁻² :	above ground biomass (dry weight);
LAI:	leaf area index (m ² m ⁻²)
NUPTK, kg N/ha:	total N uptake by vegetative (non-grain) organ;
N%:	N concentration in vegetative tissue;
FLOOD, mm:	floodwater depth
RAIN+IRR, mm:	cumulative rainfall and irrigation for the growing season;
PESW, cm:	plant-available soil water in the profile (soil water content - lower limit);

- CSD1: cumulative water stress factor affecting photosynthesis at respective stages;
- CSD2: cumulative water stress factor affecting leaf expansion and growth (more sensitive to water stress);
- CNSD1: cumulative nitrogen stress factor affecting photosynthesis at respective stages; and
- CNSD2: cumulative nitrogen stress factor affecting leaf expansion and growth at respective stages.

The final simulation screen gives the irrigation scheduling and a table of predicted and observed results. Missing observed values are indicated by -9.0 or 0.0.

Computer Sample Screen

DAY OF YR	32	33	34	35	36	37	38	40	42	44	46	48	50	52
AMOUNT mm	5.	5.	5.	3.	5.	5.	30.	16.	36.	16.	16.	15.	14.	12.
DAY OF YR	54	56	59	62	66	83	89	98	104	112	123			
AMOUNT mm	15.	11.	11.	10.	11.	10.	11.	10.	10.	10.	13.			

IRRIGATION THIS SEASON : 306. mm

	PREDICTED	OBSERVED
HEADING DATE	95	92
MATURITY DATE	125	124
GRAIN YIELD (KG/HA)	6169.	5890.
GRAIN WEIGHT (G)	.0250	.0201
GRAINS PER SQ METER	21223.	0.
PANICLES PER SQ METER	447.	488.
MAX. LAI	4.75	.00
BIOMASS (KG/HA)	10021.	8583.
STRAW (KG/HA)	4715.	3518.
GRAIN N%	1.45	1.25
TOT N UPTAKE (KG N/HA)	110.1	88.8
STRAW N UPTAKE	33.4	21.8
GRAIN N UPTAKE	76.7	67.0

Press <ENTER> key to continue.

Computer Sample Screen

Simulation complete for this treatment.

Do you want to :

- 0 Repeat the Same Experiment
- 1 Return to Experiment and Treatment Menu
- 2 Display Detailed Outputs on Screen
- 3 Quit

Input a number (default is 0)

2

Which File do you wish to display

- 1 No File Display - Return to Simulation Menu
- 2 Summary Output File
- 3 Crop Growth Output File
- 4 Weather and Water Balance File
- 5 Nitrogen Balance File
- 6 Floodwater Chemistry File

Input a number (Default is 2)

3

Once simulation for a given treatment is completed, the following four options in the Simulation menu are available:

- Option 0. Repeat the same experiment again;
- Option 1. Run another experiment and/or treatment by returning to Experiment and Treatment menu;
- Option 2. Display detailed output for the run just completed;
- Option 3. Quit crop simulation and graph the results.

Example: To display the crop growth output file, **type "2"** (Display Detailed Outputs on Screen) **and press the <ENTER> key**. Next select "3" from the File Display menu (**type "3" and press the <ENTER> key**).

Computer Sample Screen

```

RUN 1      demo
INST_ID    :IR SITE_ID: PL EXPT_NO: 01 YEAR : 1985 TRT_NO: 5
EXP.       :IRRI, PILA JAN 85 UREASE INHIBITORS 15N
TRT.       :60 kg N as urea (2/3 18DT 1/3 38DT)
WEATHER    :1985 PILA, LAGUNA
SOIL       :ANDAQUEPTIC HAPLAQUOLL
VARIETY    :IR 58
PLANTING   :TRANSPLANTED; SIMULATION COMMENCES AT TRANSPLANTING
FERT APPL  :Broadcast on floodwater/saturated soil- No incorp.
IRRIG.     :AUTO. IRRIG. SCHEDULE TO CONSTANT BUND HEIGHT OF ---
           20.mm - TRANSPLANTED
NOTE: not irrigated if demand is less than 10.00 mm
  
```

DAY OYR	SDTT	BIO g/m2	TPSM	LAI	ROOT	STEM	PANICLE	LEAF	RTD (cm)	PTF	L1	L3	L5
					Weight in g						RLV		
38	344.	7.	75.	.14	.11	.00	.00	.10	18.	.47	2.0	.0	.0
45	462.	8.	75.	.15	.24	.00	.00	.11	39.	.31	3.0	.1	.0
52	582.	20.	314.	.42	.31	.00	.00	.26	50.	.46	3.6	.2	.0
59	706.	91.	454.	1.68	.42	.20	.00	1.02	50.	.74	4.4	.3	.0
66	85.	224.	595.	3.21	.57	.86	.00	2.12	50.	.84	5.4	.8	.0
73	203.	307.	588.	3.66	.64	1.61	.00	2.48	50.	.86	6.1	.9	.0
80	327.	412.	577.	4.18	.74	2.59	.00	2.90	50.	.88	7.7	1.1	.0
87	452.	526.	556.	4.55	.85	3.81	.00	3.21	50.	.89	8.8	1.2	.0

Press <ENTER> key to continue

Screen display of detailed crop growth output at weekly interval (default).

DAY OYR: day of year [1-365; 1-366 (for leap year)];
 SDTT: sum of daily thermal time per growth stage (C);
 BIO: aboveground biomass in g m⁻².
 BIO= [STEM+GRAIN+LEAF+(EAR-GRAIN)]*PLANTS
 where PLANTS is plant population (plants m⁻²);
 TPSM: number of tillers per m²;
 LAI: leaf (blade) area index (m² m⁻²);
 ROOT: root dry weight (g/plant);
 STEM: stem and tassel dry weight (g/plant);
 PANICLE: panicle dry weight (g/plant);
 LEAF: leaf blade and leaf sheath dry weight (g/plant);
 RTD: rooting depth (cm);
 PTF: daily assimilate partitioning factor for tops (shoot);
 L1 L3 L5: root length volume (RLV) for soil layers 1, 3, and 5
 (cm³cm⁻³), respectively.

In addition to the crop growth output (OUT2.RI), the user may also display summary output (OUT1.RI), weather and water balance output (OUT3.RI), and nitrogen balance output (OUT4.RI) files. These files also may be viewed or printed using DOS commands at the end of a model session.

To graph results, exit from File Display menu (**type "1" and press the <ENTER> key**) and quit Simulation menu (**type "3" and press the <ENTER> key**) as shown in the screen example.

On a floppy diskette system, you will be prompted to replace the Program disk (No. 1) with the Graphics disk (No. 4). On a hard-disk system, the program will immediately proceed with the graphics section of the model.

Computer Sample Screen

94	577.	650.	522.	4.75	.97	5.28	.00	3.39	50.	.90	9.7	1.4	.0
101	133.	792.	452.	3.78	1.11	7.27	.00	3.29	50.	.91	10.9	1.7	.0
108	117.	919.	447.	2.95	1.17	4.02	5.07	3.17	50.	.91	11.5	1.8	.0
115	248.	977.	447.	2.07	1.18	3.42	6.62	2.98	50.	.92	11.4	1.9	.0
122	384.	1002.	447.	1.20	1.17	2.80	7.81	2.81	50.	.92	11.2	1.8	.0

End of File

Press <ENTER> key to continue.

Which File do you wish to display

- 1 No File Display - Return to Simulation Menu
- 2 Summary Output File
- 3 Crop Growth Output File
- 4 Weather and Water Balance File
- 5 Nitrogen Balance File
- 6 Floodwater Chemistry File

Input a number (Default is 2)

1

Computer Sample Screen

Simulation complete for this treatment.

Do you want to :

- 0. Repeat the Same Experiment
- 1. Return to Experiment and Treatment Menu
- 2. Display Detailed Outputs on Screen
- 3. Quit

Input a number (default is 0)

3

On a floppy diskette system, the graphics program is on drive A: and the data is stored on drive B:. For hard-disk systems, **type the drive number (C, D, E, etc.)** corresponding to your system and pathname **\RICE** as shown in the example for graphics program and C: for data drive.

Choose the graphics option that fits your system. If you have monochrome graphics, for example, select 2 (**type "2" and press the <ENTER> key**).

If you wish to save the setup, **type "Y" and press the <ENTER> key**; otherwise, **type "N" and press the <ENTER> key**.

Once the setup is saved, type "GRAPH" at the C: prompt when program terminates.

Computer Sample Screen

Type Drive and path of graphics program ? a:
Which data drive contains the selected data? b:

>

Graphics Options Available

- [1] - CGA-LOW - 320 x 200 pixels, 3 color graph
- [2] - CGA-HIGH - 640 x 200 pixels, monochrome graph (HERCULES NOT AVAILABLE)
- [3] - EGA-LOW - 640 x 200 pixels, 6 color graph, requires EGA
- [4] - EGA-MED - 640 x 350 pixels, 3 color graph. requires EGA
- [5] - EGA-HIGH - 640 x 350 pixels, 6 color graph, requires EGA
& 128k video memory

>

Enter graphics option ? 5

Would you like to save disk drive and graphics option for future runs? Y

The Select Graph Type menu allows four types of graphs for the CERES models. To plot crop variables on the screen:

Type "1" and press the <ENTER> key.

Computer Sample Screen

SELECT GRAPH TYPE

- 1. Crop variables
- 2. Weather and soil variables
- 3. Nitrogen variables [CERES models only]
- 4. Harvest variables
- 5. Graphical display of plant [Soybean only]
- 0. Exit graph

Option (0,1,2,3,4 or 5)? 1

Computer Sample Screen

VARIABLES AVAILABLE FOR GRAPHING ARE: RUN# AVAILABLE FOR SELECTION ARE:

- | | |
|--|---------|
| 1. Growth Stage (C/day) | 1. demo |
| 2. Biomass (g/m ²) | |
| 3. Number of Tillers | |
| 4. Leaf Area Index | |
| 5. Root Dry Weight (g/plant) | |
| 6. Stem Dry Weight (g/plant) | |
| 7. Grain Dry Weight (g/plant) | |
| 8. Leaf Dry Weight (g/plant) | |
| 9. Root depth cm | |
| 10. Daily Partitioning Factor for Shoot | |
| 11. Root Length Density Level 1 cm/cm ³ | |
| 12. Root Length Density Level 3 cm/cm ³ | |
| 13. Root Length Density Level 5 cm/cm ³ | |

You may plot 1 to 6 lines with any combination of variables and run#

How many lines do you want to plot ? 3

LINE# 1 : ENTER VARIABLE#,RUN# 6,1

LINE# 2 : ENTER VARIABLE#,RUN# 7,1

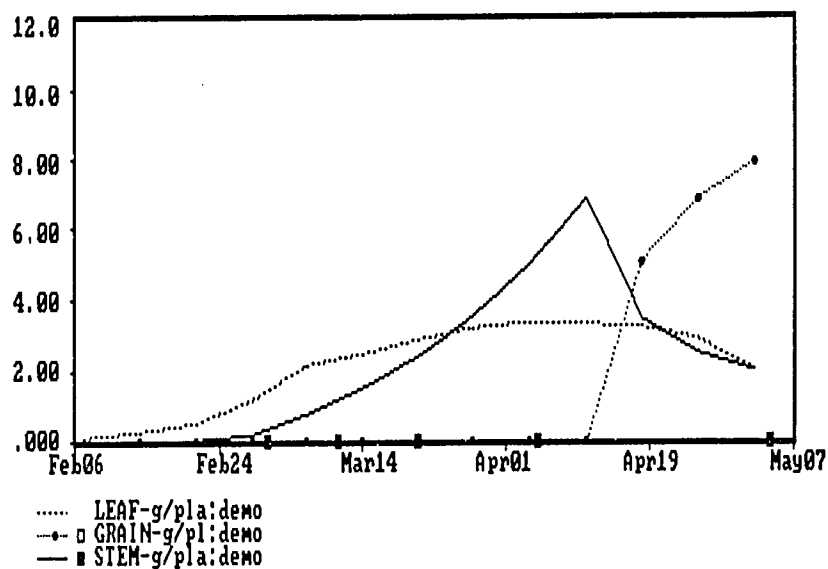
LINE# 3 : ENTER VARIABLE#,RUN# 8,1

Do you want to change X-axis, Y-axis or graphics display (Y/N)? N

However, if you had typed "Y" in response to the above question, the program would allow the following options:

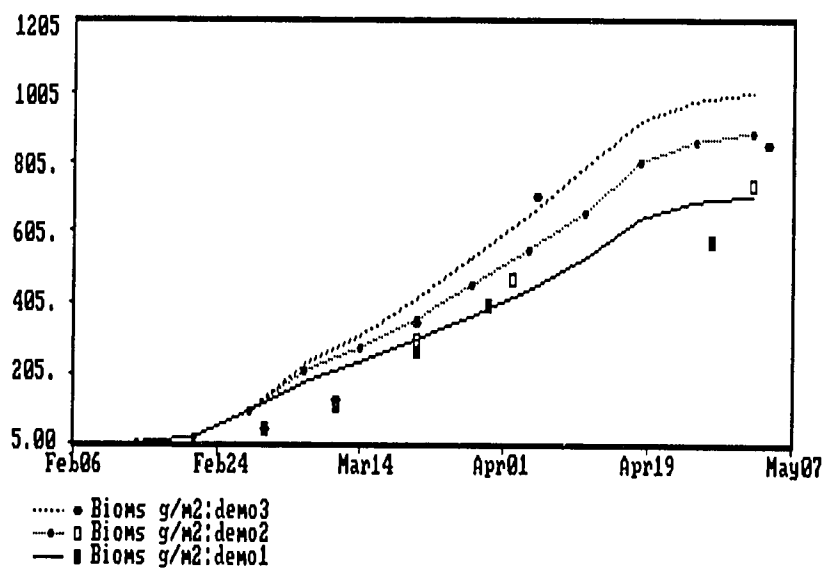
- Option 1. Change screen type.
- Option 2. Change X-axis scale from calendar dates to days
 after planting.
- Option 3. Change X-axis scale.
- Option 4. Change Y-axis scale.

Computer Sample Screen



Single-treatment, multiple-variable plot. The screen display on the top has Y-axis in g/plant for the variables (stem, leaf, and grain dry weights) chosen. When plotting more than one variable, please make certain that the variables have a comparable range of values.

Computer Sample Screen



Multiple-treatment, single-variable plot. The second graph was generated after running the CERES RICE model for treatments 1, 3, and 5 of experiment 1 (IRRI, PILA JAN 85 Urease Inhibitors). In the example shown, only one variable (biomass) is plotted for each of the runs.

The following graphs were generated following simulation of all the experiments and treatments that had corresponding observed data on the CERES RICE V2.10 Data Diskette (No. 2). Harvest variables were plotted (Option 4 in Select Graph Type menu).

There are 13 harvest variables available for graphing. Final harvest values are used for all the variables except maximum LAI. Maximum LAI is determined at anthesis. In the example that follows, observed vs. simulated results for variable 3 (grain yield) are given.

Computer Sample Screen

SELECT GRAPH TYPE

1. Crop variables
2. Weather and soil variables
3. Nitrogen variables [CERES models only]
4. Harvest variables
5. Graphical display of plant [Soybean only]
0. Exit graph

Option (0,1,2,3,4 or 5)? 4

Computer Sample Screen

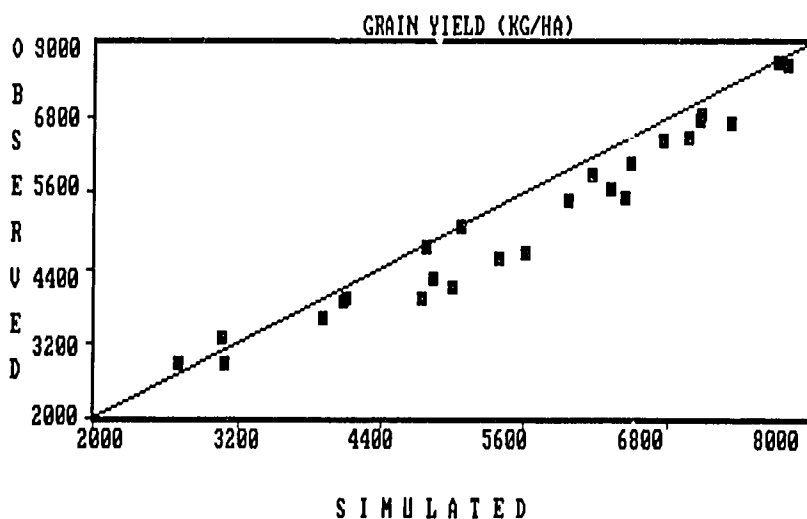
THE VARIABLES AVAILABLE FOR GRAPHING ARE:

1. HEADING DATE
2. MATURITY DATE
3. GRAIN YIELD (KG/HA)
4. GRAIN WEIGHT (G)
5. GRAINS PER SQ METER
6. PANICLES PER SQ METER
7. MAX. LAI
8. BIOMASS (KG/HA)
9. STRAW (KG/HA)
10. GRAIN N%
11. TOT N UPTAKE (KG N/HA)
12. STRAW N UPTAKE
13. GRAIN N UPTAKE

ENTER OPTION (1 to 13)? 3

Do you want to change X and Y scale or graphics display (Y/N)? N

Computer Sample Screen



Computer Sample Screen

SELECT GRAPH TYPE :

1. Crop variables
2. Weather and soil variables
3. Nitrogen variables [CERES models only]
4. Harvest variables
5. Graphical display of plant [Soybean only]
0. Exit graph

Option (0,1,2,3,4 or 5)? 0

CERES RICE V2.10 offers a multiple-year simulation option using either real time or synthetic weather data. This option is started by selecting the appropriate experiment from the main-level menu, i.e., Main Experiment menu. In the example presented, Experiment No. 5 from CHIANGMAI was used for the multiple-year simulation.

Multiple-Year Simulation

Type "5" and press the <ENTER> key to run the multiple-year simulation.

Computer Sample Screen

LIST OF EXPERIMENTS TO BE SIMULATED

- 1) IRRI, PILA JAN 85 UREASE INHIBITORS
- 2) IRRI, 1986 Urea Appl. STUDY
- 3) Effects of appl. N & envir. on rice
- 4) IRRI, LOS BANOS, IRRIG. & N STUDY, 1980
- 5) IRRIG. & N STUDY :MULTIYR CHIANGMAI

INST. ID	SITE ID	EXPT. NO	YEAR
IR	PL	01	1985
IR	MZ	01	1986
DT	SP	02	1985
IR	PI	01	1980
IR	PI	01	1980

- 1] <=== CURRENT EXPERIMENT SELECTION.
- <---- NEW SELECTION?

5

Treatment Selection

In the second-level menu, i.e., Treatment menu, a treatment that has the multiple-year run option is marked with an asterisk. In the given example, the treatment has the multiple-year simulation capability. The user, therefore, should run the above treatment.

Type "1" and press the <ENTER> key.

Computer Sample Screen

NO.	IRRIG. & N STUDY	TRT ID	INST. ID	SITE NO	EXPT. YEAR
1)	IR36, 120 kg N/ha, W1 irrig. level	IR	PI	01	1980 *

* Indicates Multi-Year can be run for this treatment

1] <=== CURRENT TREATMENT SELECTION.
<--- NEW SELECTION?

1
Multiple Year Run 3 Years

RUN-TIME OPTIONS?

0) RUN SIMULATION
1) SELECT SIMULATION OUTPUT FREQUENCY
2) MODIFY SELECTED MODEL VARIABLES INTERACTIVELY.
3) RUN MULTI-YEAR SIMULATION

<=== CHOICE? [DEFAULT = 0]
3

"Run Time Options?"

The third-level menu (Run Time Options menu) has an additional fourth choice, the ability to run multiple-year simulation (Option 3). At this point, the user still has the option (Option 0) to run a single-year simulation for the above treatment.

Type "3" and press the <ENTER> key to run the multiple-year (3 years) simulation.

Display Options

The Multi-Year Output Selection menu has selections ranging from detailed output for growth, water balance, and nitrogen balance to one-line summary output for each year.

Type "3" and press the <ENTER> key to implement the one-line summary output.

The input echo display for multi-year simulation is identical to the single-year display as shown by sample screens below.

Computer Sample Screen

Multi-Year Output Selection Menu
Select an option from the list :

- 1) Full output with files for water balance, N balance and growth
- 2) Summary output file with key variables output at growth stages
- 3) One line summary output for each year

Default value is 3.

3

<===TYPE THE RUN IDENTIFIER, <ENTER> FOR NONE.

multiyear chiangmai

Computer Sample Screen

INST_ID :IR SITE_ID: PI EXPT_NO: 01 YEAR : 1980 TRT_NO: 1
EXP. :IRRIG. & N STUDY :MULTIYR CHIANGMAI
TRT. :IR36, 120 kg N/ha, W1 irrig. level
WEATHER :CHIANGMAI, 25 YEARS DATA FROM 1951
SOIL :FINE, MIXED, ISOHYPERTHERMIC, ANDAQUEPTIC HAPLAQUOLL
VARIETY :IR 36
PLANTING :DIRECT SEEDED
IRRIG. :ACCORDING TO THE FIELD SCHEDULE.

PLANT POPULATION = 369.00 PLANTS PER SQ METER
LATITUDE = 18.8 , SOWING DEPTH = 3. CM

GENETIC SPECIFIC CONSTANTS	P1 = 450.00	P2O = 11.7	P2R = 149.00
	P5 = 350.00	G1 = 68.0	G2 = .0230
	G3 = 1.00	G4 = 1.00	

Please press <ENTER> key to continue.

Computer Sample Screen

DEPTH-CM	LO LIM	UP LIM	SAT SW	EXT SW	IN SW	WR	NO3	NH4
0.- 5.	.280	.397	.412	.117	.397	1.000	8.7	18.0
5.- 15.	.280	.397	.412	.117	.397	1.000	5.0	15.0
15.- 29.	.275	.392	.407	.117	.392	1.000	4.1	3.0
29.- 38.	.198	.264	.412	.066	.264	.200	3.8	3.0
38.- 47.	.198	.264	.412	.066	.264	.200	3.5	2.0
47.- 58.	.174	.235	.373	.061	.235	.100	3.5	2.0
58.- 69.	.174	.235	.373	.061	.235	.050	.5	.5
69.- 96.	.152	.213	.366	.061	.213	.000	.5	.5
96.- 123.	.152	.213	.366	.061	.213	.000	.5	.5
123.- 135.	.172	.238	.364	.066	.238	.000	.5	.5
T 0.- 135.	25.7	35.7	51.6	10.0	35.7		27.*	37.*

* NOTE: Units are in kg / hectare.

FERTILIZER INPUTS

DAY OF YEAR	KG/HA	DEPTH	SOURCE	METHOD
8	120.00	10.00	UREA	0

Please press <ENTER> key to continue.

Output Display

The simulated output as requested is a one-line summary for each year. The variables are:

#: simulation number
 GRAIN YIELD: final grain yield (kg ha⁻¹)
 MATURE BIOMASS: final aboveground biomass (kg ha⁻¹)
 ANTHES BIOMASS: aboveground biomass at anthesis (kg/ha)
 N UPTAKE: total N uptake (kg N ha⁻¹)
 N LOSS: N loss due to leaching from a layer 100 cm deep or to bottom of the profile if it is shallower plus any N loss due to denitrification (kg N ha⁻¹)
 E-M DAYS: number of days from emergence to maturity
 E-M RAIN: amount of rain (mm) from emergence to maturity
 WAT STRS1: water stress factor at growth stage 1 (tassel initiation to silking)
 WAT STRS5: water stress factor at growth stage 5 (grain filling phase)
 NIT STRS1: nitrogen stress factor at growth stage 1 (tassel initiation to silking)
 NIT STRS5: nitrogen stress factor at growth stage 5 (grain filling phase)
 YR: year number.

On completion of the multiple-year (3 years) simulation, the output is sorted according to increasing grain yield. For example, the highest yield occurred in the third year.

“Do you want to:”

The user has the option to return to the Main Experiment menu, display detailed output on screen, or quit simulation. However, for the one-line summary output, it is not possible to choose Option 2 (Display Detailed Outputs on Screen).

Computer Sample Screen

Simulation Outputs sorted according to yield

#	GRAIN YIELD	MATURE BIOMASS	ANTHES BIOMASS	N UPTAKE	N LOSS	E-M DAYS	E-M RAIN	WAT STRS1	WAT STRS5	NIT STRS1	NIT STRS5	YR
1	4924.	13841.	9899.	173.	5.	116.	123.	.0	.6	.0	.0	1.
2	5509.	13460.	8716.	157.	29.	113.	376.	.0	.0	.0	.0	2.
3	5656.	15382.	10817.	180.	3.	113.	117.	.0	.3	.0	.0	3.

Press <ENTER> key to Continue

Simulation complete for this treatment.

Do you want to :

- 0 Repeat the same Experiment
- 1 Return to Experiment and Treatment Menu
- 2 Display Detailed Outputs on Screen
- 3 Quit

Input a number (default is 0)

3

Simulation Output Frequency

At the third-level simulation menu (Run-time Options menu), in addition to carrying out simulation for the given input, a user has the option to change output frequency for water balance, crop growth, and nitrogen balance from a 7-day (default) interval to any other user-specified interval. The minimum interval is a daily time step.

To change output frequency select choice 1. **Type "1" and press the <ENTER> key.**

Computer Sample Screen

RUN-TIME OPTIONS?

- 0) RUN SIMULATION
- 1) SELECT SIMULATION OUTPUT FREQUENCY
- 2) MODIFY SELECTED MODEL VARIABLES INTERACTIVELY.

<=== CHOICE? [DEFAULT = 0]

1

The screen example illustrates daily output for water balance, growth, nitrogen, and lowland components. After typing in the desired frequencies, run the model by choosing the "Run Simulation" option.

Type "0" and press the <ENTER> key.

Computer Sample Screen

```
7 Days <=== OUTPUT FREQUENCY FOR WATER BALANCE COMPONENTS.
<--- NEW VALUE?
1
7 Days <=== OUTPUT FREQUENCY FOR GROWTH COMPONENTS.
<--- NEW VALUE?
1
7 Days <=== OUTPUT FREQUENCY FOR NITROGEN COMPONENTS.
<--- NEW VALUE?
1
7 Days <=== OUTPUT FREQUENCY FOR LOWLAND COMPONENTS.
<--- NEW VALUE?
1

RUN-TIME OPTIONS?

0) RUN SIMULATION
1) SELECT SIMULATION OUTPUT FREQUENCY
2) MODIFY SELECTED MODEL VARIABLES INTERACTIVELY.

<=== CHOICE? [ DEFAULT = 0 ]
0
```

CHAPTER 11

Sensitivity Analysis

The third-level menu also gives the option to run **sensitivity analysis studies** with the model. The sensitivity analysis menus are structured in a hierarchical manner and enable a user to modify almost all of the input parameters interactively. The user can readily pose "what if" questions without using a text editor to modify any of the input data. This interactive option would be particularly suitable for use in training workshops as well as for developing new applications.

After selecting a particular experimental and treatment case study (Experiment No. 1, treatment No. 6 was used for the examples in this section), you should select **Option 2** from the **Run-time Options menu**.

When Option 2 **Modify Selected Model Variables Interactively** is chosen, a primary-level interactive menu appears as shown (screen on bottom right). This menu identifies the general subject area of variables you may wish to examine. When any **option between 1 and 12** is selected, further instructions (sub-level menus) to help the user modify input data appear. Each of these menus features a terminator, enabling you to return to the main interactive menu.

Option 13 allows the display of key input data on the screen for checking of data prior to running the simulation. This is the "echo" which normally precedes all runs.

Option 14 allows you to run the model with interactively modified data.

Option 15 allows you to abandon all changes and return to experiment menu. (*Note: Option 15 was used after completion of options 1-12, in the examples only to show how to use all the different options.*)

Any time you change a particular parameter in the sensitivity analysis section, the model will inform you that the model prediction will not conform with the measured (observed) field data.

It should be noted that the changes you make are "volatile" in that they will only exist for the model run you are commencing. The original data are preserved and are never overwritten by any of your menu selections. All the changes in date(s)/days(s) must be in day of year (DOY) units.

Computer Sample Screen

RUN-TIME OPTIONS?

- 0) RUN SIMULATION
- 1) SELECT SIMULATION OUTPUT FREQUENCY
- 2) MODIFY SELECTED MODEL VARIABLES INTERACTIVELY.

<=== CHOICE? [DEFAULT = 0]

2

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

- 1. Transplanting/Planting Method
- 2. Transplanting/Planting Date and Seedling Age and Depth
- 3. Flood Water Management
- 4. Plant Population
- 5. Nitrogen Non-Limiting
- 6. Irrigation Inputs and Water Balance Switch
- 7. Fertilizer Inputs
- 8. Select New Variety
- 9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
- 10. Select Weather Data
- 11. Initial Soil Fertility and Water,
and Crop Residue Parameters
- 12. Climate Change Effects
- 13. Display Echo
- 14. End of Changes
- 15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 1

Screen Examples

The following screen demonstrates the options provided in the various sub-menus when each of the 12 options is in turn selected from the primary menu. For example, when **Option 1** (transplanting/ planting method) is chosen from the primary menu, the sub-menus come up with further choices.

All of the 12 primary menu options are illustrated with **some** of their corresponding sub-menus in the screen examples that follow. *[Note: All screen options are not illustrated, hence the submenu screens may not be in sequence.]* Screen number 2 on page 43 illustrates the display **Option 13**.

Computer Sample Screen

PLANTING METHOD OPTIONS:

1. Rice crop is direct seeded.
2. Rice crop is transplanted but model will simulate growth of seedlings.
3. Rice crop is transplanted, simulation begins at transplanting.
4. Rice crop is pregerminated, direct seeded.
5. Return to main menu.

The current option is : 3

Input new option : 1

Existing Planting Date is : 35

Input New Planting Date : 35

Plant Population = 75.0 /sq meter.

Enter new plant populaton : 75

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 3

Input new choice : 1

Is crop 1) upland or
2) bunded-flooded ?

Choose one : 1

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 1

Computer Sample Screen

PLANTING METHOD OPTIONS:

1. Rice crop is direct seeded.
2. Rice crop is transplanted but model will simulate growth of seedlings.
3. Rice crop is transplanted, simulation begins at transplanting.
4. Rice crop is pregerminated, direct seeded.
5. Return to main menu.

The current option is : 1

Input new option : 2

Existing Planting Date is : 35

Input New Planting Date : 35

The current age of plant at transplanting is 23 .

Enter new value for age: 23

The current nursery temperature is 25.

Enter new value for temperature: 25

Transplant Population = 25.0 hills/sq meter.

Enter new transplant population : 25

Number of plants per hill = 3.0.

Enter new value for plants/hill :3

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 1

Input new choice : 2

Computer Sample Screen

The field is not bunded.

Would you like presence of bunding (Y/N) ? Y

Enter number of times bund,
floodwater depth or irrigation will be changed : 1

There are 1 bund heights.

On day 32 the field is bunded at a height of 20.0 mm.
Floodwater depth is = 5.00 mm.
Irrigation method is = 7

Would you like to change the date at which new bund,
water level or irrigation method is set (Y/N) ? N

Would you like to change the bund height (Y/N) ? Y
Current height is = 20.0
Enter new bund height (mm) : 10

Would you like to change the floodwater depth (Y/N) ? N

Would you like to change the irrigation method (Y/N) ? N

Would you like to change
the minimum amount of irrigation applied (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 2

There are 1 bund heights.

On day 32 the field is bunded at a height of 10.0 mm.
Floodwater depth is = 5.00 mm.
Irrigation method is = 7

Would you like to change the date at which new bund,
water level or irrigation method is set (Y/N) ? Y
Enter the new date : 32

Would you like to change the bund height (Y/N) ? Y
Current height is 10.0
Enter new bund height (mm) : 10

Computer Sample Screen

Would you like to change the floodwater depth (Y/N) ? Y

The water level is set at = 5.00 mm.

NOTE: the water level cannot exceed the bund height of 10.0 mm.

Enter the new depth (mm) : 10

Would you like to change the irrigation method (Y/N) ? Y

Current Irrigation Method is = 7

Enter the new irrigation method : 7

Would you like to change

the minimum amount of irrigation applied (Y/N) ? Y

Current Value is : 10.0

Enter the new minimum amount : 10

Computer Sample Screen

NOTE: To change from upland to banded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 1

The field is not banded.

Would you like to remove bunding (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 5

How many times does the water table depth change ? 1

Would you like to

change date at which the water table change (Y/N) ? Y

Enter date (DOY) when water table depth changes : 32

Would you like to change

the perched water table depth (Y/N) ? Y

The perched water table depth is : .0 cm.

Enter new perched water table depth : 10

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 6

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water, and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 1

Computer Sample Screen

PLANTING METHOD OPTIONS:

1. Rice crop is direct seeded.
2. Rice crop is transplanted but model will simulate growth of seedlings.
3. Rice crop is transplanted, simulation begins at transplanting.
4. Rice crop is pregerminated, direct seeded.
5. Return to main menu.

The current option is : 2

Input new option : 4

Existing Transplanting Date is : 35.

Input New Planting Date : 35

The current seedling age at transplanting is: 23.

Enter new value for age : 23

The current nursery temperature is: 25.

Enter new value for temperature : 25

Plant Population = 75.0 /sq meter.

Enter new plant population : 75

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 2

Input new choice : 4

WARNING : Can not run nitrogen balance with this option.
Do you want to choose another irrigation option (Y/N) ? N

Water and Nitrogen have been set to Non-Limiting.
Press <ENTER> key to continue.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 1

Computer Sample Screen

PLANTING METHOD OPTIONS:

1. Rice crop is direct seeded.
2. Rice crop is transplanted but model will simulate growth of seedlings.
3. Rice crop is transplanted, simulation begins at transplanting.
4. Rice crop is pregerminated, direct seeded.
5. Return to main menu.

The current option is : 4

Input new option : 1

Existing Planting Date is : 35

Input New Planting Date : 35

Plant Population = 75.0 /sq meter.

Enter new plant population : 75

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 4

Input new choice : 3

Is crop 1) upland or
2) bunded-flooded ?

Choose one : 2

Enter the constant floodwater depth : 10

Would you like to remove bunding (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 6

Computer Sample Screen

Do you want to :

1. Change Planting/Transplanting Date ?
2. Change Simulation Date ?
3. Change Seedling Age (days) ?
4. Change Seeding Depth (cm) ?
5. Return to main menu ?

Enter number of choice : 1

Existing Transplanting Date is : 35.
Input New Plant Date : 35

The current seedling age at transplanting is: 23.
Enter new value for age : 23

The current nursery temperature is: 25.
Enter new value for temperature: 25

Biomass at transplanting is : 0.
Enter new value for biomass (default is 0.) : .1

Transplant Population = 25.0 hills/sq meter.
Enter new transplant population : 25

Number of plants per hill = 3.0.
Enter new value for plant/hill : 3

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 3

Input new choice : 3

Enter the constant floodwater depth : 10

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 2

Computer Sample Screen

Do you want to:

1. Change Planting/Transplanting Date ?
2. Change Simulation Date ?
3. Change Seedling Age (days) ?
4. Change Seeding Depth (cm) ?
5. Return to main menu ?

Enter number of choice : 2

Existing simulation date is : 32

Input New Date to Begin Simulation : 36

WARNING : Simulation date is after planting date !
Please make sure simulation date is before planting date.
Press <ENTER> key to continue.

Computer Sample Screen

Do you want to:

1. Change Planting/Transplanting Date ?
2. Change Simulation Date ?
3. Change Seedling Age (days) ?
4. Change Seeding Depth (cm) ?
5. Return to the main menu ?

Enter number of choice : 2

Existing simulation date is : 36

Input New Date to Begin Simulation : 32

Computer Sample Screen

Do you want to:

1. Change Planting/Transplanting Date ?
2. Change Simulation Date ?
3. Change Seedling Age (days) ?
4. Change Seedling Depth (cm) ?
5. Return to main menu ?

Enter number of choice : 5

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 3

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 1

Would you like to remove bunding (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 2

Computer Sample Screen

There are 9 bund heights.

On day 32 the field is bunded at a height of 20.0 mm.

Floodwater depth is = 5.00 mm.

Irrigation method is = 7

Would you like to change the date at which new bund,
water level or irrigation method is set (Y/N) ? N

Would you like to change the bund height (Y/N) ? N

Would you like to change the floodwater depth (Y/N) ? Y

The water level is set at = 5.00 mm.

NOTE: the water level cannot exceed the bund height of 20.0 mm

Enter the new depth (mm) : 10

Would you like to change the irrigation method (Y/N) ? N

Would you like to change
the minimum amount of irrigation applied (Y/N) ? Y

Current Value is : 10.0

Enter the new minimum amount : 20

Computer Sample Screen

On day 38 the field is bunded at a height of 100.0 mm.

Floodwater depth is = 30.00 mm.

Irrigation method is = 7

Would you like to change the date at which new bund,
water level or irrigation method is set (Y/N) ? Y

Enter the new date : 39

Would you like to change the bund height (Y/N) ? Y

Current height is = 100.0

Enter new bund height (mm) : 50

Would you like to change the floodwater depth (Y/N) ? Y

The water level is set at 30.00 mm.

NOTE: the water level cannot exceed the bund height of 50.0 mm

Enter the new depth (mm) : 20

Would you like to change the irrigation method (Y/N) ? N

Would you like to change
the minimum amount of irrigation applied (Y/N) ? N

Computer Sample Screen

On day 42 the field is bunded at a height of 150.0 mm.
Floodwater depth is = 50.00 mm.
Irrigation method is = 7

Would you like to change the date at which new bund,
water level or irrigation method is set (Y/N) ? N

Would you like to change the bund height (Y/N) ? N

Would you like to change the floodwater depth (Y/N) ? N

Would you like to change the irrigation method (Y/N) ? N

Would you like to change
the minimum amount of irrigation applied (Y/N) ? N

Six more similar screens will appear—choose the necessary answer.

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 3

Field is puddled when 1 and not puddled if 0.

Current option is : 1

Enter new option : 1

Computer Sample Screen

NOTE: To change from upland to banded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 5

How many times does the water table depth change ? 1

Would you like to change
the date at which the water table changes (Y/N)? Y
Enter date when water table depth changes : 45

Would you like to change
the perched water table depth (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to banded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 5

The water table depth changes 1 time.

Would you like to change
the number of times the water table changes (Y/N)? N

Would you like to change
the date at which the water table change (Y/N) ? N

Would you like to change
the perched water table depth (Y/N) ? N

Computer Sample Screen

NOTE: To change from upland to bunded-flooded,
choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm),
Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 6

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 4

Computer Sample Screen

Transplant Population = 25.0 hills/sq meter.
Enter new transplant population : 25

Number of plants per hill = 3.0.
Enter new value for plants/hills : 4

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 5

Computer Sample Screen

Nitrogen Effect is Simulated.

Do You Want to:

1. Switch off Simulation of Nitrogen Balance Totally
2. Switch off Nitrification only
3. Switch off Denitrification only
4. Switch off Ammonia Loss from floodwater only
5. Switch off Ammonia Loss from Drained soils only
6. Switch off Leaching only
7. Return to main menu

Enter Number of Option : 1

Computer Sample Screen

Nitrogen is assumed non-limiting.

Do You Want To Simulate Nitrogen Balance ? (Y/N) : Y

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation for the entire growing season.

Treatment is flooded-bunded, transplanted.
Automatic Irrigation. Crop will be irrigated to floodwater depth of 5.00 mm or to 25.00 % of the bund height.

Do you want to:

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation meihod or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 1

WARNING : Can not run nitrogen balance with this option.

Do you want to choose another irrigation method (Y/N) ? N

Water and Nitrogen have been set to Non-Limiting.

Press <ENTER> key to continue.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation
for the entire growing season.

WATER NON-LIMITING. WATER BALANCE NOT SIMULATED

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 2

Nothing to modify for irrigation method : 5

Press <ENTER> key to continue.

Computer Sample Screen

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 4

Computer Sample Screen

Water non-limiting. To change irrigation method or to switch on water balance, choose option 5 of the menu.

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 5

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 4

Input new choice : 1

The field is not bunded.

Would you like to remove bunding (Y/N)? Y

Computer Sample Screen

NOTE: To change from upland to bunded-flooded, choose OPTION 1 from the MAIN MENU.

Do you want to view or modify :

1. Presence of bunds
2. Bund Height (mm), Floodwater Depth (mm), Irrigation Method
3. Puddled Field Option
4. Percolation rate (cm/day)
5. Depth of perched water table, if drained (cm)
6. End of changes

Number of choice : 6

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation
for the entire growing season.

This treatment is not irrigated.
Choose option 4 to apply irrigation.

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 5

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 1

Input new choice : 2

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation for the entire growing season.

Treatment is flooded-bunded, transplanted.

No scheduled irrigation applied.
Press <ENTER> key to continue.

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 5

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 2

Input new choice : 3

Enter the constant floodwater depth : 10

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation for the entire growing season.

Treatment is flooded-bunded, transplanted.
Automatic Irrigation. Crop will be irrigated to floodwater depth of 10.00 mm or to 50.00 % of the bund height.

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 5

Computer Sample Screen

Irrigation options are :

1. No irrigation
2. Irrigation applied using field schedule
3. Automatically irrigated at threshold soil water
4. Assume no water stress, water balance not used
5. End of change.

The current option is : 3

Input new choice : 4

WARNING : Can not run nitrogen balance with this option.
Do you want to choose another irrigation option (Y/N) ? N

Water and Nitrogen have been set to Non-Limiting.
Press <ENTER> key to continue.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 6

Computer Sample Screen

Option allows for only a single method of irrigation for the entire growing season.

WATER NON-LIMITING. WATER BALANCE NOT SIMULATED

Do you want to :

1. Bypass Water & Nitrogen (assume both non-limiting) ?
2. Modify existing data ?
3. Add additional data ?
4. Apply irrigation ?
5. Change irrigation method or switch irrigation off ?
6. View irrigation data ?
7. Return to main menu ?

Enter number of choice : 7

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 7

Computer Sample Screen

FERTILIZER APPLICATION DATA FOR TREATMENT NO. 6.

Event No.	DAY OF EVENT	AMOUNT	DEPTH	TYPE	METHOD
1	53	40.	1.	5	1
2	73	20.	1.	5	1

Do you want to :

1. Modify existing data ?
2. Add another application ?
3. View fertilizer data again ?
4. Return to main menu ?

Enter number of choice : 2

Enter Additional Day : 35

Enter New Amount : 20

Enter New Depth : 1

Enter New Type : 5

Enter New Method : 1

Computer Sample Screen

Do you want to :

1. Modify existing data ?
2. Add another application ?
3. View fertilizer data again ?
4. Return to main menu ?

Enter number of choice : 1

Enter Event No. : 1

Modify Day of Year ? (Y/N) : N

Modify Amount ? (Y/N) : Y

Enter New Amount : 60

Modify Depth ? (Y/N) : N

Modify Type ? (Y/N) : N

Modify Method ? (Y/N) : N

Computer Sample Screen

Do you want to :

1. Modify existing data ?
2. Add another application ?
3. View fertilizer data again ?
4. Return to main menu ?

Enter number of choice : 3

Computer Sample Screen

FERTILIZER APPLICATION DATA FOR TREATMENT NO. 6.

Event No.	DAY OF EVENT	AMOUNT	DEPTH	TYPE	METHOD
1	35	60.	1.	5	1
2	53	40.	1.	5	1
3	73	20.	1.	5	1

Do you want to :

1. Modify existing data ?
2. Add another application ?
3. View fertilizer data again ?
4. Return to main menu ?

Enter number of choice : 4

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 8

Computer Sample Screen

VARIETIES IN THE DATA BASE

NO.	VARIETY NAME	P1	P2O	P5	P2R	G1	G2	G3	G4
1	IR 8	880.00	12.10	550.00	52.0	65.0	.0280	1.00	1.00
2	IR20	500.00	11.20	500.00	166.0	65.0	.0280	1.00	1.00
3	IR 36	450.00	11.70	350.00	149.0	68.0	.0230	1.00	1.00
4	IR 43	720.00	10.50	580.00	120.0	65.0	.0280	1.00	1.00
5	LABELLE	318.00	12.80	550.00	189.0	65.0	.0280	1.00	1.00
6	MARS	698.00	13.00	550.00	134.0	65.0	.0280	1.00	1.00
7	NOVA 66	389.00	11.00	550.00	155.0	65.0	.0280	1.00	1.00
8	PETA	420.00	11.30	550.00	240.0	65.0	.0280	1.00	1.00
9	STARBONNETT	880.00	13.00	550.00	164.0	65.0	.0280	1.00	1.00
10	UPLRI5	620.00	11.50	380.00	160.0	50.0	.0220	.60	1.00
11	UPLRI7	760.00	11.70	450.00	150.0	65.0	.0280	1.00	1.00
12	IR 58	460.00	13.50	420.00	5.0	60.0	.0250	1.00	1.00
13	SenTaNi (???)	320.00	10.00	550.00	50.0	70.0	.0300	1.00	1.00
14	IR 54	350.00	11.50	520.00	125.0	60.0	.0280	1.00	1.00
15	IR 64	500.00	12.00	450.00	160.0	60.0	.0250	1.00	1.00
16	IR 60 (Est)	490.00	11.50	320.00	100.0	75.0	.0275	1.00	1.00

PRESS <ENTER> KEY TO CONTINUE LISTING.

Computer Sample Screen

NO.	VARIETY NAME	P1	P2O	P5	P2R	G1	G2	G3	G4
17	IR 66	500.00	12.50	490.00	50.0	62.0	.0265	1.00	1.00
118	IR 72	560.00	13.50	390.00	20.0	60.0	.0250	1.00	1.00
19	RD 7 (cal.)	603.33	11.20	452.50	150.0	65.0	.0230	1.00	1.00
20	RD 23 (cal.)	310.33	11.20	370.00	140.0	53.0	.0230	1.00	1.00
21	CICA8	700.00	11.70	360.00	120.0	60.0	.0270	1.00	1.00
22	LOW TEMP.SEN	400.00	12.00	420.00	120.0	60.0	.0250	1.00	.80
23	LOW TEMP.TOL	400.00	12.00	420.00	120.0	60.0	.0250	1.00	1.25
24	17 BR11, T.AMAN	740.00	10.50	400.00	180.0	55.0	.0250	1.00	.90
25	18 BR22, T.AMAN	650.00	12.00	400.00	110.0	60.0	.0250	1.00	1.00
26	19 BR 3, T.AMAN	650.00	12.00	420.00	110.0	65.0	.0250	1.00	1.00
27	20 BR 3, BORO	650.00	13.00	400.00	90.0	65.0	.0250	1.00	1.00
115	IR 64	540.00	12.00	490.00	160.0	50.0	.0250	1.10	1.00

Press <ENTER>key to continue.

Computer Sample Screen

The current variety is : 12

Do you want to :

1. Select a new variety ?
2. Create a new variety ?
3. Modify current genetic coefficients ?
4. View the varieties again ?
5. Return to the main menu ?

Enter number of choice : 1

New Variety : 15

You have chosen variety : 15

Press <ENTER> key to continue.

Computer Sample Screen

The current variety is : 15

Do you want to :

1. Select a new variety ?
2. Create a new variety ?
3. Modify current genetic coefficients ?
4. View the varieties again ?
5. Return to the main menu ?

Enter number of choice : 3

Computer Sample Screen

Current Values of Coefficients to Modify

1. P1 = 500.00
2. P2R = 160.00
3. P5 = 450.00
4. P2O = 12.00
5. G1 = 60.0
6. G2 = .0250
7. G3 = 1.00
8. G4 = 1.00
9. End of changes

Parameter choice : 1

The current value of P1 is: 500.00

Input new value : 520

Computer Sample Screen

Current Values of Coefficients to Modify

1. P1 = 520.00
2. P2R = 160.00
3. P5 = 450.00
4. P2O = 12.00
5. G1 = 60.0
6. G2 = .0250
7. G3 = 1.00
8. G4 = 1.00
9. End of changes

Parameter choice : 9

Computer Sample Screen

The current variety is : 15

Do you want to :

1. Select a new variety ?
2. Create a new variety ?
3. Modify current genetic coefficients ?
4. View the varieties again ?
5. Return to the main menu ?

Enter number of choice : 5

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 9

Computer Sample Screen

SOILS IN THE DATA BASE.

=====

REF NO.	TAXONOMY NAME	PEDON NUMBER
1)	ANDAQUEPTIC HAPLAQUOLL	PILA LOWLAND
2)	VERTIC TROPAQUEPT	MUNOZ
3)	ANDAQUEPTIC HAPLAQUOLL	IRRI UB3
4)	LITHIC HAPLUDOLL	IRRI UU1
5)	AERIC TROPAQUEPT	PILA LOWLAND
6)	ANDAQUEPTIC HAPLAQUOLL	VICTORIA
7)	ANDAQUEPTIC HAPLAQUOLL	IRRI J6
8)	ANDAQUEPTIC HAPLAQUOLL	IRRI G4
9)	ANDAQUEPTIC HAPLAQUOLL	IRRI C13
10)	ANDAQUEPTIC HAPLAQUOLL	PILA LOWLAND
11)	ANDAQUEPTIC HAPLAQUOLL	IRRI UL
12)	VERTIC TROPAQUEPT	MABITAC
13)	AERIC TROPAQUEPT	CALAUAN
14)	AQUIC HAPLUSTOLL	AGUILAR
15)	AQUIC USTIFLUVENT	ZAMBALES
16)	AERIC TROPAQUEPT	CALAUAN

Press <ENTER> key to continue listing.

Computer Sample Screen

SOILS IN THE DATA BASE.

=====

REF NO.	TAXONOMY NAME	PEDON NUMBER
17)	MAAHAS	BLOCK M
20)	VERTIC TROPAQUEPT	MUNOZ
63)	FINE, MIXED, ISOHYPERTHERMIC, ANDAQUEPTIC HAPLAQUOLL	IRRI UPLAND
71)	Fine, Mixed, Non-acid, Isohyper., Aeric Tropaquept	Suphan LowL,
72)	MULTI-YEAR EXP SOIL	MUNOZ
73)	AERIC	CHIATA
81)	COARSE-LOAMY, MIXED, TROPIC TROPAQUALFS	SANSAI

Press <ENTER> key to continue listing.

Computer Sample Screen

The current soil is: 1

Do you want to :

1. Select a new soil ?
2. Modify or view parameters of current soil ?
3. View the soils again?
4. Return to the main menu ?

Enter number of choice : 1

Input new soil selection : 12

You have chosen soil number : 12

Press <ENTER> key to continue.

Computer Sample Screen

The current soil is number : 12

Do you want to :

1. Select a new soil ?
2. Modify or view parameters of current soil ?
3. View the soils again ?
4. Return to the main menu ?

Enter number of choice : 2

Computer Sample Screen

Current Parameters to Modify or View :

1. Swcon - Soil water drainage, fraction drained/day
2. CN2 - SCS curve number used to calculate daily runoff
3. DMOD - Mineralization rate modifier
4. CEC - Topsoil for calculating diffusion
5. LL - Lower limit of plant-extractable soil water
6. DUL - Drained upper limit soil water content
7. SAT - Saturated water content
8. WR - Weighting factor to determine new root growth
9. BD - Moist bulk density of soil
10. OC - Organic carbon concentration
11. End of changes

Parameter choice : 1

The current value of SWCON is : .00

Input new value : .4

Computer Sample Screen

Current Parameters to Modify or View :

1. Swcon - Soil water drainage, fraction drained/day
2. CN2 - SCS curve number used to calculate daily runoff
3. DMOD - Mineralization rate modifier
4. CEC - Topsoil for calculating diffusion
5. LL - Lower limit of plant-extractable soil water
6. DUL - Drained upper limit soil water content
7. SAT - Saturated water content
8. WR - Weighting factor to determine new root growth
9. BD - Moist bulk density of soil
10. OC - Organic carbon concentration
11. End of changes

Parameter choice : 11

Computer Sample Screen

The current soil is number : 12

Do you want to :

1. Select a new soil ?
2. Modify or view parameters of current soil ?
3. View the soils again ?
4. Return to the main menu ?

Enter number of choice : 4

WARNING !!

You have chosen a new soil.

Make sure soil layers, SW, NH4, NO3, pH in IRPL8501.R15
match the new soil. Use option 11 from the main menu or
<Ctrl>-C quit to edit the values in IRPL8501.R15

Press <ENTER> key to continue.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 10

Computer Sample Screen

WEATHER DATA SETS AVAILABLE		DATES FROM	AVAILABLE UNTIL	INST ID	WEATHER STATION ID
1)	1985 MRRTC, MUNOZ, N. ECIJA	01/01/85	12/31/85	IR	MZ
2)	1986 MRRTC, MUNOZ, N. ECIJA	01/01/86	12/31/86	IR	MZ
3)	1987 MRRTC, MUNOZ, N. ECIJA	01/01/87	12/31/87	IR	MZ
4)	1988 MRRTC, MUNOZ, N. ECIJA	01/01/88	12/31/88	IR	MZ
5)	1989 MRRTC, MUNOZ, N. ECIJA	01/01/89	12/31/89	IR	MZ
6)	1990 MRRTC, MUNOZ, N. ECIJA	01/01/90	12/31/90	IR	MZ
7)	1991 MRRTC, MUNOZ, N. ECIJA	01/01/91	05/31/91	IR	MZ
8)	1985 PILA, LAGUNA	01/01/85	12/31/85	IR	PI
9)	1986 PILA, LAGUNA	01/01/86	12/31/86	IR	PI
10)	1987 PILA, LAGUNA	01/01/87	12/31/87	IR	PI
11)	1988 PILA, LAGUNA	01/01/88	12/31/88	IR	PI
12)	1989 PILA, LAGUNA	01/01/89	12/31/89	IR	PI
13)	1980 WEATHER (UPI AND) DATA	01-01-80	12-31-80	IR	PI
14)	CHIANGMAI, 25 YEARS DATA FROM 1951	01-01-51	12-31-75	IF	CH
15)	1985 WEATHER	01-01-85	12-31-85	DT	SP

8] <=== CURRENT WEATHER FILE SELECTION.
<---- NEW SELECTION?

14

The following screens related to modification of soil fertility, water, and crop residue parameter were obtained using experiment No. 1, treatment No. 5.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED :

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 11

Computer Sample Screen

Do you want to :

1. Modify or view the soil profile parameters ?
2. Initialize soil moisture to a percentage
of whole profile storage ?
3. Modify crop residue parameters ?
4. Return to the main menu ?

Enter number of choice: 1

Computer Sample Screen

Current Parameters to Modify or View :

1. Dlayr - Depth of layer
2. SW - Soil water content of layer
3. NH4 - Soil ammonium in soil layer
4. NO3 - Soil nitrate in soil layer
5. pH - pH of soil in soil layer
6. End of changes

Parameter choice : 3

Computer Sample Screen

Current values of NH4 (ppm) by layers

<u>Layer</u>	<u>NH4</u>
1	12.70
2	12.70
3	3.20
4	3.20

How many layers would you like to modify ?
(Input 0 to exit when finished) : 1

Input the layer number : 1
Input new value for NH4 : 13

Computer Sample Screen

Current values of NH4 by layers

Layer	NH4
1	13.00
2	12.70
3	3.20
4	3.20

How many layers would you like to modify ?
(Input 0 to exit when finished) : 0

Computer Sample Screen

Current Parameters to Modify or View:

1. Dlayr - Depth of layer
2. SW - Soil water content of layer
3. NH4 - Soil ammonium in soil layer
4. NO3 - Soil nitrate in soil layer
5. pH - pH of soil in soil layer
6. End of changes

Parameter choice : 6

Computer Sample Screen

Do you want to:

1. Modify or view the soil profile parameters ?
2. Initialize soil moisture to a percentage of whole profile storage ?
3. Modify crop residue parameters ?
4. Return to the main menu ?

Enter number of choice: 2

Computer Sample Screen

Layer	LL	DUL	SW
1	.289	.415	.700
2	.289	.415	.650
3	.289	.415	.600
4	.289	.415	.600

Input a value to estimate how "full" the profile is at the beginning of the run.

A value of 1.0 indicates full to the dul.

Value chosen is : 1.0

Computer Sample Screen

Do you want to:

1. Modify or view the soil profile parameters ?
2. Initialize soil moisture to a percentage of whole profile storage ?
3. Modify crop residue parameters ?
4. Return to the main menu ?

Enter number of choice: 4

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 12

Computer Sample Screen

Increased CO2 effect is not simulated.

Do You Want To Simulate CO2 Effect (Y/N) ? Y

Current CO2 concentration is 330.0 ppm.

Do you want to change it (Y/N) ? Y

Enter new CO2 concentration (0.0- 10000.0) : 400

Current Rel. Gross Photosynthetic Factor is: 1.00

Do you want to change it (Y/N) ? N

Do you want to consider temperature change (Y/N) ? N

Do you want to modify rainfall amount (Y/N) ? N

Do you want to modify the solar radiation value (Y/N) ? Y

Input the multiplicative factor for solar radiation

(range is 10 to 0.1) : 1.1

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 12

Computer Sample Screen

CO2 Effect is Simulated.

Do You Want to switch off effect of increased CO2 (Y/N) ? N

Current CO2 concentration is 400 ppm.

Do you want to change it (Y/N) ? N

Current Rel. Gross Photosynthetic Factor is 1.00

Do you want to change it (Y/N) ? N

Do you want to consider temperature change (Y/N) ? Y

The temperature change will be a constant additive
(or subtractive) increment, i.e. the value you input
will be added to daily temperature.

Input the value for maximum temperature
(range is + or - 10 degrees) : 1

Input the value to add to minimum temperature
(range is + or - 10 degrees) : 1

Do you want to modify rainfall amount (Y/N) : N

Do you want to modify the solar radiation value (Y/N) ? N

CHAPTER 12

Genetic Coefficients

CERES RICE makes use of eight genetic coefficients that summarize various aspects of the performance of a particular genotype. These coefficients are required by the model to simulate the growth and development of a particular rice variety planted in different places and different times. The eight genetic coefficients are:

Development Aspects		Usual Range of Values
Juvenile phase coefficient	P1	300-900 GDD (°C)
Critical photoperiod	P2O	10-14 hours
Photoperiodism coefficient	P2R	5-250 GDD h ⁻¹
Grain filling duration coefficient	P5	300-900 GDD (°C)
Growth Aspects		
Spikelet number coefficient	G1	30-100
Single grain weight	G2	0.022-0.029 g
Tillering coefficient	G3	0.5-2.0
Temperature tolerance coefficient	G4	0.7-1.5

The P coefficients enable the model to predict such events as flowering and maturity. The growth or G coefficients represent the potential value for a particular cultivar under nonlimiting condition. For example the genetic coefficient for grain size represents the size that can be achieved under ideal conditions. The biological meaning for the above genetic coefficients are:

- P1:** Time period (expressed as growing degree days (GDD) in °C above a base temperature of 9°C) from seedling emergence during which the rice plant is not responsive to changes in photoperiod. This period is also referred to as the basic vegetative phase of the plant.
- P2O:** Critical photoperiod or the longest day length (in hours) at which the development occurs at a maximum rate. At values higher than P2O developmental rate is slower, hence there is delay due to longer day lengths.
- P2R:** Extent to which phasic development leading to panicle initiation is delayed (expressed as GDD in °C) for each hour increase in photoperiod above P2O.
- P5:** Time period in GDD (°C) from beginning of grain filling (3 to 4 days after flowering) to physiological maturity with a base temperature of 9°C.
- G1:** Potential spikelet number coefficient as estimated from the number of spikelets per g of main culm dry weight (less leaf blades and sheaths plus spikes) at anthesis. A typical value is 55.
- G2:** Single grain weight (g) under ideal growing conditions, i.e., nonlimiting light, water, nutrients, and absence of pests and diseases.
- G3:** Tillering coefficient (scalar value) relative to IR64 cultivar under ideal conditions. A higher tillering cultivar would have coefficient greater than 1.0.
- G4:** Temperature tolerance coefficient. Usually 1.0 for varieties grown in normal environment. G4 for a japonica type rice growing in a

warmer environment would be 1.0 or greater. Likewise, the G4 value for indica type rice in very cool environment or season would be less than 1.0.

Approximate values of each of these genetic coefficients for a genotype that is not present in the genetics file GENETICS.RI9 (Table 16), but for which experimental data are available, can be obtained by genetic coefficient calculator [GC-CALC] (Hunt and Parajasingham, 1991).¹ Estimates of genetic coefficients can also be derived by trial and error, following this general sequence of steps:

1. Select initial genetic coefficient values for the genotype in question. Do this by identifying in Table 16 (GENETICS.RI9 file) a genotype which grows in an area of adaptation similar to that of the genotype which has similar characteristics to that of the genotype in question.
2. Enter the name of the genotype in question, and the selected initial coefficient values, in the genetics (GENETICS.RI9) file. There are several ways of doing this:
 - a. Use any text editor, but be sure not to enter any tabs when the file is stored.
 - b. Use the menu options within the CERES models to enter a new genotype, or modify an existing genotype (see example following).
 - c. Use the INPUTS program, which is available with the CERES RICE model.
3. Run the model for one location/treatment combination for which data are available.
4. Estimate the day length during the early part of the growing cycle of the crop.
5. Initial assumption would be that the initial coefficient for P2O, is correct (chose a variety with similar characteristics to the one in question).
6. Carry out the step listed in (a) below if the day length was less than P2O, and (b) if the day length was greater than P2O.
 - a. Examine and note the goodness-of-fit between the predicted and observed heading or panicle initiation date. If the predicted heading date (or panicle initiation) was later (or earlier) than the observed, decrease (or increase) the value for P1 (the first variable) in the genetics file. The change necessary can be approximated for many conditions by subtracting the predicted value from the observed, and multiplying the difference by 7. Repeat until a reasonable fit is obtained.
 - b. Examine and note the goodness-of-fit between the predicted and observed heading date and/or panicle initiation date. If the predicted heading date or panicle initiation date was later (or earlier) than the observed, decrease (or increase) the value of P2R (the second variable in the genetics file). Repeat until a reasonable fit is obtained.

1. Available from IBSNAT Project, University of Hawaii.

7. If phenological data from planting date experiments are available, then repeat step 6 for each of the planting dates. If the P2R and P1 values differ by more than 50 GDD, for different planting date treatments, then repeat step 6 with $P2O + 0.5$ h.
8. Examine and note the goodness-of-fit between the predicted and actual days to maturity. If not satisfactory, increase (or decrease as appropriate) P5 (the third variable in the genetics file). Rerun and rechange the coefficient until a satisfactory fit is obtained.
9. Examine and note the goodness-of-fit between predicted and observed grain number per m^2 . Adjust G1 (the fifth variable in genetics file) if the experiment was conducted under nonstressed conditions, rerun, and recompare until satisfied.
10. Examine and note the goodness-of-fit between predicted and observed single grain weight. Adjust G2 (the sixth variable in genetics file) if the experiment was conducted under nonstressed conditions, rerun, and recompare until satisfied.
11. Keep the G3 value at 1.0. Adjust G3 (the seventh variable) only if the experimental results are from nonstressed conditions and the difference between the observed and predicted panicles per plant are more than 2.
12. Keep the G4 coefficient at 1.0. Change this value only if there were extremes of low and/or high temperatures to influence panicle initiation, fertilization or grain filling. If the crop performance was affected by low temperatures, use G4 values of less than 1.0 but greater than 0.5. Under heat stress conditions use G4 values of 1.0 or higher.
13. Determine whether the estimates of the various coefficients lie within the usual range of values. If outside the usual range, examine the data dealing with the environmental conditions under which the crop was grown, and determine whether any exceptional stress was present during the growing cycle (e.g., very low soil phosphorus, very low pH, etc.). If so, note that the coefficients should not be used more widely than for the treatment/location from which they were derived, and should be flagged out if entered into the genetic coefficient file.
14. If more treatments/location combinations are available, note the values estimated for the first treatment/location combination and repeat for all other combinations. When all runs are complete, calculate means from those treatment/locations at which no extreme stress was present, and enter these into the genetic file.

Computer Sample Screen

MODIFICATION OF SELECTED MODEL VARIABLES INTERACTIVELY

VARIABLES TO BE MODIFIED:

1. Transplanting/Planting Method
2. Transplanting/Planting Date and Seedling Age and Depth
3. Flood Water Management
4. Plant Population
5. Nitrogen Non-Limiting
6. Irrigation Inputs and Water Balance Switch
7. Fertilizer Inputs
8. Select New Variety
9. Soil Profile Inputs (Water Balance, Root Preference, DMOD)
10. Select Weather Data
11. Initial Soil Fertility and Water,
and Crop Residue Parameters
12. Climate Change Effects
13. Display Echo
14. End of Changes
15. Abandon all Changes and Return to Experiment Menu

ENTER NUMBER OF MODIFICATION : 8

Computer Sample Screen

VARIETIES IN THE DATA BASE

NO.	VARIETY NAME	P1	P2O	P5	P2R	G1	G2	G3	G4
1	IR 8	880.00	12.10	550.00	52.0	65.0	.0280	1.00	1.00
2	IR 20	500.00	11.20	500.00	166.0	65.0	.0280	1.00	1.00
3	IR 36	450.00	11.70	350.00	149.0	68.0	.0230	1.00	1.00
4	IR 43	720.00	10.50	580.00	120.0	65.0	.0280	1.00	1.00
5	LABELLE	318.00	12.80	550.00	189.0	65.0	.0280	1.00	1.00
6	MARS	698.00	13.00	550.00	134.0	65.0	.0280	1.00	1.00
7	NOVA 66	389.00	11.00	550.00	155.0	65.0	.0280	1.00	1.00
8	PETA	420.00	11.30	550.00	240.0	65.0	.0280	1.00	1.00
9	STARBONNETT	880.00	13.00	550.00	164.0	65.0	.0280	1.00	1.00
10	UPLRI5	620.00	11.50	380.00	160.0	50.0	.0220	.60	1.00
11	UPLRI7	760.00	11.70	450.00	150.0	65.0	.0280	1.00	1.00
12	IR 58	460.00	13.50	420.00	5.0	60.0	.0250	1.00	1.00
13	SenTaNi (???)	320.00	10.00	550.00	50.0	70.0	.0300	1.00	1.00
14	IR 54	350.00	11.50	520.00	125.0	60.0	.0280	1.00	1.00
15	IR 64	500.00	12.00	450.00	160.0	60.0	.0250	1.00	1.00
16	IR 60 (Est)	490.00	11.50	320.00	100.0	75.0	.0275	1.00	1.00

PRESS <ENTER> TO CONTINUE LISTING.

Computer Sample Screen

NO.	VARIETY NAME	P1	P2O	P5	P2R	G1	G2	G3	G4
17	IR 66	500.00	12.50	490.00	50.0	62.0	.0265	1.00	1.00
118	IR 72	560.00	13.50	390.00	20.0	60.0	.0250	1.00	1.00
19	RD 7 (cal.)	603.33	11.20	452.50	150.0	65.0	.0230	1.00	1.00
20	RD 23 (cal.)	310.33	11.20	370.00	140.0	53.0	.0230	1.00	1.00
21	CICA8	700.00	11.70	360.00	120.0	60.0	.0270	1.00	1.00
22	LOW TEMP.SEN	400.00	12.00	420.00	120.0	60.0	.0250	1.00	.80
23	LOW TEMP.TOL	400.00	12.00	420.00	120.0	60.0	.0250	1.00	1.25
24	17 BR11,T.AMAN	740.00	10.50	400.00	180.0	55.0	.0250	1.00	.90
25	18 BR22,T.AMAN	650.00	12.00	400.00	110.0	60.0	.0250	1.00	1.00
26	19 BR 3,T.AMAN	650.00	12.00	420.00	110.0	65.0	.0250	1.00	1.00
27	20 BR 3,BORO	650.00	13.00	400.00	90.0	65.0	.0250	1.00	1.00
115	IR 64	540.00	12.00	490.00	160.0	50.0	.0250	1.00	1.00
116	HEAT SENSITIVE	460.00	13.50	390.00	5.0	62.0	.0250	1.00	1.15
29	CPIC8	380.00	12.80	300.00	150.0	38.0	.0210	1.00	1.00
30	LEMONT	500.00	12.80	300.00	50.0	60.0	.0207	1.00	1.00
31	RN12	380.00	12.80	300.00	50.0	40.0	.0199	1.00	1.15

Press <ENTER> key to continue.

Computer Sample Screen

The current variety is : 12

Do you want to :

1. Select a new variety ?
2. Create a new variety ?
3. Modify current genetic coefficients ?
4. View the varieties again ?
5. Return to the main menu ?

Enter number of choice : 3

Computer Sample Screen

Current Values of Coefficients to Modify :

1. P1 = 460.00
2. P2R = 5.00
3. P5 = 420.00
4. P2O = 13.50
5. G1 = 60.01
6. G2 = .0250
7. G3 = 1.00
8. G4 = 1.00
9. End of changes

Parameter choice : 3

The current value of P5 is : 420.00
Input new value : 450

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Table 1. Files in "1. CERES RICE V2.10 PROGRAM" diskette.

MRI1	EXE
FILES	40
RIINS	BAT
GRAPH	BAT
INPUT	BAT
HELPFLOP	BAT
RIHARD	BAT
RIINS2	BAT
HELPRI	BAT
GRFLOPPY	BAT
INFLOPPY	BAT
RIFLOPPY	BAT
HELPHARD	BAT

Table 2. Files "1a. CERES RICE V2.10 Source Code" diskette.

MRI2	FOR	MNBAL	FOR
MRI3	FOR	METRAT	FOR
MRI3B	FOR	MRI1	FOR
MRI3C	FOR	COINPUT	BLK
MRISUB	FOR	COMIBS	BLK
MMENU	FOR	ENVIRO	BLK
MMENU2	FOR	GRAPH	BLK
MMENU3	FOR	NMOVE	BLK
MMENU4	FOR	NTRC1	BLK
MMENU5	FOR	NTRC2	BLK
MMENU6	FOR	PADDY	BLK
MFCHEM	FOR	PREDOB	BLK
MPOROSIT	FOR	RICE1	BLK
MPERCOL	FOR	RICE2	BLK
MNEWNV	FOR	RICE3	BLK
MDISOUT	FOR	RICE4	BLK
MEQUIL2	FOR	COMPILE	BAT
MAMTHERM	FOR	RILINK	BAT
MOXLAYR	FOR	RIOBJ	
MDRYUP	FOR		

Table 3. Files in "2. CERES RICE V2.10 DATA" diskette.

GENETICS RI9	DTSP8502 RIB
IRMZ8601 RI0	IRPI8002 RI0
IRMZ8601 RI5	IRPI8001 RI4
IRMZ8601 RI7	IRPI8001 RI5
IRMZ8601 RI8	IRPI8001 RI7
IRMZ8601 RIA	IRPI8002 RI7
IRMZ8601 RIB	IRPI8001 RI8
IRPL3501 RI0	IRPI8001 RIA
IRPL8501 RI4	IRPI8001 RIB
IRPL8501 RI5	IRPI8002 RI8
IRPL8501 RI7	IRPI8001 RI6
IRPL8501 RI8	IRMZ8601 RI4
IRPL8501 RIA	IRPL8501 RI6
IRPL8501 RIB	IRMZ8601 RI6
RIINS BAT	WTH DIR
RIINS2 BAT	RIEXP DIR
DTSP8502 RI0	DTSP0112 W85
DTSP8502 RI4	IRPI0112 W80
DTSP8502 RI5	IRPI0112 W85
DTSP8502 RI6	IRPI0112 W86
DTSP8502 RI7	IRMZ0112 W85
DTSP8502 RI8	IRMZ0112 W86
DTSP8502 RIA	SPROFILE RI2
	CHMA0112.W51

Table 4. Files in "3. CERES RICE V2.10 INPUT" diskette.

INPUT BAT	FILE8 HLP
RIINS BAT	FILE9 HLP
RIINS2 BAT	FILEA HLP
GENETICS RI9	FILEB HLP
SPROFILE RI2	FILE10 HLP
MCREATE EXE	NINIT MEM
FILE1 HLP	INTRO DAT
FILE2 HLP	CROPLIST DAT
FILE4 HLP	SOILS SCR
FILE5 HLP	INFLOPPY BAT
FILE6 HLP	RIEXP DIR
FILE7 HLP	WEATHER2.TXT

Table 5. Files in "4. CERES RICE V2.10 GRAPHICS" diskette.

RIINS	BAT
RIINS2	BAT
GLABEL3	DAT
GLABEL4	DAT
GLABEL	DAT
GLABEL2	DAT
GRAPH	BAT
GRFLOPPY	BAT
MAIN	EXE
GRPH	EXE
HVGRF	EXE
CHANGE	EXE
BRUN40	EXE

Table 6. File "RIEXP.DIR"

IRPL8501 IRRI, PILA JAN 85 UREASE INHIBITORS	IRPI0112.W85 SPROFILE.RI2
IRPL8501.RI4 IRPL8501.RI5 IRPL8501.RI6 IRPL8501.RI7 IRPL8501.RI8 GENETICS.RI9	
IRPL8501.RIA IRPL8501.RIB OUT1.RI OUT2.RI OUT3.RI OUT4.RI OUT5.RI	
IRPL8501.RI0 OUT6.RI	
IRMZ8601 IRRI, 1986 Urea Appl. STUDY	IRMZ0112.W86 SPROFILE.RI2
IRMZ8601.RI4 IRMZ8601.RI5 IRMZ8601.RI6 IRMZ8601.RI7 IRMZ8601.RI8 GENETICS.RI9	
IRMZ8601.RIA IRMZ8601.RIB OUT1.RI OUT2.RI OUT3.RI OUT4.RI OUT5.RI	
IRMZ8601.RI0 OUT6.RI	
DTSP8502 Effects of appl. N & envir. on rice	DTSP0112.W85 SPROFILE.RI2
DTSP8502.RI4 DTSP8502.RI5 DTSP8502.RI6 DTSP8502.RI7 DTSP8502.RI8 GENETICS.RI9	
DTSP8502.RIA DTSP8502.RIB OUT1.RI OUT2.RI OUT3.RI OUT4.RI OUT5.RI	
DTSP8502.RI0 OUT6.RI OUT7.RI	
IRPI8001 IRRI, LOS BANOS, IRRIG. & N STUDY, 1980	IRPI0112.W80 SPROFILE.RI2
IRPI8001.RI4 IRPI8001.RI5 IRPI8001.RI6 IRPI8001.RI7 IRPI8001.RI8 GENETICS.RI9	
IRPI8001.RIA IRPI8001.RIB OUT1.RI OUT2.RI OUT3.RI OUT4.RI OUT5.RI	
IRPI8002.RI0 OUT6.RI	
IRPI8001 IRRIG. & N STUDY :MULTIYR CHIANGMAI	CHMA0112.W51 SPROFILE.RI2
IRPI8001.RI4 IRPI8001.RI5 IRPI8001.RI6 IRPI8001.RI7 IRPI8002.RI8 GENETICS.RI9	
IRPI8001.RIA IRPI8001.RIB OUT1.RI OUT2.RI OUT3.RI OUT4.RI OUT5.RI	
IRPI8002.RI0 OUT6.RI	

Table 7. File "IRPI0112.W85" (for the first 30 days only).

IRPI	14.20	121.30	12.07	.00		
IRPI 85	1	11.90	27.6	21.6	.1	DATE 1-31'DATA COME FROM IRIW0112.W85
IRPI 85	2	12.80	27.7	20.1	.0	
IRPI 85	3	11.00	28.2	21.2	.5	
IRPI 85	4	14.40	27.6	19.9	.0	
IRPI 85	5	10.40	26.9	21.2	.4	
IRPI 85	6	9.70	26.2	21.0	3.0	
IRPI 85	7	14.80	27.2	18.5	.0	
IRPI 85	8	18.70	27.5	18.2	.0	
IRPI 85	9	16.90	26.3	17.6	.0	
IRPI 85	10	19.40	28.4	17.9	.0	
IRPI 85	11	18.40	29.3	17.0	.0	
IRPI 85	12	17.60	28.4	18.8	.0	
IRPI 85	13	17.30	28.1	19.5	.0	
IRPI 85	14	11.50	27.1	18.0	.1	
IRPI 85	15	10.40	26.7	20.8	.7	
IRPI 85	16	9.00	26.5	20.1	.0	
IRPI 85	17	5.20	26.0	22.0	.0	
IRPI 85	18	11.90	29.5	22.4	.0	
IRPI 85	19	7.20	27.6	23.4	.0	
IRPI 85	20	13.30	28.0	22.7	.0	
IRPI 85	21	13.10	28.2	21.0	.0	
IRPI 85	22	11.90	27.7	21.0	.1	
IRPI 85	23	8.50	27.9	22.9	.0	
IRPI 85	24	16.70	29.2	22.3	.0	
IRPI 85	25	17.10	28.2	21.7	1.0	
IRPI 85	26	12.80	28.8	21.0	4.2	
IRPI 85	27	11.90	28.9	22.0	.2	
IRPI 85	28	11.90	28.4	22.8	.0	
IRPI 85	29	13.10	29.1	21.5	.0	
IRPI 85	30	13.00	28.1	22.4	2.0	

Table 8. File "WTH.DIR"

IRPI 1980 WEATHER (UPLAND) DATA	01-01-80	12-31-80	IRPI0112.W80
IRPL 1985 IRRI PILA	01-01-85	12-31-85	IRPI0112.W85
IRMZ 1986 IRRI MUNOZ	01-01-86	12-31-86	IRMZ0112.W86
IFCH CHIANGMAI, 25 YEARS DATA FROM 1951	01-01-51	12-31-75	CHMA0112.W51
DTSP 1985 WEATHER	01-01-85	12-31-85	DTSP0112.W85

Table 9. File "sprofile.ri2".

1 PILA LOWLAND ANDAQUEPTIC HAPLAQUOLL												
.13	7.50	.00	87.00	27.0	3.8	1.0	.27E-02	58.0	6.68	.03	1.00	40.
5.	.289	.415	.700	.415	1.000	.75	2.45					
15.	.289	.415	.650	.415	.850	.90	2.45					
15.	.289	.415	.600	.415	.200	.90	1.45					
15.	.289	.415	.600	.415	.050	.88	1.45					
-1.												
2 MUNOZ VERTIC TROPAQUEPT												
.13	7.50	.00	87.00	27.0	4.3	1.5	.27E-02	58.0	6.68	.03	1.00	40.
5.	.258	.389	.650	.389	1.000	.85	1.30					
15.	.258	.389	.600	.389	.850	.90	1.20					
15.	.267	.396	.550	.396	.200	.90	.65					
15.	.267	.396	.550	.396	.050	.90	.50					
-1.												
3 IRRI UB3 ANDAQUEPTIC HAPLAQUOLL												
.13	7.50	.40	87.00	27.0	3.8	1.0	.27E-02	58.0	6.68	0.03	1.00	30.
5.	.227	.349	.650	.349	1.000	.95	1.10					
10.	.227	.349	.650	.349	.850	.95	1.00					
15.	.227	.345	.600	.345	.250	1.05	.59					
15.	.227	.345	.600	.345	.050	1.05	.50					
15.	.227	.345	.600	.345	.005	1.05	.50					
-1.												
4 IRRI UU1 LITHIC HAPLUDOLL												
.14	7.50	.50	75.00	27.0	3.8	0.9	0.27E-02	58.0	6.68	0.03	1.00	31.
5.	.226	.314	.387	.314	1.000	1.10	1.13					
10.	.226	.314	.387	.314	.900	1.10	1.13					
15.	.259	.323	.388	.373	.250	1.20	.89					
15.	.259	.323	.388	.373	.050	1.10	.65					
15.	.259	.323	.388	.373	.010	1.10	.55					
-1.												
5 PILA LOWLAND AERIC TROPAQUEPT												
.13	7.50	.00	87.00	27.9	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00	40.
5.	.289	.415	.700	.415	1.000	.75	3.30					
5.	.289	.415	.700	.415	.900	.85	3.30					
10.	.289	.415	.650	.415	.825	.90	3.20					
15.	.289	.415	.600	.415	.200	.90	1.30					
15.	.289	.415	.600	.415	.050	.88	1.30					
15.	.289	.415	.600	.415	.010	.88	1.00					
-1.												
6 VICTORIA ANDAQUEPTIC HAPLAQUOLL												
.13	7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00	34.
5.	.262	.388	.650	.388	1.000	.85	1.47					
15.	.262	.388	.650	.388	.850	.90	1.47					
15.	.232	.354	.600	.354	.200	.90	.54					
15.	.232	.354	.600	.354	.050	.90	.54					
-1.												

7	IRRI J6	ANDAQUEPTIC HAPLAQUOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 46.
	5. .333	.456	.650	.456	1.000		.85	2.30			
	15. .333	.456	.650	.456	.850		.90	2.30			
	15. .329	.451	.600	.451	.200		.90	1.27			
	15. .329	.451	.600	.451	.050		.90	1.27			
	-1.										
8	IRRI G4	ANDAQUEPTIC HAPLAQUOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 38.
	05. .262	.389	.650	.389	1.000		.85	1.78			
	15. .262	.389	.650	.389	.850		.90	1.78			
	15. .262	.388	.600	.388	.200		.90	1.56			
	15. .262	.388	.600	.388	.050		.90	1.56			
	-1.										
9	IRRI C13	ANDAQUEPTIC HAPLAQUOLL									
	.13 7.50	.00	87.00	27.0	3.8	0.8	0.27E-02	58.0	6.68	0.03	1.00 41.
	5. .307	.430	.650	.430	1.000		.85	2.10			
	15. .307	.430	.650	.430	.850		.90	2.10			
	15. .311	.434	.600	.434	.200		.90	1.13			
	15. .311	.434	.600	.434	.050		.90	1.13			
	-1.										
10	PILA LOWLAND	ANDAQUEPTIC HAPLAQUOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 41.
	5. .285	.412	.650	.412	1.000		.85	1.78			
	15. .285	.412	.650	.412	.850		.90	1.78			
	15. .285	.411	.600	.411	.200		.90	.59			
	15. .285	.411	.600	.411	.050		.90	.59			
	-1.										
11	IRRI UL	ANDAQUEPTIC HAPLAQUOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 29.
	5. .223	.354	.600	.354	1.000		.93	1.17			
	5. .223	.354	.600	.354	.950		.93	1.17			
	10. .236	.366	.550	.366	.850		1.16	1.06			
	10. .236	.366	.550	.366	.300		1.11	1.06			
	15. .289	.414	.550	.414	.100		1.00	.52			
	15. .289	.414	.550	.414	.010		1.00	.52			
	-1.										
12	MARITAC	VERTIC TROPAQUEPT									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 26.
	5. .262	.391	.406	.391	1.000		0.85	1.82			
	15. .262	.391	.406	.391	.850		0.90	1.82			
	-1.										
13	CALAUAN	AERIC HAPLUSTOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 48.
	5. .271	.399	.414	.399	1.000		0.85	4.30			
	15. .271	.399	.414	.399	.850		0.90	4.30			
	-1.										
14	AGUILAR	AQUIC HAPLUSTOLL									
	.13 7.50	.00	87.00	27.0	3.8	1.0	0.27E-02	58.0	6.68	0.03	1.00 25.
	5. .143	.273	.386	.273	1.000		0.85	1.59			
	15. .143	.273	.386	.273	.850		0.90	1.59			
	-1.										

15 ZAMBALES AQUIC USTIFLUVENT
.13 7.50 .00 87.00 27.0 3.8 1.0 0.27E-02 58.0 6.68 0.03 1.00 5.
5. .063 .190 .345 .190 1.000 0.85 1.89
15. .063 .190 .345 .190 .850 0.90 1.89
-1.

16 CALAUAN AERIC TROPAQUEPT
.13 7.50 .00 87.00 27.0 3.8 1.0 0.27E-02 58.0 6.68 0.03 1.00 47.
5. .284 .410 .650 .410 1.000 .80 3.70
15. .284 .410 .650 .410 .850 .90 3.70
-1.

17 BLOCK M MAAHAS
0.13 7.84 0.4 76.00 25.0 5.0 1.0 1.32E-03 58.0 6.67 0.04 1.00 35.
5. 0.270 0.397 0.412 0.397 1.000 0.95 3.54 -9.0 -9.0 6.0 -9.0
10. 0.270 0.397 0.412 0.397 0.861 0.95 3.54 -9.0 -9.0 6.0 -9.0
15. 0.265 0.392 0.407 0.392 0.200 0.93 1.48 -9.0 -9.0 6.5 -9.0
15. 0.257 0.380 0.412 0.380 0.005 0.78 0.52 -9.0 -9.0 7.0 -9.0
15. 0.257 0.380 0.412 0.380 0.000 0.78 0.52 -9.0 -9.0 7.0 -9.0
-1. 0.000 0.000 0.000 0.000 0.000 0.00 0.00 0.0 0.0 0.0 -9.0

20 MUNOZ VERTIC TROPAQUEPT
.13 7.50 .00 87.00 27.0 4.3 1.2 .27E-02 58.0 6.68 .03 1.00 35.
5. .258 .389 .650 .389 1.000 .85 1.30
15. .258 .389 .600 .389 .850 .90 1.20
15. .267 .396 .550 .396 .200 .90 .65
15. .267 .396 .550 .396 .050 .90 .50
-1.

63 IRRI UPLAND FINE, MIXED, ISOHYPERTHERMIC, ANDAQUEPTIC HAPLAQUOLL
0.13 12.00 0.50 67.00 28.0 3.0 1.0 0.32E-003 58.7 6.67 0.04 1.00 25.
5. 0.280 0.397 0.412 0.397 1.000 1.00 2.45 -9.0 -9.0 6.0 -9.0
10. 0.280 0.397 0.412 0.397 1.000 1.00 2.45 -9.0 -9.0 6.0 -9.0
14. 0.275 0.392 0.407 0.392 1.000 1.00 1.48 -9.0 -9.0 6.5 -9.0
9. 0.198 0.264 0.412 0.264 0.200 0.93 0.52 -9.0 -9.0 7.0 -9.0
9. 0.198 0.264 0.412 0.264 0.200 0.93 0.52 -9.0 -9.0 7.0 -9.0
11. 0.174 0.235 0.373 0.235 0.100 0.78 0.31 -9.0 -9.0 6.9 -9.0
11. 0.174 0.235 0.373 0.235 0.050 0.78 0.31 -9.0 -9.0 6.9 -9.0
27. 0.152 0.213 0.366 0.213 0.000 0.74 0.25 -9.0 -9.0 7.0 -9.0
27. 0.152 0.213 0.366 0.213 0.000 0.74 0.25 -9.0 -9.0 7.0 -9.0
12. 0.172 0.238 0.364 0.238 0.000 0.55 0.06 -9.0 -9.0 7.0 -9.0
-1. 0.000 0.000 0.000 0.000 0.000 0.00 0.00 0.0 0.0 0.0 0.0

71 Suphan LowL, Fine, Mixed, Non-acid, Isohyper., Aeric Tropaquept
.10 7.50 .00 60.00 28.0 5.0 1.0 .27E-02 58.0 6.68 .03 1.00 05.
5. .245 .332 .398 .374 1.000 1.41 1.81
3. .245 .332 .398 .374 1.000 1.41 1.81
11. .210 .341 .402 .341 .361 1.49 .79
9. .242 .369 .404 .369 .200 1.39 .54
10. .242 .369 .404 .369 .100 1.39 .54
13. .218 .344 .388 .344 .100 1.34 .32
-1.

```

72 MUNOZ          MULTI-YEAR EXP SOIL
  .13  7.50    .00 87.00 27.0  4.3 1.0   .27E-02  58.0  6.68   .03 1.00 40.
    5.   .258   .389   .650   .389  1.000   .85  1.30
   15.   .258   .389   .600   .389   .850   .90  1.20
   15.   .267   .396   .550   .396   .200   .90   .65
   15.   .267   .396   .550   .396   .050   .90   .50
  -1.

73 CHIATA          AERIC
  0.12 20.36   0.05 76.00 20.0  5.0 0.8 1.32e-003  65.6  6.67  0.04 1.00 18.
    5.   0.052  0.202  0.394  0.202  1.000  0.85  0.85 -9.0 -9.0  5.6 -9.0
   10.   0.167  0.308  0.391  0.308  0.500  0.90  0.40 -9.0 -9.0  5.8 -9.0
   13.   0.168  0.309  0.390  0.309  0.200  0.90  0.10 -9.0 -9.0  5.8 -9.0
   10.   0.169  0.309  0.392  0.309  0.300  0.90  0.10 -9.0 -9.0  5.7 -9.0
   17.   0.264  0.393  0.408  0.393  0.200  0.90  0.10 -9.0 -9.0  5.6 -9.0
   12.   0.263  0.393  0.408  0.393  0.050  0.90  0.10 -9.0 -9.0  5.7 -9.0
   25.   0.267  0.397  0.412  0.397  0.020  0.90  0.10 -9.0 -9.0  5.7 -9.0
  -1.

81 SANSai          COARSE-LOAMY, MIXED, TROPIC TROPAQUALFS
  .13  8.20    0.05 88.00 26.5  7.3 1.0  2.67E-03  62.0  6.68  0.03 0.70 38.
    5.   0.113  0.231  0.347  0.265  1.000  1.56   .55
    5.   0.113  0.231  0.347  0.265  1.000  1.56   .50
   20.   0.101  0.219  0.338  0.208   .300  1.72   .35
   20.   0.093  0.219  0.327  0.220   .100  1.76   .35
  -1.

```

Table 10. File "irpl8501.r18".

```

IRPL8501  1 Control 0 N                                15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  2 Control 0 N (drained)                        15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  3 30 kg N as urea(2/3 18DT 1/3 38DT)          15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  4 30 kg N as urea(2/3 18DT 1/3 38DT)Drain    15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  5 60 kg N as urea(2/3 18DT 1/3 38DT)        15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  6 60 kg N as urea(2/3 18DT 1/3 38DT)Drain    15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  7 90 kg N as urea(2/3 18DT 1/3 38DT)          15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  8 90 kg N as urea(2/3 18DT 1/3 38DT)Drain    15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501  9 120 kg N as urea(2/3 18DT 1/3 38DT)        15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0
IRPL8501 10 120 kg N as urea(2/3 18DT 1/3 38DT)Drain   15  12
    32 35 75.00 0.200 2.00 7 1  1.00 0.20  99.0 95.00 0

```

Table 11. File "irpl8501.ri0".

```

IRPL8501  1  3  25.0 3.0  35 23.   0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  2  3  25.0 3.0  35 23.   0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  51  0.5  0.5  8
  52 15.0 10.0  6
  56 15.0  5.0  7
  71  0.4  0.4  8
  72 15.0 10.0  6
  76 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  3  3  25.0 3.0  35 23.   0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  4  3  25.0 3.0  35 23.   0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  51  0.5  0.5  8
  52 15.0 10.0  6
  56 15.0  5.0  7
  71  0.4  0.4  8
  72 15.0 10.0  6
  76 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  5  3  25.0 3.0  35 23.   0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0

```



```

IRPL8501  6  3  25.0 3.0  35 23.  0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  51  0.5  0.5  8
  52 15.0 10.0  6
  56 15.0  5.0  7
  71  0.4  0.4  8
  72 15.0 10.0  6
  76 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  7  3  25.0 3.0  35 23.  0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  8  3  25.0 3.0  35 23.  0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  51  0.5  0.5  8
  52 15.0 10.0  6
  56 15.0  5.0  7
  71  0.4  0.4  8
  72 15.0 10.0  6
  76 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501  9  3  25.0 3.0  35 23.  0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0
IRPL8501 10  3  25.0 3.0  35 23.  0. 25.0 0.15  1  1
  32  2.0  0.5  7
  38 10.0  3.0  7
  42 15.0  5.0  7
  51  0.5  0.5  8
  52 15.0 10.0  6
  56 15.0  5.0  7
  71  0.4  0.4  8
  72 15.0 10.0  6
  76 15.0  5.0  7
  -1  0.0  0.0  0
  -1  0.0

```

Table 12. File "irpl8501.ri6".

```

1 IRPL8501
  -1  -1
2 IRPL8501
  -1  -1
3 IRPL8501
  -1  -1
4 IRPL8501
  -1  -1
5 IRPL8501
  -1  -1
6 IRPL8501
  -1  -1
7 IRPL8501
  -1  -1
8 IRPL8501
  -1  -1
9 IRPL8501
  -1  -1
10 IRPL8501
  -1  -1

```

Table 13. File "irpl8501.ri5".

```

1 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
2 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
3 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
4 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
5 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
6 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
7 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
8 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0

```

```

9 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0
10 IRPL8501
  05  0.700 12.7  0.1  6.2
  15  0.650 12.7  0.1  6.2
  15  0.600  3.2  0.1  6.4
  15  0.600  3.2  0.1  6.4
  -1. -1.000 -1.0 -1.0 -1.0

```

Table 14. File "irpl8501.r17"

```

1 IRPL8501
  -1
2 IRPL8501
  -1
3 IRPL8501
  53  20.0   1.0  5  1
  73  10.0   1.0  5  1
  -1
4 IRPL8501
  53  20.0   1.0  5  1
  73  10.0   1.0  5  1
  -1
5 IRPL8501
  53  40.0   1.0  5  1
  73  20.0   1.0  5  1
  -1
6 IRPL8501
  53  40.0   1.0  5  1
  73  20.0   1.0  5  1
  -1
7 IRPL8501
  53  60.0   1.0  5  1
  73  30.0   1.0  5  1
  -1
8 IRPL8501
  53  60.0   1.0  5  1
  73  30.0   1.0  5  1
  -1
9 IRPL8501
  53  80.0   1.0  5  1
  73  40.0   1.0  5  1
  -1
10 IRPL8501
  53  80.0   1.0  5  1
  73  40.0   1.0  5  1
  -1

```

Table 15. File "irpl8501.ri4".

IRPL8501	1	200.	15.	30.	300.
IRPL8501	2	200.	15.	30.	300.
IRPL8501	3	200.	15.	30.	300.
IRPL8501	4	200.	15.	30.	300.
IRPL8501	5	200.	15.	30.	300.
IRPL8501	6	200.	15.	30.	300.
IRPL8501	7	200.	15.	30.	300.
IRPL8501	8	200.	15.	30.	300.
IRPL8501	9	200.	15.	30.	300.
IRPL8501	10	200	15.	30.	300.

Table 16. File "genetics.ri9".

1 IR 8	880.00	52.00	550.00	12.1	65.0	0.0280	1.00	1.00
2 IR 20	500.00	166.00	500.00	11.2	65.0	0.0280	1.00	1.00
3 IR 36	450.00	149.00	350.00	11.7	70.0	0.0230	1.00	1.00
4 IR 43	720.00	120.00	580.00	10.5	65.0	0.0280	1.00	1.00
5 LABELLE	318.00	189.00	550.00	12.8	65.0	0.0280	1.00	1.00
6 MARS	698.00	134.00	550.00	13.0	65.0	0.0280	1.00	1.00
7 NOVA 66	389.00	155.00	550.00	11.0	65.0	0.0280	1.00	1.00
8 PETA	420.00	240.00	550.00	11.3	65.0	0.0280	1.00	1.00
9 STARBONNETT	880.00	164.00	550.00	13.0	65.0	0.0280	1.00	1.00
10 UPLRI5	620.00	160.00	380.00	11.5	50.0	0.0220	0.60	1.00
11 UPLRI7	760.00	150.00	450.00	11.7	65.0	0.0280	1.00	1.00
12 IR 58	460.00	5.00	420.00	13.5	65.0	0.0250	1.00	1.00
13 SenTaNi (???)	320.00	50.00	550.00	10.0	70.0	0.0300	1.00	1.00
14 IR 54	350.00	125.00	520.00	11.5	60.0	0.0280	1.00	1.00
15 IR 64	500.00	160.00	450.00	12.0	60.0	0.0250	1.00	1.00
16 IR 60(Est)	490.00	100.00	320.00	11.5	75.0	0.0275	1.00	1.00
17 IR 66	500.00	50.00	490.00	12.5	62.0	0.0265	1.00	1.00
18 IR 72	560.00	20.00	390.00	13.5	60.0	0.0250	1.00	1.00
19 RD 7 (cal.)	603.33	150.00	452.50	11.2	65.0	0.0230	1.00	1.00
20 RD 23 (cal.)	380.33	140.00	390.00	11.2	55.0	0.0230	1.30	1.00
21 CICA8	700.00	120.00	360.00	11.7	60.0	0.0270	1.00	1.00
22 LOW TEMP.SEN	400.00	120.00	420.00	12.0	60.0	0.0250	1.00	0.80
23 LOW TEMP.TOL	400.00	120.00	420.00	12.0	60.0	0.0250	1.00	1.25
24 17 BR11,T.AMAN	740.00	180.00	400.00	10.5	55.0	0.0250	1.00	0.90
25 18 BR22,T.AMAN	650.00	110.00	400.00	12.0	60.0	0.0250	1.00	1.00
26 19 BR 3,T.AMAN	650.00	110.00	420.00	12.0	65.0	0.0250	1.00	1.00
27 20 BR 3,BORO	650.00	90.00	400.00	13.0	65.0	0.0250	1.00	1.00
115 IR 64	540.00	160.00	490.00	12.0	50.0	0.0250	1.10	1.00
116 HEAT SENSITIVE	460.00	5.00	390.00	13.5	62.0	0.0250	1.00	1.15

Table 17. File "irpl8501.ria".

IRPL8501	1	3910.	0.0199	0.	444.	0.00	5803.	2440.	89	117
	1.13	55.0	14.8	40.3						
IRPL8501	2	3873.	0.0201	0.	456.	0.00	5700.	2370.	89	117
	1.12	55.3	15.5	39.8						
IRPL8501	3	5073.	0.0202	0.	325.	0.00	7420.	3058.	92	122
	1.17	72.3	18.0	54.3						
IRPL8501	4	4110.	0.0201	0.	394.	0.00	6247.	2713.	92	122
	1.17	61.0	17.0	44.0						
IRPL8501	5	5890.	0.0201	0.	488.	0.00	8583.	3518.	92	124
	1.25	88.8	21.8	67.0						
IRPL8501	6	5498.	0.0196	0.	463.	0.00	8098.	3370.	92	124
	1.15	78.3	20.8	57.5						
IRPL8501	7	6420.	0.0200	0.	394.	0.00	9914.	4393.	92	126
	1.38	110.3	29.0	81.3						
IRPL8501	8	6078.	0.0199	0.	431.	0.00	9034.	3808.	92	126
	1.30	98.0	25.8	72.3						
IRPL8501	9	6700.	0.0199	0.	369.	0.00	10277.	4515.	92	126
	1.42	121.0	34.0	87.0						
IRPL8501	10	6478.	0.0200	0.	369.	0.00	10251.	4680.	92	126
	1.45	120.3	34.3	86.0						

Table 18. File "irpl8501.rib".

INST_ID:	IR	SITE_ID:	PL	EXPT_NO:	1	YEAR:	1985	TRT_NO:	1
4	3	2	6	7					
61	0.00	44.	0.	0.					
70	0.00	118.	0.	0.					
80	0.00	265.	0.	0.					
89	0.00	394.	0.	0.					
117	0.00	580.	0.	0.					
-1									
INST_ID:	IR	SITE_ID:	PL	EXPT_NO:	1	YEAR:	1985	TRT_NO:	2
4	3	2	6	7					
61	0.00	40.	0.	0.					
70	0.00	105.	0.	0.					
80	0.00	285.	0.	0.					
89	0.00	411.	0.	0.					
117	0.00	570.	0.	0.					
-1									
INST_ID:	IR	SITE_ID:	PL	EXPT_NO:	1	YEAR:	1985	TRT_NO:	3
4	3	2	6	7					
61	0.00	46.	0.	0.					
70	0.00	110.	0.	0.					
80	0.00	301.	0.	0.					
92	0.00	468.	0.	0.					
122	0.00	742.	0.	0.					
-1									

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 4
4 3 2 6 7

61	0.00	43.	0.	0.
70	0.00	117.	0.	0.
80	0.00	323.	0.	0.
92	0.00	482.	0.	0.
122	0.00	625.	0.	0.

-1

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 5
4 3 2 6 7

61	0.00	45.	0.	0.
70	0.00	124.	0.	0.
80	0.00	344.	0.	0.
95	0.00	703.	0.	0.
124	0.00	858.	0.	0.

-1

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 6
4 3 2 6 7

61	0.00	48.	0.	0.
70	0.00	111.	0.	0.
80	0.00	348.	0.	0.
95	0.00	642.	0.	0.
124	0.00	810.	0.	0.

-1

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 7
4 3 2 6 7

61	0.00	41.	0.	0.
70	0.00	114.	0.	0.
80	0.00	291.	0.	0.
98	0.00	738.	0.	0.
126	0.00	991.	0.	0.

-1

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 8
4 3 2 6 7

61	0.00	47.	0.	0.
70	0.00	122.	0.	0.
80	0.00	303.	0.	0.
98	0.00	723.	0.	0.
126	0.00	903.	0.	0.

-1

INST_ID: IR SITE_ID: PL EXPT_NO: 1 YEAR: 1985 TRT_NO: 9
4 3 2 6 7

61	0.00	53.	0.	0.
70	0.00	157.	0.	0.
80	0.00	341.	0.	0.
98	0.00	775.	0.	0.
126	0.00	1028.	0.	0.

-1

INST_ID:	IR	SITE_ID:	PL	EXPT_NO:	1	YEAR:	1985	TRT_NO:	10
4	3	2	6	7					
61	0.00	43.	0.	0.					
70	0.00	125.	0.	0.					
80	0.00	345.	0.	0.					
98	0.00	723.	0.	0.					
126	0.00	1025.	0.	0.					
-1									

Table 19. File "GLABEL.DAT".

01. Growth Stage (C/day)
SumDtt
02. Biomass (g/m^2)
Bioms g/m2
03. Number of Tillers
Tillers/m2
04. Leaf Area Index
LAI
05. Root Dry Weight (g/plant)
ROOT-g/plant
06. Stem Dry Weight (g/plant)
STEM-g/plant
07. Grain Dry Weight (g/plant)
GRAIN-g/plant
08. Leaf Dry Weight (g/plant)
LEAF-g/plant
09. Root depth cm
RTDEP cm
10. Daily Partitioning Factor for Shoot
Shoot Partition Ratio
11. Root Length Density Level 1 cm/cm3
RLD L1
12. Root Length Density Level 3 cm/cm3
RLD L3
13. Root Length Density Level 5 cm/cm3
RLD L5

Table 20. File "GLABEL2.dat".

01. Average Plant Transpiration (mm)
EP-mm
02. Average Evapo-Transpiration (mm)
ET-mm
03. Average Potential Evaporation (mm)
EO-mm
04. Average Solar Radiation (MJ/m2)
SR-MJ/m2
05. Average Maximum Temperature (C)
Tmax-C
06. Average Minimum Temperature (C)
Tmin-C
07. Period Precipitation (mm)
Prec-mm
08. Soil Water Content level 1 cm3/cm3
SWC L1
09. Soil Water Content level 2 cm3/cm3
SWC L2
10. Soil Water Content level 3 cm3/cm3
SWC L3
11. Soil Water Content level 4 cm3/cm3
SWC L4
12. Flood Water Depth mm
FLOOD mm
13. Potential Extractable Water -cm
PESW-cm

Table 21. File "GLABEL3.dat".

01. Tops N%
 TOPS N%
 02. NFAC
 NFAC Ratio
 03. Vegetative N-Uptake Kg/ha
 VGNUP-kg/ha
 04. Grain N-Uptake Kg/ha
 GRNUP-kg/ha
 05. NO3 in Layer 1 ug N/g soil
 ug N/g L1
 06. NO3 in Layer 2 ug N/g soil
 ug N/g L2
 07. NO3 in Layer 3 ug N/g soil
 ug N/g L3
 08. NO3 in Layer 4 ug N/g soil
 ug N/g L4
 09. NO3 in Layer 5 ug N/g soil
 ug N/g L5
 10. NH4 in Layer 1 ug N/g soil
 ug N/g L1
 11. NH4 in Layer 2 ug N/g soil
 ug N/g L2
 12. NH4 in Layer 3 ug N/g soil
 ug N/g L3

Table 22. File "irp18002.r18".

IRPI8015 01 IR36, 120 kg N/ha, W1 irrig. level 023 003
 001 009 369.00 00.000 2.50 2 1 000.00 00.00 0000.0 000.00 0 3

APPENDIX A

FILE0: Rice Crop Management and Hydrology Additional Information

Description

This file is peculiar to rice and contains data on rice management. It operates in conjunction with FILE8. All other crop models can ignore this file.

FILE0 contains crop management data for each treatment averaged over all replications. This file is accessed when IIRR value in FILE8 is higher than 4. At least four lines of data are required for each treatment of an experiment and must be in consecutive order. On the first line, the experiment code identifier, treatment number, method of planting, number of hills per square meter, number of plants per hill, date of transplanting, age of transplant, biomass of the transplant, average nursery temperature, percolation rate (cm/day), puddled-field option, and variable irrigation option are designated. On lines two to n (depending on the number of times bund, floodwater or irrigation options are changed), date when bund height, floodwater depth or irrigation options are set, bund height (cm), floodwater depth (cm), and irrigation method are specified. The latter applies only when irrigation method is set to 7, 8, 9, and 11. On the fourth line (if the bund was set only once—line 3 is used to terminate bund option with "-1") date and depth of perched water table (cm) are specified ("-1" for no observation or termination of observations).

DATA FORMATS

Variable Name	Format	Description
FORMAT FOR LINE 1		
INSTE	A2	Code for institute ID
SITEE	A2	Code for site ID
YEAR	A2	Year number, last two digits
EXPTNO	I2	Experiment number
TRTNO	1X, I2	Treatment number
ITRANS	1X, I2	Flag to indicate method of transplanting. Itrans=1 Direct-seeded Itrans=2 Transplanted with simulation starting from sowing date.

(Continued)

Variable Name	Format	Description
----------------------	---------------	--------------------

FORMAT FOR LINE 1 (Continued)

		Itrans=3 Transplanted with simulation starting on transplanting date. Model uses age of transplant, ambient nursery temperature and transplant biomass (if available) to estimate growth components and transplanting shock.
TPLANTS	1X, F5.1	Transplant population (hills/m**2)
NPPH	1X, F3.1	Average number of plants/hill
ITDATE	1X, I3	Transplanting date
TAGE	1X, F3.0	Age of transplants (days)
TBIOMS	1X, F4.0	Transplant Shoot biomass (mg/plant)
ATEMP	1X, F4.1	Average temperature during transplant nursery growth either water or air temperature whichever is more appropriate (°C).
PERC	1X, F4.2	Percolation rate (cm/day)
IPUDLE	1X, I2	Soil puddling code 1: Soil was puddled before transplanting 2: Soil was not puddled.
IROPT	1X, I2	Variable irrigation option (1), single method of irrigation (0).

FORMAT FOR LINE 2 AND BEYOND

IBDAT (J)	1X, I3	Date for bund height (floodwater depth) change
BUND (J)	1X, F4.1	Bund height from this date on (cm)
COND (J)	1X, F4.1	Depth of floodwater (cm) on this day for rainfed and scheduled irrigation. When IIRRV(J) = 7, 8, 9, and 11 then depth of floodwater remains constant from that day on.
IIRRV(J)	1X, I2	Irrigation method (See FILE8) Current value used if IROPT = 1, otherwise uses value in FILE8.

terminate with -1

FORMAT FOR WATER TABLE OBSERVATIONS

IDWAT(J)	1X, I3	Date for depth of water table observation
PDWAT(J)	1X, F5.1	Depth to perched water table on this day (cm)

terminate with -1

Example

```

IRPL8501 01 3 25.0 3.0 035 21. 000. 26.0 0.15 01 01
030 10.0 5.0 07
051 2.0 0.0 08
052 10.0 0.0 08
056 10.0 5.0 07
071 0.4 0.0 08
072 10.0 0.0 08
076 10.0 5.0 07
-1
-1

```

Line 1 : Treatment, transplanting population, etc.

Lines 2-8 : Bund, floodwater depth, etc.

Line 9 : Termination of bund data.

Line 10 : Termination of perched water table observation (no observation)

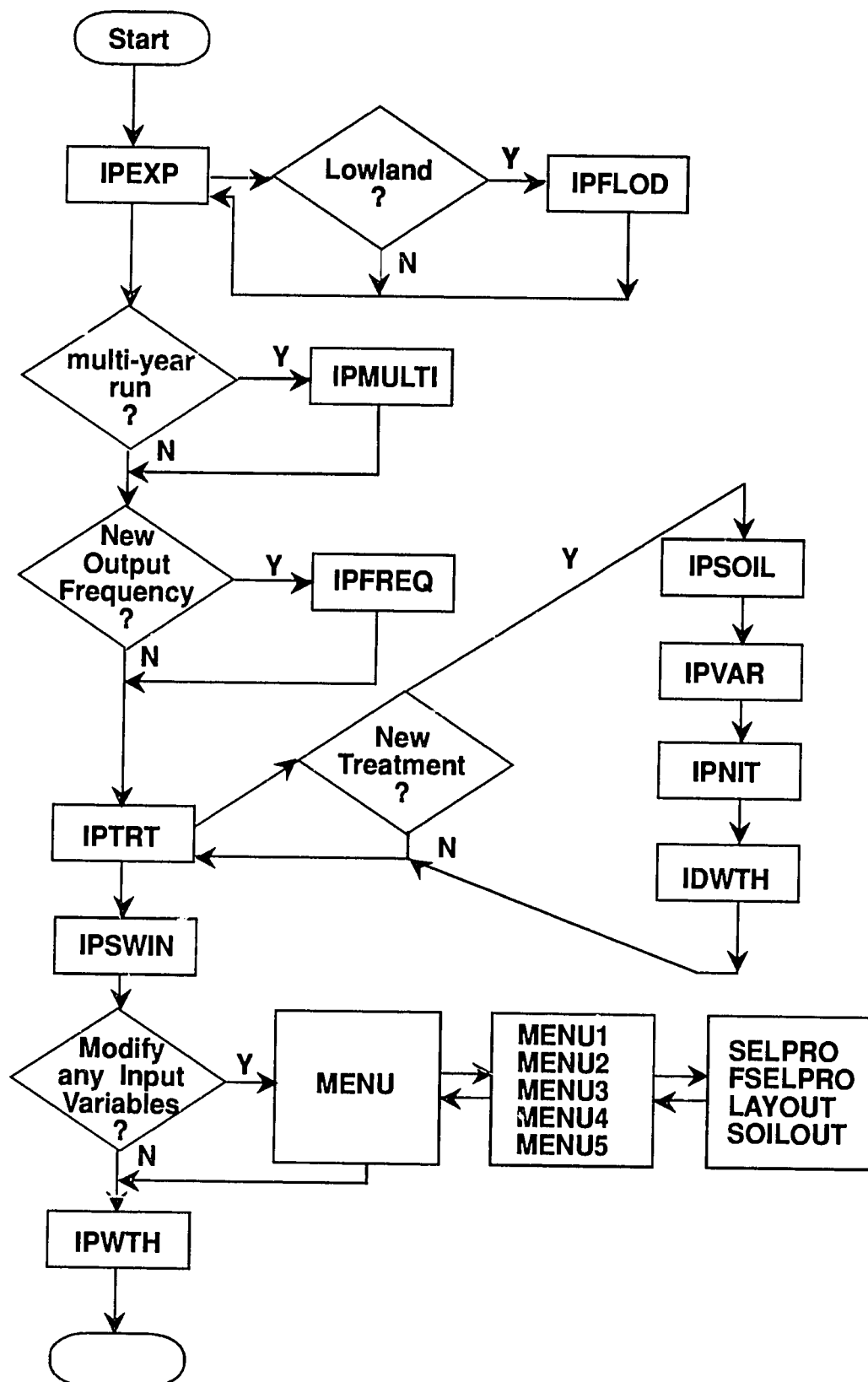
FERTILIZER APPLICATION METHOD CODE FOR CERES-RICE V2.01

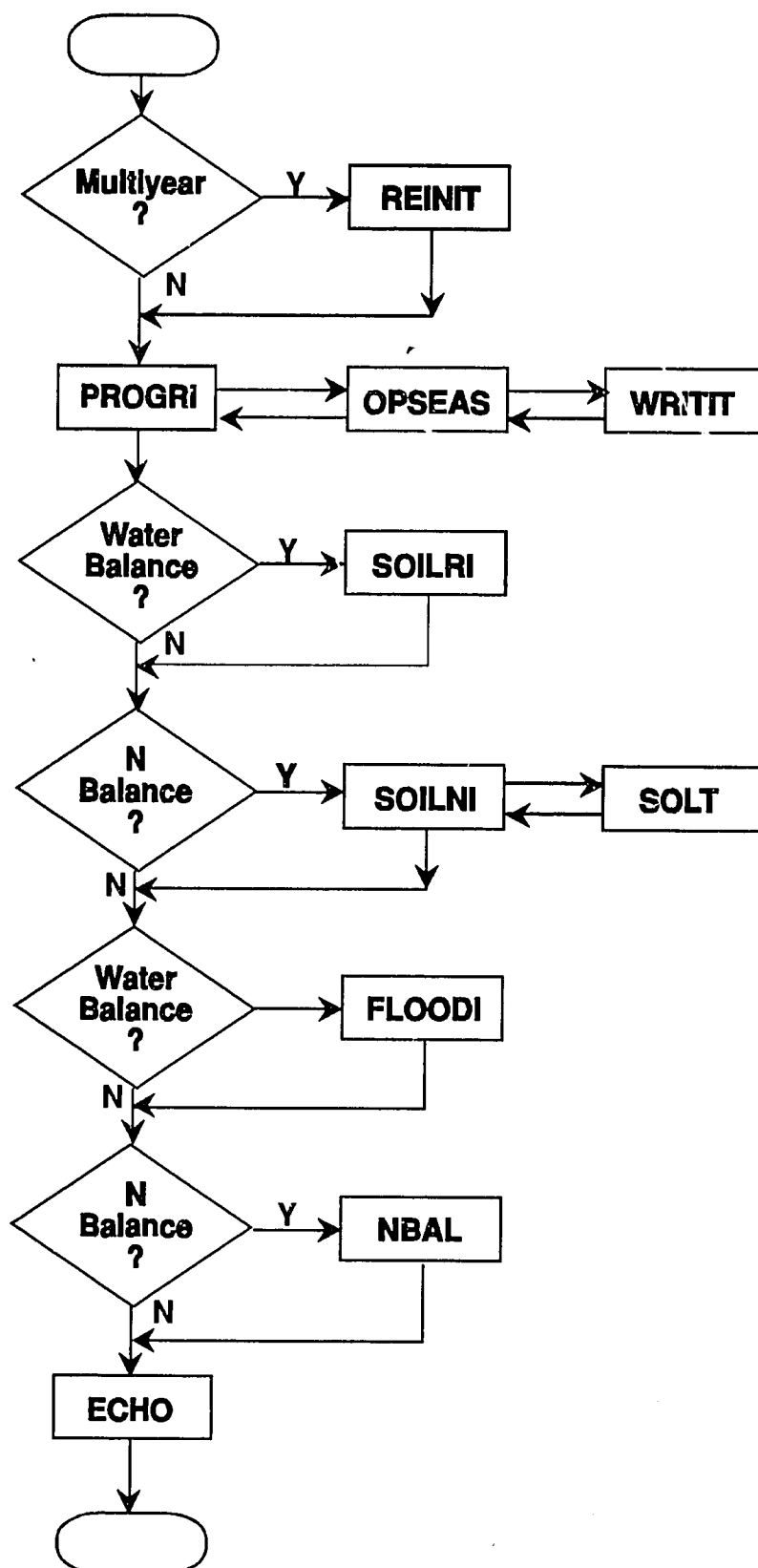
Code (IMC)	Mixing Efficiency	Description
1	0.0	Broadcast on floodwater/saturated soil—no incorporation.
2	0.15	Broadcast on floodwater/saturated soil—very poorly incorporated.
3	0.30	Broadcast on floodwater/saturated soil—partially incorporated.
4	0.45	Broadcast on floodwater/saturated soil—moderately incorporated.
5	0.60	Broadcast on floodwater/saturated soil—moderately well incorporated.
6	0.75	Broadcast on floodwater/saturated soil—well incorporated.
7	0.90	Broadcast on floodwater/saturated soil—thoroughly incorporated.
8	0.92	Deep placement on saturated soil—up to 2 cm floodwater.
9	0.95	Hand deep-point placement using urea supergranules or pellets.
10	1.0	Upland incorporated.

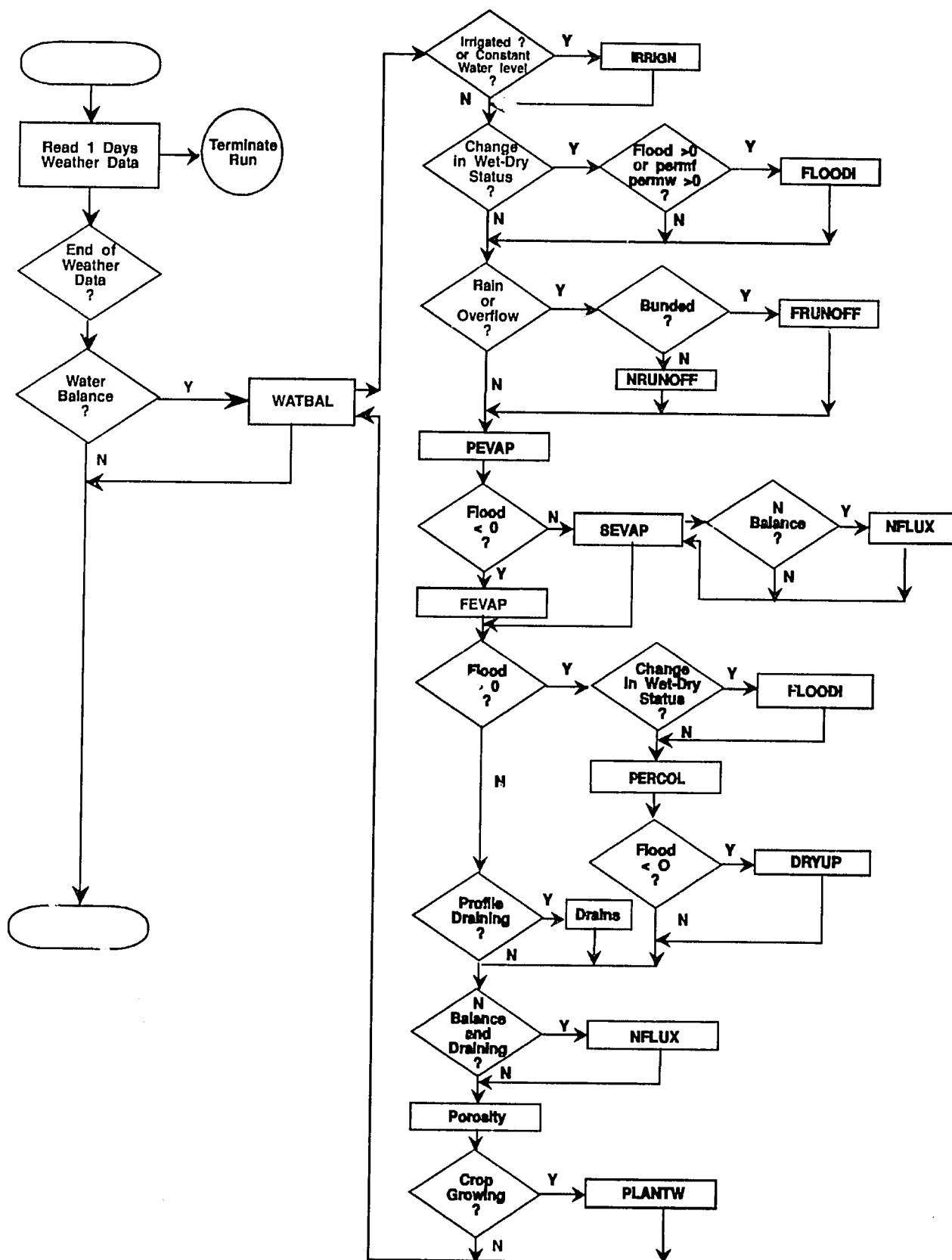
IRRIGATION AND PLANTING CODE FOR CERES-RICE V2.01

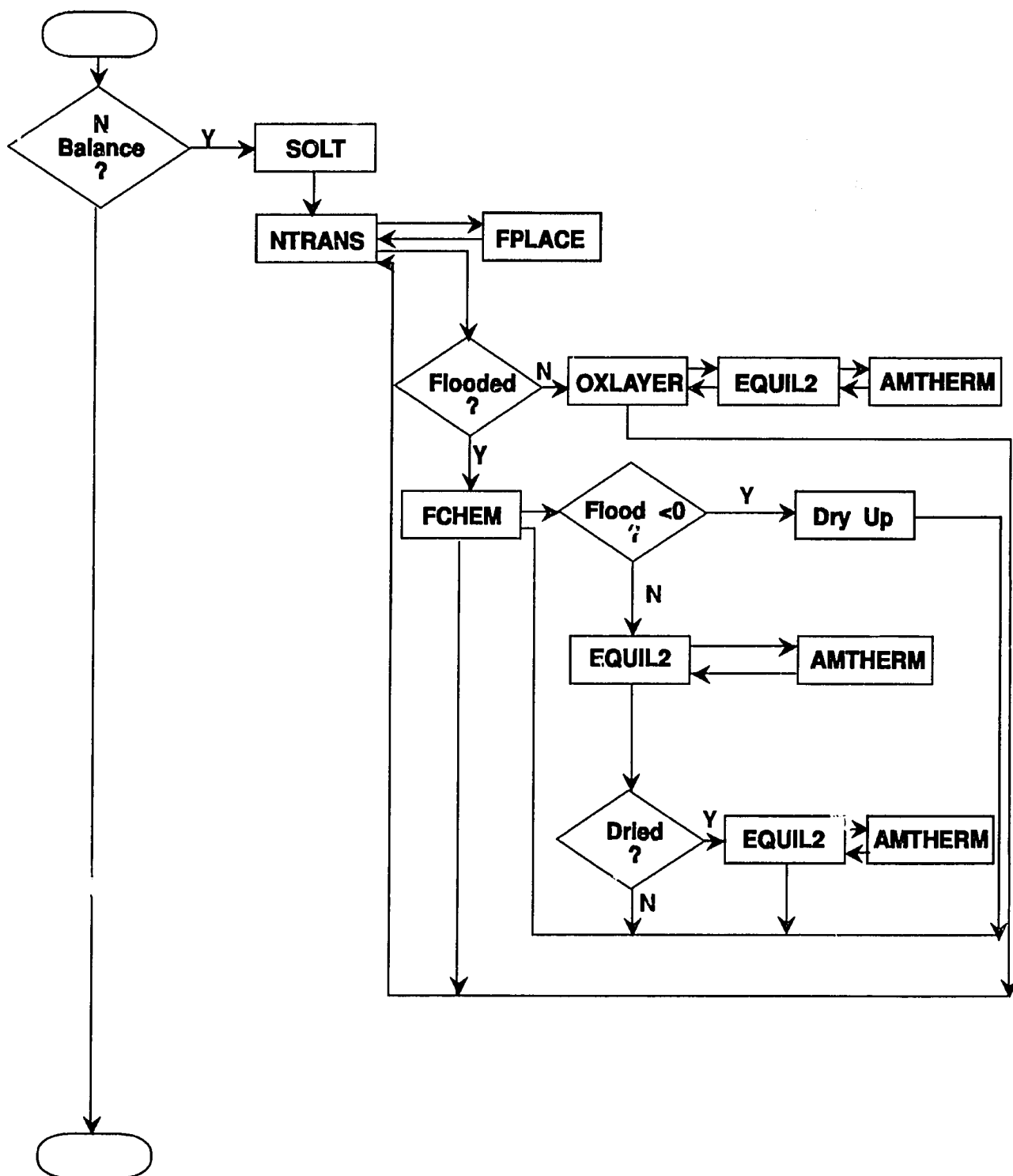
Code (IIRR)	Description
1	Fully upland, direct-seeded—not irrigated.
2	Fully upland, direct-seeded—irrigated according to field schedule.
3	Fully upland, direct-seeded—automatically irrigated.
4	Direct-seeded—assume no water stress—water balance (and N model) not used.
5	Transplanted—assume no water stress—water balance (and N model) not used.
6	Flooded-bunded, transplanted—not irrigated or irrigated according to schedule.
7	Flooded-bunded, transplanted—automatically irrigated to a specified floodwater depth.
8	Flooded-bunded, transplanted—automatically and continuously irrigated to a constant floodwater depth.
9	Flooded-bunded, direct-seeded—automatically irrigated to a specified floodwater depth.
10	Flooded-bunded, direct-seeded—not irrigated or irrigated according to schedule.
11	Flooded-bunded, direct-seeded—automatic and continuous irrigation with a constant floodwater depth.
12	Flooded-bunded, direct-seeded—water balance (and N model) not used.

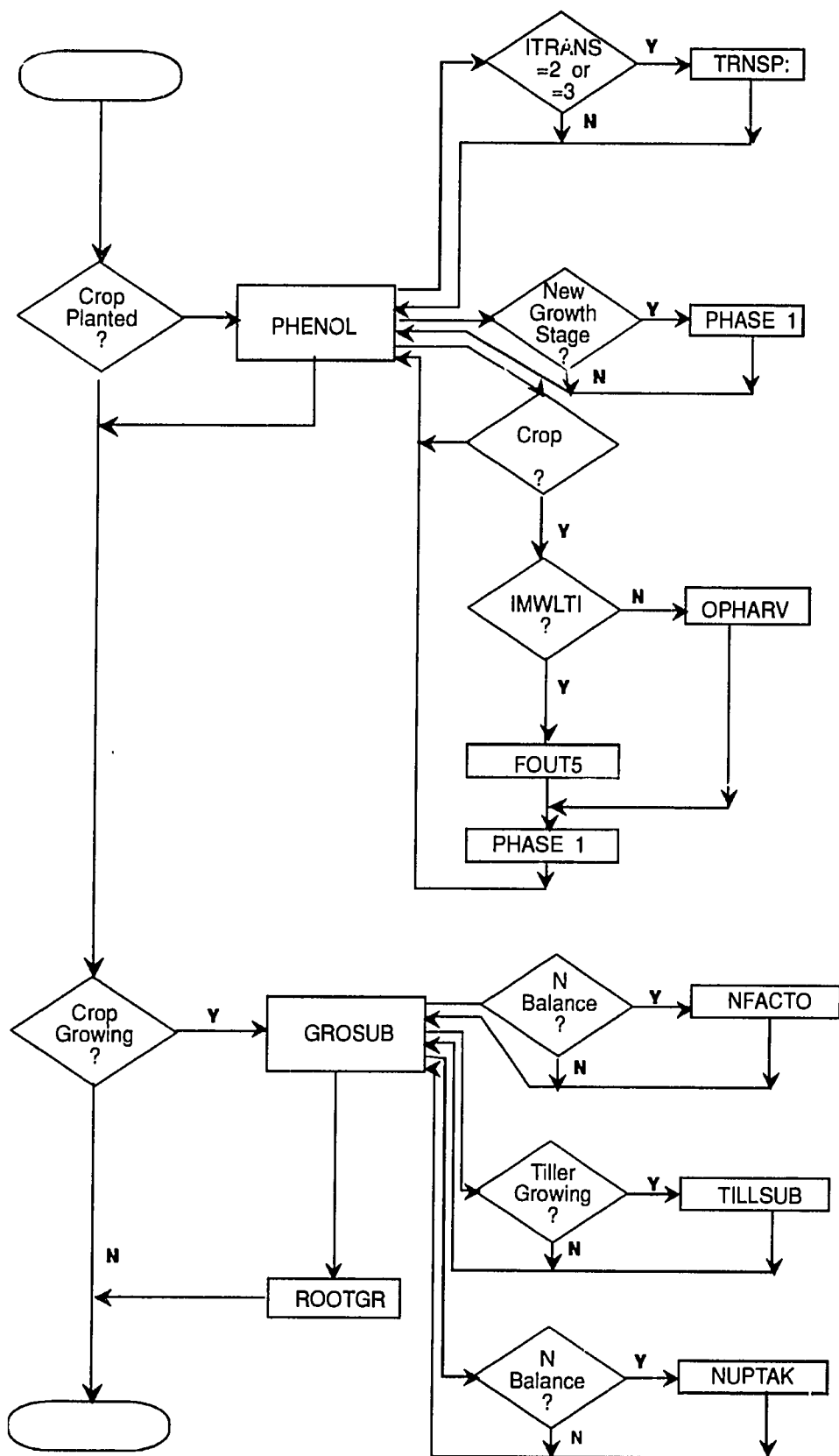
APPENDIX B

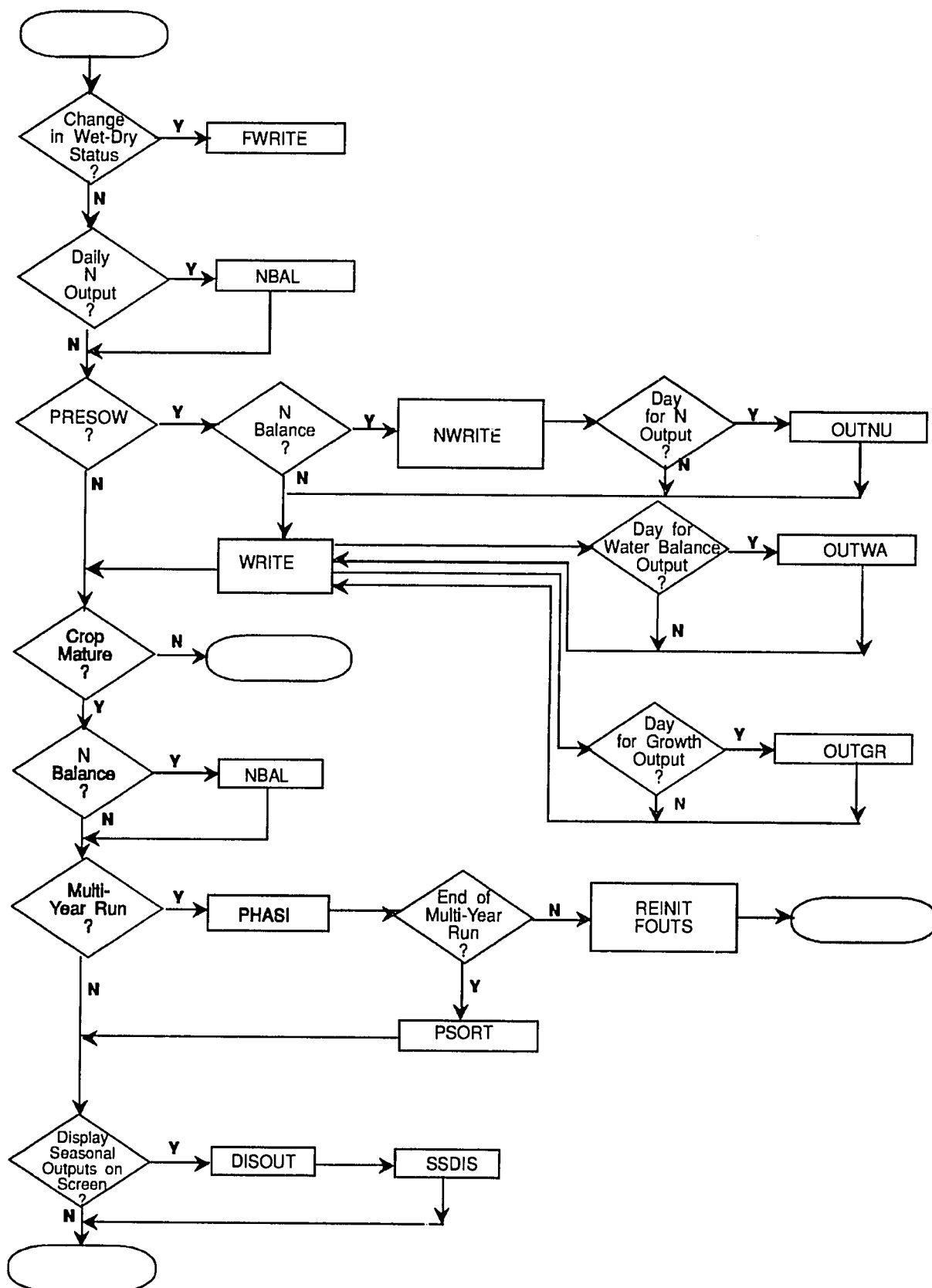












APPENDIX C

FORTRAN Files for CERES Rice Model

File Name	Subroutines	Function
MRI1.FOR		Main program
	PROGRI	Program initialization
	SOILRI	Read and initialize water balance parameters
	SOILNI	Initialize N balance parameters and soil temperatures
MRI2.FOR	ECHO	Display input parameters on screen or write to output file
	OUTWA	Output for water balance
	OUTGR	Output for growth
	NWRITE	Write subroutine for soil and plant N output
	OUTNU	Soil and plant N output routine
	WRITE	Write subroutine for water balance and plant growth
	CALDAT	Convert julian day to calendar date
	OPHARV	Output harvest report and compare with observations, write predicted and observed output to summary out1 file
	REINIT	Reinitialize soil information and commence new run
	FOUT5	Write data to output file for multiple year simulation: out5.r1
	PSORT	Sort the variables for multiple year simulation output, display sorted outputs on screen
	OUTC	Output subroutine for floodwater chemistry
	FWRITE	Write routine for floodwater chemistry output
MRI3.FOR	PHENOL	Calculate phenological stage, determine duration of each growth stage
	TRNSPL	Calculate transplanting shock and estimate growth stage & new value for P1, BIOMAS, RTWT, and PLA
MRI3B.FOR	WATBAL	Calculate runoff, infiltration, drainage, evaporation, root water uptake, and root distribution
	FRUNOFF	Floodwater runoff routine
	URUNOFF	Upland runoff routine
	DRAINS	Drainage routine
	PEVAP	Potential evaporation routine
	FEBAP	Floodwater evaporation routine
	SEVAP	Soil evaporation routine
	PLANTW	Transpiration plant water uptake and plant water relation
	IRRIGN	Irrigation routine—works with both paddy and upland

(Continued)

File Name	Subroutines	Function
MRI3C.FOR	PHASEI	Phase initialization routine, initialize growth and ontogeny parameters for new growth stage
	GROSUB	Growth routine, calculate growth of leaves, stems, roots, panicles, and grain
	TILLSUB	Tiller routine
	ROOTGR	Root growth and depth routine
MFCHEM.FOR	FCHEM	Floodwater chemistry
	FLOODI	Floodwater initialization
	NRUNOFF	Calculate N loss with water over the bund
	POROSITY	Calculate air filled porosity
MPERCOL.FOR	PERCOL	Percolation routine
MDRYUP.FOR	DRYUP	Subroutine for initializing soil chemistry variables when soil dries up
MRISUB.FOR	IPEXP	Experiment selection
	IDWTH	Select a Weather file
	IPVAR	Select and input genotypic data
	IPSOIL	Select and input soils data
	IPSWIN	Input soil initial conditions
	IPTRT	Treatment selection
	IPWTH	Check weather file for starting and ending status
	IPFREQ	Select new output frequency
	IPNIT	Select & input fertilizer and crop residue data
	OPSEAS	Generate titles for seasonal outputs, initialize counters, averages
	IPFLOD	Read in flood data from file 10
	WRITIT	Write title to output files
	IPMULTI	Multi-year run setup routine
MMENU.FOR	MENU	Menu for variables to modify
MMENU2.FOR	MENU1	Menu for variety change
MMENU3.FOR	MENU2	Menu for soil data change
MMENU4.FOR	MENU3	Menu for weather file selection
MMENU5.FOR	MENU4	Menu for modifying soil data and crop residue data
MMENU6.FOR	MENU5	Menu for climate change study
MOXLAYR.FOR	OXLAYER	Oxidized layer chemistry

(Continued)

File Name	Subroutines	Function
MNEWNV.FOR	NFLUX	Calculate nitrate and urea movement
	NFACTO	Nitrogen deficiency factor routine, determine N stress indices
	SOLT	Soil temperature in soil layers
	NTRANS	Calculate: mineralization/immobilization nitrification denitrification
	NUTAK	Calculate N uptake by plant
	FPLACE	Fertilizer placement routine
MDISOUT.FOR	DISOUT	Display output files 1, 2, 3, 4, on the screen
	SSDIS	Display output files on screen
	SELPRO	Procedure for checking and processing input selections
	FSELPRO	Procedure for checking floating point (real) input selections
	CLEAR	Clear screen
MEQUIL2.FOR	EQUIL2	Calculate diffusive fluxes between the floodwater and surface soil layer for each of ammonium, nitrate, and urea
MAMTHERM.FOR	AMTHERM	Ammonium adsorption/desorption isotherm
MNBAL.FOR	NBAL	N balance output routine, writes to NBAL.OUT
	OPHRV2	Write predicted and observed output to NBAL.OUT file
METRAT.FOR	ETRATIO	Calculate plant responses to rising CO2
	BLRRES	Calculate boundary layer resistance