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TECHNICAL REPORT 4

Documentation for the IBSNAT Data Base Management System

for the Decision Support System for Agrotechnology Transfer (DSSAT V.2.1)

IBSNAT International Benchmark Sites Network for Agrotechnology Transfer

IBSNAT, the International Benchmark Sites Network for Agrotechnology Transfer, is a group consisting of the contractor (the University of Hawaii) and several collaborators. Together they have created a prototype network of national, regional, and international agricultural research centers for the purpose of developing, validating, and using a scientific method for the effective transfer of agrotechnology among and within countries in the tropics and subtropics.

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CHAPTER 1

Introduction

In the IBSNAT Progress Report, 1982-1985, the primary objectives of the International Benchmark Sites for Agrotechnology Transfer (IBSNAT) Project are stated thus:

- To accelerate the flow of agrotechnology on a scientific basis from its site of origin to recipient sites with a well-characterized agroenvironment;
- To increase the success rate of technology transfer from agricultural research centers to farmers' fields.

The development by IBSNAT of the Decision Support System of Agrotechnology Transfer (DSSAT) version 2.1 is an integral and essential step in the achievement of these objectives. DSSAT V.2.1 is a microcomputer software package combining soil, crop, and weather data bases, with crop models and application programs, to simulate multi-year outcomes of crop management strategies. As a software package integrating the effects of soil, crop genotype, weather, and management options, DSSAT allows users to ask "what if" questions and seek answers by conducting, in a matter of a few hours on a microcomputer, experiments which would consume a significant part of an agronomist's career. The DSSAT software consists of four components.

- DSSAT Shell
- Data Base Management System (DBMS)
- Crop Models
- Agrotechnology Transfer Applications

In the following chapters, we will examine the DSSAT Shell and detail the logic used in this program. Then, we will explain the data structure of the experiment, weather, and soil data bases and how the following DBMS programs interact with the data in the data bases.

- Experiment Data Entry programs
- Weather Data Entry program
- Minimum Data Set (MDS) Summary Reports program
- Weather Graphics programs
- Soil Data Retrieval for Crop Models programs
- MDS Retrieval for Crop Models program
- Utilities program

DSSAT Shell

The DSSAT Shell integrates the DBMS, Crop Models and Application programs into one whole system and provides a user-friendly menu that allows easy access to each of the programs. It also provides a flexible option which enables users to define the location of each of the modules at any time.

DBMS

The development of the DBMS makes possible the storage, retrieval, and exchange of the minimum data sets (MDS) (see IBSNAT Technical Report 1: *Experimental Design and Data Collection Procedures for IBSNAT, 1988, third edition*) collected by IBSNAT collaborators around the world, and the validation and calibration of existing and future crop simulation models.

Hardware and Software Requirements

DSSAT V.2.1 is developed to be used on a microcomputer with the following configurations.

- An IBM PC-XT, PC-AT, or any fully IBM-compatible microcomputer with: 1) a minimum of 640K of random access memory (RAM); and 2) a graphics adaptor.
- Any dot-matrix printer with an IBM graphics mode.
- A math coprocessor (optional; it helps to speed up the processing time for Crop Models and Agrotechnology Applications).
- A hard disk of at least 8 megabytes available disk space to load all DSSAT programs. Users who have two floppy disk drives rather than a hard disk can install only the DBMS and Crop Model programs.
- DOS 3.0 or later.

CHAPTER 2

The DSSAT Shell

The DSSAT Shell is a menu-driven program which enables hard disk users to easily select and use any of the DSSAT components. Figure 2-1 shows an overview of the DSSAT Shell. Information related to this program is listed as follows.

Language The DSSAT Shell is written in C.

Compiler The program is compiled with Turbo C version 2.0 by Borland.

Source Codes MENU.H, DSSAT.H, INTDSSAT.C, C_WINDOW.C, DOSHELP.C, MENU.C, DSSAT.C.

Executable Program DSSAT.EXE.

Program Location The program is located in directory C:\DSSAT.

Input The input to this program is an ASCII file called INTDSSAT.DAT. Table 2-A lists the content of this file. INTDSSAT.DAT is created during the installation process of DSSAT. When the user installs DSSAT in the hard disk, they will be asked to identify the program or data locations and executable program names. This information will then be stored in file INTDSSAT.DAT.

Function

INTDSSAT.DAT is used to identify the location of programs that are installed in the DSSAT Shell. However, if the program has to be executed in another location, the desired location must be specified. An example of such a case is illustrated with the Crop Models. Assume the Maize Model program is in C:\DSSAT\MODEL\MAIZE, and the input/output files are located in C:\DSSAT\MODEL\MAIZE\DATA. When the Maize Model is selected from the Shell, the default directory will be changed to C:\DSSAT\MODEL \MAIZE\DATA. Then, the Maize Model program will be called from the default directory.

File format

Column 1 - 3: The first three characters are special codes assigned to the individual program or data group. Table 2-B shows a list of the codes and their definitions.

Column 5 - 6: This field indicates the drive location. If the user does not install a program, a default drive name,"A:", will be assigned. For data groups, a default drive name B: will be assigned. For example, if the sorghum model was not installed, "A:" will be assigned to the sorghum model program, and "B:" will be assigned to the sorghum model data.

Column 8 - 80: Included in this area are the path and program names. A space is required to separate these two items.

Path Name

For a program that is located in the root directory, a back slash (\) must be entered in the path area. A back slash (\) is also used as default path name for any programs or data groups that have not been installed.

Program Name

The DSSAT Shell only allows executable programs (programs that end with file extension .EXE) and batch files (programs that end with file extension .BAT) in this area. The file extension must be attached with the file name.

Process

The DSSAT Shell is loaded to memory when the user starts DSSAT. It will take up to 70K of RAM. After the user has selected an option from the DSSAT Main Menu, the code for the selected option will be matched with the program codes listed in INTDSSAT.DAT. Once it finds a matched code, the location will be identified. With the location information, the program will change the current directory to the directory location information for both the program and data. It will then change the current directory to the data directory and execute the program from there.

Setup Option

The Setup option in the DSSAT Main Menu allows users to update information in INTDSSAT.DAT. If the location or program name is changed, the user can use this option to update the information.

Figure 2-1. DSSAT Shell Overview

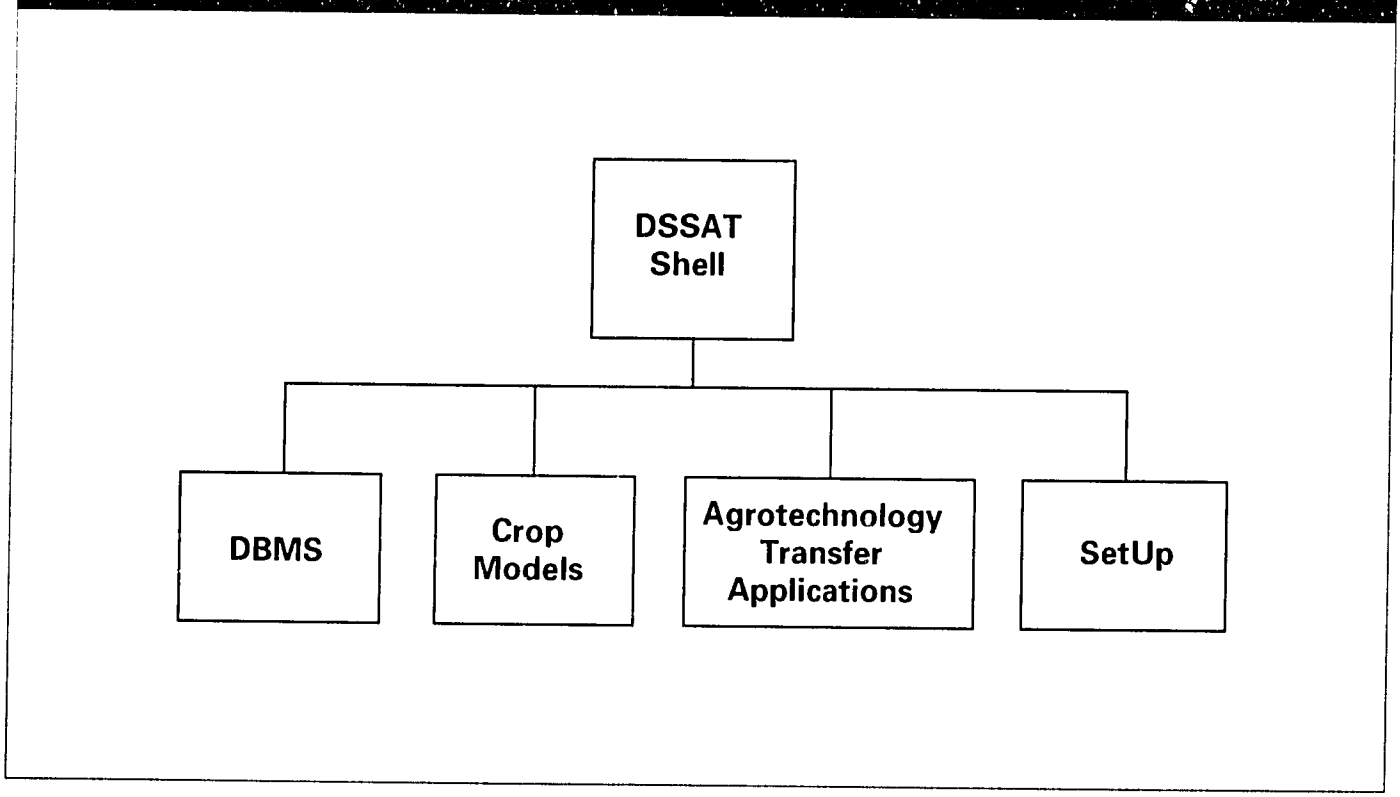


Table 2-1. An Example of File INTDSSAT.DAT

DSSAT MENU INIT FILE

DB1	C:	\DSSAT\DBMS\EXPER MENUA_H.EXE
DB2	C:	\DSSAT\DBMS\EXPER MENUI_S.EXE
DB3	C:	\DSSAT\DBMS\WEATHER WEATHER.EXE
DB4	C:	\DSSAT\DBMS\RETRIEVE RETRIEVE.EXE
DB5	C:	\DSSAT\DBMS\SUMMARY DBREPORT.EXE
DB6	C:	\DSSAT\DBMS\SUMMARY WEAGRAPH.BAT
DB7	C:	\DSSAT\DBMS\UTIL UTIL.EXE
DB8	C:	\DSSAT\DBMS\EXPER PRNTMDS.EXE
SP1	C:	\DSSAT\DBMS\SOIL GETSOIL.BAT
SP2	A:	\
ARM	A:	\
CSM	A:	\
BAM	A:	\
BNM	A:	\
MZM	C:	\DSSAT\MODEL\MAIZE MZV2.EXE
MLM	A:	\
PNM	C:	\DSSAT\MODEL\PEANUT GRO.EXE
PTM	A:	\
RIM	A:	\
SGM	A:	\
SBM	C:	\DSSAT\MODEL\SOYBEAN GRO.EXE
WHM	C:	\DSSAT\MODEL\WHEAT WHV2.EXE
GRM	C:	\DSSAT\MODEL\GRAPH MAIN.EXE
ARD	B:	\
CSD	B:	\
BAD	B:	\
BND	B:	\
MZD	C:	\DSSAT\MODEL\MAIZE\DATA
MLD	B:	\
PND	C:	\DSSAT\MODEL\PEANUT\DATA
PTD	B:	\
RID	B:	\
SGD	B:	\
SBD	C:	\DSSAT\MODEL\SOYBEAN\DATA
WHD	C:	\DSSAT\MODEL\WHEAT\DATA
AT1	C:	\DSSAT\WGEN WGENGEN.EXE
AT2	C:	\DSSAT\WGEN WMAKRGEN.EXE
AT3	A:	\
AT4	C:	\DSSAT\STRATEGY STRAT.BAT
AT5	A:	\
AT6	C:	\DSSAT\WGEN WGEN.BAT
AT7	C:	\DSSAT\WGEN WMAKER.BAT
DD1	C:	\
DD2	C:	\DSSAT\HISTDATA

Table 2-2. Listing of Program Codes

DB1	-	Experiment Data Entry - Form A-H
DB2	-	Experiment Data Entry - Form I-S
DB3	-	Weather Data Entry - Form C
DB4	-	MDS Retrieval for Crop Model
DB5	-	MDS Summary Reports
DB6	-	Weather Graphics
DB7	-	DBMS Utilities
DB8	-	Print Experimental Data Forms
SP1	-	Soil Retrieval for Crop Model
SP2	-	(see note)
ARM	-	Aroid Crop Model Program
CSM	-	Cassava Crop Model Program
BAM	-	Barley Crop Model Program
BNM	-	Dry Bean Crop Model Program
MZM	-	Maize Crop Model Program
MLM	-	Millet Crop Model Program
PNM	-	Peanut Crop Model Program
PTM	-	Potato Crop Model Program
RIM	-	Rice Crop Model Program
SGM	-	Sorghum Crop Model Program
SBM	-	Soybean Crop Model Program
WHM	-	Wheat Crop Model Program
GRM	-	Model Graphic Program
ARD	-	Aroid Data
CSD	-	Cassava Data
BAD	-	Barley Data
BND	-	Dry Bean Data
MZD	-	Maize Data
MLD	-	Millet Data
PND	-	Peanut Data
PTD	-	Potato Data
RID	-	Rice Data
SGD	-	Sorghum Data
SBD	-	Soybean Data
WHD	-	Wheat Data
AT1	-	WGEN Weather Estimator - Determine Coefficient
AT2	-	WMAKER Weather Estimator - Determine Coefficient
AT3	-	(see note)
AT4	-	Strategy Evaluation Program
AT5	-	(see note)
AT6	-	WGEN Weather Estimator - Estimate Daily Weather Data
AT7	-	WMAKER Weather Estimator - Estimate Daily Weather Data
DD1	-	(see note)
DD2	-	Historical Weather Data

NOTE: Reserve for future development.

CHAPTER 3

DBMS Overview

The DSSAT Data Base Management System (DBMS) is used to organize and store the Minimum Data Set (MDS) (see IBSNAT Technical Report 1, 1988, third edition), provide user-friendly data entry and data retrieval programs, and produce standard summary reports. Figure 3-1 shows an overview of the DBMS.

The DBMS has been designed for two sets of users: IBSNAT collaborators, and crop modelers. It has also been designed so that users may utilize any of its programs without having to understand either the applications programs or the system's internal physical structure. Thus, collaborators can easily and competently input data, make data inquiries, and obtain results, using only the knowledge needed to use a microcomputer and the MDS forms. Likewise, crop modelers can access the DBMS to obtain summarized experimental data to calibrate and validate their models.

The DSSAT DBMS has two basic elements: data bases, and DBMS programs. The data bases include the Experimental, Weather, and Soil data bases. Along with this, user-friendly DBMS programs were developed to access the data in the data bases.

Data Bases

Using a relational data base approach, IBSNAT systems analysts designed file structures corresponding to the MDS forms. These files are independent of each other, but are related with the common keys. Data items can be retrieved from different files in multiple ways within the system.

dBASE III

IBSNAT systems analysts chose the relational dBASE III Plus software for the DBMS because it can be implemented on an IBM-PC microcomputer, without the need for a mainframe or mini computer. Yet, dBASE III still provides the sophistication and programming power to develop applications necessary to run the centralized DBMS, and the capability to link with crop modelers' simulation programs. Moreover, its use on the PC offers on-site collaborators a portable, inexpensive, and reliable means for inputting experimental data, and for transferring on floppy disks, copies of that data to IBSNAT headquarters. This data is then stored in the centralized IBSNAT data base.

Terminology

Data base file

A dBASE III PLUS data base file is indicated with the file extension DBF. It stores data in records each of which is intended to contain a set of unique information.

Index file

The index file provides a means to use a data base file in a logical order. For instance, records in a data base file can be arranged in alphabetical order using an index file. Index files relate a key to a corresponding record number in a data base file. When using a data base with an index file, the data base appears to be in the order of the key item. A related key can represent one or more fields of the data base file.

Record

A record is a group of related fields of information that is treated as a unit.

Data field

A data field is an individual data item in a record.

DBMS Programs

Software programs are written to facilitate access to the data bases. They are written to dBase and compiled with Clipper. The compiled programs can be executed on the DOS system. Four types of programs are implemented in the DBMS.

- Data Entry
- Data Retrieval
- Summary reports & graphics
- Utilities

Data Entry

The data entry programs allow users to enter a minimum data set into the Experimental and Weather Data Base. These programs also enable users to edit, delete, and print input data. The applications programs include the Experiment Data Entry (Forms A-H), Experiment Data Entry (Forms I-S), Print Experiment Data Forms, and Weather Data Entry (Form C).

Data Retrieval

The data retrieval programs create input files for use in crop models by retrieving data from the Experimental, Weather, and Soil data bases.

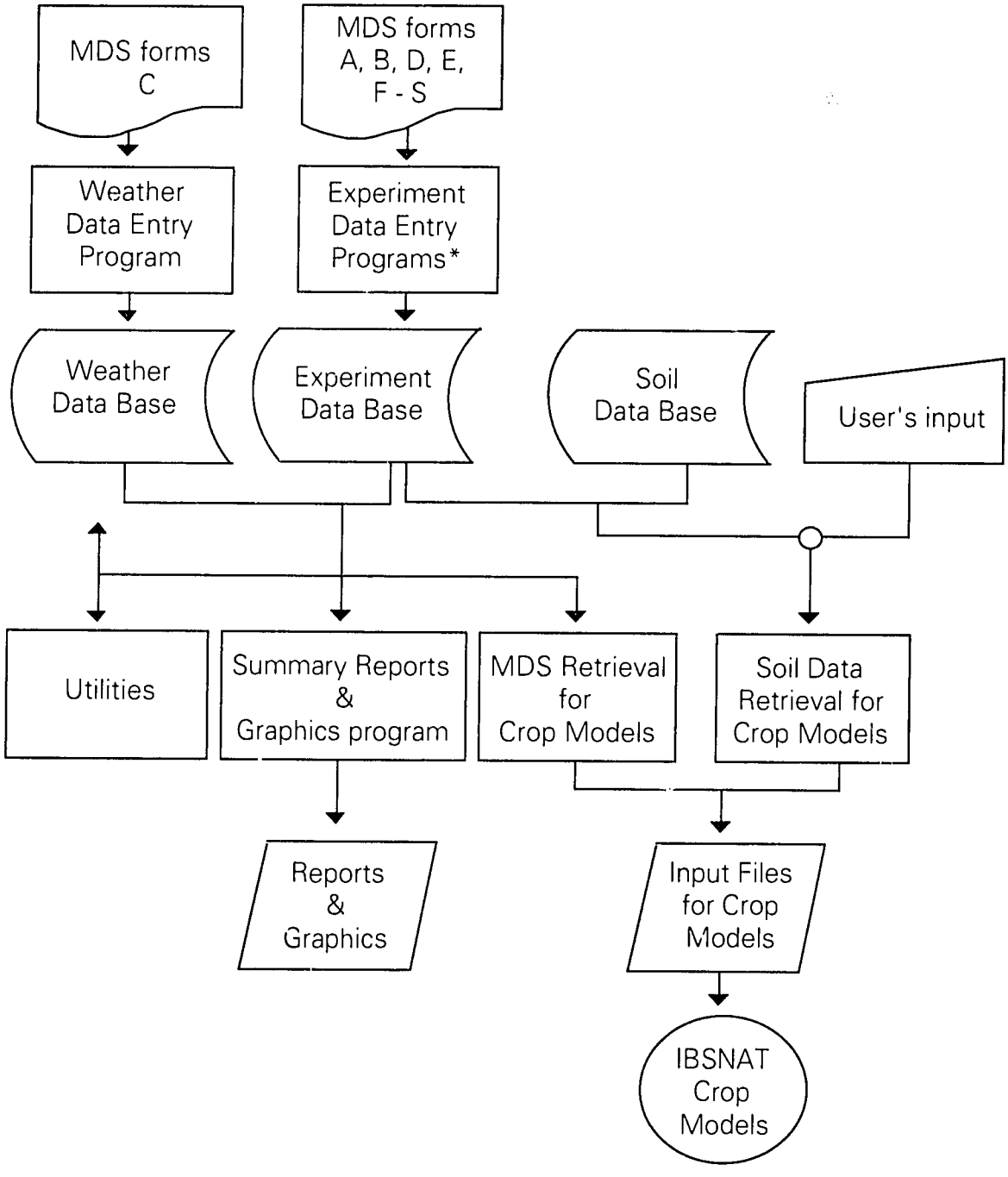
Summary Reports & Graphics

The summary reports and graphics programs generate summary and graphical reports for data that are stored in the Experimental and Weather Data Bases.

Utilities

The utilities are provided to convert data and, modify common keys, in the Experimental and Weather Data Base.

Figure 3-1. DBMS Overview



*NOTE: * Experiment Data Entry Programs includes Experiment Data Entry Forms A-H, Experiment Data Entry Form I-S, and Print Experiment data Forms*

CHAPTER 4

Experimental Data Base

The Experimental Data Base stores data recorded in MDS Form A, B, D to F, H to S (Refer to Technical Report 1, 1988, third edition). It is developed with dBASE III PLUS, a relational data base software package. The Experimental Data Base is designed to allow easy access and flexibility for file linkage. Each individual data file has the same type of data items which correspond to the information in the MDS forms.

When users enter data for an experiment, a set of data base files and its associated index file will be created. The following sections display the data structures of the data base files, the index file related to each data file, and the keys used with the index files.

Data Structure for Institution IDs

INSTITU.DBF serves as a library for all Institute IDs that are assigned by the IBSNAT Project. Users do not have access to this file. It is used in the DBMS programs to validate input.

INSTITU.DBF is located in the same directory as the DBMS programs. Refer to Table 4-1 for a list of IDs that have been assigned by the IBSNAT Project.

FILE NAME: **INSTITU.DBF**
INDEX FILE: **INXSTITU.NTX**
INDEX KEY: **ID**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
INSTITUTE	Char.	70		Institution name
COUNTRY	Char.	20		Country

Data Structure for Product Codes

PRODUCT.DBF serves as a library of codes for all commonly used herbicides, insecticides, and fungicides. Users do not have access to this file, as it is used only in the DBMS programs to validate input. If a product is not in the file, the user can specify the type of product while entering data. The input information will then be stored in another file called NEWPROD.DBF which has the same structure as PRODUCT.DBF.

PRODUCT.DBF is located in the same directory as the DBMS programs. NEWPRO.DBF is saved in the same location as the data files. Refer to Table 4-2 for a list of product codes in PRODUCT.DBF.

FILE NAME: **PRODUCT.DBF**
INDEX FILE: **IXPROD.NTX**
INDEX KEY: **PRO_CODE**

Data Field Name	Type	Width	Decimal Place	Description
PRO_CODE	Num.	4		Product code
PRO_NAME	Char.	35		Product name

Data Structure for Other Codes

Some data, such as irrigation method and growth stage, are coded to maintain consistency and data integrity. CODE.DBF serves as a library for all codes used in the DBMS program. Users do not have access to this file as it is only used in the DBMS programs to validate input. If new codes are needed, the user can specify their own code and code definition. The input information will then be stored in another file called NEWCODE.DBF which has the same structure as CODE.DBF. CODE.DBF is located in the same directory as the DBMS programs. NEWCODE.DBF is saved in the same location as the data files.

The ID data field indicates which type of information is coded. For example, all records that are identified as "CROP" are the crop codes. Refer to Table 4-3 for the IDs and type of codes and Table 4-4 for a list of codes in CODE.DBF.

FILE NAME: **CODE.DBF**
INDEX FILE: **IXCODE.NTX**
INDEX KEY: **ID+CHAR_ID+STR(NUM_ID,2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	7		Type of code
CHAR_ID	Char.	3		Alphanumeric code
NUM_ID	Num.	2		Numeric code
NAME	Char.	45		Definition of a code

Data Structure for Form A

FORMA.DBF stores institute information of an experiment.

FILE NAME: **FORMA.DBF**
INDEX FILE: **INXFORMA.NTX**
INDEX KEY: **ID**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char	2		Institute ID
MAIL_ADDR1	Char.	35		Mailing address
MAIL_ADDR2	Char.	35		Mailing address
MAIL_ADDR3	Char.	35		Mailing address
MAIL_ADDR4	Char.	35		Mailing address
COUNTRY	Char.	20		Country
TELEX	Char.	17		Telex
PHONE	Char.	20		Telephone number
CABLE	Char.	24		Cable
MAIL_NET	Char.	24		Electronic mail network
MAIL_ADDR	Char.	24		Electronic mail address

Data Structure for Form B

FORMB.DBF stores information for long-term climatic stations. If there is more than one long-term station, multiple records will be created.

FILE NAME: **FORMB.DBF**
INDEX FILE: **INXFORMB.NTX**
INDEX KEY: **ID+STATION**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION	Char.	25		Climatic station name
RP_ADDR1	Char.	35		Address of responsible organization
RP_ADDR2	Char.	35		Address of responsible organization
RP_ADDR3	Char.	35		Address of responsible organization
RP_ADDR4	Char.	35		Address of responsible organization
RP_ADDR5	Char.	35		Address of responsible organization
RP_ADDR6	Char.	35		Address of responsible organization
LONGITUDE	Num.	6	2	Longitude
LONG_DIR	Char.	1		Longitude direction
LATITUDE	Num.	6	2	Latitude
LAT_DIR	Char.	1		Latitude direction
ELEVATION	Num.	4		Elevation
TMIN	Num.	3		Number of years on recording min. temperature
TMIN_CI	Char.	1		A character to indicate if records are completed
TMAX	Num.	3		Number of years on recording max. temperature
TMAX_CI	Char.	1		A character to indicate if records are completed
PRECIP	Num.	3		Number of years on recording precipitation
PRECIP_CI	Char.	1		A character to indicate if records are completed
SOL_RAD	Num.	3		Number of years on recording solar radiation
SOL_CI	Char.	1		A character to indicate if records are completed
HR_SUN	Num.	3		Number of years on recording hours of sunshine
SUN_CI	Char.	1		A character to indicate if records are completed
PER_CLOUD	Num.	3		Number of years on recording percent cloud cover
CLOUD_CI	Char.	1		A character to indicate if records are completed
HUMIDITY	Num.	3		Number of years on recording humidity
HUM_CI	Char.	1		A character to indicate if records are completed
SOIL_TEMP	Num.	3		Number of years on recording soil temperature
SOIL_CI	Char.	1		A character to indicate if records are completed
WINDRUN	Num.	3		Number of years on recording windrun
WIND_CI	Char.	1		A character to indicate if records are completed
RAIN_INT	Num.	3		Number of years on recording rainfall intensity
RAIN_CI	Char.	1		A character to indicate if records are completed

Data Structure for Form D

FORMD.DBF stores experiment site information. The pedon number and climatic station ID can be used to link this data to the soil data base and the weather data base respectively.

FILE NAME: **FORMD.DBF**
INDEX FILE: **INXFORMD.NTX**
INDEX KEY: **ID+SITE_ID**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
SITE_NAME	Char.	50		Experiment site name
SITE_DESC1	Char.	74		Description of site
SITE_DESC2	Char.	74		Description of site
PEDON_NUM	Char.	14		Pedon number
SOIL_NAME	Char.	70		Soil series name
SOIL_CLAS1	Char.	50		Soil classification
SOIL_CLAS2	Char.	50		Soil classification
NA_VEGET1	Char.	74		Natural vegetation
NA_VEGET2	Char.	74		Natural vegetation
CULT_YR1	Char.	74		Years in cultivation and past management practice
CULT_YR2	Char.	74		Years in cultivation and past management practice
LATITUDE	Num.	6	2	Latitude
LAT_DIR	Char.	1		Latitude direction
LONGITUDE	Num.	6	2	Longitude
LONG_DIR	Char.	1		Longitude direction
ELEVATION	Num.	4		Elevation
STATION_ID	Char.	2		Climatic station ID

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Data Structure for Form E

FORME.DBF stores experiment information. Although users can input the dates in European format (dd/mm/yy), they are stored in American format (mm/dd/yy) on the file.

FILE NAME: **FORME.DBF**
INDEX FILE: **INXFORME.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
EXP_NAME	Char.	70		Experiment name
EXP_DESC1	Char.	62		Experiment description
EXP_DESC2	Char.	62		Experiment description
EXP_DESC3	Char.	62		Experiment description
EXP_DESC4	Char.	62		Experiment description
RESEARCHER	Char.	60		Responsible researchers
BEGIN_DATE	Date	8		Beginning date
END_DATE	Date	8		Ending date
DESIGN1	Char.	56		Experimental design
DESIGN2	Char.	56		Experimental design
DESIGN3	Char.	56		Experimental design
DESIGN4	Char.	56		Experimental design
STATION_ID	Char.	2		Weather station ID
DISTANCE	Num.	5		Distance from weather station
VERT_ANGLE	Num.	3		Vertical angle from horizontal to the top of hills or other obstructions to sun's rays

Data Structure for Form F

Five data base files are used to store information in FORM F. FORMF.DBF is the master file, and is used to identify any existing data in the rest of the data base files. If FORMF.DBF is empty, the DBMS program knows that there are no data recorded for FORM F.

FORMF1.DBF stores the experimental factor information. The data entry application program controls the limit of five or less factor codes entered in this file. The program also assigns a factor code for each entered factor. The codes are FACTOR_A, FACTOR_B, FACTOR_C, FACTOR_D, and FACTOR_E.

FORMF2.DBF stores level information for factor(s) that are recorded in FORM F-1. Users are asked to assign the level code for each level defined during the data entry process.

FORMF3.DBF stores factor and level information of treatment(s) applied in an experiment. Each record contains level codes that are related to the respective factor. Thus, LEV1 has level codes for FACTOR_A, LEV2 has level codes for FACTOR_B, and so forth.

FORMF4.DBF stores plot and replication numbers for treatment(s) applied in an experiment. Each record represents a treatment that is identified with a plot number and replication number. For a treatment that has three replicates, there will be three records. Each record will have a plot number for each replicate. As a result, these three records will have the same treatment number.

To illustrate how data is stored in the data base files, examples are shown after the data structure listings for Form F.

FILE NAME: FORMF.DBF
INDEX FILE: INXFORMF.NTX
INDEX KEY: ID+SITE_ID+STR(EXP_ID,2)

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID
1	IB	WA	1

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Data Structure for Form F *(cont.)*

FILE NAME: **FORMF1.DBF**
INDEX FILE: **IXFORMF1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+FACT_CODE**

Field Name	Data Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
FACT_CODE	Char.	8		Factor name
FACT_DESC	Char.	35		Factor name description

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	FACT_CODE	FACT_DESC
1	IB	WA	1	FACTOR_A	Applied nitrogen
2	IB	WA	1	FACTOR_B	Cultivar

FILE NAME: **FORMF2.DBF**
INDEX FILE: **IXFORMF2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+LV_CODE**

Field Name	Data Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
LV_CODE	Char.	6		Level amount or name
LV_DESC	Char.	35		Level amount or name description

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	LV_CODE	LV_DESC
1	IB	WA	1	0	No nitrogen applied
2	IB	WA	1	50	50 Kg N/ha
3	IB	WA	1	200	200 Kg N/ha
4	IB	WA	1	H610	Cultivar H610
5	IB	WA	1	X304C	Cultivar X304C

FILE NAME: **FORMF3.DBF**
INDEX FILE: **IXFORMF3.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(TREAT_ID,2)**

Field Name	Data Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
TREAT_ID	Num.	2		Treatment number
LEV1	Char.	6		Level amount or name for a factor
LEV2	Char.	6		Level amount or name for a factor
LEV3	Char.	6		Level amount or name for a factor
LEV4	Char.	6		Level amount or name for a factor
LEV5	Char.	6		Level amount or name for a factor

Data Structure for Form F *(cont.)*

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	TREAT_ID	LEV1	LEV2	LEV3	LEV4	LEV5
1	IB	WA	1	1	0	X304C			
2	IB	WA	1	2	50	X304C			
3	IB	WA	1	3	200	X304C			
4	IB	WA	1	4	0	H610			
5	IB	WA	1	5	50	H610			
6	IB	WA	1	6	200	H610			

FILE NAME: **FORMF4.DBF**
INDEX FILE: **IXFORMF4.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(TREAT_ID,2)+STR(PLOTS,2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
TREAT_ID	Num.	2		Treatment number
REP_ID	Num.	2		Replicate number
PLOTS	Num.	2		Plot

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	TREAT_ID	REP_ID	PLOTS
1	IB	WA	1	1	1	1
2	IB	WA	1	1	2	16
3	IB	WA	1	1	3	17
4	IB	WA	1	2	1	5
5	IB	WA	1	2	2	9
6	IB	WA	1	2	3	22

Data Structure for Form H

There are two data base files for Form H. FORMH2.DBF stores information for type of residue, and FORMH1.DBF stores the rest of the information in Form H.

FORMH2.DBF might have more than one record, depending on the number of crops the user defined. Each record represents a crop and the percentage input. A two character code is assigned to each crop list in Form H. These codes can be identified by looking up the file CODE.DBF using "RESIDUE" as the ID. When a user inputs the percentage for a crop, the data entry DBMS program will automatically put the appropriate crop codes in RESI_TYPE.

FILE NAME: FORMH1.DBF
INDEX FILE: IXFORMH1.NTX
INDEX KEY: ID+SITE_ID+STR(EXP_ID,2)

Field Name	Data Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
PLOT_AREA	Num.	3		Plot area
SLOPE	Num.	2		Slope
SLOPE_LEN	Num.	4		Slope length
ASPECT	Char.	2		Aspect (direction)
SOIL_DEPTH	Num.	4		Depth of soil drain
DRAIN_DIS	Num.	3		Distance between drains
CONS1	Char.	74		Specific comments
CONS2	Char.	74		Specific comments
CONS3	Char.	74		Specific comments
CONS4	Char.	74		Specific comments
RESI_AMT	Num.	4		Amount of weed/crop residue incorporated during land preparation
RESI_DEP	Num.	2		Depth of residual incorporated during land preparation
BURNT	Char.	1		Indicate whether residue was burned

FILE NAME: FORMH2.DBF
INDEX FILE: IXFORMH2.NTX
INDEX KEY: ID+SITE_ID+STR(EXP_ID,2)+RESI_TYPE+' '

Field Name	Data Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
RESI_TYPE	Char.	2		Type of residue
RESI_PER	Num.	3		Residue percentage

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	RESI_TYPE	RESI_PER
1	IB	WA	1	DG	80
2	IB	WA	1	ST	20

Data Structure for Form I-1 & I-2

Data base files for Form I-1 and I-2 have the same structure. File FORMI1B.DBF and FORMI2B.DBF store information for FORMI-1 while FORMI1.DBF and FORMI2.DBF have data for FORM I-2. Information in file FORMI.DBF is shared by both forms.

FORMI1B.DBF and FORMI1.DBF record the sampled plot numbers. Each record represents a plot that is sampled on a particular date. Therefore, if five plots were sampled in one date, five records will be stored in the file.

FORMI2B.DBF and FORMI2.DBF store all data that are associated with the sampled plots. Each record represents data collected for one or more plots on a particular date.

Data field PLOT_CODE is used to link the sampled plots with data that are collected. It is transparent to the user. When a user enters data, he or she inputs the date, all sampled plots, and the data collected. To the user, the information appears as a record. In reality, the data entry application program accepts all the information and stores it in different records in different files. To be able to identify the relationship between the data, the program assigns a PLOT_CODE for each record. For future access, the PLOT_CODE is an important key to link all associated data of a sample date.

To illustrate, assume the following data are recorded on Form I-1.

Method of P extraction: Modified Truog

Date	Plot(s)	Upper	Lower	H_2O	KCl	NO_3-N	NH_4-N	P	K	Al
18/11/83	1,16,17	0	5	5.2	4.8	4	3	27	-9	-9
18/11/83	1,16,17	5	15	5.2	4.6	3	3	25	-9	-9
18/11/83	5,9,22	0	5	5.2	4.8	5	3	27	-9	-9
18/11/83	5,9,22	5	15	5.2	4.6	4	2	25	-9	-9

Examples of how these data are stored in the data base files are shown after each data structure listing. Several specifics about data storage should be noted.

- Dates are stored in the American format, but the program will accept dates input in the European format.
- Since three plots were sampled on each soil layer, each line of data is stored in three records in FORMI1B.DBF. Records that have the same PLOT_CODE are groups of sampled plots for a soil layer. Each group of sampled plots can be linked to a record in FORMI2B.DBF that has the same PLOT_CODE.
- There are four records in FORMI2B.DBF. Each record represents data collected for each soil layer in a group of sampled plots. Each PLOT_CODE assigned is associated with the PLOT_CODEs in FORMI1B.DBF.

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Data Structure for Form I-1 & I-2 (cont.)

FILE NAME: **FORMI.DBF**
INDEX FILE: **INXFORMI.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
METH_CODE	Char.	3		Method code
EXT_METH	Char.	25		Method of extraction

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	METH_CODE	EXT_METH
1	IB	WA	1	P	Modified Truog

FILE NAME: **FORMI1B.DBF and FORMI1.DBF**
INDEX FILE: **IFORMI1B.NTX and IXFORMI1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(SDATE),4)+ STR(MONTH(SDATE),2)+STR(DAY(SDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Num.	2		Experiment number
SDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link file
PLOTS	Num.	2		Plot number

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	SDATE	PLOT_CODE	PLOTS
1	IB	WA	1	11/18/83	1	1
2	IB	WA	1	11/18/83	1	16
3	IB	WA	1	11/18/83	1	17
4	IB	WA	1	11/18/83	2	1
5	IB	WA	1	11/18/83	2	16
6	IB	WA	1	11/18/83	2	17
7	IB	WA	1	11/18/83	3	5
8	IB	WA	1	11/18/83	3	9
9	IB	WA	1	11/18/83	3	22
10	IB	WA	1	11/18/83	4	5
11	IB	WA	1	11/18/83	4	9
12	IB	WA	1	11/18/83	4	22

FILE NAME: **FORMI2B.DBF and FORMI2.DBF**
INDEX FILE: **IFORMI2B.NTX and IXFORMI2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(SDATE),4)+ STR(MONTH(SDATE),2)+STR(DAY(SDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Char.	2		Experiment number
PLOT_CODE	Num.	3		Internal code used to link files
SDATE	DATE	8		Date of measurement
UPPER	Num.	3		Upper soil layer
LOWER	Num.	3		Lower soil layer
H2O	Num.	4	1	H_2O in pH
KCL	Num.	4	1	KCl in pH
NO3	Num.	5	1	NO_3-N in g/Mg
NH4	Num.	5	1	NH_4-N in g/Mg
P	Num.	5	1	P in g/Mg
K	Num.	5	1	K in g/Mg
AL	Num.	5	2	Al in %

EXAMPLE:

Record #	ID	SITE ID	EXP ID	PLOT CODE	SDATE	UPPER	LOWER	H2O	KCL	NO_3	NH_4	P	K	Al
1	IB	WA	1	1	11/18/83	0	5	5.2	4.8	4	3	27	-9	-9
2	IB	WA	1	2	11/18/83	5	15	5.2	4.6	3	3	25	-9	-9
3	IB	WA	1	3	11/18/83	0	5	5.2	4.8	5	3	27	-9	-9
4	IB	WA	1	4	11/18/83	5	15	5.2	4.6	4	2	25	-9	-9

Data Structure for Form J-1 & J-2

Data base files for Form J-1 and J-2 have the same structure. File FORMJ1B.DBF and FORMJ2B.DBF store information for FORMJ-1, while FORMJ1.DBF and FORMJ2.DBF have data for FORM J-2. FORMJ.DBF contains the upper and lower levels of all layers in a soil profile. Information in this file is shared by Form J-1 and J-2.

FORMJ1B.DBF and FORMJ1.DBF record the sampled plot numbers. Each record represents a plot that is sampled on a particular date. Therefore, if five plots were sampled on one date, five records will be stored in the file.

FORMJ2B.DBF and FORMJ2.DBF store all data that are associated with the sampled plots. Each record contains volumetric water content measured for one or more plots at a soil layer on a particular date.

To illustrate, assume the following data are recorded in Form J-2.

Layers	1	2	3	4	5	6	7	8	9	10
Upper	0	5	15	30	50					
Lower	5	15	30	50	70					

		Volumetric Water Content in % for Layers									
Date	Plot(s)	1	2	3	4	5	6	7	8	9	10
02/01/84	1,16,17,8,12,21	17	30	34	35	39					
02/01/84	4,14,18,3,11,19	18	32	32	37	38					

Examples of how these data are recorded in the data base files are shown after each data structure listing. In addition, the logic used in relating files and data storage is explained. In sections Form I-1 and I-2, the following points should be noted.

- In FORMJ.DBF, a data field LAY_CODE is used internally to identify a soil layer. This code can be linked with LAY_CODE in FORMJ2.DBF to associate volumetric water content with the appropriate layer. The data entry program assigns alphabetical lettering to each soil layer in sequence.

- Each record in FORMJ2.DBF contains a volumetric water content for a soil layer. In this example, the first five records contain volumetric water content for five soil layers collected at plots 1, 16, 17, 8, 12, and 21.

FILE NAME: **FORMJ.DBF**
INDEX FILE: **INXFORMJ.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+LAY_CODE**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experiment site ID
EXP_ID	Char.	2		Experiment number
LAY_CODE	Char.	1		Internal used soil layer code
BEG_LAY	Num.	3		Upper level
END_LAY	Num.	3		Lower level

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	LAY_CODE	BEG_LAY	END_LAY
1	IB	WA	1	A	0	5
2	IB	WA	1	B	5	15
3	IB	WA	1	C	15	30
4	IB	WA	1	D	30	50
5	IB	WA	1	E	50	70

FILE NAME: **FORMJ1.DBF**
INDEX FILE: **IXFORMJ1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(JDATE),4)+ STR(MONTH(JDATE),2)+STR(DAY(JDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
JDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link file
PLOTS	Num.	2		Plot number

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	JDATE	PLOT_CODE	PLOTS
1	IB	WA	1	01/02/84	1	1
2	IB	WA	1	01/02/84	1	16
3	IB	WA	1	01/02/84	1	17
4	IB	WA	1	01/02/84	1	8
5	IB	WA	1	01/02/84	1	12
6	IB	WA	1	01/02/84	1	21
7	IB	WA	1	01/02/84	2	4
8	IB	WA	1	01/02/84	2	14
9	IB	WA	1	01/02/84	2	18
10	IB	WA	1	01/02/84	2	3
11	IB	WA	1	01/02/84	2	11
12	IB	WA	1	01/02/84	2	19

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Data Structure for Form J-1 & J-2 *(cont.)*

FILE NAME: FORMJ2.DBF
INDEX FILE: IXFORMJ2.NTX
INDEX KEY: ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(JDATE),4)+STR(MONTH(JDATE),2)+STR(DAY(JDATE),2)+STR(PLOT_CODE,3)

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
JDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link file
LAY_CODE	Char.	1		Internal code used to link file
VOL_WATER	Num.	4		Volumetric water content

EXAMPLE:

Record #	ID	SITE_ID	EXP_ID	JDATE	PLOT_CODE	LAY_CODE	VOL_WATER
1	IB	WA	1	01/02/84	1	A	17
2	IB	WA	1	01/02/84	1	B	30
3	IB	WA	1	01/02/84	1	C	34
4	IB	WA	1	01/02/84	1	D	35
5	IB	WA	1	01/02/84	1	E	39
6	IB	WA	1	01/02/84	2	A	18
7	IB	WA	1	01/02/84	2	B	32
8	IB	WA	1	01/02/84	2	C	32
9	IB	WA	1	01/02/84	2	D	37
10	IB	WA	1	01/02/84	2	E	38

Data Structure for Form K

Two data base files are used to store information for Form K. FORMK1.DBF records, the sampled plot numbers, and FORMK2.DBF stores all data that are associated with the sampled plots.

Examples and explanations of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMK1.DBF**
INDEX FILE: **IXFORMK1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(KDATE),4)+STR (MONTH (KDATE),2)+STR(DAY(KDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
KDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMK2.DBF**
INDEX FILE: **IXFORMK2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(KDATE),4)+ STR(MONTH (KDATE),2)+STR(DAY(KDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
KDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
IMP_CODE	Num.	2		Implement code
DEPTH	Num.	2		Depth
INFO	Char.	35		Other information

Data Structure for Form L

There is only one file to store information for Form L. Each record in FORML.DBF contains cultivar information.

FILE NAME: **FORML.DBF**
INDEX FILE: **INXFORML.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+CULT_NAME**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
CULT_NAME	Char.	10		Cultivar name
OTHER_NAME	Char.	10		Other names
TYPE	Char.	10		Type
SEED_WT	Num.	6		Seed weight
SEED_AGE	Num.	4		Seed age
SEED_LEN	Num.	4		Sprout length

Data Structure for Form M

Three data base files are used to store information for Form M. FORMM3.DBF stores planting method, FORMM1.DBF records the sampled plot numbers, and FORMM2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMM3.DBF**
INDEX FILE: **IXFORMM3.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
TYPE_METH	Num.	1		Method of planting

FILE NAME: **FORMM1.DBF**
INDEX FILE: **IXFORMM1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(MDATE),4)+ STR(MONTH(MDATE),2)+STR(DAY(MDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
MDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMM2.DBF**
INDEX FILE: **IXFORMM2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(MDATE),4)+ STR(MONTH(MDATE),2)+STR(DAY(MDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
MDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
CULTIVAR	Char.	10		Cultivar
ROW_SPACE	Num.	5		Row spacing
PLT_CNT	Num.	6		Plant count
PLT_POP	Num.	6		Plant population
SEED_DEPTH	Num.	4		Seed depth
IMPLEMENT	Num.	2		Implement code

Data Structure for Form N

Two data base files are used to store information for Form N. FORMN1.DBF records the sampled plot numbers, and FORMN2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMN1.DBF**
INDEX FILE: **IXFORMN1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(NDATE),4)+ STR(MONTH (NDATE),2)+STR(DAY(NDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
NDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMN2.DBF**
INDEX FILE: **IXFORMN2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(NDATE),4)+ STR(MONTH (NDATE),2)+STR(DAY(NDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
NDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
MAT_CODE	Num.	2		Material code
PL_CODE	Num.	2		Placement code
METHOD	Num.	2		Method code
DEPTH	Num.	2		Depth
N_AMT	Num.	3		Amount of N in kg/ha
P_AMT	Num.	3		Amount of P in kg/ha
K_AMT	Num.	3		Amount of K in kg/ha
CACO3_AMT	Num.	3		Amount of $CaCO_3$ in kg/ha
Other	Num.	3		Amount of other fertilizer applied in kg/ha

Data Structure for Form O

Two data base files are used to store information for Form O. FORMO1.DBF records the sampled plot numbers, and FORMO2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMO1.DBF**
INDEX FILE: **IXFORMO1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(ODATE),4)+ STR(MONTH(ODATE),2)+STR(DAY(ODATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
ODATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMO2.DBF**
INDEX FILE: **IXFORMO2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(ODATE),4)+ STR(MONTH(ODATE),2)+STR(DAY(ODATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
ODATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PROD_CODE	Num.	4		Product code
ACT_INGRED	Num.	4		Amount of active ingredient applied in kg/AI/ha
TARGET	Char.	25		Target

Data Structure for Form P

Two data base files are used to store information for Form P. FORMP1.DBF records the sampled plot numbers, and FORMP2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMP1.DBF**
INDEX FILE: **IXFORMP1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(PDATE),4)+ STR(MONTH(PDATE),2)+STR(DAY(PDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
PDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMP2.DBF**
INDEX FILE: **IXFORMP2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(PDATE),4)+ STR(MONTH(PDATE),2)+STR(DAY(PDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
PDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
AMOUNT	Num.	3		Amount irrigated
METHOD	Num.	2		Method of irrigation

Data Structure for Form Q

Two data base files are used to store information for Form Q. FORMQ1.DBF records the sampled plot numbers, and FORMQ2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMQ1.DBF**
INDEX FILE: **IXFORMP1.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(QDATE),4)+ STR(MONTH(QDATE),2)+STR(DAY(QDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
QDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
PLOTS	Num.	2		Plot number

FILE NAME: **FORMQ2.DBF**
INDEX FILE: **IXFORMQ2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(QDATE),4)+ STR(MONTH(QDATE),2)+STR(DAY(QDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
QDATE	Date	8		Date of measurement
PLOT_CODE	Num.	2		Internal code used to link file
TYPE_DAM	Num.	2		Type of damage code
TISS_DAM	Num.	2		Tissue damage code
PLT_LOSS	Num.	3		% plant loss
NECR_AREA	Num.	3		% necrotic area
OBSERVE1	Char.	36		Comments
OBSERVE2	Char.	36		Comments

Data Structure for Form R-1

Two data base files are used to store information for Form R-1. FORMR1A.DBF records the sampled plot numbers, and FORMR1B.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMR1A.DBF**
INDEX FILE: **IFORMR1A.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(RDATE),4)+ STR(MONTH(RDATE),2)+STR(DAY(RDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
RDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link files
PLOTS	Num.	2		Plot number

FILE NAME: **FORMR1B.DBF**
INDEX FILE: **IFORMR1B.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(RDATE),4)+ STR(MONTH(RDATE),2)+STR(DAY(RDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
RDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link files
V_GS	Char.	3		Vegetative growth stage
R_GS	Char.	3		Reproductive growth stage

Data Structure for Form R-2

Each record in FORMR2B.DBF represents amount collected for a crop component at a plot on a particular date. Thus, if data were collected for five different crop components in a plot, five records with the same PLOTS number will be created.

To illustrate, assume the following data recorded on Form R-2.

				Harvest Codes					
Date	Plot	V-stage	R-stage	1	3	8	9	10	13
02/01/84	1	V6		5.79	27.78	27.78			1.05
08/02/84	3		R1		512.2	204.9	97.0	190.7	4.2

Examples of how these data are recorded in the data base files are shown after the data structure listing.

FILE NAME: **FORMR2B.DBF**
INDEX FILE: **IFORMR2B.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(RDATE),4)+ STR(MONTH(RDATE),2)+STR(DAY(RDATE),2)+STR(PLOTS,2)+ V_GS+R_GS**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
RDATE	Date	8		Date of measurement
PLOTS	Num.	2		Plot number
V_GS	Char.	3		Vegetative growth stage
R_GS	Char.	3		Reproductive growth stage
COMP_CODE	Num.	2		Harvest code
AMT	Num.	9	2	Measurement

EXAMPLE:

ID	SITE_ID	EXP_ID	RDATE	PLOTS	V_GS	R_GS	COMP_CODE	AMT
IB	WA	1	01/02/84	1	V1		1	5.79
IB	WA	1	01/02/84	1	V1		3	27.78
IB	WA	1	01/02/84	1	V1		8	27.78
IB	WA	1	01/02/84	1	V1		13	1.05
IB	WA	1	02/08/84	3		R1	3	390.20
IB	WA	1	02/08/84	3		R1	8	204.90
IB	WA	1	02/08/84	3		R1	9	97.00
IB	WA	1	02/08/84	3		R1	10	190.70
IB	WA	1	02/08/84	3		R1	13	4.20

Data Structure for Form S

Two data base files are used to store information for Form S. FORMS1.DBF records the sampled plot numbers, and FORMS2.DBF stores all data that are associated with the sampled plots.

Examples and explanation of how these data are recorded in the data base files have been shown in sections Form I and Form J. Please refer to these sections if you want to review the logic.

FILE NAME: **FORMS1.DBF**
INDEX FILE: **IXFORMS1NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(SDATE),4)+ STR(MONTH(SDATE),2)+STR(DAY(SDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
SDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link files
PLOTS	Num.	2		Plot number

FILE NAME: **FORMS2.DBF**
INDEX FILE: **IXFORMS2.NTX**
INDEX KEY: **ID+SITE_ID+STR(EXP_ID,2)+STR(YEAR(SDATE),4)+ STR(MONTH(SDATE),2)+STR(DAY(SDATE),2)+STR (PLOT_CODE,3)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
SITE_ID	Char.	2		Experimental site ID
EXP_ID	Num.	2		Experiment number
SDATE	Date	8		Date of measurement
PLOT_CODE	Num.	3		Internal code used to link files
COMP_CODE	Num.	2		Plant component code
NUTRI_CODE	Char.	2		Nutrient Concentration code
NUTRI_AMT	Num.	5	2	Nutrient Concentration

Data Structure for Comments

COMMENT.DBF stores the input comments for Form I to Form S. It can be linked to different forms using the data field FORM as the key.

FILE NAME: **COMMENT.DBF**

Data Field Name	Type	Width	Decimal Place	Description
FORM	Char.	2		Form character
COMM	Char.	80		Comment

Table 4-1. Listing of Institute IDs

ID	Institute	Country
99	Other	
AC	Arab Center for Studies of Arid Zones and Dry Lands	Syria
AI	Agency for Agricultural Research and Development	Indonesia
AP	A. P. Agricultural University	India
AT	Asian Vegetable Research and Development Center	Taiwan
AU	Auburn University, Alabama	U.S.A.
BA	Bangladesh Agricultural Research Council, Dacca	Bangladesh
BI	Bangladesh Agricultural Research Institute, Joydepur	Bangladesh
BU	Bangladesh Agricultural University, Mymensingh	Bangladesh
CA	Centro Agronomico Tropical de Investigación y Enseñanza	Costa Rica
CB	Instituto Colombiano Agropecuario	Colombia
CC	Centro Internacional de Agricultura Tropical	Colombia
CH	National Chung-Hsing University	Taiwan
CI	Centro Internacional de Mejoramiento de Maiz y Trigo	Mexico
CL	North Central Conservation Res. Lab., USDA-ARS	U.S.A.
CM	Chiang Mai University, Chiang Mai	Thailand
CO	Cornell University	U.S.A.
CP	Centro Internacional de la Papa (International Potato Center)	Peru
CR	Center for Soil Research	Indonesia
CS	Commonwealth Scientific and Industrial Research Organization	Australia
CV	Centro Nacional de Investigaciónes Agropecuarias	Venezuela
CW	Central Weather Bureau, Taiwan	Taiwan
DN	Department of Scientific and Industrial Research	New Zealand
DT	Department of Agriculture	Thailand
EB	Empresa Brasileira de Pesquisas Agropecuaria	Brazil
ER	Economic Research Service	U.S.A.
FA	Food and Agriculture Organization, United Nations	Italy
FF	Food & Fertilizer Technology Center for the Asian & Pacific Region	Taiwan
FN	Fondo Nacional de Investigaciónes Agropecuarias	Venezuela
GA	University of Georgia	U.S.A.
GT	Grassland, Soil and Water Research Laboratory	U.S.A.
GU	Gujarat Agricultural University	India
HA	Haryana Agricultural University	India
IA	Institut de la Recherché Agronomique	Cameroon
IB	International Benchmark Sites Network for Agrotechnology Transfer	U.S.A.
IC	Indian Council for Agricultural Research	India
ID	Instituto de Investigación Agropecuaria de Panama	Panama
IE	International Center for Agri. Research in Dry Areas	Syria
IF	International Fertilizer Development Center	U.S.A.
IG	Instituto de Ciencia y Technología Agrícolas, Guatemala	Guatemala
II	International Institute for Tropical Agriculture	Nigeria
IL	Isabela State University, Isabela	Philippine
IN	Institut National de la Recherché Agronomique	France
IO	University of Idaho	U.S.A.
IR	International Rice Research Institute	Philippines
IS	International Soybean Program	Taiwan
IT	International Crops Research Institute for the Semi-Arid Tropics	India
IU	Iowa State University	U.S.A.
KK	Khon Kaen University	Thailand
KS	Kansas State University	U.S.A.

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Table 4-1. Listing of Institute IDs (cont.)

ID	Institute	Country
LC	Lincoln College	New Zealand
LU	Louisiana State University	U.S.A.
MA	Malaysian Agricultural Research & Development Institute	Malaysia
MI	Ministry of Primary Industries	Fiji
MO	University of Missouri, Columbia	U.S.A.
MP	Marathwada Agricultural University	India
MS	Michigan State University	U.S.A.
MU	Mississippi State University	U.S.A.
MT	Tropical Agriculture Research Station, USDA-ARS,	P.R.
MW	Dept. of Agricultural Research	Malawi
NB	National Bureau of Soil Survey and Land Use Planning	India
NC	North Carolina State University	U.S.A.
ND	North Dakota State University	U.S.A.
NI	Nitrogen Fixation by Tropical Agricultural Legumes	U.S.A.
NO	National Oceanographic and Atmospheric Administration	U.S.A.
OH	Ohio State University	U.S.A.
OK	Oklahoma State University	U.S.A.
OR	Office de la Recherché Scientifique et Technique Outre-Mer	France
OS	Oregon State University	U.S.A.
PA	Pakistan Agricultural Research Council	Pakistan
PC	Philippine Council for Agri. and Resources Research and Development	Philippines
PO	Irrigated Research and Extension Center, USDA-ARS, Prosser	U.S.A.
PP	Peanut Production, Disease and Harvesting Res; USDA-ARS	U.S.A.
PR	Purdue University	U.S.A.
PU	Punjab Agricultural University	India
PX	U. S. Water Conservation Laboratory, Pheonix	U.S.A.
QD	Queensland Department of Primary Industry	Australia
QU	University of Queensland	Australia
RW	Universite National du Rwanda	Rwanda
SC	Soil and Crop Evaluation Project	Fiji
SI	Saskatchewan Irrigation Development Center	Canada
SP	University of South Pacific	Fiji
TA	Texas A & M University, College Station	U.S.A.
TH	Thailand Land Development Department	Thailand
TN	Tamilnadu Agricultural University	India
TR	Tropical Agriculture Research Center	Japan
UB	University of Burundi	Burundi
UC	University of Guelph	Canada
UF	University of Florida	U.S.A.
UG	University of Guam	Guam
UH	University of Hawaii	U.S.A.
UI	University of Illinois	U.S.A.
UJ	University of Jordan	Jordan
UM	University of Melbourne	Australia
UN	University of Nebraska	U.S.A.
UP	University of Puerto Rico	Puerto Rico
UR	University of Costa Rica	Costa Rica
US	Utah State University	U.S.A.
UZ	University of Zambia	Zambia
WS	Washington State University	U.S.A.

Table 4-2. Listing of Product Codes

PRO_CODE	PRO_NAME
-9	Missing
1001	Alachlor(Lasso), Metholachlor(Dual)
1002	Propanil
1003	Trifluralin
1004	Dalapon
1005	MCPA
1006	2,4-D
1007	2,4,5-T
1008	Pendimethalin, Prowl
1009	Atrazine
1010	Diquat
1011	Paraquat
1999	Others
2001	Carbaryl, Sevin, Septene
2002	Malathion, Mercaptothion
2003	Naled
2004	Dimethoate
2005	Fenthion
2006	Diazinon, Basudin
2007	Ethion, Diethion
2008	Oxydemeton-Methyl
2009	Azinphos-Methyl
2010	Phosphamidon
2011	Mevinphosl
2012	Methyl Parathion
2013	Parathion
2014	DDT
2015	BHC, HCH
2016	Chlordane
2017	Heptachlor
2018	Toxaphene
2019	Aldrin
2020	Dieldrin
2021	Endrin, Nendrin
2022	Methomyl, Lannate
2023	Thiotex
2024	Furadan
2025	Endosulfan
2999	Others
3001	Captan
3002	Benomyl
3003	Zineb
3004	Maneb
3005	Mancozeb
3006	Tilt
3999	Others

Table 4-3. Listing of IDs and Type of Codes in CODE.DBF

ID	Type of Code
ARGRO	Growth stage codes for aroid
ARHAR	Harvest codes for aroid
CROP	Crop codes
CSGRO	Growth stage codes for cassava
CSHAR	Harvest codes for cassava
DAMAGE	Type of damage codes
GWRGRO	Growth stage codes for grain sorghum, wheat, rice, barley and millet
GWRHAR	Harvest codes for grain sorghum, wheat, rice, barley and millet
IMPLE	Field implement codes
IRRIGAT	Irrigation method codes
MATERIA	Material codes
METHOD	Method codes
MZGRO	Growth stage codes for maize
MAHAR	Harvest codes for maize
PLACEMN	Placement codes
PLANT	Plant component codes
PNGRO	Growth stage codes for peanut
PNHAR	Harvest codes for peanut
PTGRO	Growth stage codes for potato
PTHAR	Harvest codes for potato
RESIDUE	Type of residue
SOFLGRO	Growth stage codes for soybean and dry bean
SOFLHAR	Harvest codes for soybean and dry bean

Table 4-4. Listing of Other Codes

ID	CHAR_ID	NUM_ID	Name
ARGRO			Missing
ARGRO	V0		50% of plants have 1 visible leaf tip
ARGRO	V1		50% of plants have 1 fully opened leaf
ARGRO	V2		50% of plants have 2 fully opened leaves
ARGRO	V3		50% of plants have 3 fully opened leaves
ARGRO	V4		50% of plants have 4 fully opened leaves
ARGRO	V5		50% of plants have 5 fully opened leaves
ARGRO	V6		50% of plants have 6 fully opened leaves
ARGRO	V7		50% of plants have 7 fully opened leaves
ARGRO	V8		50% of plants have 8 fully opened leaves
ARGRO	V9		50% of plants have 9-10 fully opened leaves
ARGRO	V11		50% of plants have 11 fully opened leaves
ARGRO	V12		50% of plants have 12-24 fully opened leaves
ARGRO	V25		50% of plants have 25 fully opened leaves
ARGRO	S		50% of plants have suckers aboveground
ARGRO	R7		50% of plants have only 2 or 3 active leaves remaining on plant
ARHAR		-9	Missing
ARHAR		1	Plant population of harvest area (plants/m^2)
ARHAR		2	Area harvested (m^2)
ARHAR		3	Aboveground biomass (dry) (g/m^2)
ARHAR		4	Corm weight (undried) (g/m^2)
ARHAR		5	Corm weight (dry) (g/m^2)
ARHAR		6	Corm number (corms/m^2)
ARHAR		7	Cormel weight (undried) (g/m^2)
ARHAR		8	Cormel weight (dry) (g/m^2)
ARHAR		9	Cormel number (cormels/m^2)
ARHAR		10	Leaf weight (dry) (g/m^2)
ARHAR		11	Petiole weight (dry) (g/m^2)
ARHAR		12	Root weight (dry) (g/m^2)
ARHAR		13	Leaf area (cm^2)
ARHAR		99	Other
CROP	99		Other
CROP	AR		Aroid
CROP	BA		Barley
CROP	BN		Dry bean
CROP	CS		Cassava
CROP	ML		Millet
CROP	MZ		Maize
CROP	PN		Peanut
CROP	PT		Potato
CROP	RI		Rice
CROP	SB		Soybean
CROP	SG		Grain sorghum
CROP	WH		Wheat
CSGRO			Missing
CSGRO	R1		50 % of plants flowering
CSGRO	R7		50 % of plants at harvest maturity
CSGRO	V1		50% of plants with at least 1 apical meristem
CSGRO	V2		50% of plants with at least 2 apical meristems

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Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
CSGRO	V3		50% of plants with at least 3 apical meristems
CSGRO	V4		50% of plants with at least 4 apical meristems
CSGRO	V5		50% of plants with at least 5 apical meristems
CSGRO	V6		50% of plants with at least 6 apical meristems
CSGRO	V7		50% of plants with at least 7 apical meristems
CSGRO	V8		50% of plants with at least 8 apical meristems
CSGRO	V9		50% of plants with at least 9 apical meristems
CSGRO	VE		50% w/ at least 1 shoot on planting stick more than 1 cm
CSHAR		1	Plant population of harvest area (Plants/m^2)
CSHAR		2	Area harvested (m^2)
CSHAR		3	Aboveground biomass (dry) (g/m^2)
CSHAR		4	Total tuber weight (undried) (g/m^2)
CSHAR		5	Total tuber weight (dry) (g/m^2)
CSHAR		6	Total tuber number (tubers/m^2)
CSHAR		7	Usable tuber weight (undried) (g/m^2)
CSHAR		8	Usable tuber weight (dry) (g/m^2)
CSHAR		9	Usable tuber number (tubers/m^2)
CSHAR		10	Leaf weight (dry) (g/m^2)
CSHAR		11	Petiole weight (dry) (g/m^2)
CSHAR		12	Stem weight (dry) (g/m^2)
CSHAR		13	Feeder root weight (dry) (g/m^2)
CSHAR		14	Leaf area (cm^2)
CSHAR		-9	Missing
CSHAR		99	Other
DAMAGE	1		Assimilate sappers
DAMAGE	2		Leaf senescence accelerator
DAMAGE	3		Light stealers
DAMAGE	4		Metabolic diverters
DAMAGE	5		Photosynthesis rate reducers
DAMAGE	6		Resource competitors
DAMAGE	7		Stand Reducers
DAMAGE	8		Tissue consumers
DAMAGE	9		Tissue disrupters
DAMAGE	10		Translocation disrupters (stranglers)
DAMAGE	11		Turgor reducers
DAMAGE	-9		Missing
DAMAGE	99		Others
GWRGRO			Missing
GWRGRO	00		Dry seed
GWRGRO	01		Start of imbibition
GWRGRO	02		
GWRGRO	03		Imbibition complete
GWRGRO	04		
GWRGRO	05		Radicle emerged from seed coat
GWRGRO	06		
GWRGRO	07		Coleoptile emerged from seed coat
GWRGRO	08		
GWRGRO	09		Leaf just at coleoptile tip
GWRGRO	10		First leaf through coleoptile

Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
GWRGRO	11		First leaf unfolded
GWRGRO	12		2 leaves unfolded
GWRGRO	13		3 leaves unfolded
GWRGRO	14		4 leaves unfolded
GWRGRO	15		5 leaves unfolded
GWRGRO	16		6 leaves unfolded
GWRGRO	17		7 leaves unfolded
GWRGRO	18		8 leaves unfolded
GWRGRO	19		9 or more leaves unfolded
GWRGRO	20		Main shoot only
GWRGRO	21		Main shoot and 1 tiller
GWRGRO	22		Main shoot and 2 tillers
GWRGRO	23		Main shoot and 3 tillers
GWRGRO	24		Main shoot and 4 tillers
GWRGRO	25		Main shoot and 5 tillers
GWRGRO	26		Main shoot and 6 tillers
GWRGRO	27		Main shoot and 7 tillers
GWRGRO	28		Main shoot and 8 tillers
GWRGRO	29		Main shoot and 9 or more tillers
GWRGRO	30		Pseudo-stem erection (winter cereals only)
GWRGRO	31		1st node detectable
GWRGRO	32		2nd node detectable
GWRGRO	33		3rd node detectable
GWRGRO	34		4th node detectable
GWRGRO	35		5th node detectable
GWRGRO	36		6th node detectable
GWRGRO	37		Flag leaf just visible
GWRGRO	38		
GWRGRO	39		Flag leaf ligule just visible
GWRGRO	40		
GWRGRO	41		Flag leaf sheath extending
GWRGRO	42		
GWRGRO	43		Boots just visibly swollen
GWRGRO	44		
GWRGRO	45		Boots swollen
GWRGRO	46		
GWRGRO	47		Flag leaf sheath opening
GWRGRO	48		
GWRGRO	49		First awns visible
GWRGRO	50		
GWRGRO	51		First spikelet of ear just visible
GWRGRO	52		
GWRGRO	53		1/4 of ear emerged
GWRGRO	54		
GWRGRO	55		1/2 of ear emerged
GWRGRO	56		
GWRGRO	57		3/4 of ear emerged
GWRGRO	58		
GWRGRO	59		Emergence of ear completely
GWRGRO	60		

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Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
GWRGRO	61		Beginning of flowering (not easily detectable in barley)
GWRGRO	62		
GWRGRO	63		
GWRGRO	64		
GWRGRO	65		Flowering halfway
GWRGRO	66		
GWRGRO	67		
GWRGRO	68		
GWRGRO	69		Flowering complete
GWRGRO	70		
GWRGRO	71		Seed coat water ripe
GWRGRO	72		
GWRGRO	73		Early milk
GWRGRO	74		
GWRGRO	75		Medium milk
GWRGRO	76		
GWRGRO	77		Late milk
GWRGRO	78		
GWRGRO	79		
GWRGRO	80		
GWRGRO	81		
GWRGRO	82		
GWRGRO	83		Early dough
GWRGRO	84		
GWRGRO	85		Soft dough (fingernail impression not held)
GWRGRO	86		
GWRGRO	87		Hard dough (fingernail impression held, head losing chlorophyll)
GWRGRO	88		
GWRGRO	89		
GWRGRO	90		
GWRGRO	91		Seed coat hard (difficult to divide by thumbnail)
GWRGRO	92		Seed coat hard (can no longer be dented by thumbnail)
GWRGRO	93		Seed coat loosening in daytime
GWRGRO	94		Overripe, straw dead and collapsing
GWRGRO	95		Seed dormant
GWRGRO	96		Viable seed giving 50% germination
GWRGRO	97		Seed not dormant
GWRGRO	98		Secondary dormancy induced
GWRGRO	99		Secondary dormancy lost
GWRHAR		1	Plant population of harvest area (plants/m^2)
GWRHAR		2	Area harvest (m^2)
GWRHAR		3	Aboveground biomass (dry) (g/m^2)
GWRHAR		4	Seed weight (undried) (g/m^2)
GWRHAR		5	Seed weight (dry) (g/m^2)
GWRHAR		6	Seed number (seeds/m^2)
GWRHAR		7	Panicle number (panicles/m^2)
GWRHAR		8	Leaf blade weight (dry) (g/m^2)

Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
GWRHAR		9	Leaf sheath weight (dry) (g/m^2)
GWRHAR		10	Stem weight (dry) (g/m^2)
GWRHAR		11	Panicle weight (dry) (g/m^2)
GWRHAR		12	Root weight (dry) (g/m^2)
GWRHAR		13	Leaf area index
GWRHAR		14	Leaf number
GWRHAR		-9	Missing
GWRHAR		99	Others
IMPLE		1	Combine
IMPLE		2	Tandem Disk
IMPLE		3	Offset disk
IMPLE		4	Oneway disk
IMPLE		5	Moldboard plow
IMPLE		6	Chisel plow
IMPLE		7	Disk plow
IMPLE		8	Subsoiler
IMPLE		9	Bedder/Lister
IMPLE		10	Field cultivator
IMPLE		11	Row crop cultivator
IMPLE		12	Harrow-springtooth
IMPLE		13	Harrow-spike
IMPLE		14	Rotary hoe
IMPLE		15	Roto-tiller
IMPLE		16	Row crop planter
IMPLE		17	Drill
IMPLE		18	Shredder
IMPLE		19	Hoe
IMPLE		20	Planting stick
IMPLE		21	Animal-drawn implement
IMPLE		22	Hand
IMPLE		23	Manual hoeing
IMPLE		-9	Missing
IMPLE		99	Other
IRRIGAT		1	Furrow
IRRIGAT		2	Alternating furrows
IRRIGAT		3	Flood
IRRIGAT		4	Sprinkler
IRRIGAT		5	Drip or trickle
IRRIGAT		-9	Missing
IRRIGAT		99	Other
MATERIA		1	Ammonium nitrate
MATERIA		2	Ammonium sulfate
MATERIA		3	Ammonium nitrate-sulfate
MATERIA		4	Anhydrous ammonia
MATERIA		5	Urea
MATERIA		6	Diammonium phosphate
MATERIA		7	Monoammonium phosphate
MATERIA		8	Calcium nitrate
MATERIA		9	Aqua ammonia
MATERIA		10	Urea ammonium nitrate solution

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Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
MATERIA		11	Calcium ammonium nitrate solution
MATERIA		12	Ammonium polyphosphate
MATERIA		13	Single superphosphate
MATERIA		14	Triple superphosphate
MATERIA		15	Liquid phosphoric acid
MATERIA		16	Potassium chloride
MATERIA		17	Potassium nitrate
MATERIA		18	Potassium sulfate
MATERIA		19	Calcitic limestone
MATERIA		20	Dolomitic limestone
MATERIA		21	Rock phosphate
MATERIA		22	Green manure
MATERIA		23	Barnyard manure
MATERIA		24	Rhizobium
MATERIA		25	Crop residue
MATERIA		26	Calcium hydroxide
MATERIA		-9	Missing
MATERIA		99	Other
METHOD		1	Hand
METHOD		2	Machine
METHOD		-9	Missing
METHOD		99	Other
MZGRO			Missing
MZGRO	R1		50% of plants with some silks visible outside husks
MZGRO	R2		50% of plants in "blister" stage-endosperm is abundant
MZGRO	R3		50% of plants in "milk"
MZGRO	R4		50% of plants in "dough" stage
MZGRO	R5		50% of plants in "dent" stage
MZGRO	R6		50% of plants at physiological maturity
MZGRO	R7		50% of plants at harvest maturity
MZGRO	VE		50% of plants with some part visible at soil surface
MZGRO	V1		50% of plants with collar of 1st leaf visible
MZGRO	V2		50% of plants with collar of 2nd leaf visible
MZGRO	V3		50% of plants with collar of 3rd leaf visible
MZGRO	V4		50% of plants with collar of 4th leaf visible
MZGRO	V5		50% of plants with collar of 5th leaf visible
MZGRO	V6		50% of plants with collar of 6th leaf visible
MZGRO	V7		50% of plants with collar of 7th leaf visible
MZGRO	V8		50% of plants with collar of 8th leaf visible
MZGRO	V9		50% of plants with collar of 9th leaf visible
MZGRO	VT		50% of plants w/ last branch of tassel visible but silk not visible
MZHAR		1	Plant population of harvest area (plants/m^2)
MZHAR		2	Area harvested (m^2)
MZHAR		3	Aboveground biomass (dry) (g/m^2)
MZHAR		4	Seed weight (undried) (g/m^2)
MZHAR		5	Seed weight (dry) (g/m^2)
MZHAR		6	Seed number (seeds/m^2)
MZHAR		7	Ear number (ears/m^2)

Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
MZHAR		8	Leaf blade weight (dry) (g/m^2)
MZHAR		9	Leaf sheath weight (dry) (g/m^2)
MZHAR		10	Stem + tassel weight (dry) (g/m^2)
MZHAR		11	Cob + shuck weight (dry) (g/m^2)
MZHAR		12	Root weight (dry) (g/m^2)
MZHAR		13	Leaf area index (m^2/m^2)
MZHAR		14	Leaf number
MZHAR		-9	Missing
MZHAR		99	Other
PLACEMN		1	Broadcast, not incorporated
PLACEMN		2	Broadcast, incorporate
PLACEMN		3	Banded on surface
PLACEMN		4	Banded beneath surface
PLACEMN		5	Applied in irrigation water
PLACEMN		6	Foliar spray
PLACEMN		7	Bottom of hole
PLACEMN		8	On the seed
PLACEMN		-9	Missing
PLACEMN		99	Other
PLANT		1	Secondary stems
PLANT		2	Cob
PLANT		3	Corm
PLANT		4	Cormel
PLANT		5	Ear
PLANT		6	Ear leaf
PLANT		7	Hull
PLANT		8	Husk
PLANT		9	Leaf blade
PLANT		10	Leaf sheath
PLANT		11	Panicle
PLANT		12	Petiole
PLANT		13	Pod
PLANT		14	Root
PLANT		15	Seed (or grain)
PLANT		16	Stem
PLANT		17	Stover
PLANT		18	Straw
PLANT		19	Tiller leaf
PLANT		20	Tiller leaf sheath
PLANT		21	Tiller stem
PLANT		22	Tuber
PLANT		23	Whole aboveground plant
PLANT		24	Petiole and leaf blade
PLANT		25	Whole aboveground tiller
PLANT		26	Whole aboveground primary plant
PLANT		27	Main stem
PLANT		-9	Missing
PLANT		99	Other
PNGRO			Missing

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Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
PNGRO	R1		50% of plants beginning bloom (with 1 open flower at any node)
PNGRO	R2		50% of plants beginning peg (with 1 elongated peg)
PNGRO	R3		50% of plants beginning pod
PNGRO	R4		Full pod
PNGRO	R5		Beginning seed
PNGRO	R6		Full seed
PNGRO	R7		Beginning maturity
PNGRO	R8		Harvest maturity
PNGRO	R9		Over mature pod
PNGRO	VE		50% of plants with some part visible at soil surface
PNGRO	V1		50% of plants with 1 developed node on the main axis
PNGRO	V2		50% of plants with 2 developed nodes on the main axis
PNGRO	V3		50% of plants with 3 developed nodes on the main axis
PNGRO	V4		50% of plants with 4 developed nodes on the main axis
PNGRO	V5		50% of plants with 5 developed nodes on the main axis
PNGRO	V6		50% of plants with 6 developed nodes on the main axis
PNGRO	V7		50% of plants with 7 developed nodes on the main axis
PNGRO	V8		50% of plants with 8 developed nodes on the main axis
PNGRO	V9		50% of plants with 9 developed nodes on the main axis
PNHAR		1	Plant population of harvest area (Plants/m^2)
PNHAR		2	Area harvest (m^2)
PNHAR		3	Aboveground biomass (dry) (g/m^2)
PNHAR		4	Seed weight (undried) (g/m^2)
PNHAR		5	Seed weight (dry) (g/m^2)
PNHAR		6	Seed number (seed/m^2)
PNHAR		7	Pod number (pods/m^2)
PNHAR		8	Leaf blade weight (dry) (g/m^2)
PNHAR		9	Petiole weight (dry) (g/m^2)
PNHAR		10	Stem weight (dry) (g/m^2)
PNHAR		11	Empty shell weight (dry) (g/m^2)
PNHAR		12	Root weight (dry) (g/m^2)
PNHAR		13	Leaf area index
PNHAR		14	Nodule weight (dry) (g/m^2)
PNHAR		-9	Missing
PNHAR		99	Other
PTGRO			Missing
PTGRO	T1		Tuber initiation. 50% have at least 1 tuber >= 1cm in diameter
PTGRO	T2		T1 + 20 days
PTGRO	T3		T1 + 40 days

Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
PTGRO	T4		Green canopy cover reaches 20% of the maximum achieved
PTGRO	VE		50% of plants with some part visible at soil surface
PTGRO	V1		50% of plants with 1 developed node on the main axis
PTGRO	V2		50% of plants with 2 developed nodes on the main axis
PTGRO	V3		50% of plants with 3 developed nodes on the main axis
PTGRO	V4		50% of plants with 4 developed nodes on the main axis
PTGRO	V5		50% of plants with 5 developed nodes on the main axis
PTGRO	V6		50% of plants with 6 developed nodes on the main axis
PTGRO	V7		50% of plants with 7 developed nodes on the main axis
PTGRO	V8		50% of plants with 8 developed nodes on the main axis
PTGRO	V9		50% of plants with 9 developed nodes on the main axis
PTHAR		1	Plant population of harvest area (plants/m^2)
PTHAR		2	Area harvest (m^2)
PTHAR		3	Number of main stems (stems/m^2)
PTHAR		4	Main stem length (cm)
PTHAR		5	Number of auxiliary branches > 30 cm (branches/m^2)
PTHAR		6	Leaf weight (undried) (g/m^2)
PTHAR		7	Leaf weight (dry) (g/m^2)
PTHAR		8	Stem weight (undried) (g/m^2)
PTHAR		9	Stem weight (dry) (g/m^2)
PTHAR		10	Tuber weight (5-30 mm, undried) (g/m^2)
PTHAR		11	Tuber weight (5-30 mm, dry) (g/m^2)
PTHAR		12	Tuber number (5-30 mm) (tubers/m^2)
PTHAR		13	Tuber weight (>30 mm, undried) (g/m^2)
PTHAR		14	Tuber weight (>30 mm, dry) (g/m^2)
PTHAR		15	Tuber number (>30 mm) (tubers/m^2)
PTHAR		16	Tuber dry matter content (%)
PTHAR		17	Leaf area index (m^2/m^2)
PTHAR		18	Ground cover (%)
PTHAR		19	Plant maturity rating
PTHAR		-9	Missing
PTHAR		99	Other
RESIDUE	99		Other
RESIDUE	AR		Aroid
RESIDUE	CA		Cassava
RESIDUE	DB		Dry broad leaf weeds
RESIDUE	DG		Dry grass weeds
RESIDUE	FB		Dry bean
RESIDUE	GB		Green broad leaf weeds

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Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
RESIDUE	GG		Green grass weeds
RESIDUE	GS		Grain sorghum
RESIDUE	MA		Maize
RESIDUE	PE		Peanut
RESIDUE	PO		Potato
RESIDUE	RI		Rice
RESIDUE	SO		Soybean
RESIDUE	ST		Shrubs/trees
RESIDUE	WH		Wheat
SOFLGRO			Missing
SOFLGRO	R1		50% plants w/ one flower at any node
SOFLGRO	R2		50% plants w/ flower at node immediately below upper-most node
SOFLGRO	R3		50% plants w/ a pod 0.5 cm long at one of 4 upper-most nodes
SOFLGRO	R4		50% plants w/ a pod 2 cm. long at one of 4 upper-most nodes
SOFLGRO	R5		50% plants w/ beans beginning to develop
SOFLGRO	R6		50% plants w/ a pod containing full size green beans
SOFLGRO	R7		50% plants w/ pods yellowing
SOFLGRO	R8		50% plants w/ 95% of pods brown - harvest maturity
SOFLGRO	V0		50% plants w/ some part visible at soil surface
SOFLGRO	V1		50% plants w/ completely unrolled leaf at unifoliated node
SOFLGRO	V2		50% plants w/ completely unrolled leaf at 1st node above unifoliated
SOFLGRO	V3		50% plants w/ 3 nodes on main stem beginning w/ unifoliated
SOFLGRO	V4		50% plants w/ 4 nodes on main stem beginning w/ unifoliated
SOFLGRO	V5		50% plants w/ 5 nodes on main stem beginning w/ unifoliated
SOFLGRO	V6		50% plants w/ 6 nodes on main stem beginning w/ unifoliated
SOFLGRO	V7		50% plants w/ 7 nodes on main stem beginning w/ unifoliated
SOFLGRO	V8		50% plants w/ 8 nodes on main stem beginning w/ unifoliated
SOFLGRO	V9		50% plants w/ 9 nodes on main stem beginning w/ unifoliated
SOFLHAR		1	Plant population of harvest area (plants/m^2)
SOFLHAR		2	Area harvested (m^2)
SOFLHAR		3	Aboveground biomass (dry) (g/m^2)
SOFLHAR		4	Seed weight (undried) (g/m^2)
SOFLHAR		5	Seed weight (dry) (g/m^2)
SOFLHAR		6	Seed number (seeds/m^2)
SOFLHAR		7	Pod number (pods/m^2)
SOFLHAR		8	Leaf blade weight (dry) (g/m^2)

Table 4-4. Listing of Other Codes *(cont.)*

ID	CHAR_ID	NUM_ID	Name
SOFLHAR		9	Petiole weight (dry) (g/m^2)
SOFLHAR		10	Stem weight (dry) (g/m^2)
SOFLHAR		11	Empty shell weight (dry)) (g/m^2)
SOFLHAR		12	Root weight (dry) (g/m^2)
SOFLHAR		13	Leaf area index
SOFLHAR		14	Nodule weight (dry) (g/m^2)
SOFLHAR		-9	Missing
SOFLHAR		99	Other

CHAPTER 5

Weather Data Base

The Weather Data Base stores data recorded in MDS Form C-1 and C-2 (Refer to Technical Report 1, 1988, third edition). It was developed with dBASE III PLUS, a relational data base software package. The Weather Data Base is designed to allow easy access and flexibility for file linkage. Each individual data file has the same type of data items corresponding to the information in the MDS forms.

Unlike the Experimental Data Base, the Weather Data Base has different file names for each weather station. Only six files are created for each station. The six files store data such as site information, time of observation, daily weather data, and comments. To identify weather data files for a station, a standard file name convention has been adopted. All six file names begin with an Institute ID and are followed by a two character station ID. Then, a string is added at the end of the ID to identify the different types of files. Table 5-1 explains the file naming convention.

Table 5-1. Weather File Name Convention

First two characters	Institute ID
Next two characters	Weather station ID
Next one or two characters	"UN" for file stores weather station information "1" for file stores observation time "2" for file stores required daily weather data (Form C-1) "3" for file stores comments of the required daily weather data "4" for file stores optional daily weather data (Form C-2) "5" for file stores comments of the optional daily weather data

Example:
Weather data base files for Waipio Weather Station in Hawaii are: IBWAUN.DBF, IBWA1.DBF, IBWA2.DBF, IBWA3.DBF, IBWA4.DBF, and IBWA5.DBF.

Data Structure for Site Information

xxxxUN.DBF stores weather station information. The DATA_UNIT and SOLAR_UNIT data field indicate the unit system used for weather data. Two possible values, 1 and 2, can be stored in these files. For DATA_UNIT, "1" means input data are recorded in metric system and "2" indicates input data are recorded in English units. If SOLAR_UNIT equals "1", the input solar radiation measurements are recorded in MJ/m^2; whereas "2" means data are stored in Cal/m^2.

FILE NAME: **xxxxUN.DBF**
INDEX FILE: **IXxxxxUN.NTX**
INDEX KEY: **ID+STATION_ID**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
DATA_UNIT	Char.	1		Unit system used for daily weather data
SOLAR_UNIT	Char.	1		Unit system used for solar radiation
STA_NAME	Char.	35		Station name
LAT	Num.	6	2	Latitude
LONG	Num.	6	2	Longitude
LAT_DIR	Char.	1		Direction for latitude
LONG_DIR	Char.	1		Direction for longitude
VERSION	Num.	4	2	DSSAT version number

Data Structure for ObservationTime

xxxx1.DBF stores the observation time. If a user switches to a different observation time, another record will be created to store the new observation time and the date observation started.

FILE NAME: **xxxx1.DBF**
INDEX FILE: **IXxxxx1.NTX**
INDEX KEY: **ID+STATION_ ID+STR(YEAR(START_DT),4)+STR(MONTH (START_DT),2)+STR(DAY(START_DT),2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
OBSERVE_TM	Char.	12		Time of observation
START_DT	Date.	8		Date to start this time of observation

Data Structure for Required Daily Weather Data

FILE NAME: **xxxx2.DBF**
INDEX FILE: **IXxxxx2.NTX**
INDEX KEY: **ID+STATION_ID+STR(YEAR(WDATE_DT),4)+STR(MONTH (WDATE_DT),2)+STR(DAY(START_DT),2)**

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
WDATE	Date	8		Date of measurement
TMIN	Num.	5	1	Minimum temperature
TMAX	Num.	5	1	Maximum temperature
PRECIP	Num.	8	3	Precipitation
SOL_RAD	Num.	6	2	Solar radiation

Data Structure for Comments of Required Weather Data

FILE NAME: xxxx3.DBF
INDEX FILE: IXxxxx3.NTX
INDEX KEY: ID+STATION_ID+STR(YR,2)+STR(MO,2)

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
MO	Num.	2		Month
YR	Num.	2		Year
COMMENT1	Char.	74		Comment
COMMENT2	Char.	74		Comment
COMMENT3	Char.	74		Comment

Data Structure for Optional Daily Weather Data

FILE NAME: xxxx4.DBF
INDEX FILE: IXxxxx4.NTX
INDEX KEY: ID+STATION_ID+STR(YEAR(WDATE_DT),4)+STR(MONTH (WDATE_DT),2)+STR(DAY(START_DT),2)

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
WDATE	Date	8		Date of measurement
WET_BULB	Num.	5	1	Wet bulb
DRY_BULB	Num.	5	1	Dry bulb
WINDRUN	Num.	6	2	Windrun

Data Structure for Comments of Optional Weather Data

FILE NAME: xxxx5.DBF
INDEX FILE: IXxxxx5.NTX
INDEX KEY: ID+STATION_ID+STR(YR,2)+STR(MO,2)

Data Field Name	Type	Width	Decimal Place	Description
ID	Char.	2		Institute ID
STATION_ID	Char.	2		Weather station ID
MO	Num.	2		Month
YR	Num.	2		Year
COMMENT1	Char.	74		Comment
COMMENT2	Char.	74		Comment
COMMENT3	Char.	74		Comment

CHAPTER 6

Soil Data Base

The initial IBSNAT Soil Data Base was created from information stored in the Soil Conservation Service (SCS) Foreign Soil Data Base. Currently, there are 751 pedons stored in the IBSNAT Soil Data Base. Of these soils 696 came directly from the SCS Foreign Soils Data Base. The remaining 55 soils are from Hawaii and other collaborators.

The IBSNAT Soil Data Base is made up of two files. The first file contains information that is associated with a single soil profile and does not vary depending on the layer of the soil itself. In general, it contains the descriptive data for each soil profile. This file is called PROFHEAD.DBF and is sorted two different ways. The first index file PROFHEAD.NTX sorts using the data field IDPED. The other index file is PROFHD2.NTX and sorts the file first using IDSIT (site information) and then using IDPED.

The other soil file is called PROFLAYR.DBF and is sorted by the information in data field IDPED and BHDEP. This file contains information that is associated with a single layer of a soil profile. In general, this is the analytical data associated with each layer of a soil.

The relationship between PROFHEAD.DBF and PROFLAYR.DBF is a one-to-many relationship. Basically, the structure of these two files eliminates redundancy of data and thus provides the integrity and efficiency of the data base.

Data Structure for Descriptive Soil Data

Each record in PROFHEAD.DBF represents the descriptive information of a soil profile.

Notes:

- Data field SOURCE indicates the source of the soil data. Table 6-1 lists the definition of the source codes.
- The third to fifth characters in data field IDSIT represent the FIPS country code. Refer to Table 6-9 for a list of FIPS country codes and countries.
- Data fields TXORD to TXTEM store the SCS soil taxonomy codes. Definitions of these codes are stored in file SCSCODES.DBF. Table 6-10 shows a listing of the codes and definitions.

Records in the SCSCODES.DBF file that have TYPE equal to "GGCODE" are used to identify codes for TXORD, TXSORD, and TXGG. The data field CODE in these records contains a five character code. The first character identifies the order code; the next two characters identify the suborder code; and the last two characters identify the great group code.

The great group of a particular soil in the IBNSAT Soil Data Base is formed by concatenating the soil's order code (TXORD), suborder code (TXSORD), and great group code (TXGG) to create a five character code. This five character code will then be used to search through the codes in the SCSCODES.DBF file to find a correct great group name.

Descriptions for codes in data fields TXSGM, TXTEX, TXMIN, TXPH, TXTEM, ESPERM, and SDRAIN can be found in file SCSCODES.DBF with the corresponding TYPE codes listed below:

TXSGM	-	all records with TYPE equal to "SUBGCODE"
TXTEX	-	all records with TYPE equal to "PARTSIZE"
TXMIN	-	all records with TYPE equal to "MINECODE"
TXPH	-	all records with TYPE equal to "REACCODE"
TXTEM	-	all records with TYPE equal to "TREGCODE"
ESPERM	-	all records with TYPE equal to "PERMCODE"
SDRAIN	-	all records with TYPE equal to "DRAINAGE"

- The first two characters in the data field SLOPE represent the percent of slope.

- DCOLOR1 and MCOLOR1 are codes for dry and moist soil color respectively. Using the coding system in the Munsell Color Chart, the codes in both data fields include information such as Munsell hue (five characters starting from the third position), Munsell value (the ninth character), and Munsell chroma (the last character).

FILE NAME: PROFILE.DBF
INDEX FILES: PROFHEAD.NTX, PROFHD2.NTX
INDEX KEY FOR PROFHEAD: DPED
INDEX KEY FOR PROFHD: SUBSTR(IDSIT,3,3)+IDPED

Data Field Name	Type	Width	Decimal Place	Description
SOURCE	Char.	3		Source of the profile (see Table 5-1)
IDPED	Char.	7		Pedon number
IDSIT	Char.	9		Site information (??CCC????, CCC = FIPS Country code)
LATSTR	Char.	7		Latitude
LONGSTR	Char.	8		Longitude
TXORD	Char.	1		SCS soil taxonomy code, Order
TXSORD	Char.	2		SCS soil taxonomy code, Suborder
TXGG	Char.	2		SCS soil taxonomy code, Great Group
TXSGM	Char.	4		SCS soil taxonomy code, Subgroup Modifier
TXTEX	Char.	3		SCS soil taxonomy code, Texture
TXMIN	Char.	2		SCS soil taxonomy code, Mineralogy
TXPH	Char.	2		SCS soil taxonomy code, Reaction
TXTEM	Char.	2		SCS soil taxonomy code, Temperature
ELEV	Char.	4		Site Elevation in meters
SLOPE	Char.	11		Site Slope characteristics (99????????, 99 = % of slope)
ANNA	Char.	3		Annual Air Temperature (°C)
ESPERM	Char.	1		Estimated Permeability
SDRAIN	Char.	1		Soil Drainage Class
ERWA	Char.	1		Erosion Information
DCOLOR1	Char.	10		Dry Soil Color (use Munsell Color Chart)
MCOLOR1	Char.	10		Moist Soil Color (use Munsell Color Chart)

Data Structure for Analytical Soil Data

Each record in PROFLAYR.DBF contains soil data for each layer of a soil profile. Thus variable records can be created for soil profiles with different number of layers.

Note:

- Total sand can be calculated by subtracting 100 from clay and silt.
- The first character in STRUCT1 represents the structure grade code (see Table 6-2); the next two characters are the structure size code (see Table 6-3); the last three characters are the structure shape code (see Table 6-4).
- The first character in ROOT1 represents the root quantity code which can be used to identify SCSCODES.DBF with TYPE equal to "ROOTQUAN" (see Table 6-10). The next two characters are the root size code which can be identified in SCSCODES.DBF with TYPE equal to "ROOTSIZE" (see Table 6-10). The last character in ROOT1 is the location code (see Table 6-8).

FILE NAME: PROFLAYR.DBF
INDEX FILE: PROFLAYR.NTX
INDEX KEY: IDPED+BHDEP

Data Field Name	Type	Width	Decimal Place	Description
IDPED	Char.	7		Pedon number
BHDEP	Char.	3		Depth, Bottom of Horizon Section (cm)
MASTER_HOR	Char.	2		Master Horizon
CLAY	Char.	4		Total Clay (Note: Sand = 100 - Clay - Silt)
SILT	Char.	4		Total Silt
OC	Char.	5		Walkley-Black Organic Carbon
N	Char.	6		Kjeldahl Nitrogen
P	Char.	5		Extractable Phosphorous
P_METH	Char.	3		Extractable Phos. Method (default = 001)
FEDITH	Char.	5		Dithionite Citrate Extractable Iron
ALDITH	Char.	5		Dithionite Citrate Extractable Aluminum
MNDITH	Char.	5		Dithionite Citrate Extractable Manganese
CAX	Char.	5		$NH_4$0AC Extractable Calcium
MGX	Char.	5		$NH_4$0AC Extractable Magnesium
NAX	Char.	5		$NH_4$0AC Extractable Sodium
KX	Char.	5		$NH_4$0AC Extractable Potassium
ALX	Char.	5		KCl Extractable Aluminum
SUMCAT	Char.	5		Sum of Cations
CEC7	Char.	5		$NH_4$0AC Cation Exchange Capacity (CEC)
BSESAT	Char.	5		$NH_4$0AC Base Saturation
ALSAT	Char.	5		Aluminum Saturation
PH1H2O	Char.	4		pH, 1:1 Soil-Water Suspension
CACO3	Char.	4		Carbonate < 2 MM
CACO32	Char.	4		Carbonate > 2 MM
MGSX	Char.	5		Magnesium Content Saturation Extract (H_2O)
ECSX	Char.	5		Electric Conductivity Barium-Chloride
PHNAF	Char.	4		pH, 1:50 Soil-NAF Suspension
PHKCL	Char.	4		pH, 1:1 Soil-KCl Suspension
PSORP	Char.	4		Phosphorus Absorption
PSORP_METH	Char.	3		Phosphorus Absorption Method (default = 001)
TKHFD	Char.	6		Total Potassium (HF Digestion)
D3	Char.	5		Bulk Density, 1/3 bar

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Data Structure for Analytical Soil Data *(cont.)*

DOD	Char.	5	Bulk Density, Oven Dry
WP10	Char.	5	1/10 Water Clods
WP3	Char.	5	1/3 Water Clods
W15AD	Char.	5	15 Bar Air Dry Soil
TCFRAG	Char.	5	Total Coarse Fragments > 2 MM (Weight %)
STRUCT1	Char.	6	Soil Structure (9AABBB, 9 = struct. grade, AA = struct. size,BBB = struct. shape)
CONSDRY	Char.	3	Soil Consistence Dry (see Table 6-5)
CONSMO	Char.	3	Soil Consistence Moist (see Table 6-6)
CONSOT	Char.	3	Soil Consistence Other (see Table 6-7)
ROOT1	Char.	5	Root information (quantity, size, and location) (AABBC, AA = quantity, BB = size, C = location)

Data Structure for Country Code

Basically, this file is used for table lookup of the country names and codes by programs that access the IBSNAT Soil Data Base. Refer to Table 6-9 for the contents of this file.

FILE NAME: **COUNTRY.DBF**
INDEX FILE: **IXCNTRY.NTX**
INDEX KEY: **CODE**

Data Field Name	Type	Width	Decimal Place	Description
CODE	Num.	3		FIPS codes for foreign countries as described in appendix VII of the PEDON Coding System for the National Cooperative Soil Survey (July, 1979)
COUNTRY	Char.	40		Name of the Country
CONTINENT	Num.	2		Continent Code as described in appendix VII of the PEDON Coding System for the National Cooperative Soil Survey (July, 1979)

Data Structure for Other Codes

Basically, this file is used for table lookup of SCS codes and taxonomic classifications by programs accessing the IBSNAT Soil Data Base. Refer to Table 6-10 for the contents of this file.

FILE NAME: **SCSCODES.DBF**
INDEX FILE: **SCSCODES.NTX**
INDEX KEY: **TYPE+CODE**

Data Field Name	Type	Width	Decimal Place	Description
TYPE	Char.	8		Code type, i.e., great group, subgroup, etc.
CODE	Char.	5		Code stored in the IBSNAT Soil Data Base and SCS data base
DESC	Char.	50		Item described by the CODE

Table 6-1. Listing of Soil Data Sources and Codes

Source Code	Source
SCS	Soil Conservation Service (SCS)
FAO	Food and Agricultural Organization (FAO)
THA	Thailand
TH	Others

Table 6-2. Listing of Codes for Grade of Selection

Code	Description
0	Not used
1	Weak
2	Moderate
3	Strong
4	Very strong
5	Weak and moderate
6	Moderate and strong

Table 6-3. Listing of Codes for Size of Structure

Code	Description
EF	Extremely fine
VF	Very fine
FF	Very fine and fine
F	Fine
FM	Fine and moderate
M	Medium
MC	Medium and coarse
CO	Coarse
VC	Very coarse
CV	Coarse and very coarse

Table 6-4. Listing of Codes for Shape of Structure

Code	Description
PL	Platy
COL	Columnar
SBK	Subangular blocky
CR	Crumb
WEG	Wedge
LP	Lenticular
BK	Blocky
GR	Granular
MA	Massive
PR	Prismatic
ABK	Angular blocky
CDY	Cloddy
SGR	Single grain

Table 6-5. Listing of Codes for Dry Consistency

Code	Description
L	Loose
S	Soft
SH	Slightly hard
SWH	Somewhat hard
H	Hard
VH	Very hard
EH	Extremely hard

Table 6-6. Listing of Codes for Moist Consistency

Code	Description
L	Loose
VFR	Very friable
FR	Friable
FI	Firm
VFI	Very firm
EFI	Extremely firm

Table 6-7. Listing of Codes for Other Consistency

Code	Description
WSM	Weakly smeary
SM	Strongly smeary
MS	Moderately smeary
D	Deformable
SD	Semideformable
B	Brittle
R	Rigid
VR	Very rigid
CO	Uncemented
VWC	Very weakly cemented
WC	Weakly cemented
SC	Strongly cemented
I	Indurated
SF	Slightly fluid
VF	Very fluid

Table 6-8. Listing of Codes for Location of Roots

Code	Description
C	In cracks
M	In mat at top of horizon
P	Between peds
S	Matted around stones
T	Throughout

Table 6-9. Listing of Country Codes

Code	Country	Continent
370	AFARS & ISSAS	95
110	AFGHANISTAN	95
120	ALBANIA	93
125	ALGERIA	94
140	ANDORRA	93
141	ANGOLA	94
142	ANGUILLA	
143	ANTARCTICA	92
144	ARCTIC OCEAN	91
150	ARGENTINA	92
155	ASHMORE AND CARTIER ISL AT	
160	AUSTRALIA	96
165	AUSTRIA	93
175	AZORES	93
181	BAHRAIN	95
182	BANGLADESH	
184	BARBADOS	91
190	BELGIUM	93
227	BELIZE	
960	BERLIN GERMANY	
195	BERMUDA	91
200	BHUTAN	95
205	BOLIVIA	92
210	BOTSWANA	94
212	BOUVET ISLAND	
228	BR INDIAN OCEAN TERRITORY	
220	BRAZIL	92
230	BRITISH HONDURAS	91
231	BRITISH VIRGIN ISLANDS	92
232	BRUNEI	96
245	BULGARIA	93
250	BURMA	95
252	BURUNDI	
255	CAMBODIA	95
257	CAMEROON	94
260	CANADA	91
266	CANARY ISLANDS	94
268	CAYMAN ISLANDS	91
269	CENTRAL AFRICAN REPUBLIC	94
270	CEYLON	91
273	CHAD	94
275	CHILE	92
282	CHRISTMAS ISLAND	
284	COCOS (KEELING) ISLANDS CK	
285	COLOMBIA	92
286	COMORO ISLANDS	
290	CONGO-BRAZZAVILLE	94
291	CONGO-KINSHASHA	94
293	COOK ISLANDS	
294	CORAL SEA ISLANDS TERRITORY	

Table 6-9. Listing of Country Codes *(cont.)*

Code	Country	Continent
295	COSTA RICA	91
300	CUBA	91
305	CYPRUS	93
310	CZECHOSLOVAKIA	93
311	DAHOMEY	
395	DEMOCRATIC REPUBLIC OF GERMANY	93
315	DENMARK	93
318	DOMINICA	91
320	DOMINICAN REPUBLIC	91
325	ECUADOR	92
922	EGYPT	94
330	EL SALVADOR	91
332	EQUATORIAL GUINEA	94
335	ETHIOPIA	94
336	FAEROE ISLANDS	93
337	FALKLAND AND ISLANDS MALVINAS	92
394	FEDERAL REPUBLIC OF GERMANY	93
338	FIJI	96
340	FINLAND	93
369	FR SOUTHERN AND ANTARCTIC FS	
370	FR TERRITORY OF AFARS ISSAS FT	94
350	FRANCE	93
355	FRENCH GUIANA	92
367	FRENCH POLYNESIA	97
388	GABON	94
389	GAMBIA	94
393	GAZA STRIP	95
390	GERMANY	93
396	GHANA	94
397	GIBRALTAR	93
398	GILBERT AND ELLICE ISLAND	
400	GREECE	93
405	GREENLAND	91
406	GRENADA	91
407	GUADELOUPE	91
415	GUATEMALA	91
417	GUINEA	94
737	GUINEA-BISSAU	94
418	GUYANA	92
420	HAITI	91
424	HEARD ISLAND AND MCDONALD ISLANDS	
430	HONDURAS	91
435	HONG KONG	95
445	HUNGARY	93
450	ICELAND	93
455	INDIA	95
458	INDONESIA	96
460	IRAN	95
465	IRAQ	95
467	IRAQ-SAUDI ARABIA NEUTRAL ZONE	95

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Table 6-9. Listing of Country Codes *(cont.)*

Code	Country	Continent
470	IRELAND	93
475	ISRAEL	95
476	ISRAEL-JORDAN DEMILTARIZED ZONE	95
480	ITALY	93
485	IVORY COAST	94
487	JAMAICA	91
488	JAN MAYEN	
490	JAPAN	95
500	JORDAN	95
505	KENYA	94
520	KUWAIT	95
530	LAOS	95
540	LEBANON	95
543	LESOTHO	94
545	LIBERIA	94
550	LIBYA	94
553	LIECHTENSTEIN	93
570	LUXEMBOURG	93
575	MADAGASCAR	94
577	MALAWI	94
580	MALAYSIA	95
581	MALAYSIA	96
583	MALDIVES	
585	MALI	94
590	MALTA	91
573	MAOAO	
591	MARTINIQUE	94
592	MAURITANIA	94
593	MAURITIUS	94
595	MEXICO	91
607	MONACO	93
608	MONGOLIA	95
609	MONTSERRAT	91
610	MOROCCO	94
615	MOZAMBIQUE	94
618	NAMPO SHOTO	95
621	NAURU	
625	NEPAL	95
630	NETHERLANDS	93
640	NETHERLANDS ANTILLES	91
645	NEW CALEDONIA	96
650	NEW GUINEA	97
651	NEW HEBRIDES	97
660	NEW ZEALAND	96
665	NICARAGUA	91
667	NIGER	94
670	NIGERIA	94
672	NIUE	
687	NORFOLK ISLAND	
514	NORTH KOREA	

Table 6-9. Listing of Country Codes *(cont.)*

Code	Country	Continent
685	NORWAY	93
616	OMAN	
700	PAKISTAN	95
710	PANAMA	91
712	PAPUA NEW GUINEA	97
714	PARACEL ISLANDS	
715	PARAGUAY	92
720	PERU	92
725	PHILIPPINES	96
727	PITCAIRN ISLAND	
730	POLAND	93
735	PORTUGAL	93
737	PORTUGUESE GUINEA	94
738	PORTUGUESE TIMOR	
747	QATAR	94
264	REPUBLIC OF CAPE VERDE	93
281	REPUBLIC OF CHINA	95
515	REPUBLIC OF KOREA	95
945	REPUBLIC OF VIETNAM	95
750	REUNION	94
755	ROMANIA	93
758	RWANDA	94
763	SAINT CHRISTOPHER-NEVIS-AN	
765	SAINT HELENA	94
770	SAINT LUCIA	91
773	SAINT PIERRE AND MIQUELON	
775	SAINT VINCENT	91
782	SAN MARINO	93
783	SAO TOME AND PRINCIPE	
785	SAUDI ARABIA	95
787	SENEGAL	94
788	SEYCHELLES	94
790	SIERRA LEONE	94
795	SINGAPORE	95
229	SOLOMON ISLANDS	
800	SOMALIA	94
801	SOUTH AFRICA	94
803	SOUTHERN RHODESIA	94
802	SOUTHERN YEMEN (ADEN)	94
804	SOUTHWEST AFRICA	94
805	SOVIET UNION	93
830	SPAIN	93
832	SPANISH NORTH AFRICA	
831	SPANISH SAHARA	
833	SPRATLY ISLANDS	
272	SRI LANKA	
835	SUDAN	94
840	SURINAM	92
845	SVALBARO	
847	SWAZILAND	94

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Table 6-9. Listing of Country Codes *(cont.)*

Code	Country	Continent
850	SWEDEN	93
855	SWITZERLAND	93
858	SYRIA	95
862	TAIWAN	95
865	TANZANIA	94
875	THAILAND	95
180	THE BAHAMAS	91
883	TOGO	94
884	TOKELAU ISLANDS	
886	TONGA	97
887	TRINIDAD AND TOBAGO	91
900	TRUST TERR. OF PACIFIC ISLANDS	97
890	TUNISIA	94
905	TURKEY	95
906	TURKS AND CAICOS ISLAND	
908	TUVALU	
910	UGANDA	94
888	UNITED ARAB EMIRATES	95
925	UNITED KINGDOM	93
926	UNITED STATES	91
927	UPPER VOLTA	94
930	URUGUAY	92
934	VATICAN CITY	
940	VENEZUELA	92
950	WALLIS AND FUTUNA	
963	WESTERN SAMOA	97
965	YEMEN (SANA)	95
970	YUGOSLAVIA	93
291	ZAIRE	94
990	ZAMBIA	94

Table 6-10. Listing of Other Codes

Type	Code	Description
GGCODE	AAQAL	Albaqualf
GGCODE	AAQNA	Natraqualf
GGCODE	AAQPN	Plinthaqualf
GGCODE	ABOCR	Cryoboralf
GGCODE	ABPGL	Glossoboralf
GGCODE	AUDAG	Agrudalf
GGCODE	AUDFS	Fraglossudalf
GGCODE	AUDNA	Natrudalf
GGCODE	AUSDU	Durustalf
GGCODE	AUSPA	Paleustalf
GGCODE	AXEDU	Durixeralf
GGCODE	AXENA	Natrixeralf
GGCODE	AXERH	Rhodoxeralf
GGCODE	AAQDU	Duraqualf
GGCODE	AAQGL	Glossaqualf
GGCODE	AAQTR	Tropaqualf
GGCODE	ABOEU	Eutroboralf
GGCODE	ABONA	Natriboralf
GGCODE	AUDFE	Ferrudalf
GGCODE	AUDGL	Glossudalf
GGCODE	AUDPA	Paleudalf
GGCODE	AUSHA	Haplustalf
GGCODE	AUSPN	Plinthustalf
GGCODE	AXEFR	Fragixeral
GGCODE	AXEPA	Palexeralf
GGCODE	AAQFR	Fagiaqualf
GGCODE	AAQOC	Ochraqualf
GGCODE	AAQUM	Umbraqualf
GGCODE	ABOFR	Fragiboralf
GGCODE	ABOPA	Paleboralf
GGCODE	AUDFR	Fagiudalf
GGCODE	AUDHA	Hapludalf
GGCODE	AUDTR	Tropudalf
GGCODE	AUSNA	Natrustalf
GGCODE	AUSRH	Rhodustalf
GGCODE	AXEHA	Haploxeralf
GGCODE	AXEPN	Plinthoxeralf
GGCODE	AAQPA	Paleaqualf
GGCODE	DARDU	Durargid
GGCODE	DARHA	Haplargid
GGCODE	DARND	Nadurargid
GGCODE	DARNT	Natragid
GGCODE	DARPA	Paleargid
GGCODE	DORCL	Calciorthid
GGCODE	DORCM	Camborthid
GGCODE	DORDU	Durorthid
GGCODE	DORGY	Gypsiorthid
GGCODE	DORPA	Paleorthid
GGCODE	DORSA	Salorthid
GGCODE	EAQCR	Cryaquent

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
GGCODE	EAQFL	Fluvaquent
GGCODE	EAQHA	Haplaquent
GGCODE	EAQHY	Hydraquent
GGCODE	EAQPS	Psammaquent
GGCODE	EAQSU	Sulfaquent
GGCODE	EAQTR	Tropaquent
GGCODE	EARAR	Arent
GGCODE	EFLCR	Cryofluvent
GGCODE	EFLTO	Torrifluvent
GGCODE	EFLTR	Tropofluvent
GGCODE	EFLUD	Udifluvent
GGCODE	EFLUS	Ustifluvent
GGCODE	EFLXE	Xerofluvent
GGCODE	EORCR	Cryorthent
GGCODE	EORTO	Torriorthent
GGCODE	EORTR	Troporthent
GGCODE	EORUD	Udorthent
GGCODE	EORUS	Ustorthent
GGCODE	EORXE	Xerorthent
GGCODE	EPSCR	Cryopsamment
GGCODE	EPSQU	Quartzipsamment
GGCODE	EPSTO	Torripsamment
GGCODE	EPSTR	Tropopsamment
GGCODE	EPSUD	Udipsamment
GGCODE	EPSUS	Ustipsamment
GGCODE	EPSXE	Xeropsamment
GGCODE	HFIBO	Borofibrist
GGCODE	HFICR	Cryofibrist
GGCODE	HFILU	Luvifibrist
GGCODE	HFIME	Medifibrist
GGCODE	HFISP	Sphagnofibrist
GGCODE	HFITR	Tropofibrist
GGCODE	HFOBO	Borofolist
GGCODE	HFOCR	Cryofolist
GGCODE	HFOTR	Tropofolist
GGCODE	HHEBO	Borohemist
GGCODE	HHECR	Cryohemist
GGCODE	HHELU	Luvihemist
GGCODE	HHEME	Medihemist
GGCODE	HHESI	Sulfihemist
GGCODE	HHESO	Sulfohemist
GGCODE	HHETR	Tropohemist
GGCODE	HSABO	Borosaprist
GGCODE	HSACR	Cryosaprist
GGCODE	HSAME	Medisaprist
GGCODE	HSATR	Troposaprist
GGCODE	IANCR	Cryandept
GGCODE	IANDU	Durandept
GGCODE	IANDY	Dystrandept
GGCODE	IANEU	Eutrandept

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
GGCODE	IANHY	Hydrandept
GGCODE	IANPK	Placandept
GGCODE	IANVI	Vitrandept
GGCODE	IAQAN	Andaquept
GGCODE	IAQCR	Cryaquept
GGCODE	IAQFR	Fragiaquept
GGCODE	IAQHL	Halaquept
GGCODE	IAQHP	Haplaquept
GGCODE	IAQHU	Humaquept
GGCODE	IAQPK	Placaquept
GGCODE	IAQPN	Plinthaquept
GGCODE	IAQSU	Sulfaquept
GGCODE	IAQTR	Tropaquept
GGCODE	IOCCR	Cryochrept
GGCODE	IOCDU	Durochrept
GGCODE	IOCDY	Dystrochrept
GGCODE	IOCEU	Eutrochrept
GGCODE	IOCFR	Fragiochrept
GGCODE	IOCUS	Ustochrept
GGCODE	IOCXE	Xerochrept
GGCODE	IPLPL	Plaggept
GGCODE	ITRDY	Dystropept
GGCODE	ITREU	Eutropept
GGCODE	ITRHU	Humitropept
GGCODE	ITRSO	Sombritropept
GGCODE	ITRUS	Ustropept
GGCODE	IUMCR	Cryumbrept
GGCODE	IUMFR	Fragiumbrept
GGCODE	IUMHA	Haplumbrept
GGCODE	IUMXE	Xerumbrept
GGCODE	MALAR	Argialboll
GGCODE	MALNA	Natralboll
GGCODE	MAQAR	Argiaquoll
GGCODE	MAQCA	Calciaquoll
GGCODE	MAQCR	Cryaquoll
GGCODE	MAQDU	Duraquoll
GGCODE	MAQHA	Haplaquoll
GGCODE	MAQNA	Natraquoll
GGCODE	MBOAR	Argiboroll
GGCODE	MBOCA	Calciboroll
GGCODE	MBOCR	Cryoboroll
GGCODE	MBOHA	Haploboroll
GGCODE	MBONA	Natriboroll
GGCODE	MBOPA	Paleboroll
GGCODE	MBOVE	Vermiboroll
GGCODE	MRERE	Rendoll
GGCODE	MUDAR	Argiudoll
GGCODE	MUDHA	Hapludoll
GGCODE	MUDPA	Paleudoll
GGCODE	MUDVE	Vermudoll

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
GGCODE	MUSAR	Argiustoll
GGCODE	MUSCA	Calciustoll
GGCODE	MUSDU	Durustoll
GGCODE	MUSHA	Haplustoll
GGCODE	MUSNA	Natrustoll
GGCODE	MUSPA	Paleustoll
GGCODE	MUSVE	Vermustoll
GGCODE	MXEAR	Argixeroll
GGCODE	MXECA	Calcixeroll
GGCODE	MXEDU	Durixeroll
GGCODE	MXEHA	Haploxeroll
GGCODE	MXENA	Natrixeroll
GGCODE	MXEPA	Palexeroll
GGCODE	OAQGI	Gibbsiaquox
GGCODE	OAQOC	Ochraquox
GGCODE	OAQPN	Plinthaquox
GGCODE	OAQUM	Umbraquox
GGCODE	OHUAC	Acrohumox
GGCODE	OHUGI	Gibbsihumox
GGCODE	OHUHA	Haplohumox
GGCODE	OHUSO	Sombrihumox
GGCODE	OORAC	Acrorthox
GGCODE	OOREU	Eutrorthox
GGCODE	OORGI	Gibbsiorthox
GGCODE	OORHA	Haplorthox
GGCODE	OORSO	Sombriorthox
GGCODE	OORUM	Umbriorthox
GGCODE	OTOTO	Torrox
GGCODE	OUSAC	Acrustox
GGCODE	OUSEU	Eutrustox
GGCODE	OUSHA	Haplustox
GGCODE	OUSSO	Sombriustox
GGCODE	SAQCR	Cryaquod
GGCODE	SAQDU	Duraquod
GGCODE	SAQFR	Fragiaquod
GGCODE	SAQHA	Haplaquod
GGCODE	SAQPK	Placaquod
GGCODE	SAQSI	Sideraquod
GGCODE	SAQTR	Tropaquod
GGCODE	SFEFE	Ferrod
GGCODE	SHUCR	Cryohumod
GGCODE	SHUFR	Fragihumod
GGCODE	SHUHA	Haplohumod
GGCODE	SHUPK	Placohumod
GGCODE	SHUTR	Tropohumod
GGCODE	SORCR	Cryorthod
GGCODE	SORFR	Fragiorthod
GGCODE	SORHA	Haplorthod
GGCODE	SORPK	Placorthod
GGCODE	SORTR	Troporthod

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
GGCODE	UAQAL	Albaquult
GGCODE	UAQFR	Fragiaquult
GGCODE	UAQOC	Ochraquult
GGCODE	UAQPA	Paleaquult
GGCODE	UAQPN	Plinthaquult
GGCODE	UAQTR	Tropaquult
GGCODE	UAQUM	Umbraquult
GGCODE	UHUHA	Haplohumult
GGCODE	UHUPA	Palehumult
GGCODE	UHUPN	Plinthohumult
GGCODE	UHUSO	Sombrihumult
GGCODE	UHUTR	Tropohumult
GGCODE	UUDFR	Fragiudult
GGCODE	UUDHA	Hapludult
GGCODE	UUDPA	Paleudult
GGCODE	UUDPN	Plinthudult
GGCODE	UUDRH	Rhodudult
GGCODE	UUDTR	Tropudult
GGCODE	UUSHA	Haplustult
GGCODE	UUSPA	Paleustult
GGCODE	UUSPN	Plinthustult
GGCODE	UUSRH	Rhodustult
GGCODE	UXEHA	Haploxerult
GGCODE	UXEPA	Palexerult
GGCODE	VTOTO	Torrert
GGCODE	VUDCH	Chromudert
GGCODE	VUDPE	Pelludert
GGCODE	VUSCH	Chromustert
GGCODE	VUSPE	Pellustert
GGCODE	VXECH	Chromxerert
GGCODE	VXEPE	Pelloxerert
SUBGCODE	AA00	Typic
SUBGCODE	AB00	Abruptic
SUBGCODE	AB04	Abruptic aridic
SUBGCODE	AB08	Abruptic cryic
SUBGCODE	AB10	Abruptic haplic
SUBGCODE	AB14	Abruptic ultic
SUBGCODE	AB16	Abruptic xerollic
SUBGCODE	AE00	Aeric
SUBGCODE	AE03	Aeric arenic
SUBGCODE	AE05	Aeric grossarenic
SUBGCODE	AE06	Aeric humic
SUBGCODE	AE08	Aeric mollic
SUBGCODE	AE09	Aeric tropic
SUBGCODE	AE10	Aeric umbric
SUBGCODE	AE12	Aeric xeric
SUBGCODE	AL00	Albaquic
SUBGCODE	AL02	Albaquultic
SUBGCODE	AL04	Albit
SUBGCODE	AI08	Albic glossit

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
SUBGCODE	AL10	Alfic
SUBGCODE	AL13	Alfic andeptic
SUBGCODE	AL12	Alfic arenic
SUBGCODE	AL16	Alfic lithic
SUBGCODE	AN24	Andaqueptic
SUBGCODE	AN01	Andeptic
SUBGCODE	AN11	Andeptic glossoboric
SUBGCODE	AN00	Andic
SUBGCODE	AN06	Andic dystric
SUBGCODE	AN22	Andic ustic
SUBGCODE	AN30	Anthropic
SUBGCODE	AQ00	Aqualfic
SUBGCODE	AQ02	Aquentic
SUBGCODE	AQ04	Aqueptic
SUBGCODE	AQ06	Aquic
SUBGCODE	AQ08	Aquic arenic
SUBGCODE	AQ14	Aquic duric
SUBGCODE	AQ16	Aquic duriorthidic
SUBGCODE	AQ18	Aquic dystric
SUBGCODE	AQ24	Aquic haplic
SUBGCODE	AQ26	Aquic lithic
SUBGCODE	AQ31	Aquic psammentic
SUBGCODE	AQ34	Aquollic
SUBGCODE	AQ36	Aquultic
SUBGCODE	AR00	Arenic
SUBGCODE	AR02	Arenic aridic
SUBGCODE	AR03	Arenic orthoxic
SUBGCODE	AR04	Arenic plinthaquic
SUBGCODE	AR06	Arenic plinthic
SUBGCODE	AR08	Arenic rhodic
SUBGCODE	AR10	Arenic ultic
SUBGCODE	AR14	Arenic umbric
SUBGCODE	AR16	Arenic ustalfic
SUBGCODE	AR18	Arenic ustollic
SUBGCODE	AR22	Argiaquic
SUBGCODE	AR24	Argiaquic xeric
SUBGCODE	AR26	Argic
SUBGCODE	AR28	Argic lithic
SUBGCODE	AR30	Argic pachic
SUBGCODE	AR32	Argic vertic
SUBGCODE	AR34	Aridic
SUBGCODE	AR36	Aridic calcic
SUBGCODE	AR42	Aridic duric
SUBGCODE	AR50	Aridic pachic
SUBGCODE	AR52	Aridic petrocalcic
SUBGCODE	AN03	Andaquic
SUBGCODE	BO00	Boralfic
SUBGCODE	BO02	Boralfic lithic
SUBGCODE	BO04	Boralfic udic
SUBGCODE	BO06	Borollic

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
SUBGCODE	BO08	Borollic glossic
SUBGCODE	BO10	Borollic lithic
SUBGCODE	BO12	Borollic vertic
SUBGCODE	CA00	Calcic
SUBGCODE	CA04	Calcic pachic
SUBGCODE	CA06	Calciorthidic
SUBGCODE	CA10	Calcixerollic
SUBGCODE	CA20	Cambic
SUBGCODE	CH00	Chromic
SUBGCODE	CH06	Chromudic
SUBGCODE	CR00	Cryic
SUBGCODE	CR10	Cryic lithic
SUBGCODE	CR14	Cyric pachic
SUBGCODE	CU00	Cumulic
SUBGCODE	CU02	Cumulic udic
SUBGCODE	CU04	Cumulic ultic
SUBGCODE	DU00	Durargidic
SUBGCODE	DU02	Duric
SUBGCODE	DU08	Durixerollic
SUBGCODE	DU10	Durixerollic lithic
SUBGCODE	DU11	Durochreptic
SUBGCODE	DU12	Durorthidic
SUBGCODE	DU14	Durorthidic xeric
SUBGCODE	DY02	Dystric
SUBGCODE	DY03	Dystric entic
SUBGCODE	DY04	Dystric fluventic
SUBGCODE	DY06	Dystric lithic
SUBGCODE	DY08	Dystropeptic
SUBGCODE	EN00	Entic
SUBGCODE	EN02	Entic lithic
SUBGCODE	EN06	Entic ultic
SUBGCODE	EP00	Epiaquic
SUBGCODE	EP10	Epiaquic orthoxic
SUBGCODE	EU00	Eutric
SUBGCODE	EU02	Eutrochreptic
SUBGCODE	EU04	Eutropeptic
SUBGCODE	FE00	Ferrudalfic
SUBGCODE	FI00	Fibric
SUBGCODE	FI02	Fibric terric
SUBGCODE	FL02	Fluvaquentic
SUBGCODE	FL06	Fluventic
SUBGCODE	FL12	Fluventic umbric
SUBGCODE	FR10	Fragiaquic
SUBGCODE	FR18	Fragic
SUBGCODE	GL02	Glossaquic
SUBGCODE	GL04	Glossic
SUBGCODE	GL10	Glossic udic
SUBGCODE	GL12	Glossic ustollic
SUBGCODE	GL14	Glossoboralfic
SUBGCODE	GL16	Glossoboric

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
SUBGCODE	GR00	Grossarenic
SUBGCODE	GR01	Grossarenic entic
SUBGCODE	GR04	Grossarenic plinthic
SUBGCODE	HA01	Haplaquic
SUBGCODE	HA00	Haplaquodic
SUBGCODE	HA02	Haplic
SUBGCODE	HA05	Haplohumic
SUBGCODE	HA07	Haploxerollic
SUBGCODE	HA09	Hapludic
SUBGCODE	HA12	Hapludollic
SUBGCODE	HA16	Haplustollic
SUBGCODE	HE00	Hemic
SUBGCODE	HE02	Hemic terric
SUBGCODE	HI00	Histic
SUBGCODE	HI02	Histic lithic
SUBGCODE	HI06	Histic pergelic
SUBGCODE	HU10	Humaqueptic
SUBGCODE	HU00	Humic
SUBGCODE	HU02	Humic lithic
SUBGCODE	HU05	Humic pergelic
SUBGCODE	HU06	Humoxic
SUBGCODE	HY00	Hydric
SUBGCODE	HY02	Hydric lithic
SUBGCODE	LE00	Leptic
SUBGCODE	LI00	Limnic
SUBGCODE	LI02	Lithic
SUBGCODE	LI04	Lithic mollic
SUBGCODE	LI06	Lithic ruptic-alfic
SUBGCODE	LI07	Lithic ruptic-argic
SUBGCODE	LI09	Lithic ruptic-entic
SUBGCODE	LI08	Lithic ruptic-entic-xerollic
SUBGCODE	LI13	Lithic ruptic-ultic
SUBGCODE	LI15	Lithic ruptic-xerochreptic
SUBGCODE	LI11	Lithic ruptic-xerorthentic
SUBGCODE	LI10	Lithic udic
SUBGCODE	LI12	Lithic ultic
SUBGCODE	LI14	Lithic umbric
SUBGCODE	LI16	Lithic ustic
SUBGCODE	LI18	Lithic ustollic
SUBGCODE	LI22	Lithic xeric
SUBGCODE	LI24	Lithic xerollic
SUBGCODE	MO00	Mollic
SUBGCODE	NA06	Natric
SUBGCODE	OC00	Ochreptic
SUBGCODE	OR01	Orthic
SUBGCODE	OR00	Orthidic
SUBGCODE	OR02	Orthoxic
SUBGCODE	OX00	Oxic
SUBGCODE	PA00	Pachic
SUBGCODE	PA02	Pachic udic

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
SUBGCODE	PA04	Pachic ultic
SUBGCODE	PA06	Paleorthidic
SUBGCODE	PA08	Paleustollic
SUBGCODE	PA10	Palexerollic
SUBGCODE	PE00	Pergelic
SUBGCODE	PE01	Pergelic ruptic-histic
SUBGCODE	PE02	Pergelic sideric
SUBGCODE	PE04	Petrocalcic
SUBGCODE	PE06	Petrocalcic ustalfic
SUBGCODE	PE08	Petrocalcic ustollic
SUBGCODE	PE14	Petrocalcic xerollic
SUBGCODE	PE16	Petroferric
SUBGCODE	PE20	Petrogypsic
SUBGCODE	PK00	Placic
SUBGCODE	PK10	Plaggeptic
SUBGCODE	PK12	Plaggic
SUBGCODE	PL00	Plinthaquic
SUBGCODE	PL04	Plinthic
SUBGCODE	PL06	Plinthudic
SUBGCODE	PS00	Psammaquentic
SUBGCODE	PS02	Psammentic
SUBGCODE	QU00	Quartzipsammentic
SUBGCODE	RE00	Rendollic
SUBGCODE	RH00	Rhodic
SUBGCODE	RU02	Ruptic-alfic
SUBGCODE	RU09	Ruptic-lithic
SUBGCODE	RU11	Ruptic-lithic-entic
SUBGCODE	RU15	Ruptic-lithic-xerochreptic
SUBGCODE	RU17	Ruptic-ultic
SUBGCODE	RU19	Ruptic-vertic
SUBGCODE	SA00	Salorthidic
SUBGCODE	SA02	Sapric
SUBGCODE	SA04	Sapric terric
SUBGCODE	SI00	Sideric
SUBGCODE	SO04	Sombrihumic
SUBGCODE	SP00	Sphagnic
SUBGCODE	SP02	Sphagnic terric
SUBGCODE	SP04	Spodic
SUBGCODE	SU00	Sulfic
SUBGCODE	TE00	Terric
SUBGCODE	TH04	Thapto-histic
SUBGCODE	TH06	Thapto-histic tropic
SUBGCODE	TO00	Torrertic
SUBGCODE	TO02	Torrifluventic
SUBGCODE	TO04	Torriorthentic
SUBGCODE	TO06	Torripsammentic
SUBGCODE	TO10	Torroxic
SUBGCODE	TR00	Tropaquodic
SUBGCODE	TR02	Tropeptic
SUBGCODE	TR04	Tropic

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
SUBGCODE	UD01	Udalfic
SUBGCODE	UD00	Udertic
SUBGCODE	UD02	Udic
SUBGCODE	UD03	Udollic
SUBGCODE	UD05	Udorthentic
SUBGCODE	UD10	Udoxic
SUBGCODE	UL00	Ultic
SUBGCODE	UM00	Umbreptic
SUBGCODE	UM02	Umbric
SUBGCODE	US00	Ustalfic
SUBGCODE	US02	Ustertic
SUBGCODE	US04	Ustic
SUBGCODE	US06	Ustochreptic
SUBGCODE	US08	Ustollic
SUBGCODE	US12	Ustoxic
SUBGCODE	VE00	Vermic
SUBGCODE	VE02	Vertic
SUBGCODE	XE00	Xeralfic
SUBGCODE	XE02	Xerertic
SUBGCODE	XE04	Xeric
SUBGCODE	XE08	Xerollic
PARTSIZE	002	not used
PARTSIZE	005	ashy
PARTSIZE	007	ashy over cindery
PARTSIZE	008	ashy over loamy
PARTSIZE	013	ashy over loamy-skeletal
PARTSIZE	019	ashy over medial
PARTSIZE	009	ashy-skeletal
PARTSIZE	003	cindery
PARTSIZE	006	cindery over loamy
PARTSIZE	015	cindery over medial-skeletal
PARTSIZE	017	cindery over medial
PARTSIZE	004	cindery over sandy or sandy-skeletal
PARTSIZE	114	clayey
PARTSIZE	122	clayey over fine-silty
PARTSIZE	116	clayey over fragmental
PARTSIZE	124	clayey over loamy
PARTSIZE	120	clayey over loamy-skeletal
PARTSIZE	118	clayey over sandy or sandy-skeletal
PARTSIZE	056	clayey-skeletal
PARTSIZE	058	clayey-skeletal over sandy
PARTSIZE	080	coarse-loamy
PARTSIZE	086	coarse-loamy over clayey
PARTSIZE	082	coarse-loamy over fragmental
PARTSIZE	084	coarse-loamy over sandy or sandy-skeletal
PARTSIZE	038	coarse-silty
PARTSIZE	094	coarse-silty over clayey
PARTSIZE	090	coarse-silty over fragmental
PARTSIZE	092	coarse-silty over sandy or sandy-skeletal
PARTSIZE	126	fine

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
PARTSIZE	096	fine-loamy
PARTSIZE	102	fine-loamy over clayey
PARTSIZE	098	fine-loamy over fragmental
PARTSIZE	100	fine-loamy over sandy or sandy-skeletal
PARTSIZE	097	fine-loamy over cindery
PARTSIZE	106	fine-silty
PARTSIZE	112	fine-silty over clayey
PARTSIZE	108	fine-silty over fragmental
PARTSIZE	110	fine-silty over sandy or sandy-skeletal
PARTSIZE	036	fragmental
PARTSIZE	068	loamy
PARTSIZE	072	loamy over sandy or sandy-skeletal
PARTSIZE	050	loamy-skeletal
PARTSIZE	054	loamy-skeletal over clayey
PARTSIZE	056	loamy-skeletal over fragmental
PARTSIZE	052	loamy-skeletal over sandy
PARTSIZE	010	medial
PARTSIZE	012	medial over cindery
PARTSIZE	014	medial over clayey
PARTSIZE	016	medial over fragmental
PARTSIZE	018	medial over loamy
PARTSIZE	020	medial over loamy-skeletal
PARTSIZE	022	medial over sandy or sandy-skeletal
PARTSIZE	024	medial over thixotropic
PARTSIZE	011	medial-skeletal
PARTSIZE	062	sandy
PARTSIZE	063	sandy or sandy-skeletal
PARTSIZE	066	sandy over clayey
PARTSIZE	064	sandy over loamy
PARTSIZE	044	sandy-skeletal
PARTSIZE	046	sandy-skeletal over loamy
PARTSIZE	047	sandy-skeletal over clayey
PARTSIZE	026	thixotropic
PARTSIZE	028	thixotropic over fragmental
PARTSIZE	034	thixotropic over loamy
PARTSIZE	032	thixotropic over loamy-skeletal
PARTSIZE	030	thixotropic over sandy or sandy-skeletal
PARTSIZE	027	thixotropic-skeletal
PARTSIZE	134	very fine
MINECODE	02	not used
MINECODE	04	calcareous
MINECODE	05	carbonatic
MINECODE	09	chloritic
MINECODE	07	clastic
MINECODE	08	coprogenous
MINECODE	10	diatomaceous
MINECODE	12	ferrihumic
MINECODE	14	ferritic
MINECODE	18	gibbsitic
MINECODE	20	glauconitic

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Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
MINECODE	22	gypsic
MINECODE	24	halloysitic
MINECODE	26	illitic
MINECODE	27	illitic (calcareous)
MINECODE	28	kaolinitic
MINECODE	30	marly
MINECODE	32	micaceous
MINECODE	34	mixed
MINECODE	35	mixed (calcareous)
MINECODE	37	montmorillonitic
MINECODE	38	montmorillonitic (calcareous)
MINECODE	40	oxidic
MINECODE	42	sepiolitic
MINECODE	44	serpentinitic
MINECODE	46	siliceous
MINECODE	50	vermiculitic
MINECODE	00	not used
REACCODE	01	unclassified
REACCODE	02	not used
REACCODE	04	acid
REACCODE	08	dysic
REACCODE	10	euic
REACCODE	12	nonacid
REACCODE	14	noncalcareous
REACCODE	00	not used
TREGCODE	02	not used
TREGCODE	04	frigid
TREGCODE	06	hyperthermic
TREGCODE	08	isofrigid
TREGCODE	10	isohyperthermic
TREGCODE	12	isomesic
TREGCODE	14	isothermic
TREGCODE	16	mesic
TREGCODE	18	thermic
TREGCODE	00	not used
OTHCODE	02	not used
OTHCODE	04	coated
OTHCODE	05	cracked
OTHCODE	06	level
OTHCODE	08	micro
OTHCODE	12	ortstein
OTHCODE	14	shallow
OTHCODE	15	shallow & coated
OTHCODE	17	shallow & uncoated
OTHCODE	16	sloping
OTHCODE	20	uncoated
OTHCODE	00	not used
LANDUSE	A	abandoned cropland
LANDUSE	C	cropland
LANDUSE	I	cropland irrigated

Table 6-10. Listing of Other Codes *(cont.)*

Type	Code	Description
LANDUSE	E	forest land grazed
LANDUSE	F	forest land not grazed
LANDUSE	G	pasture land and native pasture
LANDUSE	H	horticultural land
LANDUSE	L	waste disposal land
LANDUSE	N	barren land
LANDUSE	P	rangeland grazed
LANDUSE	S	rangeland not grazed
LANDUSE	R	wetlands
LANDUSE	Q	wetlands drained
LANDUSE	T	tundra
LANDUSE	U	urban and built-up land
PERMCODE	1	very slow
PERMCODE	2	slow
PERMCODE	3	moderately slow
PERMCODE	4	moderate
PERMCODE	5	moderately rapid
PERMCODE	6	rapid
PERMCODE	7	very rapid
DRAINAGE	1	very poorly drained
DRAINAGE	2	poorly drained
DRAINAGE	3	somewhat poorly drained
DRAINAGE	4	moderately well-drained
DRAINAGE	5	well drained
DRAINAGE	6	somewhat excessively drained
DRAINAGE	7	excessively drained
ROOTQUAN	VF	very few
ROOTQUAN	FF	very few to few
ROOTQUAN	F	few
ROOTQUAN	FC	few to common
ROOTQUAN	CM	common to many
ROOTQUAN	C	common
ROOTQUAN	M	many
ROOTSIZE	M	micro
ROOTSIZE	M1	micro and fine
ROOTSIZE	V1	very fine
ROOTSIZE	11	very fine and fine
ROOTSIZE	1	fine
ROOTSIZE	12	fine and medium
ROOTSIZE	2	medium
ROOTSIZE	23	medium and coarse
ROOTSIZE	3	coarse
ROOTSIZE	4	very coarse
ROOTSIZE	5	extremely coarse
ROOTSIZE	13	fine to coarse

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CHAPTER 7

Experiment Data Entry Program Form A-H

The Experiment Data Entry program, Form A-H, allows users to enter or edit minimum data sets (MDS) that are recorded in Form A, B, D, E, and F. Four functions are incorporated in this program which allow the user to: input new data, edit data, delete data, and display data that are stored in the data base files. The Experiment Data Entry program is user-friendly, and data entry screens are very similar to the format in the MDS forms. Information related to this program is listed as follows.

Language Experiment Data Entry program – Forms A-H are written in the dBASE language.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes MENUA_H.PRG, GET_EXP.PRG, TRANSA_H.PRG, FORMA.PRG, FORMB.PRG, FORMD.PRG, FORME.PRG, FORMF.PRG, FORMH.PRG, CONTROLS.PRG, CREATE.PRG, SCRSETUP.PRG, and HELP.PRG.

Executable Program The executable program name is MENUA_H.EXE.

Program Location The Experiment Data Entry program can be located in any directory. The location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu

Input/ Output MENUA_H is a data entry program which accepts the user's data input from the keyboard. Using this program, users can input data for Form A to Form H. The input data are stored in the Experimental Data Base files (as specified in Chapter 4). In addition, MENUA_H allows users to access existing data in the Experimental Data Base files and perform transactions such as edit, delete, or view data.

Program Procedures The data entry program for Form A to H is made up of different source code files and procedures within those files. Figure 7-1 illustrates the control flow within these various procedures.

MENUA_H

MENUA_H is the main program that controls the initial selection from the user and then invokes the corresponding procedure files. It calls GET_EXPERIMENT to prompt the user for a desired experiment data set. Once the experiment data set is selected, MENUA_H displays the main menu which allows the user to choose a data form. MENUA_H will then invoke the corresponding procedure files to perform data entry transactions.

GET_EXPERIMENT

This procedure reads information from the MDSINFO.DBF file and displays experiment data sets on the screen for the user's selection. MDSINFO.DBF is a file that stores the location (drive and path) of experiment data sets, experiment identifiers, and experiment descriptions. If a hard disk system is used, this file is installed in the C:\DSSAT directory. Users can input or edit information in this file through options in the "Maintain Minimum Data Set Master List Utilities" in the DBMS Utility programs (see Chapter 15). After a user selects an experiment from the list of available data sets, the location information of the data set will be

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kept in memory for later access to any data base file of the experiment. If the desired experiment is not in the list, the user can enter the drive and path of the experiment. GET EXPERIMENT will check and locate experimental data base files in the given location. If data base files are not found for an experiment, it will create files and update the MDSINFO.DBF with the new information.

TRANSFB

This procedure handles the transactions for Form B. It displays a menu from which the user can select the four available transactions: add, edit, delete, or display. It will then call STATION to process the transaction.

STATION

This is the processing routine for Form B. This routine handles any of the four allowed transactions.

FMADEH

FMADEH manages the transactions for Form A, D, E, and H. It displays the transaction menu and prompts for the user's selection. The transaction type is passed as a parameter to the corresponding routine for processing.

PROCADEH

This procedure calls the processing routine for the corresponding data entry form for Forms A, D, E, and H.

INSTINFO

This is the processing routine for Form A. This routine handles any of the four allowed transactions.

SITE

This is the processing routine for Form D. This routine handles any of the four allowed transactions.

EXPER

This is the processing routine for Form E. This routine handles any of the four allowed transactions.

PLOT

This is the processing routine for Form H. This routine handles any of the four allowed transactions.

TRANSFF

This procedures handles transactions for Form F. It allows the user to select from a menu of available transaction options, and then calls one of the four transaction handling routines depending on the type of transaction selected.

CREFORMF

This routine handles the process of creating new Forms F-1, F-2, F-3, and F-4.

ADDFORMF

This routine handles the process of adding new records to Forms F-1, F-2, F-3, and F-4.

UPFORMF

This routine handles the process of updating existing data in Forms F-1, F-2, F-3, and F-4.

DELFORMF

This routine handles the process of deleting existing data from Forms F-1, F-2, F-3, and F-4.

FACTDESC

This routine accesses data in Form F-1 for all transactions.

LEVDESC

This routine accesses data in Form F-2 for all transactions.

FACTLEV

This routine accesses data in Form F-3 for all transactions.

TREATMNT

This routine accesses data in Form F-4 for all transactions.

CONTROLS

This procedure is used everywhere in the procedure files to detect the cursor movement keys (PgUp, PgDn, ↑,←,→, and ↓) that are pressed during data entry. Parameters representing these keys will then be passed to another procedure called SCRSETUP to perform the task.

SCRSETUP

This procedure displays the data on screen depending on the type of key the user has pressed. For example, if the user pressed PgUp, the previous range of data is displayed on the screen.

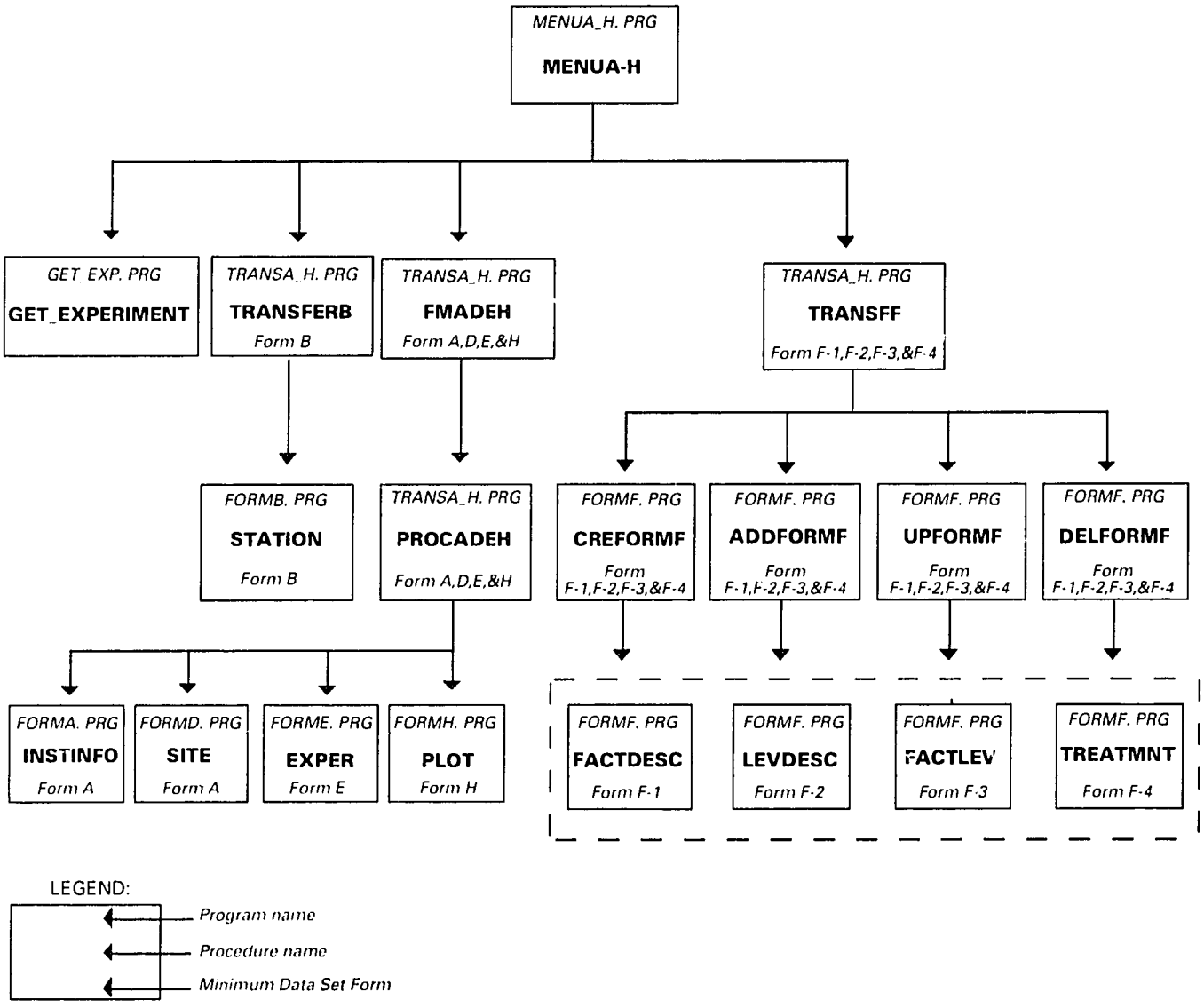
CREATE

This procedure creates the data base file structure for different Minimum Data Set forms.

HELP

The HELP procedure is called whenever the user presses <F1>. It displays the information on the screen to help users with data entry.

Figure 7-1. Control Flow Diagram for Experiment Data Entry Program (Form A-H)



CHAPTER 8

Experiment Data Entry Program Form I-S

The Experiment Data Entry program, Form I-S, allows users to enter or edit minimum data sets (MDS) recorded on Form I, J, K, L, M, N, O, P, Q, R, and S. Four functions are incorporated in this program which allow the user to: input new data, edit data, delete data, and display data that are stored in the data base files. The Experiment Data Entry program is user-friendly, and data entry screens are very similar to the format in the MDS forms. Information related to this program is listed as follows.

Language The Experiment Data Entry program – Forms I-S are written in dBASE language.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes MENUI_S.PRG, GET_EXP.PRG, TRANSFI_S.PRG, FORMI.PRG, FORMJ.PRG, FORMK_R.PRG, FORML.PRG, FORMM.PRG, FORMR2.PRG, FORMS.PRG, COMMON.PRG, PROCX.PRG, CONTROLS.PRG, ERRCHK.PRG, SCRSETUP.PRG, CREATE.PRG, and HELP.PRG.

Executable Program The executable program name is MENUI_S.EXE.

Program Location The Experiment Data Entry program can be located in any directory. The location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output MENUI_S is a data entry program which accepts users' data input from the keyboard. Using this program, users can input data for Form I to Form S. The input data are stored in the Experimental Data Base files (as specified in Chapter 4). In addition, MENUI_S allows users to access existing data in the Experimental Data Base files and perform transactions such as edit, delete, or view data.

Program Procedures The data entry program for Form I to S is made up of different source code files and procedures within those files. Figure 8-1 illustrates the control flow within the various procedures.

MENUI_S

MENUI_S is the main program that controls the initial selection from the user and then invokes the corresponding procedure files. It calls GET_EXPERIMENT to prompt the user for a desired experiment data set. Once the experiment data set is selected, MENUA_S displays the main menu which allows the user to choose a data form. MENUA_S will then invoke the corresponding procedure files to perform data entry transactions.

GET_EXPERIMENT

Functions of this procedure have been described in Chapter 7. Please refer to page 79.

TRANSFI

This procedure displays a menu from which the user can decide to access either Form I-1 or I-2.

TRANSFJ

This procedure displays a menu from which the user can decide to access either Form J-1 or J-2.

TRANSFR

This procedure displays a menu from which the user can decide to access either Form R-1 or R-2.

FMI_S

This procedure displays a menu from which the user can select from the four available transactions: add, edit, delete, or display. The procedure will then call PROCI_S to dispatch the transaction to the corresponding routines.

PROCI_S

This procedure calls the processing routines associated with the Form the user wants to access.

SOILFERT

This procedure controls the transaction processing for Form I-1 and I-2. It will first call the procedure METHEXTR to process information for method of extraction and then procedure DISPATCH to handle the rest of the data entry.

VOLWATER

This procedure controls the transaction processing for Form J-1 and J-2. It will first call the procedure SOILLAYR to process information for soil layer depths and the procedure DISPATCH to handle the rest of the data entry.

SETUPK_R

This procedure controls the transaction processing for Forms K, N, O, P, Q, and R-1. Depending on the transaction, this procedure will call the procedure DISPATCH to handle the rest of the data entry.

CULTIVAR

This procedure controls the transaction processing for Form L. Depending on the transaction, it will call either CREADDL, UPDDELL, or DISFORML to handle the data entry.

PLANTING

This procedure controls the transaction processing for Form M. It will first call the procedure TYPEPLNT to process information for method of planting and then procedure DISPATCH to handle the rest of the data entry.

HARVEST

This procedure controls the transaction processing for Form R-2. Depending on the transaction, it will call either CREADDR, UPDDELR, or DISFORMR to handle the data entry.

PLANTNU

This procedure controls the transaction processing for Form S. It will first call the procedure NUTRCODE to process information for nutrient concentration codes and then procedure DISPATCH to handle the rest of the data entry.

DISPATCH

This procedure passes the correct parameters to different transaction routines.

CREADDX

This procedure creates data base files for new experimental data and adds data to existing experimental data base files.

UPDDELX

This procedure updates and deletes existing data in the Experimental Data Base files.

DISFORMX

This procedure displays experimental data of the selected form on screen.

COMMENTS

This procedure allows the user to enter comments for a data form.

CONTROLS

This procedure is used everywhere in the procedure files to detect the cursor movement keys (PgUp, PgDn, ↑,←,→, and ↓) that are pressed during data entry. Parameters representing these keys will then be passed to another procedure called SCRSETUP to perform the task.

SCRSETUP

This procedure displays the data on screen depending on the type of key the user has pressed. For example, if the user presses PgUp, the previous range of data is displayed on the screen.

CREATE

This procedure creates the data base file structure for different Minimum Data Set forms.

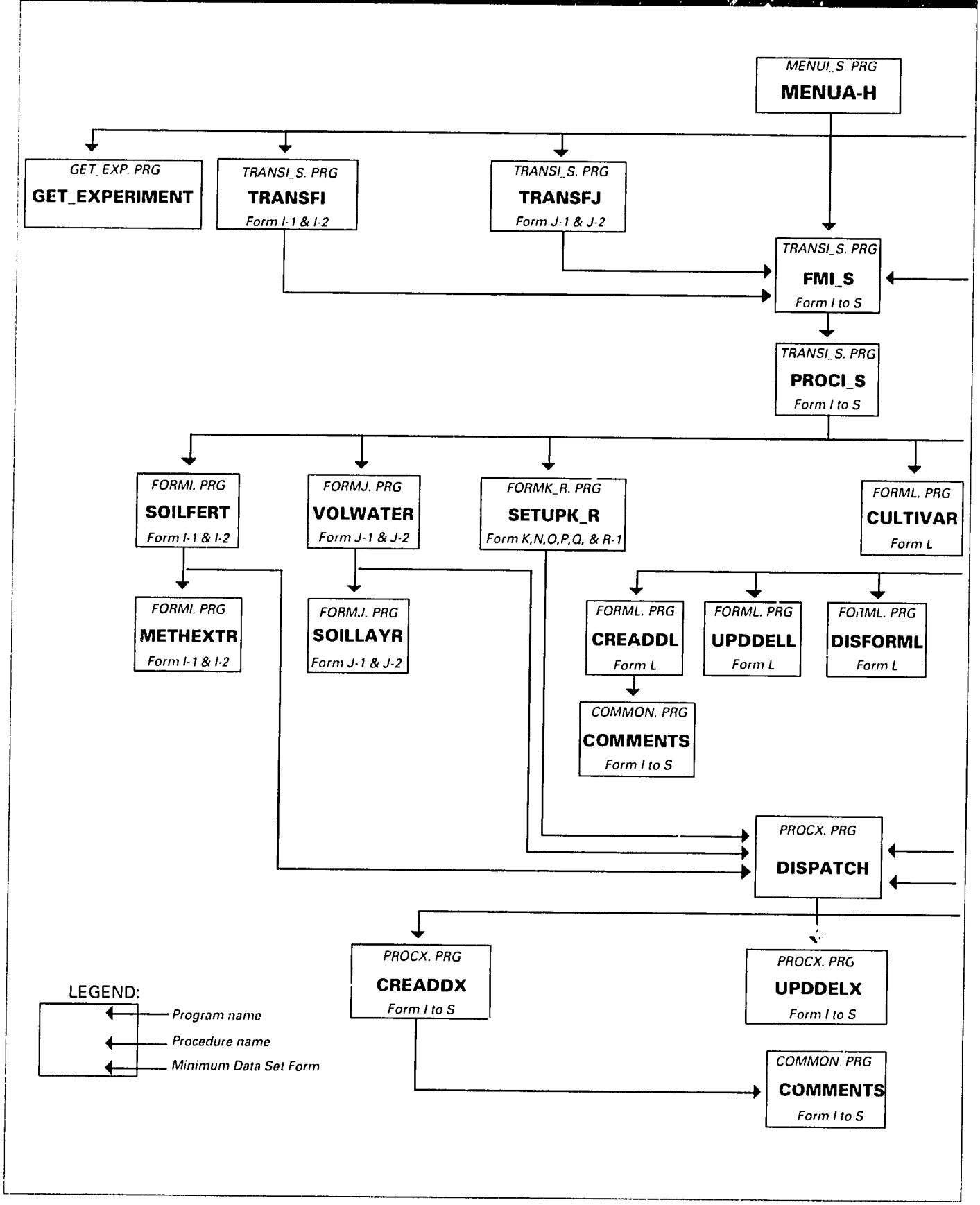
HELP

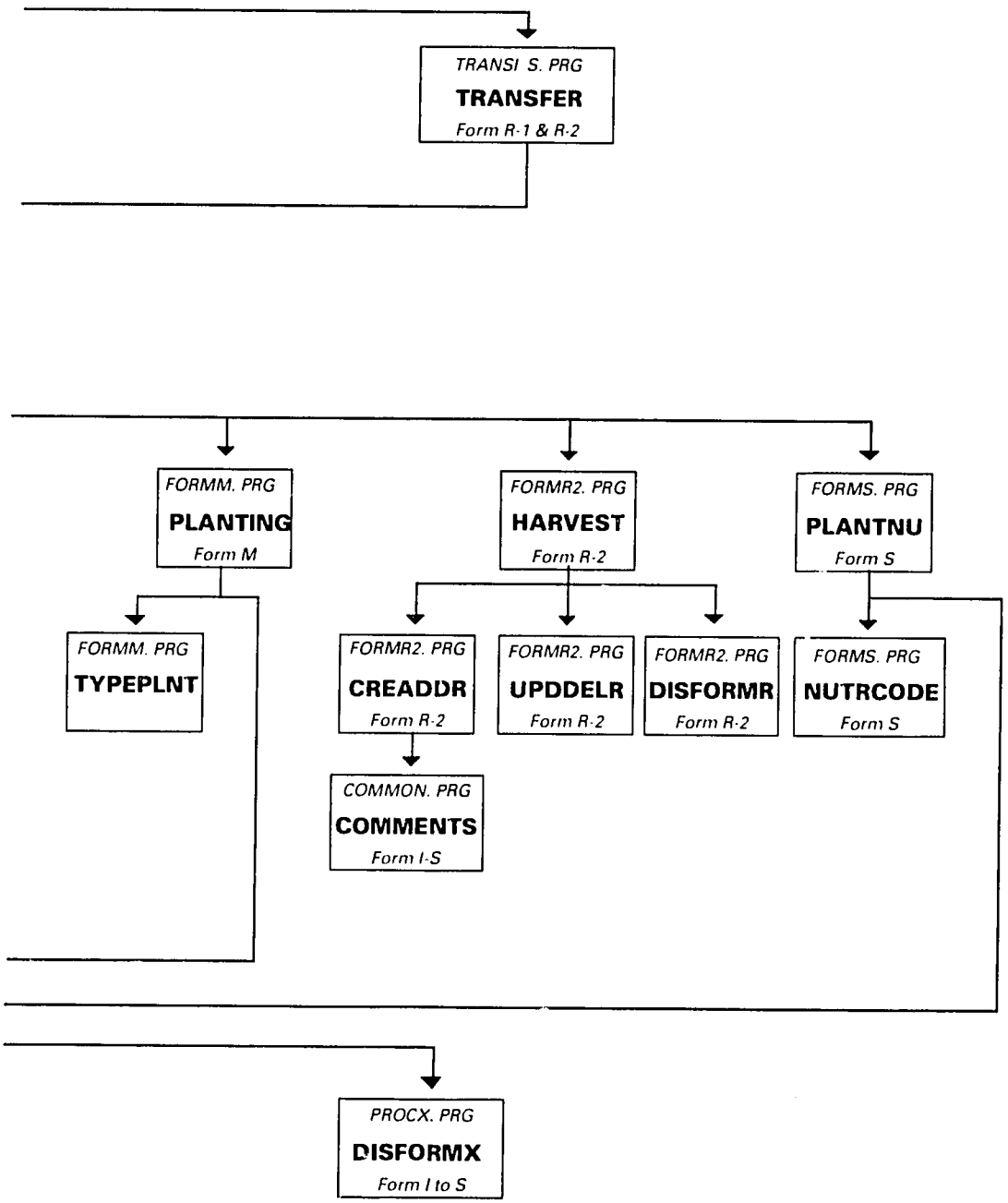
The HELP procedure is called whenever the user presses <F1>. It displays information on screen to help users with data entry.

ERRCHK

This procedure is called whenever the user enters a code for data. It validates the input code with the code library files. If it is invalid, an error will be displayed.

Figure 8-1. Control Flow Diagram for Experiment Data Entry Program (FORM I-S).




TRANSI S. PRG
TRANSFER
Form R-1 & R-2
FORMM. PRG
PLANTING
Form M
FORMR2. PRG
HARVEST
Form R-2
FORMS. PRG
PLANTNU
Form S
FORMM. PRG
TYPEPLNT
FORMR2. PRG
CREADDR
Form R-2
FORMR2. PRG
UPDDELR
Form R-2
FORMR2. PRG
DISFORMR
Form R-2
FORMS. PRG
NUTRCODE
Form S
COMMON. PRG
COMMENTS
Form I-S
PROCX. PRG
DISFORMX
Form I to S

CHAPTER 9

Print Experimental FORM A-S

Print Experimental Forms A-S allows the user to print data recorded in Form A to S (except Form C) of an experiment.

Language Print Experimental Forms A-S program is written in dBASE.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes PRNTMDS.PRG, GET_EXP.PRG, PRNTA_H.PRG, PRNTI_S.PRG,

Executable Program The executable program name is PRNTMDS.EXE.

Program Location Print Experimental Forms A-S can be located in any directory. The location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output The Print Experimental Forms A-S program allows the user to select a desired experiment data set and print the data from the selected experiment. The output of this program is a hard copy of the experimental data which have the same format as the Minimum Data Set Forms defined in Technical Report 1.

Program Procedures The Print Experimental Forms A-S program is made up of different source code files and procedures within those files. Figure 9-1 illustrates the control flow within the various procedures.

PRNTMDS

This is the main menu for the print program for Forms A-S. First, the program calls GET_EXPERIMENT and allows the user to select from a list of existing experiments, or manually enter the path of an existing experiment. The program will then allow the user to select the Form they want to print and the corresponding form(s) will be printed.

GET_EXPERIMENT

Functions of this procedure have been described in Chapter 7. Please refer to page 79.

PRTA_H

This procedure checks for data in the selected data entry Form. If there is any data, it will call the necessary routines to print the Forms A, D, E, or H.

PRTI_S

This procedure checks for data in the selected data entry Form and if there is any data, calls the routines necessary to print the Forms I to S.

PRTB

This procedure will print Form B if it contains data.

PRTF

This procedure calls the routines to print Forms F-1, F-2, F-3, and/or F-4, if they contain data.

PRTFORMA

This procedure prints Form A if it contains data.

PRTFORMD

This procedure prints Form D if it contains data.

PRTFORME

This procedure prints Form E if it contains data.

PRTFORMH

This procedure prints Form H if it contains data.

PRTFF1

This procedure prints Form F-1.

PRTFF2

This procedure prints Form F-2.

PRTFF3

This procedure prints Form F-3.

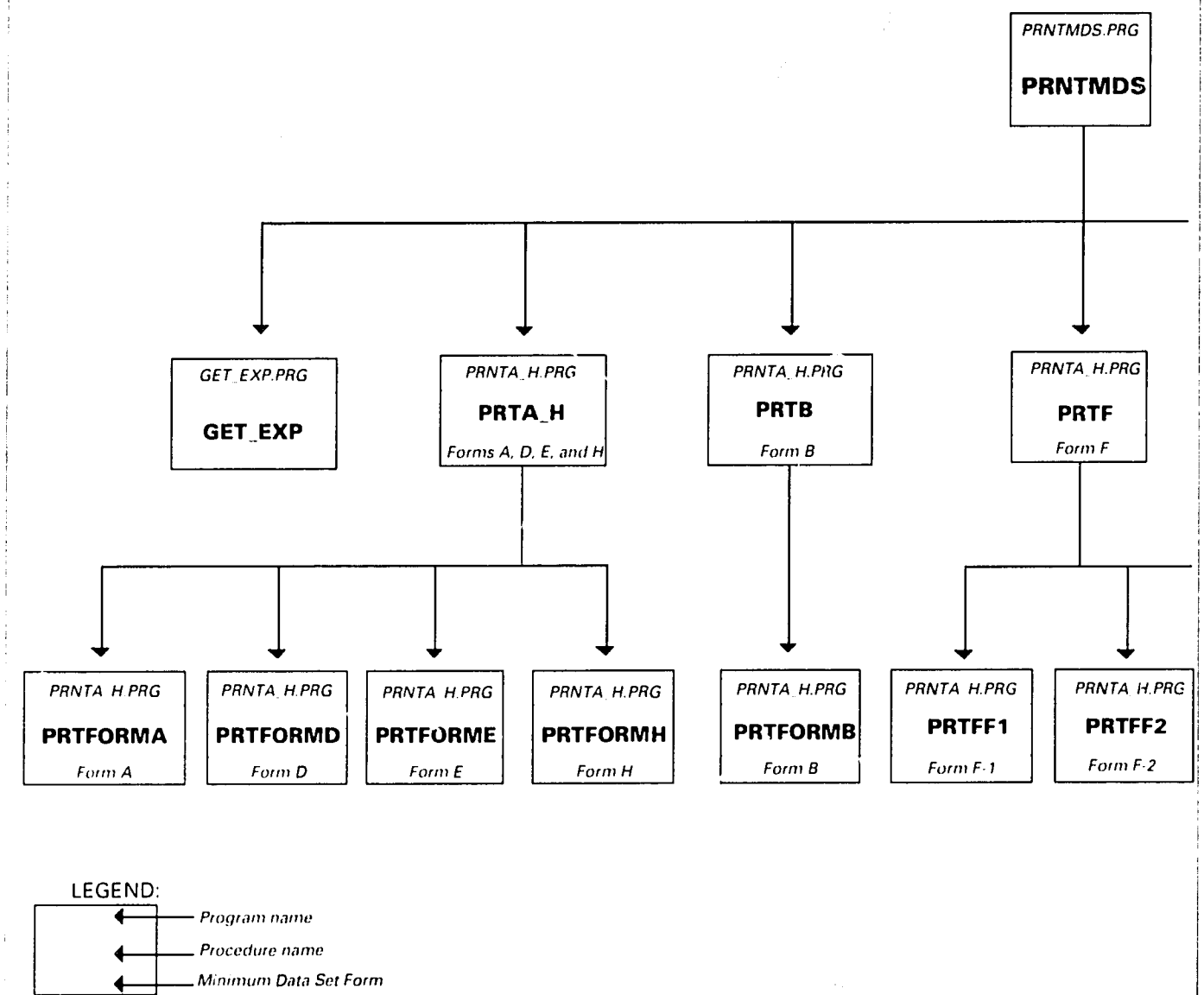
PRTFF4

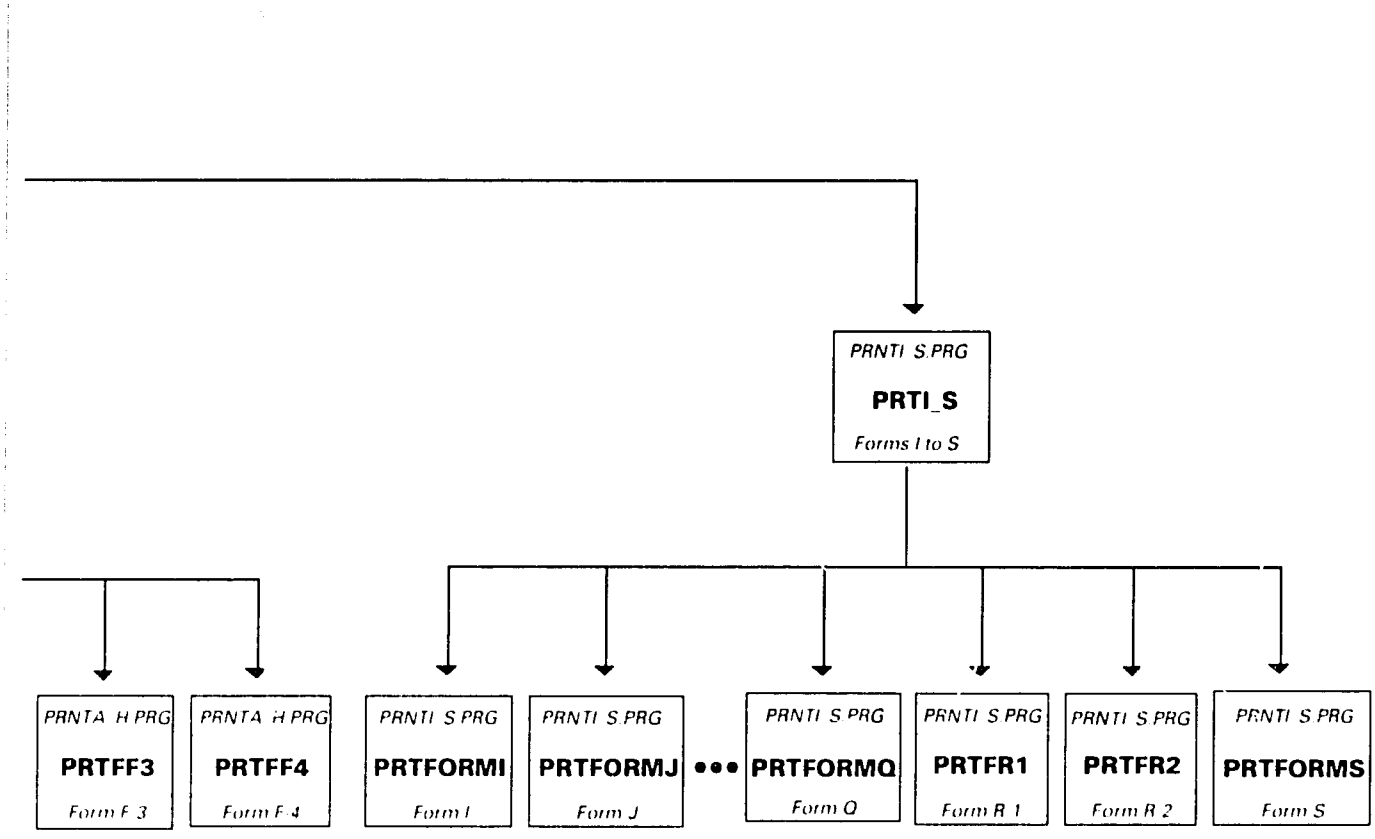
This procedure prints Form F-4.

PRTFORMI to PRTFORMS

These procedures print Forms I to S if they contain data.

Figure 9-1. Control Flow Diagram for Print Experiment Data (FORMS A-S)




PRNTI S.PRG
PRTI_S
Forms I to S
PRNTA H PRG
PRTFF3
Form F 3
PRNTA H PRG
PRTFF4
Form F 4
PRNTI S PRG
PRTFORMI
Form I
PRNTI S.PRG
PRTFORMJ
Form J
PRNTI S PRG
PRTFORMQ
Form Q
PRNTI S PRG
PRTFR1
Form R 1
PRNTI S PRG
PRTFR2
Form R 2
PRNTI S PRG
PRTFORMS
Form S

CHAPTER 10

Weather Data Entry Program

The Weather Data Entry program, Form C, allows the user to enter or edit weather data that are recorded in Form C. Four functions incorporated in this program allow the user to: input new data, edit data, delete data, and display data that are stored in the data base files. The Weather Data Entry program is user-friendly, and the data entry screens are very similar to the format in the MDS forms. Information related to this program is listed as follows.

Language The Weather Data Entry program is written in dBASE.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes WEATHER.PRG, T2.PRG, OBSERVDT.PRG, WEAEDIT.PRG, OPTEDIT.PRG, WEAUTIL.PRG, HELP.PRG

Executable Program The executable program name is WEATHER.EXE.

Program Location The Weather Data Entry program can be located in any directory. The location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output WEATHER is a data entry program which accepts the user's data input from the keyboard. Using this program, the user can input required and optional weather data in Form C-1 and C-2. In addition, WEATHER allows the user to access existing data in the Weather Data Base files (described in Chapter 5) and perform transactions such as edit, delete, or view data.

Program Procedures The Weather Data Entry program is made up of different source code files and procedures within those files. Figure 10-1 illustrates the control flow within the various procedures.

WEATHER

WEATHER.PRG is the main drive of the Weather Data Entry program. It initializes the global variables of the program and calls GET_WEATHER to allow the user to select from a list of existing weather data.

CREATDB

This function creates new weather data base files with file names derived from the institute ID and weather station ID. It prompts the user for the weather station name, location, and units used for data collection. This information is then stored in the data base file. For hard disk users, an entry for the weather station will be created in the WEAMDS.DBF file. Detailed information about the WEAMDS.DBF file will be mentioned in the GET_WEATHER procedure.

CNVERTDB

This function performs the conversion of data base files from version 1.1 to version 2.1. It returns a "0" if the procedure is aborted by the user, or a "1" if the conversion is successful.

GET_WEATHER

This procedure reads information from the WEAINFO.DBF file and displays weather data sets on the screen for the user's selection. WEAINFO.DBF is a file that stores the location (drive and path) of weather data sets, weather data identifiers (institute ID and station ID), data range (beginning and ending dates), and longitude and latitude information. If a hard disk system is used, this file is installed in the C:\DSSAT directory. The user can input or edit information in this file through the option "Maintain Minimum Data Set Master List Utilities" in the DBMS Utility programs (see Chapter 15).

After the user selects a weather data set from the list, the location information of the data set will be kept in memory for later access. If the desired weather data is not on the list, the user can specify the data set by entering the location and the weather data identifiers. GET_WEATHER will check and locate weather data base files in the given drive and path. If the data base files are not found, it will create files and add a new entry to the WEAINFO.DBF using the given information.

OBSER_DT

This procedure initializes the global variables and displays the submenu for observation time. It will then call the procedure to handle the selected transaction.

ADD_OBSER

This procedure allows the user to add new observation time and dates to the data base file.

CHG_OBSER

This procedure allows the user to change existing data in the observation date file.

DEL_OBSER

This procedure allows the user to delete existing data in the observation date file.

WEAEDIT

This procedure displays the submenu of the required weather data (maximum and minimum air temperature, solar radiation, and precipitation), and carries out the user's selected option.

ADD_REQ_DATA

This procedure allows the user to add required weather data to the data base file.

CHG_REQ_DATA

This procedure allows the user to change existing required weather data in the data base file.

DEL_REQ_DATA

This procedure presents the delete submenu and carries out the user's selected option.

DEL_REQ_RANGE

This procedure allows the user to specify a range of required weather data to be deleted from the data base file.

DEL_REQ_RECORD
This procedure allows the user to specify a particular date of required weather data to be deleted from the data base file.

PRT_REQ_DATA
This procedure prints the required weather data.

EDIT_REQ_COMM
This procedure obtains a valid month and year from the user and calls the COMMENT.PRG program to edit the comment file.

OPEDIT
This procedure displays the submenu of the optional weather data (dry bulb, wet bulb, and windrun) and carries out the user's selected option.

ADD_OPT_DATA
This procedure allows the user to add optional weather data to the data base file.

CHG_OPT_DATA
This procedure allows the user to change existing optional weather data in the data base file.

DEL_OPT_DATA
This procedure presents the delete submenu and carries out the user's selected option.

DEL_OPT_RANGE
This procedure allows the user to specify a range of optional weather data for deletion.

DEL_OPT_RECORD
This procedure allows the user to specify a particular date of optional weather data for deletion.

PRT_OPT_DATA
This procedure prints optional weather data in the data base file.

EDIT_OPT_COMM
This procedure obtains a valid month and year from the user and calls the COMMENT.PRG program to edit the comment file.

COMMENT
This procedure presents the comment submenu and carries out the user's selected option.

ADD_COMMENT
This procedure allows the user to input comments to the data base file.

CHG_COMMENT
This procedure allows the user to change existing comments in the file.

DEL_COMMENT
This procedure allows the user to delete existing comments in the file.

WEAUTIL

This procedure is called when the user selects "Run Utility" from the main menu of weather data entry. It displays the utility submenu and carries out the user's selected option.

CONVERT

This procedure converts the units used to record the weather data. After it has detected the units that are currently used for the selected weather data, it prompts the user for the new units that the data will be converted to. Minimun and maximum air temperatures, and dry bulb and wet bulb temperatures can be converted from Celsius to Fahrenheit and vice versa. Precipitation can be converted from millimeters to inches and vice versa. The units for solar radiation can be either in MJ/m^2 or cal/cm^2. Conversion formulas are listed below:

For maximum and minimum air temperatures and dry bulb and wet bulb temperatures:

Celsius (°C) to Fahrenheit (°F): °F = °C * (9 / 5) + 32
Fahrenheit (°F) to Celsius (°C): °C = (°F - 32) * (5 / 9)

For precipitation:

millimeters (mm) to inches (in): in = mm / 25.4
inches (in) to millimeters (mm): mm = in * 25.4

For solar radiation:

MJ/m^2 (MJ) to cal/cm^2 (cal): cal = MJ / 86.4 * 2065
cal/cm^2 (cal) to MJ/m^2 (MJ): MJ = cal * 86.4 / 2065

REINX

This procedure rebuilds the index files for the weather data base files. Index keys for each index file are specified in Chapter 5 : The Weather Data Base.

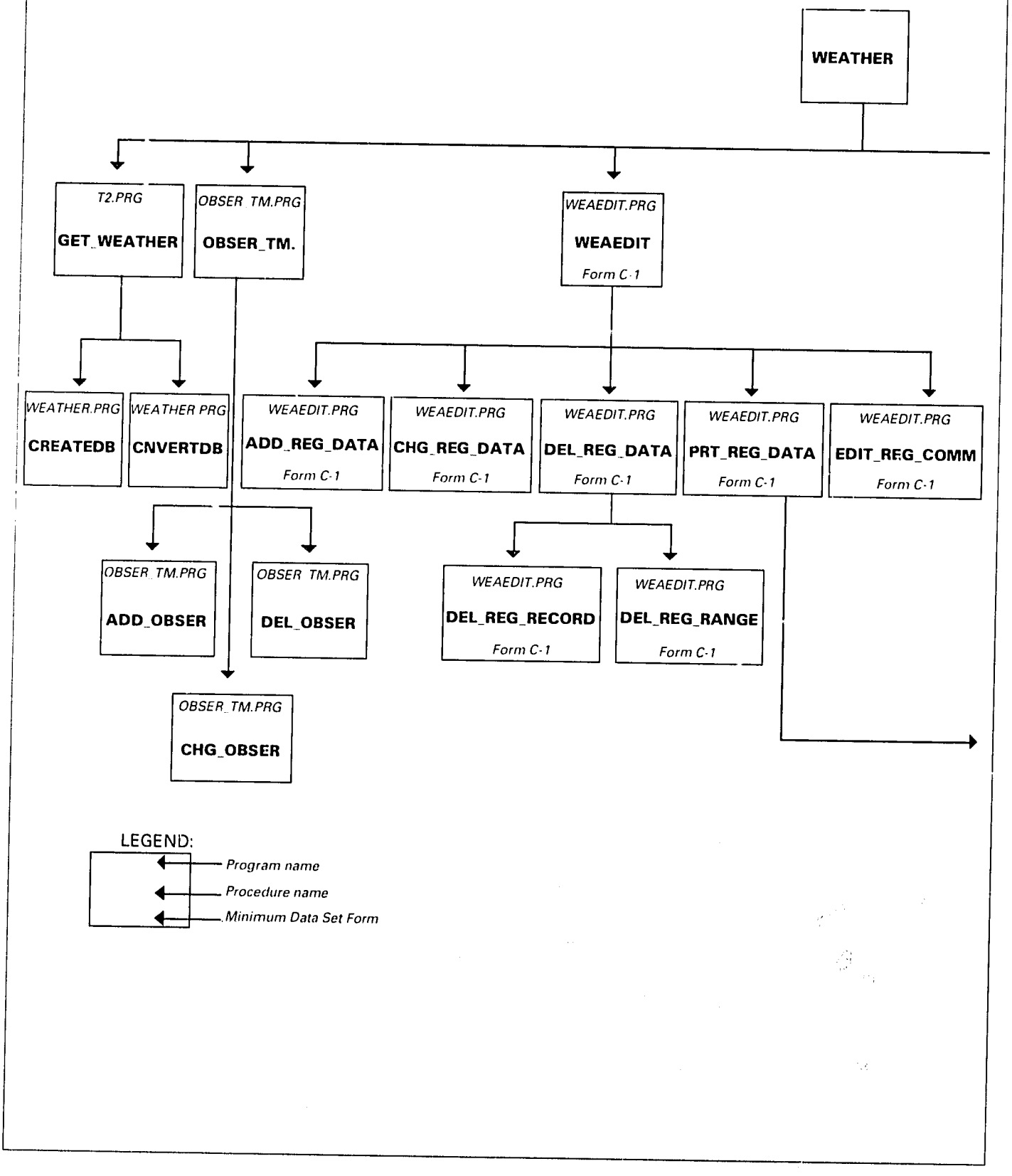
APPEND

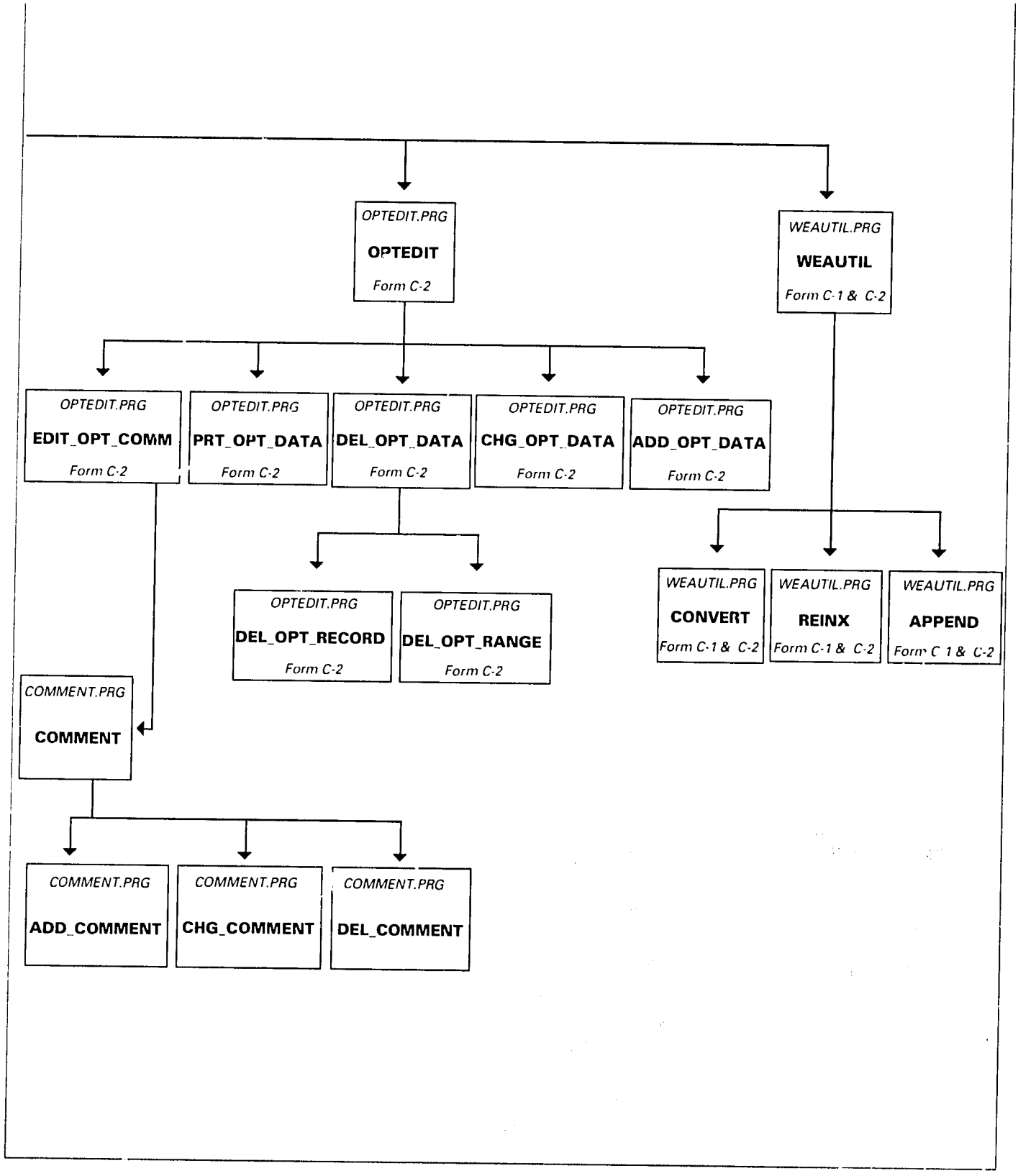
This procedure allows the user to append data from other weather data files to the currently selected weather data files.

HELP

The HELP.PRG is invoked whenever the help key <F1> is pressed during a wait state. The global variable HELP_CODE is used to determine what action should be taken when this procedure is called. This procedure provides all help screens that are used in the weather data entry program. Each help screen is identified by a code. When <F1> is pressed, the help code is passed to this procedure to select the appropriate help screen for display.

Figure 10-1. Control Flow Diagram for Weather Data Entry Program




OPTEDIT.PRG
OPTEDIT
Form C-2
WEAUTIL.PRG
WEAUTIL
Form C-1 & C-2
OPTEDIT.PRG
EDIT_OPT_COMM
Form C-2
OPTEDIT.PRG
PRT_OPT_DATA
Form C-2
OPTEDIT.PRG
DEL_OPT_DATA
Form C-2
OPTEDIT.PRG
CHG_OPT_DATA
Form C-2
OPTEDIT.PRG
ADD_OPT_DATA
Form C-2
OPTEDIT.PRG
DEL_OPT_RECORD
Form C-2
OPTEDIT.PRG
DEL_OPT_RANGE
Form C-2
WEAUTIL.PRG
CONVERT
Form C-1 & C-2
WEAUTIL.PRG
REINX
Form C-1 & C-2
WEAUTIL.PRG
APPEND
Form C-1 & C-2
COMMENT.PRG
COMMENT
COMMENT.PRG
ADD_COMMENT
COMMENT.PRG
CHG_COMMENT
COMMENT.PRG
DEL_COMMENT

CHAPTER 11

MDS Summary Reports Program

The MDS Summary Reports program allows the user to produce reports on the experimental and weather data that are input in the data base files using the Data Entry programs. Four reports are produced by this program: Chronological Listing of Events in an Experiment, Total Substance Input by Plots, Summary of Preplant Soil Fertility and Water Content, and Weather Data Summary Report. Information related to this program is listed below.

Language The MDS Summary Reports program is written in dBASE.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes DBREPORT.PRG, DBASELIB.PRG, CHRON.PRG, MANRPT.PRG, SOILRPT.PRG, WREPORT.PRG, WGRP.PRG

Executable Program The executable program name is DBREPORT.EXE.

Program Location The MDS Summary Reports program can be located in any directory. Location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output The program produces reports on the data that are stored in the Experimental and Weather Data Bases. All reports are printed on letter size computer paper.

Program Procedures The MDS Summary Reports program is made up of different source code files and the procedures within those files. Figure 11-1 illustrates the control flow within the various procedures.

DBREPORT

DBREPORT.PRG is the main drive of the Summary Reports program. It displays a menu with the four report choices. After the user selects a report option, it invokes the appropriate procedure to print the summary report.

CHRON

CHRON.PRG produces a chronological listing of events for an experiment including experimental operations, phenological stages and unusual events affecting crop growth.

CHRON invokes the procedure GET_EXPERIMENT (functions of this procedure are mentioned in previous chapters) to accept a selected experiment data set from the user. It then creates a temporary file using procedure ADD_FIELD to hold data that are extracted from the selected data sets. During the extraction, data that are coded in the experiment data set are translated to detail description using the procedures GET_CODE and GET_PROD. GET_PROD translates product codes to meaningful descriptions. The rest of the codes that are used in the experiment data set (e.g. implement codes, method codes, etc.) are handled by GET_CODE.

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When all necessary information is retrieved, a chronological summary report is printed.

MANRPT

MANRPT.PRG produces a report on the total amount of substance (N, P, K, and $CaCO_3$) and biocides applied to each plot. Information for the report is obtained from Form N and Form O of a selected experiment data set.

MANRPT.PRG invokes the procedure GET_EXPERIMENT to accept a selected experiment data set from the user. It then creates a temporary file using procedure ADD_FIELD to hold data that are extracted from the selected data set. Since data in Form N and Form O are stored in the order of application dates, procedures PART1 and PART2 are invoked respectively for data in Form N and Form O, to calculate the total amount of substances or biocides that are applied to a plot on different dates. When the total amounts are obtained, data are printed in a summary report. A table with the substance and biocide codes and descriptions is listed at the end of each page of the report. These tables are printed by the procedure TABLE1 and TABLE2 for Forms N and O respectively.

SOILRPT

SOILRPT.PRG produces a report of preplant soil fertility and soil water contents that were measured for a selected experiment data set. The information for the report is obtained from Form F-3, Form I-1, and Form J-1.

SOILRPT.PRG invokes the procedure GET_EXPERIMENT to accept a selected experiment data set from the user. It then creates a temporary file using procedure ADD_FIELD to hold data that are extracted from the selected data set. From Form F-3, it figures the plots under each treatment. This information will be used later to calculate treatment averages for soil fertility and water content data. It also checks the layers in Form I-1 and Form J-1 for a match. If there are differences, it averages the layers and creates a standard set for the data in Forms I-1 and J-1. When the treatment and layer information are prepared, it invokes procedure F5_FMJ_SEARCH to retrieve the preplant soil water content data. F5_FMJ_SEARCH sums all data that were measured for each treatment, and calculates the total amount of soil water content measured in each layer. If the layers in Form J-1 are different from the standard layers that were prepared earlier in SOILRPT, F5_FMJ_SEARCH calculates the total amount using the weight-and-average method.

After the data from Form J-1 have been retrieved and stored on the temporary file, SOILRPT invokes F5_FMI_SEARCH to perform the same tasks for the data in Form I-1.

When all data are extracted, SOILRPT prints the summary report using data in the temporary file.

WREPORT

WREPORT.PRG produces monthly or ten-day periodic summary reports of weather data including maximum and minimum temperature, solar radiation, precipitation, and degree day. The weather data are retrieved from Form C-1 of a selected weather data set.

WREPORT.PRG invokes the procedure GET_WEATHER (functions of this procedure are specified in Chapter 10, page 93) to accept a selected weather data set from the user. Depending on the user's choice of report format, it

invokes the procedure WREPORT1 to process weather data that will be printed in monthly format, or WREPORT2 for ten-day periodic format.

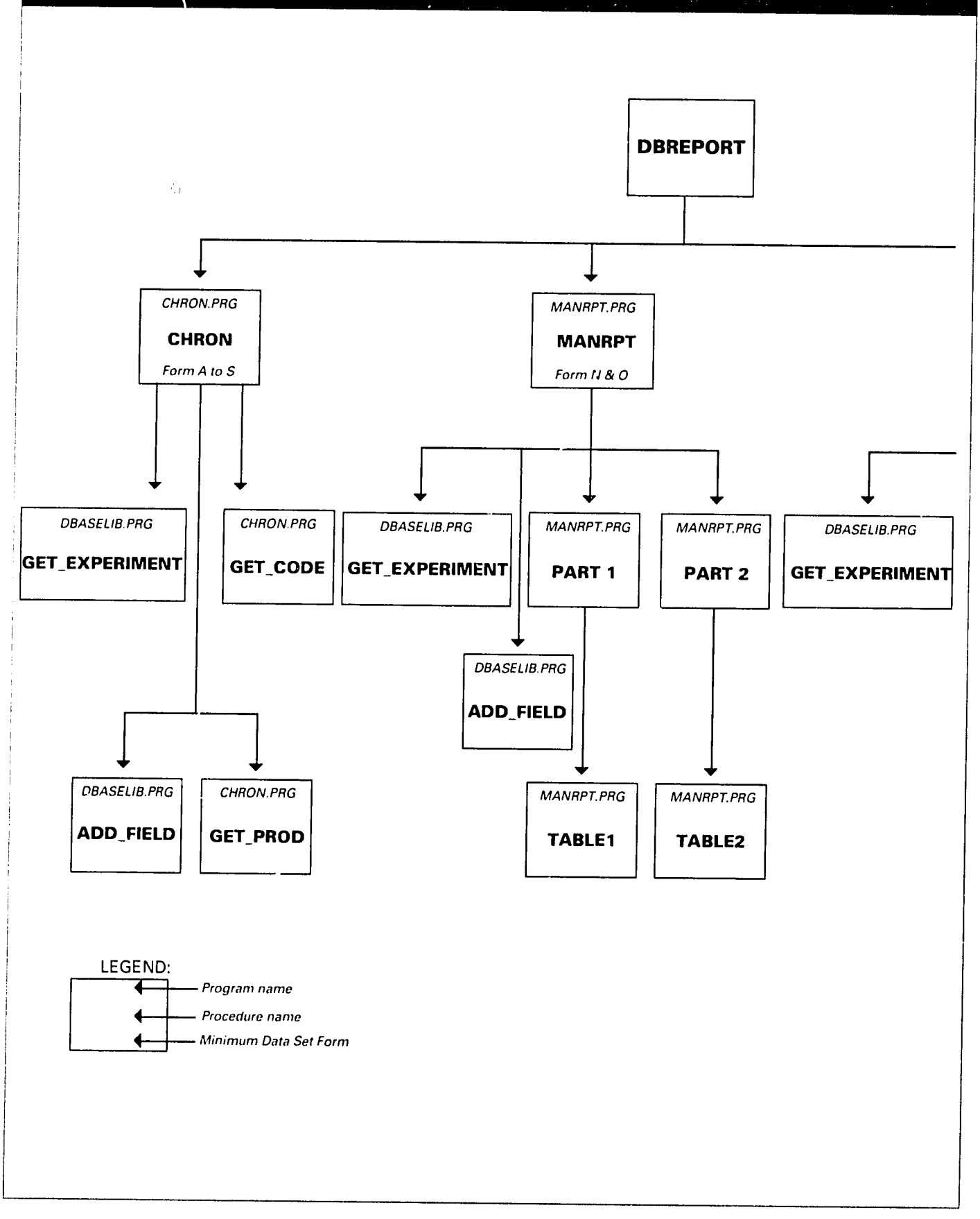
WREPORT1 prints a monthly summary table of the entire weather data stored in Form C-1. It calculates the monthly averages for maximum and minimum temperature and solar radiation, and accumulates the monthly total for precipitation and degree days.

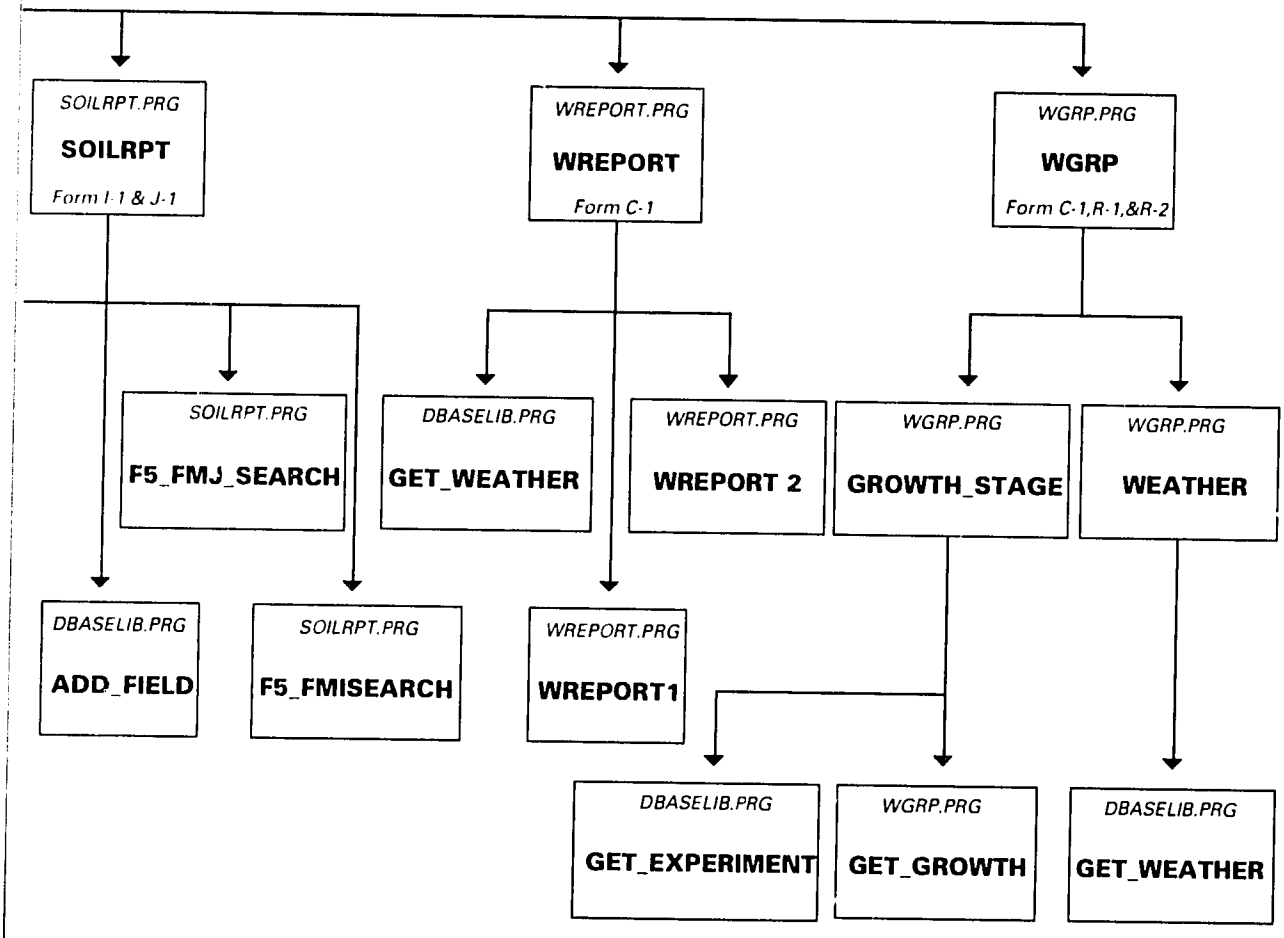
WREPORT2 prints a 10-day periodic summary table for the range of weather data that the user specifies. It calculates the 10-day averages for maximum and minimum temperature and solar radiation, and accumulates the total for precipitation and degree days.

WGRP

WGRP.PRG is a procedure that prepares data for the Weather Graphics program. The functions of this procedure will be discussed in the next chapter.

Figure 11-1. Control Flow Diagram for MDS Summary Reports




SOILRPT.PRG
SOILRPT
Form I-1 & J-1
WREPORT.PRG
WREPORT
Form C-1
WGRP.PRG
WGRP
Form C-1,R-1,&R-2
SOILRPT.PRG
F5_FMJ_SEARCH
DBASELIB.PRG
GET_WEATHER
WREPORT.PRG
WREPORT 2
WGRP.PRG
GROWTH_STAGE
WGRP.PRG
WEATHER
DBASELIB.PRG
ADD_FIELD
SOILRPT.PRG
F5_FMISEARCH
WREPORT.PRG
WREPORT1
DBASELIB.PRG
GET_EXPERIMENT
WGRP.PRG
GET_GROWTH
DBASELIB.PRG
GET_WEATHER

CHAPTER 12

Weather Graphics Program

The Weather Graphics program allows the user to graphically display any or all of the weather data items for a particular site. These weather data items include, minimum or maximum temperature, precipitation, solar radiation, and degree days. For each data item, the user's graph type options include graphing every point, 10-day average graphs, bar graphs, or accumulation graphs.

Two procedures are involved in the weather graphics process. The function of the first procedure is to create an ASCII file that contains the necessary weather and growth stage data for the graphs. This procedure is carried out by the subroutine WGRP in the DBREPORT program that was presented in the previous chapter. The second part of the weather graphics process is to display the retrieved weather and growth stage data in graphical form by running a C program called WGRAPH.EXE.

The two procedures are linked together and executed by a DOS batch file called WEAGRAPH.BAT. Basically, WEAGRAPH.BAT invokes the DBREPORT.EXE program with a parameter "WGRP". Once DBREPORT recognizes the parameter, it invokes the procedure WGRP. When WGRP is done, the batch file executes the WGRAPH.EXE program.

Language The first part of the weather graphics process is written is dBASE, and the second is written in C. Some windowing routines are used in the C programs. The routines are based on a modified version of C-Windowing Toolbox provided by Christopher McVicar through PC-SIG.

Compiler The programs are compiled with CLIPPER version Summer '87 and Turbo C version 1.5.

Source Codes WEAGRAPH.BAT, DBREPORT.PRG, WGRP.PRG, WGRAPH.C, WGRAPH2.C, WGRAPH.H, CHRONO.OBJ, FILEIO.OBJ, WMENU.OBJ, and C_WINDOW.OBJ

Executable Program The executable program name is WEAGRAPH.BAT, DBREPORT.EXE, and WGRAPH.EXE

Program Location The weather graphics programs can be located in any directory. The location of the programs can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output The program input is the required weather data: maximum and minimum temperature, solar radiation, and precipitation, that are stored in the Weather Data Base files (Form C-1). If the user wants to superimpose dates of growth stage on the weather data graphs, the Experiment Data Base files which store the growth stage information (Form R-1 and R-2) are also needed.

When weather and growth stage data are retrieved, they are stored in a temporary ASCII file called TEMP.DAT. The format of this file is illustrated in Table 12-1. TEMP.DAT is the input file for WGRAPH.EXE. The program displays the input data items on screen with these graphic modes:

CGA	Color Graphics Adapter
MCGA	Multi-Color Graphics Array

EGA	Enhanced Graphics Adapter
EGA64	Enhanced Graphics Adapter-64 Colors
EGAMono	Enhanced Graphics Adapter-Monochrome
HercMono	Hercules Graphics Adapter
ATT400	AT&T 400 Line Graphics Adapter
VGA	Video Graphics Array

Program Procedures

The weather graphics programs are made up of dBASE and C source files. The dBase procedures are WGRP, GROWTH_STAGE, WEATHER, GET_EXPERIMENT, GET_GROWTH, and GET_WEATHER. Control flow of these procedure has been illustrated in Figure 11-1. The C programs contain various routines as well as a few other object modules that have the required functions for the program. Control flow of the C procedures is shown in Figure 12-1.

WGRP

WGRP.PRG is the main program that invokes procedures GROWTH_STAGE and WETHER.

GROWTH_STAGE

If the user chooses to include growth stage data on the graphs, procedure GET_EXPERIMENT is invoked to accept a selected experiment data set from the user. GROWTH_STAGE then looks at the data recorded in Form R-1 and Form R-2. Depending on the type of crop, function GET_GROWTH is invoked to search for the required growth stage information Below are the growth stage codes required for each crop.

Crop	*Growth Stage Codes*
Aroid	V1 to V9 and S
Barley	10, 13, 15, 65, and 94 or above
Cassava	VE, V1 to V9
Dry bean	V0, V4, R1, R3, R5, and R7 or R8
Maize	VE, V6, R1, and R6 or R7
Millet	10, 13, 15, 65, and 94 or above
Peanut	VE, V4, R1, R4, R6, and R7, R8, or R9
Potato	VE, T1, and T4
Rice	10, 13, 15, 65, and 94 or above
Sorghum	10, 13, 15, 65, and 94 or above
Soybean	V0, V4, R1, R3, R5, and R7 or R8
Wheat	10, 13, 15, 65, and 94 or above

GET_GROWTH

GET_GROWTH searches for growth stage information in the data base files for Form R-1 and R-2. The information is the growth stage code, date of growth stage, and the growth stage code description. When the information is found, it writes them to the TEMP.DAT file. If the data are not found, it returns a false flag to GROWTH_STAGE.

WEATHER

GET_WEATHER is invoked to accept a selected weather data set from the user. The user is also asked to define the range of weather data that is retrieved. Based on the input range, it searches the data base file for Form C-2 for the daily weather data, and writes them to the TEMP.DAT file.

WGRAPH

This is the main program of the C Weather Graphics program. It initializes the screen to the graphics mode, reads in the weather data, displays information about the weather data, and prompts the user to define the graph to be displayed. Calls are made to functions INITIALIZE(), READ_WEA_DATA(), SHOW_STATUS() and WMENU(), respectively, to perform the described operations.

W_INIT

This function initializes the text windowing system used in this program.

INITIALIZE

This function initializes the graphics output mode. It also stores information about the colors available, size of the screen, and the hardware aspect ratio.

NEW_DRIVER

This function allows the user to define the program's selected graphics mode/driver.

READ_WEA_DATA

This function reads the raw weather data into internal memory arrays.

GET_USER_INFO

This function prompts the user to define the graph to be displayed. The user must select the weather data item, type of graph, and the line style.

SHOW_STATUS

This function displays current information about the weather data set and, optionally, the associated experiment data set being graphed. This information includes, institute ID, site ID, duration of weather data, experiment number, experiment year, crop code, and number of growth stages.

GRAPH_DATA

This function displays the graph, legends, and superimposes any experiment growth stages onto the graph.

GRAPHPT

This function graphs a set of data values as a point to point graph.

BARPT

This function graphs a set of data values as a bar graph.

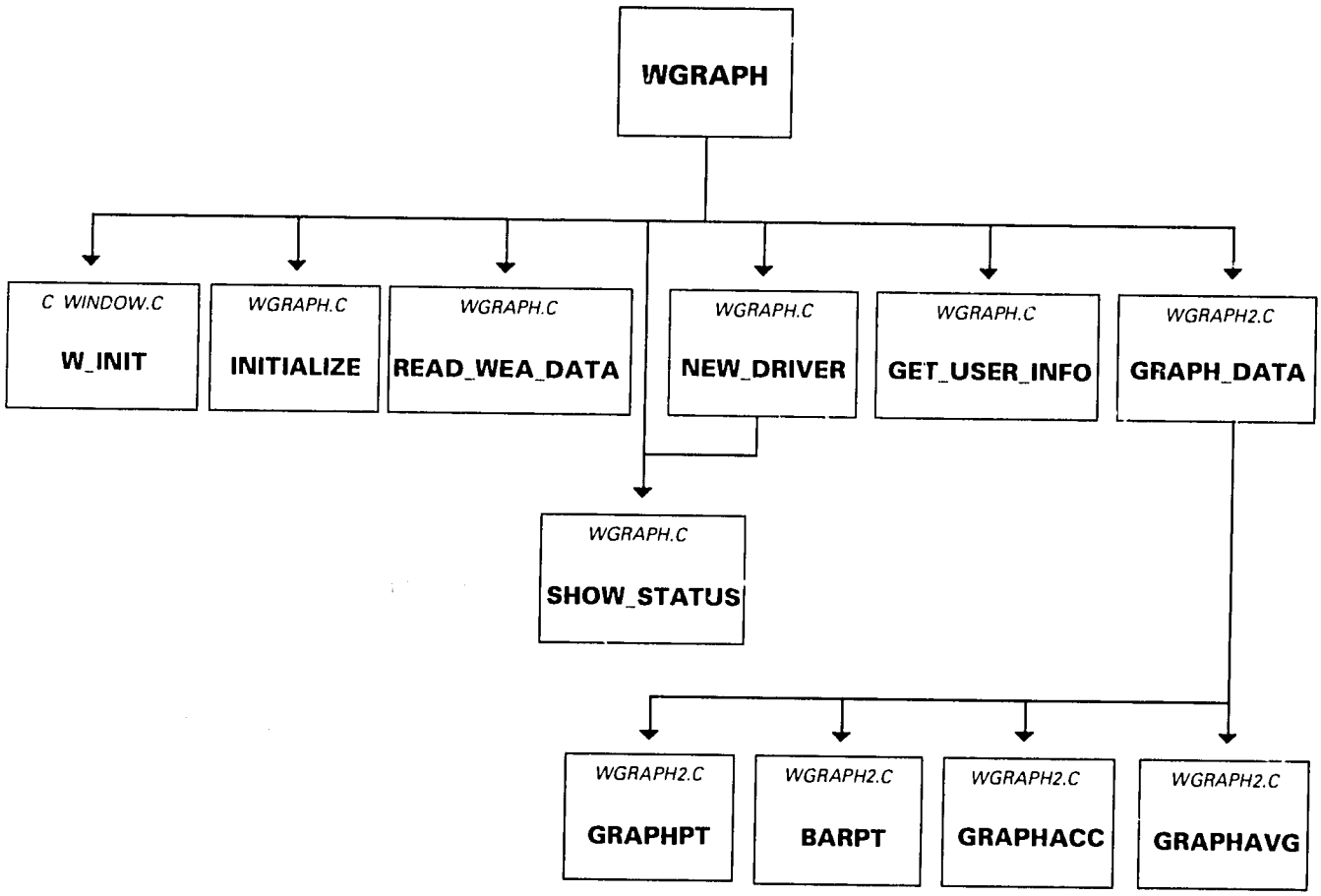
GRAPHACC

This function graphs a set of data values as an accumulation graph.

GRAPHAVG

This function graphs a set of data values as a 10-day average line graph.

Figure 12-1. Control Flow Diagram for Weather Graphics



LEGEND:

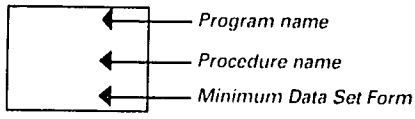


Table 12-1. Format of TEMP.DAT

Column No.	Description
Format for Line 1 of growth stage data	
1 - 4	A string "@MDS" to indicate following data are growth stage data.
6 - 7	Institute ID.
9 - 10	Site ID.
12 - 13	Experiment number.
15 - 16	Crop code.
18 - 19	Year of experiment.
Format for Line n of growth stage data	
1 - 7	Date of growth stage. The first four numbers are year and the last three numbers are the Julian date.
9 - 10	Growth stage code.
12 - 80	Description of growth stage code.
Format for Line 1 of weather data	
1 - 8	A string "@WEATHER" to indicate following data are weather data.
10 - 11	Institute ID.
13 - 14	Weather station ID.
16 - 22	Beginning date of weather data. The first four numbers are year and the last three numbers are the Julian date.
24 - 30	Ending date of weather data. The first four numbers are year and the last three numbers are the Julian date.
Format for Line n of weather data	
1 - 7	Date of weather data. The first four numbers are year and the last three numbers are the Julian date.
9 - 13	Minimum temperature.
15 - 19	Maximum temperature.
21 - 24	Precipitation.
26 - 31	Solar radiation.

Example:

```
@MDS IE BR 01 WH 84
1985013 13 3 leaves unfolded
1985147 92 Seed coat hard (can no longer be dented by thumbnail)
@WEATHER IE BR 1984306 1985156
1984306  11.5  16.0    0   5.10
1984307  10.0  19.5    2  11.10
.
.
...etc.
```

CHAPTER 13

Soil Data Retrieval for Crop Model Programs

Soil Data Retrieval for the Crop Models has two main source programs. The functions of the first program are for retrieving soil data from the IBSNAT Soil Data Base (described on Chapter 6), and for storing the retrieved soil profile to a temporary ASCII file called ASCDUMP.DAT (see Table 13-1 for file format). This part of the program is written in dBASE. The ASCII file will then be read by a C program which converts and adds the data to SPROFILE.xx where xx is the crop code. If users can't find their soil information in the Soil Data Base, they can manually input the soil data through the C program. Input data will be added to SPROFILE.xx.

The two main source programs are linked together and executed by a DOS batch file called GETSOIL.BAT This batch file invokes the DBF2ASC.EXE program and then the SDB.EXE.

Language Soil Data Retrieval for the Crop Models is written in dBASE and C.

Compiler The program is compiled with CLIPPER version Summer '87 and Turbo C version 2.0.

Source Codes GETSOIL.BAT, DBF2ASC.PRG, GET_EXP.PRG, GET_OPT.PRG, SDB.C, INPUT.C, ERRCHK.C, OUTPUT.C, and CALC.C.

Executable Program The executable program names are DBF2ASC.EXE and SDB.EXE.

Program Location Soil Data Retrieval for the Crop Models can be located in any directory. Location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output The Soil Data Retrieval for the Crop Models retrieves soil data from the IBSNAT Soil Data Base. If the desired soil data are not found in the data base, the programs accept the user's input from the keyboard. After data are calculated, they are written to the SPROFILE of the selected crop.

Program Procedures The Soil Data Retrieval for the Crop Models is made up of different source files and the procedures within those files. Figure 13-1 illustrates the control flow within the various procedures.

DBF2ASC

This is the main program that calls the routines to retrieve soil profile data from the IBSNAT Soil Data Base. Three searching methods are provided. The user can search the data base by a particular soil sampling year, the closest matching soil classification, or by country. The program invokes the procedures: GET_EXPERIMENT, GET_CLASS, SEL_PED, and SEARCH.

GET_EXPERIMENT

The user has an option to enter the soil classification of the desired soil profile on the keyboard or obtain it from a selected experiment data set in the Experiment Data Base. If a user chooses to obtain soil classification from Form D of an experiment, the procedure GET_EXPERIMENT is invo' d. Functions of GET_EXPERIMENT have been described in Chapter 7. Please refer to page 79.

GET_CLASS

This procedure allows the user to enter a soil classification, or uses the soil classification found in Form D of the selected experiment data set to search the IBSNAT Soil Data Base for the closest matching soil classification.

GET_CLASS calls the procedure PARSE to convert the input soil classification to various SCS codes (SCS soil classification codes are listed on Table 6-10). The converted SCS codes are then used to search data in the data base.

The search begins with matching the soil order of the input soil classification with those soil profiles in the data base having the same soil order. It then continues with a process of elimination. It eliminates profiles from the list using the following criteria in the given order: suborder, great group, subgroup modifier, texture, mineralogy, reaction, and temperature regime. At each step of the elimination process, it invokes procedure SHOWPROF to display the pedon numbers and soil profiles on screen for the user to review.

When 32 or less profiles remain, the user can stop the elimination process and the procedure GET_PED is invoked.

SEL_PED

This procedure performs a soil profile search based on the passed parameter. It searches by soil sample year if the parameter is "P", or by country if parameter is "C".

After it has retrieved the data with the specified criteria, it calls the procedure GET_PED to display the retrieved information on screen.

GET_PED

This procedure displays the retrieved soil classification, countries, and pedon numbers on screen and allows the user to select a pedon number from the list. To display the soil classification, it invokes the procedure MAKENAME to convert the SCS soil codes in the data base file to soil classification.

SEARCH

This procedure uses the selected pedon number to retrieve soil data from the IBSNAT Soil Data Base. It calls procedure CONVERT to calculate the retrieved data and stores the results to file ASCDUMP.DAT. Format of this file is shown in Table 13-1.

SDB

This procedure is the main program that creates the SPROFILE. This program can either read in ASCDUMP.DAT which is created by ASC2MDS.EXE, or it accepts soil data input from the keyboard. It calls the functions: GETCROP, READASC, INUSER, PRPT_OTHER, DATA_OK, SHOW_IN, EDIT_IN, DO_CALC, and WRITE_OUTPUT to perform data checking and calculation, and stores the results to the SPROFILE of the selected crop.

GETCROP

This procedure allows the user to select the crop that the created soil profile will be used for.

READASC

This procedure reads in file ASCDUMP.DAT.

INUSER

This procedure calls the routines that allow the user to manually input the required soil data for adding to SPROFILE. The routine includes: GET_SLOPE_COLOR, GET_PERM, GET_DRAIN, GET_DEPTHS, GET_HORIZON, GET_PERCS, GET_STO, GET_OC, GET_BD, GET_PH, GET_AL, and GET_ROOT_QUAN.

PRPT_OTHER

This procedure prompts the user for the other information that simulates the nitrogen routine of the crop models.

DATA_OK

This procedure calls the routines necessary to check the input data for missing or invalid values. The routines include CHK_SSC, CHK_OC, CHK_BD, CHK_STO, CHK_AL, and CHK_PH.

SHOW_IN

This procedure displays the current input values on the screen so that users may verify their inputs.

EDIT_IN

This procedure displays a menu from which the user can select the data items that need to be re-entered. If the user chooses to input the values again, the input routines listed under the procedure INUSER will be called.

DO_CALC

This procedure calls the routines necessary to calculate the soil profile values. The routines includes: TRANSFER, CALC_WATER, CALC_WR, CALC_SALB, CALC_SWCON, CALC_SWCON2, CALC_U, CALC_CN2, and CHK_LAYERS.

WRITE_OUTPUT

This procedure writes the created soil profile to the SPROFILE of the selected crop.

GET_SLOPE_COLOR

This routine obtains the values for percentage slope of the land and the color of the top soil layer.

GET_PERM

This routine obtains the permeability code value for the soil.

GET_DRAIN

This routine obtains the drainage code value for the soil.

GET_DEPTHS

This routine obtains the various layer depths for the soil.

GET_HORIZON

This routine obtains the horizon designation information for each layer of the soil.

GET_PERCS

This routine obtains the percentages for sand, silt, and clay for each layer of the soil.

GET_STO
This routine obtains the values for coarse fractions that are greater than 2 mm for each layer of the soil.

GET_OC
This routine obtains the values for organic carbon for each layer of the soil.

GET_BD
This routine obtains the values for bulk density and 1/3 bar for each layer of the soil.

GET_PH
This routine obtains the values for pH in water for each layer of the soil.

GET_AL
This routine obtains the values for aluminum saturation for each layer of the soil.

GET_ROOT_QUAN
This routine obtains the codes for root quantity information for each soil layer.

CHKSSC
This routine checks the percentages of sand, silt, and clay for each layer of the soil. If there is enough information, it estimates any missing values.

CHK_OC
This routine checks the organic carbon values for each soil layer. If there is enough information, it estimates any missing values.

CHK_BD
This routine checks the values for bulk density and 1/3 bar for each soil layer. If there is enough information, it estimates any missing values.

CHK_STO
This routine checks the values for coarse fractions that are greater than 2 mm for each layer of the soil. If there is enough information, it estimates any missing values.

CHK_AL
This routine checks the values for aluminum saturation for each layer of the soil. If there is enough information, it estimates any missing values.

CHK_PH
This routine checks the values for pH in water for each layer of the soil. If there is enough information, it estimates any missing values.

ESTVALF
This routine estimates floating point values by taking the average values in the layers above and below the missing value.

TRANSFER
This routine transfers values from the input data that need no altering calculations to the output data structure.

CALC_WATER
This procedure calls routines necessary to calculate values for lower limit (LL), drain upper limit (DUL), and saturated water content (SAT).

CALC_WR

This procedure calculates values for the weighting factor which determines each layer's new root growth distribution (WR).

CALC_SALB

This procedure calculates the value for bare soil albedo (SALB).

CALC_SWCON

This procedure calculates the value for the soil water conductivity constant (SWCON).

CALC_SWCON2

This procedure calculates the value for SWCON2.

CALC_U

This routine calculates the value for the upper limit of stage one soil evaporation (U).

CALC_CN2

This routine calculates the value for CN2 (curve number input used to calculate daily runoff).

CHK_LAYERS

This routine checks the depths of each soil layer and splits any that are considered too thick.

Table 13-1. Format of ASCDUMP.DAT

Variable	Column #	Format	Description
Format for line 1:			
IDPED	1 - 7	99P9999	Pedon ID Number. The first two digits are soil sample year followed by string "P" and the last four digits are number assigned by SCS.
SLOPE	9- 10	I2	% Slope.
TAV	12 - 14	I3	Average ambient air temperature.
PERM	16 - 16	I1	Permeability code.
DRAIN	18 - 18	I1	Drainage code.
COLOR	20 - 21	A2	Color code for top layer of soil.
SOILNAME	23 - 118	A96	Soil classification.
Format for other lines:			
LAYER	1 - 2	I2	Layer number.
UPPER	4 - 6	I3	Upper layer depth.
LOWER	7 - 9	I3	Lower layer depth.
HORIZON	11 - 12	A2	Horizon designation.
ROOTQUAN	14 - 15	A2	Description of root quantity.
CLAY	17 - 20	F4.1	% Clay.
SILT	22 - 25	F4.1	% Silt.
SAND	27 - 30	F4.1	% Sand.
OC	32 - 36	F5.2	Organic Carbon.
ALSAT	38 - 42	F5.1	AL Saturation.
PHH2O	44 - 47	F4.1	Default pH of soil layer in 1:1 soil:water slurry.
D3	49 - 53	F5.2	Bulk density 1/3 bar.
TCFRAG	55 - 59	F5.0	% Stone.

Example:

```
82P0367,01,027,4,5,BN,Coarse-loamy,  siliceous,  isohyperthermic
Typic  Natrustalf
1,   0,  13,AP,C#,  3.2,18.3,77.9,  0.42,  -3.0,  5.6,  1.66,   -3.
2,  13,  30,AP,F#,  8.5,14.1,77.4,  0.32,  -3.0,  5.1,  1.68,   -2.
3,  30,  62,BA,F#,[illegible],[illegible],73.4,  0.17,  -3.0,  4.7,  1.58,   -3.
4,  62,  84,BA,F#,  [illegible],[illegible],73.6,  0.13,  -3.0,  5.4,  1.55,   -3.
5,  84,100,BT,F#,[illegible],[illegible],70.5,  0.17,  -3.0,  6.7,  1.76,   -3.
6,100,140,BT,FF,[illegible],[illegible],65.9,  0.15,  -3.0,  9.0,  1.63,   -1.
7,140,180,BT,##,14.5,16.2,69.3,  0.13,  -3.0,  8.7,  1.57,   -3.
```

Figure 13-1. Control Flow Diagram for Soil Retrieval for Crop Model - Part 1

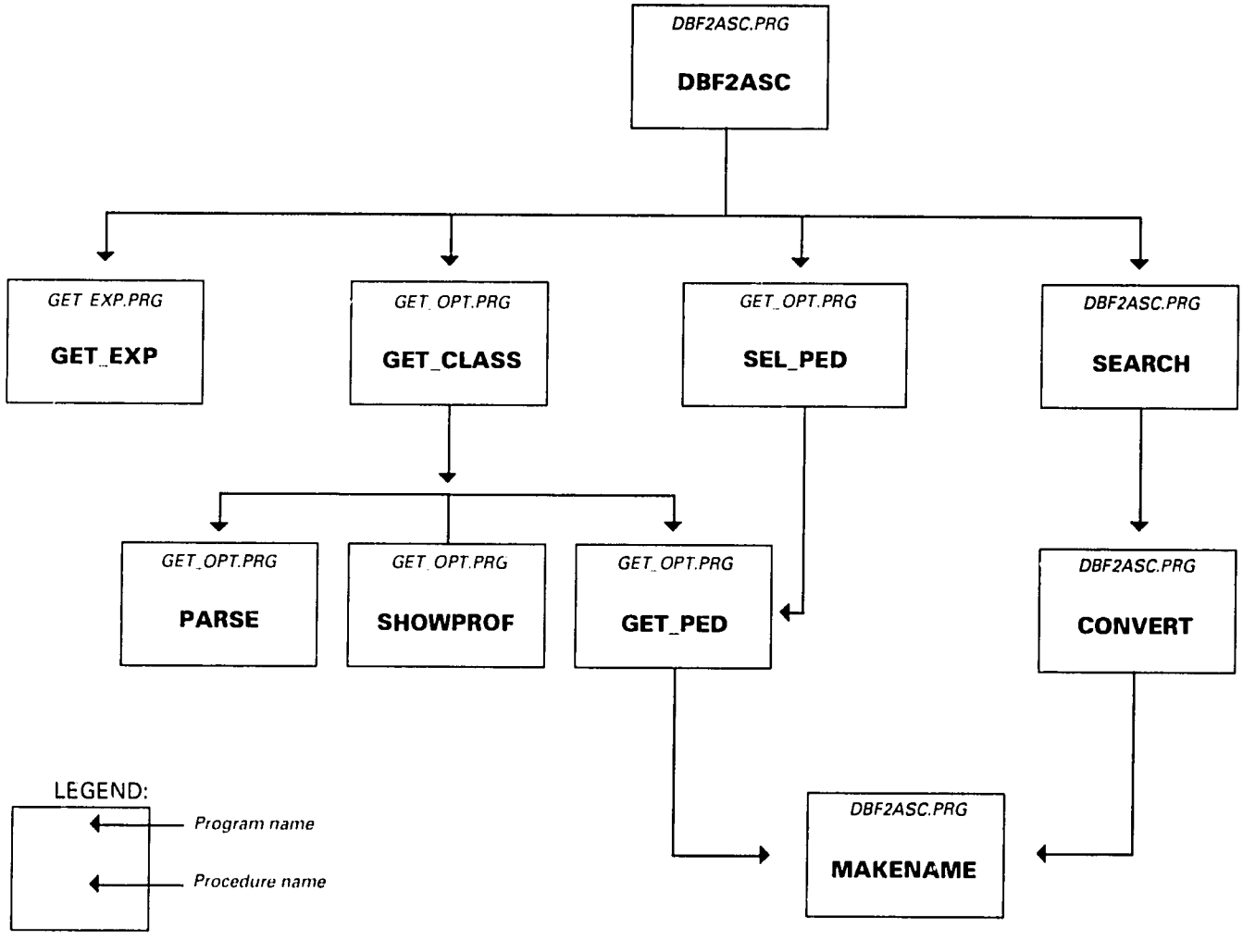
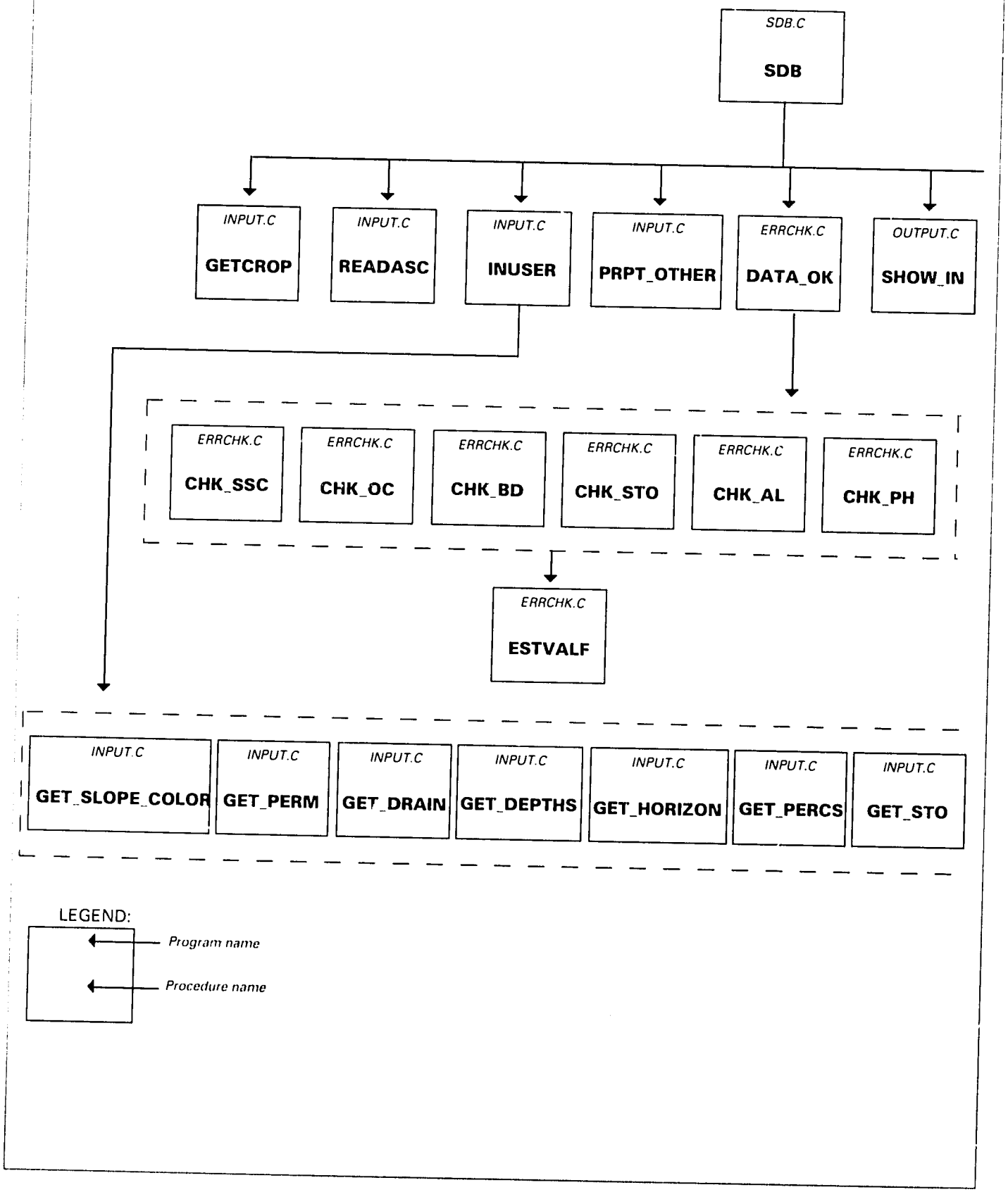
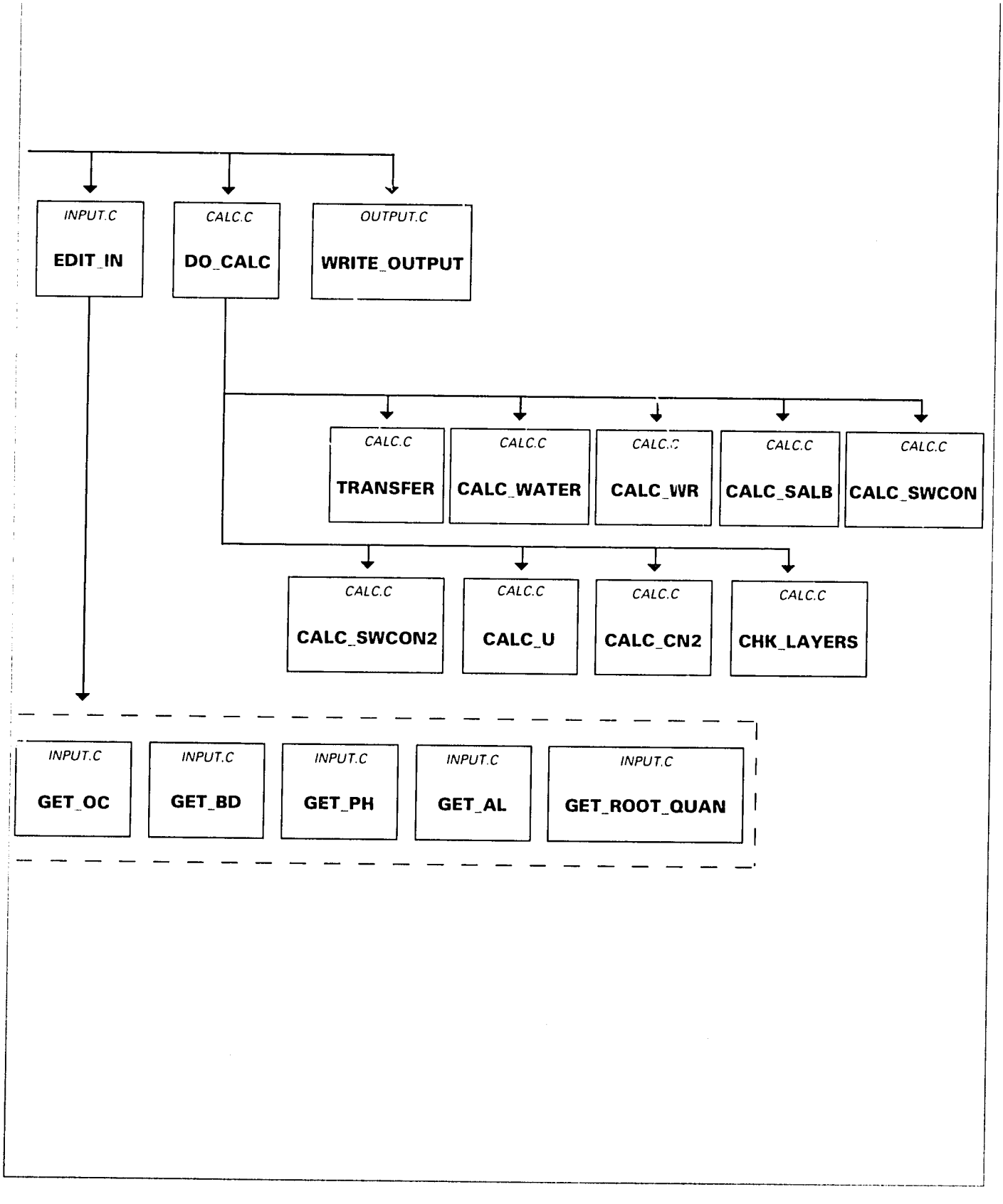


Figure 13-1. Control Flow Diagram for Soil Retrieval for Crop Model - Part 2




INPUT.C
EDIT_IN
CALC.C
DO_CALC
OUTPUT.C
WRITE_OUTPUT
CALC.C
TRANSFER
CALC.C
CALC_WATER
CALC.C
CALC_WR
CALC.C
CALC_SALB
CALC.C
CALC_SWCON
CALC.C
CALC_SWCON2
CALC.C
CALC_U
CALC.C
CALC_CN2
CALC.C
CHK_LAYERS
INPUT.C
GET_OC
INPUT.C
GET_BD
INPUT.C
GET_PH
INPUT.C
GET_AL
INPUT.C
GET_ROOT_QUAN

CHAPTER 14

MDS Retrieval for Crop Model Programs

The MDS Retrieval for the Crop Model programs retrieves data from the Experiment Data Base and Weather Data Base to create input files for the crop models. Detailed description of the crop model input files is provided in IBSNAT Technical Report 5: *Documentation for IBSNAT Crop Model Input & Output Files, 1990, version 1.1.*

Language

The MDS Retrieval for the Crop Models is written in C. Windowing routines are based on a modified version of C-Windowing Toolbox provided by Christopher McVicar through PC-SIG. It also includes dBASE file access routines from CODE BASE 3 provided by Sequiter Software Inc.

Compiler

The program is compiled with Turbo C version 1.5.

Source Codes

RETRIEVE.H, RETRIEVE.C, EXP_RETR.C, WEA_RETR.C, CODEGET_DATA.C, FILE4.C, FILE5.C, FILE6.C, FILE7.C, FILE8.C, FILEA.C, FILEA_MZ.C, FILEA_WH.C, FILEA_SB.C, FILEA_PN.C, FILEB.C, FILEB_MZ.C, FILEB_SB.C, FILEB_PN.C, CUL_SOIL.C, TRACE.C, HELP.C, DOSHELP.C, CHRONO.OBJ, FILEIO.OBJ, WMENU.OBJ, C_WINDOW.OBJ.

Executable Program

The executable program name is RETRIEVE.EXE.

Program Location

MDS Retrieval for Crop Model programs can be located in any directory. Location of programs can be defined during the installation process or using the "SETUP" option in the DSSAT Main Menu.

Input/ Output

MDS Retrieval for the Crop Models retrieves data from the Experiment Data Base and Weather Data Base to create crop model input files: FILE 1, FILE 4, FILE 5, FILE6, FILE 7, FILE 8, FILE A, and FILEB. Moreover, it adds the file names information to the crop model directory files EXP.DIR and WTH.DIR.

Retrieval Logic

As discussed in previous chapters, the minimum data sets (MDS) are stored in dBASE III files. If a user wants to run a crop model simulation program using the MDS, the MDS Retrieval for the crop models should be run to create the crop model input files in ASCII format. The Retrieval program obtains the required data from the selected data set and uses it to conduct a series of calculations before it writes the result to the ASCII files. The calculations include converting unit measurements, computing treatment averages, and doing simple mathematic calculations.

Since data are recorded in the data base by plot, and the crop model files require data reported by treatment, the Retrieval program computes treatment average for each data item using the following procedure.

1. Searches information in Form F-3 and identifies the plot numbers for each treatment.

2. Adds the retrieved values that have the same treatment number.

3. Divides the result computed in step two by number of plots under the same treatment.

The logic behind the calculations will be explained in detail in the following tables. In each of the tables, the source of the value retrieved, and the computations of the retrieved value, are listed under column headings "Source" and "Formula" respectively.

Table 14-1. Logic Used for Retrieving Data for File 1

Variable	Format	Source	Formula
Line 1:			
INSTW	A2	Form C	Institute ID.
STATW	A2	Form C	Station ID.
XLAT	1X,F6.2	Form C	The latitude that is stored in degree and minutes in the data base will be converted to degree value. If the latitude direction is south, the latitude will be changed to negative value.
XLONG	1X,F6.2	Form C	The longitude that is stored in degree and minutes in the data base will be converted to degree value.
PARFAC	1X,F5.2		Retrieval program assigns a default value of 12.07.
PARDAT	1X,F5.2		Retrieval program assigns a default value of 0.
Other lines:			
INSTS	A2	Form C-1	Institute ID.
STATW	A2	Form C-1	Station ID.
IYR	1X,I2	Form C-1	Extracts the last two digits of the year.
JUL	1X,I3	Form C-1	Converts the calendar date to Julian.
SOLRAD	1X,F5.2	Form C-1	If the solar radiation in the data base is stored in cal/cm^2, it will be converted to MJ/m^2 using this equation: MJ = cal * 86.4 /2065.
XTMAX	1X,F5.1	Form C-1	If maximum temperature is stored in °F, it will be converted to °C using this equation: °C = (°F - 32) * (5 / 9).
XTMIN	1X,F5.1	Form C-1	If minimum temperature is stored in °F, it will be converted to °C.
XRAIN	1X,F5.1	Form C-1	If precipitation is stored in inches, it will be converted to millimeter using this equation: mm = in * 25.4.
XPAR	1X,F6.2		This value is not retrieved by the Retrieval program.

Table 14-2. Logic Used for Retrieving Data for File 4

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Institute ID.
SITES	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Retrieves the treatment number.
STRAW	1X,F5.0	Form H	Takes the amount of residue. If it is missing (i.e. -9 is recorded), Retrieval program will assign a default value of 1000.
SDEP	1X,F5.0	Form H	Takes the depth of residue. If it is missing (i.e. -9 is recorded), Retrieval program will assign a default value of 15.
SCN	1X,F5.0	Form H	Retrieval program assigns a value depending on the type of residue. The types of residue and their corresponding values are listed at the end of this table. If residue type is missing, Retrieval program assigns a default value of 75.
ROOT	1X,F5.0		Computes by multiplying STRAW by 0.1.

Type of Residue	SCN
Barnyard manure (rotted)	20
Bean/soybean/peanut	15
Clover	23
Others	75
Green grass	36
Green rye	36
Maize (green)	32
Maize (stover dry)	60
Pine	286
Sawdust	400
Sweet clover (young)	12
Tomato	45

Table 14-3. Logic Used for Retrieving Data for File 5

Variable	Format	Source	Formula
Line 1:			
TRTNO	I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
INSTS	1X,A2		Institute ID.
SITES	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
Other lines:			
DLAYR	F6.0	Form J-1 I-1 or SPROFILE	Takes the lower and upper layers defined in Form J-1, I-1 or SPROFILE. (The layer depths are constant for all treatments).
SW	1X,F6.3	Form J-1	Divides the treatment average of volumetric soil water content value by 100.
*NH4	1X,F4.1	Form I-1	Takes the treatment average of NH_4
*NO3	1X,F4.1	Form I-1	Takes the treatment average of NO_3
*PH	1X,F4.1	Form I-1	Takes the treatment average of H_2O

*Format of these values will be changed to F5.1 if overflow occurs in the result of calculations.

Table 14-4. Logic Used for Retrieving Data for File 6

Variable	Format	Source	Formula
Line 1:			
TRTNO	I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
INSTE	1X,A2		Institute ID.
SITEE	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
Other lines:			
JDLAPL	I4	Form P	Converts the calendar date of irrigation to Julian date.
AMT	1X,F4.0	Form P	Takes the treatment average of irrigation amount.

Table 14-5. Logic Used for Retrieving Data for File 7

Variable	Format	Source	Formula
Line 1:			
TRTNO	A2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
INSTE	1X,A2		Institute ID.
SITEE	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
Other lines:			
JFDAY	I4	Form N	Searches for the date that nitrogen fertilizer is applied. If it is found, converts calendar date to Julian date.
AFERT	1X,F5.1	Form N	Takes the treatment average of fertilizer nitrogen added.
DFERT	1X,F5.1	Form N	Takes the value of depth.
IFTYPE	1X,I2	Form N	Takes the material code. If material code greater than 26, assigns value of 5 and sends a warning message to the error report.

Table 14-6. Logic Used for Retrieving Data for File 8

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
TITLET	X,A40	Form F-4 & F-1	Concatenates the level code and the factor descriptionfor this treatment.
ISOILT	1X,I4	SPROFILE	Obtains sequence number form SPROFILE by searching & Form D through the file for a matched soil classification that is found in Form D. If there is no match, Retrieval program will prompt for the user's input. (This value is constant for all treatments.)
IVARTY	1X,I4	GENETICS & Form M	Obtains a variety number form GENETICS by searching through the file for a matched cultivar name that is found in Form M. If there is no match, Retrieval program will prompt for the user's input.
Line 2:			
ISIM	I4	Form E	Converts the beginning date of experiment from calendar to Julian.

Table 14-6. Logic Used for Retrieving Data for File 8 *(cont.)*

Variable	Format	Source	Formula
ISOW	1X,I3	Form M	Converts the planting date from calendar to Julian.
PLANTS	1X,F6.2	Form R-2 & Form M	The searching logic for this value is done with the following order: 1. Takes the treatment average for plant populations of harvest area (i.e. data with harvest code 1); or 2. If the planting method in Form M indicated as row planting, value is computed by: treatment average of plant count / (treatment average of row spacing / 100); or 3. If the planting method in Form M is not indicated as row planting, treatment average of plant count is used.
ROWSPC	1X,F6.3	Form M	The searching logic for this value is done in the following order: 1. If the planting method in Form M is indicated as row planting, divides the treatment average of row spacing by 100. 2. If the planting method in Form M is not indicated as row planting, treatment average of plant count is used.
SDEPTH	1X,F5.2	Form M	Takes the value of sowing depth.
IIRR	1X,I2	Form P	Retrieval program assigns a value of 2 if the experiment is irrigated (i.e. data are presented in Form P); otherwise, a value of 1 is assigned. (This value is constant for all treatment.)
ISWNIT	1X,I2	Form N	Retrieval program assigns a value of 1 if nitrogen fertilizer are applied to the experiment (i.e. data for nitrogen are presented in Form N); otherwise, a value of 0 is assigned. (This value is constant for all treatment.)
EFFIRR	1X,F6.2		Retrieval program assigns a default value of 1.
DSOIL	1X,F5.2		Retrieval program assigns a default value of 0.5.
THETAC	1X,F6.1		Retrieval program assigns a default value of 40.
PHINT	1X,F6.2		Retrieval program assigns a default value of 95.
IPHN	1X,I2		Retrieval program assigns a default value of 0.

Data items in File A and B are crop dependent. The following tables will explain the retrieval logic for each crop. To simplify the display of the calculations, codes are used in the equations. Please refer to the end of each table for description of the codes.

Table 14-7. Logic Used for Retrieving Data for File A (Maize)

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Institute ID.
SITES	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Obtains the treatment number and identifies all plot number under this treatment.
XYIELD	1X,F7.0	Form R-2	Value is computed using the following formula: 1. (10 * C5R7) / 0.845; or 2. 10 * C4R7
XGRWT	1X,F7.4	Form R-2	Value is computed using the following formula: 1. (C5R7 / C6R7); or 2. (C4R7 / C6R7 * 0.845)
XGPSM	1X,F6.0	Form R-2	C6R7
XGPE	1X,F4.0	Form R-2	C6R7 / C7R7
XLAI	1X,F5.2	Form R-2	C13R1
XBIOM	1X,F6.0	Form R-2	10 * C3R7
XSTRAW	1X,I6.0	Form R-2	Value is computed using the following formula: 1. (C3R7 - C5R7) * 10; or 2. C3R7 - (C4R7 * 0.845) * 10; or 3. (C8R7 + C9R7 + C10R7 + C11R7) * 10.
ISLKJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R1 to Julian.
MATJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R6 to Julian.
Line 2:			
GRPCTN	F6.2	Form S	N15
XTOTNP	1X,F5.1	Form R-2 & S	Value is computed using the following formula: 1. XAPTNP + XGNUP; or 2. C3R7 * N23 * 0.1
XAPTNP	11X,F5.1	Form R-2 & S	Value is computed using the following formula: 1. N17 * 0.01 * XSTRAW; or 2. [(C8R7 * N9) + (C9R7 * N10) + (C10R7 * N16) + (C11R7 * N8)] * 0.1.
XGNUP	1X,F5.1	Form R-2	Value is computed using the following formula: 1. N15 * 0.1 * C5R7; or 2. N15 * 0.1 * (C4R7 * 0.845).

Table 14-7. Logic Used for Retrieving Data for File A (Maize)

(cont.)

Codes:

C3R7	=	Takes treatment average of amounts with harvest code 3 (aboveground biomass) at growth stage R7 or R6.
C4R7	=	Takes treatment average of amounts with harvest code 4 (undried seed weight) at growth stage R7 or R6.
C5R7	=	Takes treatment average of amounts with harvest code 5 (dry seed weight) at growth stage R7 or R6.
C6R7	=	Takes treatment average of amounts with harvest code 6 (seed number) at growth stage R7 or R6.
C7R7	=	Takes treatment average of amounts with harvest code 7 (ear number) at growth stage R7 or code 1 (plant population) at growth stage R6.
C13R1	=	Takes treatment average of amounts with harvest code 13 (leaf area index) at growth stage R1.
N8	=	Takes treatment average of amounts of N nutrient with component code 8 (husk) during the period of 10 days before and after the growth stage R7 or R6.
N9	=	Takes treatment average of amounts of N nutrient with component code 9 (leaf blade) during the period of 10 days before and after the growth stage R7 or R6.
N10	=	Takes treatment average of amounts of N nutrient with component code 10 (leaf sheath) during the period of 10 days before and after the growth stage R7 or R6.
N15	=	Takes treatment average of amounts of N nutrient with component code 15 (seed or grain) during the period of 10 days before and after the growth stage R7 or R6.
N16	=	Takes treatment average of amounts of N nutrient with component code 16 (stem) during the period of 10 days before and after the growth stage R7 or R6.
N17	=	Takes treatment average of amounts of N nutrient with component code 17 (stover) or 18 (straw) during the period of 10 days before and after the growth stage R7 or R6.
N23	=	Takes treatment average of amounts of N nutrient with component code 23 (whole aboveground plant) during the period of 10 days before and after the growth stage R7 or R6.

Table 14-8. Logic Used for Retrieving Data for File B (Maize)

Variable	Format	Source	Formula
Line 1:			
		Form F-3	Obtains treatment information form Form F-3.
Line 2:			
			Retrieval program assigns a string '7 3 4 5 6 7 8 2'.
Other lines:			
JULDATE	I3	Form R-2	Converts calendar date to Julian date.
LEAFNO	1X,F6.1	Form R-2	C14
LAI	1X,F5.2	Form R-2	C13
ROOTWT	1X,F6.1	Form R-2	C12 / Plant Pop.
STEMWT	1X,F7.1	Form R-2	C10 / Plant Pop.
GRDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. C5 / Plant Pop.; or 2. (C4 * 0.845) / Plant Pop.
LFDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. (C8 + C9) / Plant Pop. ; or 2. If growth stage is earlier than V6, C3 / Plant Pop.
XBIOMS	1X,F7.1	Form R-2	C3

Codes:

Plant Pop.	=	Takes the value of plant population from FILE 8.
C3	=	Takes treatment average of amounts with code 3 (aboveground biomass).
C4	=	Takes treatment average of amounts with code 4 (seed weight).
C5	=	Takes treatment average of amounts with code 5 (dry seed weight).
C8	=	Takes treatment average of amounts with code 8 (leaf blade weight).
C9	=	Takes treatment average of amounts with code 9 (leaf sheath weight).
C10	=	Takes treatment average of amounts with code 10 (stem + tassel weight).
C12	=	Takes treatment average of amounts with code 12 (root weight).
C13	=	Takes treatment average of amounts with code 13 (leaf area index).
C14	=	Takes treatment average of amounts with code 14 (leaf number).

Table 14-9. Logic Used for Retrieving Data for File A (Peanut)

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Institute ID.
SITES	A2		Site ID.
YEAR	I2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
XYIELD	1X,F7.1	Form R-2	10 * C5R8
XSDWT	1X,F7.4	Form R-2	C5R8 / C6R8

Table 14-9. Logic Used for Retrieving Data for File A (Peanut)

(cont.)

Variable	Format	Source	Formula
XSDSM	1X,F6.0	Form R-2	Value is computed using the following formula: 1. XYIELD / (XSDWT * 10);.or 2. C6R8
*XSPP	1X,F4.2	Form R-2	C6R8 / C7R8
XLAIR4	1X,F5.2	Form R-2	MAX13
XBIOM	1X,F6.0	Form R-2	Value is computed using the following formula: 1. 10 * C3R8; or 2. 10 * (C5R8 + C8R8 + C9R8 + C10R8 + C11R8) <C9R8 and C11R8 are optional>.
XSTALK	1X,F6.0	Form R-2	10 * (C9R8 + C10R8) <C9R8 is optional>.
IFLRJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R1 to Julian.
MATJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R7 to Julian.
Line 2			
IFFSP	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R4 to Julian.
IFFS	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R6 to Julian.
DPYLD	1X,I7	Form R-2	(C5R8 + C11R8) * 10
XPCMAT	1X,F6.2		Retrieval program assigns a default value of -9.

*If the result of computation is overflow, format of the value will be changed to F4.1.

Codes:

C3R8 = Takes the treatment average of amounts with harvest code 3 (aboveground biomass) at growth stage R8 or R9.

C5R8 = Takes the treatment average of amounts with harvest code 5 (seed weight) at growth stage R8 or R9.

C6R8 = Takes the treatment average of amounts with harvest code 6 (seed number) at growth stage R8 or R9.

C7R8 = Takes the treatment average of amounts with harvest code 7 (pod number) at growth stage R8 or R9.

C8R8 = Takes the treatment average of amounts with harvest code 8 (leaf blade weight) at growth stage R8 or R9.

C9R8 = Takes the treatment average of amounts with harvest code 9 (petiole weight) at growth stage R8 or R9.

C10R8 = Takes the treatment average of amounts with harvest code 10 (stem weight) at growth stage R8 or R9.

C11R8 = Takes the treatment average of amounts with harvest code 11 (empty shell weight) at growth stage R8 or R9.

MAX13 = Takes the maximum value of all treatment averaged amounts with harvest code 13 (leaf area index).

Table 14-10. Logic Used for Retrieving Data for File B (Peanut)

Variable	Format	Source	Formula
Line 1:			
		Form F-3	Obtains treatment information from Form F-3.
Line 2:			
			Retrieval program assigns a string of '16 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16'.
Other lines:			
JULDATE	I3	Form R-2	Converts calendar data to Julian date.
VSTAGE	1X,F4.1	Form R-2	Takes the average value of V-stages for this treatment and date. For growth stage Vx, x is the number averaged.
LAI	1X,F5.2	Form R-2	C13
PODNUM	1X,F6.1	Form R-2	C7
STDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. (C10 + C9) * 10; or 2. C10 * 10.
SDDRYWT	1X,F7.1	Form R-2	C5 * 10
LFDRYWT	1X,F7.1	Form R-2	C8 * 10
CNDRYWT	1X,F8.1	Form R-2	Value is computed using the following formula: 1. C3 * 10; or 2. (C5 + C8 + C9 + C10 + C11) * 10 <C9 and C11 are optional >.
PODWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. (C5 + C11) * 10; or 2. C11 * 10
SHELLWT	1X,F7.1	Form R-2	C11 * 10
ROOTWT	1X,F7.1	Form R-2	C12 * 10
SEEDNO	1X,F7.1	Form R-2	C6
*HARVIX	1X,F5.3	Form R-2	Value is computed using the following formula: 1. C5 / C3; or 2. C5 / (C5 + C8 + C9 + C10 + C11).
SHELL	1X,F5.1	Form R-2	100 * (C5 / (C5 + C11))
SLA	1X,F6.1	Form R-2	(C13 / C8) * 10000
SEEDSIZE	1X,F6.1	Form R-2	(C5 / C6) * 1000
NIT	1X,F5.2	Form R-2 & Form S	N9

*If the value is -9, format will be changed to F5.1.

Codes:

C3 = Takes the treatment average of amounts with harvest code 3 (aboveground biomass).

C5 = Takes the treatment average of amounts with harvest code 5 (dry seed weight).

C6 = Takes the treatment average of amounts with harvest code 6 (seed number).

Table 14-10. Logic Used for Retrieving Data for File B (Peanut)

(cont.)

Codes:

C7	=	Takes the treatment average of amounts with harvest code 7 (pod number).
C8	=	Takes the treatment average of amounts with harvest code 8 (leaf blade weight).
C9	=	Takes the treatment average of amounts with harvest code 9 (petiole weight).
C10	=	Takes the treatment average of amounts with harvest code 10 (stem weight).
C11	=	Takes the treatment average of amounts with harvest code 11 (empty shell weight).
C12	=	Takes the treatment average of amounts with harvest code 12 (root weight).
C13	=	Takes the treatment average of amounts with harvest code 13 (leaf area index).
N9	=	Takes the treatment average for amounts of nutrient N with component code 9 (leaf blade).

Table 14-11. Logic Used for Retrieving Data for File A (Soybean & Dry Bean)

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Institute ID.
SITES	A2		Site ID.
YEAR	I2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
XYIELD	1X,I7	Form R-2	10 * C5R8
XSDWT	1X,F7.4	Form R-2	C5R8 / C6R8
XSDSM	1X,I6	Form R-2	Value is computed using the following formula: 1. XYIELD / (XSDWT * 10.0); or 2. C6R8.
*XSPP	1X,I4.2	Form R-2	C6R8 / C7R8
XLAIR4	1X,F5.2	Form R-2	MAX13
XBIOM	1X,I6	Form R-2	Value is computed using the following formula: 1. 10 * C3R8; or 2. 10 * (C5R8 + C8R8 + C9R8 + C10R8 + C11R8) <C9R8 and C11R8 are optional>.
XSTALK	1X,I6	Form R-2	(C9R8 + C10R8) * 10 <C9R8 is optional>.
IFLRJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R1 to Julian.
MATJD	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R7 to Julian.
Line 2:			
IFFSP	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R3 to Julian.
IFFS	1X,I3	Form R-1 or R-2	Converts calendar date of growth stage R4 to Julian.
XPDYLD	1X,I7	Form R-2	(C5R8 + C11R8) * 10

*If the result of computation is overflow, format of the value will be changed to F4.1.

Codes:

C3R8 = Takes the treatment average of amounts with harvest code 3 (aboveground biomass) at growth stage R8 or R7.

C5R8 = Takes the treatment average of amounts with harvest code 5 (seed weight) at growth stage R8 or R7.

C6R8 = Takes the treatment average of amounts with harvest code 6 (seed number) at growth stage R8 or R7.

C7R8 = Takes the treatment average of amounts with harvest code 7 (pod number) at growth stage R8 or R7.

C8R8 = Takes the treatment average of amounts with harvest code 8 (leaf blade weight) at growth stage R8 or R7.

C9R8 = Takes the treatment average of amount with harvest code 9 (petiole weight) at growth stage R8 or R7.

Table 14-11. Logic Used for Retrieving Data for File A (Soybean & Dry Bean) *(cont.)*

Codes:

C10R8	=	Takes the treatment average of amounts with harvest code 10 (stem weight) at growth stage R8 or R7.
C11R8	=	Takes the treatment average of amounts with harvest code 11 (empty shell weight) at growth stage R8 or R7.
MAX13	=	Takes the maximum values of all treatment averaged amounts with harvest code 13 (leaf area index).

Table 14-12. Logic Used for Retrieving Data for File B (Soybean & Dry Bean)

Variable	Format	Source	Formula
Line 1:			
Line 2:		Form F-3	Obtains treatment information from Form F-3.
			Retrieval program assigns a string of '16 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16'.
Other lines:			
JULDATE	I3	Form R-2	Converts calendar date to Julian date.
VSTAGE	1X,F6.1	Form R-2	Takes the average value of all V-stages for the treatment and date. For Vx growth stage, x is the number averaged.
LAI	1X,F5.2	Form R-2	C13
PODNUM	1X,F6.1	Form R-2	C7
STDRYWT	1X,F7.1	Form R-2	(C9 + C10) * 10 <C9 is optional>.
SDDRYWT	1X,F7.1	Form R-2	C5 * 10
LFDRYWT	1X,F7.1	Form R-2	C8 * 10
CNDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. C3 * 10; or 2. (C5 + C8 + C9 + C11) * 10 <C9 and C11 are optional>.
PODWT	1X,I7.1	Form R-2	(C5 + C11) * 10 <C5 is optional>.
SHELLWT	1X,F7.1	Form R-2	C11 * 10
RTDRWT	1X,I7.1	Form R-2	C12 * 10
SEEDNO	1X,F7.1	Form R-2	C6
*HARVIX	1X,F5.3	Form R-2	Value is computed using the following formula: 1. C5 / C3; or 2. C5 / (C5 + C8 + C9 + C10 + C11).
SHELL	1X,F5.1	Form R-2	C5 / (C5 + C11) * 100
SLA	1X,F5.0	Form R-2	(C13 / C8) * 10,000
SEEDSIZE	1X,F6.1	Form R-2	(C5 / C6) * 1000
NIT	1X,F5.2	Form S	N9

*If value is -9, format of the value will be changed to F5.1.

Codes:

C3 = Takes the treatment average of amounts with harvest code 3 (aboveground biomass).

C5 = Takes the treatment average of amounts with harvest code 5 (seed weight).

C6 = Takes the treatment average of amounts with harvest code 6 (seed number).

C7 = Takes the treatment average of amounts with harvest code 7 (pod number).

C8 = Takes the treatment average of amounts with harvest code 8 (leaf blade weight).

Table 14-12. Logic Used for Retrieving Data for File B (Soybean & Dry Bean)*(cont.)*

Codes:

C9	=	Takes the treatment average of amounts with harvest code 9 (petiole weight).
C10	=	Takes the treatment average of amounts with harvest code 10 (stem weight).
C11	=	Takes the treatment average of amounts with harvest code 11 (empty shell weight).
C12	=	Takes the treatment average of amounts with harvest code 12 (root weight).
C13	=	Takes the treatment average of amounts with harvest code 13 (leaf area index).

Table 14-13. Logic for File A (Barley, Millet, Rice, Sorghum & Wheat)

Variable	Format	Source	Formula
Line 1:			
INSTS	A2		Institute ID.
SITES	A2		Site ID.
YEAR	A2		Year of experiment.
EXPTNO	I2		Experiment number.
TRTNO	1X,I2	Form F-3	Obtains the treatment number and identifies all plot numbers under this treatment.
XYIELD	1X,F7.0	Form R-2	Value is computed using the following formula: 1. (10 * C5S93); or 2. (10 * C4S93).
XGRWT	1X,F7.4	Form R-2	Value is computed using the following formula: 1. C5S93 / C6S93; or 2. C4S93 / C6S93.
XGPSM	1X,F7.0	Form R-2	C6S93
XGPE	1X,F5.0	Form R-2	C6S93 / C7S93
XLAI	1X,F5.2	Form R-2	C13S65
XBIOM	1X,F6.0	Form R-2	10 * C3S93
XSTRAW	1X,I6.0	Form R-2	Value is computed using the following formula: 1. (C3S93 - C5S93) * 10; 2. (C3S93 - C4S93) * 10; or 3. (C8S93 + C9S93 + C10S93 + C11S93) * 10.
ISLKJD	1X,I3	Form R-1 or R-2	Converts calendar date with growth stage 65, 61, or 69 to Julian date.
MATJD	1X,I3	Form R-1 or R-2	Converts calendar date with growth stage 87, 91, 92, or 93 to Julian date.
Line 2:			
GRPCTN	F6.2	Form S	N15
XTOTNP	1X,F5.1	Form S	Value is computed using the following formula: 1. XAPTNP + XGNUP; or 2. C3S93 * N23 * 0.1.
XAPTNP	1X,F5.1	Form S	Value is computed using the following formula: 1. N17 * 0.01 * XSTRAW; or 2. [(C8S93 * N9) + (C9S93 * N10) + (C10S93 * N16) + (C11S93 * N8)] * 0.1.
XGNUP	1X,F5.1	Form S	Value is computed using the following formula: 1. N15 * 0.1 * C5S93; or 2. N15 * 0.1 * C4S93.

Codes:

C3S93 = Takes the treatment average of amounts with harvest code 3 (aboveground biomass) at growth stage 93 or any stage between 84 to 94.

Table 14-13: Logic for File A (Barley, Millet, Rice, Sorghum & Wheat) *(cont.)*

Codes:

C4S93	=	Takes the treatment average of amounts with harvest code 4 (undried seed weight) at growth stage 93 or any stage between 84 to 94.
C5S93	=	Takes the treatment average of amounts with harvest code 5 (dry seed weight) at growth stage 93 or any stage between 84 to 94.
C6S93	=	Takes the treatment average of amounts with harvest code 6 (seed number) at growth stage 93 or any stage between 84 to 94.
C7S93	=	Takes the treatment average of amounts with harvest code 7 (panicle number) at growth stage 93 or any stage between 84 to 94.
C8S93	=	Takes the treatment average of amounts with harvest code 8 (leaf blade weight) at growth stage 93 or any stage between 84 to 94.
C9S93	=	Takes the treatment average of amounts with harvest code 9 (leaf sheath weight) at growth stage 93 or any stage between 84 to 94.
C10S93	=	Takes the treatment average of amounts with harvest code 10 (stem weight) at growth stage 93 or any stage between 84 to 94.
C11S93	=	Takes the treatment average of amounts with harvest code 11 (panicle rachis weight) at growth stage 93 or any stage between 84 to 94.
C13S65	=	Takes the treatment average of amounts with harvest code 13 (leaf area index) at growth stage 65 , 61 or 69.
N8	=	Takes the treatment average of N nutrients with component code 8 (husk).
N9	=	Takes the treatment average of N nutrients with component code 9 (leaf blade).
N10	=	Takes the treatment average of N nutrient with component code 10 (leaf sheath).
N15	=	Takes the treatment average of N nutrient with component code 15 (seed or gain).
N16	=	Takes the treatment average of N nutrient with component code 16 (stem).
N17	=	Takes the treatment average of N nutrient with component code 17 (stover).
N23	=	Takes the treatment average of N nutrient with component code 23 (whole aboveground plant).

Table 14-14. Logic for File B (Barley, Millet, Rice, Sorghum & Wheat)

Variable	Format	Source	Formula
Line 1:			
		Form F-3	Obtains treatment information from Form F-3.
Line 2:			
			Retrieval program assigns a string of ' 7 3 4 5 6 7 8 2'.
Other lines:			
JULDATE	I3	Form R-2	Converts calendar date to Julian.
LEAFNO	1X,F6.1	Form R-2	C14
LAI	1X,F5.2	Form R-2	C13
ROOTWT	1X,F6.1	Form R-2	C12 / Plant Pop.
STEMWT	1X,F7.1	Form R-2	C10 / Plant Pop.
GRDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. C5 / Plant Pop.; or 2. C4 * 0.845 / Plant Pop.
LFDRYWT	1X,F7.1	Form R-2	Value is computed using the following formula: 1. (C8 + C9) / Plant Pop.; or 2 C3 / PlantPop if growth stage is ealier than 23.
XBIOMS	1X,F7.1	Form R-2	C3

Codes:

Plant Pop.	=	Takes the calculated plant population value form File 8.
C3	=	Takes the treatment average of amounts with harvest code 3 (aboveground biomass).
C5	=	Takes the treatment average of amounts with harvest code 5 (dry seed weight).
C8	=	Takes the treatment average of amounts with harvest code 8 (leaf blade weight).
C9	=	Takes the treatment average of amounts with harvest code 9 (leaf sheath weight).
C10	=	Takes the treatment average of amounts with harvest code 10 (stem weight).
C12	=	Takes the treatment average of amounts with harvest code 12 (root weight).
C13	=	Takes the treatment average of amounts with harvest code 13 (leaf area index).
C14	=	Takes the treatment average of amounts with harvest code 14 (leaf number).

Program Procedures

The Retrieval program is made up of two main parts: the experiment data retrieval, and the weather data retrieval. The experiment data retrieval source files are named after the respective crop model input file that it creates, and the weather data retrieval source file is contained in a single file. Figure 14-1 illustrates the control flow through the various procedures.

RETRIEVE

This is the main menu for the Retrieval program. It displays the options that allow the user to retrieve experimental data, weather data, or both.

EXP_RETR

This is the main program for the experiment data retrieval portion of the Retrieval program. In this routine, the user is allowed to determine which crop model input files they want to create and whether or not they want to compile error messages on the values retrieved during the process. This routine will also call the necessary file retrieval subroutines, display the status of the retrieval processes, and then call the routine required to create the crop model input files.

WEA_RETR

This is the main program for the weather data retrieval part of the Retrieval program. In this routine, the user is allowed to select the weather station, specify the beginning and ending dates for the retrieval, and whether or not they want to compile error messages about the values retrieved. This routine will then retrieve the data and create File 1 for the crop model.

GET_EXPERIMENT

Functions of this procedure have been described in Chapter 7. Please refer to page 79.

GET_WEATHER

Functions of this procedure have been described in Chapter 10. Please refer to page 93.

GET_CULTIVAR

This routine searches Form M for the names of the cultivars used in the MDS experiment, references the existing GENETICS file to find the corresponding genotype numbers, then prompts the user to confirm that they are correct.

GET_SOIL

This routine searches Form D for the pedon number of the soil at the site of the MDS experiment, reads in the existing SPROFILE file, and allows the user to enter the soil sequence number for the soil that matches the pedon number. The user is then allowed to specify the volumetric water content "fullness" of the soil profile.

FILE4

This routine creates FILE 4, the Soil Nitrogen Balance Parameters file. It searches Form H-1 and H-2 by treatments and outputs the retrieved data to the crop model input file.

FILE5

This routine creates FILE 5, the Soil Profile Initial Conditions file. First, it searches SPROFILE, Forms I-1, and Form J-1 for the soil layer depth information. Then, it searches Form E, Form I-1, and J-1 by treatments for the soil profile water and nitrogen dynamics initial conditions for each soil layer. The data is then output by treatment and soil layers to the crop model input file.

FILE6

This routine creates FILE 6, the Irrigation Management Data file. It searches Form P by treatment, and outputs the retrieved Julian dates and irrigation amounts to the crop model input file.

FILE7

This routine creates FILE 7, the Fertilizer Management Data file. It searches Form N by treatment and outputs the retrieved Julian dates, amount, and depth of fertilizers to the crop model input file.

FILE8

This routine creates FILE 8, the Treatment Management Data file. It searches Form E, F, M, N, P, and R-2 by treatment for the soil profile number, cultivar, row spacing, sowing depth, and other information describing each treatment of an experiment. The crop management data for each treatment is averaged over all replications and then output to the crop model input file.

FILEA

This routine opens Forms R-2 and S, then calls the subroutine required to create FILE A, the Measured Crop Summary Data file. Crop experimental data will vary for each crop and are needed for the standard outputs which list simulated and measured data side-by-side. For the crop MZ, FILEA_MZ is called, for crops BN and SB, FILEA_SB is called, for the crop PN, FILEA_PN is called, and for crops WH, SG, ML, and BA, FILEA_WH is called.

FILEA_MZ

This routine searches Form R-2 and S for all of the field measured data for a maize experiment, averages it by treatment over all replications, and then outputs it to the crop model input file.

FILEA_SB

This routine searches Form R-2 and S for all of the field measured data for a dry bean or soybean experiment, averages it by treatment over all replications, and then outputs it to the crop model input file.

FILEA_PN

This routine searches Form R-2 and S for all of the field measured data for a peanut experiment, averages it by treatment over all replications, and then outputs it to the crop model input file.

FILEA_WH

This routine searches Form R-2 and S for all of the field measured data for a wheat, sorghum, millet, or barley experiment, averages it by treatment over all replications, and then outputs it to the crop model input file.

FILEB

This routine opens Form R-2 and calls the subroutine required to create FILE B, the Observed Data for Graphics file. Observation data stored in FILE B will vary for each crop and allows you to plot observed data with the simulated results for each treatment. For crops MZ, SG, WH, ML, and BA, FILEB_MZ is called, for crops BN and SB, FILEB_SB is called, and for the crop PN, FILEA_PN is called.

FILEB_MZ

This routine searches Form R-2 for all of the observed field data for a maize, sorghum, wheat, millet, or barley experiment and outputs it by Julian date to the crop model input file.

FILEB_SB

This routine searches Form R-2 for all of the observed field data for a dry bean or soybean experiment and outputs it by Julian date to the crop model input file.

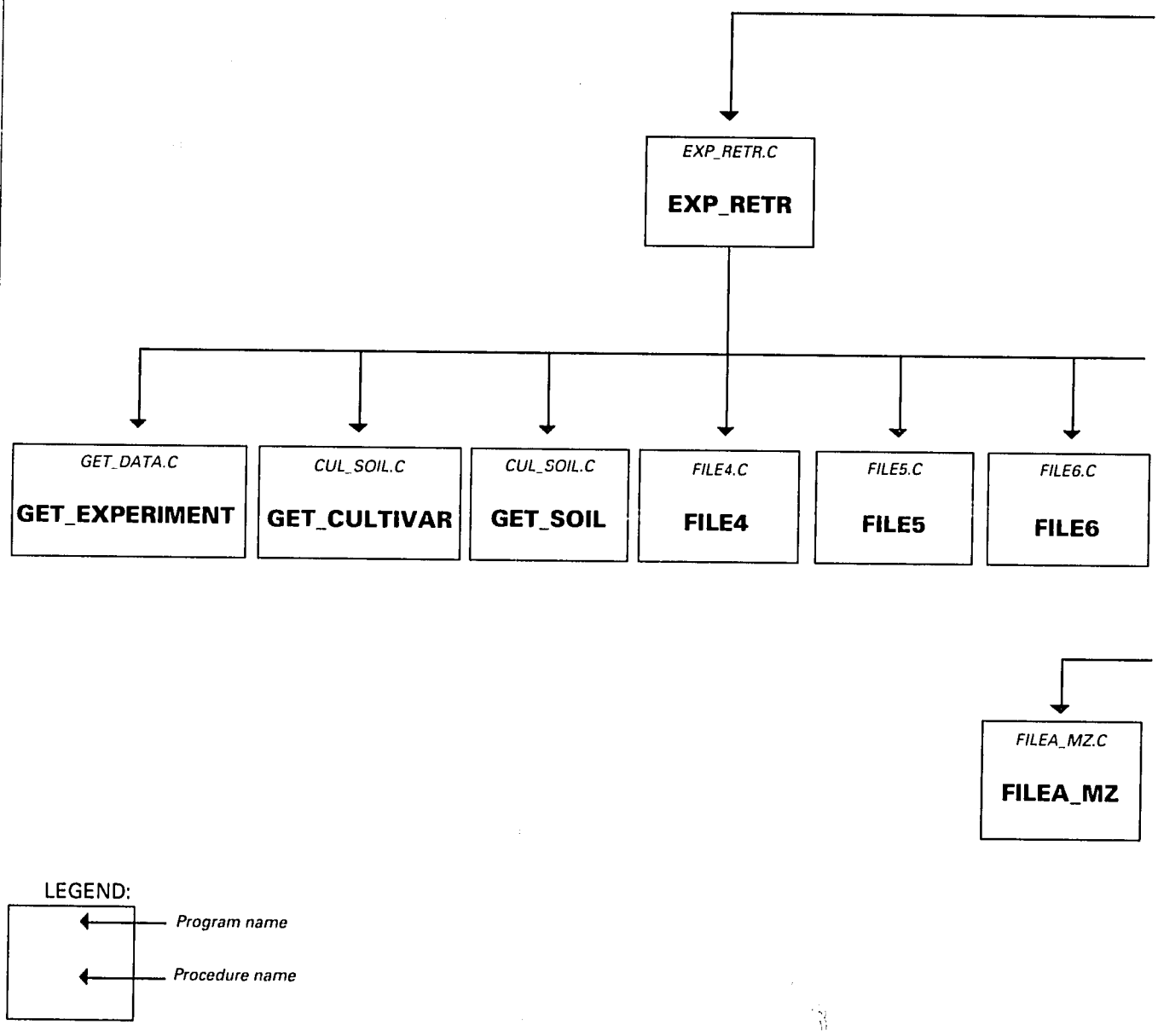
FILEB_PN

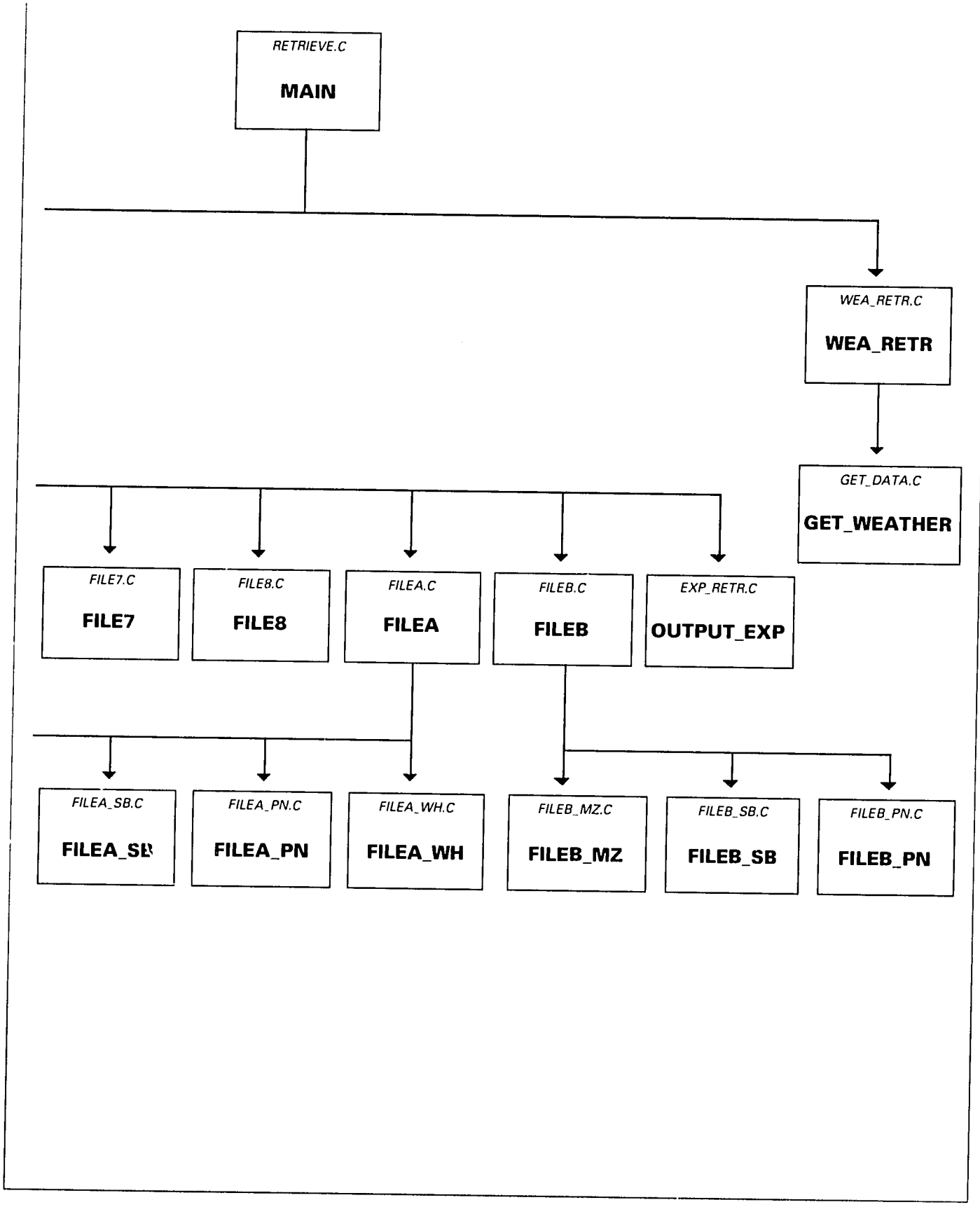
This routine searches Form R-2 for all of the observed field data for a peanut experiment and outputs it by Julian date to the crop model input file.

OUTPUT_EXP

This routine checks the specified drive and path location for matching crop model input files, prompts whether or not they should be replaced, and then creates/replaces the crop model input files.

Figure 14-1. MDS Retrieval for Crop Model Control Flow Diagram




RETRIEVE.C
MAIN
WEA_RETR.C
WEA_RETR
GET_DATA.C
GET_WEATHER
FILE7.C
FILE7
FILE8.C
FILE8
FILEA.C
FILEA
FILEB.C
FILEB
EXP_RETR.C
OUTPUT_EXP
FILEA_SB.C
FILEA_SB
FILEA_PN.C
FILEA_PN
FILEA_WH.C
FILEA_WH
FILEB_MZ.C
FILEB_MZ
FILEB_SB.C
FILEB_SB
FILEB_PN.C
FILEB_PN

CHAPTER 15

UTILITIES PROGRAM

The Utilities program provides a means for users to manage data in the Experimental and Weather Data Bases. The utilities include: changing IDs of an experiment or weather data set; rebuilding Experiment Data Base files if their index files are damaged; upgrading experiment data sets from version 1.1 to 2.1; converting ASCII weather data to data base format; importing ASCII harvest data to data base files for Form R-2; and maintaining a list of experiment or weather data sets on the computer systems.

Language The Utilities program is written in dBASE.

Compiler The program is compiled with CLIPPER version Summer '87.

Source Codes UTIL.PRG, INDEXMDS.PRG, ASC2MDS.PRG, CONVERT.PRG, MOD_ID.PRG, ASCR.PRG, MAST_LST.PRG, HELP.PRG, GET_EXP.PRG.

Executable Program The executable program name is UTIL.EXE.

Program Location The Utilities program can be located in any directory. Location of the program can be defined during the installation process or by using the "SETUP" option in the DSSAT Main Menu.

Input/ Output The input and output of each utility is defined below:

Rebuild Index Files of Experiment Data Sets

This utility reads in all data base files of a selected experiment data set, and constructs new index files for the data base files.

Convert ASCII Weather Data to MDS Format

This utility reads in weather data that are stored in ASCII files and writes the data to data base files using the data structures defined in Chapter 5: The Weather Data Base.

Upgrade Experiment Data Set to Version 2.1 Format

This utility reads in all data base and index files of a selected experiment data set, and moves the data to new data base files using the data structures defined in Chapter 4: Experimental Data Base.

Modify IDs of an Experiment Data Set

This utility changes the IDs such as institute ID, site ID, experiment number, and year of experiment, which are recorded on the data base files of a selected experiment data set, and changes them to user input IDs.

Modify IDs of a Weather Data Set

This utility changes the IDs such as institute ID and weather station ID which are recorded on the data base files of a selected weather data set, to the new IDs that the user inputs.

Import Harvest Data from ASCII into Form R-2

This utility reads in harvest data that are stored in ASCII files and writes the data to data base files that use the data structure defined in Chapter 4: The Experimental Data Base.

Maintain Minimum Data Set Mast List

This utility allows users to input, edit, and produce data reports stored in the MDSINFO.DBF and WEAINFO.DBF files. As mentioned in Chapters 7 and 10, MDSINFO.DBF stores the locations (drives and paths) of experiment data sets, experiment identifiers (institute ID, site ID, experiment number, year of experiment), and experimental descriptions. WEAINFO.DBF stores the locations of weather data sets, weather data identifiers (institute ID and station ID), data range (beginning and ending dates), and longitude and latitude information. If a hard disk system is used, these files are installed in the C:\DSSAT directory.

Program Procedures

The Utilities program is made up of different source code files and procedures within those files. Figure 15-1 illustrates the control flow within the various procedures.

UTIL

This is the main program of all of the utilities routines. It displays the main menu with the utility options. After a user selects an option from the menu, it invokes the corresponding routine to perform the function.

INDEXER

This routine calls the procedure GET_EXPERIMENT so that the user may select an experiment data set from the Master List. Using the location information, it reads in all data base files of the selected experiment data set, and constructs new index files for them.

ASCTOMDS

This routine asks the user for information which is input in ASCII weather data files. The information includes the location of the file and position, and unit measurements of the four required weather data items: minimum and maximum temperature, solar radiation, and rainfall. With the given information, ASCTOMDS reads data from the ASCII file and creates data base files to store the data.

UPGRDMDS

This routine calls the procedure GET_EXPERIMENT so that users may select an experiment data set from the Master List. With the location information, it reads in all data base files of the selected experiment data set, and invokes the procedure MAKEFORM to create new data structures for the files. When all data from the old data base files are moved to the new structure, UPGRDMDS calls the procedure ERASEFILE to delete the old files.

MAKEFORM

This routine calls the procedure MAKESTRU to create new data structures for the data base files.

MAKEFILE

This routine creates data base files based on the data structures defined in procedure MAKESTRU.

CHGIDS

This routine calls the procedure GET_EXPERIMENT so that the user may select an experiment data set from the Master List, and prompts the user for the new IDs for the selected data set. After all data base files of the selected experiment are replaced with the new IDs, their index files will be re-indexed.

CHGWIDS

This routine calls the procedure GET_WEATHER so that the user may select a weather data set from the Master List, and prompts the user for the new IDs for the selected data set. After all data base files of the selected weather are replaced with the new IDs, their index files will be re-indexed.

ASCR

This routine asks the user for the location of the ASCII file that is stored with the harvest data, and calls the procedure GET_EXPERIMENT so that the user may identify the experiment data set for the imported harvest data. With this information, ASCR starts to read in data from the ASCII file, and transfers it to the data base file. When the process is done, the data will be stored in the data base files for Form R-2.

MAST_LIST

MAST_LIST is the main routine for of the Master List utility. It displays a menu with five options, and invokes the procedure MAKEINFO, EDIT_INFO, EXP_REPORT, and WEA_REPORT, according to the user's selected option.

MAKEINFO

This routine asks the user for the disk drives that will be searched for the experiment and weather data sets. To search for data sets from the specified drives, it locates file name IDFILE.DBF for experiment data sets, and xxxxUN.DBF for weather data sets. When the search is done, the location of each data set will be written to an ASCII file called MDSINFO.DAT, for the experiment data set, and WEAINFO.DAT for the weather data set. In order to transfer the information from these ASCII files to data base files, MDSINFO.DBF and WEAINFO.DBF, MAKEINFO invokes the procedure MDSINFO for the experiment data sets and WEAINFO for the weather data sets.

MDSINFO

This routine transfers data from the ASCII file MDSINFO.DAT to the data base file MDSINFO.DBF. It invokes the function CHK_MDS2 to check for errors in the data sets.

CHK_MDS2

This function checks the experiment data set for valid versions and IDs in the file IDFILE.DBF.

WEAINFO

This routine transfers data from the ASCII file WEAINFO.DAT to the data base file WEAINFO.DBF. It invokes the function CHK_WEA2 to check for errors in the data sets.

CHK_WEA2

This function checks if the data base file xxxxUN.DBF exists in the given location.

EDIT_INFO

This routine allows the user to edit information in the Experiment Master List (MDSINFO.DBF) and Weather Master List (WEAINFO.DBF).

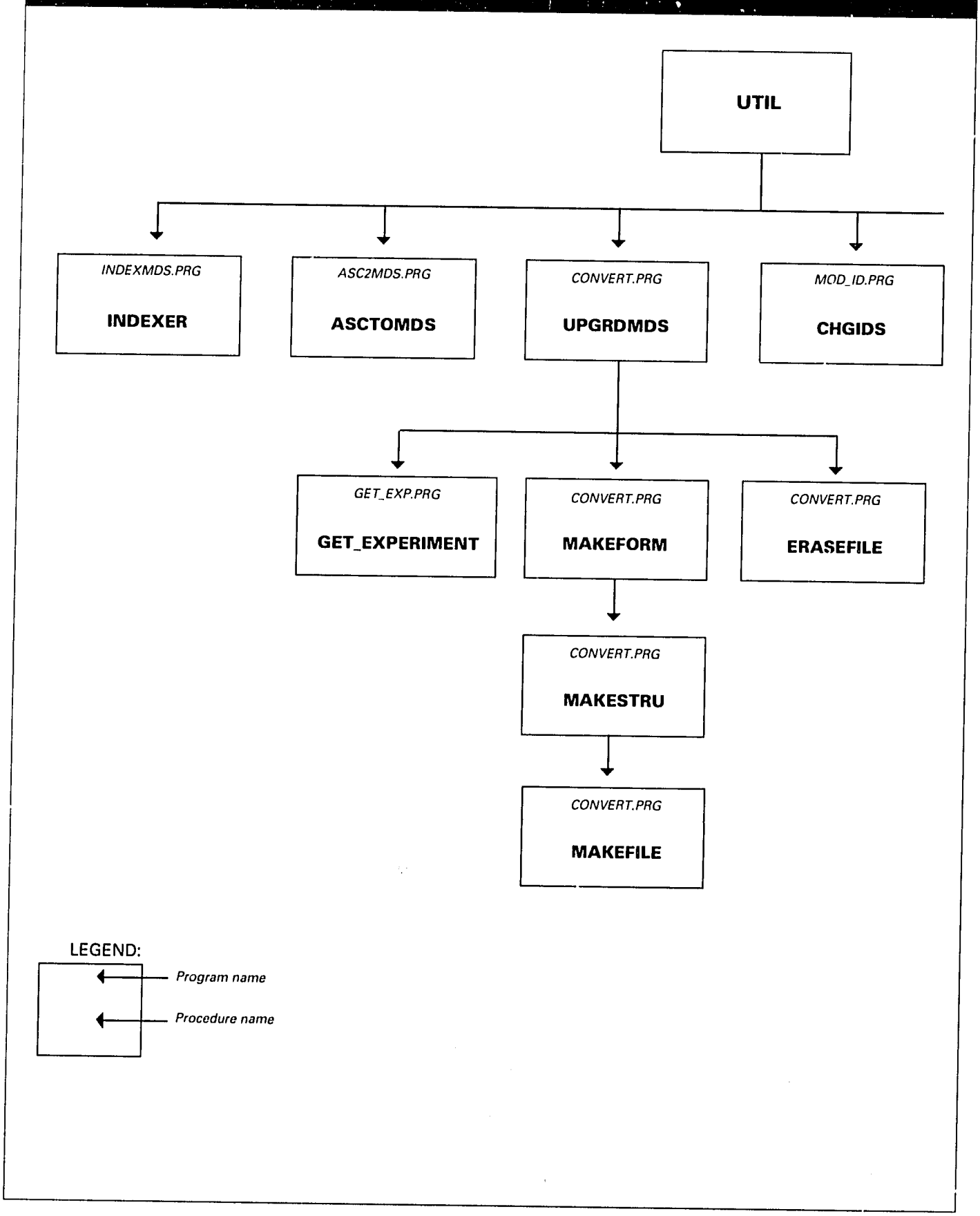
EXP_REPORT

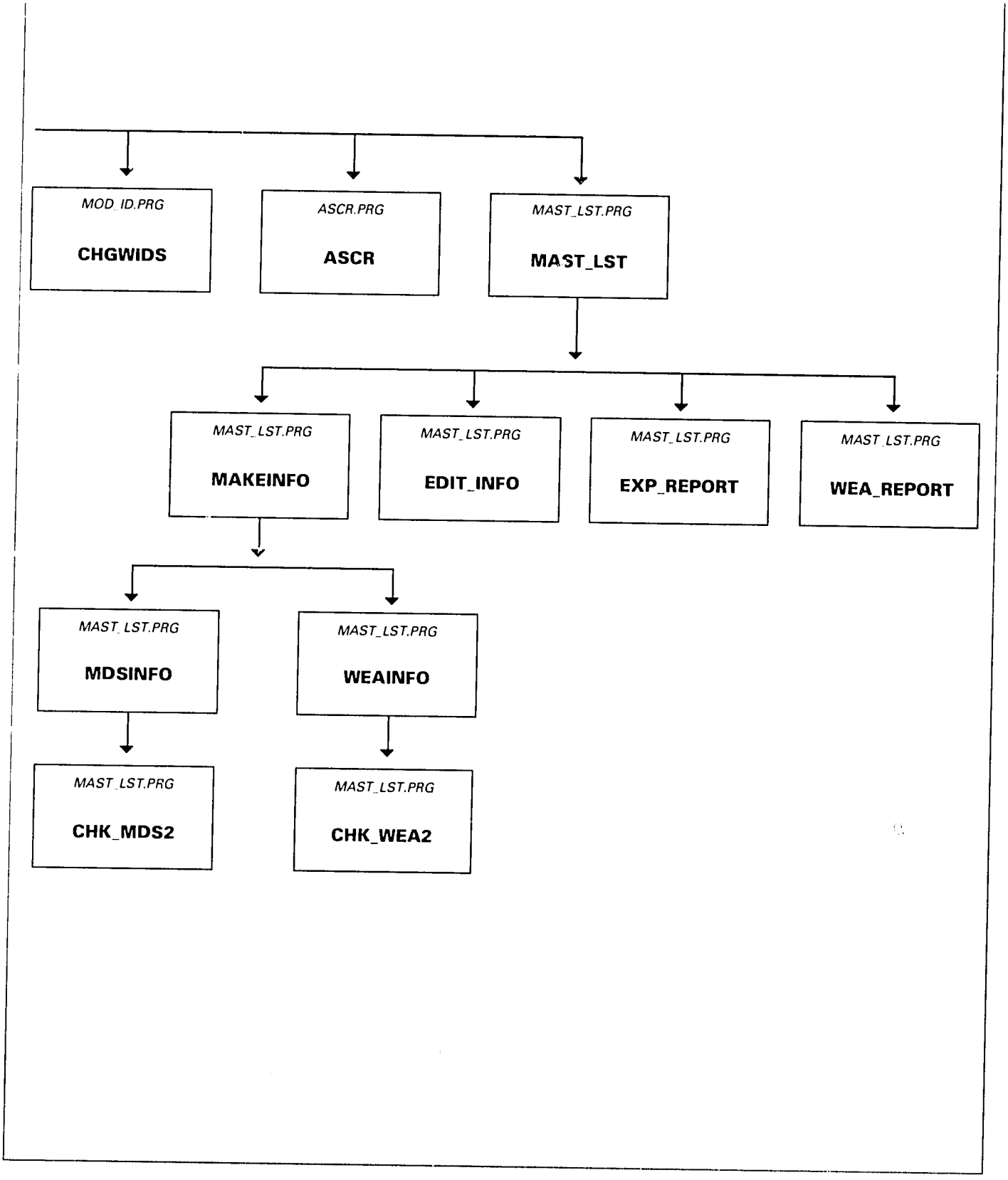
This routine produces a list of all of the experiment data sets stored under the Experiment Master List.

WEA_REPORT

This routine produces a list of all of the weather data sets stored under the Weather Master List.

Figure 15-1. Control Flow Diagram for DNMS Utilities




MOD_ID.PRG
CHGWIDS
ASCR.PRG
ASCR
MAST_LST.PRG
MAST_LST
MAST_LST.PRG
MAKEINFO
MAST_LST.PRG
EDIT_INFO
MAST_LST.PRG
EXP_REPORT
MAST_LST.PRG
WEA_REPORT
MAST_LST.PRG
MDSINFO
MAST_LST.PRG
WEAINFO
MAST_LST.PRG
CHK_MDS2
MAST_LST.PRG
CHK_WEA2