

APPENDIX A

IRRSCHM Model Setup

Setup of IRRSCHM model runs for evaluating BMPs is accomplished by performing the following tasks:

- Defining soil profiles
- Defining irrigation schedules
- Developing a cropping sequence
- Creating driver files based on defined profiles, schedules, and sequencing
- Executing the program to process the runs

In describing each of these tasks, program and file names are given with a complete relative path within the project directory. It is generally assumed that a program should be run while in the directory containing the program.

Defining Soil Profiles

Each soil profile definition begins with obtaining a description of the profile. In this case, the Doña Ana Soil Survey was used as the source for profile descriptions. Enter each soil profile description into a spreadsheet using the following format:

	A	B	C	D	E	F	G	H
1	Map	Series	Depth (cm)	Depth (cm)	Texture	USDA	Numeric	Organic Matter
2	ID	Name	Top	Bottom	Code	Texture	Soil ID	%
3	AA	A Soil	0	5	CL	Clay Loam	2	1.34
4			5	15	SA	Sand	5	1.12

Note that the first two rows contain header information identifying the contents of each column, and that the Map ID and Series Name appear only on the first line for that series. Each layer is usually distinguished by changing horizons and/or soil classification.

The spreadsheet is then saved as a TAB delimited ASCII file in IRRSCH\PDF for processing by the IRRSCH\PDF\XL2PDF.BAT program. This program reads the above data from the ASCII file and uses it to create a base-line PDF file for each soil series found. The program is executed with the name of the input file list on the command-line (wildcards allowed) as follows:

```
d:\...\irrsch\pdf> XL2PDF <name.ext> [<name.ext>...]
```

Note that you may use multiple files as input for this program.

The IRRSCH\PDF\FIXALL.BAT program is then executed to form adjusted copies of each base PDF file in the appropriate directory in the FIELDS directory tree. Execute the program with no arguments:

```
d:\...\irrsch\pdf> FIXALL
```

IRRSCH\PDF\FIXALL.BAT calls the program IRRSCH\PDF\FIXPDF.BAT to make the appropriate adjustments to the cell sizes for a 2.54cm dispersion length, and Retardation coefficients and Half-Life values for DUAL and BLADEX. When IRRSCH\PDF\FIXALL.BAT is done, there are two new copies of each base PDF; one for DUAL, the other for BLADEX.

IRRSCH\PDF\FIXPDF.BAT also can be run as a stand-alone program. It prompts for each input value and the output file name when run. It takes the name of the input PDF file as a command-line parameter:

d:... \irrsch\pdf> FIXPDF <name.ext>

Do NOT use wildcards in the file specification on the command-line when using this program as it generates only one output file and will not distinguish between multiple input files.

The subdirectories and files in the IRRSCH\FIELDS directory tree are organized according to surface soil type and Map ID. Contained within the IRRSCH\FIELDS directory are the subdirectories for each Soil Type, named according to the Type ID Number. Each soil type directory contains subdirectories for each PDF which has that soil type for the top layer. These subdirectories have the same name as the corresponding PDF file, without the PDF extension. Each of these contain the two actual PDF files for DUAL and BLADDEX, named DUAL90.PDF and BLDX14.PDF, respectively. The path to each PDF file is of the form:

IRRSCH\FIELDS\<Surface_Soil_ID_#>\<Soil_Type_ID_CODE>\DUAL90.PDF
IRRSCH\FIELDS\<Surface_Soil_ID_#>\<Soil_Type_ID_CODE>\BLDX14.PDF

Where:

Surface_Soil_ID_# is the two-digit ID number of the top layer, and
Soil_Type_ID_CODE is the two-letter Map Unit ID for the soil type.

The Surface Soil ID is determined by calling the IRRSCH\PDF\TYPESET.BAT program. This program matches the Map Unit ID to a Soil Type ID. It is called as follows:

d:... \irrsch\pdf> TYPESET <MUID>

Where:

MUID is the Map Unit ID code (usually two letters).

Defining Irrigation Schedules

Irrigation schedules are defined by entering the crop name, field ID, year, and irrigation dates in a spreadsheet in the following format:

	A	B	C	D
1	Crop: <name>			
2	No. <field #>			
3	Year: <year>			
4		Date		Irrigation (inches)
5		<m/d/y>		<amount>
.				
.				
.				
	No. <field #>			
	Year: <year>			
		Date		Irrigation (inches)
		<m/d/y>		<amount>
.				
.				
.				
	CROP: <name>			
	No. <field #>			
	Year: <year>			
.				
.				

In short, the file can contain as many different crops and fields as needed for the given soil type. When all schedules are entered into a spreadsheet, the file should be exported as a TAB delimited ASCII file in the SRC directory.

This file is then processed by running SRC\ISF.BAT which will create a directory of the same name as the input file, and create separate ISF (irrigation schedule files) files for each crop, field, and year as specified in the data. Execute the program with the input file list on the command line (wildcards allowed) as follows:

```
d:\src> ISF <name.ext> [<name.ext>...]
```

The completed schedule files are then copied into the IRRSCH directory structure by the SRC\COPYISF.BAT program. Execute the program as follows:

```
d:\src> COPYISF
```

This program copies the ISF files from a list of subdirectories (c c l l l s a l), according to crop types in the list (a l f c h i c o r c o t o n i) corresponding to the five crop types used in the runs. This program does not require any command-line parameters, and expects its input to be in the set of directories listed. It will leave untouched any files in any other directories, so schedule spreadsheet files should be converted to ASCII files with appropriate names.

The copied files are organized by soil type, and crop ID under the IRRSCH\ISF directory, so the path to each file is of the form:

```
IRRSCH\ISF\<SoilType#\<CROPID#\_\_\_<F#\<YR>.ISF
```

where:

F# is the field ID number (two digits) from the input file, and YR is the year (two digits) of the Schedule.

Developing a Cropping Sequence

The cropping sequence is a function of the relative area within the region which is devoted to each crop being evaluated. The frequency of each crop within the sequence is directly proportional to the ratio of the crop with respect to all crops in the set for evaluation. The sequence input file IRRSCH\ROTATION.CRP is generated by picking random items from a collection with a uniform distribution based on the proportionality of each crop. For example, if corn, alfalfa, cotton, chile and onions have respectively the percentages 2, 5, 75, 15, and 3, the collection would have 100 items with the proportions for each crop equal to that crop's percentage. Random selection from that collection, for a large sample set, gives the sequence for the IRRSCH\ROTATION.CRP file. This file is then used to generate individual crop sequences for each soil type group by randomly selecting a starting point in the file and sequencing through it.

Create Driver Files Based on Defined Profiles, Schedules, and Sequencing

The IRRSCH program requires several input files, including data for climate information, irrigation schedules, crop descriptions, and soil profiles. The soil profile generation is fully described in *Defining Soil Profiles*. The other files required must still be put together using the components created as described in *Defining Irrigation Schedules* and *Developing a Cropping Sequence*.

The IRRSCH\IRRSCHMK.BAT program does most of the remaining work to process the input data files. Execute the program with no command-line arguments as follows:

d:.\irrsch> IRRSCHMK

This program reads the IRRSCH\ROTATION.CRP file and generates two 30-year crop sequences for each soil type directory in the IRRSCH\FIELDS\ directory, one starting with Chile, and one starting with Cotton. As it steps through each sequence, it reads the description for the next crop in line from IRRSCH\CDF\

When IRRSCH\IRRSCHMK.BAT is finished the current practice data files are completed. To create the input files for the tensiometer based management practices, the program IRRSCH\FIELDS\MKTNSM.BAT is run to reprocess each of the previously created data sets. This program uses the PERL scripts IRRSCH\FIELDS\FIXCR_?.PL (where ? is one of {M,S,T}) to adjust the tensiometer settings in each crop driver file (CDF) to create three new versions, one for each of the tensiometer-based BMPs; NRCS recommendation with moving tensiometer, NRCS recommendation with stationary tensiometer, and 50 percent depletion. The adjusted CDFs are named by prepending the original file name with 'M', 'S', or 'T' for Moving, Stationary, and 50 percent Tensiometer readings, respectively. The IRRSCH\MKTNSM.BAT program also creates a new irrigation schedule using the PERL script IRRSCH\FIELDS\FIXSCHEM.PL to eliminate all applications except those used to add chemicals from the original schedules. The new schedule is named by prepending the original name with 'NW'.

The data file sets are completely generated when both of these programs are finished. The final preparation step for running the model is the set marker files for IRRSCH\FIELDS\RUNALL.BAT to identify which files are associated with each PDF file. These marker files are created by running the IRRSCH\FIELDS\SETRUNS.BAT program. This program sets marker files for each directory so that all runs will be made.

After IRRSCH\FIELDS\SETRUNS.BAT has been run, you may disable particular runs, or sets of runs by doing one of the following:

To Disable:	Do:
All runs for a SOIL NUMBER	create NO_RUN in the SOIL NUMBER dir.
One runs for a PDF Set	create NO_RUN in the PDF's dir.
One Start Crop Series	delete all marker files with the Series ID in the PDF dir.
One run for a Crop Series	delete the appropriate marker file with the Series ID in the PDF dir.

Marker files are files with the same name as the associated PDF file with an extension containing the Crop Series ID. The Series ID is the first two letters of the Crop Series name (e.g. CO for cotton) and is preceded by an optional one-letter-code for the BMP (one of {M,S,T}).

Execute the Program to Process the Runs

The final step is to run the model for each data set and process the output to determine peak and average concentrations and to generate a data file which can be used to plot the concentrations over time. This is done by the IRRSCH\FIELDS\RUNALL.BAT program. Execute the program with no command-line arguments as

follows:

```
d:\... \irrsch\fields> RUNALL
```

This program calls two other batch files to process Farmers practices and tensiometer-based BMP runs, IRRSCH\FIELDS\RUNFMSCH.BAT and IRRSCH\FIELDS\RUNTNSM.BAT, respectively. Each of these may be run individually:

```
d:\... \irrsch\fields> RUNFMSCH
```

OR

```
d:\... \irrsch\fields> RUNTNSM
```

These programs call the IRRSCHMR.EXE program, which should be in the current PATH statement in the DOS environment. When IRRSCHMR.EXE has completed, IRRSCH\FIELDS\PROC_CNC.BAT is called to generate the processed output files IRRSCH\FIELDS\

When the processing is complete, the raw output file (OUT) is deleted to conserve disk space.