

ALMANAC

User Guide and References

Manual for the Agricultural Land Management Alternatives with Numerical Assessment Criteria Model

James R. Kiniry Deborah A. Spanel
USDA-ARS
Grassland, Soil and Water
Research Laboratory
Temple, TX

Revised: January 2009

Table of Contents

USER MANUAL

ASSEMBLY FORMS

REFERENCES

Model Description

1. A general, process-oriented model for two competing plant species
2. Applications of models with different spatial scales
4. The ALMANAC model's sensitivity to input variables
3. Field-measured limits of soil water availability as related to laboratory-measured properties

Maize and Sorghum

1. Evaluation of two maize models for nine U.S. locations
2. Maize and sorghum simulation in diverse Texas environments
3. Maize and sorghum simulations with CERES-Maize, SORKAM, and ALMANAC under water-limiting conditions
4. Similarity of maize seed number responses for a diverse set of sites
5. Row spacing effects of light extinction coefficients of corn, sorghum, soybean, and sunflower
6. Radiation-use efficiency in biomass accumulation prior to grain-filling for five grain-crop species

Other Crops

1. Sunflower simulation using the EPIC and ALMANAC models
2. Rice parameters describing crop performance of four U.S. cultivars
3. EPIC model parameters for cereal, oilseed, and forage crops in the northern Great Plains region

Crops and Weed Competition

1. Modeling crop:weed interactions in wheat with ALMANAC
2. Simulation intercropping with the ALMANAC model
3. Radiation-use efficiency and grain yield of maize competing with johnsongrass

Grasses and Trees

1. Radiation use efficiency and leaf CO₂ exchange for diverse C₄ grasses
2. Simulating Alamo switchgrass with the ALMANAC model
3. Simulating grass productivity on diverse range sites in Texas
4. Biomass accumulation and radiation use efficiency of honey mesquite and eastern red cedar

Quick Start on ALMANAC

D. Spanel

*USDA-Agricultural Research Service
Grassland, Soil and Water Research Laboratory
Temple, Texas*

Rev. 01/2009

TABLE OF CONTENTS

Introduction

Chapter 1: ALMANAC Demonstration

Chapter 2: Introduction to UTIL

Chapter 3: Weather Generator and Daily Weather File

Chapter 4: United States Weather

Table 1: ALMANAC Files and Description

Figure 1: Diagram of ALMANAC File Structure and Flow

Table 2: Description of UTIL Commands and Function Keys

Dataset Assembly Forms

NOTE: The following tables are found in the ALMANAC Supplemental File

Table 3: Soil Series Available with GETSOIL Command

Table 4: Weather Parameters Available for Several Locations in Mexico

Table 5.1 - 5.6: Description of Inputs Found in ALMANAC Files: Dataset, Control Files, Model Development, Crop-Weed Parameters, Tillage

INTRODUCTION

The ALMANAC model was designed to simulate the interactions of two or more plant species competing for water, light, and nutrients. The competing species can be anything from mesquite trees in a bermudagrass pasture to a corn crop with a foxtail weed problem. ALMANAC also can be used to model typical farming monoculture such as a corn, sorghum, or wheat crop and has successfully been used to model forage production including native range grasses such as switchgrass, indiangrass and little bluestem. There is a large body of scientific papers on the use of ALMANAC for yield predictions

The purpose of this manual is to explain the logical progression of steps in running the model. Also information on how to create new datasets with UTIL (Universal Text Integrating Language) is included. This manual was written with the assumption that the user is: familiar with DOS and can manipulate files with a text editor..

CHAPTER 1: ALMANAC DEMONSTRATION

To run an example of the ALMANAC model, first unzip the file named ALMANAC.ZIP in a new file folder called ALMANAC. For workshop participants, also unzip the MUUF.ZIP in a folder called MUUF and unzip WEATHER.ZIP in a folder titled weather.

Once the files have been unzipped, access the DOS command prompt and change to the ALMANAC directory. The command to change to the ALMANAC directory is: `c:\> cd \almanac`. Then type the following command to execute the model:

At the prompt type: **ALNC2009 TXCORN.DAT**

This is a simulation of a corn crop grown in El Campo, Texas.

The execution will be complete when you get the C: prompt again. You may look at the results. Use any editor to look at the output file: **TXCORN.OUT**. Or type **LIST TXCORN.OUT**. List is a program that will load the output file and allow you to look at it. You may also just type the output file after the c: prompt which will open in file in "notebook".

To run a sorghum crop for the same location as the corn crop, at the prompt type:
ALNC2009 TXSORG.DAT

You may look at the output as before. The output file will be named **TXSORG.OUT**. The output file is created automatically for you using your dataset name plus the extension: ".OUT".

CHAPTER 2: INTRODUCTION TO UTIL (A SMART EDITOR)

One easy way to edit the ALMANAC input files is to use the UTIL (Universal Text Integrating Language) program. UTIL identifies each formatted field in a file and provides help for that field. To see how UTIL works type:

UTIL ALNC TXCORN.DAT

The word - ALNC in the above command is the driver file. You will get a screen similar to this:

```

1.→ MS-DOS Prompt - UTIL
Auto
CORN 15:07 12:43 6Jan94 8:44 28May 2
TXTEMPLE.DAT
WEA: 72 TX TEMPLE WI: 72 TX TEMPLE SOIL: 353 HOUSTON BLACK D
 2 1 1 1 03 123 0 0 1
 1.00 86.0 .10 .0250 .0500 .0500 1.0 30.67 76.2 .0
 .8 50.0
 50.0 .0001 1.00 0.
 85.10 180.60 8.00 .0 .0
 14.15 16.39 20.98 25.62 29.01 33.00 35.49 35.81 32.02 26.92 20.45 16.02
 1.92 3.84 7.82 13.13 17.42 21.19 22.91 22.67 19.66 14.05 7.78 3.53
 7.80 7.10 6.09 4.48 3.52 2.92 2.51 2.76 3.97 4.97 6.19 6.48
 6.03 5.31 5.33 4.61 3.33 2.31 1.39 1.65 3.44 4.63 5.35 5.28
 47.5 69.1 50.8 78.4 109.3 83.3 40.1 54.7 87.0 87.1 66.6 56.7
 10.4 15.2 11.2 13.7 18.3 20.1 14.5 16.5 18.5 21.1 14.5 13.0
 5.31 3.79 2.18 .44 1.36 1.73 1.99 .96 1.76 2.34 1.46 1.84
 .160 .180 .170 .180 .190 .130 .090 .100 .150 .120 .130 .140
 .470 .470 .380 .410 .410 .440 .400 .380 .480 .480 .490 .460
 7.19 7.35 6.67 7.01 7.55 5.65 4.04 4.31 6.72 5.81 6.09 6.38
 10.7 16.0 15.7 28.4 39.9 27.4 46.7 33.5 33.5 35.1 14.5 11.2
2.→ 10.6 13.5 17.8 20.1 23.4 27.0 25.8 24.8 21.0 16.8 12.7 10.3
3.→ UTIL2501:ALNC Line: 1 File:test3.dat
4.→ 1 TITLE(1) - Description of dataset
5.→ Character Field
6.→ 1|HELP 2|ANLYZ 3|EXIT 4|SAVE 5|LINEDT 6|STAT 7|AUTOE 8|QUIT 9|LSTC 10|COMNDS

```

- 1 The first input field highlighted
- 2 This line shows the version of UTIL, the driver file that is loaded, the line number the cursor is on, and the name of the file currently loaded.
- 3 The variable name and its description of the highlighted field.
- 4 Displays type of variable, either character or the numerical range.
- 5 The command line - type in commands as those described later (Table 2).
- 6 Displays definitions of the function keys (Table 2). **Help key for information about each variable is F1**

To edit field one, place the cursor at field one using arrow keys, press the Enter key. Pressing the Enter key changes from COMMAND mode (the cursor at the bottom of the screen) to EDIT mode (the cursor on the field to be edited). Type the new information and press Return.

Some UTIL commands are available to load large groups of data from the weather and soils databases that are important inputs to the dataset. The commands most commonly used are the GETWEAT and GETSOIL. You type these commands in area 5 of UTIL, the command line. The cursor will be blinking when you are on the command line. Details on using these commands are as follows:

GETWEAT *SOME* # WMO - to insert weather generation parameters from a desired weather station (there are 70 locations for Mexico provided, see table 3).

GETWEAT 76665 WMO

GETSOIL - to load a soil from the United States soils database:

GETSOIL 240 Loads soil number 240, series Fitchville,(see table 4)

(No soils have been provided for Mexico, user will have to provide the values needed. See ALMANAC assembly sheets for minimum soils dataset needed)

USING UTIL TO EDIT OTHER ALMANAC INPUT FILES

There is one driver file for each ALMANAC input file. ALMANAC reads several files before execution takes place. (See Table 1 File Structure and Figure 1, Diagram of ALMANAC file structure and flow) These files can be edited if necessary. UTIL is available to edit these files as long as the correct driver file must be used with its corresponding ALMANAC file.

The rest of the input files may be edited in the same way with UTIL but for the beginner it is not expected that these additional files will be changed. However, UTIL is available if needed.

To edit the crop parameter file type:

UTIL CROP CROP2009.DAT

To edit the tillage file type:

UTIL TILL TILL2009.DAT

To edit the multi-year file type:

UTIL MLRN MLRN2009.DAT

To edit the print file type:

UTIL PRNT PRNT2009.DAT

To edit the control file type:

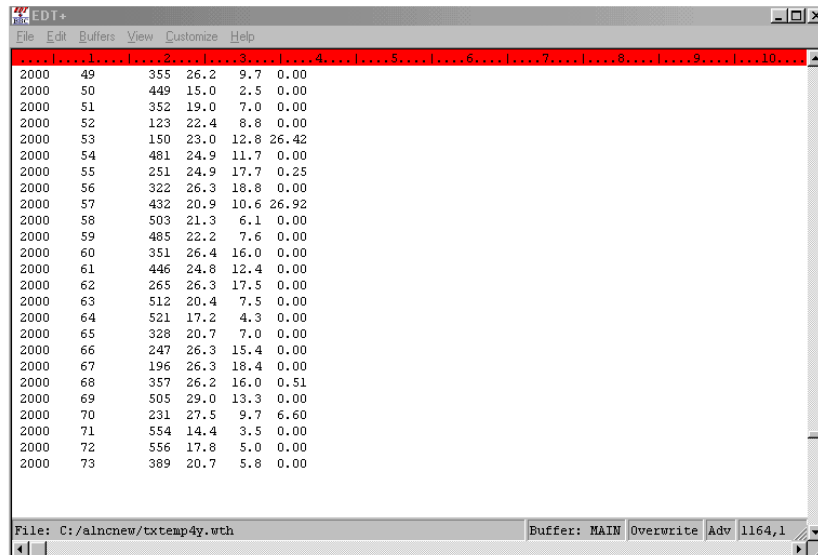
UTIL FILE ALNCFILE.DAT

CHAPTER 3: WEATHER GENERATOR AND DAILY WEATHER FILE

In the dataset there is an option to generate weather or read daily weather (NGN). For long-term, decision-making it is suggested that weather be generated. However, for model testing, daily weather is usually read in. The entire year (365 days) or years must be input. If there are missing values for rainfall or maximum and minimum temperatures ALMANAC will generate these if the value in the corresponding field is set to 999. If solar radiation values are missing they will be generated if the field is left blank or entered as 0.

IF DAILY WEATHER IS READ THEN THE NAME OF THE DAILY WEATHER FILE MUST BE ON THE LAST LINE OF THE DATASET AFTER SKIPPING ONE BLANK LINE TO END THE LAST ROTATION SERIES.

The basic weather components entered in the weather file are: solar radiation (in either mega joules d^{-1} or langleys d^{-1}), maximum temperature ($^{\circ}C$), minimum temperature ($^{\circ}C$), and precipitation (mm) . If values for wind speed and relative humidity are known they may be entered also. However any combination of real weather values can be input as long as rain is an input. (See control code NGN in UTIL) Missing values for rain, and temperatures are generated if the value is set to 999. Solar radiation values are generated when field is left blank or is 0 . They are read in the order of SR, MAX, MIN, and RAIN by the following FORTRAN format: (16x,F4.0,F6.1,F6.1,F6.3). Below is an example of a weather file showing year and day in columns 1-16, solar radiation in columns 17-20, maximum temperature in column 21-26, minimum temperatures in column 27-32 and rain in columns 33-38.



2000	49	355	26.2	9.7	0.00
2000	50	449	15.0	2.5	0.00
2000	51	352	19.0	7.0	0.00
2000	52	123	22.4	8.8	0.00
2000	53	150	23.0	12.8	26.42
2000	54	481	24.9	11.7	0.00
2000	55	251	24.9	17.7	0.25
2000	56	322	26.3	18.8	0.00
2000	57	432	20.9	10.6	26.92
2000	58	503	21.3	6.1	0.00
2000	59	485	22.2	7.6	0.00
2000	60	351	26.4	16.0	0.00
2000	61	446	24.8	12.4	0.00
2000	62	265	26.3	17.5	0.00
2000	63	512	20.4	7.5	0.00
2000	64	521	17.2	4.3	0.00
2000	65	328	20.7	7.0	0.00
2000	66	247	26.3	15.4	0.00
2000	67	196	26.3	18.4	0.00
2000	68	357	26.2	16.0	0.51
2000	69	505	29.0	13.3	0.00
2000	70	231	27.5	9.7	6.60
2000	71	554	14.4	3.5	0.00
2000	72	556	17.8	5.0	0.00
2000	73	389	20.7	5.8	0.00

CHAPTER 4: UNITED STATES WEATHER

Available in the WEATHER.ZIP file are monthly average information for about 200 locations for each state of the United States. If desired, one state at a time can be installed by following these directions:

- 1) Insert the United States Weather diskette in your disk drive.
- 2) At the C: prompt type the disk drive that the diskette is in and the state file name that you are interested in.

For example: The weather diskette is in drive A: and you want Texas weather, type the command **A:TXZIP**: your command line should look like this:

C: A:TXZIP

Following this command a self-extracting utility will unzip the Texas weather files and you will now have the weather file called weattx.dat, the wind file: windtx.dat and a list file :weattx.lis.

The following explains how to load these weather parameters automatically in your data set by using the LOCWEAT command of the UTIL dataset editing program.

While editing a dataset with UTIL, get on the command line and type:

LOCWEAT 31.5 97.0 <return>Locates and loads a weather station closest to latitude 31.5 and longitude 97.0 from the weather data base you have installed from the United States Weather diskette.

Table 1. ALMANAC FILES - names and descriptions of files on the ALMANAC diskette.

Name	Description
MODEL	
ALNC2009.EXE	Compiled version of the ALMANAC Model.
DATABASE FILES	
Crop2009.DAT	Established parameters for several crops and weeds.
TILL2009.DAT	Farm machinery table.
CONTROL FILES	
PRNT2009.DAT	Output control file.
MLRN2009.DAT	Multi_period control file.
MODEL DEVELOPMENT FILE	
PARM2009.DAT	Experimental paramaters used in developing and modifying the model. These are essentially constants.
USER DATASETS	
TXCORN.DAT	Simulation of a corn crop in El Campo, TX
TXSORG.DAT	Simulation of a sorghum crop in EL Campo, TX
CORNSOY.DAT	Simulation of corn/soybean intercropping in Temple, TX..
SOYBEAN.DAT	Simulation of soybean growth without corn competition.
TNACKH.DAT	Simulation of soybean/johnsongrass interaction in Jackson, TN.
TNJACKA.DAT	Simulation of soybean growth without weed competition.
MESBER.DAT	Bermuda grass pasture invaded by Mesquite trees
TNJACKH.WTH	Weather file for Jackson, TN.
TXDANE98.WTH	Weather file for El Campo, TX
MOR78-93.WTH	Weather file for Morelia, MI, MEXICO
DRIVER FILE	
ALNCFILE.DAT	This file contains the names of the above files that the model needs to know to be able to execute and also a user named file for ALMANAC to write to.
OUTPUT FILES	
TXCORN.OUT	Results from ALMANAC simulation are written to
TXSORH.OUT	The *.OUT file
CORNSOY.OUT	
SOYBEAN.OUT	
OTHER FILES	
UTIL.EXE	Editor for ALMANAC datasets

ALMANAC FILE STRUCTURE

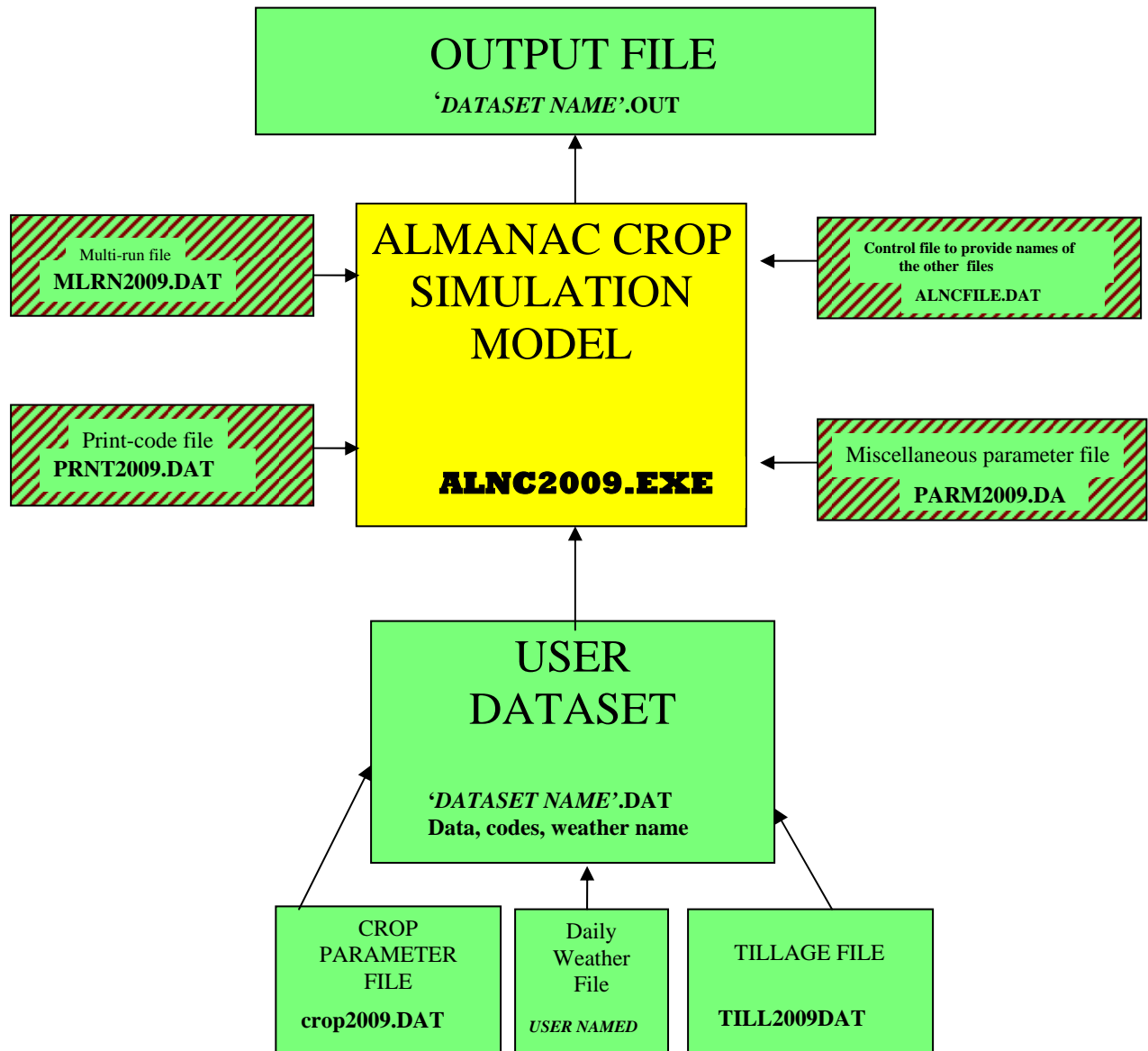


Figure 1. ALMANAC file structure

Table 2. Description of UTIL Function Keys.

HELP _ the [F1] key

The HELP command reads the HELP file for information specific to the current VARIABLE. By placing the cursor on a VARIABLE, and entering the command "HELP" or pressing the F1 key, UTIL displays information for that VARIABLE. Some VARIABLE's have interactive HELP in which case a menu appears with several choices. The cursor or arrow keys are used to chose one of the options. If the cursor is on the choice that is desired, the <Enter> key will insert this new value into the DATASET. By pressing either the [F1] key or the <ESC> key no choice is made and the value that is in the DATASET remains.

ANALYZE _ the [F2] key (DO NOT USE)

EXIT _ the [F3] SAVE/EXIT key

This command will EXIT the UTIL program and WILL automatically SAVE the current DATASET. To SAVE without EXITing use the [F4] SAVE key. To EXIT without saving the DATASET use the [F8] QUIT/NOSAVE command.

SAVE _ the [F4] SAVE key

The SAVE command works in conjunction with the LOAD command to SAVE a dataset that is currently LOAD'ed in UTIL. There are options to save the current file without entering the name again.

FORMAT:

```
SAVE filename.ext  
SAVE filename.ext REP  
SAVE filename.ext REP BLANKS  
SAVE * REP
```

WHERE:

- 1 SAVE filename.ext saves a new filename for the first time.
- 2 SAVE filename.ext REP will replace the old version, should one already exist.
- 3 SAVE filename.ext REP BLANKS will save all the blank lines. Normally, UTIL removes any blank lines from the bottom of a DATASET.
- 4 The SAVE * saves the DATASET with the same name as the one that was last LOADED. Should it already exist, UTIL will ask if it alright to write over it.
- 5 SAVE * REP is a complete command that will SAVE the file under the LOADED name and REPlace it if it already exists.

EDLIN _ the [F5] key

The EDLIN command may be typed in or the [F5] key may be pressed. The line that the cursor is on will be edited as an entire line rather than by fields.

QUIT _ the [F8] QUIT/NOSAVE key

Exits the UTIL program without saving the current DATASET.

DELETE _ the [Delete] key

CAREFUL! This command immediately deletes the line in the DATASET that the UTIL cursor is currently on.

INSERT _ the [Insert] key

CAREFUL! The INSERT command is the compliment to the DELETE command. This command should NOT be used unless the documentation for a specific application directly instructs to do so.

COMMANDS _ the [F10] key

Displays some of the most used commands by typing COMMANDS or press the [F10] key.

*****FORM 1*****
ALMANAC DATA ASSEMBLY FORM
 (inputs not necessary for model execution are shaded)

Title	
1.1	TITLE(1)
2.1	TITLE(2)
3.1	TITLE(3)

Program control codes

4.1	Number of years of simulation	_____	NBYR
4.2	Starting date - Year	_____	IYR
4.3	-Month	_____	IMO
4.4	-Day	_____	IDA
4.5	Printout interval ¹	_____	NIPD
4.6	Output print code	_____	IPD
4.7	Weather code	_____	NGN
4.8	Number of times generator cycles ¹	_____	IGN
4.9	Day weather generator stops generating same weather ¹	_____	IGSD

General data

5.1	Watershed drainage area (ha)	_____	WSA
5.2	Runoff curve number	_____	CN2
5.3	Channel Length1 (Km)	_____	CHL
5.4	Average channel slope1 (m/ m)	_____	CHS
5.5	Channel roughness factor(manning's N)	_____	CHN
5.6	Surface roughness factor(manning's N)	_____	SN
5.7	Peak runoff-rate rainfall-energy adjustment factor	_____	APM
5.8	Latitude of watershed (degrees)	_____	YLT
5.9	Average elevation of watershed ² (m)	_____	ELEV
5.10	Water content of snow on ground at start of simulation (mm)	_____	SNO

1 May be left blank or 0 if unknown

2 Leave blank if Priestly-Taylor is used to estimate potential evaporation, must enter for Penman.

***** FORM 2 *****
ALMANAC DATA ASSEMBLY FORM

- | | | | |
|-----|---|-------|-----|
| 6.1 | Average concentration of nitrogen in rainfall (g m ³) | _____ | RCN |
| 6.2 | Number of years of cultivation before simulation starts (yr.) | _____ | RTN |

Water erosion data

- | | | | |
|-----|-------------------------------------|-------|-----|
| 7.1 | Slope length (m) | _____ | SL |
| 7.2 | Slope steepness (m /m) | _____ | S |
| 7.3 | Erosion control practice | _____ | PEC |
| 7.4 | Water erosion equation ¹ | _____ | DRV |

1 May be left blank or zero if unknown.

*** FORM 3 ***

ALMANAC DATA ASSEMBLY FORM

(light shaded area do not have to be entered if daily weather is input, dark shaded areas does not have to be input regardless of whether daily is input or weather generator is used)

Weather data

8.1	Number of years of max monthly 0.5 hour rainfall record	_____	TP5
8.2	Ten year frequency 6 hour rainfall	_____	TP6
8.3	Number of years of max monthly 0.5 hour rainfall record	_____	TP24
9.1- 9.12	Average monthly maximum air temperature (°C)	_____	OBMX (1-12)
10.1- 10.12	Average monthly minimum air temperature (°C)	_____	OBMN (1-12)
11.1- 11.12	Monthly standard deviation maximum air temperature ^{2,3} (°C)	_____	SDTMX (1-12)
12.1- 12.12	Monthly standard deviation minimum air temperature ^{2,3} (°C)	_____	SDTMN (1-12)
13.1- 13.12	Average monthly precipitation (mm)	_____	RMO (1-12)
14.1- 14.12	Monthly standard deviation of daily precipitation ^{1,3} (mm)	_____	RST2 (1-12)
15.1- 15.12	Monthly skew coefficient for daily precipitation ^{1,3}	_____	RST3 (1-12)
16.1- 16.2	Monthly probability of wet day after dry day ^{3,4}	_____	PRW1 (1-12)
17.1- 17.12	Monthly probability of wet day after wet day ^{3,4}	_____	PRW2 (1-12)
18.1- 18.12	Average number of days of rain per month ⁵	_____	DAYP (1-12)
19.1 12	Monthly maximum 0.5 hour-rainfall for period of record (TP24) ¹ (mm) [in.]	_____	WI (1-12)
20.1- 20.12	Monthly average daily solar radiation (MJ/m ² or ly)	_____	OBSL (1-12)
21.1 21.12	Monthly average relative humidity (fraction) ⁶	_____	RH (1-12)

- 1 may be left blank or zero if unknown..
- 2 Temperature extremes may be substituted.
- 3 May be left blank or zero if daily rainfall is inputted (ref 4.7>>0).
- 4 Blank or zero if unknown and average number of days of rain per month is entered.
- 5 Blank or zero if rainfall is generated and wet-dry probabilities are entered.
- 6 May be left 0 unless Penman equation is used to estimate potential evaporation (elev > 0)

***** FORM 4 *****
ALMANAC DATA ASSEMBLY FORM

Wind erosion data

22.1	Field length ^{1,3} (km)	_____	FL
22.2	Field width ^{1,3} (km)	_____	FW
22.3	Clockwise angle of field from north ^{1,3} (deg)	_____	ANG
22.4	Standing dead crop residue ¹ (t/ha)	_____	STD

Wind data

23.1	Power of modified exponential distribution of wind speed ^{1,2,3}	_____	UXP
23.2	Climate factor ^{1,3}	_____	DIAM
23.3	Wind erosion adjustment factor ³	_____	ACW
24.1- 24.12	Average monthly wind velocity ^{2,3} (m/s)	_____	UAVM(1-12)
25.1- 25.12	N wind during each month ³ (%)	_____	DIR1 (1-12)
26.1 26.12	NNE wind during each month ³ (%)	_____	DIR2 (1-12)
27.1 27.12	NE wind during each month ³ (%)	_____	DIR3 (1-12)
28.1 28.12	ENE wind during each month ³ (%)	_____	DIR4 (1-12)
29.1 29.12	E wind during each month ³ (%)	_____	DIR5 (1-12)
30.1 30.12	ESE wind during each month ³ (%)	_____	DIR6 (1-12)
31.1 31.12	SE wind during each month ³ (%)	_____	DIR7 (1-12)
32.1 32.12	SSE wind during each month ³ (%)	_____	DIR8 (1-12)

1 May be left blank or zero if unknown.

2 May be left blank if Priestley-Taylor method is used to estimate potential evaporation and wind erosion is not estimated.

3 May be left blank or zero if wind erosion is not estimated.

***** FORM 5 *****
ALMANAC DATA ASSEMBLY FORM

33.1- 33.12	S wind during each month ¹ (%)	DIR9 (1-12)
34.1- 34.12	SSW wind during each month ¹ (%)	DIR10 (1-12)
35.1- 35.12	SW wind during each month ¹ (%)	DIR11 (1-12)
36.1- 36.12	WSW wind during each month ¹ (%)	DIR12 (1-12)
37.1- 37.12	W wind during each month ¹ (%)	DIR13 (1-12)
38.1- 38.12	WNW wind during each month ¹ (%)	DIR14 (1-12)
39.1- 39.12	NW wind during each month ¹ (%)	DIR15 (1-12)
40.1- 40.2	NNW wind during each month ¹ (%)	DIR16 (1-12)

1 May be left blank if wind erosion is not estimated.

***** FORM 6 *****
ALMANAC DATA ASSEMBLY FORM

Soil data

41.1	Soil albedo	_____	SALB
41.2	Maximum number of soil layers ¹	_____	TSLA
41.3	Minimum thickness of maximum layer ¹ (m)	_____	ZQT
41.4	Minimum soil profile thickness ¹ (cm)	_____	ZF
41.5	Initial soil water content-fraction of field capacity ¹	_____	FFC
41.6	Minimum depth to water table ¹ (m)	_____	WTMN
41.7	Maximum depth to water table ¹ (m)	_____	WTMX
41.8	Initial depth to water table ¹ (m)	_____	WTBL
41.9	soil weathering code ¹	_____	XIDS
41.10	Time for sub surface flow travel time(d) ¹	_____	RFTT

42.1- Depth from the surface to the bottom of the soil layer (m) Z(1-10)
 42.10 _____

43.1- Bulk density of the soil layer (t/m³) BD (1-10)
 43.10 _____

44.1- Wilting point¹ (1500 kPa) (m/m) U (1-10)
 44.10 _____

45.1- Field capacity¹ (33kPa) (m/m) FC (1-10)
 45.10 _____

46.1- Sand content (%) SAN (1-10)
 46.10 _____

47.1- Silt content (%) SIL (1-10)
 47.10 _____

48.1- Organic N concentration¹ (g/t) WN (1-10)
 48.10 _____

49.1- Soil pH PH (1-10)
 49.10 _____

1 May be left blank or zero if unknown

***** FORM 7 *****
ALMANAC DATA ASSEMBLY FORM

50.1- 50.10	Sum of bases ¹ (cmol/kg)	SMB (1-10)
51.1- 51.10	Organic carbon (%)	CBN (1-10)
52.1- 52.10	Calcium carbonate (%)	CAC (1-10)
53.1- 53.10	Cation exchange capacity ¹ (cmo ¹ /kg)	CEC (1-10)
54.1- 54.10	Coarse fragment content ¹ (% vol)	ROK (1-10)
55.1- 55.10	Initial Nitrate concentration ¹ (g/t3)	WNO3 (1-10)
56.1- 56.10	Labile P concentration ¹ (g/t3)	O (1-10)
57.1- 57.10	Crop residue ¹ (t/ha)	RSD (1-10)
58.1- 58.10	Bulk density (oven dry) ¹ (t/m ³)	BDD (1-10)
59.1- 59.10	Phosphorus sorption ratio ¹	PSP (1-10)
60.1- 60.10	Saturated conductivity ¹ (mm/h)	SC (1-10)
61.1- 61.10	Not used at this time, leave blank	
62.1- 62.10	Organic P concentration ¹ (g/t)	WP (1-10)

¹ May be left blank or zero if unknown

*** FORM 8 ***

ALMANAC DATA ASSEMBLY FORM

(shaded areas can be left as zero unless user provided irrigation values are to be considered or the automatic irrigator or automatic fertilizer option is to be used)

Management information - operation codes

63.1	Crop rotation duration (yr.)	_____	NRO
63.2	Rigid or variable irrigation (1=irrigate by user entered amounts, 0 = automatic irrigator or no irrigations)	_____	NIRR
63.3	Irrigation code ⁴ (0=dryland, >1=irrigated)	_____	IRR
63.4	Minimum application interval for automatic irrigation ^{1,4} (d)	_____	IRI
63.5	Minimum fertilizer application interval for automatic fertilizer ¹ (d)	_____	IFA
63.6	Liming code ¹	_____	LM
63.7	Furrow dike code ¹	_____	IFD
63.8	Drainage code ¹	_____	IDR
63.9	Automatic fertilizer rigidity code ¹ (1 = user entered amounts, 0=automatic fertilizer or no fertilizer)	_____	IFFR
64.1	Water stress factor to trigger automatic irrigation ^{1,4}	_____	BIR
64.2	Irrigation runoff ratio ¹	_____	EFI
64.3	Maximum annual irrigation volume allowed for each crop ¹ (mm) [in.]	_____	VIMX
64.4	Minimum single application volume automatic irrigation ¹ (mm) [in.]	_____	ARMN
64.5	Maximum single application volume automatic irrigation ¹ (mm) [in.]	_____	ARMX
64.6	N stress factor to trigger automatic fertilizer ³	_____	BFT
64.7	Amount of fertilizer (IDFT) per automatically scheduled application ¹	_____	FNP
64.8	Maximum annual N fertilizer application for a crop ¹ (kg/ha) [lb./ac]	_____	FMX
64.9	Time required for drainage system to reduce stress ¹ (d)	_____	DRT
64.10	Fraction of furrow dike volume available for storage ¹	_____	FDSF

1 May be left blank or zero if unknown.

2 May be left blank or zero if drainage is not used.

3 Must enter this to trigger automatic fertilizer option

4. Must enter this to trigger automatic irrigator

*** FORM 9 ***
ALMANAC DATA ASSEMBLY FORM

8.3 Management Information-Irrigation Fertilizer/Tillage Schedule

Management data begins on line 65 and continues for as many as 1 to 10 rotations. The irrigation, fertilization and tillage information are entered in that order for each rotation, but separated by one line. The look of this area will vary depending on what scenario is wanted. For instance, if automatic irrigation is picked, then there will be no lines entered for irrigation amounts. Similarly for automatic fertilizer.

Following are samples of management input lines based on different scenarios:

1. User has real values for irrigation, fertilization and is planting corn:

(NIRR =1, IRR = 1 OR 2)

* (*MON DAY IRRIGATION AMOUNTS (MM)*)

* 04 15 50.0

* 05 15 50.0

*

* (*MON DAY N APPLIED(KG/HA) P APPLIED(KG/HA) APPLICATION DEPTH*)

* 03 05 120.0 35.0 50.0

*

* (*MON DAY OPERATION # CROP # PHU PLANTING DENSITY*)

* 02 15 16 (*OPERATION 16 IS A DISK BEDDER*)

* 03 14 04 02 2000 5.0 (*OPERATION 4 IS A PLANT OPERATION., 02 IS CROP #*)

* 07 15 07 02 (*OPERATION 7 IS A HARVEST OPERATON*)

(*CROP #2 IS CORN, MUST ENTER IT # AT HARVEST ALSO*)

- all lines are entered including blank lines except what is in italics; the asterisk is not entered

2. User sets values for automatic irrigator, and automatic fertilizer option:

(IRR=1 or 2, IRI >0, BIR > 0) and (IFA > 0 and BFT > 0)

02 15 16

03 14 04 02 2000 5.0

07 15 07 02

3. User wants dryland corn, so no irrigation, but has values for fertilization:

02 05 120.0 35.0 50.0

02 15 16

03 14 04 02 2000. 5.0

07 15 07 02

4. User has dryland corn and added no fertilizer:

02 05 0.0 0.0 0.0

02 15 16

03 14 04 02 2000. 5.0

07 15 07 02

***** FORM 10 *****
ALMANAC DATA ASSEMBLY FORM

9.1 Daily weather file name

This is entered only if you have chosen to input daily weather data.

Enter the complete file name, including directories (if necessary).

7 or 70 characters maximum in each file name

SKIP ONE LINE AFTER MANAGEMENT DATA BEFORE ENTERING WEATHER NAME.