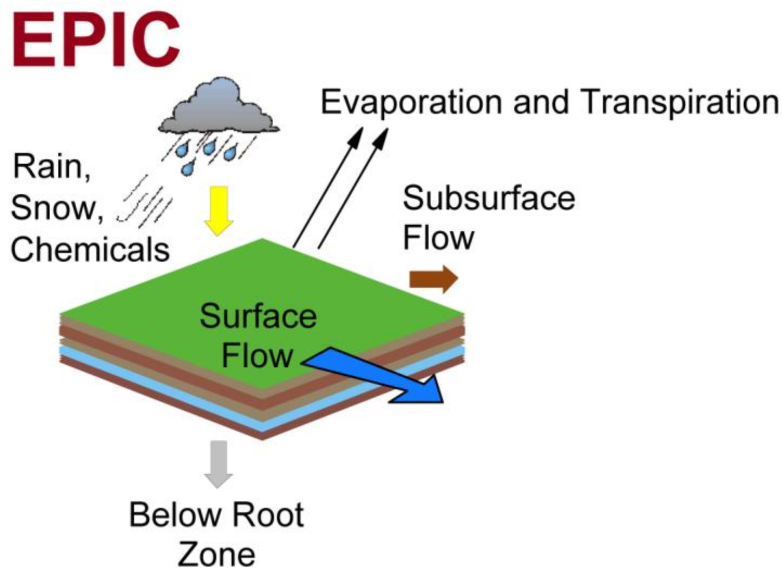
Environmental Policy Integrated Climate Model

WinEPIC Interface Manual Ver. 0810

September 2013

Environmental Policy-Integrated Climate model (EPIC) and WinEPIC

Blackland Research and Extension Center
Texas A&M AgriLife
720 East Blackland Road
Temple, Texas



WinEPIC Development Team:

Dr. Tom Gerik
Co-project leader, quality control and beta testing

Dr. Wyatte Harman
Co-project leader, quality control and beta testing

Dr. Jimmy Williams	Author of EPIC
Larry Francis	Visual Basic programming
John Greiner	Visual Basic programming
Melanie Magre	Database maintenance, beta testing, guide development
Avery Meinardus	EPIC programming support
Evelyn Steglich	Model validation, website maintenance, guide development
Robin Taylor	WinEPIC 0810 Interface Manual revision

Disclaimer

Information presented is based upon best estimates available at the time prepared. The Texas A&M University System makes no warranty, expressed or implied, or assumes any legal liability or responsibility for the accuracy, completeness or usefulness of any information.

Model Objective:

- Assess the effect of soil erosion on productivity;
- Predict the effects of management decisions on soil, water, nutrient and pesticide movements;
- Predict the combined impact of changes to soil, water, and nutrient flux and pesticide fate on water quality and crop yields for areas with homogeneous soils and management.

Model Operation:

- Daily time step.
- Long term simulations (1-4,000 years).
- Soil, weather, tillage and crop parameter data supplied with model.
- Soil profile can be divided into 3-15 layers.
- Choice of actual weather or weather generated from long term averages.
- Homogeneous areas up to large fields or small watersheds.

Model Components:

Weather	Soil temperature	Evapotranspiration	Snow melt
Surface runoff	Return flow	Percolation	Lateral subsurface flow
Water erosion	Wind erosion	Nitrogen leaching	N & P loss in runoff
Organic N & P transport by sediment	N & P immobilization and uptake	N & P mineralization	Denitrification
Mineral P cycling;	N fixation	Tillage practices	Crop rotations
Crop growth & yield for over 100 crops	Plant environment control	Fertilization	Pesticide fate & transport
Liming	Drainage	Irrigation	Furrow diking
Feed yards	Lagoons	Waste management	Economic accounting

EPIC Overview:

The original function of EPIC was to estimate soil erosion by water under different crop and land management practices, a function reflected its original name: Erosion Productivity Impact Calculator. The development of the field-scale EPIC model was initiated in 1981 to support assessments of soil erosion impacts on soil productivity for soil, climate, and cropping practices representative of a broad spectrum of U.S. agricultural production regions. The first major application of EPIC was a national analysis performed in support of the 1985 Resources Conservation Act (RCA) assessment. The model has continuously evolved since that time and has been used in a wide range of field, regional, and national studies both in the U.S. and in other countries. The range of EPIC applications has also expanded greatly over that time including:

- Irrigation studies;
- Climate change effects on crop yields;
- Nutrient cycling and nutrient loss studies;
- Wind and water erosion studies;
- Soil carbon sequestration studies;
- Economic and environmental studies.

EPIC is a process-based computer model that simulates the physico-chemical processes that occur in soil and water under agricultural management. It is designed to simulate a field, farm or small watershed that is homogenous with respect to climate, soil, landuse, and topography – termed a Hydrologic Landuse Unit (HLU). The area modeled may be of any size consistent with required HLU resolution. EPIC operates solely in time; there is no explicitly spatial component. Output from the model includes files giving the water, nutrient, and pesticide flux in the HLU at time scales from daily to annual. The growth of crop plants is simulated depending on the availability of nutrients and water and subject to ambient temperature and sunlight. The crop and land management methods used by growers can be simulated in considerable detail.

The model can be subdivided into nine separate components defined as weather, hydrology, erosion, nutrients, soil temperature, plant growth, plant environment control, tillage, and economic budgets (Williams 1990). It is a field-scale model that is designed to simulate drainage areas that are characterized by homogeneous weather, soil, landscape, crop rotation, and management system parameters. It operates on a continuous basis using a daily time step and can perform long-term simulations for hundreds and even thousands of years. A wide range of crop rotations and other vegetative systems can be simulated with the generic crop growth routine used in EPIC. An extensive array of tillage systems and other management practices can also be simulated with the model. Seven options are provided to simulate water erosion and five options are available to simulate potential evapotranspiration (PET). Detailed discussions of the EPIC components and functions are given in Williams et al. (1984), Williams (1990), Sharply & Williams (1990), and Williams (1995).

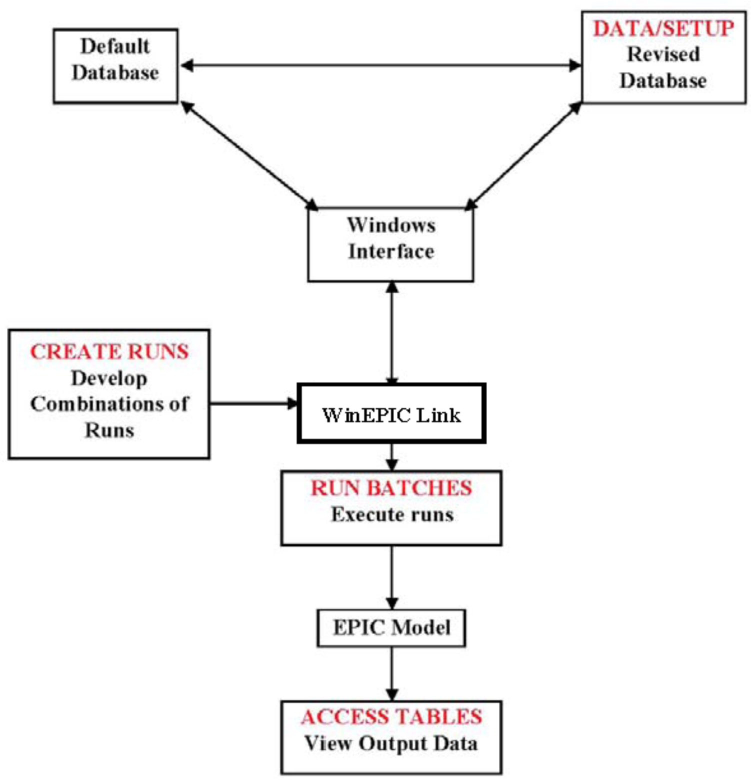
I. Introduction

WinEPIC is a Windows® -compliant user-friendly interface for the EPIC (Environmental Policy Integrated Climate) crop simulation model (Williams et al. 1989). It combines many features of the CroPMan (Crop Production and Management) model (Gerik & Harman 2001). WinEPIC is designed to be a comprehensive user's simulation model for analyses of cultural practices and cropping systems on production, soil quality, water quality, water and wind erosion, and profits (Gerik et al. 2004). WinEPIC was developed with a focus on research applications in which multiple runs need to be made efficiently. This is in contrast to CroPMan in which single or a limited number of comparisons are executed and displayed using graphic displays for convenient interpretation by the user.

The WinEPIC interface allows the user to:

- Provide minimal input data to run EPIC;
- Customize specific EPIC input variables.

The following diagram shows the flow of information in WinEPIC:



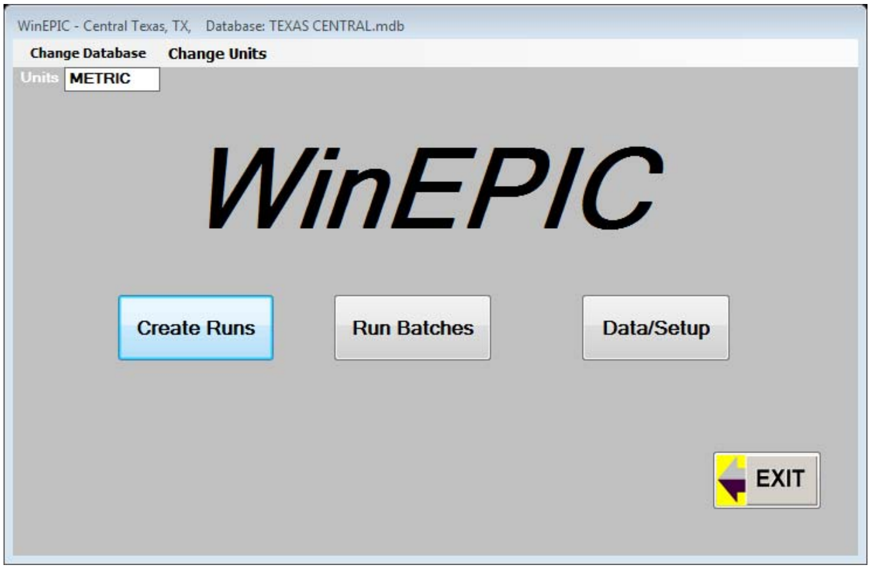
Definitions: EPIC Projects, Scenarios & Runs

A project is a study designed to model and explore an idea or concept regarding the impact of agricultural management practice(s), geography (location and/or topography), or climate on crop yield, environmental impact, and/or economics of the agricultural enterprise. It will involve the manipulation of one or more variables (e.g. presence or absence of a management practice or constant versus increasing atmospheric CO_2). Each model execution with a defined set of input data is a scenario. A scenario may be run standalone or as a member of a batch run. A scenario is therefore a single specific model configuration within a project or study which will typically consist of one or more runs of one or more scenarios. The following examples illustrate the flexibility of EPIC to simulate the environmental impact of agriculture:

- An EPIC project may involve the same crop and land management scenario applied to several separate parcels of land (a field, farm, or small watershed), each with different soil and/or weather input in a series of runs;
- An EPIC project may involve a variety of management scenarios applied in a series of runs to the same parcel of land having the same soil and weather files;
- An EPIC project may be created for a virtual or real parcel of land subjected to the same scenario (management practices, soil, and weather kept constant), while the geographic characteristics (latitude, longitude, altitude, slope, or aspect) of the site are varied in a series of runs.

II. WinEPIC Main Menu

On launching WinEPIC, the Main Menu screen presents the basic functions of WinEPIC. Three buttons and two menu items are used to setup, create and run one or more EPIC model runs: **Create Runs**, **Run Batches**, **Data/Setup**, **Change Database** & **Change Units** To exit the program, press the **Exit** button in the lower right corner of the window. All other windows have a **Back** button to bring you back to the previous screen and ultimately to this window.



Create Runs is used to set up and save new sets of simulation criteria into a specific scenario.

Run Batches allows the user to manage the saved scenarios and select scenario(s) to run.

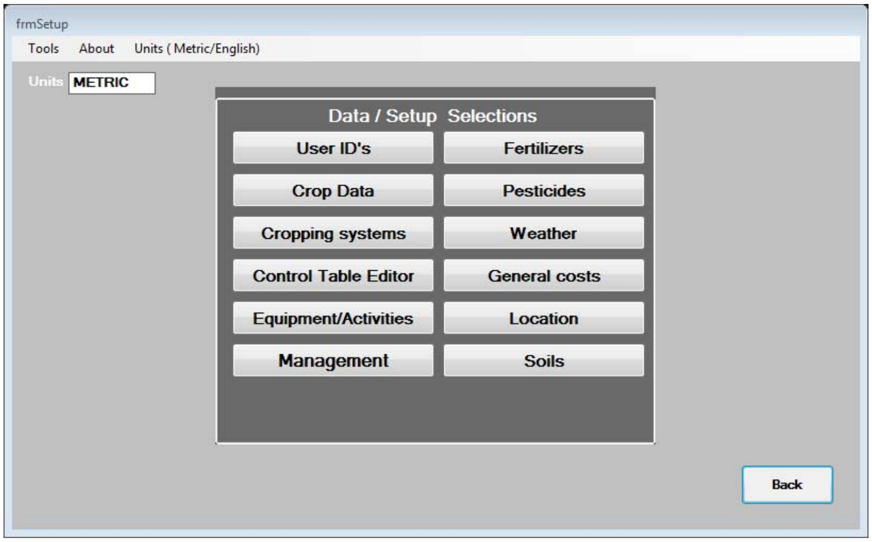
Data/Setup is used to select and specify parameters for a project.

Change Database is used to select the user database for the current session.

Change Units selects English or metric units for the model.

A. Data/Setup

Data/Setup is used to tailor WinEPIC with specific information as to the location, to modify the user's information including user IDs, farms, fields, zones, soils, cropping systems, weather, fertilizers and pesticides. Also, it can be used to modify control data, selected crop physiology characteristics, prices, and costs. Click **Data/Setup** on the Main Menu screen to access the Data/Setup screen:



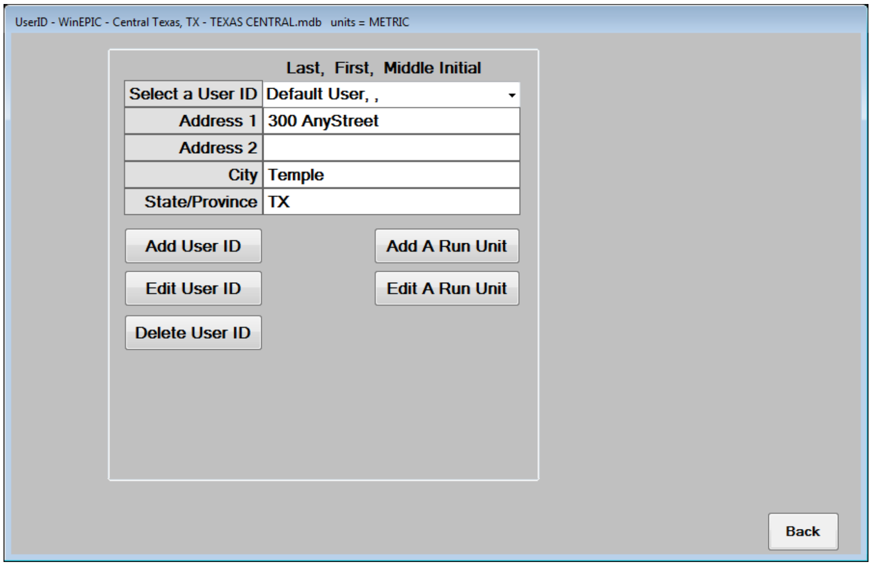
The buttons and menus in **Data/Setup** allow the following functions:

- Entry of information about User IDs and their farming units.
- Entry of information specific to the user's geographic location (address, telephone number, latitude, longitude, etc.)
- Selection of soils, cropping systems, fertilizers, pesticides and other program parameters.
- Editing/adding control files and setting years of simulation.
- Editing of lime, fuel, labor, fertilizer and pesticide costs, grain and forage prices and machinery prices.
- Addition of custom cropping systems to the default set of cropping systems furnished with the program.
- Editing/adding crop budgets and equipment items.

1. User ID's

The purpose of the User ID database is to identify the location and other pertinent data associated with each WinEPIC project. The information entered here is used to label all input and output files. The User ID database will be reviewed as if the user were creating a new User ID rather than using the default User ID already present in the program.

To begin managing the User ID database, select **User ID's** on the Data/Setup screen and then click **Add User ID** to access the User ID Add screen. Stored users are obtained with the drop down menu *Select a User ID*:



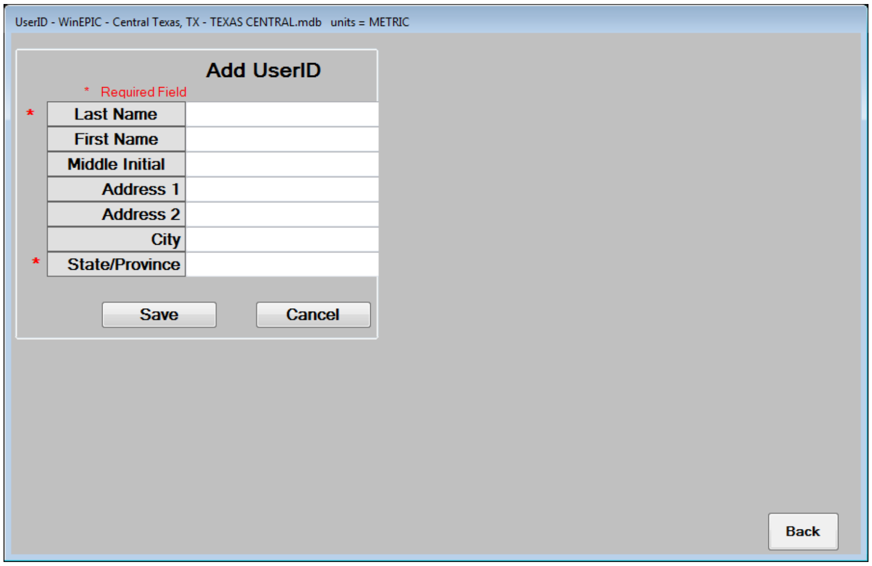
There are two parts to this feature— User ID data and Run Unit data. The User ID database contains general information about each user, such as name, address, phone numbers, etc. Also included is information on the run units (farm, site, zone) used in a WinEPIC run. Consequently, all run units are linked to a specific User ID. There may be multiple records for a User ID Run Units, e.g. several farms and several fields and/or zones within each farm.

Some of the database options discussed below will not appear until a name is selected from the drop down menu on the Add User ID screen. However, once the User ID name is selected, the user may proceed with additional options to maintain the User ID database. The *User ID* options include **Add User ID**, **Edit User ID**, and **Delete User ID** and the *Run Unit* options include **Add a Run Unit** and **Edit a Run Unit**.

NOTE: Immediately after a new User ID has been added, the program will use it as the default User ID and the user may view this new User ID on the User ID Add screen.

a. Adding a User ID

Enter the general User ID information for a new User ID. The "last name" field is a required entry meaning a name must be entered to add a User ID. Each User ID must be unique; if the user enters a User ID's "first name" and "last name" that already exist in the database, the user will be prompted to change the entry. After all of the User ID data are entered, click **Save** and either **Yes** or **No** to add additional User ID s.



b. Editing a User ID

The user must click successive buttons to edit the User ID information: After selecting the User ID on the Add User ID screen, click **Edit User ID**. If the user makes changes to any of the fields or attempts any other operation including editing any of the run unit data, the user will be prompted to save these changes. Note: Editing the User ID information in no way changes the associated run unit information. To change the User ID for the associated run units, edit the User ID. DO NOT delete the User ID and add another one; this will cause all of the associated run unit information to be deleted.

c. Deleting a User ID

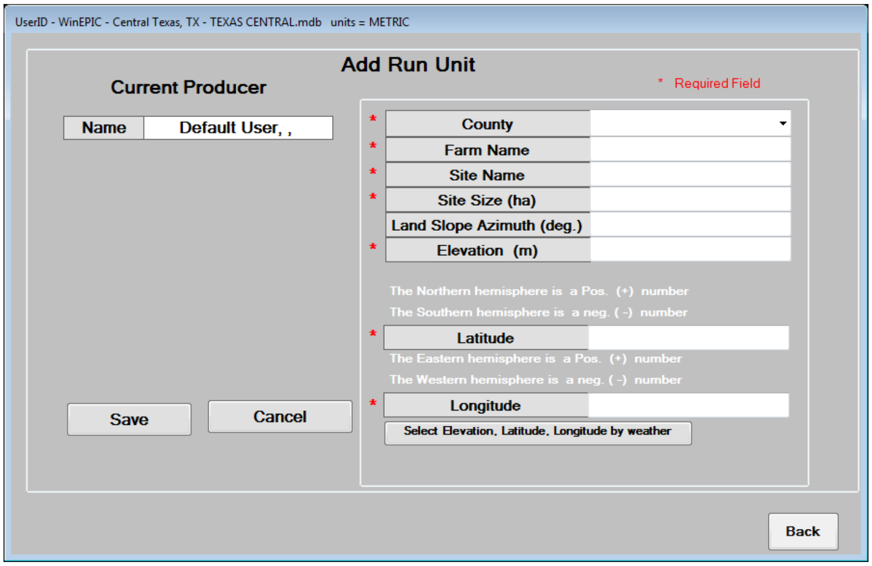
If **Delete User ID** is chosen, the user will be notified that if the current User ID is deleted, all of the User ID data (both input and output) and associated run units will be deleted. Each User ID is assigned a unique ID when first entered. This ID is used once and cannot be re-assigned. This ID is also saved with each of the respective owners' run units; and therefore, will be used to delete the run units along with the associated User ID information if the user continues.

After the initial User ID information has been added and saved, the WinEPIC program will automatically return to the Adding a User ID screen and load the User ID that was last added. If an alternative User ID exists, scroll to select another User ID to make additions or deletions. Until a new or existing User ID is selected, the database options will not appear.

If desired, the user may **Add a Run Unit** and/or **Edit a Run Unit** in **Run Unit Options**, after the User ID has been selected.

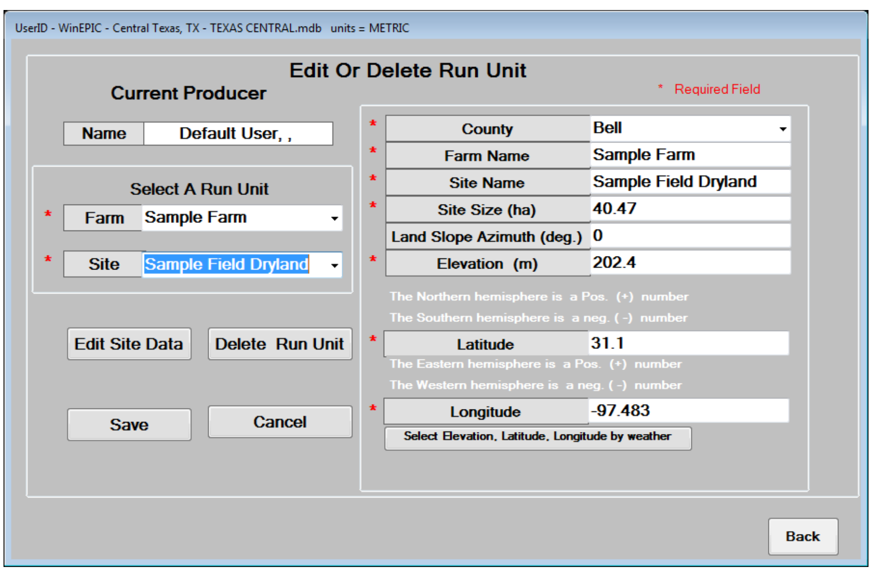
d. Adding a run unit

A run unit may be added by clicking **Run Unit Options** and then **Add a Run Unit**. This allows the user to add a new run unit or to make changes to any existing run unit, if applicable, and to save it as a new one. To add the first run unit, click "Unlock form to add new Run Unit" and simply fill the form with the necessary or required fields. To add successive run units or add additional run units by modifying an existing run unit, select the appropriate bullet, i.e. "Select a Run Unit to Modify" or "Unlock form to add new Run Unit". After entering the data to create a new run unit or edit an existing run unit, click **Site Data**. Here, the user will establish the type of irrigation regimen used on the field (whether the irrigation amount is fixed or flexible), the flexible irrigation interval time, and various other parameters. If the field is not irrigated, set the irrigation code to dryland and no irrigations will occur. Caution: If flexible irrigation is selected and the crop budget contains irrigation amounts also, they will be replaced with the flexible amounts needed to fill the soil profile on the exact days indicated for irrigation applications in the crop budget. After the site data has been set, click **Back** and **Save** to complete the operation.



e. Editing or Deleting a run unit

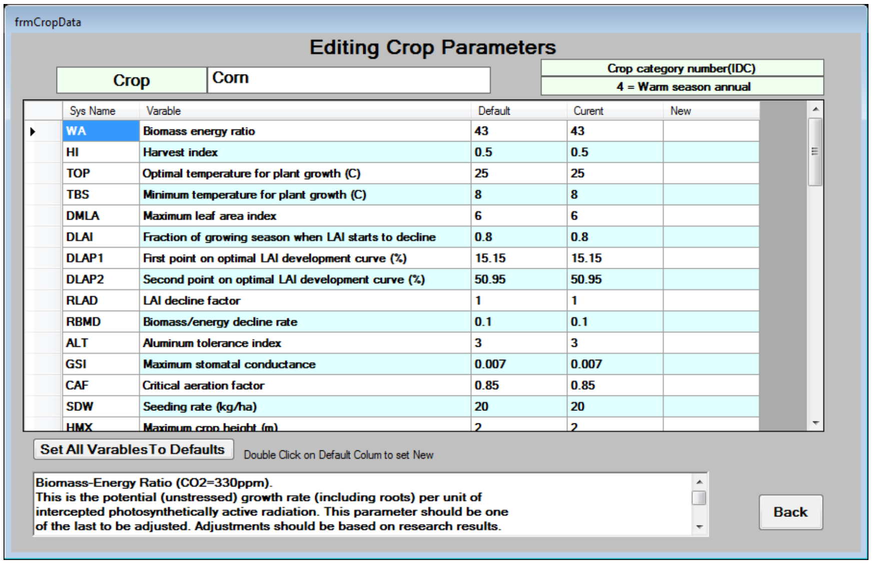
Edit a Run Unit is the default mode of operation of this screen. If the user makes changes to any of the fields or attempts any other operation (including editing any of the User ID information), the user will be



prompted to save these changes. To edit a run unit, click **Edit a Run Unit**, select the farm and field from the drop down menus, change the entries as desired and click **Save**. To delete a run unit, select the farm and site to delete and click **Delete Run Unit**.

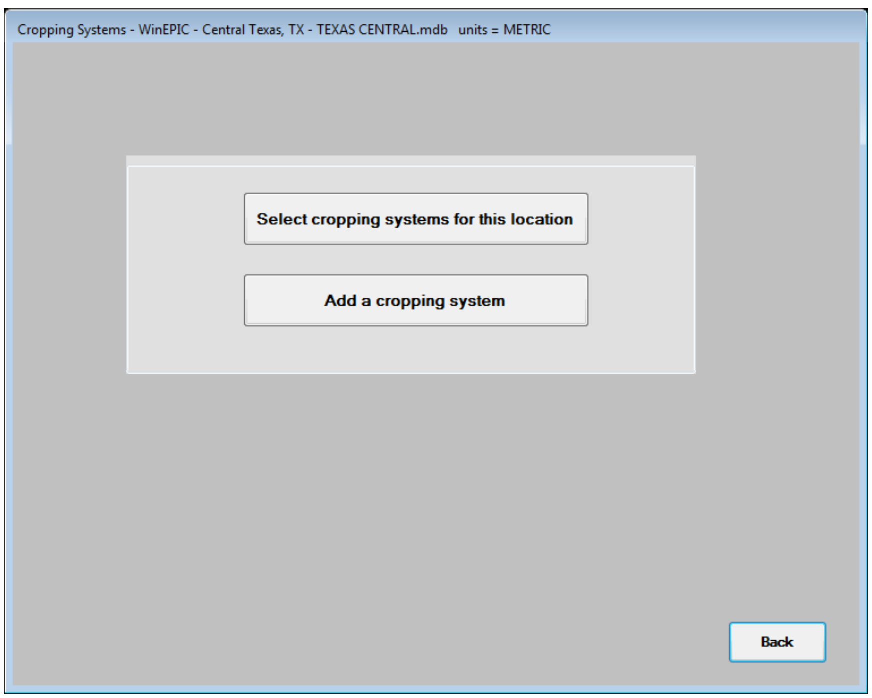
2. *Crop Data*

Selecting **Crop Data** on the Data/Setup screen is used to edit parameters by category for all of the crops included in WinEPIC. The user may enter a new value or reset the parameter to the default value. It should be noted that the seed cost and yield price can be revised in this section.

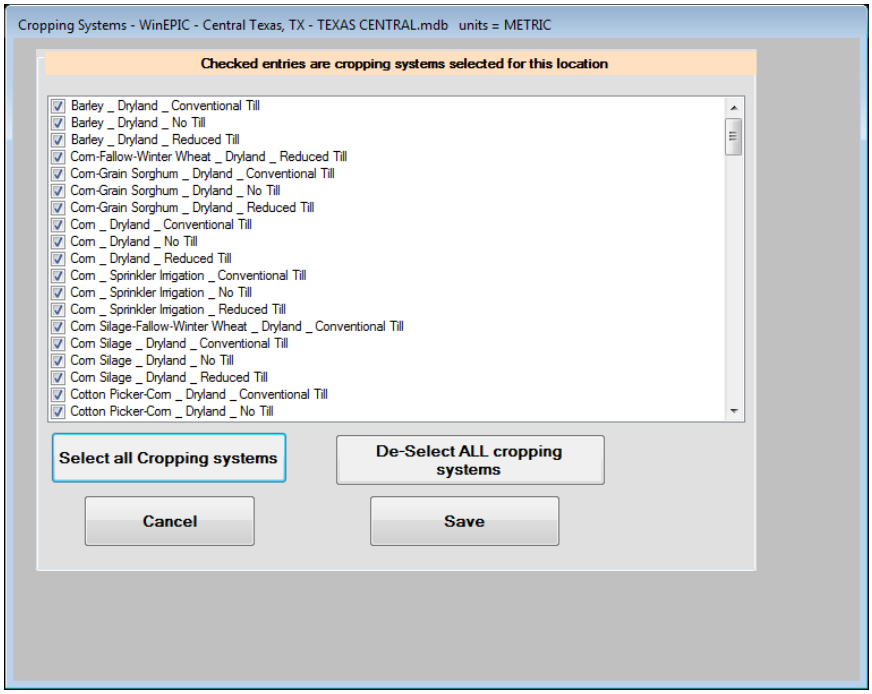


3. *Cropping Systems*

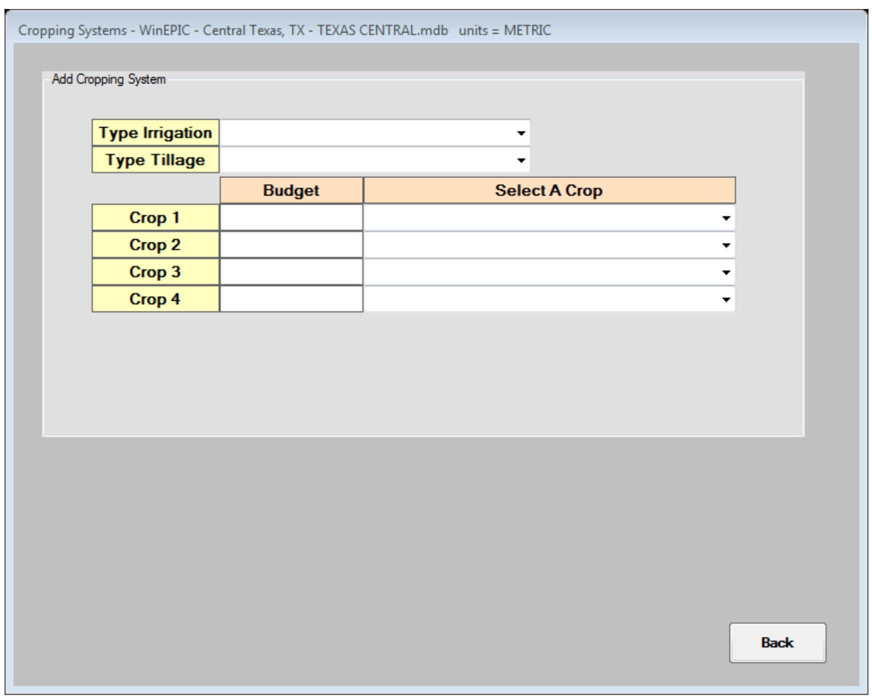
Cropping systems are defined as unique combinations of the rotation (crop order), as well as the type, timing, rate and method for each operation associated with the rotation. Cropping systems may be



defined for a single crop or up to 4 crops in a rotation. Cropping systems may be combined to create longer rotations. The user may either select or add cropping systems for the specific location by clicking **Cropping Systems** on the Data/Setup screen. Click **Select cropping systems for this location** to select one, many or all cropping systems from the entire list for use in the WinEPIC program.



Alternatively, by clicking **Add a cropping system** the user may create a new cropping system from various combinations of three components: irrigation method, tillage type and up to 4 crops.



4. . Control Table Editor

Control Table Editor on the Data/Setup screen is used to manage the control records. Within the control table editor, the starting year of the simulation, as well as the duration of the simulation are set. Automatic irrigation and fertilization parameters among numerous other control parameters are also set within the control table, including the auto irrigation trigger. In order to make scenarios using different years of simulation or irrigation strategies, several control tables must be created. The control table will determine when and under what circumstances the scenarios will be run.

Control Table Editor has three buttons: **Add New Record**, **Add New Record Using Existing Record** or **Edit Record**. Upon selection, the user may add or change the parameter values in the Current column. For convenience, the default value is listed in the Default column.

a. Add New Control Record

Click **Add New Record** to add a new control record and a new number will be assigned automatically as the record number. Type a name (up to eight-characters) in the **Enter New Control Record** field. The user may enter values in each of the cells in the Current column or click **Set All to Default** to automatically enter the default values for all of the parameters on the current page, i.e. if only a few of the parameters are different from the values in the default control file, this will quickly add the default values into the Current values column and those few parameters can be entered individually. Entries can be cancelled or saved by clicking the appropriate button. Upon saving the record, a message stating, "A New Record has been Added" will appear.

The start date of the simulation in the control table must be identical to (or later than) the initial date of the weather history. Otherwise, all weather will be generated as a random process. Also, a start date past the date of weather history will initiate generated weather. For a weather history with varying dates like this, the user may consider setting up multiple control files containing exact beginning and ending dates to select from in **Create Runs**.

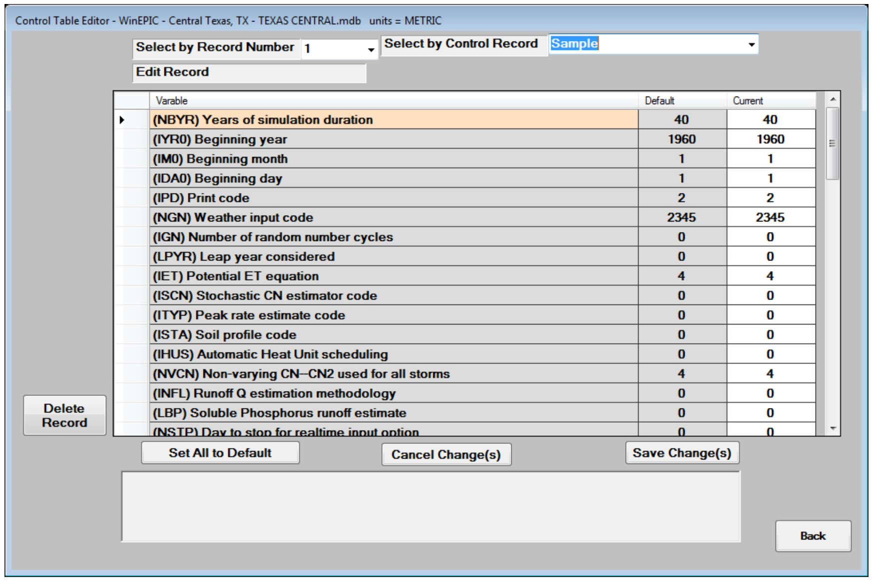
b. Add New Record Using Existing Record

Click **Add New Record Using Existing Record** to add a new control record based on an existing record. Existing records may be selected by clicking the drop down menus Select by Record Number or Select by Control Record. You will then be prompted to enter a new control record name. Make changes to the parameter values in the Current column (which is similar to the procedure above for adding a control record). Entries can be reset to their original values by clicking **Set All to Default**. Click **Cancel Change(s)** or **Save Changes(s)** to exit without saving or complete the process.

NOTE: When creating a new run, the last control record saved will appear along with previous ones saved as different record numbers; otherwise, only one will appear for selection. All runs created with the last control record, and all runs previously created with other control records having the same record number as the last one, will use only one control record—the last one. Changing the name has no effect on the data being used in the control record—only the record number affects the data used.

c. Edit Record

Click **Edit Record** and select an existing record from the drop down menu to change an existing control record. Make changes to the parameter values in the Current column (which is similar to the procedure above for adding a control record). Entries can be reset to their original values by clicking **Set All to Default**. Click **Cancel Change(s)** or **Save Changes(s)** to exit without saving or complete the process.



d. Key Parameters for Revision

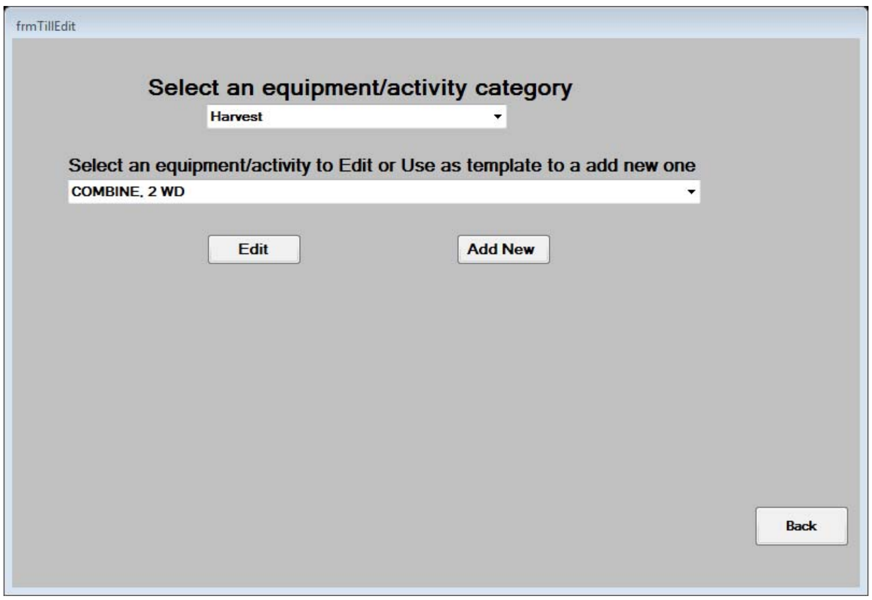
The list below gives a description of some key parameters that need to be reviewed for each set of batch runs.

Variable	Description
NBYR	Number of simulated years. For crop rotations, make the year a multiple of the rotation period.
IYRO, IMO, IDA	See **Add Control Record**
NGN	Must be set to non-zero value if actual weather history is to be used.
IET	Must use an appropriate PET method for yield validation.
ISTA	Must set to 1.0 if no erosion is to occur (e.g. for short-term yield validation).
IHUS	Instructs the budget operation to occur when indicated GDUs (fraction of growing season GDU).
NCOW	Must be greater than 0 for forage to be grazed and forage yields to be reported.
FL, FW	Length and width of the field impacted by wind (wind run).
STD	Crop residue impacts wind and water erosion and it is only good for first day of simulation whether a pre-run year or a simulated year. Thus, if a level of residue is required to begin a simulation, then DO NOT perform any pre-run years.
ACW	If nutrient or pesticide losses are being analyzed, they will be unduly influenced by gross soils losses (as opposed to net soil losses due to soil replacement) by wind. In these situations, losses are difficult to estimate accurately though relative losses may be used in analysis with caution.
BIR	The irrigation trigger—this turns on automatic irrigation and if combined with flexible applications, budget dates and amounts are ignored. If combined with fixed applications, irrigations will be added to the scheduled applications as needed to meet the water conditions.

PEC	This parameter is crucial for determining soil erosion.
GZLM.	This parameter is crucial to prevent erosion of a grazed crop
DRV	This parameter is crucial for choosing the water erosion equation.

5. Equipment Editor

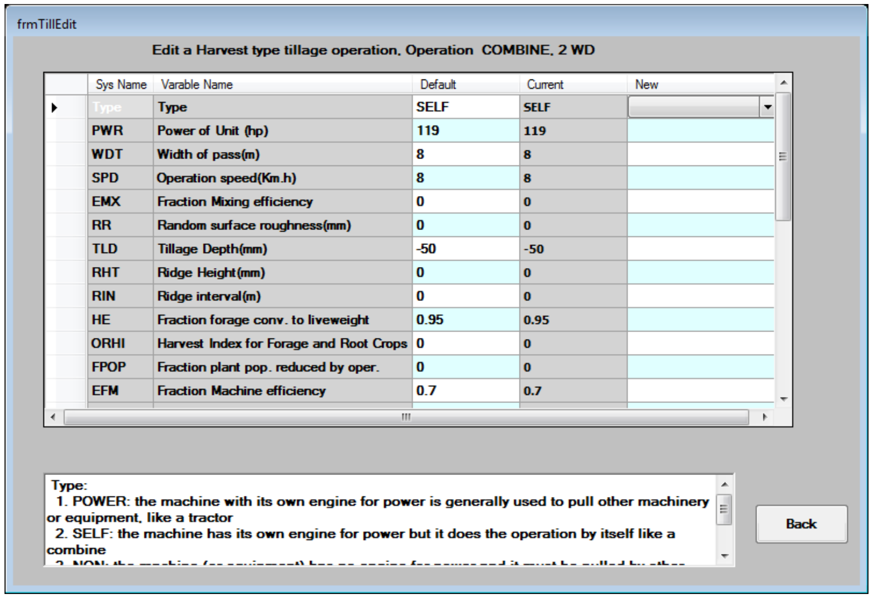
Click **Equipment/Activities** on the Data/Setup screen to edit tillage and irrigation equipment information; for example, the user may indicate grazing quantity and manure deposited each day using this option. Select the activity category and then select the specific activity and equipment combination in the second drop down menu..



a. Edit a Tillage Activity

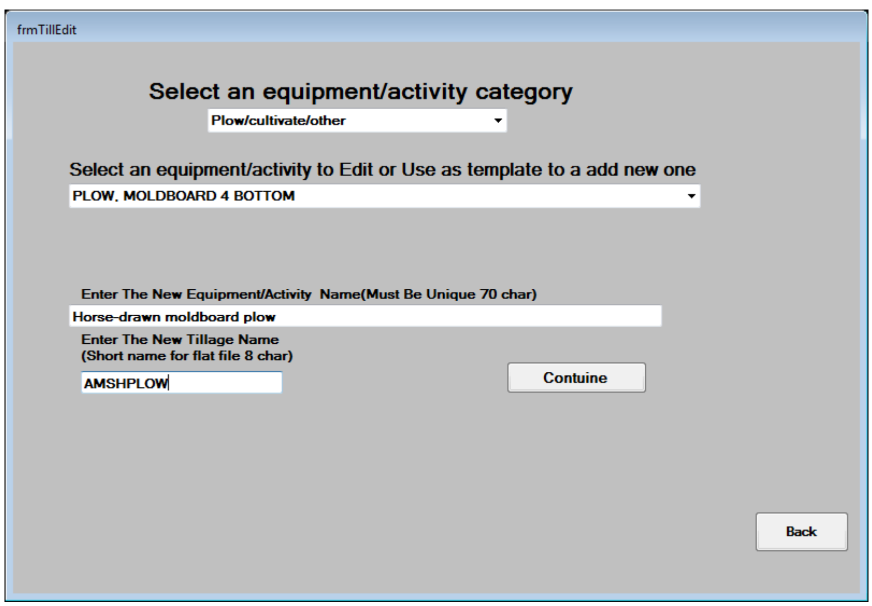
Select Harvest and COMBINE, 2 WD for example and click **Edit** to select the combination of machinery/equipment for editing. Select the particular activity to modify and type the new values in the New column. After all changes are complete, click **Save**, then **Save Edited Op. And Exit**. **Back** will cancel edits.

In the case of irrigation systems with efficiencies indicated in their titles, the percentage runoff and percentage distribution efficiency cannot be changed. If, after reviewing the various systems, a center pivot system does not exist with the correct combination of runoff and distribution efficiency, there is a center pivot system with no efficiency in its title for customizing percentage runoff and percentage distribution efficiency.

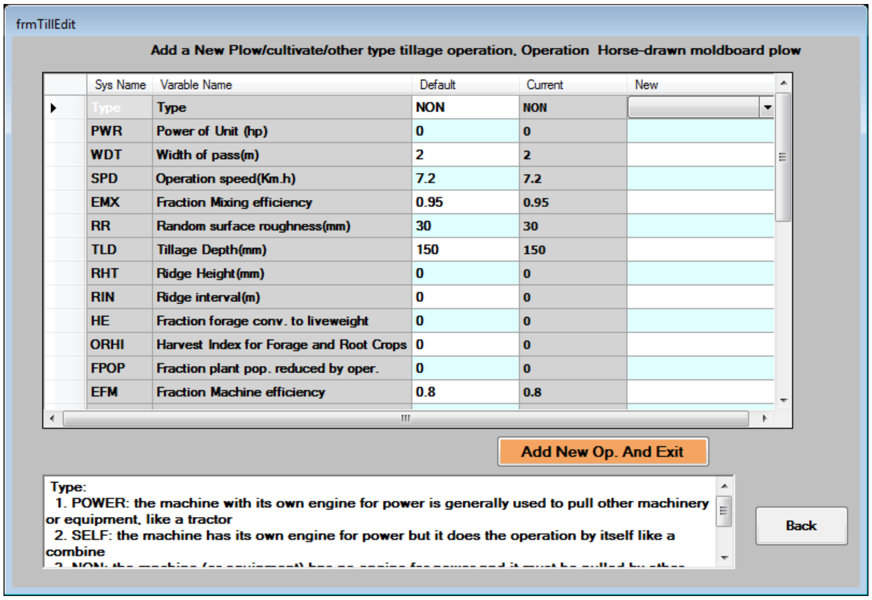


b. Add a Tillage Activity

To add a tillage activity select the activity category and specific activity Click **Add New** to modify an existing activity. Type the new activity name in the title box and an 8 character abbreviation, then click **Continue**.



Enter changes in the New column, click **Save**, and **Save Edited Op. And Exit**. **Back** will cancel edits.



c. Specialized Categories

The Equipment Editor has some specialized categories in the following sections:

Grazing

Using grazing as an enterprise, the amount of dry forage grazed is set in ORHI - Override Harvest Index as (kg/head/day). This value must be equal to or greater than 1.0 in the Graze Start activity. Otherwise, it will be read as a Harvest Index for a forage harvester, the amount of biomass above ground harvested. In order for grazing to occur, it is essential that NCOW be greater than zero in the Control Record. When the Grazing Limit (GZLM) or the above ground plant material (T/ha) is met, grazing stops until the crop grows above GZLM. This is to keep from over grazing and killing the crop. Graze Stop is an activity that is required in the management activities to stop grazing, facilitating multiple grazing periods within or across years.

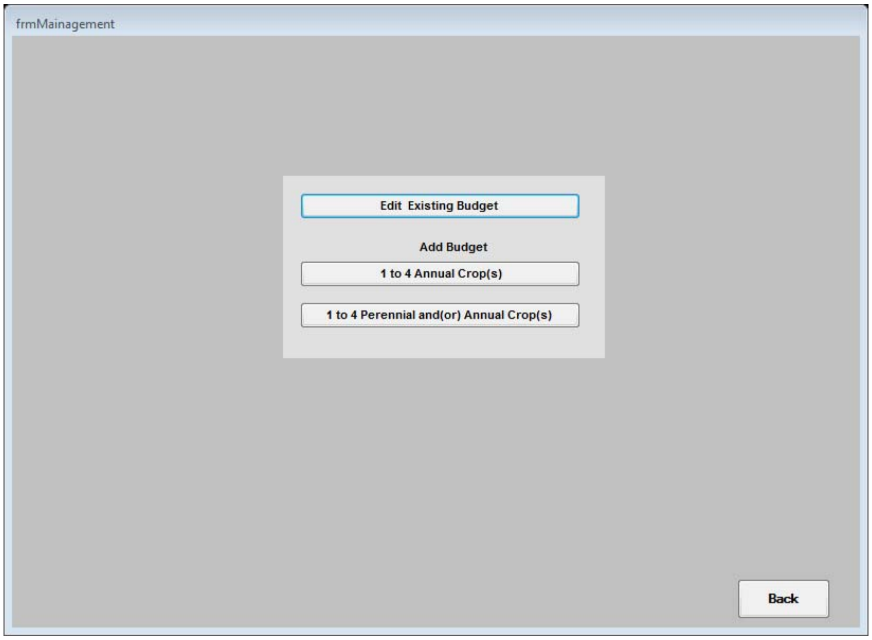
The custom hire is the cost of the custom operation or in the case of grazing, the price of operating costs for fencing, care, medicine, etc.

NOTE: Crop grazing income is not included in this version. The researcher must add crop-grazing income and subtract additional costs to calculate grazing profits to be added to crop profits.

Plastic Cover

To use plastic cover to control or minimize weeds and evaporation, revise the "fraction soil surface covered" to a fractional estimate. Random surface roughness impacts wind erosion and can be set near 0 if nearly the entire soil surface is covered with plastic. There is also a special equipment item typically used for rice flood irrigation: puddle rice paddy which causes layer 2 of soil profile to reduce infiltration significantly. To return soil to normal condition, include Puddle Stop as an operation.

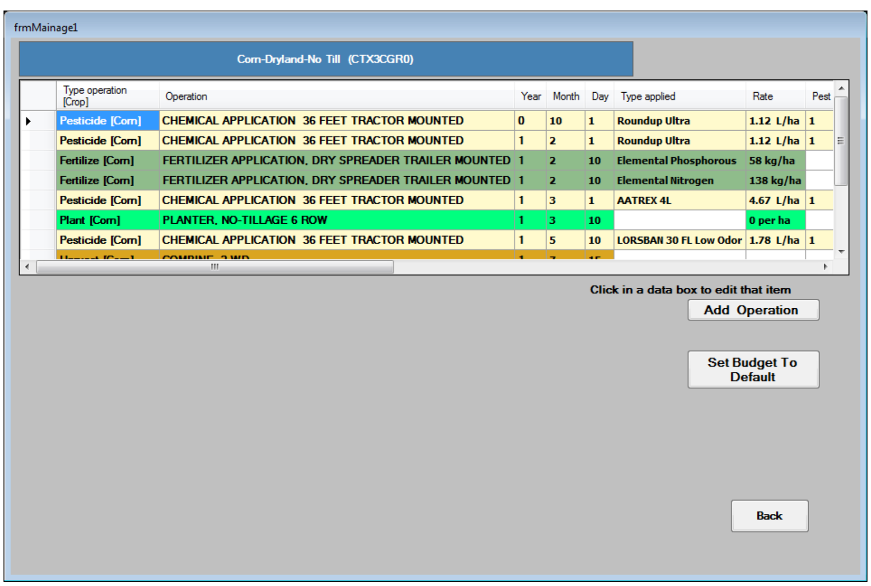
6. Management Editor



Click **Management** on the Data/Setup screen to create or edit existing budgets.

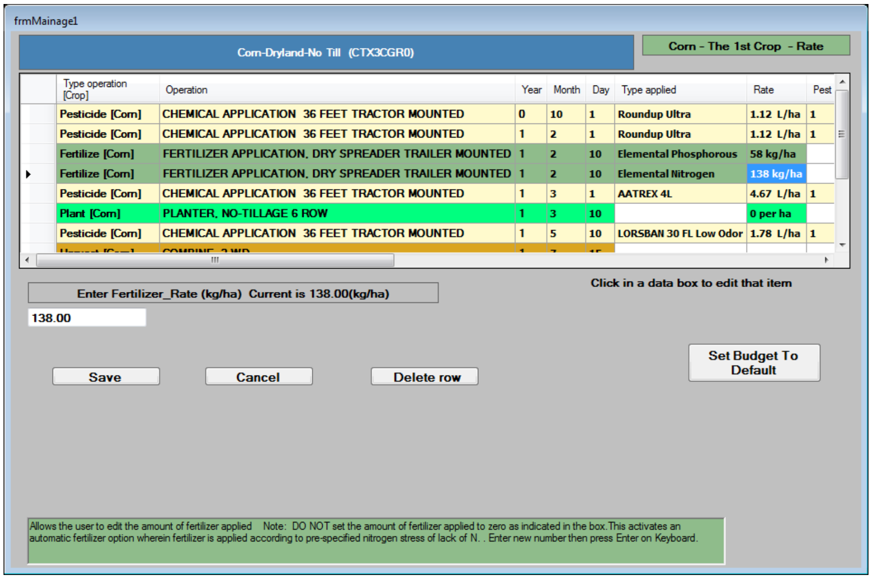
a. Edit Existing Budget

To edit an existing budget by modifying, click **Edit Existing Budget** on the Edit or Add Budget screen and select the crop budget to edit from the drop down menu. The operations for the selected budget will be displayed in the Data/Setup-Edit Budgets screen. To edit an existing operation type, amount of application, etc., the user may enter



data directly by selecting any cell in the datasheet and then making the desired changes with the drop down menus below the datasheet to the desired fields. Similarly, new operations may be added to the datasheet by clicking **Add Operation** .

For example, in the above corn budget, the user may want to change the amount of fertilizer applied on a particular date. The user would use the lower horizontal scroll bar to scroll over to the right side of the budget to the fertilizer rate column and click on line to change in the “Rate” data box

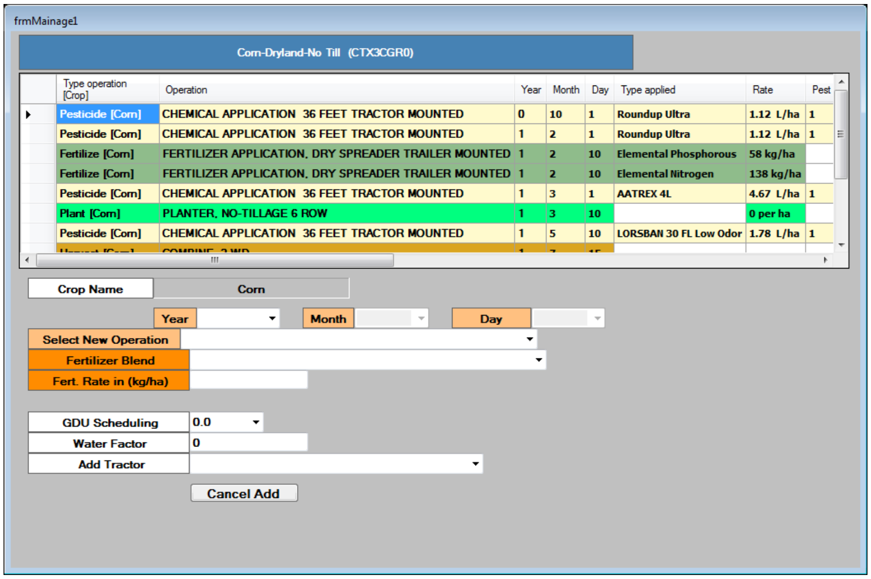


This action generates the appropriate menus below the budget to change and save the information. In this example, the screen below the budget has a box for the new fertilizer value. After making selections, the user may **Save**, **Cancel** or **Delete Row**: click the **Save** button to save changes or **Cancel** to cancel changes to the fertilizer rate. The entire row of the budget may be deleted by clicking **Delete Row**. To have changes revert back to the default values, simply click **Set Budget to Default**. The bottom of the screen has a box with the variable definition and/or range of values permitted for the selected operation or parameter.

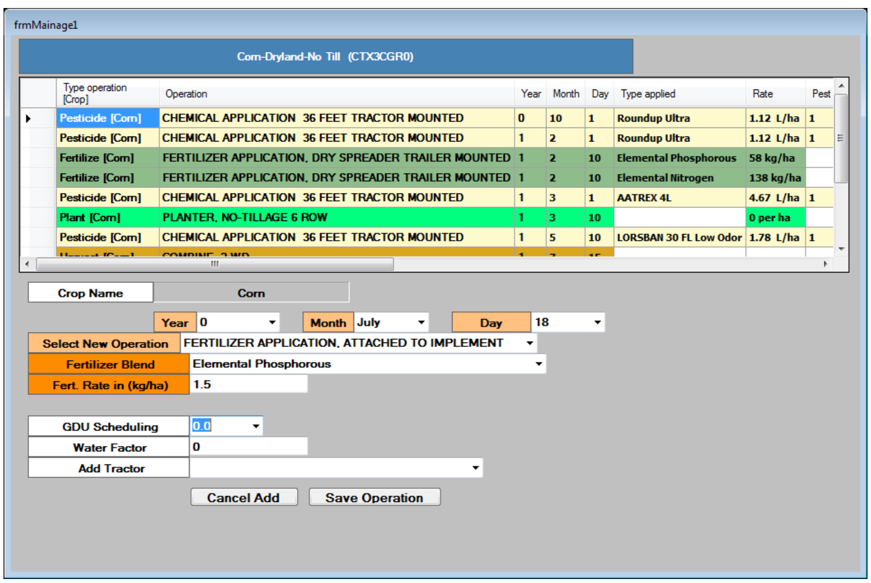
Caution: DO NOT set the amount of fertilizer rate applied to zero. This activates an automatic fertilizer option wherein fertilizer is applied according to pre-specified nitrogen stress of lack of N.

NOTE: When modifying or adding operations, the date of operation is critical, especially for those using the yield for calculating costs. In the case of drying, hauling, ginning and bagging & ties, the date of these operations must be after HARVEST and before KILL for the cost calculations to be correct. In the case of dual inputs such as putting on a starter fertilizer with the planter, simply add the fertilizer on the same day as planting with a "Fertilizer application, attached to implement" with the kind, amount, and depth of fertilizer placement, but do not add a tractor. In similar fashion, dual or triple pesticide mixes can be applied at the same time, or two machines can be pulled by one tractor. Omitting the tractor for the 2nd, 3rd, up to the nth operations on the same day avoids double counting tractor fuel, repairs, and labor costs. Also, using equipment items that are "attached to implement" prevents double counting of machinery depreciation and interest on investment costs. In the event of an operation such as spot spraying in which there is no specific machine or tractor used, select the "no cost operation" and include the kind and estimated amount of input per land unit, i.e. Roundup Ultra, 0.01 gal/ac.

Note: The user may alter other fields, in a similar manner as in the example above, using the table entry method to move across the data sheet or table to enter changes. To view the entire budget, the user may move through the datasheet by using the up/down and right/left scroll arrows .

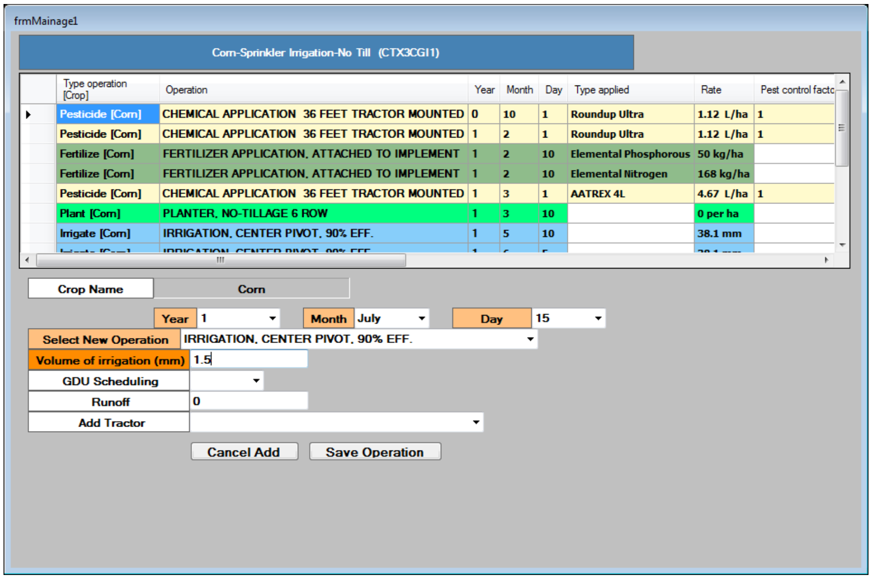


To edit an existing budget by adding a new operation, click **Add Operation** on the Data/Setup-Edit Budgets screen and select the type of operation to add from the drop down menu provided. For example, a new fertilizer may be added to an existing budget by selecting “Fertilize” from the drop down menu. This action generates the appropriate menus beneath the budget.



After entries are completed, click **Save Operation**. Similarly, to add a new irrigation from the Data/Setup-Edit Budgets screen, click **Add Operation**, select “Irrigate” from the drop down menu provided make the appropriate selections and **Save Operation**.

Several sprinkler systems of various application efficiencies can be selected but the furrow (row) irrigation application efficiency with gated pipe is set at 75% of which 20% is runoff loss and 5% is distribution loss. To revise this and other irrigation system efficiencies, the user may edit the appropriate irrigation system in **Equipment/Activities** on the Data/Setup screen.



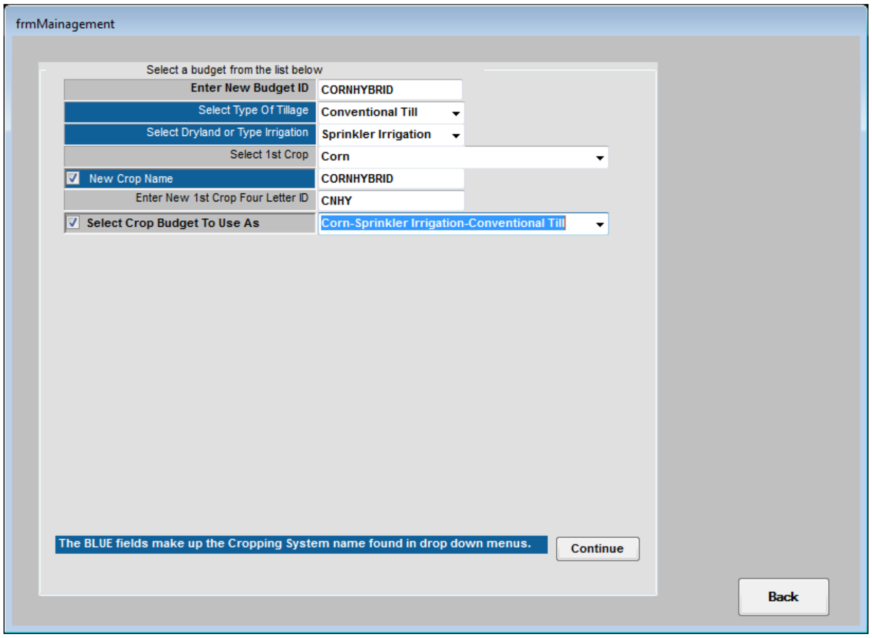
The user may at any time click the **Set Budget to Default** to cancel all changes to the budget and reset the budget values back to the original default budget values for all operations. After all of the operations have been changed or added, click **Save** to save the new information in the datasheet. Click **Back** to exit the budget. The user will either click **Yes** to save all changes to the budget before exiting or **No**.

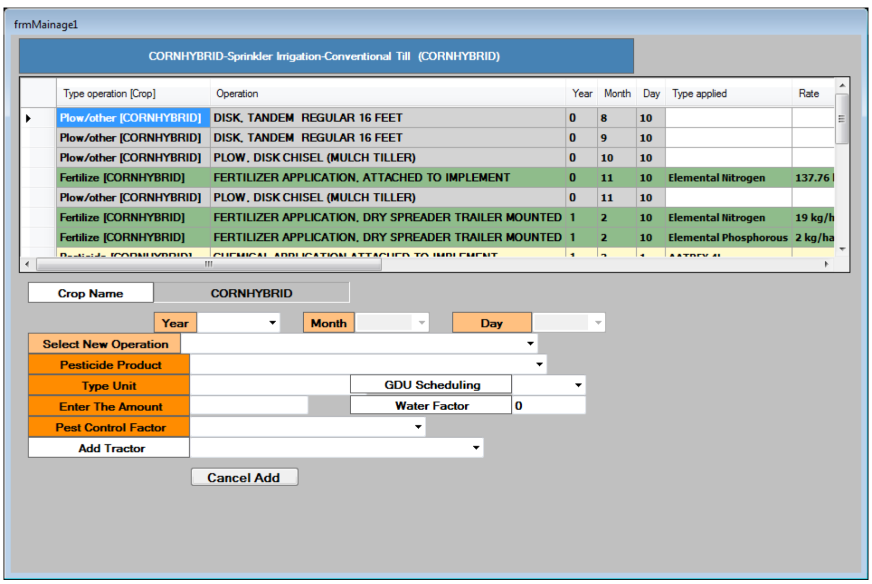
b. Add 1 to 4 Annual Crop(s)

From the Edit or Add Budget screen, click **1 to 4 Annual Crop(s)** on the Edit or Add Budget screen to make a budget for one to four crops per year. Select the number of crops to add and click **Continue**. Adding more than one crop assumes these crops are successive crops or are intercropped as opposed to double cropped which is restricted to two successive crops. Fill in the required fields: enter a new budget ID to the new budget, identify the type of tillage and irrigation regimen, select the crop(s), and enter a new crop name and crop ID for each of the crops.

NOTE: The new budget ID is limited to 10 alphanumeric characters. Click **Continue** and the budget operations for the new selections are displayed in the Data/Setup-Edit Budgets screen

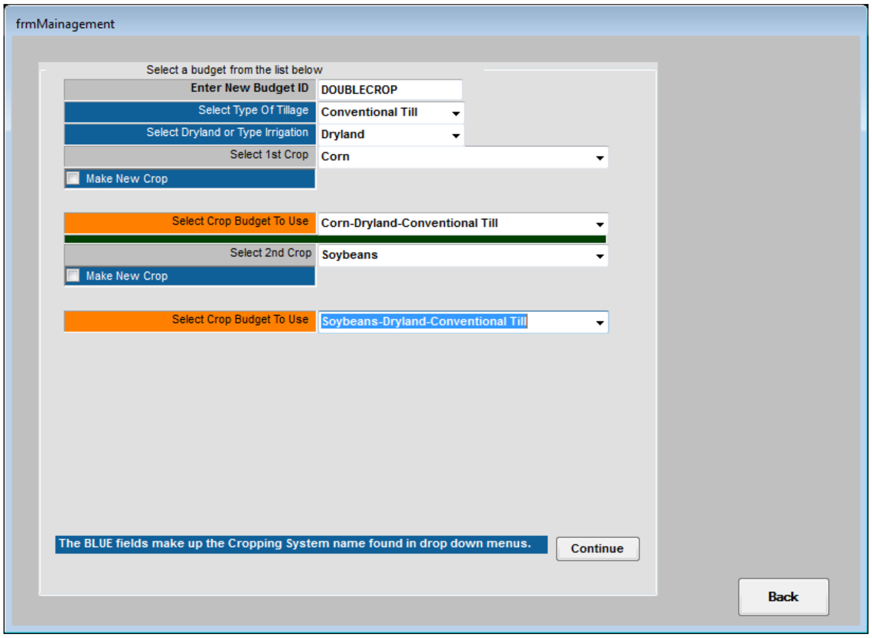
Essentially, this creates a new budget and it is treated from this point as an existing budget, i.e. the user may make other additions or changes to an existing budget in the same manner used above to **Edit Existing Budgets**. A warning message appears prompting the user to check the dates of operations or sequencing of operations so as to prevent errors from occurring. New operations are added by clicking **Add Operation**, which brings up and edit screen





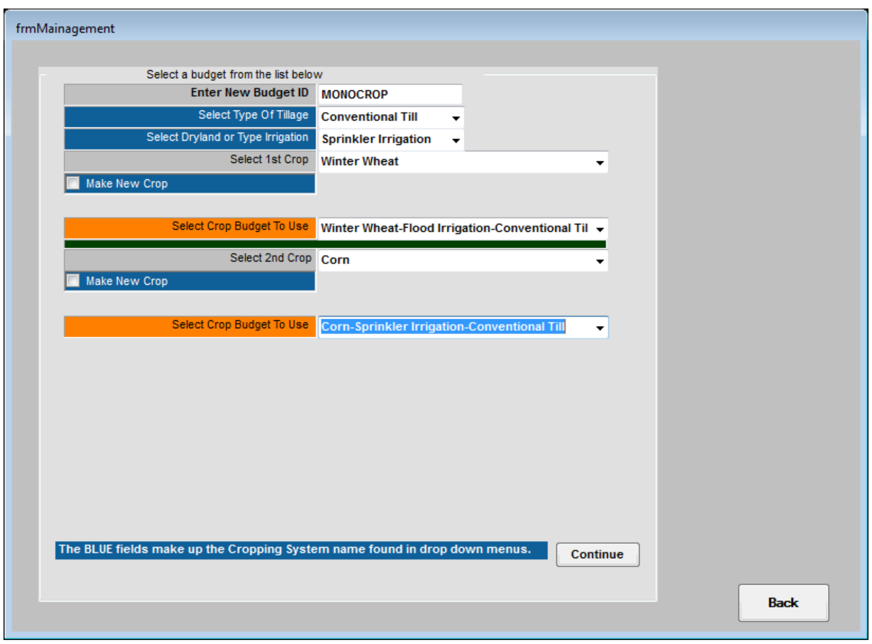
c. Add a Double Annual Crop Budget

To add a new budget with a double annual crop, click **1 to 4 Annual Crop(s)** on the Edit or Add Budget screen and select 2 crops in the drop down menu from the Edit or Add Budget screen. Fill in the required fields: assign a new budget ID to the new budget, identify the type of tillage and determine whether dryland or some other type of irrigation system will be used. Select the first cropping system that will act as a starting point for the first crop in the new budget. Enter the second crop in the same manner as the first. Clicking **Continue** leads to the Edit Budget screen where the budget templates may be modified and operations added. Editing is as described above

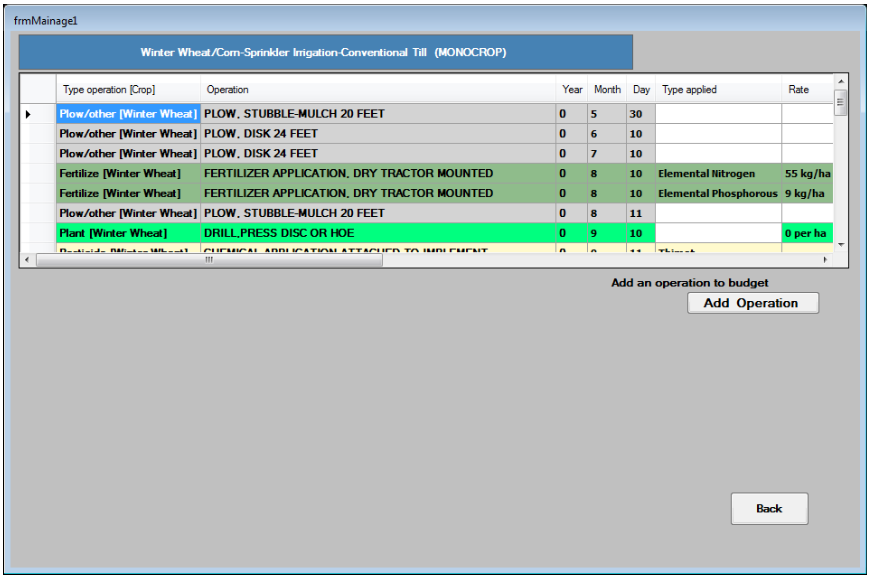


d. Add a Mono with Annual Cover Crop Budget

To add a new single crop budget with an annual cover crop, click **1 to 4 Annual Crop(s)** on the <u>Edit or Add Budget</u> screen and fill in the required fields: assign a new budget ID to the new budget, identify the type of tillage and define what type of irrigation will be used. Select the cover cropping system that will act as a starting point for the new budget. The user may either use a crop already present in the database or create a new crop by clicking Make New Crop and fill in the new crop name and crop ID. Select the second crop in the same manner as the first.



Click Continue and the budget operations for the new selections are displayed in the Data/Setup-Edit Budgets screen since the budget just added is now treated as an existing budget which may be edited.

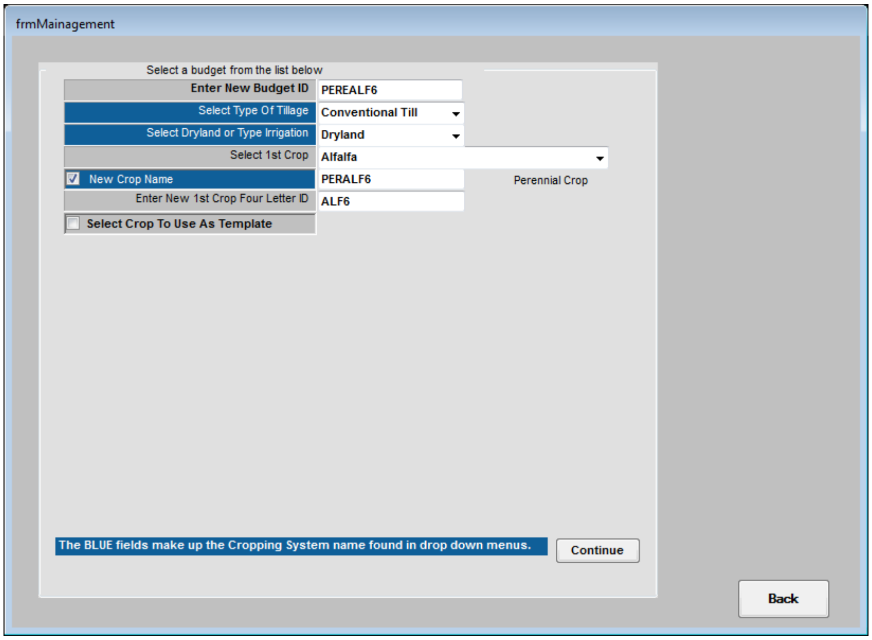


e. Add 1 to 4 Perennial Crops Budget

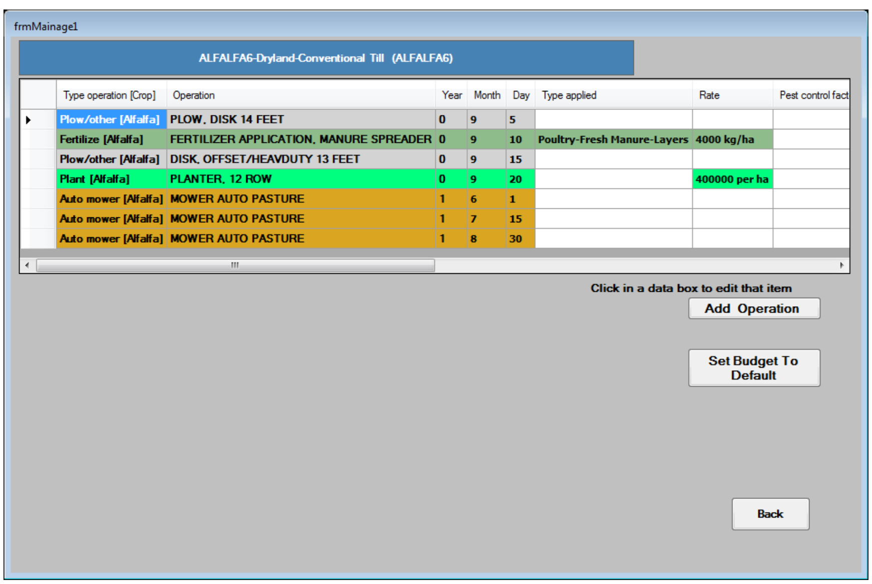
To add one to four perennial crop budgets for up to 50 years, click **Add 1 to 4 Crops (Perennial)** on the Edit or Add Budget screen. Select the number of crops and the number of years in the budget. Fill in the required fields: assign a new budget ID number to the new budget, identify the type of tillage and determine whether dryland or some type of irrigation system will be used. Select the first crop that will act as a starting point for the new budget. The user may either use the crop already present in the database or create a new crop by checking the "Make a New Crop" box and filling in the new crop name and crop ID. The user may choose "Select Crop To Use As Template" and then select the proxy crop in the same manner as the first. If the user wants the same crop in subsequent years, and wants to automatically add operations for the remaining years, he/she will be able to add operations, which will occur on a yearly basis, with this single action and the program will automatically add the operations every year of the budget. This will save time from having to enter the repetitious operations one by one.

Click **Continue** and if no proxy template is selected, answer yes or no. If yes, a budget screen appears to build year 1 to be used as a repetitive process for years 2, 3…n. If no, a generic budget including only a plant operation will appear to be used for years 2, 3…n to this planting operation. The user will only need to add operations that are repeated. A harvest operation is required to get yields.

The number of years in a perennial crop budget in SETUP must be equal to or an exact multiple of the number of years being simulated in the **CONTROL TABLE**. If less, and the crop is harvested in the last year only, no yield will be reported in the CROP SUMMARY or CROP YEARLY output ACCESS tables. Additionally, if the simulated years are longer than in the perennial crop budget, yields will be reported for the first rotation of crop years but not necessarily for all of the years of the 2nd, 3rd, or nth rotations if the simulated years are not an exact multiple of the budget years in SETUP.



By selecting one year more than the template budget, a screen will display year 1 operations of the template to allow major modifications, which are to be repetitive each year in the new crop budget. Make the necessary changes here and they will be repeated in all years after clicking **Continue**. Because the wrong number of years was originally selected, several operations at the end may need to be deleted to restore the correct number of years to the rotation (change the final year of the kill but do not delete it).



When editing the final budget for repetitive operations with the same name, select the operation and hit the “Enter” button to register the change then click **Change All**. For irrigation and fertilizer amounts, select the amount and type in the correct amount in the box and hit the “Enter” button to register the change, then click **Change All**. A message will appear requesting if the new amount is to replace all of the entries with the old amount. If so, click **Yes**.

Click **Continue** and **OK** to warning of checking dates on each operation. The budget operations for the new selections are displayed in the Data/Setup-Edit Budgets screen since the budget just added is now treated as an existing budget that may be edited.

NOTE: A perennial hay crop (e.g. alfalfa) will be harvested at the specified GDU fraction(s) of the growing season each year if and only if it is planted in YEAR 0 and harvested thereafter in years 0 or 1at one or more GDUs. If it is planted in year 1 and harvested in year 2, it will be planted every other year and harvested every other year at the specified GDUs. If a perennial hay crop is NOT to be harvested, create a new perennial crop budget of the same crop. However, in the new crop budget DELETE all harvest operations. This will cause the crop to grow until the end of the period, e.g. 20 years, without being harvested anytime. In perennial cropping systems, harvest(s) will occur every year for the number of years simulated (indicated in the control table) if planted in year 1 despite the number of years in the crop budget.

If a fall-seeded perennial is to be reseeded after the last harvest, change all operations in year 0 to year 1. Then, move the kill operation to follow harvest in year1, but it must precede planting. Otherwise, if it is not to be reseeded after harvest, delete all operations in year 1 and change operations in year 0 to year 1.

If a fall-seeded perennial is put into a rotation with an annual crop, make a seeded perennial template seed in year 0 instead of year 1 by:

1) Develop a fake perennial budget called "ZZZZ" though the normal process of making a single crop, perennial for N years. This process will automatically renumber the fall seeding year to 0 if the correct number of years in the template rotation are selected, i.e. if the template is for 3 years (years 1-3), selecting 2 years will renumber it 0-2 years.

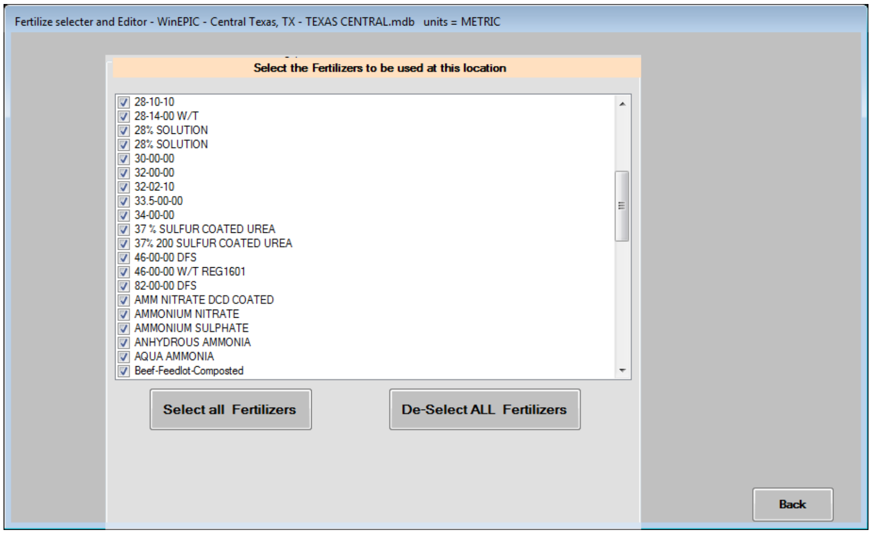
2) Develop the new perennial budget named the desired name, using the appropriate crop, and using "ZZZZ" as the template budget. The new fall-seeded budget will then be numbered 0,1,2...n.

3) When making the rotation in **Cropping Systems**, always select the annual crop first followed by the new perennial crop numbered 0,1,2…n. This facilitates planting the perennial after the annual crop and harvesting both in sequential years.

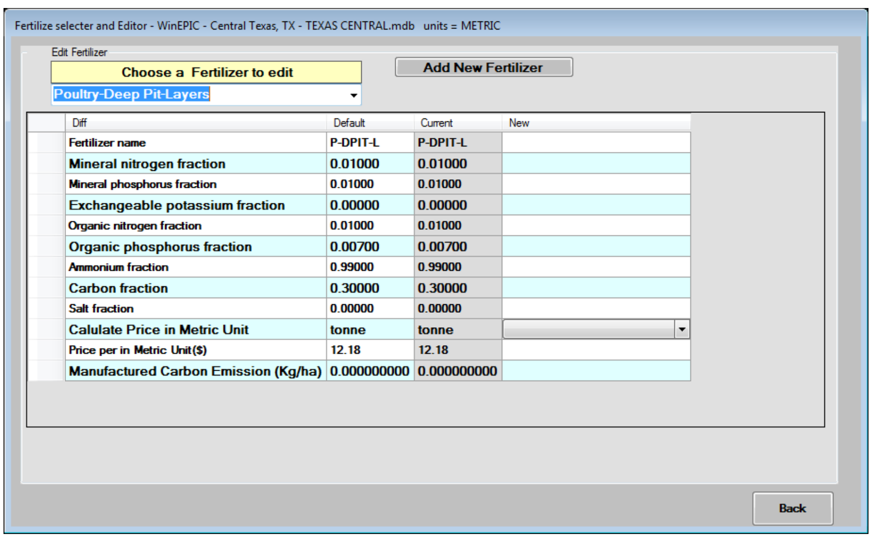
To exit the Data/Setup-Edit Budgets screens, the user must click **Back** through several screens until the Data/Setup screen reappears.

7. *Fertilizers*

Fertilizers on the Data/Setup screen is used to edit or select fertilizers for use in WinEPIC. To select/deselect specific fertilizer products to be used, click **Select Fertilizers for this location** and select fertilizers (or deselect certain unnecessary fertilizer products) from the list provided. To modify any of the specific fertilizer products, click **Edit Selected Fertilizers**, choose specific fertilizer to edit from the drop down

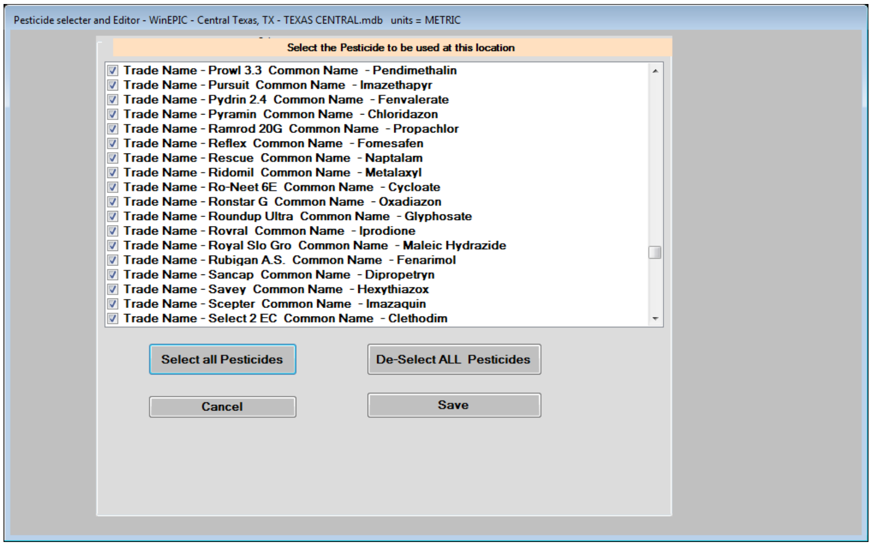


menu and make the desired changes. The user can modify any prices of the existing fertilizers. Fertilizer price data listed under the "Current" column may be changed by entry of new data under the "New" column. **Cancel** and **Save** appear when a change is entered in the "New" column. Note: The gray fields may not be altered.

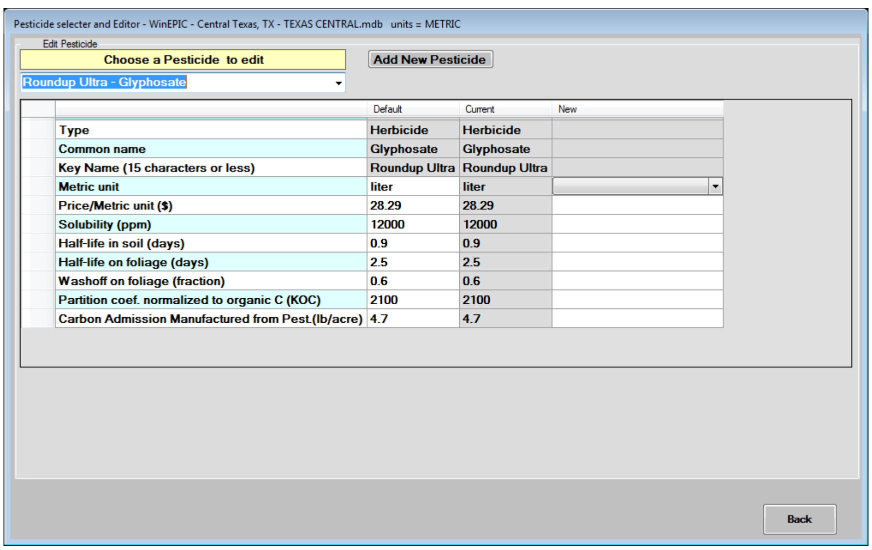


8. *Pesticides*

Pesticides on the Data/Setup screen is used to edit or select pesticides for use and to turn pesticide fate and transport on by checking the box in WinEPIC. To select/deselect specific pesticide products to be used, click **Select Pesticide products for this location** and select pesticides (or deselect certain unnecessary pesticide products) from the list provided. To modify any of the specific pesticide products,

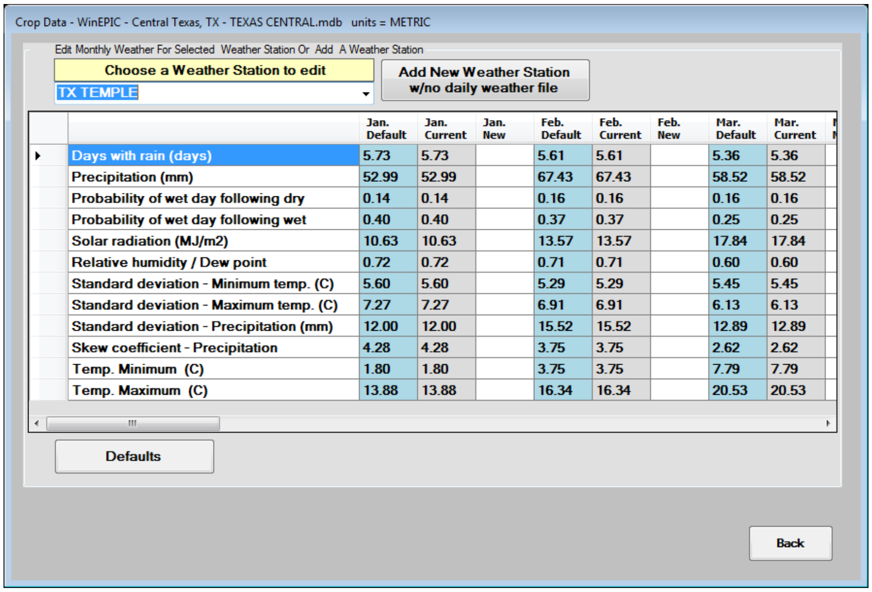


click **Edit Selected Pesticides**, choose specific pesticide to edit from the drop down menu and make the desired changes. The user can modify any prices of the existing pesticides. Pesticide price data listed under the "Current " column may be changed by entry of new data under the "New " column. **Cancel** and **Save** appear when a change is entered in the "New" column. Note: The gray fields may not be altered.



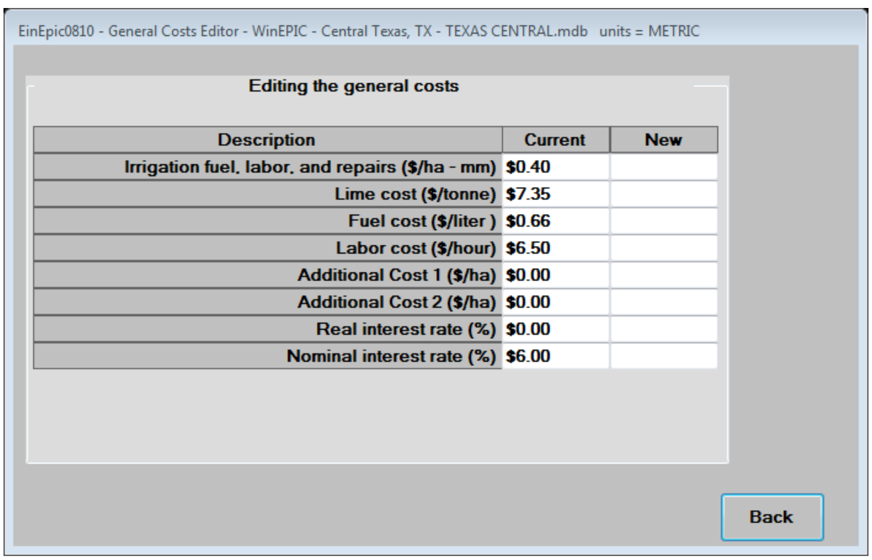
9. Weather

By clicking WEATHER on the Data/Setup screen, the user may select or edit weather stations for use in WinEPIC. Weather stations are selected using the drop down menu Choose a Weather Station to edit. To modify values for the chosen weather station, enter them in the New columns – one per month. Once a value has been entered, **Cancel** and **Save** buttons appear. After changes have been made and saved, the original values can be reinstated by clicking **Defaults**.



10. General Costs

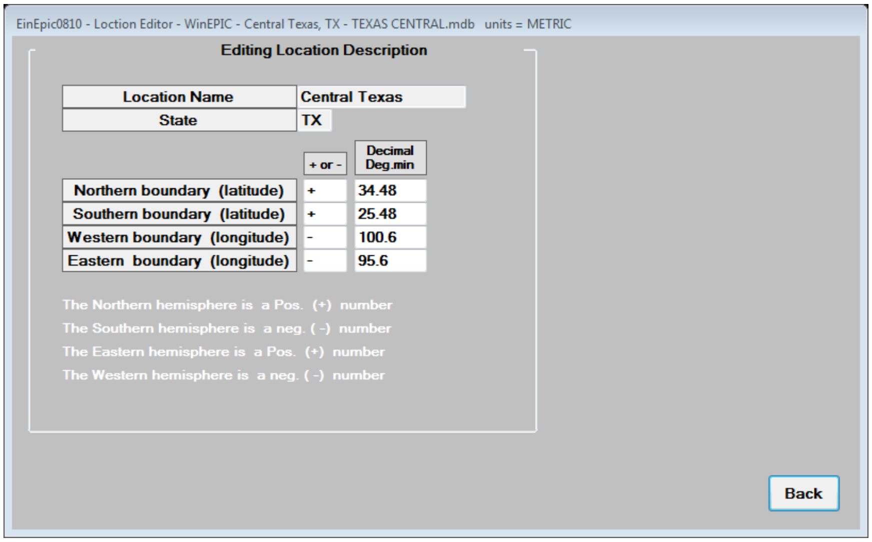
By clicking General Costs on the Data/Setup screen appears. The default parameters are listed in the



Current column for irrigation pumping cost, lime cost, fuel cost, labor cost and additional costs. These default parameters may be changed by clicking on the appropriate box under the New column. Once a change is made, the user is given the option to **Cancel** or **Save** changes.

11. Location

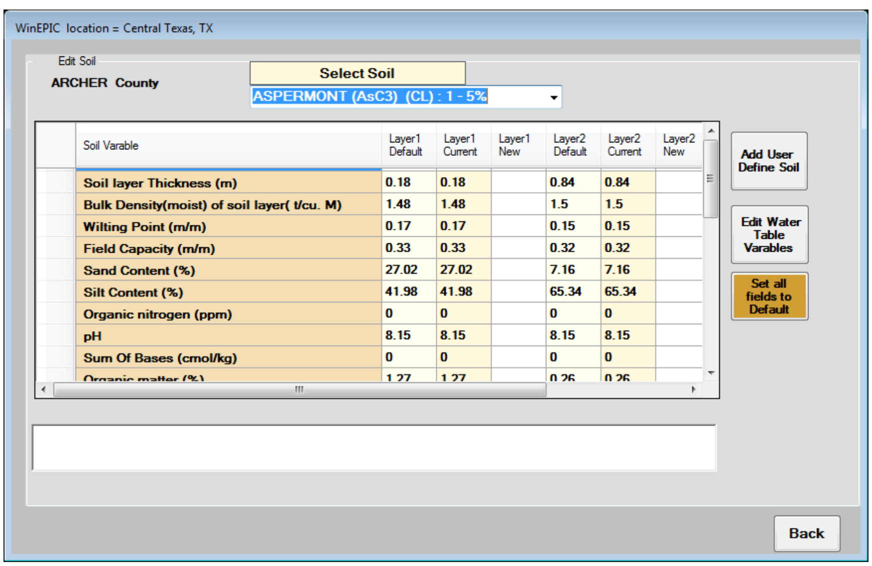
Location contains name, address, latitude, longitude and other miscellaneous data about the location or database. The latitude and longitude define the boundaries of the database.



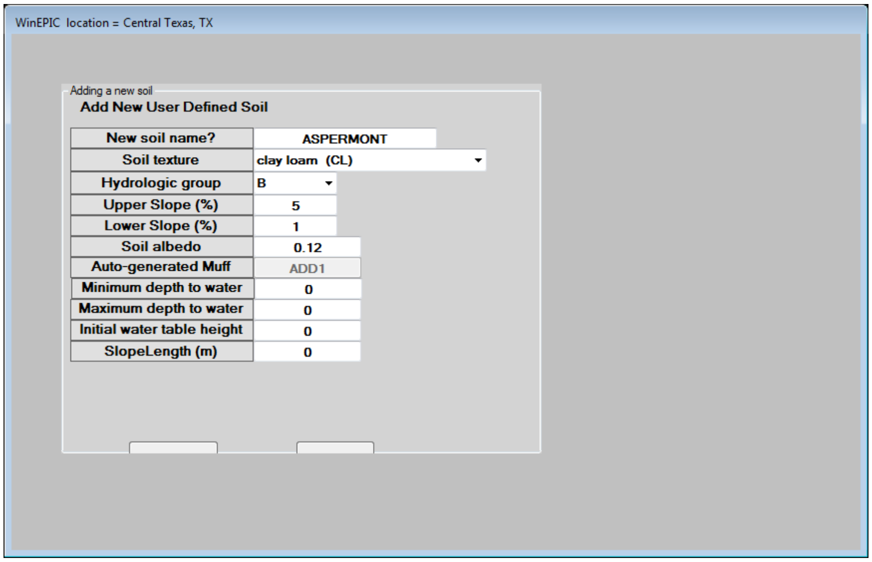
Maximum and minimum latitude and longitude are used for error checking when the latitude and longitude for individual run units (fields, farms, and small watersheds) are entered. If the run unit does not fall within the bounds specified under Data/Setup/Location, the user is warned as the run unit data is entered.

12. Soils

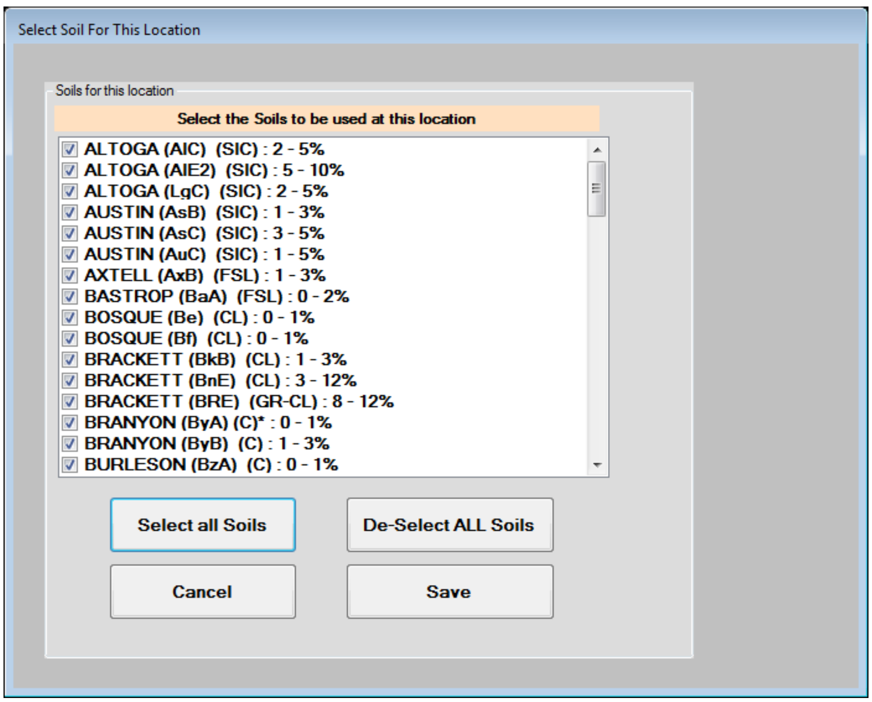
Soils for a specific county can be added, selected or modified by clicking **Soils** on the Data/Setup screen.



By first selecting a specific county, the user may then select soils for editing or use: **Edit selected soils for XXX county** or **Select soils for XXX county**. To edit soils, use the drop down menu Select Soils and enter new values in the New column and when all edits are completed click Save Changes. To cancel click **Cancel Changes** or to return to default values, click **Set all fields to Default**. Water table data may be changed by clicking **Edit Water Table Variables**. New records may be entered in the database by clicking **Add User Define Soil** and entering data into a header window. Accepting the these data will bring up an edit window for the new soil. Values from the soil used as a template will be entered in the Current column; enter new values into the New column. Click **Save Changes** to enter the new record into the database.



To select/deselect specific soils to be used in a scenario, click **Select soils for XXX county**.



A new soil can be added by selecting a soil as described above and clicking **Add** next to the soil drop down menu on the Editing a Soil Screen. The user can rename the soil (30 character limit) and make any changes to the soil characteristics. To save the new soil, click **Save**. The program will return to the Editing a Soil Screen. The new soil can be edited as described previously.

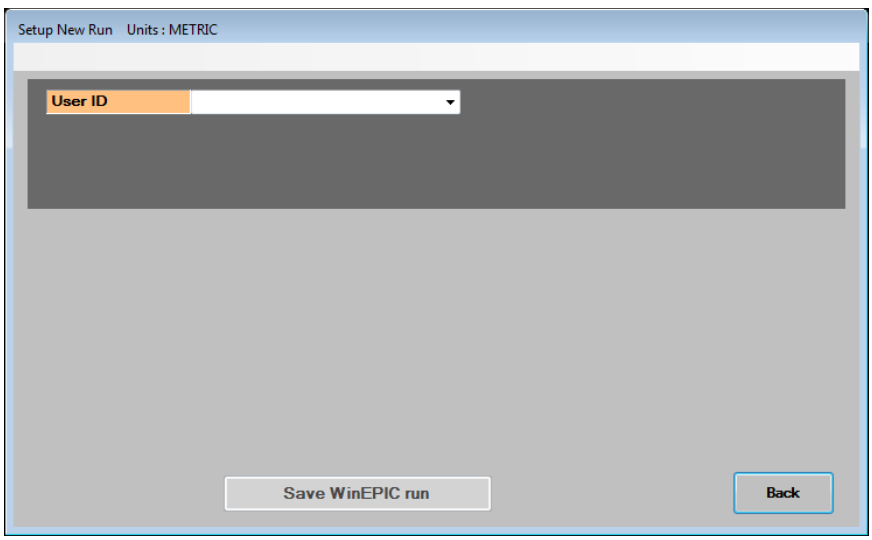
B. Create Runs

This feature allows the user to make a new input dataset and run WinEPIC. Selections for User ID, site, name, location (county), land condition, soil, weather station, cropping system and control file are made from drop down menus. The interface uses these choices to build an input file for the WinEPIC program and the model to run.

Specifying the soils, cropping system and climate conditions were discussed previously in **Data/Setup**. Specification of the land condition facilitates identification of hydrologic characteristics including infiltration and runoff as affected by straight row planting, contour planting or contour planting combined with terraces. These conditions when considered along with the soil hydrologic group determine the NRCS curve number (see APPENDIX A – NRCS Curve Numbers). From this screen, the user can access specific User IDs, the associated farm names, site names and locations. Then by specifying the soil, weather, cropping system, land condition and control file, runs can be made for this User ID.

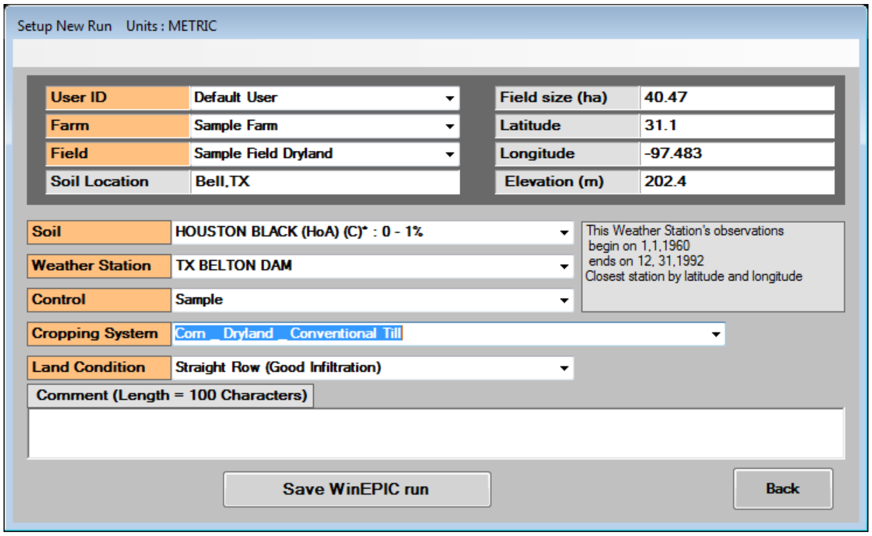
1. *Create WinEPIC Run*

From the Main Menu screen, click **Create Runs** to start a new input dataset



When this screen is first accessed, **Save WinEPICV3 Run** will be dimmed indicating that it is not active or is disabled. It will not become active until all the selections necessary (required green fields) for a WinEPICV3 Run have been made. Use the selection boxes to choose a User ID, farm, site, location, soil, land condition, weather station, cropping system and control record. Note: Selections in **Data/Setup** for one or more User IDs, farms, sites and locations must have been made previously.

The message at the bottom indicates the actual weather history of the selected weather station. Warning: The selected **Control Table** must indicate the same (or a later) starting date as in the weather history if actual weather is to be simulated. Otherwise, weather will be simulated if the start date is before or after the actual weather history.



For convenience, the user may select **Clear All Fields** to clear all the selections that have been made in this screen and begin again. In addition, the user may **Switch to Field entry mode** or **Switch to User Id entry mode** to enter selections.

After all required selections for one run (orange data fields in Field Entry Mode and green data fields in User ID Entry Mode) are completed and entries are made on the Create Runs screen, the user may click **Save WinEPICV3 Run**. Successive runs may be saved from this screen. At this point, the saved runs have not actually been run; therefore, no output will be available until the batch has been run though **Run Batches**.

2. *Save WinEPIC Run*

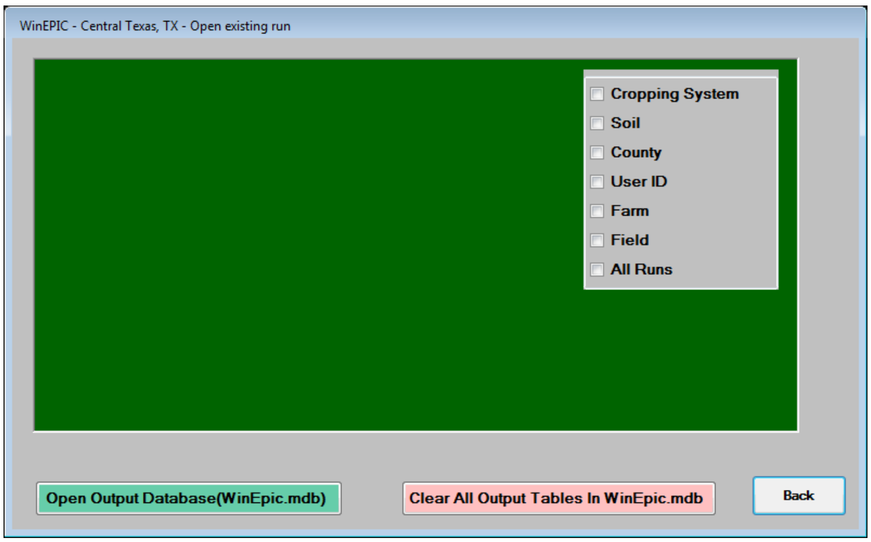
When all sections of the Create Runs screen have been filled in with appropriate entries, **Save WinEPIC Run** will become active or enabled. Click **Save WinEPIC Run** and a blinking message box will be displayed stating that the **Run is Saved**. Continue creating runs by making changes to the selections at will and click **Save WinEPICV3 Run** for each run. For convenience, click the **Clear** button to clear all selections and start with a blank screen before creating new runs. When all of the desired runs have been created, click **Back** to return to the Main Menu screen.

C. Run Batches

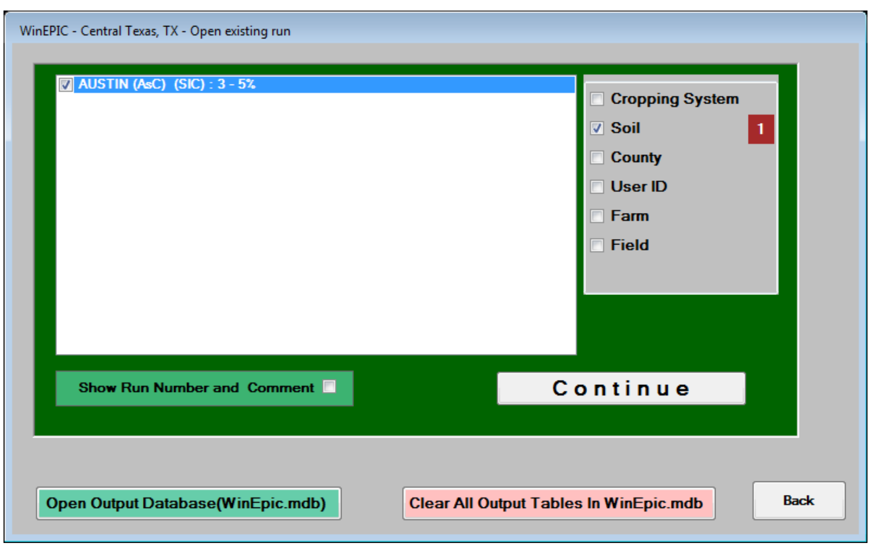
Click **Run Batches** on the Main Menu screen to begin selecting the runs to include in the groups or batches of runs.

1. Select Run Batches

To select runs to form a "Batch of Runs", the user may select all of the saved runs or the runs meeting specific selection criteria on the Run Batches Selection screen .



The criteria include cropping system, soil, county, weather station, User ID, farm, site, and zone. One or more criteria may be used to select runs.

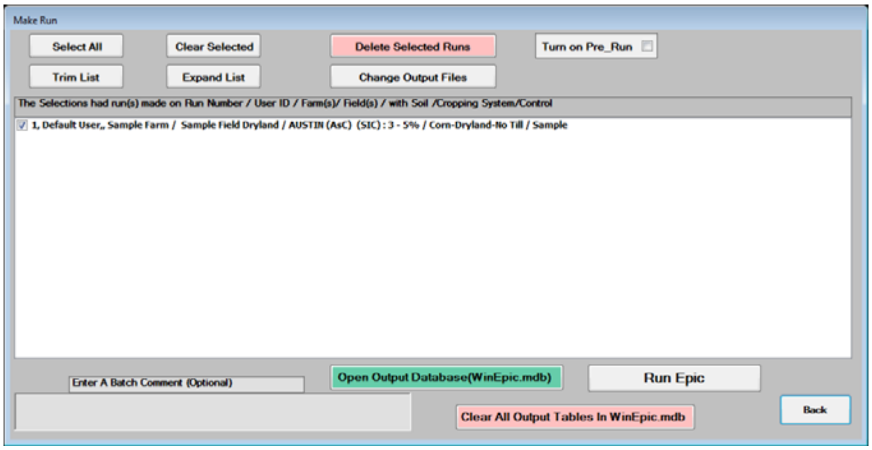


Here, the list includes all saved runs listed by soil from which the user may select. Check the box next to each type of criteria the user desires to use in selecting the Batch of Runs and then select the individual runs. At this time, the user may want to clear all previous output results by clicking **Clear All Output Tables in WinEpic.mdb**. To first review the contents of the output database click **Open Output Database (WinEpic.mdb)**. This allows the user access to the file without having to exit the program.

For more information, see section IV.A. After all selections are made, click **Continue** to proceed.

2. Options for Run Selection(s)

After the Run Batches have been selected, the user may refine the list by checking runs in the list with the mouse and/or clicking **Clear Selected**, **Select All**, **Expand List** or **Trim List** (to view only the selected runs in the batch). Other options include **Delete Selected Runs** and the pre-run options (to make a simulation run for 12 years before the onset of the actual run), number of years of the run, the number of years in cultivation and the beginning year of the pre-run.

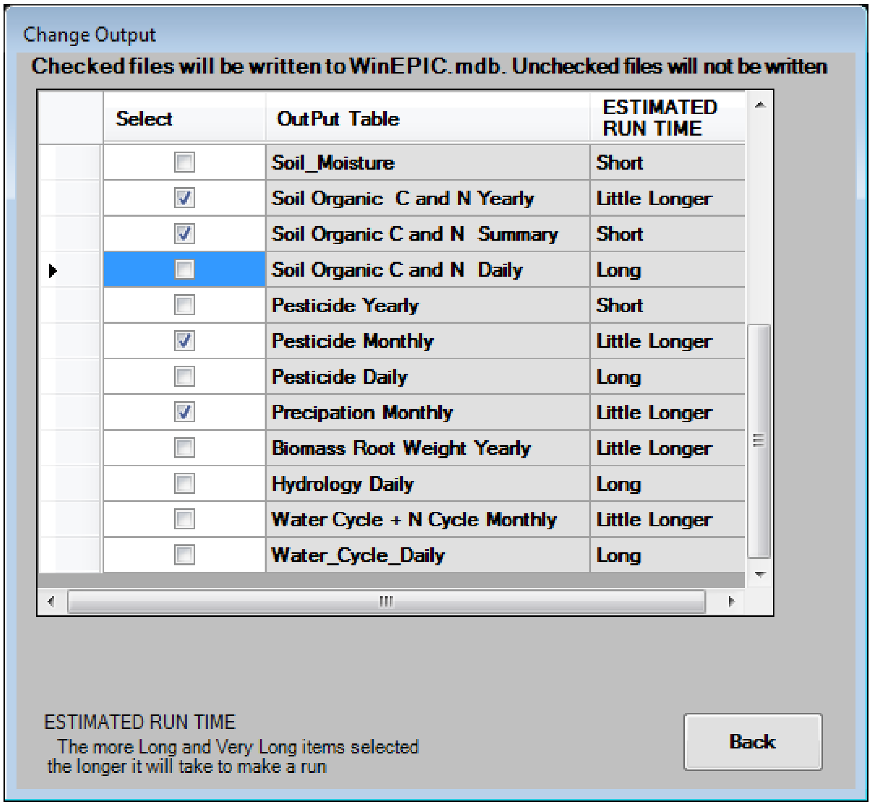


Output from the pre-run will not be displayed in the WinEPIC output database. Performing a pre-run allows for the soil properties to be adjusted by the local climate and cropping practices. It is suggested that 12 years be pre-run prior to the initial years of simulation if the rotation is one of 2, 3, or 4 crops, providing adequate weather data precedes the initial year.

3. Output Selection

Select **Change Output Files** and check the output tables of interest.

WARNING: Do not select output with daily results unless they are specifically needed because the volume of data generated is quite large and are stored together in the same output file. If the simulation is run for too many years, the daily files may be too large for Access to accommodate and output will be unpredictable.

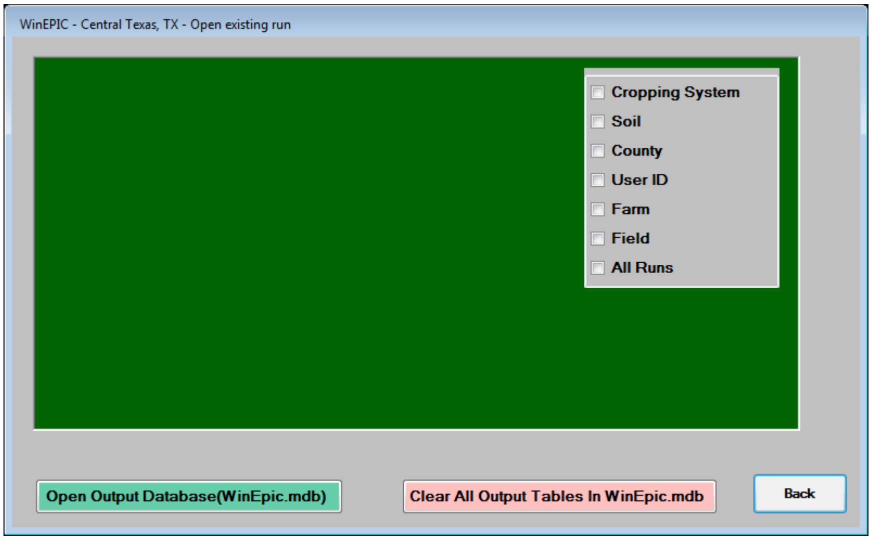


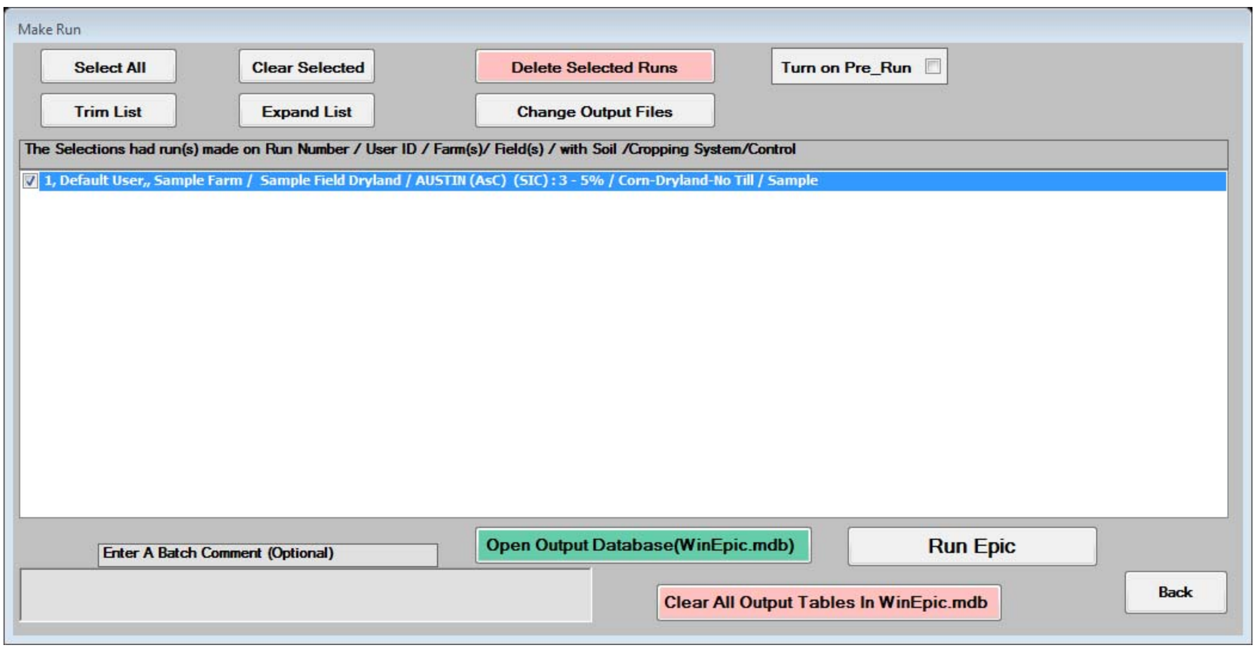
4. Run EPIC

After all selections are made, click Continue. The runs within the batch run will be made. After all runs are completed, the Run Batches Selection Screen Options for Run Selection(s) will reappear. At this point the output can be viewed in the WinEPIC database. For more detail see section IV. All results are in metric units in the ACCESS WinEPIC.mdb file, despite the input being entered in English units. After selections are complete, the user may click **Run WinEPIC**. This produces an Output Selection screen.

D. Viewing and/or Analyzing the Output

The output generated by WinEPIC is written to a Microsoft Access database in the cpm0320V2 folder with filename WinEPIC.mdb. This file can be easily managed in a number of ways:

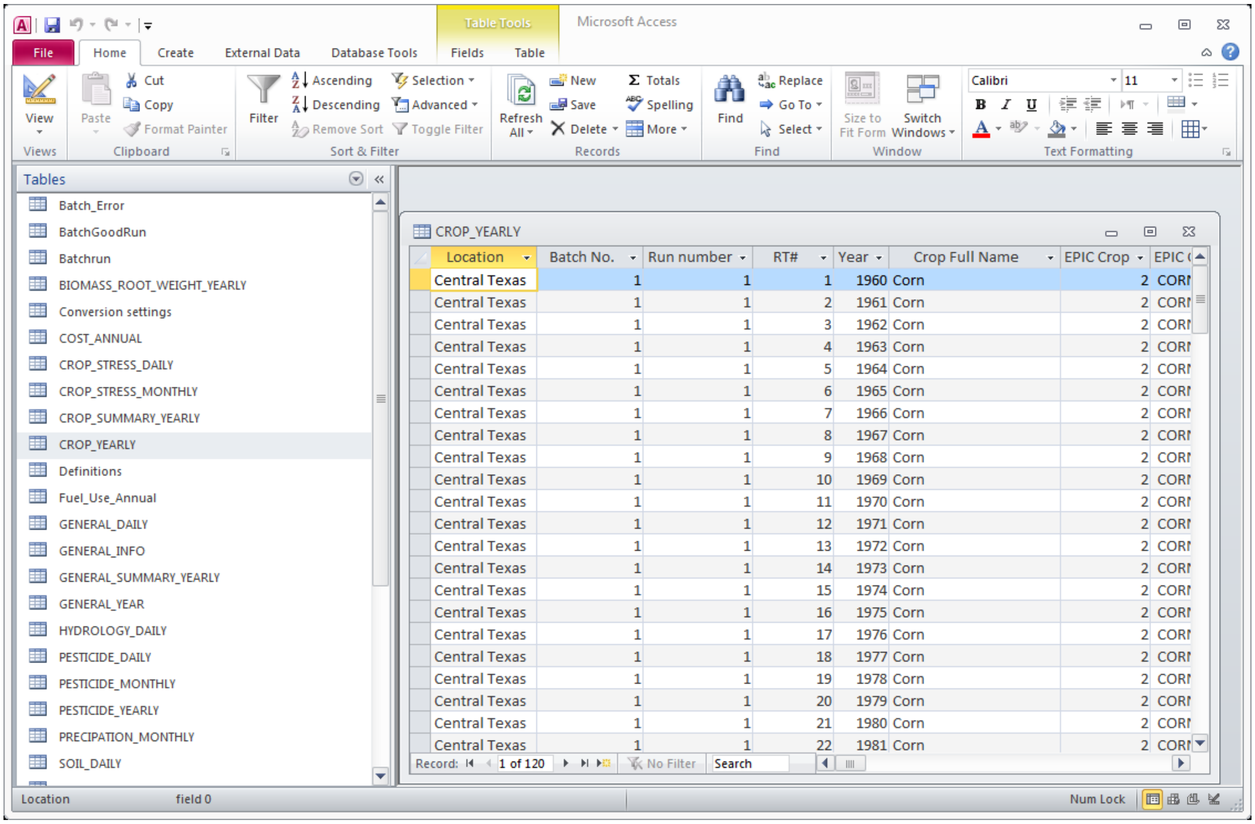




1. Open or View Output using the ACCESS

Click Open Output Database (WinEpic.mdb) to examine output from the EPIC run and manage the data.

All output tables are listed using nomenclature similar to that used below in the ACCESS Tables window. Tables that were not selected by the user on the Output Selection screen will have zero (0) in all fields. Variable definitions are also listed in **APPENDIX D – WinEPIC Variable Definitions.**



The user may save separate runs by renaming the WinEPIC.mdb file before it is cleared each time the program is run and use the output from these runs outside the **WinEPIC** program. The user would use the standard procedure with the Windows file manager to copy the output file to another file using copy and paste and then renaming the file (save as another file). The WinEPIC.mdb file is found in the cpm0320V2 parent directory. After a file is renamed, the user must use Windows Explorer and Microsoft Access to open, edit or delete the file. *If the file is not renamed or cleared, all the data from each successive run is placed into the same file: WinEPIC.mdb.*

Depending on the type of output the table contains, the user may subset this dataset further by selecting only specific *fields*, *runs*, *crops*, *soil layers*, *years*, *months and/or days* with the buttons to the right of the run and table drop down menus. Once selected, the information within may be used to again subset the data from a larger set of output and then added to a spreadsheet to minimize the amount of data the user must handle.

Query Wizard and Query Design functions in ACCESS can be used to examine output that satisfies conditions; queries may be for a single table or may include several tables. Alternatively, ACCESS table may be exported as Excel tables for analysis and graphical representation.

From Excel, tables can be imported into most statistical packages (e.g. SAS, Statistica, Systat, etc.) for more detailed analysis

III. Installation and Support

1. Hardware Requirements

A personal computer running **Windows X**® or **Windows 7**® with a minimum of 1 gigabytes of RAM and 1 gigabytes of free hard disk space is required to run the **WinEPIC** program. Improved performance will be obtained with 4 gigabytes of RAM and additional free hard disk space.

2. Software Requirements

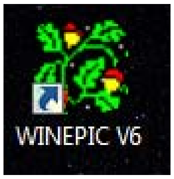
Basic knowledge and use of Microsoft **ACCESS** is the software needed to manage database files.

3. Installation

i. Download the **WinEPIC** installation package from http://epicapex.tamu.edu/downloads/ and documentation from http://epicapex.tamu.edu/downloads/user-manuals/ .

ii. Save the install file to a directory and unzip it.

iii. Double click **setup.exe** and follow the install instructions. A shortcut will be placed on your desktop:



iv. When the installation is finished, double click the **WinEPIC** shortcut and click **Data/Setup** from the Main Menu screen to start.

3. Reinstall/Update

If the user wishes to save established databases for a User ID(s) and location(s), do not reinstall or update the **WinEPIC** without first moving your databases as they will be overwritten by the installation process.

4. Technical Support

Technical support is available by emailing us at epicapex@brc.tamus.edu

IV. References

Gerik T & Harman WL. (2001) CroPMan User's Guide: Version 3.1. Blackland Research and Extension Center, Temple, Texas, pp. 101.

Gerik TJ, Harman WL, Williams JR, Francis L, Greiner J, Magre M, Meinardus A & Steglich E. (2003) User's Guide: *CroPMan* (Crop Production and Management) model, version 3.2. Blackland Research and Extension Center, Temple, Texas, pp.150.

Sharpley AN & Williams JR (Eds.). (1990) EPIC – erosion/productivity impact calculator: 1. model documentation. USSDA Tech. Bull. 1768. Washington DC.

Williams JR. (1990) The erosion productivity impact calculator (EPIC) model: A case history. *Phil. Trans. R. Soc. Lond.* **329**:421-428.

Williams JR. (1995) The EPIC Model. Pp. 909-1000 in *Computer Models of Watershed Hydrology* (Ed. Singh VP). Water Resources Publications, Highlands Ranch, CO.

Williams JR, Jones CA & Dyke PT. (1984) A modeling approach to determining the relationship between erosion and soil productivity. *Trans. ASAE* **27**:129-144.

Williams JR, Jones CA, Kiniry JR & Spanel DA. (1989) The *EPIC* crop growth model. Trans ASAE 32(2): 497-511.

V. Appendices

APPENDIX A: Runoff curve numbers for hydrologic soil-cover complexes

Land use	Cover Treatment or practice	Hydrologic condition	Hydrologic soil group A	B	C	D	Land Use Number
Fallow	Straight row	----	77	86	91	94	1
Row crops	Straight row	Poor	72	81	88	91	2
	" "	Good	67	78	85	89	3
	Contoured	Poor	70	79	84	88	4
	" "	Good	65	75	82	86	5
	Contoured & terraced	Poor	66	74	80	82	6
	" "	" Good	62	71	78	81	7
Small grain	Straight row	Poor	65	76	84	88	8
	" "	Good	63	75	83	87	9
	Contoured	Poor	63	74	82	85	10
	" "	Good	61	73	81	84	11
	Contoured & terraced	Poor	61	72	79	82	12
	" "	Good	59	70	78	81	13
Close-seeded	Straight row	Poor	66	77	85	89	14
Legumes[1] or	" "	Good	58	72	81	85	15
rotation meadow	Contoured	Poor	64	75	83	85	16
	" "	Good	55	69	78	83	17
	Contoured & terraced	Poor	63	73	80	83	18
	" "	Good	51	67	76	80	19
Pasture or range							
<50% groundcover or heavily grazed		Poor	68	79	86	89	20
50-75% ground cover & not heavily grazed		Fair	49	69	79	84	21
>75% ground cover & lightly grazed		Good	39	61	74	80	22
Above characteristics & Contoured		Poor	47	67	81	88	23
" "		Fair	25	59	75	83	24
" "		Good	6	35	70	79	25
Meadow (continuous grass, not grazed and generally mowed for hay)		Good	30	58	71	78	26
Woods							
Small trees and brush (heavy grazing & regular burning		Poor	45	66	77	83	27
Woods are grazed by not burned, some litter covers soil		Fair	36	60	73	79	28
Woods are not grazed, litter & brush cover soil		Good	25	55	70	77	29
Farmsteads		----	59	74	82	86	30
Roads (dirt)[2]		----	72	82	87	89	31
(hard surface)[2]		----	74	84	90	92	32
Sugarcane			39	61	74	80	33
Bermuda grass			49	69	79	84	34
Impervious (Pavement, urban area)		----	98	98	98	98	35

1 Close-drilled or broadcast. 2 Including right of way.
Taken from the National Engineering Handbook (U.S. Department of Agriculture, Soil Conservation Service 1972).

APPENDIX B: Input Databases

The database(s) provided with the WinEPIC program includes actual soils and weather station data for each region or location. These data include all county soils and weather data for each region or location within **WinEPIC**.

Note: The **CONTROL TABLE** beginning year, month, and day must agree with the same variables of the actual weather, ******.dly, file.

a. Location

Location is the defined area used in a WinEPIC run that may be an entire state or a subset of counties forming a region.

b. Climate

Table 1: Sample Daily Weather Input for WinEPIC

Year	Month	Date	SRAD	MaxT	MinT	Precip	RH	Wind
1991	10	1	18	29	19	0	0.72	0
1991	10	2	16	29	20	0	0.81	0
1991	10	3	17	30	19	0	0.72	0
1991	10	4	18	32	18	0	0.62	0
1991	10	5	13	33	18	0	0.48	0
1991	10	6	12	22	19	0	0.58	0
1991	10	7	7	23	16	0	0.63	0
1991	10	8	9	25	20	0	0.66	0
1991	10	9	9	26	18	0	0.42	0
1991	10	10	11	27	20	0	0.52	0
1991	10	11	14	32	18	0	0.76	0
1991	10	12	17	35	18	0	0.56	0
1991	10	13	18	34	18	0	0.73	0
1991	10	14	16	35	19	0	0.80	0
1991	10	15	11	29	18	0	0.60	0
1991	10	16	9	29	18	0	0.44	0
1991	10	17	12	28	18	0	0.63	0
1991	10	18	13	31	18	0	0.34	0
1991	10	19	13	30	19	0	0.56	0
1991	10	20	14	27	19	0	0.52	0
1991	10	21	11	27	19	0	0.33	0
1991	10	22	12	27	19	0	0.57	0
1991	10	23	19	30	19	0	0.58	0

1991	10	24	22	31	19	0	0.58	0
1991	10	25	22	33	19	0	0.63	0
1991	10	26	21	29	8	0.1	0.86	0
1991	10	27	17	28	10	2	0.93	0

Using the **WXPARM** tool, a file with the extension *.lis* was created for each site that met the necessary criteria. The **.lis* file contains average monthly statistical parameters for such variables as maximum temperatures, minimum temperatures, solar radiation, precipitation and relative humidity.

Using the town and city list, the Climate Data database was queried for sites with approximately 30 years of continuous daily temperature and precipitation data. For each of the towns and cities located, the following steps are performed individually. The closest existing location in the **WXPARM** database of numerous locations with existing long-term weather statistical parameters is located, then the temperature and precipitation data is read in. Next, using the **WXGEN** weather generator tool, the existing daily parameters are processed to produce a daily file in **WinEPIC** format that carries the maximum temperature (°C), minimum temperature (°C), solar radiation (MJ/m^2), precipitation (mm), relative humidity (%) and wind speed (m/s).

Table 3: Sample Average Monthly Weather Statistics for **WinEPIC** Input

Month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	
Tmax	15	18	22	26	29	33	35	35	32	27	21	17	C
Tmin	3.9	5.9	9.9	15	19	22	23	23	21	15	9.5	5.4	C
Sd Tmax	7	6.8	5.6	4	3.3	3	2	3	3.8	5	5.8	6.3	C
Sd min	5.6	5.3	5.3	5	3.3	2	1	2	3.3	5	5.6	5.6	C
Rain	48	60	47	72	115	94	52	53	86	98	58	58	mm
Sd Rain	12	13	9.5	15	20	20	19	17	17	20	14	14	mm
Skew Rain	4.9	2.7	2.7	2.0	2.8	3.0	4.0	3.0	2.9	3.0	3.8	3.3	
P[w-d]	0.2	0.2	0.2	0	0.2	0	0	0	0.2	0	0.2	0.1	fraction
P[w-w]	0.4	0.4	0.3	0	0.4	0	0	0	0.4	0	0.4	0.5	fraction
Days Rain	6.6	6.4	6.1	7	8.1	6	5	5	7.2	6	6.3	6.5	number
Solar Rad	11	13	16	17	21	25	26	23	19	16	12	10	MJ/m^2
Rel Hum	0.7	0.8	0.7	1	0.8	1	1	1	0.7	1	0.7	0.7	fraction
Wind Speed	0	0	0	0	0	0	0	0	0	0	0	0	m/s
Sd Wspeed	0	0	0	0	0	0	0	0	0	0	0	0	m/s
Skew Wspeed	0	0	0	0	0	0	0	0	0	0	0	0	

c. Soils

The soils database used to run **WinEPIC** is the Soils-5 database that was created and is maintained by the USDA-NRCS. The data were extracted using the Map Unit Use File (MUUF) program written by Otto Baumer, Paul Kenyon and Jeremy Bettis. The source code was modified by Nancy Sammons (USDA-ARS Temple, TX) to produce an ASCII file to be loaded into a Microsoft **ACCESS** database. These data are then used by the WinEPIC-LINK program to write the correct soil properties and the soil layer information in the **WinEPIC** dataset.

Table 2: Soil Variables Required by WinEPIC:

Acronym	Full Name	Units
S5NUM	Soils 5 number	
S5NAME	Soils 5 name	
TEXTID	Texture ID	
HYDGRP	Hydrologic group	
LAYERNUM	Soil layer number	
SALB	Soil albedo	
Z	Depth (bottom of layer)	meters
BD	Bulk Density	tons/meter
U	Wilting Point	meter/meter
FC	Field Capacity	meter/meter
SAN	Sand Content	%
SIL	Silt Content	%
WN	Organic Nitrogen-N Concentration	grams/ton
PH	Soil pH	
SMB	Sum of the bases	cmol/kilogram
CBN	Organic carbon	%
CAC	Calcium carbonate	%
CEC	Cation exchange capacity	cmol/kilogram
ROK	Rock	% by volume
WNO	Nitrate Concentration	grams/ton
AP	Labile phosphorus concentration	grams/ton
RSD	Crop residue	tons/hectare
BDD	Oven dry bulk density	tons/meter^3
PSP	Phosphorus sorption ratio	
SC	Saturated conductivity	mm/hour
WP	Organic phosphorus concentration	grams/ton

d. Rotations

For each county of interest, a collection of the most common crop rotations was made using the 1992 Natural Resource Inventory (NRI). The National Resource Inventory (NRI) database is accurate at state level for all states and to county level for Oklahoma, Kansas, Texas, Illinois, Idaho, South Dakota and Minnesota. For crop rotations only, use 1989, 1990, 1991 and 1992 for data and codes 180 or less (181+ is forest, road or other land not crops). The Product design team has broken down the NRI data by state. Each site location receives only data for its own state rotation for now, not the surrounding states.

e. Crops

Crops included in WinEPIC's default data were selected to meet the needs of the Agricultural Sector Model (ASM). Crops were selected for use in the ASM by identifying the crops listed by state in the U.S. Department of Agriculture, National Agricultural Statistics Service's (NASS) annual publication, Agricultural Statistics. A 20-year period, for example 1973-1993, was used to identify alternative crops that had been produced in that state.

Table 3 : List of Crops available for use in WinEPIC:

Common name	*Scientific name*	Common name	*Scientific name*
Alfalfa	*Medicago sativa*	Wild Rye	*Leymus angustus*
Annual Rye Grass	*Lolium multiflorum*	Asparagus	*Brassica oleracea*
Barley	*Hordeum vulgare*	Big Bluestem	*Andropogon gerardii*
Broccoli	*Brassica oleracea*	Brome Grass	*Bromus inermis*
Buffalo Grass	*Buchloe dactylodes*	Cabbage	*Brassica oleracea*
Canadian Barley	*Hordeum vulgare*	Canadian Oats	*Avena sativa*
Canadian Spring Wheat	*Triticum aestivum*	Canola	*Brassica napus*
Cantaloupe	*Cucumis melo*	Carrots	*Daucus carota sativus*
Cauliflower	*Brassica oleracea*	Celery	*Brassica rapa*
Cheatgrass (Downy Brome)	*Bromus tectorum*	Clover Alsike	*Trifolium hybridum*
Coastal Bermuda	*Cynodon dactylon*	Corn	*Zea mays*
Corn Silage	*Zea mays.*	Cucumbers	*Cucumis sativus*
Dry Beans	*Phaseolus vulgaris*	Durum Wheat	*Triticum turgidum*
Eggplant	*Solanum melongena*	Faba Beans	*Vica faba*
Fallow Fescue	*Festuca spp.*	Field Peas	*Pisum sativum*
Flax	*Linum spp.*	Grain Sorghum	*Sorghum bicolor*
Green Beans	*Phaseolus vulgaris*	Foxtail (Green/Yellow)	*Setaria glauca*
Honeydew Melon	*Cucumis melo*	Johnson Grass	*Sorghum halapense*
Leaf Lettuce	*Latuca sativa*	Lentils	*Lens culinaris*
Lettuce	*Latuca sativa*	Lima Beans	*Phaesolus limensis*

Oats	*Avena sativa*	Onions	*Allium cepa*
Peanuts	*Arachis hypogaea*	Pearl Millet	*Pennisetum americanum*
Peas	*Pisum sativum*	Peppers	*Capsicum annuum*
Picker Cotton	*Gossypium hirsutum*	Potato	*Solanum tuberosum*
Range Red clover	*Trifolium pretense*	Rice	*Oryza sativa*
Russian Wild Rye	*Psathyrostachys juncea*	Rye	*Secale cerale*
Sideoats Grama	*Bouteloua crutipendula*	Sorghum Hay	*Sorghum bicolor*
Soybeans	*Glycine max*	Spinach	*Spinacia oleracea*
Spring wheat	*Triticum aestivum*	Strawberries	*Fragaria spp.*
Stripper Cotton	*Gossypium hirsutum*	Sugarbeets	*Beta vulgaris*
Sugarcane	*Saccharum spp.*	Summer Pasture	
Sunflowers	*Helianthus spp.*	Sweet Clover	*Melilotus spp.*
Sweet Corn	*Zea mays*	Sweet Potatoes	*Ipomea batatas*
Timothy	*Phleum pratense*	Tomato	*Lycopersicon spp.*
Watermelon	*Citrullus lanatus*	Western Wheat Grass	*Pascopyrum smithii*
Winter Pasture		Winter Peas	*Pisum sativum*
Winter Wheat	*Triticum aestivum*		

f. Budgets

Currently there are approximately 1700 single crop enterprise budgets by state, tillage (conventional, reduced and no-till), irrigated and dryland for selected field crops and vegetables. These budgets were developed for use as input to the Agricultural Sector Model (ASM) that addresses regional impacts from policy changes. These 1700 budgets were based upon 1993 machinery and input costs, as well as, output prices and yields. Machinery and input costs as well as output prices from 2000 USDA survey data.

For each crop budget, the same sequence of production operations and input use or "management" was used as management input for WinEPIC. Thus, short run costs of production for single crop enterprises can be linked with environmental impacts of the management operations used in a given budget. These 1700 crop enterprise budgets were divided into regions (states or smaller) used to assemble data for each location of interest.

g. Fertilizers

A comprehensive list of fertilizers and types of animal manure are provided with costs from several sources in 2010.

h. Pesticides

A comprehensive list of pesticides is provided with costs from several sources in 2010.

i. Management Operations

A representative machinery schedule for a selected crop was obtained by sorting machinery data from the USDA 1992 Cropping Practices Survey by ERS/NASS production region and by state. These sorts were made for the three tillage systems in the 1992 Cropping Practices Survey (conventional tillage, conservation till and no-till). Selection of a representative machinery schedule by crop, by tillage system and by region was accomplished with two data sorts: one sort by fraction of residue remaining after field operations and a second sort by combinations of implements. The first data sort by residue remaining was conducted by grouping the observations by fraction of residue remaining on the field surface after all the tillage operations were completed. These fractions were adapted from the National Association of Conservation Districts (NACD) Conservation Technology Information Center's estimates by type of tillage. The second grouping of machinery schedules was by implement numbers within the modal residue remaining grouping. The modal unique combination of implement operations was then selected as the specific set of operations to build into the budgets and parallel WinEPIC data sets.

j. Yield Prices

Prices used for each crop were updated from U.S. Department of Agriculture, National Agricultural Statistics Service, Agricultural Prices, 2010 Summary. These are harvest-time prices for crops sold during the 1999 marketing year. Prices were converted to dollars/kilogram on a dry weight basis to meet EPIC input requirements.

APPENDIX C: WinEPIC Worksheets

1. Nitrogen Mass Balance Worksheet

DESCRIPTION	OUTPUT PARAMETER	UNITS
Start of Simulation:		
Initial soil soluble N	TNO3	ppm
Initial N in active organic pool	ORNAC	ppm
Initial N in stable organic pool	ORNST	ppm
Additions:		
Mineral N fertilizer (includes ammonium nitrogen)	FN	kg/ha, lbs/ac
Fert N	FNO3	kg/ha, lbs/ac
Fert NH	FNH3	kg/ha, lbs/ac
N added in precipitation	RN	kg/ha, lbs/ac
N in irrigation water		kg/ha, lbs/ac
N fixed by leguminous crops	NFIX	kg/ha, lbs/ac
Organic Nitrogen fertilizer (animal wastes)	FNO	(fraction of dry weight of manure)
Ammonium Nitrogen fraction	FAMO	(Fraction of mineral
Losses:		
Surface runoff soluble N losses (loading & concentration)	Soluble N	kg/ha, lbs/ac
Organic N losses with sediment	YON	kg/ha, lbs/ac
N in harvested crop yield	YLN	kg/ha, lbs/ac
Denitrification N losses	DN	kg/ha, lbs/ac
Mineral N loss in percolate (loading & concentration)	PRKN	kg/ha, lbs/ac ppm
Mineral N losses in subsurface flow (loading & conc.)	SSFN	kg/ha, lbs/ac ppm
Nitrogen volatilization (NH3-N)	AVOL	kg/ha, lbs/ac
End of Simulation:		
Remaining soluble N	TNO3	ppm
Remaining N in active organic pool	ORNAC	ppm
Remaining N in stable organic pool	ORNST	ppm
Total NH3-N present in soil profile	TNH3	ppm
Other:		
N mineralized	MHN	kg/ha, lbs/ac
N uptake by the crop	UNO3	kg/ha, lbs/ac

Normal fraction of N in crop biomass at emergence	BN1	g/g, lb/lb
Normal fraction of N in crop biomass at midseason	BN	g/g, lb/lb
Normal fraction of N in crop biomass at maturity	BN3	g/g, lb/lb
Normal fraction of N in yield	CNY	g/g, lb/lb
soluble N moved from top 0.2m soil to top layer	EVN	kg/ha, lbs/ac
N mineralized from stable organic matter	HMN	kg/ha, lbs/ac
Stable organic matter (humus) in profile	HUM	tonnes/ha, tons/ac
N immobilized by decaying residue	MN	kg/ha, lbs/ac
Nitrification NH3-N conversion to NO3-N	NITR	kg/ha, lbs/ac
Average Nitrogen concentration in rainfall	RCN	ppm
NO3-N concentration in irrigation water	RTN	ppm
Organic carbon	ORGC	percent

2. Pesticide Mass Balance Worksheet

DESCRIPTION	OUTPUT PARAMETER	UNITS
Start of Simulation:		
Additions:		
Pesticide applied considering application efficiency	PAPL	g/ha, lbs/ac
Pesticide in runoff (loading & concentration)	PSRO	g/ha, lbs/ac
Pesticide in subsurface flow (loading & concentration)	PSSF	g/ha, lbs/ac
Pesticide on lost sediment	PSED	g/ha, lbs/ac
Pesticide leached below the soil profile	PLCH	g/ha, lbs/ac
Pesticide degraded on foliage	PDGF	g/ha, lbs/ac
Pesticide degraded in the soil	PDGS	g/ha, lbs/ac
End of Simulation:		
Pesticide on foliage at the end of a month	PFOL	g/ha, lbs/ac
Pesticide in the soil at the end of a month	PSOL	g/ha, lbs/ac
Other:		
Application efficiency	PAR	percent
Pest Control Factor	PCF	percent

3. Phosphorus Mass Balance Worksheet

DESCRIPTION	OUTPUT PARAMETER	UNITS
Start of Simulation:		
Organic P concentration	ORGP	ppm
Initial mineral P soil profile	PMIN	kg/ha, lbs/ac
Initial labile P (plant available) in soil profile	PLAB	kg/ha, lbs/ac
Additions:		
Mineral P fertilizer (actual P)	FP	kg/ha, lbs/ac
Organic Phosphorus (actual P) of manure	FPO	Fraction of dry wt.
Losses:		
P loss with sediment (loading & concentration)	YP	kg/ha, lbs/ac
Soluble P loss in runoff (loading & concentration)	YAP	kg/ha, lbs/ac
P in harvested crop yield	YLD	kg/ha, lbs/ac
End of Simulation:		
Organic P	ORG P	ppm
Mineral P concentration in active pool (by layer)	MNPAC	ppm
Mineral P concentration in stable pool	MNPST	ppm
Labile P (by layer)	LAB P	ppm
Other:		
P uptake by the crop	UPP	kg/ha, lbs/ac
P mineralized	MNP	kg/ha, lbs/ac
Normal fraction of P in crop biomass at emergence	BP	g/g, lb/lb
Normal fraction of P in crop biomass at midseason	BP2	g/g, lb/lb
Normal fraction of P in crop biomass at maturity	BP3	g/g, lb/lb
Normal fraction of P in yield	CPY	g/g, lb/lb
P immobilized by decaying residue P by layer	IMP	kg/ha, lbs/ac
Labile P concentration (by layer)	AP	ppm

4. Sediment Mass Balance Worksheet

DESCRIPTION	OUTPUT PARAMETER	UNITS
Start of Simulation:		
Additions:		
Losses:		
Soil loss from small watershed	MUSS	tonnes/ha, tons/ac
Soil loss from water erosion	MUSLE	tonnes/ha, tons/ac
Soil loss from user supplied coefficients	MUSI	tonnes/ha, tons/ac
Soil loss from theoretically based MUSLE equations	MUST	tonnes/ha, tons/ac
Soil loss from water erosion using Onstad-Foster	AOF	tonnes/ha, tons/ac
Modified		
End of Simulation:		
Other:		
Enrichment ratio (nutrient content of sediment/nutrient	ER	ratio
content of top soil layer)		
Thickness of soil eroded by wind and water	THR	mm, in
Soil erosion from water using USLE Bulk density by soil layer Bulk density (oven dried) by layer Porosity (by layer)	USLEBD BDD Porosity	tonnes/ha, tons/ac tonnes/m, ton/ft33 tonnes/ m, ton/ft33 m 3/m 3, ft 3/ft 3

5. Water Mass Balance Worksheet

DESCRIPTION	OUTPUT PARAMETER	UNITS
Start of Simulation:		
Soil water (by layer)	SW	mm, in
water equivalent in snow	SNO	mm, in
Additions:		
Snowmelt	SNOM	mm, in
Inflow to the rootzone from the water table	QIN	mm, in
Precipitation	RAIN	mm, in
Irrigation water	IRGA	mm, in
Losses:		
Percolation below the rootzone	PRK	mm, in
Surface runoff	Q	mm, in
Subsurface flow	SSF	mm, in
Evapotranspiration	ET	mm, in
End of Simulation:		
Soil water by layer		
Other:		
Crop available water	CAW	mm, in
Soil water content at field capacity (33 kPa for many	FC	mm, in
soils) by layer		
Soil water content at wilting point (1500 kPa for many	WP	mm, in
soils) by layer		
Transpiration	EP	mm, in
Soil evaporation	ES	mm, in
Initial Soil Water Content field capacity	FFC	fraction of
Water equivalent of snow on ground	SNO	mm, in

APPENDIX D: EPIC VARIABLE DEFINITIONS

The variable names and definitions used in EPIC can be found in **Data/Setup**

Epic Name	Full Name	MUnit	EUnit	Definition
.acy	Annual subarea crop yield			Annual subarea crop yield
.asa	Annual subarea file			Annual subarea file
.aws	Annual watershed outlet file			Annual watershed outlet file
.can	Annual soil organic C and N table			Annual soil organic C and N table
.dcn	Daily soil organic C & N table			Daily soil organic C & N table
.ddd	Daily dust distribution			Daily dust distribution
.dgz	Daily grazing			Daily grazing
.dhy	Daily subarea hydrology file			Daily subarea hydrology file
.dps	Daily subarea pesticide file			Daily subarea pesticide file
.drs	Daily reservoir file			Daily reservoir file
.dux	Daily manure application			Daily manure application
.dws	Daily watershed outlet file			Daily watershed outlet file
.efr	Runoff event flood routing			Runoff event flood routing
.ehy	Runoff event hydrographs			Runoff event hydrographs
.man	Special manure management summary file			Special manure management summary file
.msa	Monthly subarea file			Monthly subarea file
.mws	Monthly watershed file			Monthly watershed file

.out	Standard output file			Standard output file
.rcd	Daily reach file			Daily reach file
.sad	Daily subarea file			Daily subarea file
.scx	Summary soil organic C & N table			Summary soil organic C & N table
.sot	Subarea final soil table for use other runs			Subarea final soil table for use other runs
.sus	Subarea summary file			Subarea summary file
.swt	Watershed output to SWAT			Watershed output to SWAT
.wss	Watershed summary file			Watershed summary file
29BN	N fraction in plant when growth is 0..,.5,1.0			N fraction in plant when growth is 0..,.5,1.0
32BP	P fraction in plant when growth is 0..,.5,1.0			P fraction in plant when growth is 0..,.5,1.0
35BK	K fraction in plant when growth is 0..,.5,1.0			Potassium fraction in plant when growth is 0..,.5,1.0
38BW	Wind erosion factors			Wind erosion factors for standing live, standing dead, and flat residue
ACW	Wind erosion control factor			Wind erosion control factor. 0.0 = No wind erosion, 1.0 for normal simulation, >1 accelerates wind erosion (condenses time)
AIR	Aeration stress on crop growth	days	days	Aeration stress on crop growth
AL5	1/2 Hour alpha			1/2 Hour alpha
ALPH	.5-h precipitation/total storm precipitation			.5-h precipitation/total storm precipitation
ALSA	Root growth aluminum saturation factor	%	%	Root growth aluminum saturation factor

ALSAT	Soil Aluminum saturation (2)	%	%	Soil Aluminum saturation (2)
ALT	Index of crop tolerance to aluminum saturation			Index of crop tolerance to aluminum saturation. 1 = sensitive thru 5 = tolerant.
ALTC	Alpha			Alpha
ANG	Clockwise angle of field length			Clockwise angle of field length from North (Degrees) Blank if unknown
AOF	Soil loss from water erosion using Onstad-Foster	t/ha	T/ac	Soil loss from water erosion using Onstad-Foster
AP	Labile P concentration (by layer)	ppm	ppm	Labile phosphorus concentration (by layer)
AP0	Initial plw depth (Parm 43) soluble P concentration	g/t	oz/T	Initial plw depth (Parm 43) soluble P concentration
AP15	Plow depth Parm(43) soluble P concentration	g/t	oz/T	Plow depth Parm(43) soluble P concentration
APBC	Soluble phosphorus in top 6"	ppm	ppm	The amount of soluble phosphorus in the plow layer (top 6")
apexcont.dat				
APF	Final plow depth(Parm 43) soluble P concentration	g/t	oz/T	Final plow depth(Parm 43) soluble P concentration
APL	Manure application area			Manure application area 0 non manure application area Use the positive subarea ID of the feedlot to indicate solid manure application and the negative subarea ID of the feedlot (lagoon) to indicate liquid manure application.
APM	`Peak rate - EI adjustment factor			`Peak rate - EI adjustment factor (1.0 if unknown). The peak runoff-rate-rainfall energy adjustment factor(APM) provides a means for fine tuning the energy factor used in estimating water erosion. APM value of 1 is normal range is 0.5 - 1.5
APRT	Pesticide application rate	g/ha	lb/acre	Pesticide application rate

ARMN	Minimum single application volume allowed	mm	in	Minimum single application volume allowed.
ARMX	Maximum single application volume allowed	mm	in	Maximum single application volume allowed
AS	Aeration Stress Factor			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth).
AS (2)	Excess Water Stress (2)	days	days	The number of days the crop suffered from this type of stress. This type of stress occurs when there is excess water in the soil reducing the amount of air present in the soil.
ASCII	A Small Computer Interface			A small computer interface
ASM	Ag Ssector Model			Ag Ssector Model
ASTM	Mean annual soil temperature	C	F	Mean annual soil temperature
AVOL	Nitrogen volatilitization	kg/ha	lb/acre	Nitrogen volatilitization
B	5			(Spare1)
BD	Bulk density at 33 kPa	t/m3	b/cu ft	The moist bulk density
BDD	Dry soil bulk density	t/m-3	b/cu ft	Dry soil bulk density (oven dry)
BFT	Fertigation auto trigger			1 = Plant nitrogen stress factor (0-1), 2 = Soil nitrogen concentration in root zone (G/T)
BFT0	Auto fertilizer trigger			1 = Plant nitrogen stress factor (0-1), 2 = Soil nitrogen concentration in root zone (G/T)
BIOM	Crop Biomass	t/ha	T/ac	The crop biomass (shoot + root)
BIR	Irrigation trigger			Irrigation trigger. 1 = Plant water stress factor (0-1), 2 = Soil water tension in top 200 mm (>1 KPA), 3 = Plant available water deficit in root zone (-mm)

Bitmap	A map composed of bits that represent a picture			A map composed of bits that represent a picture
BLG1	Lignin fraction in plant at			Lignin fraction in plant at maturity
	maturity			
BLG2	Lignin fraction in plant at .5 maturity			Lignin fraction in plant at .5 maturity
BMC0	Initial microbrial biomass C content	kg/ha	lb/acre	Initial microbrial biomass carbon content
BMCF	Final microbrial biomass C content	kg/ha	lb/acre	Final microbrial biomass carbon content
BMN0	Initial microbial biomass N content	kg/ha	lb/acre	Initial microbial biomass nitrogen content
BMNF	Final microbrial biomass N content	kg/ha	lb/acre	Final microbrial biomass nitrogen content
BN1	Normal fraction of N in crop at emergence			Normal fraction of nitrogen in crop biomass at emergence
BN2	Normal fraction of N in crop at midseason			Normal fraction of nitrogen in crop biomass at midseason
BN3	Normal fraction of N in crop at maturity			Normal fraction of nitrogen in crop biomass at maturity
BP	Normal fraction of P in crop at emergence			Normal fraction of phosphorus in crop biomass at emergence
BP2	Normal fraction of P in crop at midseason			Normal fraction of phosphorus in crop biomass at midseason
BP3	Normal fraction of P in crop at maturity			Normal fraction of phosphorus in crop biomass at maturity

BTA	Coefficient governing wet-dry probabilities			Coefficient(0-1) governing wet-dry probabilities given days of rain (Blank if unknown or if W/D Probabilities input)
BUS	Input parms for MUSI			YSD(6) = BUS(1)*QD**BUS(2)*QP**BUS(3)*WSA**BUS(4)*KCPLS
BUS(1)	MUSI input			MUSI input - YSD(6) = BUS(1) * QD ** BUS(2) * QP**BUS(3)*WSA**BUS(4)*KCPLS
BUS(2)	MUSI input (2)			MUSI input
BUS(3)	MUSI input (3)			MUSI input
BUS(4)	MUSI input (4)			MUSI input
BW1	Wind erosion factor for standing live			Wind erosion factor for standing live biomass
BW2	Wind erosion factor for standing dead			Wind erosion factor for standing dead crop residue
BW3	Wind erosion factor for flat residue			Wind erosion factor for flat residue
BWD	Channel bottom width/depth	m/m	ft/ft	Channel bottom width/depth
BXCT	Linear coefficient of change in rainfall from E to W.	PI/PO/KM	PI/PO/Mile	Linear coefficient of change in rainfall from E to W.
BYCT	Linear coefficient of change in rainfall from S to N.	PI/PO/KM	PI/PO/Mile	Linear coefficient of change in rainfall from S to N.
C	4			Cropman
C	Crop management factor (2)			Average water erosion/crop management factor
C USLE	Crop management factor			crop management factor
C/N0	Initial C/N ratio			Initial carbon/nitrogen ratio
C/NF	Final C/N ratio			Final carbon/nitrogen ratio

CAC	Free soil calcium carbonate	%	%	Free soil calcium carbonate
CACO3	Calcium carbonate	%	%	Free soil calcium carbonate
CAF	Critical Aeration factor			Critical aeration factor - fraction of soil porosity where poor aeration starts limiting plant growth
CARE	Cost and Returns Estimator			Cost and Returns Estimator
CAW	Crop available water	mm	in	Quantity of water available to crop during growing season. Includes plant extractable water at planting + precipitation received during growing season minus surface runoff.
CBN	Organic carbon	%	%	Organic carbon
CD-ROM	Compact Disc - Read Only Memory			Compact Disc - Read Only Memory
CEC	Cation exchange capacity	cmol/kg	unknown	Cation exchange capacity
CF	Cash flow	$/ha	$/ac	At crop harvest, gross returns less operating costs where operating costs include an interest rate charge on cash expenses.
CF (2)	Wind erosion equation climatic factor			Wind erosion equation climatic factor
CHC	Channel C Factor			With bare channel condition, CHC should be 0.5-0.7 and if the channel has very good land cover, it should take a value of 0.001.
CHD	Channel depth	m	ft	Channel depth
CHK	Channel K Factor			reflects channel’s erodibility. For example, with a rock condition, CHK should be 0.01; with loess (silt/mud) condition, it should be 0.30.
CHL	Mainstem channel length	km	mi	Mainstem channel length (Blank if unknown)
CHN	Mannings N for channel			Mannings N for channel (Blank if unknown)
CHS	Mainstem channel slope	m/m	ft/ft	Mainstem channel slope

CHSO	Average upland slope in watershed	m/m	ft/ft	Average upland slope in watershed
CHT	Crop Height	m	ft	Crop Height
CKY	K fraction of yield	kg/kg	lb/lb	Potassium fraction of yield
CLAY	Clay percent	%	%	The percent of clay in the soil
CLF	Climatic factor used to regulate crop growth			Climatic factor used to regulate crop growth--a function of annual average temperature and precipitation
CMD	Routing command name			Routing command name
CN	SCS runoff curve number			SCS runoff curve number
CN2	SCS runoff curve number for moisture cond. 2			SCS runoff curve number for moisture condition 2
CNDS	Initial NO3 concentration	g/t	oz/T	Initial NO3 concentration
CNO3I	Concentration of No3 in irrigation water	ppm	ppm	Concentration of NO3 in irrigation water
CNY	Normal fraction of N in yield	g/g	lb/lb	Normal fraction of nitrogen in yield
CO2	CO2 concentration in atmosphere	ppm	ppm	Carbon dioxide concentration in atmosphere
CO2 LOSS	CO2 lost to the atmosphere from respiration	kg/ha	lb/acre	Carbon dioxide lost to the atmosphere from respiration during plant residue decay
COIR	Cost of irrigation water	$/mm	$/in	Cost of irrigation water
COL	Cost of lime	$/t	$/T	Cost of lime
CONC	Concentration	ppm	ppm	Concentrations
COOP	Operation cost	$/ha	$/ac	At crop harvest, the total cash expenses accrued including interest charges at the nominal interest rate. Total costs of all operations and inputs (seed, fertilizer, equipment, time, and labor.

COSD	Seed Cost	$/kg	$/lb	Seed Cost
COST	Total production cost	$/ha	$/ac	Total cost of operations, fertilizers, pesticide products, etc.
COTL	Total cost	$/ha	$/ac	The total cost of the operation including equipment and material costs.
COW	Number of cows residing in this subarea			Number of cows residing in this subarea
COWW	Lagoon input from wash water	M3/COW/D	unknown	Lagoon input from wash water
CPNM	Crop Name			The name of the crop in the rotation
CPRH	Fraction inflow partitioned to horizontal crack or pipe flow			Fraction inflow partitioned to horizontal crack or pipe flow
CPRV	Fraction inflow partitioned to vertical crack or pipe flow			Fraction inflow partitioned to vertical crack or pipe flow
CPY	Normal fraction of P in yield	g/g	lb/lb	Normal fraction of phosphorus in yield
CQV	Growing season runoff (2)	mm	in	The portion of precipitation or irrigation on an area received during the growing season which does not enter the soil
CQW	Growing season runoff	mm	in	The portion of precipitation or irrigation on an area received during the growing season which does not enter the soil
CR	Cash rent	$/ha	$/ac	Cash rent
CRF	Growing season precipitation	mm	in	The total amount of precipitation received by the crop during only the growing season.
CROP	Crop name			Crop name (.man)
CROPN	Crop Name (2)			Crop name
CROPNAME	Full crop name			The full descriptive name of the crop
CROPNUM	EPIC crop number			The number assigned by EPIC to every crop
CROPSYM	EPIC crop symbol			The 4-letter code used by EPIC to identify each crop

CSALT	Salt in irrigation water	mg/L	ppm	Concentration of salt in irrigation water
CSLT	Concentration of salt in irrigation water	ppm	ppm	Concentration of salt in irrigation water
CSP	Average concentration of soluble P in surface			Average concentration of soluble P in surface
CSTZ	Miscellaneous cost	$/ha	$/ac	Miscellaneous cost
CVF	Cover factor			Soil erosion crop cover factor. Either USLE or RUSLE
CVM	Minimum value of water erosion C factor			Minimum value of water erosion C factor
D	Day			The day of a particular month
DALG	Fraction of Subarea controlled by lagoon.			Fraction of Subarea controlled by lagoon.
DAYP	Precipitation days			Number of days with precipitation
DAYQ	Runoff days			Number of days with runoff
DBR	Rate of manure transport from surface to 2nd soil layer	t/ha/day	T/ac/day	Rate of manure transport from surface to 2nd soil layer by dung beetles.
DDLG	Time to reduce lagoon storage from max to norm	days	days	Time to reduce lagoon storage from maximum to normal
DEG	Sediment degradation within a reach	t/ha	T/ac	Sediment degradation within a reach
DEP	Sediment deposition within a reach	t/ha	T/ac	Sediment deposition within a reach
DEPTH	Depth of soil layer	m	ft	The depth of the soil layer from the surface of the profile to the bottom of the soil layer.
DIAM	Soil particle diameter	um	in	Soil particle diameter

DIR1	Monthly % wind from North	%	%	Monthly % wind from North
DIR10	Monthly % wind from South - South West	%	%	Monthly % wind from South West
DIR11	Monthly % wind from South West	%	%	Monthly % wind from South West
DIR12	Monthly % wind from West South West	%	%	Monthly % wind from West South West
DIR13	Monthly % wind from West	%	%	Monthly % wind from West
DIR14	Monthly % wind from West North West	%	%	Monthly % wind from West North West
DIR15	Monthly % wind from North West	%	%	Monthly % wind from North West
DIR16	Monthly % wind from North - North West	%	%	Monthly % wind from North -North West
DIR2	Monthly % wind from North- North East	%	%	Monthly % wind from North East
DIR3	Monthly % wind from North East	%	%	Monthly % wind from North East
DIR4	Monthly % wind from East North East	%	%	Monthly % wind from East North East
DIR5	Monthly % wind from East	%	%	Monthly % wind from East
DIR6	Monthly % wind from East South East	%	%	Monthly % wind from East South East
DIR7	Monthly % wind from South East	%	%	Monthly % wind from South East

DIR8	Monthly % wind from South - South East	%	%	Monthly % wind from South -South East
DIR9	Monthly % wind from South	%	%	Monthly % wind from South
DKH	Furrow dike height	mm	in	Furrow dike height
DKI	Furrow dike interval	m	ft	Furrow dike interval
DLAI	Fraction of growing season when leaf area index st			Fraction of growing season when leaf area index starts declining
DLAP	LAI development parms			Leaf area index development parms--numbers before decimal = % of growing season. Numbers after decimal = fraction of DMLA at given %.
DMLA	Maximum leaf area index	m2/m2	ft2/ft2	Maximum potential leaf area index
DN	N loss by denitrification	kg/ha	lb/acre	The amount of nitrogen lost to denitrification
DNIT	N loss by denitrification (2)	kg/ha	lb/acre	The amount of nitrogen lost to denitrification
DNO3	Net mineralization	kg/ha	lb/acre	Net mineralization of nitrogen calculated as a simple nitrogen balance to check the complex computations in RNMN.
DP	Depth of tillage	mm	in	Depth of tillage
DRNN	Soluble N outflow from a drainage system	kg/ha	lb/acre	soluble nitrogen outflow from a drainage system
DRT	Drainage system plant stress reduction			Time required for a drainage system to reduce plant stress (Blank if drainage not used)
DRV	Specifies water erosion driving equation			0 = MUST, 1 = AOF, 2 = USLE, 3 = MUSS, 4 = MUSL, 5 = MUSI, 6 = RUSLE
DRYIRR	Dry or irrigated?			Indicates whether the rotation consisted of a dryland or irrigated cropping system.
DT	Date of run			This identifies the date and time the run was made. This is unique for every run

DTHY	Time interval for flood routing			Time interval for flood rounding
DUR	Rainfall energy factor			Rainfall energy factor
DWOC	Change in organic C during simulation	kg/ha	lb/acre	Change in organic carbon during simulation (initial - final) (WOC0 - WOCF)
DWON	Change in organic N during simulation	kg/ha	lb/acre	Change in organic nitrogen during simulation (initial - final) (WON0 - WONF)
DXT	TMNS - TMNW	C	F	Difference between mean summer and winter temperatures
E	2			EPIC
ECND	Electrical conductivity (2)	mmho/cm	unknown	Electrical conductivity
EFI	Runoff vol/vol irrigation water applied			Runoff vol/vol irrigation water applied (Blank if IRR = 0)
EI	Rainfall energy factor (2)			Rainfall energy factor
EK	Soil erodibility factor for water erosion			Soil erodibility factor for water erosion
ELEV	Elevation	m	ft	Average watershed elevation
EMDT	Emergence date (2)			The date at which the shoot pierces the soil surface and is visible.
EMF	Machine efficiency			Machine efficiency (equipment)
EMX	Mixing efficiency			The mixing efficiency of the operation is the fraction of materials (crop residue and nutrients) that is mixed uniformly in the plow depth of the implement.
EP	Transpiration	mm	in	Transpiration
EPIC	Environmental Policy - Integrated Climate Model			Environmental Policy - Integrated Climate Model
EQ	Operation or equipment code			Equipment or operation code used by EPIC

EQP	Equipment description			Equipment description
ER	Enrichment ratio			Enrichment ratio (nutrient content of sediment/nutrient content of top soil layer)
ES	Soil evaporation	mm	in	Soil evaporation
ET	Evapotranspiration	mm	in	The actual amount of water lost due to soil evaporation and crop transpiration during the entire year. (annual value)
EVN	Soluble N moved from top 0.2m soil to top layer	g/g	lb/lb	Soluble N moved from top 0.2m soil to top layer
EXCK	Exchangeable K concentration	g/t	oz/T	Exchangeable potassium concentration
EXPK	Parameter used to modify exponential			Parameter used to modify exponential rainfall amount distribution (Blank if unknown or if ST DEV 7 SK CF are input
F	7			(Spare3)
FAMO	Ammonium nitrogen fraction			Ammonium nitrogen fraction (Fraction of mineral)
FBM	Fraction of org C in biomass pool			Fraction of organic carbon in biomass pool
FC	Fixed Cost	$/ha	$/ac	Tractor and equipment depreciation plus taxes and insurance on farm equipment items.
FC (2)	Soil Water Content (field capacity)	m/m	ft/ft	Soil water content at field capacity (33 kPa for many soils)
FC SW	Soil water Content at field capacity	m/m	f/ft	Soil water content at field capacity
FCC	Fraction of field cap. for initial water storage			Fraction of field cap. for initial water storage
FCM	Fuel consumption multiplier			Fuel consumption multiplier (equipment)
FCW	Floodplain width/channel width	m/m	ft/ft	Floodplain width/channel width

FDFS	Fraction of furrow dike volume available for water			Fraction of furrow dike volume available for water storage.
FDSO	Furrow dike safety factor			Furrow dike safety factor (0-1)
FFC	Fraction of field capacity for initial water storage			Fraction of field capacity for initial water storage
FFED	Fraction of time herd in feeding area			Fraction of time herd is in feeding area
FFPQ	Fraction of floodplain flow			Fraction of floodplain flow --Partitions flow through filter strips.
FHP	Fraction of humus in passive pool			Fraction of humus in passive pool
FIXX	Fixed potassium concentration	g/t	oz/T	Fixed potassium concentration
FL	Field length	km	mi	Field length
FLT	Fraction lint			(cotton lint/picker yield)
FMX	Maximum annual N fertilizer application for a crop	kg/ha	lb/acre	Maximum annual nitrogen fertilizer application for a crop
FN	Average annual N fertilizer rate	kg/ha	lb/acre	Average annual nitrogen fertilizer rate
FNH3	Fert NH	kg/ha	lb/acre	Fert NH
FNO	Organic Nitrogen fertilizer (animal waste)			Organic Nitrogen fertilizer (animal waste) - fraction of dry weight of manure
FNO3	Fert N	kg/ha	lb/acre	Fertilizer nitrogen
FNP	Fert Application variable			Fert Application variable. 1 = Application rate auto/fixed, 2 = Manure input to lagoon (kg/cow/D) IRR = 4
FNP5	Automatic Manure application rate	kg/ha	lb/acre	Automatic Manure application rate
FP	Average Annual P fertilizer rate	kg/ha	lb/acre	Average annual phosphorus fertilizer rate

FPL	Mineral P fertilizer applied			Mineral P fertilizer applied
FPO	Organic Phosphorus (actual P) of manure			organic Phosphorus (actual P) of manure (Fraction of dry weight)
FPOP	Fraction of plant population reduced by operation			Fraction of plant population reduced by operation (equipment)
FPSC	Floodplain saturated hydraulic conductivity	mm/hr	in/hr	Floodplain saturated hydraulic conductivity
FRCP	Fraction of soil compacted			Fraction of soil compacted - equipment. (Tire width/tillage width)
FRS	Frost damage curve.			Two points on the frost damage curve. Numbers before the decimal are the minimum temperatures© and numbers after the decimal are the fraction of biomass lost when specified minimum temperature occurs
FRST	Frost damage parms			Numbers before the decimal = minimum temperature. Numbers after decimal = fraction lost when given minimum temperature is experienced.
FSLG	Safety factor for lagoon spillover			Safety factor for Lagoon spillover (fraction 0_1).
FTN	Fertilizer N applied	kg/ha	lb/acre	The amount of nitrogen fertilizer applied
FTO	Fraction turnout			(cotton lint/stripper yield)
FTP	Fertilizer P applied	kg/ha	lb/acre	The amount of phosphorus fertilizer applied
FULP	Cost of fuel	$/l	$/gal	Cost of fuel
FW	Field Width	km	mi	Field Width
FYLD	Forage yield (2)	t/ha	T/ac	Forage yield
GMHU	Heat units required for germination			Heat units required for germination
GMN	Nitrogen mineralized	kg/ha	lb/acre	The amount of nitrogen mineralized.
GRF	Gross return forages	$/ha	$/ac	Total sale value of forage crop.

GRG	Gross return grain	$/ha	$/ac	Total sale value of grain crop.
GRRE	Gross return	$/ha	$/ac	Gross return
GSET	Growing season evapotranspiration	mm	in	Total amount of water lost due to soil evaporation and crop transpiration during the growing season.
GSI	Maximum stomatal conductance			Drought tolerant plants have low values
GWMX	Maximum groundwater storage	mm	in	Maximum groundwater storage
GWSO	Maximum ground water storage	mm	in	Maximum ground water storage
GWST	Groundwater storage	mm	in	Groundwater storage
GYLD	Yield	t/ha	T/ac	The average annual crop yield.
GYLD	Grain Yield (2)	t/ha	T/ac	Grain yield
GZLM	Above ground plant material grazing limit	t/ha	T/ac	Above ground plant material grazing limit
GZLM (1)	Grazing limit for each herd Minimum Plant Material	t/ha	T/ac	Grazing limit for each herd Minimum Plant Material in t/ha.
GZLM(10)	Grazing limit for each herd Minimum Plant Material	t/ha	T/ac	Grazing limit for each herd Minimum Plant Material.
GZLO	Grazing limit (minimum plant material	t/ha	T/ac	Grazing limit (minimum plant material)
HAMT	High amount on high day of month			High amount on high day of month
HC	IHC code			Operation code.
HDAY	High day of month			High day of month
HI	Harvest efficiency (Harvest index)			Harvest index(crop yield/above ground biomass)

HMN	N mineralized from stable organic matter	kg/ha	lb/acre	The amount of nitrogen mineralized from stable organic matter.
HMX	Maximum crop height	m	ft	Maximum crop height
HPCF	Final passive humus C content	kg/ha	lb/acre	Total carbon in slow humus pool at the end of simulation
HPCO	Initial slow humus C content (2)	kg/ha	lb/acre	Total carbon in slow humus pool at the start of simulation
HPN0	Initial passive humus N content	kg/ha	lb/acre	Initial passive humus nitrogen content
HPNF	Final passive humus N content	kg/ha	lb/acre	Final passive humus nitrogen content
HRL	Life of equipment	hours	hours	Life of equipment (equipment)
HRLT	Day length	hours	hours	Day length
HRY	Annual use	hours	hours	Annual use (equipment)
HSC	Saturated conductivity in the horizontal direction	mm/h	in/hr	Saturated conductivity in the horizontal direction
HSC0	Initial slow humus C content	kg/ha	lb/acre	Total carbon in slow humus pool at the start of simulation
HSCF	Initial slow humus C content (3)	kg/ha	lb/acre	Total carbon in slow humus pool at the start of simulation
HSG	Soil hydrologic group			Soil Hydrologic group - 1 = A, 2 = B, 3 = C, and 4 = D
HSN0	Initial slow humus N content	kg/ha	lb/acre	Initial slow humus nitrogen content
HSNF	Final slow humus N content	kg/ha	lb/acre	Final slow humus nitrogen content
HU	Heat units	C	F	Heat units-average daily temperature minus base temperature of crop
HUI	Heat unit index			Heat unit index
HUM	Stable organic matter	t/ha	T/ac	Stable organic matter (humus) in profile
HUSC	Heat unit schedule			Heat unit schedule as a fraction; crop heat units to maturity if a crop is growing of fraction of average annual heat units accumulated with 0 C as the base temperature

HVDT	Harvest date (2)	The date at which the grain or other harvestable material is removed from the plant.
HVEF	Harvest efficiency	Fraction of yield removed from field by harvest operation
HYDGRP	Hydrologic group	Hydrologic group
IAPL	Fertigation code	0 = NO MANURE , 1 = LIQUID MANURE, 2 = SOLID MANURE
ICF	C factor code	= 0 Uses RISLE C factor for all erosion equations. >0 uses EPIC C factor for all erosion equations except RUSLE
ICG	Crop growth biomass conversion option	0 for traditional EPIC radiation to biomass, 1 for new experimental water use to biomass
ID	Outflow ID number computer assigned	Outflow ID number computer assigned
ID#	Subarea ID number input by user	Subarea ID number input by user
IDA	Day of month simulation begins	Day of month simulation begins
IDC	Crop category number	1 = Warm season annual legume, 2 = Cold season annual legume, 3 = Perennial legume, 4 = Warm season annual, 5 = Cold season annual, 6 = Perennial, 7 = Tree crop
IDF0	Fertilizer number for auto fert & fertigation	Fertilizer number for auto fert & fertigation --blank default to elemental nitrogen
IDF1	Liquid Fertilizer	Liquid Fertilizer
IDF2	Solid Fertilizer	Solid Fertilizer
IDF3	Grazing Animals Fertilizer	Grazing Animals Fertilizer
IDFT1	Liquid Fertigation Number	Fertigation Fertilizer from Lagoon.Put in number of fertilizer from lists provided (FERT1310.dat).
IDFT2	Solid Fertigation Number	Automatic solid manure application. Put in number of fertilizer from lists provided (FERT1310.dat).

IDFT3	Grazing Animals Fertigation Number			For daily fresh manure application from grazing animals. See also IDMU in the site file. If IDMU is used IDFT3 can be left null. Put in number of fertilizer from lists provided (FERT1310.dat)
IDFT4	Commercial Fertigation Number			For automatic commercial fertilizer application.Put in number of fertilizer from lists provided (FERT1310.dat).
IDON	Owner ID			Owner ID - must be entered
IDR	Drainage code (2)			0 = no drainage, = depth of drainage system
IDR0	Drainage code	mm	in	0 = no drainage, = depth of drainage system
IDY	Normal run vs.. Tillage number			= 0 Normal run, > 0 = tillage number for automatic tillage special soil drying simulation
IE	Current Subarea Number			Current Subarea Number
IERT	Enrichment ratio method code			0 for EPIC enrichment ratio method, 1 for GLEAMS enrichment ratio method
IET	PET method code			1 for Penman-Monteith, 2 for Penman, 3 for Priestley-Taylor, 4 for Hargreaves, 5 for Baier-Robertson
IFA	Min Interval For Auto Fertigation	days	days	Minimum fertilizer application interval for auto option.
IFD	Furrow dike trigger			0 = without furrow dikes, 1 = with furrow dikes
IFED	Fraction of time herd in feeding area (2)			0 = NON FEEDING AREA , 0.001 - 1 = FRACTION OF TIME HERD IS IN FEEDING AREA
IFLS	Filter Strip Code			Filter Strip Code0 for normal subarea1 for filter strip
IGMD	Emergence date			The date at which the shoot pierces the soil surface and is visible. (2)
IGMX	Number of times generator seeds are initialized			Number of times generator seeds are initialized for a site

IGN	Number of times random number generator			Number of times random number generator cycles before simulation starts
IGS0	Weather generator code			0 = Future weather generated after stop date (NSTP), = beginning year for historical weather used to estimate future weather after NSTP
IGSD	Weather generator stop day			Determines the day that the weather generator stops generating daily weather
IHC	Operation code			-2 = destroys furrow dikes, -1 = builds furrow dikes, 1 = harvest and kill crop, 2 = harvest without kill, 3 = harvest once during simulation without kill, 4 = harvest with mower, no kill, 5 = plant in rows, 6 = plant with drill, 7 = Apply pesticide, 8 = irrigate, 9 = fertilize
IHUS	Heat unit code			0 for normal operation, 1 for automatic heat unit schedule (PHU must be input at planting)
IHVD	Harvest date			The date at which the grain or other harvestable material is removed from the plant.
IHY	Flood routing trigger			= 0 for no flood routing. = 1 for flood routing.
II	Feeding area			0 = feeding area, 1 = Non-feeding area
IMN	N immobilized by decaying residue	kg/ha	lb/acre	Nitrogen immobilized by decaying residue
IMO	Month simulation begins			Month simulation begins
IMP	P immobilized by decaying residue	kg/ha	lb/acre	Phosphorus immobilized by decaying residue
INFL	Infiltration code			0 for CN estimate of Q, 1 for Green and Ampt Estimate of Q, RF EXP DST, PEAK RF RATE simulated, 2 for G&A, RF EXP DST, PEAK RF INPUT, 3 for G&A, RF uniformly DST, PEAK RF INPUT
INPS	Soil number from soil list			Soil number from soil list

IO	Receiving Subarea Number			Receiving Subarea Number is the subarea this subarea drain into (Downstream Subarea)
IOP	Management			The operation schedule file, typically named filename.ops Management operation by date and type of operation.
IOPS	Operation schedule from operation schedule list			Operation schedule from operation schedule list
IOW	Owner			OWNER NUMBER Owner Of Land In Subarea
IPD	Printout code			N1 for annual printout, N2 for annual with soil table, N3 for monthly, N4 for monthly with soil table, N5 for monthly with soil table at harvest, N6 for N day interval, N7 for soil table only N day interval, N8 for N day interval rainfall days only, N9 for N day interval during growing season
IPLD	Planting date			The date in which the seed is placed in the soil.
IRDL	Irrigation Distribution loss	mm	in	The amount of irrigation water lost from the point of origin (well, etc) to the point of delivery due to seepage, leeks, evaporation, etc.
IRGA	Irrigation water applied	mm	in	The amount of irrigation water applied
IRI	Min Interval For Irrigation	days	days	Minimum Application Interval
IRR	Irrigation code			0 = Dryland areas, 1 = From sprinkler irrigation, 2 = For furrow irrigation, 3 = for irrigation with fertilizer added, 4 = for irrigation from lagoon, 5 = for drip irrigation (0 applies minimum of volume input, ARMX, FC=SW, 1 applies input volume or ARMX)
IRRV	Irrigation water applied (2)	mm	in	The amount of water applied through irrigation
ISCN	Curve number code			0 for stochastic curve number estimator, >0 for rigid curve number estimator
ISLF	Slope length/steepness factor			= 0 for RUSLE slope length/steepness factor. > 0 for MUSLE slope length/steepness factor
ISOL	Soil			Soil number from soil list

ISTA	Erosion code			0 for normal erosion of soil profile, 1 for static soil profile.
ISW	Soil water calculation code			= 0 input or estimated 33 & 1500 KPA soil water remains constant for the run. =1 updates 33 & 1500 KPA soil water annually using Walter Rawls equations for 33 & 1500 water content. = 2 updates annually using Otto Baumer's equations.
ITYP	Peak rate code			0 for modified rational EQ peak rate estimator. > 0 for NRCS TR55 peak rate estimate. = 1 for type 1 rainfall pattern. = 2 for type 1A. = 3 for type 2, 4 for type 3
IYR	Beginning year of simulation (2)			Beginning year of simulation
IYRO	Beginning year of simulation			Beginning year of simulation (2)
JC	Output variable ID number (concentration variables)			Output variable ID number (concentration variables)
JX(1)	Year of operation			year of operation
JX(2)	Month of operation			Month of operation
JX(3)	Day of operation			Day of operation
JX(4)	Equipment ID number			Equipment ID number
JX(5)	Tractor ID number			Tractor ID number
JX(6)	Crop ID number			Crop ID number
JX(7)	XMTU			= time from planting to maturity for tree crops at planting time only, =time from planting to harvest (harvest only), = grazing duration (d) for harvest only, = Pesticide ID number, = fertilizer ID number
K	Exchangeable K conc	g/t	oz/T	The exchangeable potassium concentration in the soil; Also = EXCK
KA	Output variable ID for accumulated and average values			Output variable ID for accumulated and average values

KD	output variable id (daily output variables)			output variable id (daily output variables)
KFL	= 0 gives no output, KFL > 0 gives output for selected files			= 0 gives no output, KFL > 0 gives output for selected files
KS	Potassium Stress Factor			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth). This type of stress occurs when the plant is limited by potassium.
KS (2)	output variable id (monthly state variables)			output variable id (monthly state variables)
KY	annual output variable ID (accumulated and average values)			annual output variable ID (accumulated and average values)
LAB P	Labile P (by layer)	ppm	ppm	Labile phosphorus (by layer)
LAI	Leaf area index	m2/m2	ft2/ft2	Leaf area index
LAP(1,2)	Two points on optimal leaf area development curve			Two points on optimal leaf area development curve. Numbers before decimal are % of growing season. Numbers after decimal are fractions of maximum potential leaf area index.
LAT	Latitude	degrees	degrees	Latitude in decimal degrees
LBP	Pesticide runoff code			0 for sol P runoff estimate using GLEAMS pesticide approach, > 0 for modified non-linear approach
LC	Land cost	$/ha	$/ac	Land cost
LGIR	Volume of irrigation from a lagoon	mm	in	Volume of irrigation from a lagoon
LGMI	Manure input to lagoon	kg/ha	lb/acre	Manure input to lagoon
LGMO	Manure output from lagoon			Manure output from lagoon

LIME	Limestone applied (CaCO3 equivalent)	t/ha	T/ac	The amount of limestone applied
LINT	Lint Yield	t/ha	T/ac	Lint yield (cotton in the Cropman interface)
LM	Lime application switch			0 applies lime, 1 does not apply lime
LM	Liming Code			0 applies lime automatic 1 applies no lime.
LMC0	Initial metabolic litter C content	kg/ha	lb/acre	Initial metabolic litter carbon content
LMCF	Final metabolic litter C content	kg/ha	lb/acre	Final metabolic litter carbon content
LMN0	Initial metabolic litter N content	kg/ha	lb/acre	Initial metabolic litter nitrogen content
LMNF	Final metabolic litter N content	kg/ha	lb/acre	Final metabolic litter nitrogen content
LPD	Day of year to trigger lagoon pumping			Day of year to trigger lagoon pumping disregarding normal pumping trigger -- usually before winter or high rainfall season.
LPYR	Leap year considered			Leap year considered. 0 if considered, 1 if ignored
LSC0	Initial structural litter C content	kg/ha	lb/acre	Initial structural litter carbon content
LSCF	Final structural litter C content	kg/ha	lb/acre	Final structural litter carbon content
LSN0	Initial structural litter N content	kg/ha	lb/acre	initial structural litter nitrogen content
LSNF	Final structural litter N content	kg/ha	lb/acre	Final structural litter nitrogen content
LUN	Land use number			Land use number
M	Month			The month of a particular year
MAP	manure applied to subarea	kg/ha	lb/acre	manure applied to subarea
MASP	Pesticide mass code			< 0 for mass only, no pesticide in .out. 0 for mass only pesticides in .out, >0 for pesticide and nutrient output in mass & concentration
MASS	Amount applied	kg/ha	lb/acre	The amount of the fertilizer or pesticide applied

MAT-HV	Years from planting to maturity or harvest			Tree crops only. Years from planting to maturity or harvest
MN	N mineralized from stable organic matter	kg/ha	lb/acre	N mineralized from stable organic matter
MNN	N mineralized	kg/ha	lb/acre	The amount of nitrogen mineralized.
MNP	P mineralized	kg/ha	lb/acre	The amount of phosphorus converted from an organic form to an inorganic form as a result of microbial activity
MNPAC	Mineral P concentration in the active pool	g/t	oz/T	Mineral phosphorus concentration in the active pool
MNPST	Mineral P concentration in the stable pool	g/t	oz/T	Mineral phosphorus concentration in the stable pool
MNU	Manure application trigger			= > 0 auto dry manure application without trigger
MNUL	Manure application code			Enter 0, 1, or 2. 0 for auto application to subarea with minimal labile P concentration. 1 for variable limits on annual application based on Jan. labile P concentration. 2 for variable N rate limits on annual application based on Jan. 1 labile P concentration.
MSCP	Solid manure scraping			= 0 does not scrape extra manure from feeding area. > 0 interval for scraping solid manure from feeding area in days
MSNP	mass/nutrient output code			mass/nutrient output code - 0 = mass only, >0 for pesticide & nutrient output in mass and concentration.
MSS	Soil loss from water erosion using small wat MUSLE	t/ha	T/ac	Soil loss from water erosion using small watershed MUSLE options
MT#	Number of material from FERT or PEST files			Number of material from FERT or PEST files
MTCO	Material cost	$/ha	$/ac	Cost of materials used for operation. (This is a portion of the total costs)

MUSI	Soil loss from water erosion using mod. MUSLE	t/ha	T/ac	Soil loss from water erosion using modified MUSLE equation with user supplied coefficients
MUSL	Soil loss from water erosion using MUSLE	t/ha	T/ac	Soil loss from water erosion using modified USLE (MUSLE)
MUSLE	Modified Soil Loss Equation			Modified Soil Loss Equation
MUSS	Soil erosion-water	t/ha	T/ac	The amount of soil lost due to movement of soil by water.
MUST	Soil loss from water erosion using modified MUSLE	t/ha	T/ac	Soil loss from water erosion using modified MUSLE theoretically base equation
MUUF	Map Unit Use File			Map Unit Use File
MWDC	Maximum number of consecutive days	days	days	Maximum number of consecutive days profile only part wet
MWWCWS	Maximum number of consecutive	days	days	maximum number of consecutive days wet in all layers after winter solstice
MXDD8C	Maximum number of dry days in all layers	days	days	Maximum number of dry days in all layers with soil temp above 8 degree C
MXDDC	Number of non dry consecutive days in all layers	days	days	Number of non dry consecutive days in all layers
MXEF	Mixing efficiency of tillage operation			Mixing efficiency of tillage operation-fraction of crop residue and other materials in each soil layer of the plot depth that is mixed uniformly within the plow depth
Name	Watershed Name			Watershed is the area of land that catches rain and snow and drains or seeps into a marsh, stream, river, lake or groundwater.
Name (2)	Subarea File Name			SubArea File Name is the name for the Subarea Set. So User Can make more Subareas file for this Watershed.
NAQ	Air Quality Analysis			= 0 for no air quality analysis. = 1 for air quality analysis.

NBY0	Number of years of simulation (2)			Number of years of simulation
NBYR	Number of years of simulation			Number of years of simulation (2)
NCOW	Number of cows			Number of cows
NCUM5	Number of consecutive days soil temperature above 5 deg C	days	days	Number of consecutive days soil temperature above 5 deg C
NCUM6	Number of consecutive days soil temperature above 6 deg C	days	days	Number of consecutive days soil temperature above 6 deg C
NCUM8	Number of consecutive days soil temperature above 8 deg C	days	days	Number of consecutive days soil temperature above 8 deg C
NDD5	number of dry days in all layers soil temp above 5 deg C	days	days	number of dry days in all layers soil temp above 5 deg C
NDDCSS	Maximum number of consecutive dry days in all layers			Maximum number of consecutive dry days in all layers after summer solstice.
NDDCSS	Maximum number of consecutive dry days	days	days	Maximum number of consecutive dry days in all layers after summer solstice.
NET MN	Net N mineralization from litter, humus, and biomass	kg/ha	lb/acre	Net nitrogen mineralization from litter, humus, and biomass--net of mineralization and immobilization
NFIX	N fixed by leguminous crops	kg/ha	lb/acre	The amount of nitrogen fixed by a leguminous crop.
NGN	ID number of weather variables input			Rain = 1, Temp = 2, Rad = 3, Wind speed = 4, Rel Hum = 5
NGZ	Grazing Area			0 = For Non Grazing Area , 1= Grazing Area
NGZ(1)	Grazing Area Herd Number			0 For Non Grazing Area Herd Number NCOW(1) from site file.
NGZ(10)	Grazing Area Herd Number (2)			0 For Non Grazing Area Herd Number NCOW(1) from site file.
NIPD	Controls printing			Controls printing

NIRR	Rigidity of irrigation code			Rigidity of irrigation code (col. 3)0 for flexible applications. Applies minimum of FC-SW and ARMX.1 for rigid applications. Applies input amount or ARMX. The irrigation code is used to specify the irrigation strategy. There are two mode of irrigating -- manual and automatic. If manual irrigation is selected, irrigation occurs on user specified dates and volumes. If nirr is set to zero the irrigation is applied when needed and only as much as is needed. If Nirr is set to 1 the application is according to the amounts specified, either by automatic application (ARMX) or by user input amounts and restrictions.
NITR	Nitrification	kg/ha	lb/acre	The amount of nitrogen nitrified through the process of nitrification of ammonium nitrogen to nitrate nitrogen.
NMN	N mineralized from stable organic matter	kg/ha	lb/acre	The amount of nitrogen mineralized from stable organic matter
NO3	Nitrate concentration	g/t	oz/T	Nitrate concentration
NRI	Natural Resource Inventory			Natural Resource Inventory
NS	Nitrogen Stress Factor	days	days	A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth). The number of days the crop suffered from this type of stress. This type of stress occurs when the plant is limited by the amount of nitrogen that can be taken up by the plant.
NSTP	Real time day of year			Real time day of year
NUPC	N and P plant uptake concentration code			N and P plant uptake concentration code - 0 for Smith Curve, 1 for S-Curve
NVCN	Cover number code			0 for variable daily CN with depth soil water weighting, 1 for variable daily CN without depth weighting, 2 for variable daily CN linear CN/SW no depth weighting, 3 for non-varying CN--CN2 used for all storms, 4 for variable daily CN SMI(soil moisture index)
NWD5	number of days partly wet profile	days	days	number of days partly wet profile with soil temp above 5 deg C

NWW	number of wet days in all layers	days	days	number of wet days in all layers
NXDD	Number of non dry days in all layers	days	days	number of non dry days in all layers
NXDD5	number of non dry days above 5 deg C	days	days	number of non dry days in all layers soil temp above 5 deg C
NXDD6	number of non dry days above 65 deg C	days	days	number of non dry days in all layers soil temp above 6 deg C
NXWW	number of non wet days in all layers	days	days	number of non wet days in all layers
NXWW5	number of non wet days in all layers (2)	days	days	number of non wet days in all layers soil temperature above 5 deg C
NXWW8	number of non wet days in all layers soil	days	days	number of non wet days in all layers soil temp above 8 deg C
O	Initial labile P concentration	g/t	oz/T	Initial labile phosphorus concentration
OBC	Observed C content at end of simulation	t/ha	T/ac	Observed C content at end of simulation
OBCF	Final observed organic C	kg/ha	lb/acre	Final observed organic carbon
OBMN	Average monthly minimum air temperature	C	F	Average monthly minimum air temperature
OBMX	Average monthly maximum air temperature	C	F	Average monthly maximum air temperature
OBSL	Ave monthly solar radiation	MJ/m2	Langley's	Ave monthly solar radiation
OCPD	Organic carbon in plow depth	kg/ha	lb/acre	The amount of organic carbon found in the plow depth (top 6 inches)
OP	Tillage operation number			Tillage operation number

OPCD	Tillage equipment operation code			(-2) destroys furrow dikes; (-1) builds furrow dikes; (1) harvests and kills crop; (2) harvests without killing; (3) applies irrigation water; (4) applies fertilizer; (5) plants in rows; (6) plants with drills; (7) applies a pesticide
OPV1	potential heat units for planning			= application volume for irrigation (mm), = fertilizer application rate (kg/ha), = pest control factor for pest application (fraction of pests controlled)
OPV2	line number for SCS hydrologic soil group/runoff			line number for SCS hydrologic soil group/runoff curve number table, = pesticide application rate, = application depth for fertilizer
OPV3	plant water stress factor			= 0 to 1 is soil water tension (>1 KPA) or plant available water deficit in root zone (-mm) to trigger auto irrigation (0. Or blank does not change trigger)
OPV4	runoff vol/vol irrigation water applied			runoff vol/vol irrigation water applied
OPV5	Plant population	plants/m2	plants/ac	plant population
OPV6	Maximum annual N fertilizer applied to crop			Maximum annual nitrogen fertilizer applied to crop
OPV7	time of operation as fraction of growing season			time of operation as fraction of growing season
ORGC	Organic carbon content	%	%	Organic carbon content
ORGP	Organic phosphorus content	%	%	Organic phosphorus content
ORHI	Overrides simulated			HI if 0. <ORHI<1. Or = grazing rate(kg/ha/d) if ORHI > 1. Near optimal harvest index values (HI) are contained in table III.I, the crop parameters. As the crop grows, these values may be adjusted for water stress. For some crops like hay, the harvest index is not affected by water stress and should maintain the table III.I value. For the rest of this description please refer to the source document.
ORNAC	Organic N concentration in	g/T	oz/T	Organic nitrogen concentration in the active pool

	the active pool			
ORNST	Organic N concentration in the stable pool	g/t	oz/T	Organic nitrogen concentration in the stable pool
OWN#	Subarea owner number			Subarea owner number
OWNC	Owner operation cost	$/ha	$/ac	Owner operation cost
OWNF	Owner fixed cost	$/ha	$/ac	Owner Fixed cost
P SORP	Phosphorus sorption coefficient			Phosphorus sorption coefficient
P#	Pesticide number			Pesticide number
P5MX	Monthly maximum 0.5 h rainfall	mm	in	Monthly maximum 0.5 h rainfall for period of record
PAKP	Leached P	kg/ha	lb/acre	Leached phosphorus
PAPL	Pesticide applied	g/ha	lb/acre	Pesticide applied with consideration to the application efficiency of the machine
PAR	Application efficiency	%	%	Application efficiency
PARM(1)	Crop canopy-pet(1_2)			Factor used to adjust crop canopy resistance in the Penman-Monteith PET equation.
PARM(10)	Pest damage cover threshold(t/ha)(1_10)			Crop residue + above ground biomass.
PARM(11)	Moisture required for seed germination(mm)(10_30)			Soil water stored minus wilting point storage in top 0.2 meters of soil.
PARM(12)	Soil evaporation coefficient(1.5_2.5)			Governs rate of soil evaporation from top 0.2 m of soil.
PARM(13)	Hargreaves PET EQ. EXP(0.5_0.6)			Original value = 0.5. Modified to 0.6 to increase PET.
PARM(14)	Nitrate leaching ratio(0.1_1)			Nitrate concentration in surface runoff to nitrate concentration in percolate.

PARM(15)	Ground water storage loss rate(mm/d)(1_10)	Ground water storage loss rate.
PARM(16)	Depth of plow layer(m)(0.05_0.2)	Used to track soluble phosphorus concentration or weight
PARM(17)	Crack flow coefficient(0_1)	Fraction of inflow to a soil layer allowed to flow through in cracks.
PARM(18)	Pesticide leaching ratio(0.1_1)	Pesticide concentration in surface runoff to pesticide concentration in percolate.
PARM(19)	Fraction of maturity at spring growth initiation(0_1)	Allows fall growing crops to reset heat unit index to a value greater than 0 when passing through the minimum temp. month.
PARM(2)	Root growth-soil strength(1_2)	Normally 1.15 < PARM(2)<1.2. Set to 1.5 to minimize soil strength constraint on root growth. PARM(2) >2. Eliminates all root growth stress.
PARM(20)	Soil evaporation-cover coefficient(0.05_0.02)	Regulates soil water evaporation as a function of soil cover by flat and standing residue and growing biomass.
PARM(21)	Fraction of mineralized fresh organic matter….(0.1_0.3)	Fraction of mineralized fresh organic matter added to the active humus pool.
PARM(23)	Exponential coefficient in EPIC soil….(0.5_2.)	Exponential coefficient in EPIC soil erosion C factor equation. Relates C factor to soil cover by flat and
PARM(24)	Maximum depth for biological mixing(m)(0.1_0.3)	Maximum depth for biological mixing.
PARM(25)	Biological mixing efficiency(0.1_0.5)	Simulates mixing in top soil by earthworms etc. PARM(24) sets depth.
PARM(26)	Fraction of N fixation added to active humus pool(0_0.2)	Fraction of nitrogen fixation added to active humus pool
PARM(27)	Lower limit nitrate concentration(0_10.)	Maintains soil nitrate concentration at or above PARM(27)

PARM(28)	Acceptable plant N stress Level(0_1)	Used to estimate annual nitrogen application rate as part of the automatic fertilizer scheme.
PARM(29)	Mineralization rate constant(0.0003_0.003)	Mineralization rate constant
PARM(3)	Water stress-harvest index(0_1)	Sets fraction of growing season when water stress starts reducing harvest index.
PARM(30)	Denitrification soil-water threshold(.9_1.1)	Fraction of field capacity soil water storage to trigger denitrification.
PARM(31)	Furrow irrigation sediment routing exponent(1_1.5)	Exponent of water velocity function for estimating potential sediment concentration.
PARM(32)	Minimum C factor value in EPIC soil erosion eq.(0.0001_0.8)	Minimum C factor value in EPIC soil erosion equation.
PARM(34)	Soluble P in runoff exponent modified GLEAMS method(1_1.5)	Soluble phosphorus in runoff exponent modified GLEAMS method. Makes soluble phosphorus runoff concentration a non-linear function of organic phosphorus concentration in soil layer 1.
PARM(35)	Water stress weighting coefficient(0_1)	At 0 plant water stress is strictly a function of soil water content; at 1 plant water stress is strictly a function of actual ET divided by potential ET. 0<PARM(35)<1 considers both approaches.
PARM(36)	Furrow irrigation base sediment conc.(t/m^3)(0.01_0.2)	Potential sediment concentration when flow velocity = 1.(m/s)
PARM(37)	Pest kill scaling factor(100_10000)	Scales pesticide kill effectiveness to magnitude of pest growth index.
PARM(38)	Hargreaves PET eq. Coef(0.0023_0.0032)	Original value = 0.0023. Modified to 0.0032 to increase PET.
PARM(39)	Auto N Fert scaling factor	Sets initial annual crop nitrogen use considering WA and BN3

PARM(4)	Denitrification rate constant(.1_2)	Controls denitrification rate.
PARM(40)	Soil water content to trigger auto till(0.6_0.75)	Special PARM for sediment drying--auto till occurs if PDSW/PDAW < PARM(40)
PARM(41)	Crop growth climatic factor adjustment(c/mm)(40._100.)	Ratio of average annual precipitation/temperature. PARM(40) = 0. Or IRR > 0--CLF = 1.
PARM(42)	SCS curve number index coef.(.5_1.5)	Regulates the effect of PET in driving the SCS curve number retention parameter.
PARM(43)	Residue decay rate	Relates decay rate to soil temperature and water content
	constant(0.01_0.05)	& residue nutrient content.
PARM(44)	Exponential coeff. In RUSLE C factor eq.(0.5_1.5)	Used in estimating the residue effect.
PARM(45)	Exponential coeff. In RUSLE C factor eq.(0.05_0.2)	Used in estimating the effect of growing plants.
PARM(46)	Regulates fall rate of standing dead residue(0.001_0.02)	Relates fall rate to rainfall amount.
PARM(47)	Used in special sediment drying study(0.6_0.75)	Material is ready for transport when PDSW/PDAW<PARM(47).
PARM(48)	Weighting factor for estimating soil evaporation(0_1)	At 0 total compensation of water deficit is allowed between soil layers. At 1. No compensation is allowed. 0<PARM(48)<1. Gives partial compensation.
PARM(49)	Fraction of above ground plant material burned(0_1)	Burning operation destroys specified fraction of above ground biomass, and standing and flat residue.
PARM(5)	Soil water lower limit(0_1)	Lower limit of water content in the top 0.5m soil depth expressed as a fraction of the wilting point water content.

PARM(6)	Winter dormancy(H)(0_1)			Causes dormancy in winter grown crops. Growth does not occur when day length is less than annual minimum day length + PARM(6).
PARM(7)	N fixation(0_1)			At 1. Fixation is limited by soil water or nitrate content or by crop growth stage. At 0 fixation meets crop N uptake demand. A combination of the 2 fixation estimates is obtained by setting 0 < PARM(7)< 1.
PARM(8)	Soluble P in runoff coefficient(.1*M^3/T)(10_20)			Potassium concentration in sediment divided by that of the water.
PARM(9)	Pest damage moisture threshold(mm)(25_150)			Previous 30 day rainfall minus runoff
Passive Humus	Stable (or passive) humus			Stable (or passive) humus consisting of humic acids, or humins, on the other hand, are so highly insoluble (or tightly bound to clay particles that they cannot be penetrated by microbes) that they are greatly resistant to further decomposition. Thus they add few readily available nutrients to the soil, but play an essential part in providing it's physical structure.
PCD	Power code			Power code (equipment)
PCF	Pest control factor	%	%	Pest control factor
PD	Pest day	day	day	Pest day
PDAW	Plant available water storage in the plow depth	mm	in	Plant available water storage in the plow depth (FC-WP)
PDGF	Pesticide biodegraded on foliage	g/ha	lb/acre	The amount of pesticide product biodegraded on the foliage surface.
PDGS	Pesticide biodegraded in the soil	g/ha	lb/acre	The amount of pesticide product biodegraded in the soil.
PDRN	Pesticide in drainage system	g/ha	lb/acre	The amount of pesticide product loss through the drainage system.
PDSW	Plant available water in the plow depth(ST-WP)	mm	in	Plant available water in the plow depth(ST-WP)
PEC	Conservation practice factor			Conservation practice factor. = 0.0 eliminates water erosion.
PEP	Potential plant water evaporation	mm	in	Potential plant water evaporation

PERX	Percent of applied	%	%	Percent of applied
PEST	pesticide			The pesticide used.
PET	Potential evaporation	mm	in	The potential total amount of water lost due to soil evaporation and crop transpiration during the growing season.
PEW	Plant extractable water	mm	in	(PEW) The amount of water (mm or inches) plants can currently remove from each soil layer
PFOL	Pesticide biodegraded on foliage (at end of month)	g/ha	lb/acre	The amount of pesticide product biodegraded on the foliage surface. This is a monthly total.
PH	Soil PH in water			Soil PH in water
PHU	Potential heat units	C	F	Potential heat units from planting to physiological maturity.
PKRZ	Percolation rate	mm/day	in/day	Percolation rate
PLAB	Labile (plant-available) phosphorus in profile	kg/ha	lb/acre	Labile (plant-available) phosphorus in profile
PLCH	Pesticide leached	g/ha	lb/acre	The amount of pesticide product leached through the soil.
PLDT	Planting date (2)			The date in which the seed is placed in the soil.
PM	Pest month			Pest month
PMIN	Mineral phosphorus present in soil profile	kg/ha	lb/acre	Mineral phosphorus present in soil profile
POROSITY	Soil pore space	m/m	ft/ft	Soil pore space
PPEW	Total plant extractable water	mm	in	(also = TPEW) The amount of water plants can effectively remove from each soil layer. Numerically it is the difference between field capacity (-0.1 to -0.3 bars) and wilting point (-15 bars)
PPLP1	Plant population parameter			Number before decimal = # plants. Number after decimal = fraction of maximum LAI (Leaf area index)

PPLP2	Second point on plant population-LAI curve.			PPLP1 < PPLP2 -- plants/M2. PPLP1 > PPLP2-Plants/ha
PPOP	Plant population (2)	plants/m2	plants/ac	The number of plants per specified area.
PPRK	Pesticide loss to Percolation below root zone			The amount of pesticide product loss through percolation below the root zone.
PQ	Pesticide loss in Surface runoff			The amount of pesticide product loss through in precipitation or irrigation on an area which does not infiltrate the soil.
PRCP	Precipitation	mm	in	The amount of rainfall or snow
PRIC	Purchase price	$	$	Purchase price (equipment)
print file				
PRK	Percolation below the root zone	mm	in	The amount of water which moves down below the area which the roots penetrate
PRKN	Mineral N loss in percolate	kg/ha	lb/acre	Amount of mineral nitrogen lost to the downward movement of water in the soil.
PRKP	Phosphorus loss in percolate	kg/ha	lb/acre	The amount of phosphorus lost to the downward movement of water in the soil.
PROB	Profits probability			Profits probability
PROF	Profits	$/ha	$/ac	Total returns minus operating costs and fixed costs
PROY	Annual yields - probability			Annual yields - probability
PRW1	Monthly probability of wet day after dry day			Monthly probability of wet day after dry day
PRW2	Monthly probability of wet day after wet day			Monthly probability of wet day after wet day
PRY	Price of yield	$/t	$/T	Price of yield

PS	Phosphorus Stress Factor			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth). The number of days the crop suffered from this type of stress. This type of stress occurs when the plant is limited by the amount of phosphorus that can be taken up by the plant.
PSAP	Pesticide amount applied	g/ha	lb/acre	The amount of the pesticide product being applied.
PSAP1	Pesticide 1 amount applied	kg/ha	lb/acre	Pesticide 1 amount applied
PSAP10	Pesticide 10 amount applied	kg/ha	lb/acre	Pesticide 10 amount applied
PSAP2	Pesticide 2 amount applied	kg/ha	lb/acre	Pesticide 2 amount applied
PSAP3	Pesticide 3 amount applied	kg/ha	lb/acre	Pesticide 3 amount applied
PSAP4	Pesticide 4 amount applied	kg/ha	lb/acre	Pesticide 4 amount applied
PSAP5	Pesticide 5 amount applied	kg/ha	lb/acre	Pesticide 5 amount applied
PSAP6	Pesticide 6 amount applied	kg/ha	lb/acre	Pesticide 6 amount applied
PSAP7	Pesticide 7 amount applied	kg/ha	lb/acre	Pesticide 7 amount applied
PSAP8	Pesticide 8 amount applied	kg/ha	lb/acre	Pesticide 8 amount applied
PSAP9	Pesticide 9 amount applied	kg/ha	lb/acre	Pesticide 9 amount applied
PSED	Pesticide in sediment	g/ha	lb/acre	The amount of pesticide product found in transported and deposited soil particles or aggregates.
PSOL	Pesticide biodegraded in soil (at end of month)	g/ha	lb/acre	The amount of pesticide product biodegraded in the soil. This is a monthly total.
PSP	P sorption ratio < 1			Phosphorus sorption ratio < 1
PSP (2)	Stress factor			Stress factor
PSRO	Pesticide in runoff	g/ha	lb/acre	The amount of pesticide product present in runoff.
PSSF	Pesticide in subsurface flow	g/ha	lb/acre	The amount of pesticide product loss in subsurface water flow.

PST	Pest damage factor			A factor ranging from 0 to 1. It describes how effective the pesticide product is in reducing the pest damage. 1 = total control (100% control) and 0 = no control, total damage (0% control).
PSTF	Generic pest damage factor			Fraction of yield remaining after damage (insects, weeds, disease). Generic pest damage factor that is a function of temperature, moisture, and crop residue
PSTN	Pest Name			The name of the pesticide being applied. (up to 10 pesticides)
PSTN1	Pesticide 1 name			Pesticide 1 name
PSTN10	Pesticide 10 name			Pesticide 10 name
PSTN2	Pesticide 2 name			Pesticide 2 name
PSTN3	Pesticide 3 name			Pesticide 3 name
PSTN4	Pesticide 4 name			Pesticide 4 name
PSTN5	Pesticide 5 name			Pesticide 5 name
PSTN6	Pesticide 6 name			Pesticide 6 name
PSTN7	Pesticide 7 name			Pesticide 7 name
PSTN8	Pesticide 8 name			Pesticide 8 name
PSTN9	Pesticide 9 name			Pesticide 9 name
PSTX	Pest damage scaling factor			Pest damage scaling factor (0. - 10). 0 shuts off pest damage function. Pest damage function can be regulated from very mild (0.05 - 0.1) to very severe (1.0 - 10.0)
PW/D	Monthly probability of wet day after dry			Monthly probability of wet day after dry day
PW/W	Monthly probability of wet day after wet day			Monthly probability of wet day after wet day
PWR	Power of unit	KW	KW	Power of unit (equipment)

PY	Pest Year			Pest Year
Q	Annual Surface Runoff (2)	mm	in	The portion of annual precipitation or irrigation on an area which does not enter the soil
QAP	Soluble phosphorus loss in runoff	kg/ha	lb/acre	The amount of soluble phosphorus loss in runoff.
QCF	Exponent in watershed area flow rate EQ			Exponent in watershed area flow rate EQ
QDR	Flow from a drainage system	mm	in	Flow from a drainage system
QDRN	Drain tile flow	mm	in	Drain tile flow
QDRN (2)	Soluble N from a drainage system	kg/ha	lb/acre	Soluble N from a drainage system
QG	Channel Capacity Flow Rate	mm/hr	in/hr	Channel Capacity Flow Rate
QIN	Inflow to the root zone from the water table	mm	in	Inflow to the root zone from the water table
QN	Soluble N yield contained in surface run from subarea or	kg/ha	lb/acre	Soluble N yield contained in surface run from subarea or reach
QNO3	Nitrate loss in surface runoff	kg/ha	lb/acre	The amount of nitrate nitrogen, or soluble nitrogen, that has been lost in surface runoff.
QNS	Sum of soluble N yield form all subareas	kg/ha	lb/acre	Sum of soluble N yield form all subareas
QNW	Watershed soluble N yield	kg/ha	lb/acre	Watershed soluble N yield
QP	Peak runoff rate	mm/hr	in/hr	Peak runoff rate
QP (2)	Soluble P yield from subarea or reach	kg/ha	lb/acre	Soluble P yield from subarea or reach

QPS	Sum of soluble P yield from all subareas	kg/ha	lb/acre	Sum of soluble P yield from all subareas
QPW	Watershed soluble P yield	kg/ha	lb/acre	Watershed soluble P yield
QRF	Quick return flow	mm	in	Quick return flow
QRFN	Soluble N in quick return flow	kg/ha	lb/acre	Soluble N in quick return flow
QSS	Sum of surface runoff from all subareas	mm	in	Sum of surface runoff from all subareas
QSW	Watershed outflow - - surface runoff component	mm	in	Watershed outflow - - surface runoff component
QTH	Routing Threshold (MM) - VSC routing used on QVOL > QTH			Routing Threshold (MM) - VSC routing used on QVOL > QTH
QTS	Sum of total flow from all subareas	mm	in	Sum of total flew from all subareas
QTW	Watershed outflow	mm	i	Watershed outflow
RAD	Solar radiation	MJ/m2	Langley's	Solar radiation
RAIN	Precipitation (2)	mm	in	Precipitation
RAM	Random Access Memory			Random Access Memory
RBMD	Biomass-energy ratio decline rate parameter			Biomass-energy ratio decline rate parameter
RC1	Repair cost coeff 1	$	$	Repair cost coeff 1 (equipment)
RC2	Repair cost coeff 2	$	$	Repair cost coeff 2 (equipment)
RCBW	Bottom Width of Channel of Routing Reach	m	ft	Bottom Width of Channel of Routing Reach
RCHC	Channel C factor (2)			Channel USLE C factor of Routing Reach. Must be entered.

RCHD	Channel Depth of Routing Reach	m	ft	Channel Depth of Routing Reach
RCHK	Channel K factor			Channel USLE K factor of Routing Reach. Must be entered.
RCHL	Channel Length of Routing Reach	km	mi	Channel Length of Routing Reach in km.
RCHN	Channel Mannings N of Routing Reach.			Channel Mannings N of Routing Reach.
RCHS	Channel Slope of Routing Reach	m/m	ft/ft	Channel Slope of Routing Reach.
RCN	Average nitrogen concentration in rainfall	ppm	ppm	Average nitrogen concentration in rainfall
RCTW	Top Width of Channel of Routing Reach	m	ft	Top Width of Channel of Routing Reach
RD	Root depth	m	ft	Root depth
RDMX	Maximum root depth	m	ft	Maximum root depth
REG	Crop growth regulator (minimum stress factor			Crop growth regulator (minimum stress factor (0-1)
RENC	Renter operation cost	$/ha	$/ac	Renter operation cost
RENF	Renter fixed cost	$/ha	$/ac	Renter fixed cost
RETF	Gross return (Forage)	$/ha	$/ac	Total sale value of the forage crop.
RETG	Gross return (Grain) (2)	$/ha	$/ac	Total sale value of the grain crop. (2)
RETL	Gross return - Lint	$/ha	$/ac	Gross return - Lint
RETN	Gross return (Grain)	$/ha	$/ac	Total sale value of the grain crop.
RFNC	Average conc. Of N in rainfall	ppm	ppm	Average concentration of nitrogen in rainfall

RFPK	Return flow / (return flow + deep percolation)			
RFPL	Floodplain length	km	mi	Floodplain length in km.
RFPO	Return Flow/(Return Flow + Deep Percolation)			Return Flow/(Return Flow + Deep Percolation)
RFPW	Floodplain width	m	ft	Floodplain width
RFTO	Groundwater residence time	days	days	Groundwater residence time
RFV0	Precipitation			Precipitation
RFV1	Remaining farm value parm 1	$	$	Remaining farm value parm 1 (equipment)
RFV2	Remaining farm value parm 2	$	$	Remaining farm value parm 2 (equipment)
RGRF	Wind erosion ridge roughness factor			Wind erosion ridge roughness factor
RH	Monthly average relative humidity			Monthly average relative humidity (fraction)
RHT	Ridge height after tillage operation	mm	in	Ridge height after tillage operation
RHTT	Ridge Height			Ridge Height
RHUM	Relative humidity			Relative humidity
RIN	Ridge interval after tillage operation	m	ft	Ridge interval after tillage operation
RLAD	Leaf-area-index decline rate parameter			Leaf-area-index decline rate parameter
RMO	Average monthly precipitation	mm	in	Average monthly precipitation
RN	Nitrogen in precipitation	kg/ha	lb/acre	Nitrogen in precipitation

RN03	Nitrogen in rainfall	kg/ha	kg/ha	Nitrogen in rainfall
RNMN	Net mineralization (2)	kg/ha	lb/acre	Net mineralization of nitrogen
ROCK	Rock percent (2)	%	%	The percent of rock (coarse fragments) in the soil
ROK	Rock percent	%	%	The percentage of coarse fragments (rock pieces 2 mm or larger in diameter) present in the soil on a volume basis.
ROT	Rotation			cropping system
ROTN	Rotation(2)			Name of the rotation used in the run.
RR	Random roughness of soil surface	mm	in	Random roughness of soil surface created by tillage operation
RRUF	Random roughness of soil			Random roughness of soil
RSAE	Surface area at emergency spillway elevation	ha	acre	Total reservoir surface area at emergency spillway elevation in ha.
RSAP	Surface area at principal spillway elevation	ha	acre	Total reservoir surface area at principle spillway elevation in ha.
RSBD	Bulk density of sediment in reservoir	t/cubic m	lb/cubic ft	Bulk density of sediment in reservoir
RSD	Crop residue on soil surface	t/ha	T/ac	The amount of crop residue remaining on the soil surface
	and below			
RSDA	Crop residue added at harvest	t/ha	T/ac	Crop residue added at harvest
RSDC	carbon contained in crop residue	kg/ha	lb/acre	Carbon returned to soil in crop residue
RSDK	Residue decay	t/ha	T/ac	Residue decay
RSDP	Time required for the sediment to return to	day	day	Time required in days for the sediment in the reservoir to return to the normal concentrations following a runoff event.
RSDP (2)	Crop residue present	t/ha	T/ac	Crop residue present

RSFN	Subarea soluble N yield in return flow	kg/ha	lb/acre	Subarea soluble N yield in return flow
RSHC	Hydraulic conductivity of reservoir bottoms in	mm/hr	in/hr	Hydraulic conductivity of reservoir bottoms in mm/h.
RSPC	CO2 respiration	kg/ha	lb/acre	Carbon dioxide lost to atmosphere through respiration involved in residue decay
RSRR	Average principle spillway release rate	mm/h	in/hr	Average principle spillway release rate in mm/h.
RST2	Monthly standard deviation of daily precipitation	mm	in	Monthly standard deviation of daily precipitation
RST3	Monthly skew coefficient for daily precipitation			Monthly skew coefficient for daily precipitation
RSV	Initial reservoir volumes	mm	in	Initial reservoir volumes in mm.
RSVE	Volume at emergency spillway elevation	mm	in	Volume at emergency spillway elevation
RSVP	Volume at principal spillway elevation	mm	in	Volume at principal spillway elevation in mm.
RSVQ	Reservoir storage	mm	in	Reservoir storage
RSVY	Sediment contained in reservoir	t/ha	T/ac	Sediment contained in reservoir
RSYN	Normal sediment concentration in reservoirs	ppm	ppm	Normal sediment concentration in reservoirs in ppm.
RSYS	Initial sediment concentration in reservoirs	ppm	ppm	Initial sediment concentration in reservoirs in ppm
RT#	Real Time #			If a realtime run, this is the sequence number
RT1	Annual real interest rate	$/$	$/$	Annual real interest rate (equipment)

RTF	Return flow from groundwater storage	mm	in	Return flow from groundwater storage
RTFN	Soluble N in return flow	kg/ha	lb/acre	Soluble N in return flow
RTN	NO3-N concentration in irrigation water	ppm	ppm	NO3-N concentration in irrigation water
RTNO	Number of years of cultivation at start			Number of years of cultivation at start of simulation
RTRN	Total income from crop sales	$/ha	$/ac	Total income from crop sales
RUNNO	Run number			The number of the run.
RUSC	RUSLE C factor(crop and residue cover)			RUSLE C factor(crop and residue cover)
RUSL	Soil erosion by water estimated with RUSLE	t/ha	T/ac	Soil erosion by water estimated with RUSLE
RW	Total root weight	t/ha	T/ac	Total root weight
RWPC1	Root weight/biomass partitioning coefficient			Root weight/biomass partitioning coefficient
RWPC2	Root weight/biomass partitioning coefficient (2)			Root weight/biomass partitioning coefficient (2)
RWT	Root weight in a soil layer	t/ha	T/ac	Root weight in a soil layer
RYLF	Forage return	$/ha	$/acre	Forage return
RYLG	Grain yield return	$/ha	$/acre	Grain yield return
RZSW	Root zone soil water	mm	in	The amount of soil water found in the root zone.
S5name	Soils 5 name			Soils 5 name
S5num	Soils 5 number			Soils 5 number

SA#	Subarea number assigned by computer			Subarea number assigned by computer
SAIR	Excess Water Stress	days	days	The number of days the crop suffered from this type of stress. This type of stress occurs when there is excess water in the soil reducing the amount of air present in the soil.
SALB	Soil Albedo			Soil Albedo
SALT	Electrical conductivity	mmho/cm	unknown	conductivity of electricity through water or an extract of soil. Commonly used to estimate the soluble salt content in solution. (Also = ECND)
SAN	Sand percent	%	%	The percent of sand in the soil
SAND	Sand percent (2)	%	%	The percent of sand in the soil
SATO	Saturated Conductivity adjustment factor			Saturated Conductivity adjustment factor (use with Green and Ampt)
SC	Saturated conductivity	mm/h	in/hr	Saturated conductivity
SCRP(1,N)	Expresses the effect of soil coarse fragment			Expresses the effect of soil coarse fragment content on plant root growth restriction. X = %course fragment
SCRP(10,N)	Water stress effect calculation			Calculates the effect of water stress on harvest index as a function of plant water use. X = Plant water use as a % of potential plant water use during critical period.
SCRP(11,N)	Plant water stress estimation			Estimates plant water stress as function of plant available water stored. X = soil water stored divided by total plant available water storage (FC-WP)
SCRP(12,N)	Governs N volatilization	mm	in	Governs N volatilization as a function of soil depth. X = depth at the center of soil layer
SCRP(13,N)	Calculates wind erosion vegetative cover factor			Calculates wind erosion vegetative cover factor as a function of above ground plant material. X = vegetative equivalent (C1 * BIOM + C2 * STD + C3 * RSD) where C1, C2, and C3 are coefficients, BIOM is above ground biomass, STD is standing dead plant residue, and RSD is flat residue.

SCRP(14,N)	Calculates soil temperature factor.			Calculates soil temperature factor used in regulating microbial processes. X = soil temperature ©
SCRP(15,N)	Expresses plant population			Expresses plant population effect on EPIC water erosion
	effect			cover factor. X = plant population(plants/M**2)
SCRP(16,N)	Increases snowmelt as a function of time since			Increases snowmelt as a function of time since the last snowfall. X = time since the last snowfall (days)
SCRP(17,N)	Estimates the snow cover factor			Estimates the snow cover factor as a function of snow present. X = snow present (mm H2O)
SCRP(18,N)	Expresses soil temperature effect on erosion			Expresses soil temperature effect on erosion of frozen soils. X = temperature of second soil layer ©
SCRP(19,N)	Drives water table			Drives water table between maximum and minimum limits as a function of ground water storage. X = % of maximum ground water storage.
SCRP(2,N)	Governs soil evaporation	mm	in	Governs soil evaporation as a function of soil depth. X = soil depth (mm)
SCRP(20,N)	Governs plant water stress			Governs plant water stress as a function of soil water tension. X = gravimetric + osmotic tension.
SCRP(25,N)	Exception to normal S-curve procedure			Exception to normal S-curve procedure -- sets soil water contents coinciding with CN2 and CN3. X1 = soil water content as % of field capacity - wilting point; X2 = soil water content as % of porosity - field capacity.
SCRP(3,N)	Drives harvest index development			Drives harvest index development as a function of crop maturity. X = % of growing season
SCRP(4,N)	NRCS runoff curve number soil water relationship			NRCS runoff curve number soil water relationship. Exception to normal S-curve procedure--soil water fractions taken from SCRP(20,N) to match with CN2 and CN3 (average and wet condition runoff curve numbers)
SCRP(5,N)	Estimates soil cover factor			Estimates soil cover factor used in simulating soil temperature. X = total above ground plant material dead and alive.

SCRP(6,N)	Settles after tillage soil bulk density			Settles after tillage soil bulk density to normal value as a function of rainfall amount, soil texture, and soil depth. X = rainfall (mm) adjusted for soil texture and depth.
SCRP(7,N)	Root growth aeration stress factor			Determines the root growth aeration stress factor as a function of soil water content and the critical aeration factor for the crop. X = soil water-critical aeration factor.
SCRP(8,N)	Plant stress caused by N or P deficiency			Determines the plant stress caused by N or P deficiency. X = % of optimal N or P content present in plant
SCRP(9,N)	Calculates the pest damage factor			Calculates the pest damage factor as a function of temperature and relative humidity, considering thresholds for 30 day rainfall and above ground plant material. X = sum of product of daily average temperature and relative humidity.
SDRF	Monthly standard deviation of daily precip.	mm	in	Monthly standard deviation of daily precipitation
SDTMN	Monthly average standard deviation of daily min.	C	F	Monthly average standard deviation of daily minimum temperature
SDTMX	Monthly average standard deviation of daily max.	C	F	Monthly average standard deviation of daily maximum temperature
SDW	Normal planting rate	kg/ha	lb/acre	Normal planting rate
SIL	Silt percent	%	%	The percent of silt in the soil.
SILT	Silt percent (2)	%	%	The percent of silt in the soil
SIMYEARS	Number of years in simulation			The number of years included in each simulation.
SKCF	Monthly skew coefficient for daily precip			Monthly skew coefficient for daily precipitation
SLG	Land slope length	m	ft	Land slope length
SLP	Average upland slope	m/m	ft/ft	Average upland slope

SM	Initial soil water storage (Fraction of field capacity)			Initial soil water stored in soil profile. (Fraction of field capacity) Also = ST
SMB	Sum of bases in soil	cmol/kg	unknown	Sum of bases in soil
SMBS	Sum of bases in soil (2)	cmol/kg	unknown	Sum of bases in soil
SN	Surface N value			Surface N value (blank if unknown)
SNAME	Soil Name	mm	in	The name of the soil used in the simulation
SNMN	Net N mineralization	kg/ha	lb/acre	Net nitrogen mineralization
SNO	Water content of snow on ground at start of simulation			Water content of snow on ground at start of simulation
SNOA	Snow accumulation	mm	in	Snow accumulation
SNOF	Snowfall			Snowfall
SNOM	Snowmelt	mm	in	Snowmelt
SNOW	Water content of snowfall	mm	in	Water content of snowfall
SNUM	Subarea ID number			Subarea ID number
Soil.txt				
SOLK	Soluble potassium concentration	g/t	oz/T	Soluble potassium concentration
SOLQ	Ratio - liquid/total manure applied			Ratio - liquid/total manure applied
SPD	Operating speed	km/hr	mi/hr	Operation speed (equipment)
SPDM	N supply/N demand			The ratio of nitrogen supply to nitrogen demand used to regulate carbon and nitrogen transformation..

SPLG	Average upland slope length	m/m	ft/ft	Ave Upland Slope Length. The watershed slope length can be estimated by field measurement as described by Wischmeier and Smith (1978) or from topographic maps using the Contour-Extreme Point Method (Williams and Berndt 1977).
SR	Share Rent	$/ha	$/ac	Share Rent
SRQ	Annual Surface Runoff	mm	in	The portion of annual precipitation or irrigation on an area which does not enter the soil
SRT	Root growth soil temperature factor			Root growth soil temperature factor
SS	Salt Stress	days	days	The number of days the crop suffered from this type of stress. This type of stress occurs when the plant is subjected to levels of salt that interfere with growth of the plant.
SSF	Lateral subsurface flow	mm	in	Horizontal movement of water in the soil.
SSFN	Mineral N loss in lateral subsurface flow from subarea or	kg/ha	lb/acre	Amount of mineral nitrogen lost in the horizontal movement of water in the soil from subarea or reach
SSO3	N leaching rate	kg/ha/day	lb/ac/day	N leaching rate
SSURGO	Soil Survey Accurate to County Level			Soil Survey Accurate to County Level
ST	Initial soil water storage (Fraction of field capacity) (2)			Initial soil water storage (fraction of field capacity)
STD	Standing dead crop residue	t/ha	T/ac	Standing dead crop residue
STD0	Standing dead crop residue (2)	t/ha	T/ac	Standing dead crop residue
STFR	Fraction of storage interacting with NO3 leaching			Fraction of storage interacting with NO3 leaching
STL	Standing live plant biomass	t/ha	T/ac	Standing live plant biomass

STMN	Monthly average standard deviation of daily min	C	F	Monthly average standard deviation of daily minimum air temperature
STMX	Monthly average standard deviation of daily max	C	F	Monthly average standard deviation of daily maximum air temperature
STND	- VSC Routing used when reach storage > STND			- VSC Routing used when reach storage > STND
STP	Average upland slope (2)	%	%	Average Upland Slope in m/m. Must be entered. The average watershed slope can be estimated from field measurement or by using the Grid-Contour Method (Williams and Berndt 1977).
STRS	The type and number of days of stress			The type and number of days of stress by month for the three highest stress variables
STX1	Yield decrease/Salinity increase	t/ha/mmho/cm	unknown	Yield decrease/Salinity increase ((t/ha)/mmho/cm))
STX2	Salinity threshold	mmho/cm	unknown	Salinity threshold
SW	Soil water (by layer)	mm	in	Soil water (by layer)
SW (2)	Total soil water in the profile	m/m	ft/ft	The total soil water in the profile
SW10	Ratio soil water/wilting point in top 10mm			Ratio soil water/wilting point in top 10mm
SWF	Soil water factor			SQRT((ST-WP)/(FC-WP))
SWTF	Water, temperature, oxygen, tillage factor			Regulates microbial processes using soil water factor, temperature factor, oxygen content and tillage factor
TAP	Total phosphorus in soil profile	kg/ha	lb/acre	Total phosphorus present in the soil profile
TB	Optimal temperature for plant growth	C	F	Optimal temperature for plant growth
TBSC	Minimum temperature for plant growth (2)	C	F	Minimum temperature for plant growth

TC	Watershed time of concentration	hours	hours	Watershed time of concentration
TEMP	Soil temperature	C	F	The temperature of the soil
Textid	Texture ID			Texture ID
TG	Minimum temperature for plant growth	C	F	Minimum temperature for plant growth
THK	Thickness of soil eroded by wind and water	mm	in	Thickness of soil eroded by wind and water
THR	Thickness of soil eroded by wind and water	mm	in	Thickness of soil eroded by wind and water
THU	Total heat units	C	F	Total heat units from planting to harvest.
TIL	Equipment name			Equipment name
TITLE	Description of the subarea			Description of the subarea
TLD	Tillage depth	mm	in	Tillage depth (equipment). Positive depth is below the surface. Negative indicates above ground cutting height. Also used as the lower limit of grazing height
TLEF	Tillage effect on microbial processes			Tillage effect on microbial processes
TLGE	Lagoon evaporation			Lagoon evaporation
TLGF	Lagoon overflow	mm	in	Lagoon overflow
TLGQ	Runoff to lagoon			Runoff to lagoon
TLGW	Water wash to lagoon			Water wash to lagoon
TMN	Minimum daily air temperature	C	F	Minimum daily air temperature
TMNS	Mean summer temperature	C	F	Mean summer temperature
TMNW	Mean winter temperature	C	F	Mean winter temperature

TMP	Temperature in second soil layer	C	F	Temperature in second soil layer
TMX	Maximum daily air temperature	C	F	Maximum daily air temperature
TNAME	Tillage			Indicates which tillage system was used in the simulation. Choices include Conventional Tillage, Reduced Tillage, and No Tillage.
TNH3	Total NO3-N present in the soil profile	kg/ha	lb/acre	Total NO3-N present in the soil profile
TNO3	Total soluble nitrogen present in the soil profile	kg/ha	lb/acre	Total soluble nitrogen present in the soil profile
TOC	Soil Organic Carbon	kg/ha	lb/acre	Organic carbon in the soil profile
TOPC	Optimal temperature for plant growth (2)	C	F	Optimal temperature for plant growth
TOT	Total			The total summed value of a particular parameter
TOTN	Total nitrogen	kg/ha	lb/acre	Total nitrogen
TR	Tractor			This number identifies the piece of equipment used for the operation
TRSP	Respiration from residue decomposition			
TS	Temperature Stress Factor			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth)
TS (2)	Low Temperature Stress	days	days	The number of days the crop suffered from this type of stress. This type of stress occurs when the temperatures goes below the base temperature for growth set for the crop.
TSLA	Maximum number of soil layers after splitting			Maximum number of soil layers after splitting (3 - 15)
TYPE	Type of subarea			Extreme Subarea has no inlet channel, Downstream
				Subarea has a inlet channel from another subarea

U	Soil Water Content at wilting point (2)	m/m	ft/ft	Soil Water Content at wilting point (1500 KPA)
UNM	plant N uptake	kg/ha	lb/acre	plant N uptake
UNO3	Nitrogen uptake by the crop	kg/ha	lb/acre	Nitrogen uptake by the crop
UNR	N uptake rate(Manure application)	kg/ha/yr	lb/acre/yr	Manure application rate to supply N uptake rate
UPM	plant P uptake	kg/ha	lb/acre	plant P uptake
UPN	Surface roughness factor (Manning's N)			Mannings N for Upland. The surface roughness factor is Manning's "n" values.
UPP	Phosphorus uptake by the crop	kg/ha	lb/acre	Phosphorus uptake by the crop
UPR	P uptake rate(Manure application)	kg/ha/yr	lb/acre/yr	Manure application rate to supply P uptake rate
UPS	Upland slope steepness	m/m	ft/ft	Upland slope steepness
UPSL	Upland slope length	m	ft	Upland slope length
USLE	Soil loss from water erosion using USLE			Soil loss from water erosion using Universal Soil Loss Equation
UXP	Power parameter of modified exponential			Power parameter of modified exponential distribution of wind speed (Blank if unknown)
VIMX	Maximum annual irrigation volume allowed	mm	in	Maximum annual irrigation volume allowed
VIR	Irrigation water applied (3)	mm	in	The amount of water applied through irrigation
VLGN	Lagoon volume ratio			Lagoon volume ratio --Normal/maximum
VPD	Vapor pressure deficit	kPa	kPa	Vapor pressure deficit
VPD2	Vapor pressure deficit (2)	kPa	kPa	Vapor pressure deficit. Number before decimal = VPD value. Number after decimal = F2<1

VPTH	Threshold VPD	kPa	kPa	Threshold VPD
W	3			WinEPIC
WA	Energy to biomass conversion factor	t/ha-1MJ-lm-2	unknown	Energy to biomass conversion factor
WAC2	CO2 concentration			Number before decimal = CO2 concentration in future atmosphere. Number after decimal = resulting WA value
WAGE	Labor cost	$/hr	$/hr	Labor cost
WAVP	Parm relating vapor pressure deficit to WA			arm relating vapor pressure deficit to WA
WBMC	C content of biomass	kg/ha	lb/acre	Carbon content of biomass
WBMN	N content of biomass	kg/ha	lb/acre	Nitrogen content of biomass
WCY	Fraction water in yield			Fraction water in yield
WDT	Width of pass	m	ft	Width of pass (equipment)
WENG	Wind energy	kWh/m2	KWh/ft2	Wind energy
WHPC	C content of passive HUMUS	kg/ha	lb/acre	Carbon content of passive HUMUS
WHPN	N content of passive HUMUS	kg/ha	lb/acre	Nitrogen content of passive HUMUS
WHSC	C content of slow HUMUS	kg/ha	lb/acre	Carbpm content of slow HUMUS
WHSN	N content of slow HUMUS	kg/ha	lb/acre	Nitrogen content of slow HUMUS
WHT1	Weather Station			Nearest Weather Station to the center of watershed
WI	Monthly max 0.5h rainfall	mm	in	Monthly max 0.5h rainfall
WK	Soil erodibility factor for wind erosion			Soil erodibility factor for wind erosion
WK1	Wind erosion soil erodibility factor			Wind erosion soil erodibility factor

WLM	Metabolic litter	kg/ha	lb/acre	Metabolic litter
WLMC	C content of metabolic litter	kg/ha	lb/acre	Carbon content of metabolic litter
WLMN	N content of metabolic litter	kg/ha	lb/acre	Nitrogen content of metabolic litter
WLS	Structural litter	kg/ha	lb/acre	Structural litter
WLSC	Carbon content of structural litter	kg/ha	lb/acre	Carbon content of structural litter
WLSL	Lignin content of structural litter	kg/ha	lb/acre	Lignin content of structural litter
WLSLC	C content of lignin of structural litter	kg/ha	lb/acre	Carbon content of lignin of structural litter
WLSLNC	N content of lignin of structural litter	kg/ha	lb/acre	Nitrogen content of lignin of structural litter
WLSN	N content of structural litter	kg/ha	lb/acre	Nitrogen content of structural litter
WN	Initial Organic N conc.	g/t	oz/T	Initial Organic nitrogen concentration.
WNAME	Weather station			The name of the weather station used in the simulation.
WNO3	Nitrate concentration	g/t	oz/T	Nitrate concentration
WNO3 (2)	NO3 in profile	kg/ha	lb/acre	NO3 in profile
WOC	Organic carbon Concentration.	%	%	Organic carbon Concentration.
WOC0	Initial total organic C content	kg/ha	lb/acre	Initial total organic carbon content
WOCF	Final total organic C content	kg/ha	lb/acre	Final total organic carbon content
WON	Total organic C	kg/ha	lb/acre	Total organic carbon
WON0	Initial total organic N content	kg/ha	lb/acre	Initial total organic nitrogen content
WONF	Final total organic N content	kg/ha	lb/acre	Final total organic nitrogen content
WP	Initial organic P concentration	g/t	oz/T	Initial organic phosphorus concentration

WP (2)	Soil water content a wilting point	m/m	ft/ft	Soil water content a wilting point(1500kPa for many soils)
WP SW	Soil Water Content at wilting point	m/m	ft/ft	Soil water content at wilting point
WS	Drought stress days	days	days	The number of days the crop suffered from this type of stress. This type of stress occurs when the plant can no longer take up a sufficient amount of water for growth.
WS	Water Stress Factor (2)			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth).
WSA	Watershed area	sq. ha	sq. mi	Watershed area
WSF	Water Stress Factor			A stress factor ranging from 0 to 1 (0 = total stress, no plant growth; 1 = no stress, total potential plant growth).
WSLT	Soil salt content	kg/ha	lb/acre	Soil salt content
WSPD	Wind velocity	m/sec	mph	Wind velocity
WSYF	Lower limit of harvest index			Lower limit of harvest index
WSYF (2)	crop yield sensitivity coefficient to H2O stress			Coefficient of crop yield sensitivity to water stress at the most critical stage of growth
WTBL	Initial water table height	m	ft	Initial water table height
WTBL (2)	Depth from soil surface to water table	m	ft	Depth from soil surface to water table
WTMN	Minimum depth to water table	m	ft	Minimum depth to water table
WTMX	Maximum depth to water table	m	ft	Maximum depth to water table
WUB	Water use conversion to biomass	t/mm	T/in	Water use conversion to biomass
WUEF	Water use efficiency	kg yield /mm ET	lb yield/in	Amount of water taken up by plants per unit of dry matter produced. Yield is in kg/ha. ET is growing season (only) ET

WVL	Average monthly wind speed	m/sec	mph	Average monthly wind speed
WXGEN	Weather generator			Weather generator
WXPARM	Calculates monthly weather parameters			Calculates monthly weather parameters
X4	Time of concentration for overland flow	hours	hours	Time of concentration for overland flow
XCT	X Coordinate of subarea centroid.			X Coordinate of subarea centroid. It need to be entered if dust distribution and air quality is considered in the study.
XIDK	Soil Group			1 = kaolinitic, 2 = mixed, 3 = smectitic
XIDS	Soil weathering code			Soil weathering code
XLB	Lubricant factor			Lubricant factor (equipment)
XLOG	Longitude (2)	degrees	degrees	Longitude
XLP	Initial list price in current $	$	$	Initial list price in current $ (equipment)
Y	Year			The year of the run
Y (2)	Sediment yield from subarea or reach outlet	t/ha	T/ac	Sediment yield from subarea or reach outlet
Y1	The average annual grain yield	t/ha	T/ac	The average annual grain yield
Y2	The average annual forage yield	t/ha	T/ac	The average annual forage yield
YAP	Soluble P loss in runoff	kg/ha	lb/acre	The amount of soluble phosphorus loss in runoff.
YCT	Y Coordinate of subarea centroid.			Y Coordinate of subarea centroid. It need to be entered if dust distribution and air quality is considered in the study.
YLAT	Latitude	degrees	degrees	Latitude of watershed in decimal degrees range is -90 to 90
YLD	Crop yield	t/ha	T/ac	Crop yield
YLD	P in harvested crop yield	kg/ha	lb/acre	Phosphorus in harvested crop yield

YLD1	Grain, fiber, etc crop yield - dry weight	t/ha	T/ac	Grain, fiber, etc crop yield - dry weight
YLD2	Forage crop yield - dry weight	t/ha	T/ac	Forage crop yield - dry weight
YLDF	Forage Yield	t/ha	T/ac	The average annual forage yield
YLDG	Grain Yield	t/ha	T/ac	The average annual grain yield
YLN	N in crop yield	kg/ha	lb/acre	The amount of nitrogen present in the crop yield. The amount of nitrogen removed from the field after the crop is harvested
YLOG	Longitude			Longitude of watershed in decimal degrees range is -180 to 180
YLP	P in crop yield	kg/ha	lb/acre	The amount of phosphorus present in the crop yield. The amount of phosphorus removed from the field after the crop is harvested
YMUS	Sum of manure yield from all subareas	t/ha	T/ac	Sum of manure yield from all subareas
YMUW	Manure yield from subarea or reach outlet	t/ha	T/ac	Manure yield from subarea or reach outlet
YN	Sediment transported N from subarea or reach	kg/ha	lb/acre	Sediment transported N from subarea or reach
YNO3	Soluble nitrogen loss in surface runoff	kg/ha	lb/acre	The amount of soluble nitrogen loss in surface runoff.
YNS	Sum of sediment transported from all subareas	kg/ha	lb/acre	Sum of sediment transported from all subareas
YNW	Watershed yield of sediment transported N	kg/ha	lb/acre	Watershed yield of sediment transported N
YOC	Organic carbon lost with sediment	kg/ha	lb/acre	The amount of organic carbon lost in transported and deposited soil particles or aggregates.
YON	Organic N loss with sediment	kg/ha	lb/acre	The amount of organic nitrogen lost in transported and deposited soil particles or aggregates

YOP	Yield of product	t/ha	T/ac	Yield of product
YP	P loss with sediment	kg/ha	lb/acre	Amount of phosphorus lost in transported and deposited soil particles or aggregates.
YP (2)	Sediment transported P from subarea or reach	kg/ha	lb/acre	Sediment transported P from subarea or reach
YPS	Sum of sediment transported P from all subareas	kg/ha	lb/acre	Sum of sediment transported P from all subareas
YPW	Watershed yield of sediment transported P	kg/ha	lb/acre	Watershed yield of sediment transported P
YR	Year			Year in a particular run
YR#	Year Number(1-NBYR)			Year Number(1-NBYR)
YS	Sum of sediment yield from all subareas	t/ha	T/ac	Sum of sediment yield from all subareas
YSD	Sediment yield	t/ha	T/ac	Sediment yield
YW	Soil Loss from wind erosion	t/ha	T/ac	The amount of soil lost due to soil movement by wind
YW (2)	Watershed sediment yield	t/ha	T/ac	Watershed sediment yield
YWI	No Y record Maximum .5H Rain			No Y record Maximum .5H Rain (Blank if WI is not input)
Z	Soil Layer depth	m	ft	Soil Layer depth (Depth to bottom of layer)
ZCO	Organic C in the root zone	t/ha	T/ac	Organic C in the root zone
ZF	Minimum profile thickness	m	ft	Minimum profile thickness - stops simulation
ZNMA	mineral N in NH3 form in root zone	kg/ha	lb/acre	mineral N in NH3 form in root zone
ZNMN	Mineral N in NO3 form in the root zone	kg/ha	lb/acre	Mineral N in NO3 form in the root zone

ZPML	mineral P in labile form in root zone	kg/ha	lb/acre	mineral P in labile form in root zone
ZQP	Soluble P in the root zone	kg/ha	lb/acre	Soluble P in the root zone
ZQT	Minimum thickness of maximum layer	m	ft	Minimum thickness of maximum layer (splitting stops when ZQT is reached
ZTK	Minimum layer thickness for beginning	m	ft	Minimum layer thickness for beginning simulation layer splitting - model splits first layer with thickness greater than ZTK(M); if none exists the thickest layer is split.