Guidelines for In-season Yield forecasting with the Cropping System Model

DSSAT Version 4.8.5

Last updated: December 1, 2024

DSSAT CSM includes a built-in mode for simulating yield forecasts based on historical or generated weather data. Run mode "Y" triggers the model to use weather data for the current year up to the user-specified date, FODAT, and to use an ensemble of historical data or generated data from dates on and after FODAT. The value of FODAT can be specified in a new line of data in the simulation controls. If no FODAT is specified, then the model begins the forecast on the day after the last available weather date.

New simulation options:

A new line can be added to the simulation options to define parameters for the forecasting option. The new line of controls is listed in the box below. This line also contains information that has not yet been implemented; only the FODAT, the forecast start date, is currently used by DSSAT-CSM Version 4.8.

```
@N SIMDATES    ENDAT    SDUR   FODAT  FSTRYR  FENDYR FWFILE           FONAME
 1 SI        1978365     365 1978176    1970    1991 UFGA2020122.FCW  May 1, 2019 forecast

! ENDAT = End of simulation date (YYYYDDD) - NOT CURRENTLY USED
! SDUR  = Maximum duration of one season (days after simulation) - NOT CURRENTLY USED
! FODAT = Forecast start date (YYYYDDD), i.e., day after last weather data available
! FSTART= Ensemble start year (YYYY) - NOT CURRENTLY USED
! FEND  = Ensemble end year (YYYY) - NOT CURRENTLY USED
! FWFILE= Forecast weather file (for short term forecast) - NOT CURRENTLY USED
```

Command line

To run the yield forecast mode from a command line, use RNMODE = 'Y':

C:\DSSAT48\DSCSM048 Y DSSBATCH.V48

Weather data options

The weather data for the current (i.e., forecast) year is always read from a WTH file that contains real weather data from the start of simulation date to the day before the forecast date (FODAT), regardless of MEWTH option. The name of this current year weather file is constructed from WSTA in the FIELDS section of FileX, like with any "M" option weather file.

The method of weather data input (MEWTH option in simulation controls) controls the method of obtaining the ensemble of forecast weather data when running in yield forecast mode. The table

below lists these options. Forecast weather data (i.e., weather data on and after FODAT and after the short-term forecast file) are obtained based on the normal rules for each of the values of the four MEWTH weather method types:

MEWTH	Action	Weather files needed
M	Forecast data read from historical ensemble	WTH, *optionally FCW*
G	Forecast data read from generated weather files	WTH, WTG, *optionally FCW*
W	Forecast data are generated using WGEN	WTH, CLI, *optionally FCW*
S	Forecast data are generated using SIMMETEO	WTH, CLI, *optionally FCW*

The in-season measured weather data for the forecast season are read from a WTH file and stored for retrieval and use at the beginning of each year of the ensemble simulation. *If a short-term weather forecast is available, these weather records are appended to the in-season measured weather data and stored for use in each ensemble (not yet implemented).*

Implementation

Inputs

- FODAT = forecast date (weather data prior to this date can be used.
    - Weather data on or after this date are assumed to be "unknown" and will be generated or read from historical weather data files.
    - FODAT is the YRDOY to start the forecast mode.
    - Between YRSIM and FODAT, the actual weather data are read from WTH file(s)
- NYRS = number of weather years to generate for forecast ensemble.

Start of simulation is used each year for NYRS number of years without modification. For example, if start of simulation date is 1985001 and NYRS = 30, then there will be outputs for 30 years, each with start date in 1985. Weather data for ensemble forecast will come from years 1955 through 1984 (for data read from files).

Outputs:

- One additional output in Summary.OUT: WYEAR is the year associated with the weather data YRSIM. For most simulations this will equal the year portion of SDATE, but for forecast mode, it is the year associated with the historical weather ensemble.
- Weather.OUT has a column that shows the actual date of the weather data used for either the in-season observed data or from the historical ensemble.