

**THE WEB-BASED CROP-WEATHER PROGRAM FOR SOUTH TEXAS:  
MONITORING CROP WATER USE AND GROWTH IN COTTON**

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**Abstract**

Crop Water Use is one of the tools available to users registered with The Crop-Weather Program for South Texas (<http://cwp.tamu.edu>). Crop Water Use is available only for fields cultivated with cotton and allows users to estimate the progression of canopy development, crop water use, and moisture storage in the soil profile for a specific field management unit. Upon choosing a previously created field profile and selecting Crop Water Use in the applications panel, the user is asked to provide additional simple inputs, such as the ending date for calculations, the source of rainfall data, and the initial soil moisture estimate. Because outputs produced by Crop Water Use are stored in a database, users can run the program any number of times during the season without having to repeat previous runs. Crop Water Use will run a session starting from the end of a previous run (default) or starting from planting date, if the user chooses to do so. Since Crop Water Use performs thousands of calculations per hourly step, the default option saves substantial processing time. Once a run is completed, results are saved in a database and displayed in a summary table and two other tables with more detailed results. Crop Water Use runs at hourly time intervals and uses soil, weather, and crop information to calculate the use of water by a cotton crop. The step previous to performing core calculations, the program accesses databases to retrieve 1) the field profile's basic information including user name, field name, production year, soil name, name of the nearest weather station, planting rate, cultivar name, planting date, and type of water supply, 2) weather data and pre-calculated physical and astronomical data for the period of time chosen to run the simulation, 3) soil information and the initial soil water balance, 4) irrigation data and/or rainfall events occurring in the field, and 5) cultivar information regarding anatomical and physiological parameters determining plant water use. Core calculations performed by Crop Water Use include: 1) resistances of the soil surface to evaporative losses, 2) potential and actual soil evaporation in fallow soil, 3) water balance of non-rooted soil at 1-inch depth intervals, 4) production of main stem nodes and increase in plant dimensions, 5) production of leaf area, 6) progression of inter-row canopy closing, 7) resistances of canopy surface to transpiration losses, 8) potential and actual canopy transpiration, 9) crop water use as the combined soil and canopy water losses, and 10) the water balance of rooted soil at 1-inch depth intervals. Outputs produced by Crop Water Use are displayed in three summary tables in the results page. Below these tables there are also two hyperlinks connecting to the Daily Output Summary Table and the Soil Water Balance Table. The first summary table shows information of the particular field for which Crop Water Use was run, and the starting and ending dates. The summary second table shows end-of-run values of selected crop growth state variables, namely, main stem nodes, canopy height, average length of internodes (under both, restricted growth and unrestricted growth), leaf area index, and percentage of ground cover by the canopy. The third summary table shows end-of-run values of selected crop water use and soil moisture state variables, namely, cumulative crop water use, cumulative soil water loss, cumulative irrigation and rainfall, and the profile's available water content (both relative and absolute values) for the rooted and non-rooted soil. The Daily Output Summary Table displays daily values (for the current run and any previous runs) of the state variables shown in the end-of-run summary table plus other variables calculated by crop water use. The Soil Water Balance Table shows end-of-run or current values of available soil water capacity and relative available soil water contents of rooted and non-rooted soil for each 1-inch layer into which the soil profile is divided. The Crop Water Use tool produces valuable information regarding, plant growth and canopy development, crop water use, soil moisture storage and the distribution of moisture through out the soil profile, which cotton growers can use to make more informed in-season crop management decisions.