APRIL 2005

CIMIS

California Irrigation Management Information System

Irrigation scheduling using reference evapotranspiration

Reference evapotranspiration is the sum total of evaporation and transpiration from a standardized grass (ETo) and/or alfalfa (ETr) surface. The standardization is necessitated by the fact that different plants need different amounts of water. The California Irrigation Management Information System (CIMIS) uses cool season grass as a standardized surface. Hence ETo refers to CIMIS's reference evapotranspiration in this article.

With ETo values from the CIMIS database, irrigators can schedule their irrigation using what is known as the water budget method. The water budget method is nothing more than an accounting of the soil moisture. Precipitation and irrigation will be added, and runoff, deep percolation, and evapotranspiration will be subtracted from the soil moisture. The first thing a scheduler needs to do is convert ETo to actual evapotranspiration (ETc) from a specific crop/plant. This is accomplished using crop coefficients (Kc), a ratio of evapotranspiration from the standardized surfaces to that of the specific crop/plant. This ratio has been developed through research and can be obtained from various sources. When the balance reaches a predetermined soil moisture level, it is time to irrigate.

Visit the CIMIS home page at http://www.cimis.water.ca.gov

Some argue that using soil moisture sensors is superior to using the ETo approach. There is no denying that soil moisture is the ultimate indicator if there is a need for irrigation, since plant roots get their water directly from the soil. The sensors, however, have limitations, including, among other things, the spatial variability of soil physical, chemical, and biological properties; cracks around the sensors because of the expansion and contraction of soils as a result of the wetting and drying processes; and the effect of salinity on the accuracy of the sensors.

Some of these limitations can be overcome by using the ETo approach. This does not, however, mean that the ETo approach has no problems. The ETo approach is expensive, complex, time consuming, and deals with atmospheric demand alone.

The intent of this article is not to state which method is better for irrigation scheduling. It is rather intended to show how difficult it is to choose one method over another. Local conditions and availability of data dictate the choice one has to make. The best scenario, however, would probably be to fine-tune the ETo based approach using the soil moisture sensors.

For more CIMIS information...

CIMIS information is published quarterly in the CATI *Update* newsletter. Articles are provided by the California Department of Water Resources, CIMIS program staff.

For more information about CIMIS or its programs, contact any of the following representatives at these offices:

Northern District
Jamie Dubay
(530) 529-7367
dubay@water.ca.gov

San Joaquin District
Steve Ewert
(559) 230-3334
sewert@water.ca.gov

Central District
Mark L. Anderson
(916) 227-7603
marcla@water.ca.gov

Southern District
Sergio Fierro
(818) 543-4652
sergiof@water.ca.gov

lf you are unable to reach a CIMIS representative near you, call the CIMIS Helpline at 1-800-922-4647.

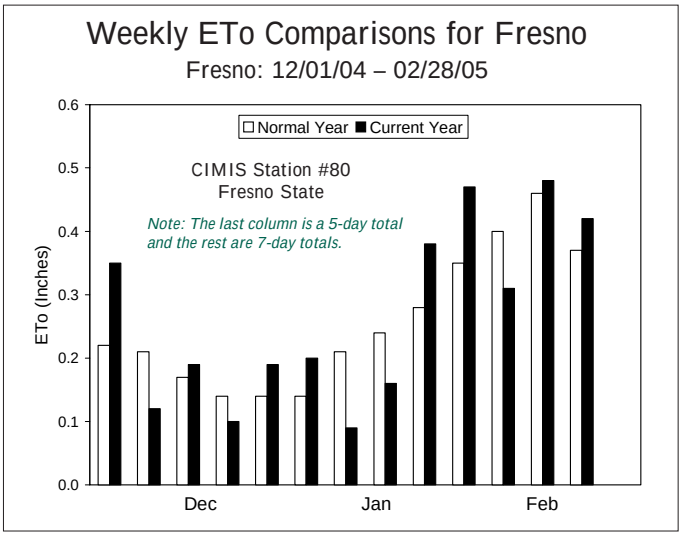

Chart shows ETo variation from normal over last three months.