

Irrigation management service—a new water-management tool

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The U.S. Department of Agriculture's Agricultural Research Service and the Bureau of Reclamation have developed a new scientific tool for determining when to irrigate and how much water to apply to specific crops. This Irrigation Management Service (IMS) uses a computer program that takes meteorological data and calculates the rate at which various crops are using water; performs various bookkeeping chores; and forecasts the date and amount of the next irrigation for individual fields and

The IMS was first introduced by the Bureau of Reclamation in Idaho in 1969. There are now 10 private businesses performing IMS for growers in that state. The IMS program was demonstrated in the Westlands Water District in western Fresno County in 1972 and on about 7,400 acres in the James, Tranquillity, Solano, and El Dorado Irrigation districts in 1976. Westlands Water District is now operating its own program and providing service to 15,000 acres. Two private companies in Fresno are scheduling irrigations on about 60,500 acres, and other companies are preparing to start scheduling services next season.

The Bureau's IMS program is providing several services for growers in California during the season. Two radio stations in Sacramento and one in Fresno broadcast daily values of evapotranspiration potential (inches of water that a crop of alfalfa consumes daily, depending on meteorological conditions). Local Cooperative Extension personnel assist growers in adjusting the broadcasted values to particular crops and areas. Indications are that many growers in the Central Valley use this broadcasted information.

Another Bureau program provides irrigation schedules for individual fields. Field personnel check each field about once a week, collecting information, such as soil moisture content, stage of crop growth, crop health, and effectiveness of recent irrigations. These data are entered into a computer program, along with the daily meteorological readings of

such data as solar radiation, maximum and minimum temperatures, wet and dry bulb temperatures, rainfall, and 24-hour wind movement. The next irrigation is then forecast. An experienced field man can schedule 6,000 to 10,000 acres or more, depending on size of fields, terrain, crops, and distance between fields.

The Bureau operates three-year programs with irrigation districts. After the three-year contract expires, the district may either operate the program itself or hire a private firm. The Bureau also cooperates with the Soil Conservation Service, U.C. Cooperative Extension, the California Department of Water Resources, and private companies.

A new tool for field irrigation scheduling is the neutron probe, which has been used for about 20 years in soil moisture research to measure evapotranspiration rates. The IMS technique using neutron probes was developed by Bureau personnel in Arizona, and was first used in northern California in May 1976 in the El Dorado Irrigation District. New, lightweight instruments now being developed will increase the usefulness of this technique.

The probe method involves installing a metal access tube on one site in an irrigated field. This site should have soil with better-than-average water-holding

capacity for the field. When stress is observed in plants on the lighter soils in the field, the moisture content at the access-tube site (refill value) is measured, and the field is irrigated. The moisture content is then monitored periodically with the neutron probe. The date when the soil moisture content is projected to again reach the predetermined refill value is the next irrigation date, and the forecasted depletion at the access-tube site is the amount to be applied.

Dates to irrigate and amounts of water to apply can be forecast quite accurately several days in advance with this technique. In the future, it is expected that the computer program can be made even more reliable with data collected by the neutron probe on selected key crops and fields.

Bureau research on IMS produced another new development in 1976—a method of lateral scheduling, designed to coordinate farm water deliveries through an irrigation district's distribution system. In the future, this tool may give water requirements for laterals and turnouts on a daily, weekly, monthly, and annual basis as well as information on expected peak demands. Such information may be useful for many districts.

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Dr. Melvin Campbell of the US Bureau of Reclamation operates the lightweight neutron probe instrument that he helped to design. The probe is placed over metal tubing, which has been installed permanently in the ground, and counts hydrogen ions in the soil near the tube. This ion count is directly related to the quantity of water in the soil and available to the plants. The instrument is calibrated for each field separately.