▶ Hardware And Software Tools For Irrigation Scheduling

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Increases in water-use efficiency are being sought in irrigated agriculture, a large user of water resources. Irrigation scheduling has long been advocated as an improved water-management technique which agricultural producers can apply to better use water resources, reduce crop stress, and improve crop yields. In addition, proper scheduling of irrigations can result in savings in energy and labor costs, and reductions in water and fertilizer runoff.

A variety of tools are available to offer guidance in making irrigation and water-management decisions. Hardware tools range from simple hand tools for periodic sampling to automated electronic sensors and dataloggers for continuous, season-long monitoring. Soil probes and augers can be used to periodically sample in the root zone to evaluate moisture conditions and estimate depth of water penetration. For periodic manual measurements, atmometers and evaporation pans can give estimates of evaporative demand and water requirements. For detailed monitoring, electronic datalogging instruments and soil and plant sensors provide continuous, automated measurements. Utilizing sensor data requires some time and effort to obtain and analyze the information, but increasing availability of wireless data transmission capability is making data-collection more convenient.

Irrigation scheduling and crop-growth models estimate crop water use and available soil-water resources using weather and crop information. The water-balance approach, in which movement of water into and out of the soil is tracked, is a commonly used method. Crop-water use is estimated from local weather data and crop-specific parameters, and combined with rainfall and irrigation information to obtain a daily accounting of soil-water reserves and irrigation requirements. Stand-alone computer software and internet browser-based models have been developed and are available for many regions around the country. Mobile/smartphone apps are being developed in several regions to offer convenient and timely information in a readily available format. Water-balance models are usually less labor-intensive to manage than hardware and sensor measurements, but require the user to estimate some model inputs.

Irrigation scheduling tools are often used to provide current, daily information on soil-water resources to enable real-time scheduling of irrigations. They can also be used for post-season diagnostic evaluation of irrigation activities and water use. Sensors are installed and measurements are collected passively throughout the season. After harvest, the sensor data are examined, in conjunction with other production information, to evaluate how irrigation and production activities affected soil-water resources and crop yields.

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