primary benefit of the model-based cutoff system is that the irrigator now needs to return to the field only once, to turn off the inflow after receiving a cellular text message, thereby saving valuable time and labor costs. In conventional cutoff practice, the irrigator makes five or six or even more trips back to the field to visually monitor the water advancement downfield.

Beyond these measurements, the most tedious and time-consuming variable to acquire for the model during each irrigation event is the water inflow rate (*q*). Expensive flow meter equipment that is readily adaptable to field-specific inflow setups is typically required to obtain a reliable value. Our tests were performed in fields with different inflow setups: siphon tubes, alfalfa valves and gated pipes (table 1). Based on field data, it seemed conceivable that regulated inflow setups with uniform application rates could be developed and applied to the entire irrigation season for a particular setup.

Regardless of the inflow setup, in our tests the wetting-front speed remained constant for an irrigated check as the wetting front advanced downfield (Arnold 2013), indicating a constant inflow rate prior to cutoff (Saha 2010). Recall that all tests were performed in the same fields but not necessarily within the same checks. Therefore, to verify that separate irrigations illustrate similar behavior, inflow rates must be consistent between irrigated checks during a given irrigation (i.e., across the entire irrigated set of checks). Table 4 shows the variation in measured inflow rates (Arnold 2013) within a single irrigated check during one irrigation event, between different checks during the same irrigation event (i.e., for an irrigated set of checks) and between different checks during different irrigation events.

When a sensor (white pole) detects water arrival, a wireless signal is sent to the central module (black box), which generates a text message alert to the irrigator.

UC Cooperative Extension Centennial

Placement of Tensiometers as guides to irrigation practices

With the introduction of new tools to measure soil moisture, agricultural research took a major step forward in the development of efficient crop irrigation techniques. In this 1960 article, researchers explain how tensiometers work and give specific, practical advice on where to place them in the field.

1960 "The moisture sensing unit — a porous cup — of tensiometers must be reached by the irrigation water if the moisture measuring instruments are to be of practical value as guides to irrigation practices.

"In most soils a good location for a tensiometer station is often next to the furrow, but it may be necessary to locate the porous cup under the furrow in orchard soils with little or no lateral movement of water during irrigation. In sprinkler-irrigated orchards the cup must be in soil that is re-wetted by the sprinkler at each irrigation but is not shielded by a low hanging branch nor is flooded by runoff from a branch. Also the porous cup should be in areas of active feeder roots as determined by root density studies, or by digging at different sites until a general pattern of root densities is apparent.

"Some traffic between the tree rows is necessary in most orchards, so the soil moisture measuring instrument must be in a protected spot reached by irrigation water and where feeder root density is average for the tree. In general, a good location for a tensiometer is at the drip line on the tree side of the first furrow, south or west of the tree."

Solzy LH, et al. 1960. Placement of tensiometers as guides to irrigation practices. Calif Agr 14(3):11–2.

Lewis H. Stolzy joined UC Riverside's Department of Irrigation and Soil Science in 1954 as an irrigation engineer. He was instrumental in the invention of new soil oxygen and water sensors, including a portable neutron probe for use in the field. He also studied how soil contents and constituents affect plant development — and, therefore, how data from the new technology could help improve farming practices.

Like Stolzy, Albert W. Marsh was an irrigation innovator. A Cooperative Extension irrigation and soils specialist at UC Riverside, Marsh is credited with introducing drip irrigation to California, which has allowed the state's agriculture to conserve inestimable volumes of water and allowed farming to continue in many areas despite sometimes arid conditions. An environmental sciences scholarship at UC Riverside honors Marsh's memory.

Richard E. Puffer and Dwight C. Baier were well-known and respected UC Cooperative Extension farm advisors serving Southern California growers.

—W.J. Coats

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