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OPTIMIZING AGRICULTURAL WATER USE AND MANAGEMENT

The ARS Watershed and Water Availability research program develops solutions that improve water management for efficient agricultural production. In the United States, irrigated agriculture produces 49 percent of U.S. crop market value on 18 percent of cropped lands. However, agriculture is subject to growing competition for water resources, growing pressure to safeguard water quality, and a clear need to adapt to alternative water resources. The following FY 2020 research accomplishments highlight ARS advancements in irrigation, drainage technology, and decision support systems for addressing the challenges associated with agricultural water use.

Sub-surface drip irrigation reduces seasonal irrigation applications for corn. In the face of declining water supplies, crop farmers need to maximize the yield per unit of water used in crop production. ARS scientists in Bushland, Texas, found that subsurface drip irrigation (SDI) in grain corn reduced water loss to evaporation by 2 to 5 inches during the growing season compared to losses that occurred with sprinkler irrigation. SDI also reduced overall corn water use by up to 6 inches and increased grain yields by up to 20 percent. These benefits are enough to offset the higher costs for SDI installation.

Deficit irrigation saves water in peach production under arid conditions. Deficit irrigation—which involves irrigating crops only at drought-sensitive stages of growth—is a potential strategy to save water in arid and semiarid regions of the world without severely impacting crop production. ARS researchers in Parlier, California, demonstrated in a 10-year peach production field study that deficit irrigation can result in up to 40 percent water savings without significant yield losses or reductions in fruit quality. Findings from this study provide peach growers an alternative irrigation strategy to save water and lower input costs.

A long-term solution for thirsty crops. Polymer hydrogels increase the capacity of soil to hold water to support plants in water limited environments. ARS researchers in Kimberly, Idaho, studied the impact of hydrogels on soil water availability over a 9-year study. The researchers observed a slow decline in water availability and extrapolated that hydrogels could provide water retention benefits lasting 24 to 29 years—considerably longer than current industry estimates. These long-term benefits substantially increase the cost effectiveness for farmers applying hydrogels to improve soil's water holding capacity.

> **"Hydrogels could provide water retention benefits lasting 24 to 29 years—considerably longer than current industry estimates."**

Inexpensive, accurate sensors for optimizing irrigation. Research conducted by ARS scientists in Bushland, Texas, demonstrated that irrigation scheduling based on center pivot temperature sensors are as accurate as stationary sensors mounted on crop leaves, alleviating previous concerns about the accuracy of center pivot sensors. Center pivots are now used on 30 million acres in the United States. Installing temperature sensors aboard center pivots and using them for irrigation scheduling could save farmers substantial water and reduce energy input costs.