California gets global water conservation perspectives

A 10-year drought in Australia and perpetual water scarcity in Israel have driven agricultural irrigation scientists in those countries to new levels of innovation.

At a January 12-13 conference in Modesto, organized jointly by UC Agriculture and Natural Resources (ANR) and USDA Agriculture Research Service (ARS), California water managers and growers had an opportunity to glean ideas from the scientists working with agricultural industries in situations even more extreme than California's periodic droughts.

During the conference, the water outlook for California was improving with several wet storms pouring water into reservoirs and snow falling on the Sierra Nevada. However, UC ANR water experts cautioned against complacency.

"We're still in a drought," said Doug Parker, director of UC ANR's California Institute for Water Resources. "If it continues to rain and this drought comes to an end, we'll still be working on drought. Droughts are not new to California and will always be a part of our climate."

Australia was gripped from 2000 to 2010 by what has been termed the "Millennium Drought", said Ian Goodwin, the research manager of horticulture production sciences in the Department of Economic Development, Jobs, Transport and Resources in the state of Victoria. In the Murray-Darling Basin, an agricultural area twice the size of the state of Georgia, reservoirs fell to 8.5% of capacity. In one large irrigation district in the basin, the Australian government spent $1.5 billion (U.S. dollars) on new water infrastructure — lining ditches and adding valves and pressurized irrigation systems — to conserve water.

Australia has an established water trading program that permits growers to sell single-year water rights. However, during the height of the drought, the price of water rose so high that purchasing it became uneconomical for most growers, Goodwin said. Growers implemented a range of on-farm water conservation strategies to get through the drought — among them pulling out orchards, debranching and hedging trees, conversion to microirrigation, regulated deficit irrigation and improved irrigation system maintenance, Goodwin said.

In Israel, the limited availability of fresh water has driven the development of a number of pioneering water technologies.

Half of the country's drinking water is desalinated at five energy-intense coastal plants. "We have enough water," said Uri Yermiyahu, senior research scientist in the Institute of Soil, Water and Environmental Sciences at the Gilat Research Center in Israel. "The question now is how much does it cost."

Israel also considers treated wastewater and brackish groundwater valuable resources for irrigation. The effluent from domestic treatment plants is subjected to a number of processes to limit the presence of pathogens and organic and inorganic contaminants. In research, scientists have found that brackish water isn't appropriate for all crops, but high-quality olives and dates can be produced with the high-saline water.

"Beggars can't be choosers," said Guy Levy, senior soil scientist with the Ministry of Agriculture and Rural Development in Israel. "This is the water we have."

Levy said it is fairly safe to use the effluent and brackish groundwater, but the chemical balance in the soil must be carefully monitored and managed.

The use of screen covers is another water conservation tool being used in Israel. Growers of crops from fresh herbs to pomegranates and bananas are building inexpensive structures to modify the climate. These covers cost roughly $15,000 per acre, about one-tenth the cost of greenhouses, and reduce solar radiation, daytime air temperature and wind, while increasing humidity and nighttime temperature. The reduced solar radiation and wind lead to reduced crop water use, said Shabtai Cohen, director of the Israel Ministry of Agriculture's Volcani Center.

The screen also protects crops from hail.

"One (nectarine) farmer earned back the cost of the screen cover in one season," after a hailstorm damaged the fruit in many other orchards, Cohen said. "He was the only farmer with first quality nectarines."

The Israeli measures were to an extent partial to the country's unique agricultural situation. The industry is highly subsidized by the government and less focused on producing crops that can be competitive in international food markets.

"We might not see how these practices can work for us right now, but these are water management ideas farmers can think about," said Jim Ayars, USDA-ARS agricultural engineer. "Compared to Israel, California water is cheap. But with new regulations, such as the California Sustainable Groundwater Management Act, these could be critical tools."

The conference featured presentations on a variety of precision crop water management tools being developed by California scientists, such as soil water monitoring; precise, on-farm weather monitoring; irrigation system evaluation; deficit irrigation; and salinity mapping.

California farmers shared their drought experiences growing a diversity of crops in California, including citrus, avocado, grapes and tree nuts. They also outlined the types of research support they seek from UC ANR and USDA-ARS. Daniele Zaccaria, UC ANR Cooperative Extension agricultural water management specialist, said there was almost universal interest in drought research that isn't prompted by rapid response to a drought emergency.

"They believe that drought research and planning should be done in normal years, when we are free of emergency decision making," Zaccaria said. "To be progressive, we need to get away from year to year planning and enlarge planning activities to 6 or 7 years to address water banking, drip irrigation, salinity buildup and how sustainable production over the years might be impacted by new irrigation technologies."

—Jeannette Warnert