

# About one-third of California's farmland is irrigated

*DROUGHT from Page 1*

California's newly created position of senior manager of irrigation and water efficiency.

Much is at stake. California's 80,500 farms and their supporting industries create nearly 3 million jobs, according to a legislative report. In 2015, California's farms and ranches received about \$47 billion in crops and products, more than their counterparts in any other state, according to the USDA.

And irrigation is the linchpin of California agriculture. About one-third of the state's 25 million acres of farmland is irrigated, representing the majority of harvested cropland, according to the USDA Economic Research Service.

## Research ongoing

In the heart of the San Joaquin Valley — the only part of California that remains in drought — two UC research farms are combining technology with management practices to put every drop of irrigation water to work.

"This is one of the few places in the world where you can do drought research on a field level," said Jeff Dahlberg, director of the UC's Kearney Agricultural Research and Extension Center in Parlier. "What I'm planning is a world-class drought nursery."

Among the many projects at Kearney, UC Cooperative Extension vegetable crop specialist Jeff Mitchell is working on a concept called "conservation agriculture." It involves using subsurface drip irrigation, minimizing tillage and using cover crops and crop residues to improve the soil's ability to hold water.

"This is not done right now in California," said Mitchell, who chairs the university's Conservation Agriculture Systems Innovation Center. "In the future, there may be a strong likelihood of certain agricultural sectors adopting these practices."

About 40 miles away, the UC's West Side Research and Extension Center has been working with growers to perfect micro-irrigation efficiency and test drought stress on the area's most prevalent crops, including cotton, sorghum, corn and tomatoes.

"We'll grow a tremendous number of cultivars of a crop" and identify "what seem to be the most promising cultivars when you grow them under drought conditions," said Bob Hutmacher, a cotton specialist and the center's director.

Meanwhile, the California Water Institute at California State University-Fresno has been trying to plan water use on a regional level, aiming to determine what the valley's wa-



Tim Hearden/Capital Press

Kevin Day, left, of the University of California Cooperative Extension, talks with retired USDA researcher Claude Phene about a subsurface drip irrigation experiment they're doing in a Parlier, Calif., fruit orchard. Researchers are developing ways to save water when the next drought comes to California.



Jeff Dahlberg



Bob Hutmacher



Jeff Mitchell

tersheds can support if management techniques are optimized.

On May 12, university officials dedicated a 36-acre almond orchard block on the Fresno State campus to test an automated drip irrigation system. It will independently study three different soil types to determine each's specific needs, according to a news release.

The project is funded in part by Netafim, an Israel-based manufacturing firm that is working with the Almond Board to develop technology to help growers micromanage an orchard's water, soil, fertilization and fertigation needs.

Industry leaders have placed a high priority on irrigation efficiency "for a long time, but never more than the present," said Richard Waycott, the Almond Board's president and chief executive officer.

## Debilitating drought

There may not be much time before the next drought.

California has experienced two severe droughts in the past 10 years as atmospheric patterns associated with droughts in the state have become more common in recent decades, Stanford University scientists said in a series of studies.

They said the stubborn offshore pressure ridge that marked the most recent drought was "very likely" linked to global warming, and scientists warn that droughts could become longer, more frequent and more severe as climate change takes hold.

Within agriculture, the devastation from the 2012-2016 drought in California is still fresh in everyone's mind — and its impacts are still being felt.

The UC-Davis Center for Watershed Sciences estimated the drought cost California's agricultural economy more than \$5.2 billion during its peak in 2014-2016. Water shortages during the period caused the following of more than 1 million acres and the loss of nearly 40,000 agricultural jobs, the center estimated.

The Pacific Institute, a think tank that studies water-related issues, found that California growers maintained record-high crop revenue at the height of the drought through massive groundwater pumping, which it called unsustainable.

State water experts agree, arguing that all the drought-related pumping in the Central Valley caused land to sink at historic rates while drying up numerous wells in Porterville and other places, forcing them to truck in water. They point to a 2015 National Aeronautics and Space Administration study that showed land in the valley was sinking by nearly 2 inches per month in some places.

A subsequent NASA report in February noted that subsidence — the sinking of land as the water table is drawn down — is getting worse in two "bowls" in the San Joaquin Valley. Subsidence-related damage to the California Aqueduct and other man-made canals has prompted state water regulators to consider restricting pumping near those structures.

Looming on the horizon is implementation of the Sustainable Groundwater Management Act, a 2014 law that requires local governments to regulate pumping and aquifer recharge. Local leaders in the most troubled areas face a

July 1 deadline for setting up new groundwater management agencies.

Groundwater recharge projects may help. UC researchers are working with growers throughout the valley to find fields with soils conducive to recharge and set up pilot projects, as are groups such as the Almond Board.

State-funded aquifer recharge projects already underway put at least 306,727 acre-feet of water per year back into the ground, according to Stanford University estimates. Projects are mainly concentrated in the eastern San Joaquin Valley, along the Central Coast and in Southern California.

"I actually think we're doing OK in that with annual crops and finding ways to make it work in permanent crops," Hutmacher, the UC's West Side Research and Extension Center director, said of developing groundwater recharge projects. "They're a little reticent (irrigating) too late in the spring ... until they see it's not going to cause them harm."

But there's widespread consensus the groundwater that helped growers make it through the last drought won't be nearly as available the next time.

"It'll change a whole lot of economics," Hutmacher said of the groundwater management act. "If they say anything that depletes the water table is unsustainable, wow."

## Change in approach

To adjust to the new realities, many growers may have to change their approach to water use, explained Mitchell, the UC vegetable crop specialist.

Researchers have noted that California agriculture is essentially based on tillage and irrigation, he argues, adding that there's a lot of emphasis on precision irrigation technology, but because of tillage and loss of biodiversity in the soil, growers need more water.

Conservation agriculture takes a more holistic approach, minimizing soil disturbance while preserving residues for soil cover, diversifying crop rotations and using cover crops, Mitchell said in a recent presentation.

No-till systems have changed cropping practices in parts of the Central Great Plains because of their beneficial impacts on soil health, which improved water retention and crop performance, according to a report by Randy Anderson of the USDA's Agricultural Research Service.

Mitchell said the approach will save growers money because it requires smaller equipment and less labor.

"When you couple all of the benefits, it's hard to imagine this not happening," he told the Capital Press. "In Brazil, people are doing it. Seventy percent of Brazilian farmers are already doing this. The other side of this is these systems are storing more carbon in the soil. ... It certainly

has benefits for the function of the overall system."

The new approach is not without its growing pains. Durst, the Yolo County grower, said he's using subsurface drip irrigation in his organic asparagus fields.

"One of the challenges that I have is trying to control pests that want to chew on the drip tape," he said. "Gophers love it."

## Showing results

But Durst also recognizes the benefits.

"I don't have any tail water to contend with, so I don't have to worry about where that water goes or how to recycle that water," he said. "It's easy to apply the water uniformly to the field. In the past, I'd tend not to get equal distribution. ... The drip system is very exact."

Researchers see benefits, too. Mitchell, of the Conservation Agriculture Systems Innovation Center, cites a study published in the journal *California Agriculture* in 2012 that found more water was retained in a surface foot of soil in no-till than in tilled soil.

No-till and high-residue practices could reduce summer soil evaporative losses by about 13 percent, he said.

Other subsurface irrigation trials are showing dramatic increases in yields. Khaled Bali, an irrigation water management specialist at the Kearney facility, said underground drip systems in alfalfa fields have achieved 20 to 30 percent more yields while in some cases using 20 percent less water.

In the Imperial Valley, which produces alfalfa year-round, some growers with subsurface drip systems are getting 15 tons per acre, whereas 8 or 9 tons per acre in a season is normal, Bali said.

Kevin Day, a UC Cooperative Extension pomology adviser in Tulare County, is trying subsurface drip in a peach and nectarine orchard after working with the USDA to use it for pomegranates. He's seen as much as a 90 percent reduction in weeds because there's no surface water to feed them.

"Fewer weeds, fewer pesticides," he said. "We use high-frequency irrigation. We irrigate as the crop needs it. When you do that, you keep the roots deeper, which makes for better aeration."

The gross cost of installing subsurface drip irrigation can average between \$500 and \$800 an acre, according to the University of Nebraska. Researchers note that once a system is in, it can last 10 years or longer, even with crop rotations.

Day believes systems that give plant roots "little sips of water" are the wave of the future.

"The advantages are huge," he said. "I visualize that in another 20 years we won't see flood irrigation or furrow irrigation. There won't be the

water to allow it."

## Ready for drought?

Other scientists and industry representatives largely agree, noting that many lessons were learned from the recent severe drought that will make growers more prepared for the next one.

"I do think one of the lasting things was the shift toward more precise, targeted irrigation," said Hutmacher, of the West Side research center.

Some farms also shifted crops. The planting of sorghum, which is more drought-tolerant, grew from about 10,000 acres to about 90,000 in the Central Valley during the drought, the Kearney center's Dahlberg said. "It's a good forage," he said. "It's not corn ... but for the dairy folks, looking at sorghum as an alternative forage crop is an option."

Some growers that bulldozed older almond orchards planted pistachios, which use half as much water as almonds and are more tolerant of salt in groundwater, Hutmacher said.

"I do think most people are more aware and have learned valuable lessons, but the pressure is still there to grow high-value crops" that use more water, Hutmacher said. "That's going to be in conflict with cutting your risks during the next drought."

The Almond Board recently set aside \$4.7 million to boost overall grower efficiency, including \$1.3 million for irrigation. The funding follows \$2.5 million the board set aside in 2015.

Almonds have been portrayed by environmentalists as a particularly thirsty crop. But the Almond Board has been quick to respond that growers use one-third less water per pound of nuts than they did 20 years ago.

The board has also issued best-practices guidelines for water management and advised growers on how to take advantage of state water efficiency grants. About 80 percent of almond growers now use drip irrigation systems, Waycott said.

"That keeps improving every time they replant," he said. "It's not just putting in drip, but it's managing those systems. It's part of a continuum of helping growers be more consistent in how they manage it, to make sure water distribution is correct throughout the drip line."

"I think they're far more prepared, generally speaking, than they were for when the last drought came on," he said.

Durst had to reduce his planted acres by about 20 percent at the height of the drought, but he achieved better yields than in wetter years when he had to plant under unfavorable conditions, he said.

Will he be more prepared for the next drought?

"Oh definitely," he said, "because of the drip tape and (knowing) how to manage shortages of the water."

## The court has received more than 40,000 emails about weed issue

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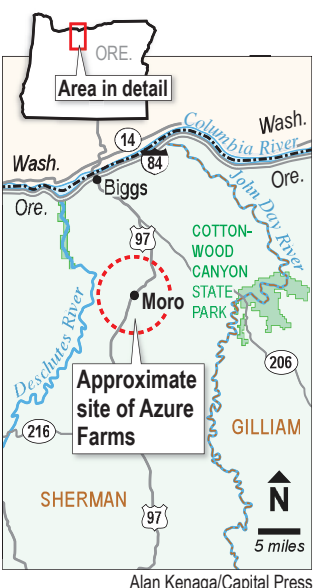
The farm proposed methods that, depending on the weed, included heavy fertilization and then deep cultivation to get at roots, spot use of Boron, citrus pulp mulch, covering weeds with landscaping fabric, salt, mowing before seeds form and spraying with calcium, manganese and boron before cultivation. "This causes the new blooms to wilt and not seed out; doesn't kill the entire plant, though, but controls the spread," the farm suggested.

The issue has blown up on social media.

The manager of Azure Farms, Nathan Stelzer, urged supporters to "Overwhelm the Sherman County representatives with your voice." A video posted on the farm website called for people to express their outrage.

McCoy, the commissioner, said the county court has received more than 40,000 emails about the issue, "and the number is increasing rapidly." On social media, critics have called the county's stance outrageous and accused the county of trying to poison the organic farm on behalf of "Big Ag" or Monsanto, which has no apparent role in the matter. McCoy said the charges against county officials are inaccurate.

David Stelzer, CEO of Azure



Alan Kenagal/Capital Press

problems for neighboring farmers. "If we took two acres out, that wouldn't be the end of the world," he said.

## Timeline

In a memo prepared for the county's May 17 meeting, weed Supervisor Asher laid out the timeline of his interactions with the farm.

**March 2:** Asher sent the farm's parent company, Ecclesia of Sinai at Dufur, a weed control ordinance violation notice. The letter listed 15 company properties covering 1,922 acres in the Moro area. It gave the farm 30 days to submit a plan to control Rush skeleton, classified by the county as a Class A noxious weed, and Canada thistle, Morning Glory and White Top, all Class B noxious weeds.

**March 27:** Ecclesia of Sinai responded that the county didn't have jurisdiction over it and cited biblical justification for not spraying.

**April 19:** The County Court discussed the issue. By then, some of the properties had been mowed, "but this was seen as a poor method of control as the weeds will grow back and root systems will flourish and continue to spread, as they have done over the many years," Asher wrote.

Local residents attending the meeting expressed "deep concern" over weeds and were

skeptical that methods other than herbicide would control them.

**May 1:** Asher sent a second letter to the farm, suggesting various control methods.

**May 2:** The county's Weed Advisory Board agreed to defer to the county court on further action.

**May 5:** Asher met with Nathan Stelzer, the Azure Farm manager, who said he was unaware weeds were such a big problem. Asher felt he'd made progress in the discussion.

**May 11:** Asher viewed Azure's social media campaign and said it "clearly misstated the situation."

"My thoughts of progress and working together in the future were dashed," Asher wrote.

The campaign, which included videos of the farm's principals urging viewers to express their outrage at the county's stance, resulted in an estimated 40,000 emails to county officials from around the world.

**May 16:** Azure Farms submits a weed management plan. It lists methods the farm will use to control Rush skeleton, Canada thistle, Bindweed and White Top.

**May 17:** The county court meets to discuss the issue. The meeting is moved from the courthouse to the high school gym, the only space large enough for the anticipated crowd.

## New well permits cannot be issued unless the commission changes rules

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There's no sunset clause for the prohibition on new agricultural wells, so new permits cannot be issued unless the commission changes the rules, he said.

It's possible the commission could reach such a decision if new data show that additional well drilling in some areas would not be harmful, he said.

Even before the new rules were adopted, OWRD was denying new groundwater rights applications on a case-by-case basis, since hydrogeological evaluations have consistently shown the water isn't available, said Brenda Bateman, administrator of the agency's technical services division.

The situation has gotten to the point where the agency needed to establish a broader policy against new well permits, she said.

However, there are people in the Walla Walla subbasin who have already obtained permits but have yet to drill wells, Bateman said.

OWRD is currently in discussions with those permit holders about possible

It's possible that additional water is still available in deeper basalt levels. I definitely think the department is jumping the gun."

John Stadel  
well driller

extensions, she said.

During the meeting, well driller John Stadel said he's disappointed in the commission's decision, since it's unlikely people in the region will ever be able to obtain new groundwater rights.

It's possible that additional water is still available in deeper basalt levels, Stadel said. "I definitely think the department is jumping the gun."

Gary Key, a water right holder, said he appreciated the commission has taken action to begin getting groundwater declines under control. "Three to four feet of water a year is just unsustainable," Key said.