

# A dry future weighs heavy on California agriculture

*Something's got to give in Central Valley farming. The only question is what.*

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On a hot summer afternoon, California farmer Chris Hurd barrels down a country road through the Central Valley city of Firebaugh, his dog Frank riding in the truck bed. He lurches to a stop in front of Oro Loma Elementary School, which was built in the 1950s to accommodate an influx of farmers' and farmworkers' children. "All three of my sons went here," Hurd says, as we walk through overgrown weeds toward the shuttered building, closed in 2010. "I was on the school board, the grass was green, kids were running around. Now it's a pile of rubble."

Agricultural land stretches out in every direction. Most of the town's 8,300 residents are involved in growing or packing produce. The city is on the west side of the San Joaquin River, an area hit particularly hard by a historic drought, now in its fifth year. Wells have run dry and farm-related jobs are running out. Many other places in the eight counties comprising the San Joaquin Valley have suffered similar fates. These areas were disadvantaged to begin with, rural and isolated, lacking infrastructure, public transportation and safe housing. Persistent drought has compounded the struggles of some of the poorest communities in the nation. As of late January, 64 percent of the state was experiencing extreme drought — down from 78 percent that time last year. But even a stellar El Niño year won't undo all the damage.

Hurd, 65, who earned a degree in mechanized agriculture from California Polytechnic San Luis Obispo in 1972, has farmed for the past 33 years. These days, he tends 1,500 acres and serves on the board of a local water district. Right now, he's debating whether to rip out 80 acres of 20-year-old almond trees whose yields don't justify the cost of the water. Three years ago, his annual water bill was \$500,000. Now, he says, it's \$2.5 million; the price per acre-foot has increased sharply since the drought. Farmers like Hurd, who have junior water rights, are the first to see their allocations from the state's two major water projects curtailed during shortages, forcing them to invest in new wells to pump groundwater or buy water on the market. In 2014, farmers with junior water rights faced an unprecedented zero allocation from the U.S. Bureau of Reclamation's Central Valley Project. That happened again last year. In late February, the federal project will announce its water supply outlook for 2016. The State Water Project has also dramatically reduced its deliveries over the last two years.

In John Steinbeck's classic novel, *The Grapes of Wrath*, farmers escape Oklahoma's Dust Bowl by heading west to California in search of jobs and fertile land. Hurd says his friends have begun joking, grimly, about the reverse scenario — California isn't working out, so why not pick up and move back to Oklahoma? "Some are leaving, some are staying to fight, a lot of them are in flux," he says. Yet while grit has something to do with who stays and who goes, it ultimately comes down to two main factors: water and money. The survivors will likely need senior water rights and money to spend on planting high-value orchards or implementing expensive technology. Economically, California remains the largest agricultural producer in the United States. But El Niño's precipitation notwithstanding, the prolonged drought is putting some farmers under heavy duress, and no one is sure how far California's Eden will sink.

California, like much of the United States, was losing farmers long before the current drought began. The number of principal operators shrank 4 percent from about 81,000 in 2007 to 78,000 in 2012, according to the most recent U.S. Census of Agriculture. The average age of California farmers skews slightly older than the rest of the nation, at 60 years old, and the state has experienced a decline in the number of farms, reflecting a national trend.

Yet the market value of its output has grown to roughly \$54 billion annually. While a mere drop in the bucket of California's \$2.2 trillion economy, this sector remains among the most productive in the world, thanks to the state's Mediterranean climate and fertile soil. And the Central Valley — a 450-mile-long stretch of flat land through the middle of the state that encompasses parts of 19 counties and multiple watersheds — produces nearly half of the nation's vegetables, fruit and nuts. California has accomplished this even though most of its precipitation happens in the north, while most of its agriculture occurs in the south.

But now, the state's major reservoirs remain below normal for February, although their levels have dramatically improved since last December. Historically, a strong El Niño means most precipitation occurs in January, February and March. Too much rain at once won't help farmers and could cause flooding, and it will do little to replenish the state's drained aquifers. There is a positive note, however: The California Department of Water Resources' semi-annual snow survey this winter, on Feb. 2, measured snowpack at 130 percent of normal in one location. Statewide, the snowpack is at 114 percent of average, which is the highest it's been since 2011. That snow will eventually melt into streams and reservoirs, providing water for farms and cities. In normal years, the snowpack supplies about 30 percent of the state's water needs.

In July 2014, a report by researchers at the University of California Davis made headlines with alarming news about the drought's impacts. Researchers projected it would cause \$1.5 billion in economic losses to agriculture — factoring in crop revenue, dairy and livestock value, and the cost of additional groundwater pumping — and the loss of 7,500 jobs directly related to farm production by the year's end. In their latest report, the Davis researchers estimate \$1.84 billion in economic losses to agriculture and 10,100 fewer agriculture jobs in 2015.

Yet for all that, California agriculture has demonstrated impressive resilience. Researchers at the Pacific Institute, in Oakland, analyzed drought's impacts on the three major crop categories of field crops, vegetables and melons, and fruits and nuts, and found that California agriculture not only survived, it flourished overall, achieving both record-high crop revenue and record-high employment.

Crop revenue has increased steadily over the past 15 years, and 2013 was the highest ever at \$34 billion; 2014 was the second highest (although it dipped slightly). Revenue has increased even as land was fallowed at high rates. A follow-up report, incorporating livestock, dairy and nursery data, found the same patterns of high levels of productivity and profitability through this drought.

Meanwhile, agricultural employment has grown every year since 2010, employing a record-setting 417,000 people in 2014. But employment in the San Joaquin Valley waned. "It is important to note that statewide and even regional estimates can hide local variability," the report's authors wrote. "State agricultural revenue and employment remain high, but there are undoubtedly winners and losers."

Excessive groundwater pumping is a major issue. "In my mind, there is an intergenerational equity issue here," says Heather Cooley of the Pacific Institute. Future generations' ability to meet their farming needs has been compromised — groundwater will sink to greater depths, water quality will deteriorate and wells could run dry. Infrastructure such as conveyance canals, roads, bridges and buildings will suffer. "Our overdependence on groundwater is tenuous and not sustainable by any stretch of the imagination. (Farmers) recognize that," says Scott Stoddard, a row-crop farm adviser in the Central Valley for the University of California Cooperative Extension. Underground aquifers took thousands of years to fill up and can't be replenished at the current rates of withdrawal.

Another resiliency factor relates to improved water efficiency and crop shifting. "Together, these two are enabling farmers to get the most out of the water that they have," Cooley says. Farmers aren't flooding fields as much and are using scientific data and technology to better pinpoint when, where and how much to

irrigate. They are shifting away from growing cotton and corn, concentrating water instead on higher-value crops, including almonds, pistachios, wine grapes, tomatoes and fruit. But permanent crops such as trees and orchards can't be easily fallowed, and that reduces the flexibility to respond to future water shortages. Short-term water transfers between willing sellers and buyers provide a third major reason for resiliency. But regulators lack a complete understanding of how much water is actually changing hands, because informal farmer-to-farmer sales — the kind that happen over coffee at the local diner — aren't tracked.

In considering how California agriculture has withstood the drought — increased groundwater pumping, water transfers, a shift from field crops to higher-value nuts and fruits, better irrigation techniques, fallowing land — many of the same strategies used in previous, albeit more modest, water shortages emerge. But, Stoddard wonders, “What happens if what we're seeing is not a drought, but the norm?”

Nonstop pressures threaten California agriculture: encroaching development, the high cost of farm and rangeland, which prices out new farmers and ranchers, onerous regulations, declining interest in the profession, water shortages and climate change. Greater climate variability may be the state's new reality, but that doesn't mean the end is near. “I think California will remain a great place to grow food and other agricultural products,” Cooley says. “One of the reasons we've seen high levels of agriculture development in the state is because we tend to have a dry summer (and) when water is available, it allows farmers to manipulate the water and use it with precision.”

Another reason is that for decades, the Central Valley's Westlands Water District has managed to pull a lot of water for farmers near Fresno. But even the powerful water utility has struggled under the current drought and state water restrictions. It remains to be seen whether it can politically pull more water as the drought continues. In the meantime, farmers are handling the crisis the way they always have, through resiliency.

Daniel Sumner, an agricultural economist at UC Davis and coauthor of the economic-projection reports, says this isn't the first time farmers have switched up crops, nor will it be the last. California used to be among the biggest wheat-producing states in the United States, and that's no longer the case. “California agriculture adapts continuously to markets and other shifts,” Sumner says. “The gradual move from field crops to more tree and vine crops and vegetables has been ongoing for decades. This drought has caused some temporary shifts, such as leaving rice land idle, and perhaps accelerated the long-term trends.”

Adaptation is nothing new to agriculture, but that offers little consolation to the individual farmers tasked with growing much of the nation's food. Sure, the sector may be doing all right, but that doesn't mean some farmers, farmworkers and their families aren't suffering. This is especially true of farmers with junior water rights, who have had to shell out lots of money to access water, and in areas of extensive fallowing, which means fewer jobs for farmworkers. Sixty-five percent of California's farms earn less than \$50,000 annually. These farms are small, and likely more vulnerable to threats such as drought. Only 8 percent of farms fall into the highest economic class, making more than \$1 million.

Increasingly, adult children find the prospect of an air-conditioned office job in a city more appealing than taking over such a harsh family business. Drought's indirect impacts will compound agriculture's other pressures but won't be realized for several years, if not decades. “It's a very strong possibility in the future that we're looking at an exodus of more and more people, if this lack-of-water situation continues,” Stoddard says. “We are using more water than the system allows, and something has to give.”

What will “give,” as Stoddard says, are farmers with exorbitant water bills, or those who just can't make their operations work anymore.

If California's agriculture is going to thrive, policymakers need to ensure better management of groundwater resources and stop underpricing water. A comprehensive statewide agriculture plan could help. So will

continued improvements in agricultural practices: conservation; transitioning to drip irrigation; using cover crops and no-tillage for better soil health and reduced water usage; employing GPS and possibly drones to pinpoint inefficiencies in irrigation; and funding plant science where genetic engineering could help crops withstand drought.

Farmers with the most resources will have the best chance of surviving. Like Cannon Michael, a sixth-generation farmer whose ancestor Henry Miller, of Miller and Lux Co., once owned the area that's now the town of Firebaugh. Michael inherited senior water rights, which gives him a safety net in this current drought. His business, Bowles Farming Co., brings in an average of \$25 million in annual gross revenue, but he still worries about the future. "Our good years are never going to be as good, and our bad years have the potential to be catastrophic," he says.

His response has been to adapt. Historically, Bowles has grown almonds, pistachios, wheat, corn, alfalfa, cotton, tomatoes, onions and melons on 10,500 irrigated acres — but the drought pushed Michael to fallow one-fourth of his ground and stop irrigating alfalfa. He reduced labor needs, installed drip irrigation and transitioned to reduced-tillage to save money on gasoline. This summer, he made a multimillion dollar investment in the installation of two solar arrays that will generate 1 megawatt of power, enough to supply electricity for nearly the whole operation, including the office, shop, houses (his and the workers) and all drip-irrigation systems. Michael is also diversifying with a new 5,000-acre farm in Uruguay, where he will grow wheat, sorghum, soybeans and corn and raise 1,000 cattle.

South America may beckon as a new agrarian frontier, but Michael, like many of his peers, refuses to give up on California yet. A few years ago, he bought a struggling young almond orchard, excited by its status as a high-value crop. He says there's not much to be excited about with farming nowadays, but raising the almonds was something that brought him hope. On a summer afternoon in 2015, before the orchard's inaugural harvest, Michael plucks an almond off the branch, picks out the seed and takes a bite. Fresh from a tree, almonds taste different: wetter with a hint of vanilla. "Can you be proud of trees?" he asks, closely admiring one of the leaves. "I'm proud of these trees."