California's Thirsty Almonds

How the water-intensive crop is helping drive the governor's $25 billion plan to ship water to the desert.

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Dan Errotabere's family has been farming the dry soils of the western San Joaquin Valley for nearly a century. His grandfather primarily grew wheat and other grains. His father grew vegetables and other annual crops almost exclusively. But in 1999, Errotabere decided to plant his first almond tree. Today, almonds account for more than a quarter of his 3,600-acre farm.

"Out here it's nothing but topsoil," he told me during a tour of his property late last year. He added that his land is especially good for growing nuts.

If there's enough water.

Errotabere's farm resides within the Westlands Water District, a barren landscape southwest of Fresno that gets very little rain — even in non-drought years. The average annual precipitation in the district is just eight inches, and the region suffers from poor drainage, high levels of toxic minerals in the soil, and salt-laden groundwater. "It's really an area that should have never been farmed," said Richard Walker, a retired UC Berkeley geography professor and an expert on agricultural economics.

Yet Westlands is almost all farmland, thanks to water from Northern California and the Sierra Nevada that the federal government pumps out of the Sacramento-San Joaquin River Delta and ships south through a series of canals and aqueducts. Throughout the 20th century, this massive transfer of water turned a large section of California desert into a bountiful — and profitable — farming region.

But ever since freshwater began flowing to the dusty west side of the valley, the landscape has been in constant flux. A decade ago, Westlands' major crop was cotton. But today, almonds are on their way to becoming king. Since 2000, the amount of land dedicated to growing almonds has more than doubled in the district, bringing the total to 75,000 acres. And now about one out of every ten almonds sold in the world comes from Westlands. The only crop more common in the district is tomatoes, which cover 80,000 acres.

Westlands farmers like Errotabere have shifted to growing almonds, and to a lesser extent, pistachios, because of the exploding international demand for them. California produces 80 percent of the almonds sold worldwide, with gross revenues of more than $6.2 billion in 2013 — nearly double what they were in 2009. Last year, almonds were California's most lucrative agricultural export by far. "We have good markets, and we're a global product that's extremely desired," said Richard Waycott, CEO of the California Almond Board.

The global almond boom is being fueled in part by sleek marketing campaigns that have made almonds the nut of choice for consumers. Subway stations in China are blanketed with billboards proclaiming almonds to be a heart-healthy snack that makes people "perpetually feel good" (almond exports to China have more than doubled in the past five years). In Korea, California almonds have been integrated into the storyline of a popular prime-time television show. And in Europe, French and British TV personalities have lauded almonds as a healthy alternative to processed foods.

In the United States, almonds have become a staple for many health-conscious consumers. In its raw form, the "power food" is said to lower cholesterol, spur weight loss, and provide powerful antioxidants such as Vitamin E and manganese. Products like almond butter and almond milk have also become increasingly popular in health food stores.

But growing almonds in an arid climate requires lots of water. In fact, Westlands' almond orchards suck up nearly 100 billion gallons of water a year. Cotton, by contrast, needs 40 percent less water per acre, and tomatoes require about half as much water as almonds.

Also, unlike cotton and tomatoes, almonds are a "permanent" crop, meaning the land they're grown on can't lie fallow when water is scarce. "It means farmers really do need to get a hold of water in dry years in order to keep the trees alive," explained Ellen Hanak, a senior fellow at the Public Policy Institute of California and an expert on water.

Almonds, in short, aren't cut out for droughts. And unless the coming months bring a deluge of rain and snow to California, the almond growers of the western San Joaquin Valley could be in for a catastrophic year. On the last day of January, the state Department of Water Resources said it would cut all water deliveries from California's vast system of reservoirs and aqueducts. The Central Valley Project, which is run by the federal government and provides water to Westlands, may also eliminate water allocations this year. And since tree nuts don't respond well to groundwater in Westlands because of its high salinity levels, the water stoppage could leave the district's almond farmers high and dry. "Every barrier that a grower would never want to experience is being placed before them today," said Gayle Holman, a spokesperson for Westlands.

Errotabere said that, under the best-case scenario, he would have to take 1,000 acres of his tomato and garlic plants out of production to free up water for his 1,000-acre almond grove. Under a worst-case scenario, he may have to uproot parts of his orchard, thereby inflicting a serious financial blow to his farm because it took a lot of time and money to grow his almond trees. "It's starting to get really scary," he said. "I simply don't have the means to farm it all, and when that happens there's lost production, lost labor, lost taxes, lost everything because the ground is doing nothing."

Many growers in the western San Joaquin Valley will have to make similarly tough decisions in the coming months, and Westlands, which is one of the most politically powerful agencies in the state, is revving up its PR machine to rally support for struggling farmers.

But many environmentalists have little sympathy for the Westlands almond growers. They note that if farmers hadn't zealously planted water-intensive crops in the desert, they wouldn't be in such a tight bind. "One of my associates referred to it as the 'Westlands death march,'" said Tom Stokely, a longtime water activist and member of the environmental group California Water Impact Network. "While Westlands is pursuing water and growing crops, in the long run it can't be sustained."

Since climate change could make droughts — even ones as severe as this year's — much more common, some water policy experts have also suggested taking huge swaths of farmland in the western San Joaquin Valley out of production permanently. This would conserve water, benefit the environment, and save taxpayers millions of dollars.

But Westlands growers aren't ready to give up their almonds. Instead, they're banking on Governor Jerry Brown's $25 billion water project, the Bay Delta Conservation Plan (BDCP), to keep them afloat. While the plan, which includes building two giant water tunnels to ship water south to Westlands and Southern California,

espouses the goals of repairing the delta's impaired ecosystem and ensuring a more reliable water supply for California, its primary objective is maintaining agriculture — and almonds — in an area that gets very little rain.

At the end of December, it looked like summertime in the western San Joaquin Valley. The parched hills along I-5 were golden-brown and the soil was bone-dry. While the area is prone to long spells without rain, it experienced the driest calendar year on record in 2013 — along with much of the state.

The historic dry spell is already wreaking havoc throughout California. Late last week, the Sierra snowpack stood at just 12 percent of normal, the lowest on record for this time of year; many reservoirs are at all-time lows; and state officials reported recently that seventeen communities could run out of water in 60 to 120 days. In January, hundreds of wildfires flared up across the state during a month in which fires are typically nonexistent. Such dire conditions compelled Governor Brown to declare a drought emergency. "We can't make it rain," he said at a press conference last month. "But we can be much better prepared for the terrible consequences that California's drought now threatens."

The dry weather will arguably take the biggest toll on Westlands' growers because, unlike farmers in other parts of the Central Valley, they have a scant natural water supply.

Over the years, Californians have tended to view the Central Valley, which spans from Redding in Northern California to Bakersfield in the south, as one giant entity. For many Bay Area residents, it's that vast farmland you see through your car window while speeding down I-5 at eighty miles per hour. But the valley's geography is incredibly nuanced, especially in terms of water.

The Sacramento Valley is the verdant area between Redding and the city of Sacramento. The middle portion of the Sacramento Valley sees between 17 and 34 inches of rain each year, and the mighty Sacramento River — which has many branches, sloughs, and a very wide flood plain — brings additional water from the surrounding mountain ranges. This relatively wet climate makes the area perfect for growing many different crops, including tree nuts. Almonds grown in the Sacramento Valley can produce four times the yields that they do in Westlands using the same amount of irrigation water.

The vast majority of California's almonds, however, are grown in the San Joaquin Valley, which is the area south of Sacramento. The region is drier overall than its northern counterpart, although portions of it get plenty of water, too.

On the east side of the valley, the towering Sierra Nevada range blocks weather systems as they move in from the Pacific Ocean, forcing them to dump their loads of rain and snow. In the spring, as the Sierra snowpack melts, surging rivers flow into the eastern San Joaquin Valley, feeding enormous underground aquifers. In some areas, tree crops barely need to be irrigated since their roots sit in the natural water table. "The east side and the center of the San Joaquin Valley is wonderful farmland, and it is well watered," said Walker, the retired UC Berkeley geography professor.

The west side of the valley, by contrast, has almost no water of its own. It's bordered to the west by the coastal range, which, unlike the Sierra, has very few rivers or streams. The mountains also create a natural barrier to the rain, making the driest parts of the region more arid than Nevada's Great Basin desert. Groundwater in Westlands is also deep in the earth — sometimes hundreds to thousands of feet below the surface — making it expensive and difficult to pump out.

Still, the west side of the valley has an abundance of one key agricultural ingredient: sunshine. And in the early 1900s, after deep-well water pumps made Westlands' groundwater accessible, irrigated agriculture in the region exploded.

It wasn't long, however, before farmers in Westlands had pumped their underground aquifers dry. Partially to rescue these growers, the federal government began constructing the Central Valley Project in the 1930s. Touted as one of the biggest water projects in the history of the world, the Central Valley Project made it possible to send trillions of gallons of freshwater from the Trinity Alps in Northern California through the delta to farmers in the western San Joaquin Valley. With this new source of cheap and abundant water, snow-white fields of cotton and endless rows of ruby-red tomatoes quickly replaced low-value grains like wheat, corn, and barley. Today, the region is an agricultural powerhouse, growing a plethora of fruits, nuts, and vegetables that generate roughly $1 billion in profits each year.

The Westlands Water District has been instrumental in this transformation. Founded in 1952, it supplies irrigation water to about 700 growers in a 1,000 square mile strip of land. The average farm size in the district is 875 acres, although many growers divide their holdings into smaller tracts in order to get subsidized water (only farms smaller than 960 acres can receive federal aid when buying water.)

Over the years, Westlands has leveraged its strong political clout to keep Northern California water flowing to its farmers. In the past three years, Westlands has spent nearly $1 million lobbying for ag-friendly causes, and its growers and board members have donated hundreds of thousands of dollars to favorable politicians. The district has also continuously litigated against environmental protections in the delta. "These folks are making a lot of money, and they have a big war chest for lawyers and lobbyists," Stokely noted.

Westlands has also received sizable public subsidies over the years. In fact, the district has still not fully repaid taxpayers for its share of the cost of building the California Water Project. According to a 2010 study by the Environmental Working Group, Westlands still owed $367 million on the project. And between 2006 and 2009, the district obtained more than $50 million in additional taxpayer-funded subsidies.

To many environmentalists, the massive public investment to grow crops in the western San Joaquin Valley has never made sense. "It's a huge cost to the economy and to the environment to give these guys water, and in the end it's not benefitting society as a whole," Stokely said.

And growing almonds has only intensified Westlands' thirst for water. In the western San Joaquin Valley, an acre of almond trees needs about 1.3 million gallons of water a year on average. Errotabere and other farmers in the region mitigate their water usage by employing computerized drip-irrigation systems that keep water from percolating below the plant's root zone, thereby increasing yields and decreasing waste. About 70 percent of the almonds grown in California use some sort of drip-irrigation system. "There's no big corporate farms here spraying every day," Errotabere said. "That's just folklore that continues to haunt us."

However, improved irrigation methods don't change the fact that tree nuts need a constant and abundant supply of water to stay alive. And since it's likely that growers will receive no water from the state or federal government this year — a historical first — some farmers may have to watch their trees whither during the valley's hot, dry summer. This could deal a substantial financial blow to almond farmers since growing the crop is expensive and time-intensive. Drip irrigation systems can cost up to $1,200 an acre, and almond trees don't fruit for their first three to four years of life, meaning that farmers have to wait for their crops to pay off. That's why when a farmer converts from annual crops like tomatoes to almonds, he's usually reluctant to change back.

The rising global demand for almonds also has made the crop irresistible to Westlands farmers. While it's hard to pin down exactly how much money the almond growers are making, it's reasonable to assume that profits have been good. For example, even though it has become much harder to grow tree crops in the region due to rising water costs and shrinking supplies, investors are still bullish about purchasing land that's suitable for tree nuts. Currently, almond and pistachio orchards in Fresno County sell for about twice as much as other farmland. "People talk about an ag bubble that's going to burst because the prices aren't sustainable," said Brian Domingos, a Fresno-based land broker.

To adapt to climate change, some water policy experts in California are considering drastic changes to the state's water system. One idea that's often tossed around is buying farmland in Westlands and allowing it to return to its natural state. This would greatly reduce water demand from the delta and benefit the environment, because western San Joaquin Valley agriculture uses about 35 percent of the water that's taken out of the estuary.

"California is going to be faced with some hard choices in the future, and growing crops where there isn't water is not a very sensible policy," retired UC Berkeley professor Walker said of Westlands. "Something has got to give, and these areas of agriculture are the most water-demanding and the least well-situated geographically for growing food."

Widespread land retirement isn't a fringe idea. Overall, irrigated farmland in California has shrunk considerably over the past few decades. The US Bureau of Reclamation has already taken 100,000 acres in Westlands out of production due to drainage problems and has considered retiring 150,000 more. According to a 2007 report by the bureau, large-scale land retirement in Westlands would actually benefit the state's economy.

There's also a strong case to be made that it would be better for the ecosystem of the western San Joaquin Valley.

Thousands of years ago, the Pacific Ocean covered much of the valley. As the sea receded, it left behind marine sediments and mineral deposits in the alkaline soil. Today, large quantities of boron and selenium are concentrated in the western San Joaquin Valley, which can be extremely toxic at high levels and tend to accumulate in irrigation runoff.

Much of the farmland in Westlands also has an impenetrable layer of clay under the topsoil — the remnants of an ancient lakebed — causing irrigation water to pool up on farms. And as growers transition to more water-intensive crops like almonds, the amount of toxic wastewater in Westlands soil has increased. "The more you irrigate, the more irrigation runoff there is, and the more exacerbated the problem becomes," said Sam Luoma, a former hydrologist for the US Geological Survey.

This problem has some environmentalists concerned that dangerous levels of minerals — namely, selenium — are building up in Westlands. And as history has shown, when selenium accumulates, it can be catastrophic for fish and wildlife.

In the 1970s, Westlands tried to build a long canal to ship its toxic wastewater to the delta and San Francisco Bay. However, funding for the project dried up and the Kesterson National Wildlife Refuge — a human-made wetland in Merced County — became Westlands' primary dumping ground.

As Westlands' toxic wastewater built up in Kesterson, the selenium levels spiked. In 1982, catastrophe struck. Droves of migratory birds living in the wetland developed crippling deformities: Some were missing eyes, feet,

and beaks; others' brains protruded from their skulls. The local populations of several species, including the black crowned night heron, were almost completely wiped out and almost all of the fish in the wetland died.

Since Kesterson, Westlands' growers have started storing their runoff in underground reservoirs and small evaporation ponds on farms. While this keeps selenium away from wildlife, it's not without its dangers. "No one knows what the long-term outcome of storing the irrigation water on the local farms or putting it on the local soils will be," Luoma said. He added that while another tragedy like Kesterson is unlikely, "ten, twenty years down the line, there may be many little Kestersons."

Longtime water rights activist Stokely thinks that a large-scale environmental disaster is brewing underground in Westlands. "All of their toxic drainage water is percolating into deeper aquifers, and in my opinion they're creating a multi-generational, underground Superfund site," he said.

The Bureau of Reclamation has said the only cost-effective solution to the drainage problem is taking large swaths of Westlands out of production. Even Floyd Dominy, who headed the bureau from 1959 to 1969, said he made a mistake when he decided to pipe water to the western San Joaquin Valley. "We went ahead with the Westlands project before we solved the drainage problem," he said in the 1997 PBS documentary *Cadillac Desert*, which was based on the bestselling nonfiction book of the same name by investigative journalist Marc Reisner. "I made a terrible mistake by going ahead with Westlands at the time we did."

California's elected officials, however, have by and large ignored the idea of buying up half of the farmland in Westlands and retiring it for good. "It would be cheaper to do that than to build these siphons under the delta," Walker noted, referring to the governor's Bay Delta Conservation Plan (BDCP). "But you'll never get the political will to do that."

Instead, the future of agriculture and almonds in the western San Joaquin Valley hinges largely on how things will play out with the BDCP. If the plan moves forward it will be the largest public works project in state history. The cornerstones are two massive 35-mile-long water tunnels — each wide enough so that three H3 Hummers would comfortably fit in them at the same time. The tunnels would stretch under the delta, redirecting water from the Sacramento River to western San Joaquin Valley farmers and Southern California.

The details of the BDCP are complex (see the *Express*' two-part series, "Tunnel Vision," 6/12/13 and 6/19/13), but the main idea behind it is that by restoring tidal wetlands and cutting back on the use of giant water pumps in Tracy — which shred tens of millions of delta fish in some years — native fish populations in the delta would rebound. In turn, water exports from the estuary would become more consistent. "Building some kind of alternative conveyance gives you more flexibility and should reduce vulnerability," said Hanak of the Public Policy Institute of California. "It makes the system more resilient."

However, the plan is mired in controversy. While the state says that BDCP won't increase the amount of water taken from the delta, the tunnels would have the capacity to drain nearly the entire flow of the Sacramento River during parts of the year. And while the BDCP calls for a $9 billion investment in wetlands restoration projects, there's no guarantee that the endeavor will benefit certain threatened fish species (the habitat restoration efforts also depend on voters passing a future bond measure). In addition, reducing the amount of clean water flowing into the estuary from the Sacramento River could make the delta much dirtier and saltier, and thus less hospitable for plants and wildlife.

Such concerns have many critics calling BDCP a conservation plan that could ultimately destroy the largest estuary on the West Coast. Barbara Barrigan-Parilla, executive director of Restore the Delta, an organization of Delta-area stakeholders working to protect the estuary, calls BDCP "a water grab in a green-washed package."

"We're supposed to sacrifice a limited, finite resource to keep this small group of people rich?" she said, referring to Westlands' growers. "No, it doesn't make sense, it's not the best use of water."

During the next few months, the public can review and comment on BDCP's 40,000-plus-page draft environmental impact report. And many environmentalists are questioning whether or not California should spend up to $67 billion (including interest on the bonds that would finance the $25 billion project) upgrading its water system in order to prop up almond growers in an area that some say should never have been irrigated in the first place. "If we ever expect to have a reasonable, science-based, and economic-based solution to California's water problems we have to stop sending this clean water to this poisoned ground," Stokely said.

Yet while Westlands' highly subsidized farms have come to embody everything negative about California agribusiness, Errotabere said he's just trying to carve out a living — albeit a prosperous one — growing almonds on land his family has farmed since before the Great Depression. "We have the land, we have the infrastructure, we have no choice, we are wholly invested in farming here," he said.

"Farming is who I am, my future, my entire livelihood is built around this," he continued. "We shouldn't just disappear in the dark. We need to have a public policy debate about whether we want agriculture in California or not."

Yet for many environmentalists and opponents of the governor's plan, the debate is not about whether California should have agriculture, it's about whether it makes sense to spend tens of billions of dollars so that farmers can grow water-intensive crops like almonds in dry environs — especially if droughts intensify because of climate change.

"When Westlands came online it was understood that it would grow things like lettuce and tomatoes," said Barrigan-Parilla. "They changed their business model, and these are the consequences, because the water isn't there anymore."