



Almond **FACTS**

High-Tech Water Management

Blue Diamond growers look to innovative solutions to help guide irrigation decisions.

By Marni Katz

Whether to make the most of a limited water supply or improve productivity from applied inputs, almond growers are relying on information and new technologies to manage their irrigation programs.

"I think almond growers throughout California are probably one of the most progressive groups to adopt modern technology and use it to get the most efficient use of water, nutrients and pesticides for the benefit of the bottom line and the environment," said Blue Diamond Director of Member Relations Dave Baker.

"Almond growers are learning about new irrigation management technology and they are quick to adopt it to make excellent judgments about what their plants need," added Baker, who serves as chairman of the Almond Board's Environmental Committee and co-chair of the Production Research Committee.

One such grower is first-time almond grower Jack Deegan. Deegan knew he needed a lot of help when he made his first foray into growing almonds five years ago after retiring as a funeral director in San Joaquin County. Soliciting input from Blue Diamond Grower Representative Mel Machado, top-notch PCAs and agronomists, generous neighbors and the UC Cooperative Extension, Deegan replanted an older 40-acre family orchard

inherited from his wife's family to a "Cadillac" orchard of Butte/Padre almonds on double-line drip, with auto-flush filtration and a high-tech system for monitoring and managing his irrigation sets.

"Being new to growing almonds, I wanted to make it as easy for myself as possible, but also wanted to do it right," Deegan said.

The result is a third-leaf orchard loaded with a harvestable crop that Machado can only describe as, "Wow."

"The orchard is a blockbuster," Machado said. "This is a second-generation orchard in a sandy soil prone to bacterial canker, and this thing is growing like it's on virgin ground."

Deegan thinks the 300 to 400 pounds per acre he expects to harvest this year at Garino-Deegan Ranch in Ripon will easily pay for his investment in a PureSense monitoring system in its first year.

The field monitoring station captures real-time information on soil moisture, climate and canopy conditions every 15 minutes. Customized software compiles that field data into easy-to-understand dashboard reports that help Deegan plan and schedule his irrigation and fertigation regimen based on environmental conditions, soil type, crop stage, and moisture status.



As a first-time grower, Deegan opted for a "Cadillac" system for applying and managing his resources not only to optimize productivity but also to simplify his decision-making.

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Blue Diamond grower Jack Deegan credits irrigation management for producing a harvestable crop out of this replanted third-leaf almond block under double line drip irrigation.



PureSense field stations measure above- and below-ground conditions every 15 minutes. Data is transmitted to a secure server and compiled into easy-to-use, customized charts and reports to help growers plan, schedule and precisely manage their irrigation activities.

Deegan can pull up and modify his irrigation schedule for the next two weeks from his laptop and can visually see that the applied water and nutrients are staying in the root zone. He can also receive text messages or emails alerting him when moisture levels are outside the optimum zone, degree-days or ET^o in the orchard reach a certain level, or the irrigation system is not operating according to schedule. Machado said large, medium and small sized Blue Diamond growers are looking at these types of newer technologies to make more informed decisions about how best to utilize their inputs.

Third-generation Blue Diamond grower Garrett Bowman, who farms 500 acres of almonds in the Salida area of Stanislaus County, has been using PureSense technology to monitor and plan his irrigations for two years. Even though Bowman is fortunate to have ample high-quality water in the Modesto Irrigation District where he farms, he believes in being a good steward of all resources, but water in particular.

“We want to make sure we are maximizing the efficiency of water use to the trees,” he said. “We don’t to waste what we have and we certainly aren’t getting any more water. All our newer plantings are on drip or micro sprinkles, and we use soil, water and moisture monitors to ensure that we are putting just the amount of water we need on it.”

Bowman Farms now has eight PureSense field stations strategically placed throughout the operation. Once he got past the learning curve, Bowman said he is using the technology more to its potential to visualize and manage the moisture in the soil profile down to 60 inches.

“It’s pretty important going into harvest for our soil to have deep moisture,” Bowman said. “And with the system taking readings every 15 minutes, we can use real-time data to be more informed about when exactly the trees are needing water and when its time to shut the sprinklers off. It’s helping me better schedule my irrigations.”

Since he started using PureSense, Bowman discovered he is better off running longer, less frequent sets than he had been to fill the soil profile more efficiently.

“The goal is to always have water available to the tree when it needs it so it doesn’t dry down, but avoid having it sit in a water-saturated condition,” he said.

That means not only optimizing water use, but also optimizing yield and plant health by applying the appropriate amount of water according to soil type and stage of crop development.

Chris Ott is also experimenting with the technology on the family’s 1,000-acre diversified farming operation near Modesto. Ott Farms installed its first PureSense station two years ago on a block of almonds recently converted to drip irrigation. He said PureSense provides an additional tool for understanding how applied water is moving through the soil profile.

“With the software, I can pull up a chart and see what the plant is using and how the water is moving through that entire profile,”

Ott said. “Switching over to drip and then putting in that system has let me apply the right amount of water at the right time.”

Kern County UCCE Farm Advisor Blake Sanden said that understanding what is happening in the soil profile and the orchard’s variable water holding capacity are important pieces of information in an efficient irrigation strategy.

He compares budgeting soil moisture to the basic economics of a bank account. Growers must understand how fast they can bring assets—in this case water—into the account (soil) and make sure they are not pulling that asset out faster than they are putting it in.

“The best, most efficient mechanism of irrigation management is utilizing overdraft protection without hitting the penalty line,” he said. In other words, if you draw down soil moisture and replenish it at the proper rate, you will not be hit with a penalty in tree stress or yield loss.

He suggests a three-pronged approach for understanding and maintaining deep soil moisture to optimize plant health and production.

First, assess plant stress visually or by measuring water status in the tree by feeling leaves or taking pressure bomb readings. Second, use a device such as the PureSense system, tensiometer or neutron probe to understand the soil’s water penetration and moisture storage. Finally, verify data in the field by using a hand probe or auger.

“If you’re not doing those three things you are not going to be on

top of the irrigation game,” he said.

By understanding field storage capacity in the root zone, and the soil characteristics that go into it, growers can keep an optimum balance of water in the root zone. Some growers rely on rudimentary methods for determining field storage capacity—like the eyeball method or experience in the orchard.

“I would say less than half the growers out there have developed the ability to just look at their trees and intuitively know where the field stands water wise. These growers simply have the gift, where their eyeballs seem calibrated to sensing the tree stress and knowing how much water to put back in the soil,” Sanden said. “These growers are usually the ones that walk the trees and faithfully hand probe. They may not gain that much by investing a lot of money in monitoring technologies. The larger half could benefit from a monitoring system like PureSense that utilizes multiple data points to guide site-specific irrigation.”

Whatever method they choose, Machado said almond growers continue to find ways to do better with the water they have.

“I don’t think there is any other crop that adapted to low-volume irrigation systems any earlier than we did,” he said. “Can we do better? There are always ways to improve on the practices we have and water management is one of the big ones. Be it PureSense, probes or water information through public resources, these are all tools to help almond growers realize optimum use of resources and production levels in their operations.”

