



almond facts

NEWS, VIEWS, AND INDUSTRY INSIGHT

MARCH–APRIL 2020



Almonds in Sacramento

A Dill-icious New Flavor

Sustainability Impact



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ON THE COVER:

Blue Diamond's Spicy Dill Pickle is the latest craveable flavor and it's dill-icious.



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Blue Diamond, the world's largest processor and marketer of almonds, exports to over 100 countries.

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Serving Our Communities in Uncertain Times

Many say the coronavirus COVID-19 could be the greatest challenge for this generation. While daily there are new challenges and uncertainties, each day is also filled with heroic action and hope. This is true for our country and certainly for our cooperative. *Blue Diamond Growers* is approaching this time with recognition for the important role we play.

We continue to manage this unprecedented situation to the best of our abilities. It is our aspiration that decades from now, we will look back at the actions we are taking and find that our resolve and resiliency are unmatched. We are fortunate that as an essential industry, we can avoid layoffs for our team members and ensure economic certainty for grower-owners. It is our responsibility and duty to ensure the food supply and take special care for our frontline team members in manufacturing and warehousing.

We are doing our part to help stop the spread of the COVID-19 virus. *Blue Diamond's* top priority remains to protect the health and safety of our team members as we ensure business continuity for our grower-owners. A number of mitigation measures were implemented, including suspending all business travel, postponing large events and meetings, increasing already stringent cleaning and disinfection protocols at all facilities and reinforcing social distancing throughout each of our campuses.

As has been the case for many of our grower-owners, team members' lives have been disrupted by school and business closures. We are supporting those team members who are able to work from home and regularly provide updates to be sure we stay connected wherever they may be. Our ongoing commitment to integrity and transparency of communication allows us to continue operating reliably and efficiently.

I had the opportunity to talk with team members on the production floor and office areas in Sacramento, Salida and Turlock, and was inspired by a strong sense of pride in the important work we do. That dedication is being recognized. We've heard from the CEOs of Walmart, Hood and several other key customers who extended their appreciation to our grower-owners and team members for working to help them keep food on their shelves for families around the world. We are constantly assessing business needs and balancing our available workforce with our production schedules to meet these critical demands.

We are also using this time to leverage our community giving strategy by partnering with organizations that provide services to those in need. With that in mind, *Blue Diamond* worked with local food banks and non-profit organizations to provide donations of our shelf-stable almond products to help families impacted by this pandemic. In times like these, food can provide a source of hope for many and it's encouraging to see that *Blue Diamond* can make an impact.



There's potentially a long road ahead of us and I am confident that *Blue Diamond's* leadership team and board of directors have the expertise and business experience to make good decisions on behalf of our 3,000 grower-owners. We appreciate the trust our grower-owners, team members and partners place in us every day. I encourage our grower-owners to reach out to our Member Relations team for help or support. They will continue to fulfill the commitment of the cooperative.

Through this global crisis, *Blue Diamond* will make every effort to prioritize the safety and wellness of our grower-owners and team members while still fulfilling our vision to deliver the benefits of almonds to the world. This year's glorious and nearly perfect bloom is a great metaphor for the optimism we feel for the future. Continue and always believe that for *Blue Diamond Growers*, the Best is Yet to Come. ◆

Mark Jansen
President & CEO

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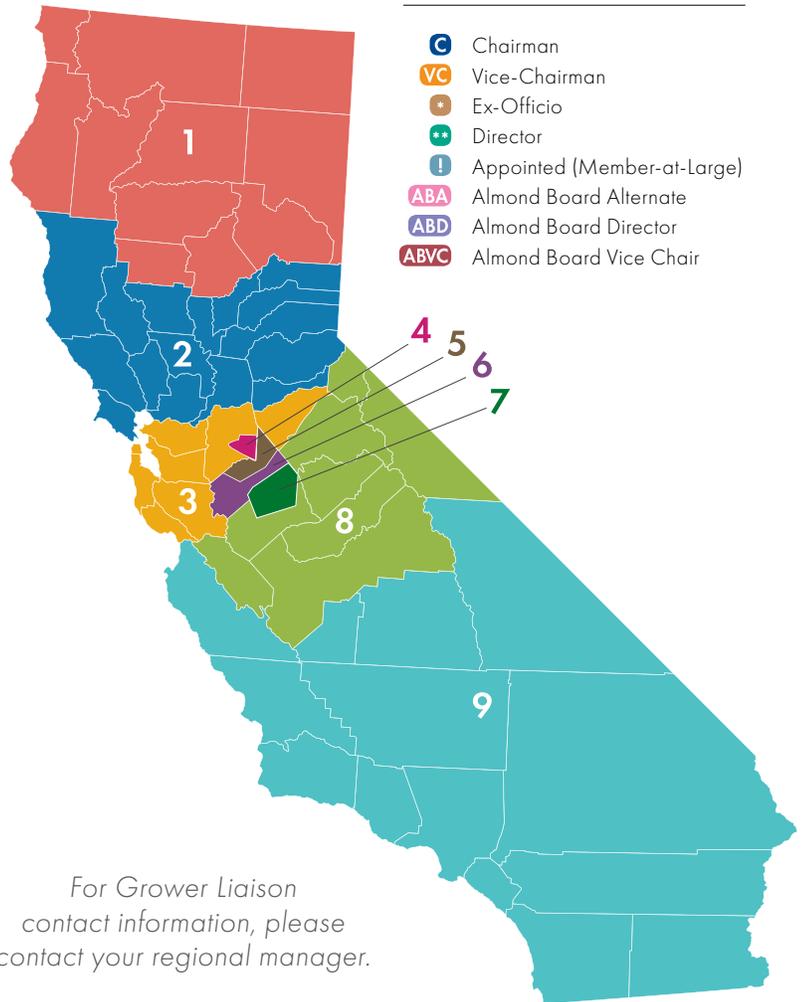
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2020 Grower Liaison

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- VC** Vice-Chairman
- *** Ex-Officio
- **** Director
- !** Appointed (Member-at-Large)
- ABA** Almond Board Alternate
- ABD** Almond Board Director
- ABVC** Almond Board Vice Chair



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- RJ Maan **!**
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- Matt Efid ******
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- Ryan Clark **!**
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- Doug Kindig
- Ray Van Beek
- Keith Gilbert **!**
- Gurcharan Dhillon
- Kyle Balakian
- Kent Stenderup ****** **ABVC**
- Clinton Shick *****



Celebrating the Almond Blossom Festival

Blue Diamond participated in the 58th Annual Almond Blossom Festival Parade on Saturday, February 22 in Ripon, California. Team members embraced this year's theme, "Celebrating 75 years of Service to the Community," with a large turnout of the Blue Diamond family to help build the co-op's iconic float and hand out almond treats to parade-goers. Blue Diamond Growers has been a proud supporter of the event and recognized as a 2020 Silver Blossom sponsor. ♦

Blue Diamond's Mel Machado Honored

Congratulations to Mel Machado, Blue Diamond's Director of Member Relations for being honored at the 17th Annual Ag One — Stanislaus County Alumni and Friends Dinner. As a Fresno State Alumnus, Mel was recognized for his involvement and many contributions to education and agriculture in the community. In 1979, Mel earned his B.S. degree with a concentration in plant protection and vegetable crops from Fresno State. According to Ag One, "Mel contributes the mentorship he received by his Jordan College of Agriculture Science and Technology professors in shaping the path he would take in his career." This honor inducts him into the Stanislaus County Hall of Fame. ♦



Almonds in Sacramento

As the farm to fork capital, the Sacramento region has thrived as an agricultural hub for more than a century. To showcase the innovative uses of almonds, the Almond Board of California hosted a food trends tour of Sacramento, focusing heavily on food manufacturers and product developers to explore some of the most inspirational and unique ways they are using California almonds to make their creations stand out. The group visited a local almond orchard to learn about the almond lifecycle and the many considerations growers take into account to produce almonds in a sustainable and safe way. Throughout Sacramento, the group had conversations with suppliers, including *Blue Diamond*, about how versatility, conduciveness to flavor exploration, opportunities for premiumization and supply chain sustainability all play a role in choosing almonds as an ingredient. Food Navigator, one of the seven trade media who attended the tour, featured *Blue Diamond*'s new Spicy Dill Pickle and Almond Protein Powder in their picture spread, "New Directions for Almonds." ◆



Almond kernel yield increase (lb/Ac) - California

■ Kelpak applied 2 to 3 times at 2-3 pts/Ac, pink bud to sepal fall (shuck split)



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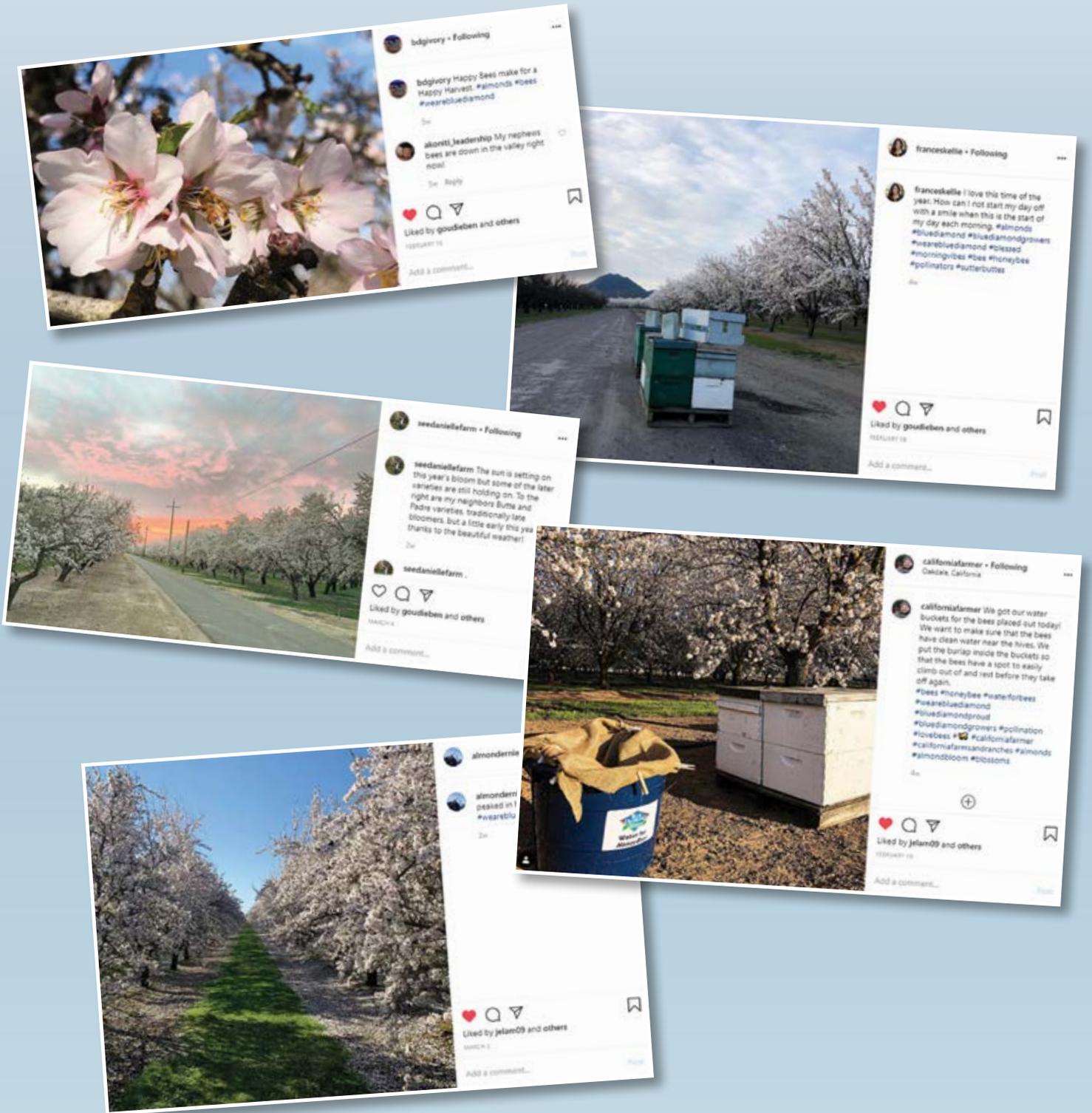
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#WeAreBlueDiamond Snapshots

Thank you, *Blue Diamond*, for sharing your photos of the 2020 almond bloom on social media. ♦





Blue Diamond at World Ag Expo

The World Ag Expo in Tulare, California welcomed thousands to see what the ag industry has to offer. *Blue Diamond* team members and regional managers were there to represent the co-op and give growers a place to relax, catch up and take home some delicious products. This year, those who stopped by the Nut Shop were able to purchase the newest flavor, Spicy Dill Pickle, before it hit stores. “The Ag Expo was very well attended,” said Justin Elam, regional member for *Blue Diamond*. “It was a great year for the co-op to participate!” ◆



“The Ag Expo was very well attended. It was a great year for the co-op to participate!”

Wild Rice Risotto with Almonds and Spring Vegetables

Makes 4 servings



Ingredients

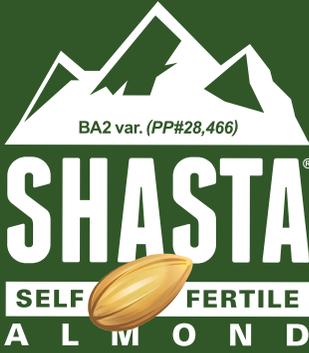
- 4 cups low-sodium chicken or vegetable broth
- Salt to taste
- ½ teaspoon pepper
- 3 tablespoons butter or olive oil
- 2 cloves garlic, minced
- 1 leek (white and light green part only), trimmed and diced
- 1 cup brown rice
- ½ cup wild rice
- 1 (2¼-ounce) package baby carrots, diced (about ⅔ cup)
- 8 stalks asparagus, trimmed and cut into 1-inch pieces
- ¾ cup fresh or thawed frozen peas
- 1 cup sliced almonds, roasted*

Directions

1. Heat broth, salt and pepper in a saucepan over medium heat and bring to a low simmer. Reduce heat to low.
2. Heat butter or olive oil in a large skillet on medium heat. Add garlic and leek and cook until soft, about 4 minutes.
3. Stir in rice and carrots, coating them with butter or oil.
4. Turn heat to medium-low. Stir in hot broth, 1 cup at a time, waiting for rice to absorb liquid before adding more — this will take 30–35 minutes. Add asparagus and peas when about 1 cup of broth is left.
5. Stir in almonds just before serving, so they stay crunchy.

*To roast slivered, chopped or sliced almonds:

Spread in an ungreased baking pan. Place in 350°F oven and bake 5 to 6 minutes or until golden brown and fragrant; stir once or twice to assure even browning. Note that almonds will continue to roast slightly after removing from oven.



REAL RESULTS REAL PROFITS



PRODUCTION HISTORY

4th leaf	Firebaugh	110 trees/ac	2,332 lbs/ac
3rd leaf	Dinuba	124 trees/ac	1,160 lbs/ac
3rd leaf	Shafter-Wasco	124 trees/ac	1,692 lbs/ac
3rd leaf	Westly	124 trees/ac	1,600 lbs/ac
3rd leaf	Oakdale	130 trees/ac	1,600 lbs/ac
3rd leaf	Turlock	130 trees/ac	1,200 lbs/ac
3rd leaf	Turlock	130 trees/ac	1,100 lbs/ac
4th leaf	Fowler	132 trees/ac	2,058 lbs/ac
4th leaf	Dinuba	124 trees/ac	2,400 lbs/ac
3rd leaf	Riverdale	132 trees/ac	1,700 lbs/ac
6th leaf	Firebaugh	135 trees/ac	3,694 lbs/ac
3rd leaf	Sanger	136 trees/ac	1,325 lbs/ac
3rd leaf	Modesto	138 trees/ac	1,503 lbs/ac
4th leaf	Modesto	138 trees/ac	3,138 lbs/ac
3rd leaf	Shafter-Wasco	124 trees/ac	1,138 lbs/ac
8th leaf	Salida	138 trees/ac	3,145 lbs/ac
4th leaf	Pixley	140 trees/ac	3,400 lbs/ac
3rd leaf	Merced	141 trees/ac	1,450 lbs/ac
4th leaf	Gustine	145 trees/ac	2,300 lbs/ac

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Sustainability Initiatives Supporting *Blue Diamond*



Blue Diamond's comprehensive Sustainability Program includes all facets of the company. While this column has historically focused on sustainability issues centered around grower practices, we want to highlight how we talk about it with regards to our facilities and our local California distribution network.

Facilities

In our processing plants, *Blue Diamond* employs a continuous improvement process in its operations, seeking to reduce inputs and waste while improving quality, throughput, and yields simultaneously improving food and team member safety. Each of our facilities has a sustainability team comprised of team members who explore, develop, and implement sustainability initiatives with the support of the entire facility.

Our buildings have green building aspects that help with energy efficiency and resource impact. Some examples include LED lighting equipped with motion sensors, controlled environment with rapid opening/closing doors, multi-staged HVAC, air compressors and boilers for on-demand point of use, and automated controls, all of which help to minimize our energy costs. Our manufacturing

processes utilize state of the art technology such as variable frequency drives, energy efficient motors, and a battery powered forklift fleet. Our processing facilities use water efficiently, mainly for sanitation and quality control. In addition, our sterile blanching water is recycled and reused.

Continued new product innovation and recycling efforts reduces our by-product streams and ensures landfill is minimized. As we continue to evaluate and reduce our waste streams, we'll continue to strive towards zero waste.

Examples of current sustainability initiatives:

- Partnering with the Department of Water Resources to reuse our super sacks as sandbags during floods, dam breaks, and levee overflows which diverted 13.58 tons of super sacks from landfill in FY19.

- Installing trash compactors to maximize haul offs, reduce CO2 emissions, and reduce our waste bills.
- Replacing disposable shoe coverings with reusable coverings, reducing our landfill and resource use.
- Using Motor Control Center metering to identify unusual spikes in power signatures that can indicate problems with equipment. This metering helps prevent down time, identifies preventative maintenance areas and identifies power signatures on equipment.

California Distribution Network

We've recently redesigned our internal storage network and distribution strategy in order to optimize material movements between facilities which will help to reduce our distribution footprint and associated greenhouse gas emissions.

Our new network and process changes will eliminate approximately 3,000 truckload movements annually, with other benefits that include:

- Avoiding 488.6 metric tons CO2eq.
- Reducing the amount of contributed particulate matter.
- Saving 47,996 gallons of diesel per year.

As *Blue Diamond Growers* continues its path of continuous improvement and sustainability, data collection and measurement as well as efficiency and impact reduction initiatives will continue to be important in all aspects of the cooperative, including our facilities, distribution network, and grower practices. ◆



Catherine Campbell,
Head of Sustainability
and Social Impact,
Blue Diamond Growers

Not Pictured:
Neal Amsberry, Sustainability Leader, Salida Facility

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Blue Diamond Exhibits at Gulfood, World's Largest Food & Beverages Trade Show



In February, *Blue Diamond* exhibited at the Gulfood show in Dubai. As the world's largest food and hospitality tradeshow with over 100,000 attendees, 5,000 exhibitors, and 120 country pavilions, the co-op's Global Ingredients team has been attending this show for over 18 years. Each year the *Blue Diamond* booth is one of the main attractions with standing room only. *Blue Diamond* also works closely with the U.S. Foreign Agriculture Service by participating in their functions at Gulfood within the USA pavilion.

"This show is unique because attendees are not only eager to learn and look for new products for their individual markets, but also many attend the show to make contracts for their almond requirements," noted Warren Cohen, vice president of

international sales for *Blue Diamond*. "Many attendees are from India, but we also book business with buyers from across the world including China, the Gulf States, North Africa, and new markets in Central Asia. The timing of the show is also perfect for many Middle Eastern markets as they are contracting for their spring Ramadan festival demand. Most attendees are well aware of the benefits of almonds as this superfood has been part of their cultures for centuries." ♦

“This show is unique because attendees are not only eager to learn and look for new products for their individual markets, but also many attend the show to make contracts for their almond requirements.”

Blue Diamond Introduces Latest Addition to BOLD Line: Spicy Dill Pickle Almonds

Blue Diamond is excited for the latest expansion to their line of BOLD Snack Almonds with the launch of Spicy Dill Pickle. This new flavor takes snacking to the next level with almonds that provide a dill-icious, tangy kick.

The Spicy Dill Pickle flavor is available online and in major retailers. This latest innovation is a mouthwatering pairing of dill and spicy garlic that harkens back to a fan-favorite snack and barbecue or picnic side dish. With a balance of savory, spicy and sour seasoning, Spicy Dill Pickle leaves taste buds reveling in tangy saltiness. The launch of Spicy Dill Pickle expands the depth of complex, delicious flavors of Blue Diamond® Almonds.

Through rigorous research, Blue Diamond found a growing demand for dill and pickle flavors across food categories. Combining zesty and vinegary flavors with our highest-quality California-grown almonds, this new flavor introduces a product that is unique and undeniably craveable. ♦



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The “Split Roll” Tax Ballot Initiative and Its Impacts on Agriculture

This year on the ballot, voters will be asked to vote on a “split roll” initiative, which would amend Proposition 13 from 1978 to exclude commercial property from its protections against extreme property tax increases. The initiative, officially known as the California Tax on Commercial and Industrial Properties for Education and Local Government Funding Initiative, has qualified to appear on the November 3, 2020 ballot in California as an initiated constitutional amendment.

This revision to the Proposition 13 is very different from the Proposition 13 that was on the March 2020 ballot which was the California Schools and Local Community Funding Act of 2018.

In fact, due to the mass confusion, Legislators are trying to have the number 13 removed from assignment for any future proposition initiative.

Background on Proposition 13

Proposition 13 has been the law for more than 40 years. In 1978, property values were soaring and so were their corresponding property taxes. There was no limit to how high an assessor could increase a property’s value in any given year. Between 1972 and 1977, home prices in Southern California doubled. Property tax bills also doubled, even if the tax rates did not change. Many taxpayers could not afford their ever-increasing property taxes and feared losing their homes. Proposition 13 brought a halt to all that — limiting total taxes to one percent of the property’s value, and any increases to a maximum of one



percent per year. California voters passed the constitutional amendment by a nearly two to one margin, and solidified property tax reasonableness and predictability.

Proposition 13 Amendments to State Constitution Keep Property Taxes Manageable and Predictable

Proposition 13 required that all categories of real property on the local assessment roll be assessed at the same basic tax rate and under the same valuation standard. It did not distinguish among residential, commercial, industrial, agricultural, or any other type of property. When a property is sold, it is reassessed at its new purchase price. It is then taxed at a rate of one percent of that new value, and from then on, Proposition 13’s tax limits apply until it is sold again. These protections provide stability and predictability to both property owners and government coffers — protecting both from very high or very low reassessed property values each year.

Furthermore, Proposition 13 required any state tax to be

approved with a two-thirds vote of both houses of the Legislature. It required approval by two-thirds of voters for any tax levied by local governments that was designated for a special purpose, like parks or roads.

What Is Split Roll?

A tax roll is the official list of all the properties to be taxed. "Split roll" means applying a different tax formula, either tax rate, reassessment frequency, or vote requirement, to commercial and industrial properties than that applied to residential properties. Proponents of a split roll would remove some of the protections of Proposition 13 from nonresidential properties in order to raise taxes.

How Will This Impact California Agriculture?

Although the revised initiative includes a small business and agricultural land exemption, the split roll still would be crippling to a significant portion of businesses. The agricultural exemption language only applies to the "land." The current tax law defines "real property" as land, improvements and fixtures, which for farmers means that real agricultural property is defined as not only the land, but also fixtures such as irrigation systems, and improvements — barns, processing facilities, and fruit trees and vineyards once they reach maturity.

Under the California Constitution, vineyards are only exempt for the first three years after the season in which they are planted, and orchards are only exempt for the first four years after the season they are planted. Other improvements would be subject to reassessment and would also require all food and agricultural processing facilities to be reassessed at their highest and best use.

The initiative would not require row crops, such vegetables and cotton, to be reassessed, as those are exempt under the

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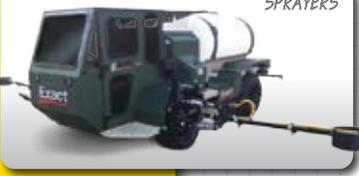
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California Constitution, but they will face higher property taxes when the crops go to packing facilities and processing areas.

Almond Alliance, California Farm Bureau Federation and California Chamber of Commerce Positions

The Almond Alliance, California Farm Bureau Federation and California Chamber of Commerce all strongly oppose the split roll proposal. The commonly shared belief is that a split roll proposal will hurt the business community as well as employees and consumers, thereby having a negative impact on our entire economy.

An almost \$11 billion split roll tax increase will prevent businesses from hiring new employees and, potentially, from keeping existing ones. The stability and predictability brought by Proposition 13 has allowed California businesses to compete nationally despite the high cost of doing business in this state.

A “yes” vote supports this constitutional amendment to require commercial and industrial properties to be taxed based on their market value, rather than their purchase price.

A “no” vote opposes this constitutional amendment, thus continuing to tax commercial and industrial properties based on a property’s purchase price, with annual increases equal to the rate of inflation or two percent, whichever is lower. ◆



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THE BEE BOX

What's All This Buzz About Citizen Science?

You see him getting into his truck very early in the morning but his vest sports no lures, he carries no tackle box, and where is the rod and reel? Where in the world is he going at this hour with those binoculars? Turns out he's one of the thousands of citizen scientists around the nation who spend a winter day counting every bird they see or hear for the annual Christmas Bird Count. This bird census administered by the National Audubon Society is one of the longest running citizen science efforts since 1900. Is citizen science going on in the world of almonds and honey bees?



Bees and almonds: opportunities abound for citizen science.

Citizen science had been taking place long before the organized bird counts. The term citizen science, while coined sometime in the last 25 years or so, has varying definitions but it is easiest to think of it as the general

public helping to collect and, at times, analyze data for research projects in conjunction with professional scientists. Yet centuries ago, specialized training didn't lead people to figure out how things worked, instead it was insatiable curiosity that drove their research. Think about our first astronomers, explorers, inventors and farmers. Now that most of the public has easy access to a highly computerized field data collector, their smartphone, we all can serve as citizen scientists, and often do.

On the highway if you are about to drive through a speed trap your GPS app, perhaps Google Maps or Waze, asks you to confirm if the trooper is still pointing the radar gun at your vehicle when you drive through those coordinates. The public is providing data for these GPS systems to deliver information to other drivers in real-time. Perhaps even unknowingly to you your smartfridge is talking to its mothership and you are involved in citizen science by default. Backcountry skiers can carry sensors for avalanche researchers, families send in their DNA to genealogy sites, hikers map unplugged orphan well sites so that they can be safeguarded, photographers snap photos of today's landscapes to compare to lithographs in history books, relatives check themselves in as safe on Facebook after a natural disaster, voters participate in exit polls after elections, all of these citizen science activities contribute to datasets in some way.

Opportunities are endless in terms of the public assisting in scientific discovery and bees and almonds are ripe for it. The Bee Informed Partnership (BIP) depends on citizen

“The term citizen science, while coined sometime in the last 25 years or so, has varying definitions but it is easiest to think of it as the general public helping to collect and, at times, analyze data for research projects in conjunction with professional scientists.”

science for data collection in various ways. As a 501(c)(3) non-profit, BIP focuses on improving honey bee colony health through data-driven activities. BIP's annual Loss and Management Survey provides information about national trends of colony health. For commercial operations we offer diagnostic services to help provide rapid disease and pest monitoring so beekeepers can make management decisions shortly after problems are discovered. In the same vein, backyard beekeepers can use our sampling kits to detect emerging problems in their hives through our Sentinel Apiary Program.

Beekeepers and growers are often remarkable citizen scientists. Many farmers keep meticulous records of the weather, inputs, pests, prices, so many that companies emerged and found a marketable niche in selling electronic record-keeping systems to agricultural businesses. Beekeepers often track similar variables throughout the years. There are beekeepers in backyard, sideliner and commercial outfits, that have tracked the blooming periods



Collecting samples for BIP's Sentinel Apiary Program.

of several flowering plants, bushes and trees stretching back decades. We are at a time when there are so many data sets captured on anything from torn off corners of feed bags to high-end and powerful computerized analysis



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tools. Working with researchers to help analyze these data, more predictions, recommendations and best management practices become possible.

Imagine taking a beekeeper's meticulous notes that list dates and pollen type collected in pollen traps over half a century. What if this type of beekeeper existed in every state, every region, every county, every 100 square-mile area? What if all of those lists were compiled and analyzed? Can you imagine what could be learned about forage resources for honey bees? This type of study would be virtually impossible without citizen science.

Can the general public be trusted to do science? Absolutely. Could there be errors in the data due to inconsistent data collection methods? Yes. The contributions of non-researchers to research studies, however, likely far outweigh the pitfalls. Additionally, citizen scientists offer a tremendous amount of anecdotal information that can help explain patterns and phenomena and add rich color about cultural and generational practices that the data alone do not convey.

As BIP heads into its first strategic planning process in 2020, the organization will seek input from external stakeholders and citizen scientist beekeepers and growers



are certainly an important segment of that group. What piece of the puzzle do almond growers hold? What questions do you have and what data could you collect to help answer these questions? The beauty of citizen science is that anyone with an interest can take part. Projects range spatially from the oceans to space, in size from the nanometer to light-years and in life from microbe to elephant. With so many projects buzzing around, there are opportunities for everyone.

Just as epidemiologists are tracking the spread of COVID-19 on maps, similar models can be used to track the spread of diseases that affect agriculture. Confirmed cases of coronavirus are reported in a central database and this allows researchers to develop predictive models. BIP serves as an aggregator of bee health data, derived from samples sent in by both trained professionals and citizen scientists. Longitudinal data, that is, information from samples taken across time, become even more valuable to analyses. Compiling the data collected from professional researchers and citizen scientists makes studies at the landscape scale possible. ♦



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THE ALMOND BOARD

Navel Orangeworm Monitoring Starts Now

Almond growers know that the fight against Navel Orangeworm (NOW) is a year-round effort — they're never "off the clock." That's because NOW remains one of the biggest threats to a grower's crop — and bottom line — due to the damage worms can do to nuts and the risk of aflatoxin contamination.

Growers' battle against NOW takes different forms during different times of year. In the winter, the focus is on ridding orchards of mummy nuts, the cold-weather hideouts for NOW larvae. During the beginning of nut set, the fight transitions to locating and eradicating as much of the first generation, or "flight," of moths that spur the exponential growth of future NOW generations each season.

Use Traps to Track NOW Levels

Pest management experts say the primary thing growers should be doing this time of year to combat NOW is to put out pheromone and egg traps to help determine NOW levels in their orchards.

Pheromone traps monitor the flight of male moths. It is recommended that growers hang one trap per 50 acres, or at least two per orchard, in the tree canopies about six to eight feet off the ground. The best time to place traps is in early March.

The University of California (UC) Integrated Pest Management (IPM) guidelines advise

growers to "count the number of moths in the trap at least once per week and track the data to identify adult flight." It is also important to correctly identify NOW moths, which are characterized by their "irregular, silver gray and black forewings and legs and a snoutlike projection at the front



March is the time when the fight against Navel Orangeworm moves from winter sanitation to setting traps in orchards.

of the head," as pheromone traps also attract meal moths, which are light brown with dark brown bands on their wings.

In terms of egg traps, UC IPM guidelines recommend that growers place these traps in their orchards by March 15. It is suggested that there be at least one trap for every 10 acres, or a minimum of four traps per orchard. More traps — as many as 10 per orchard — allow for a more accurate estimate, experts say.

Egg traps are made up of black plastic tubes with mesh siding and snap tops, and are half- to three-quarters full of almond presscake laced with three to 10 percent almond oil. Growers can also grind almond or pistachio mummy nuts to use instead of presscake.

Traps should be monitored for NOW larvae eggs one to two times a week, and are most effective during the first flight of NOW in April and May. The UC IPM website offers a monitoring form¹ growers can use to help keep track of the number of eggs per trap during the monitoring period.

Using traps to determine NOW levels and choosing the appropriate treatment option is an important part of every grower's IPM program. Growers can consult the UC IPM website² for treatment options, in addition to speak with their PCAs.

Mating Disruption Puts Monitoring into Action

Josette Lewis, director of Agricultural Affairs for the Almond Board of California, recommends growers work with their PCAs to integrate mating disruption methods into their orchards.

Mating disruption interferes with the ability of male NOW moths to find mates. It involves strategically placing “dispensers” throughout the orchard, which flood the air with a pheromone that disrupts the male’s ability to find females and mate, thus delaying or reducing mating and egg deposition.

Lewis suggested small growers consider working collaboratively with their neighbors “as the technology works best over 40 acres.” She also said there is incentive funding available from the U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) to help offset the cost of mating disruption. (For more information on NRCS incentive funding, contact your local NRCS district office.)

Beyond NOW’s direct threat to growers’ orchards is its impact on their bottom line. At ABC’s Navel Orangeworm Summit last year, *Blue Diamond’s* Director of Member Relations Mel Machado reported that Nonpareil rejections caused by NOW damage are generally below 1.5 percent across the state, but that in 2017 the levels rose to two percent. When total losses are considered, he said, NOW damage at the two percent reject level can cost growers about \$450 an acre, which is \$4,500 for a 10-acre plot. In comparison, according to Jonathan Hoff of Monte Vista Farming Company, who also spoke at the summit, a NOW control program, including sanitation, sprays and mating disruption and informed by monitoring, costs about \$250 per acre — a savings of \$2,000 per 10-acre plot when you consider the repercussions of rejected product.

To learn more about the costs associated with NOW damage and what you can do to avoid them, check out this presentation³ from the Navel Orangeworm Summit hosted by the Almond Board of California in June 2019. ◆

Article contributed by the Almond Board of California

¹ ipm.ucanr.edu/PMG/C003/almond-orgwormeggtrap.pdf

² www2.ipm.ucanr.edu/agriculture/almond/Navel-Orangeworm

³ www.almonds.com/sites/default/files/content/attachments/How%20much%20does%20NOW%20damage%20cost_slides.pdf

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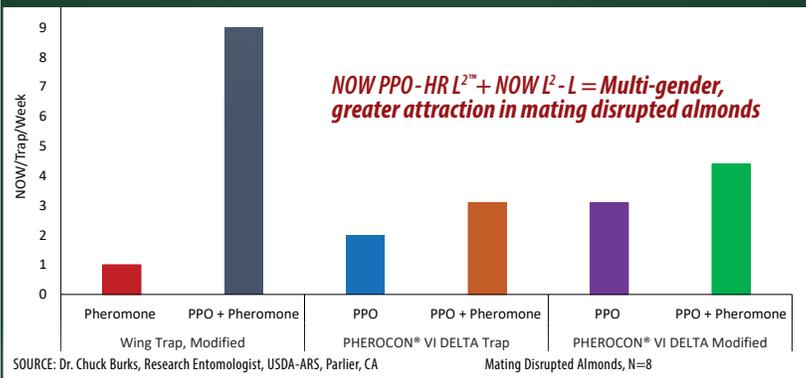
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TIME TO CONSIDER

This time of year, a wide range of tasks, all requiring careful attention, including irrigation, fertilization, and disease, insect and weed management, need to be done to deliver a high-quality crop. In 2020, spring looks to be especially challenging as crop potential seems good, but surface water availability is limited in many areas and a warm winter may accelerate insect and mite pressure.



Almond orchard in March. Photo Credit: Franz Niederholzer.

Irrigation

Nothing is more important than adequate, effective irrigation to produce the best crop possible. However, as of early March, surface water allocations are 15 to 50 percent of contract in many almond growing areas in the Central Valley Project. To help growers and CCAs do the best irrigation job possible with limited water, a recent UC ANR publication on managing almond irrigation under low water availability is available for download at anrcatalog.ucanr.edu/pdf/8515.pdf.

While it's too early to know what the final surface water allocation(s) will bring, it's not too early to review options. Many readers may already have run through the following, but here are a few practices/lessons learned for maximizing water to the crop.

- Maintain your irrigation system(s) to make sure you are evenly applying what you think you are applying. See detailed information at micromaintain.ucanr.edu.
- Run irrigation systems when evaporation risk is low, especially for sprinkler irrigated orchards. Evaporation loss from wet soil surfaces on hot, dry days is as much as 25 percent of applied water, water you paid to pump and is not plant available. This loss percentage should be less in spring but establishing the practice of night irrigation early in the season should set you up for more savings in summer. Finally, irrigation sets should be longer than six hours to reduce percentage of total water lost but not so long as to produce runoff.
- Take irrigation water samples (well and surface water) through the season to check water quality. Salinity, toxic elements and/or carbonates in irrigation water can potentially harm irrigation delivery/orchard health. These levels can change with time and water source. Don't assume that surface water is clean, as well water and runoff can end up in canals in dry years. The information in the irrigation water quality table in this article shows the general degree of risk/problems associated with different water quality measurements.
- If water availability is very tight, consider reducing irrigation on older blocks planned for removal and shift water savings to younger blocks. Loss potential in young orchards is the greatest of all plantings as vegetative growth and future yield potential are delayed with water stress. It takes two years of full irrigation to return an orchard to pre-stress production. If the plan is to remove a block within two to three years, consider removing it this year and using the saved water to keep younger blocks as healthy as possible.

Irrigation Water Quality Evaluation Measurements, Units & Relative Risk to Orchard/Irrigation Deliver				
Measurement/Concern	Unit	DEGREE OF RISK/PROBLEMS		
		None	Increasing	Severe
Salinity (Chemical Water Stress)	dS/m	<1.1	1.1 – 3.2	3.2<
Boron (Toxic Element)	mg/l; ppm	<0.5	0.5 – 3.0	3.0<
Chloride (Toxic Element)	meq/l	<4.0	4.0 – 10.0	10.0<
Sodium (Toxic Element)	meq/l	<4.0	4.0 – 7.0	7.0<
Sodium Adsorption Ratio (Infiltration)	none	<3.0	3.0 – 9.0	9.0<
Drip Emitter Plugging, Calcium Loss In Soil. (Bicarbonate)	meq/l	<1.5	1.5 – 8.5	8.5<

Practices that have not shown significant water savings:

- Removing cropland to reduce water use generally results in increased vegetative growth, which uses more water.
- Spraying trees with white mineral products (clay, chalk, etc.) can reduce water stress by a small, but relatively minor amount.
- Using anti-transpirants to reduce water loss from leaves has not shown to be effective in past UC research. Untested materials are just that and should be evaluated carefully with some similar rows left untreated for comparison.

In order to maximize benefit from available water, develop a water plan for each orchard with an experienced CCA. The stakes are high; one year of severe water stress will mean two years of losses as far fewer flowers for next year's crop differentiate and develop in water stressed trees this year.

Nutrition

The key to successful almond nutrition in mature blocks is feeding the crop as it develops. Springtime almond orchard nutrition is focused on getting enough nitrogen and potassium to the trees to maintain adequate leaf levels of those nutrients.

Nitrogen

Almonds use 68 pounds of nitrogen (N) to produce 1,000 pounds of kernel crop. There are 68 pounds N in the hulls, shells, and kernels removed from the orchard for every 1,000 pounds of kernels in your grade sheets. Annual N budget for each orchard should be calculated from average yield per acre and 68 pounds of N per 1,000 kernels. If you will be short of water this year, this should lower your production by that percentage and reduce N and potassium (K) demand per acre by that percentage. Other sources of N (irrigation water, etc.) besides fertilizer should be subtracted from the total N budget when calculating the fertilizer N budget. Current N input

IN YOUR ORCHARD

recommendation is for 20 percent of annual N budget to be applied between petal fall and by full spur leaf out, 30 percent of total N budget applied between full leaf out and shell hardening (roughly first half of April) and 30 percent of the total N budget applied between shell hardening and the end of kernel fill (mid to late May). Application of the final 20 percent of the annual N budget is recommended to go on between hull-split and early postharvest. There is an online nitrogen calculator available through the Almond Board of California's website, almonds.com/nutrients/calculator, to help with calculations and documentation.

Potassium (K)

Beware of K deficiency developing in heavy crop years. Almonds use 15 to 25 percent more K than N for the same crop, with K use running between 80 and 100 lbs. K₂O per 1,000 pounds of kernel crop. Heavy crops

remove large amounts of K and can push the orchard into deficiency if K inputs are not applied to offset this loss. If a complete K replacement program is not in your budget this year (for example, 480 pounds SOP per acre applied to replace K lost in a 3,000 pound per acre crop), consider that almond orchards treated annually with 250 pounds SOP per acre didn't drop below the 1.0 percent leaf K deficiency threshold in several UC studies, each lasting two to three years.

A spring leaf sample is a good idea in a heavy crop year to keep your nutrition program from drifting into the red. Information on the UC Early-Season Sampling program is available at ucanr.edu/sites/scrri/files/189631.pdf. Samples should be taken 36 to 48 days after full bloom and analyzed for all nutrients and all data fed into a computer model to give a prediction of July leaf N level. With spring leaf sample results, growers and PCA/CCAs

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can adjust fertilizer N rates up or down with a ballpark summer leaf N target of 2.5 percent N. Private labs also offer proprietary spring leaf sampling protocols developed in-house.

Pest Management

Warm weather speeds up insect and mite development. Earlier than normal monitoring will be key to avoiding pest surprises this season. If good weather continues, biofix for both NOW and PTB should be weeks ahead of last year. If spring temperatures fluctuate and NOW egg trap data bounce around, use the first-catch timing to plan NOW program. Mating disruption for NOW should be up in late March or early April based on manufacturers' recommendations.

A spring spray (mid-April through early May) targeting PTB and NOW can provide good control. Consider your spray budget and outside-the-orchard moth pressure when deciding on a spring spray against NOW versus adding another spray in hull split. Time the spring NOW control spray for 100 DD past biofix. The timing for PTB control is 300 to 400 DD, depending on the pesticide. Some years, the two line up fairly well and good control of both pests is possible. Dr. Frank Zalom, with UC Davis, suggests using first egg "catch" to establish biofix in the northern San Joaquin Valley and Sacramento Valley. This practice works well in predicting appearance of second-generation egg laying in late June/early July in my experience.

Plant bug (stink bugs and leaffooted bugs) adults should be carefully monitored to limit crop damage. The adults are strong flyers and can do a lot of damage, quickly, if undetected. It's too late when you see gumming nuts on the orchard floor. Pyrethroids (Brigade[®], Warrior[®], etc.) are the most effective materials for leaffooted bug control.

Spider mites often appear early in warm dry years. The UC IPM guidelines (ipm.ucanr.edu/agriculture/almond/Webspinning-Spider-Mites/) suggest starting to scout for

web-spinning mites in May, but in water-stressed blocks, spot checks prior to May could be valuable. If the spring weather goes through high and low temperature patterns, beneficial insects such as δ -spotted thrips (ipm.ucanr.edu/PMG/NE/sixspotted_thrips.html) can keep the population under control, at least before the steady heat sets in. See mite monitoring info at the UC IPM website listed above.

Spring/Summer Diseases

Rainfall is a key driver for diseases, but dew can also contribute to infection. Diseases for consideration in the spring are leaf rust, scab and anthracnose with shot hole and bacterial spot pressure generally fading (but not gone from concern) and alternaria becoming more of an issue. Details for control of all of these diseases are available at www2.ipm.ucanr.edu/agriculture/almond and ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf.

Rust can be especially damaging to future yield if not controlled as it can cause leaf loss at harvest and reduced



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The same leaf (front & back) with rust symptoms. Photo Credit: Franz Niederholzer.

flowering the following year. In blocks with a history of leaf rust, UC IPM Guidelines (www2.ipm.ucanr.edu/agriculture/almond/Rust/) recommend a sulfur spray five weeks after petal fall followed six weeks later by a FRAC 11 or 3 fungicide. Propiconazole is a FRAC 3 material and there are issues with this material in the European Union. Consult with your processor before selecting fungicides for use this spring.

A carefully calibrated sprayer is a critical tool for effective pest control. Check with water sensitive paper to make sure your sprayer delivers uniform spray coverage throughout the canopy.

Vertebrate Control

Gopher control in almonds protects trees and limits dust produced when mowers run over mounds. Trapping, phosphine gas and poison bait are all effective practices for gopher control in the spring. Use of phosphine gas

tablets is regulated, so consult with your County Ag Commissioner before doing any gopher control. Once the ground dries and cracks, gas can leak out of tunnels, giving less gopher control. Using two of the listed practices gives more complete gopher control than using just one. Providing training to your employees in gopher tunnel location and trapping improves trap catch numbers. Watch UC ANR Extension Specialist Roger Baldwin demonstrate how to locate gopher tunnels and set traps at [youtube.com/watch?v=iDW0l6eeGOM](https://www.youtube.com/watch?v=iDW0l6eeGOM).

Separate training programs for gophers, ground squirrels and meadow voles are available at ucanr.edu/sites/vpce/. (You may have to permit Adobe Flash Player to open on certain web browsers. I had to do this for Chrome.) Two CE hours can be obtained, for payment, after watching each program. No payment is needed if watching the videos for educational content.

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Weed Control

Summer weed control in mature and young orchards is challenging given the growing number of glyphosate (Roundup®, etc.) resistant weeds, increasing labor costs for repeated “burndown” sprays, and risk of herbicide damage to trunks in young orchards.

Late spring application of surflan or pendimethalin is an effective approach for summer grass (jungle rice, 3-spiked goosegrass, sprangletop, etc.) control in almond orchards, but it’s limited to sprinkler irrigated orchards. Use of one quart surflan per acre across the orchard floor in late April/early May in a sprinkler irrigated orchard gave good summer grass control from trunk to trunk in research by Joe Connell, retired UCCE Farm Advisor in Butte County. Reduced tractor trips for mowing and herbicide spraying were measured with this practice compared to mowing and strip spraying with glyphosate.

Effective weed control in young orchards is challenging given label limitations on many preemergent materials. Trellis®, surflan and pendimethalin are safe preemergent herbicide for young trees, but other popular materials specify postplanting limitations. Repeated postemergent (burndown) herbicide applications can be expensive, depending on the target weeds and herbicides used. In addition, tree damage can result from use of postemergent herbicides in young orchards.

It can be difficult to keep herbicides off young trees. Don’t expect white paint to protect young tree trunks from all herbicide rates and combos. In UC research last summer, a 1:1 white latex paint/water mixture painted on trunks did not protect second leaf almond trees from trunk damage when maximum rates of glyphosate and glufosinate were applied together. Damage was similar whether applied trunks were painted two days or nine weeks before spraying. New trunk cartons provided the best trunk protection, followed by bare, unpainted trunks hardened off by nine weeks without any carton with the painted trunks showing the worst damage (see photo). See study details at ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=38701. This work will be repeated to confirm



Vulnerable green tissue is just behind paper-thin painted bark on this 2nd leaf Nonpareil tree. Any micro cracks in the paint could allow herbicide to reach that vulnerable tissue. Photo credit: Franz Niederholzer.

the results, but this work shows 1) tree protection cartons are the best protection for young trees and 2) trunk paint can provide excellent sunburn protection but may not keep out damaging herbicides. Replacement cartons are expensive in time and labor, but that cost should be weighed against possible tree losses/trunk damage and the time and money spent pulling out and replanting what were established trees.

Finally, when selecting and timing any pesticide application, always read the label carefully and consult with an experienced PCA.

This year looks like it will be interesting and demanding in many ways: weather, water, world markets and Covid19 pandemic. All the best to all readers and their families. ♦



**Franz Niederholzer,
UCCE Farm Advisor,
Colusa & Sutter/Yuba Counties**

A graphic element consisting of three overlapping, stylized arrow shapes pointing towards the top right, located to the right of the Alion brand name.

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For more information, call Don at:
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(209) 612-4830

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