

# WEST COAST NUT

August 2018 Issue

## SPOTLIGHT:

2018 Pistachio Crop  
has Potential to be  
a Record Crop

See page 4

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Advancing Harvest with Ethephon

Adding Value to Almond Biomass

An Update on Pre-Plant Biosolarization with Hull and Shell

Finishing This Crop and Protecting Next Year's Buds

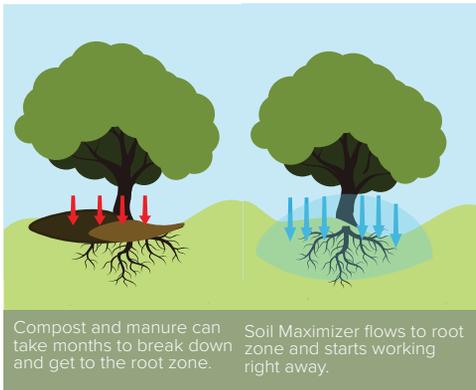
Almond Biomass Research Finds Potential

# OVERCOME REGULATORY CONSTRAINTS WHILE IMPROVING SOIL HEALTH

Nut growers face numerous challenges to maintaining healthy soils in the current regulatory environment. These include: regulations for air quality and tillage; ground water protection; nitrogen management and reporting; Food Safety and GAPs. Soil health is important to nut growers because healthy soils are productive soils which reduce production costs and increase profits. Healthy soils are also sustainable and protect natural resources on and off the farm. A traditional way of promoting soil health has been to amend with compost or manure.

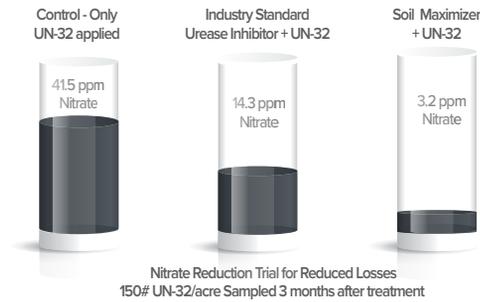
## Less dust, no harvest contamination

For other crop systems, compost can be incorporated into soil through tilling. However, in nut orchards a common practice is spreading composts or manures on top of soil and waiting for them to decay and seep into the soil. This practice has the inherent problems of expensive application, dust control and later risk of crop contamination at harvest from compost or manure residue still on the orchard floor. A proven, safer and easier to apply alternative to compost is a product called Soil Maximizer. For more than 25 years Soil Maximizer has improved soil health in orchards and other crop types.



Compost and manure can take months to break down and get to the root zone.

Soil Maximizer flows to root zone and starts working right away.



## Reduce Nitrate Losses

Increasing regulatory oversight of nitrate management has created another compliance issue for growers. Soil Maximizer has shown a significant impact on nitrate losses because it improves nutrient mineralization and availability.

## Measuring Soil Health

New tools are available to achieve and measure soil health that will allow growers to explore alternatives that are regulatorily compliant and easy to use. The measurement tools are the Solvita CO<sub>2</sub> test and the Haney Soil Health Test. The Solvita test measures soil microbe health by quantifying respiration of CO<sub>2</sub>. The amount of CO<sub>2</sub> emitted by microbes has a direct correlation to their population and indicates soil health. The Haney test was developed by a researcher at USDA and is a more comprehensive soil health test that measures several factors, including respiration. The Solvita and Haney tests have been used to show the effect of Soil Maximizer on soil health. Soil Maximizer is a liquid product that can be applied through the irrigation system using 20 gallons to the acre. This elicits the same response as two tons of compost, but at a fraction of the cost! Soil Maximizer goes directly to the root zone and starts working by enhancing nutrients from previously applied fertilizer and organic matter.

### Solvita CO<sub>2</sub> Measurement of Microbial Activity

	Farm A	Farm B	Farm C	Farm D
Untreated	1.05	4.53	2.50	33.10
Treated	4.00	5.24	4.00	78.40
Improvement %	167%	16%	60%	137%

### Haney Soil Health Test and Nutrient Availability Measurement

	Untreated	Treated	Improvement %
Soil Health Index	6.25	11.20	79%
Organic Matter	1.20	1.60	33%
Total Organic Carbon	111	146	21%

### Capacity to mineralize nutrients:

	Untreated	Treated	Improvement %
Nitrogen	7.2	15.3	113%
Phosphorus	5.6	12	114%

### Effect on nutrient availability (ppm):

	Untreated	Treated	Improvement %
Organic N	15.5	15.3	13%
Inorganic N	13	16.7	28%

## Soil Maximizer is:

- Regulatorily compliant, with no preharvest interval
- Proven to decrease nitrates to protect groundwater
- Certified plant and human pathogen free, so nuts do not become contaminated
- Registered with CDFR as an Organic Input Material
- Meets processor residue standards and biosecurity demands (many processors are banning the use of animal and green manures)

Soil Maximizer is affordable, and it improves soil health in crop systems where compost is impractical and/or hazardous.



# MARKETING

PO BOX 27772 | FRESNO CA | 93729

**Publisher:** Jason Scott  
Email: [jason@jcsmarketinginc.com](mailto:jason@jcsmarketinginc.com)

**Editor:** Kathy Coatney  
Email: [kathy@jcsmarketinginc.com](mailto:kathy@jcsmarketinginc.com)

**Associate Editor:** Cecilia Parsons  
Email: [cecilia@jcsmarketinginc.com](mailto:cecilia@jcsmarketinginc.com)

**Production:** [design@jcsmarketinginc.com](mailto:design@jcsmarketinginc.com)  
**Tel:** 559.352.4456

**Fax:** 559.472.3113

**Web:** [www.wcngg.com](http://www.wcngg.com)

## Contributing Writers & Industry Support

**Abhi Kulkarni**  
Assistant Director, Technical Support at California Walnut Board & Commission

**Almond Board of California**  
Contributing Writer

**Amy Wolfe**  
MPPA, CFRE President and CEO, Agsafe

**Chris McGlothlin**  
Western Agriculture Processors Association

**Dani Lightle**  
Orchard Advisor, UC Cooperative Extension

**Jenny Holtermann**  
Contributing Writer

**Julie R. Johnson**  
Contributing Writer

**Rory P. Crowley**  
Coo and EVP  
Nicolaus Nut Company, Chico

**Rich Kreps**  
CCA, Contributing Writer

## UC Cooperative Extension Advisory Board

**David Doll**  
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# WEST COAST NUT

## By the Industry, For the Industry

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## FEATURED ARTICLE

The pistachio industry is expecting an on year for 2018, according to Richard Matoian, executive director of American Pistachio Growers. "If you had talked to me very early on at the end of February very beginning of March, I would say that we were going to have problems in attaining a large crop this year," Matoian said... But March brought cooler weather and much needed rain.

*See the full story on page 4*



# 2018 Pistachio Crop has Potential to be a Record Crop

By: Kathy Coatney | Editor

**T**he pistachio industry is expecting an on year for 2018, according to Richard Matoian, executive director of American Pistachio Growers.

“If you had talked to me very early on at the end of February very beginning of March, I would say that we were going to have problems in attaining a large crop this year,” Matoian said.

At that time, pistachios were lacking on chill hours and rain so it looked like to be another dry year in California. But March brought cooler weather and much needed rain.

“What I initially thought was a crop that was going to be in the low end of the spectrum is probably now going to be a crop that’s going to be on the higher end of the spectrum,” Matoian said.

Matoian originally anticipated a 700 to 750 million pound for the 2018 crop, but now it looks more like a 800 to 950 million pound crop, he said.

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“That’s still a range, but it’s a much higher range than what we had thought before,” Matoian said.

Matoian is uncertain at this point whether or not this year will be a record crop.

“Our record crop was experienced in 2016 and that was 903 million pounds,” Matoian said, adding the 2018 crop has the potential to exceed it, but that won’t be determined until after harvest.

### Water Availability

The late rains had an impact in terms of water availability for the crop, Matoian said.

In certain water districts, like the Westside of the valley, they still won’t be at a 100 percent allotment. But for all other pistachio growing regions, they will receive a 100 percent of their water allocations, Matoian said.

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Pistachios at harvest.  
All photos courtesy of American Pistachio Growers.

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“It’s certainly a whole lot better than what it was when we were in February,” Matoian said.

### Insect Pressure

Matoian doesn’t have numbers in terms of navel orangeworm (NOW) pressure in the field, but there is definitely more focus on the NOW management and control. Growers are more concerned and addressing the issue, and he thinks that growers are more focused on controlling NOW in the field. Not just with spray applications, but with a variety of practices that include:

- Field sanitation during the wintertime
- Monitoring and trapping
- Spray applications at the appropriate time
- Spraying at the appropriate speed—very slow speeds

Matoian is also hopeful that the sterile insect release will add another tool to the toolbox for growers.

“I think that more growers are looking at a more holistic approach. So it’s not just trying to spray during the growing season, it’s by using all the techniques or all the tools that are available to control the pest,” Matoian said, adding but there’s no single silver bullet that will control NOW.

### Pistachio Markets

The 2017 crop is moving well, Matoian said. The domestic market has had ups and downs in recent years, but for the last two years there’s been a positive upward trend.



The export market remains strong, Matoian said. “In fact, up through this last month (the last report was for the month of April) our shipments were still ahead of the previous year.”

China has surpassed Europe as our number one export market, Matoian continued.

“I will say, despite the tariffs, movement has still been very positive to China. That’s not to say things are going to slow down,” Matoian said, adding we won’t know the impacts from the tariffs until we see the next reports.

Iran is the main country that California pistachio growers compete with for the Chinese market, Matoian continued.

Iran had large crops in 2013, 2014, and 2015, but in 2016 and 2017 they had small crops, which gave us the China market back, Matoian said.

In 2018, Iran had a freeze in the spring. “We understand that they are going to have a very short crop this year,” Matoian said, adding the freeze could also impact the 2019 crop.

“The industry believes that with a short crop from Iran, and them being our chief competitor in the world, that our shipments are going to continue to do well, and the prices are going to be very stable for pistachios, if not increasing because of the lack of product around the world,” Matoian said.

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About 70 percent of the pistachios produced in California are exported, Matoian said, and there are still several untapped export markets.

“South Korea has been a recent market that’s been opened up because of tariffs that have been lowered there, and we see good potential there,” Matoian said.

India remains an opportunity, but it hasn’t opened in the way that we’d hoped for our commodity, Matoian said.

“There are other parts of Southeast Asia that we see—Vietnam and other countries being opportunities that we’re starting to do some promotion efforts in,” Matoian said.

### **Acres Increases**

Acres continues to increase, particularly in the Sacramento Valley in northern California. “That’s where we’re seeing a lot of acres go,” Matoian said.

“The report shows that in 2017 there was about 18,000 acres planted, and that’s been up over the previous couple of years,” Matoian said, adding it’s been difficult to differenti-





# **JESSEE**

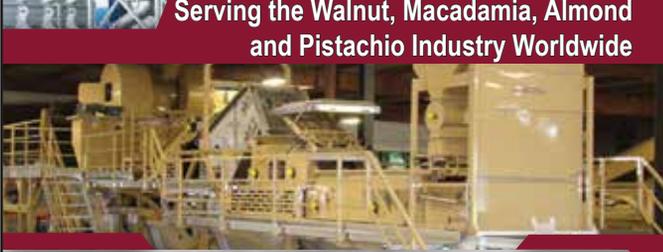
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ate between replacement acres and new acreage.

“I would say we’re seeing pistachios planted in areas of the state that we had not seen them planted previously,” Matoian said, adding with northern California being one of those areas.

Matoian said many growers are looking to diversify to pistachios, which attributes to part of the acreage increase, but he’s also heard that there are growers from the San Joaquin Valley that are looking north to areas that have a more stable water supply.

“And certainly going to northern California you would be able to get that,” Matoian said.

There are drawbacks to growing pistachios in the north, Matoian said.

“What you don’t get in northern California would be as high a production, but sometimes that becomes a tradeoff if you know you’re going to have a stable water supply,” Matoian said.

While water is definitely more uncertain in the San Joaquin Valley, there is the potential for higher production.

“But when you don’t have the water, you’re not going to get the production,” Matoian said.

### Marketing New Acreage

The increase in acreage, means finding new markets, but the great thing about pistachios is because they take so long to come into bearing, we have a long lead in time to establish new markets, Matoian said.

Some commodities are in production in three years and producing a crop, so the lead in time to open up new markets is much tighter, Matoian said.

With pistachios there is more opportunity to open up new markets due to the fact it takes seven years for pistachios to come into production, Matoian said.

“Sometimes three years just isn’t enough to open up a market, but if you have seven years, you have that ability to generate the momentum to get people to buy your product,” Matoian said.

*Comments about this article? We want to hear from you. Feel free to email us at [article@jcsmarketinginc.com](mailto:article@jcsmarketinginc.com)*



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# Advancing Harvest with **Ethephon**

By: Dani Lightle, Orchard Systems Advisor, UC  
Cooperative Extension, Glenn, Butte & Tehama Counties.

Prior to the 1930s, walnut growers and picking crews were locked in an ever-escalating battle. Crews that were hand-poling walnuts for harvest had a tendency to knock down nuts that were unable to be cleanly hulled. To reduce the problem, growers instructed poling crews to avoid removing ‘green nuts’ from the tree altogether. In response, the common practice adopted by crews was to bury the green nuts, which neatly removed them from sight and reduced criticism. A 1950 United States Department of Agriculture (USDA) technical bulletin explains that the “losses from this practice were considerable.”

The industry was desperately in need of a timely way to cleanly remove hulls, maintain kernel color, and reduce shell staining in order to compete with French imports. To aid in hull removal, the industry developed a “water-sweat” process, whereby they stuffed green nuts in a burlap sack in the shade and drenched them with water every three to four hours until the hulls were able to be removed. Despite this practice, kernel quality was still unable to compete with

imports. Fortunately, a discovery made in citrus was about to provide relief to walnut growers, who were undoubtedly tired of un-burying their crop and watering bags of nuts.

A 1929 newspaper article titled ‘Gassed Fruit’ (written by a perhaps less-than-impressed journalist), began with a description of “dingy, test-tube littered research laboratories” in which “forlorn little men have changed the destinies of the world.” The forlorn little man in question, a chemist named F.E. Denny, had discovered that a gas called ethylene could ripen train-loads of unripe lemons. The walnut industry seized on this finding and in the mid-1930s began to research application of ethylene gas to crates of unhullable walnuts. Voila—the process worked and walnuts were able to be hulled after one to three days of ethylene exposure.

The ethylene gas process was adopted widely for several decades, until a different formulation, ethephon, was developed. Ethephon is converted into ethylene by the plant upon contact with nuts and leaves, and has the effect of hastening harvest timing in the field. Five decades of research, beginning in the 1960s, helped shape the current ethephon use recommendations for walnut orchards today.

## Ethephon

Ethephon is a plant growth regulator used in walnut production for advancing harvest timing. There are several reasons for considering the use of ethephon in your production practices. With an earlier harvest, nut value may be increased because of lighter kernel color or less insect damage from a fourth generation of navel orangeworm (NOW) that happens to coincide with hull split. Additionally, if timed properly, shaking efficiency may be increased to allow the possibility of a single-shake harvest instead of two passes to remove the crop.

Of course, there are risks to using ethephon that should also be considered. Misapplied ethephon can cause leaf burning or defoliation in walnuts that can decrease crop potential in future seasons if severe enough. This is especially a risk if the trees are low vigor or water stressed—if your trees fall into either of those categories, forego application of ethephon entirely. The weather also needs to cooperate. Temperatures should be above 60°F but lower than 90°F, which may necessitate evening or night applications. Miss-timing the application may decrease the desired effect, reducing the “bang for your buck” (read on for proper timing). Lastly, walnuts may continue to degrade and lose quality if your dehydrator is not open and ready to process nuts from an earlier harvest.

## Is Ethephon Right for You?

How do you know if ethephon is right for your orchard? Start by checking which varieties you have—not all varieties respond equally to ethephon applications. Serr produces the least ethylene after treatment and, consequently, shows only a marginal response. Conversely, Tulare produces the most ethylene. Howard, Hartley, and Vina are also quite responsive to ethephon, while Chandler and Payne are intermediate. Also consider penciling out your expected costs to see if ethephon application makes sense, especially in a year with low returns. Consider harvest costs (one shake vs. two shakes), previous insect history in a given walnut block, and how you plan to schedule harvest labor if you contract out or have large acreages to divide crews among.

### Treatment Timing

Timing of the ethephon application

depends on what your goals are. There are two strategies that could be pursued:

- If planning on shaking once: Apply at 5 to 7 days after 100 percent packing tissue brown (PTB), approximately 10 days prior to the normal harvest date. This timing should remove most nuts and a second shake isn't economical.
- If planning on shaking twice: Apply when 95-100 percent of nuts have reached PTB. The first harvest will be approximately 7-10 days earlier than normal; the second shake should occur two weeks later.

Both of these timings rely on walnuts reaching the packing tissue brown

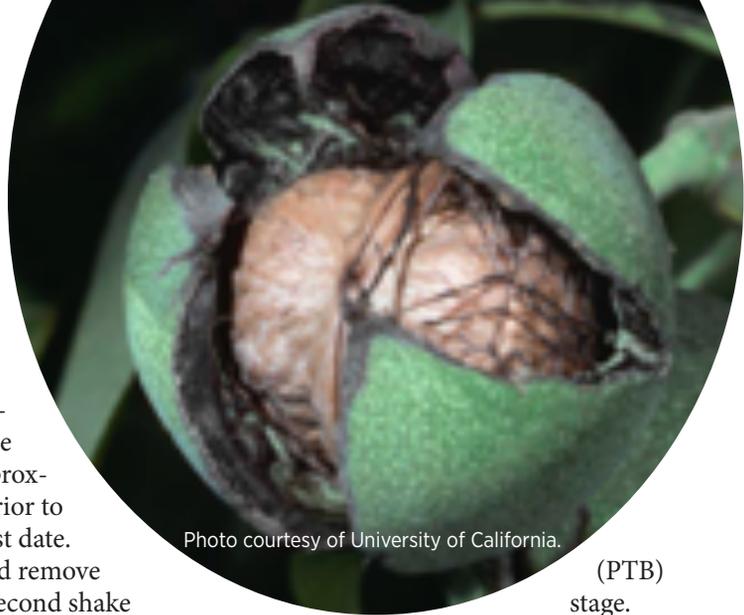


Photo courtesy of University of California.

(PTB) stage.

Treatment

prior to PTB will lead to kernel quality defects, especially shrivel. One hundred percent PTB timing can range from mid-August for early varieties (e.g. Serr) to mid-September for late varieties (e.g. Chandler). Keep in mind the seasonal temperatures—at the time of this writing (mid-June, 2018), it has been cooler than the previous couple years and

*Continued on Page 12*

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 this may delay treatment timing relative to a hot summer like 2017. PTB is reached when the tissue around the kernel halves turns brown (see images), including the stem end of the nut. If there are flecks of white, PTB has not been reached!

### PTB Stage

To determine if your orchard has reached PTB stage, begin sampling about two weeks ahead of when PTB is expected. Walk a diagonal across the block and sample 100 nuts, avoiding damaged or obviously advanced nuts that may be oil-less. Because the lower 1/3 of the canopy reaches PTB later than the upper 2/3 of the tree canopy, there is no need to pull out a pruning tower for this operation. Slide a knife into the stem end of the nut and twist to pop the nut open and examine the color of the packing tissue (don't slice your hand open!). Keep track of the number that have reached PTB and those that haven't. If you are going to err on your timing, err on the late side—treating too early can result in loss of weight and quality.

### Coverage

Good coverage is a must for ethephon applications. Leaves do not translocate the ethylene they metabolize



Left: Immature walnuts. Note the white flecks on the stem end on the top walnut. Right: Mature walnuts at PTB that are ready for treatment. Photo courtesy of Robert Beede.

from the ethephon. Therefore, the nuts must be directly sprayed in order to get a response. Watch weather conditions closely. Don't apply during drying winds or temperatures above 90°F. Application may be made from ground or by air. Ground applications should use a rate of 5 pints/acre in 150-200 gallons per acre (gpa), applied at speeds of 1.5 to 2 mph to achieve good coverage, depending on canopy density. Aerial applications should use a rate of 2-4 pints/acre in 40 gpa. The label does allow higher concentrations to be applied aerially, but these rates are not supported by the manufacturer and you run the risk of defoliation and dieback to your trees.

Contact your local farm advisor with any additional questions regarding appropriate ethephon use for your walnuts. Happy harvesting!

The author can be contacted at [dmlightle@ucanr.edu](mailto:dmlightle@ucanr.edu)

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# Adding Value to Almond Biomass:

## An Update on Pre-Plant Biosolarization with Hull and Shell

By: Rory P. Crowley  
COO and EVP | Nicolaus Nut Company, Chico

Aerial view of the treated plots.  
All photos courtesy of Rory P. Crowley.



Temporary drip system before plastic application.

**B**ack in late 2015, my family encouraged me to participate in the Almond Leadership Program (ALP). The program offers, “a one-year leadership training that inspires and prepares almond community members to join a network of leaders meeting the challenges of a changing industry.” For me, it did just that, and more. I strongly encourage up-and-coming industry members from any background or career path to participate.

As a part of the program, each participant was tasked with developing a project of his or her choice that would try to solve an industry problem. At the culmination of the program, the project would be presented to industry members and class participants. A colleague at Blue Diamond and I looked at almond biomass—hull, shell, and woody biomass from sticks or orchard takeout. Our focus narrowed over the year to hulls and shell more specifically.

### Decline in the Dairy Market

As most industry members know, almond hulls have traditionally brought value to the almond industry by utilizing this coproduct as livestock feed, particularly for dairy cows. Shell, too, has been used as livestock bedding and also has been burned in cogeneration plants for electricity production. Specifically regarding hull, however, with the dairy industry either stagnant or in decline in California over the last five to seven years—and with the almond industry expected to produce even more hulls in the coming years—we saw a clear and present challenge for hulling and shelling facilities, and for those they serve.

It was clear to us: if our dairy market continues to decline while the almond industry continues to grow, ultimately, this will have a negative economic impact on smaller, family-owned almond growers particularly. Obviously, all



1 inch minus tub grinder treated hull and shell.



Hull and shell mix pre 1 inch minus.



Ground view of plastic and drip tape below.

growers must rely on hulling and shelling operations to process product, but we believed the issue would impact the small family grower more than others.

### Innovation

Historically, the value that hull and shell had brought to the smaller grower had subsidized hulling and shelling costs. Based on 2012 United States Department of Agriculture (USDA) census data, 91 percent of almond farms in California are third- or fourth-generation family farms; furthermore, and perhaps even more striking, 74 percent of all farms in California are less than 100 acres. To us, the small family farm was in the crosshairs because of market conditions out of its control. We needed to tackle the issue, and try to come up with ways to bring value back to the grower. This meant innovation.

My colleague and I in the ALP argued that the challenge with hull and shell offered the industry a unique opportunity to ask new questions both economically and environmentally. As such, our project took up the task of examining how hull and shell could be utilized more effectively, asking what kind of new and innovative value can be added.

Generally, we cast a wide net. We

argued, I believe quite strongly, that hulls must be more versatile in many markets, not just one. Gone are the days when all we have to do is feed them to cows. Was this—livestock feed—the best use anyway, from an economic and environmental perspective? We said no, not necessarily, and almost certainly not for the future.

The ALP project generated much interest and, I believe, cultivated a sense of urgency around the topic of utilization of almond biomass. Shortly after graduating the ALP, I was invited to participate in a roundtable of sorts with executive staff from the Almond Board a few key researchers from UC Davis. Professors Jean Vanderghenst, and Christopher Simmons set the stage with a presentation that left us envisaging a new and revolutionary way to use hull and shell. The pitch: biosolarization. What in the world is that?

### Biosolarization

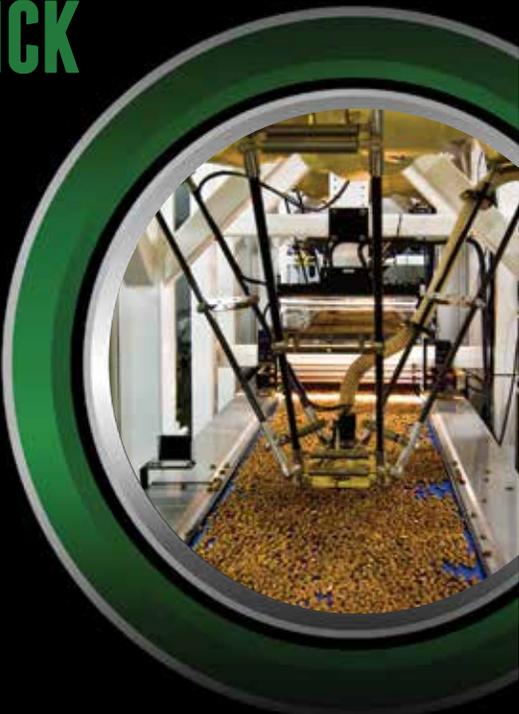
A brief excerpt from Professor Simmons of UC Davis captures the essence of the technology: “Biosolarization is a soil disinfection technology that can be used as an alternative to [chemical] soil fumigation and other pesticides. Biosolarization utilizes

*Continued on Page 16*

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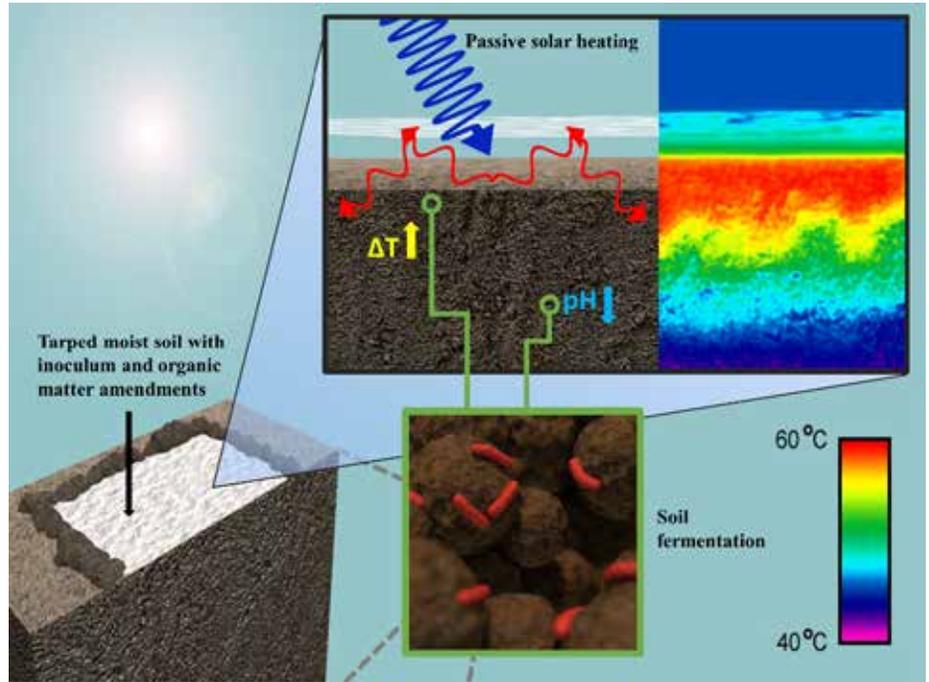
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Continued from Page 15

a combination of passive solar heating and soil fermentation to temporarily create soil conditions that are hostile to many pests.”

To break this down a bit, think of creating a greenhouse effect in the soil while also pickling it to kill nematodes. We grind hull and shell to one inch minus pieces with a 1000-horse tub grinder; we spread at 17 ton per acre; we then till it in; then put drip tape down, and finally cover with clear plastic. Then, we turn on the drip. Soil microbes and the sun go to work to solar heat the ground, while at the same time creating a bio-pesticidal effect as the microbes lower the oxygen content an pest-inactivating acids are produced from the hull and shell. The heat, combined with the low-oxygen environment, and the biopesticides created by the microbes, kill nematodes. It’s a wild concept. We can even then pulse irrigate to push the biopesticides down further in the soil.



To put this technology in perspective, a few things must be said. As the almond industry continues to learn about what will be needed to address our biomass challenges generally, and our hull and shell challenges more specifically, a few key objectives have taken center stage for almond growers, and hullers and shellers.

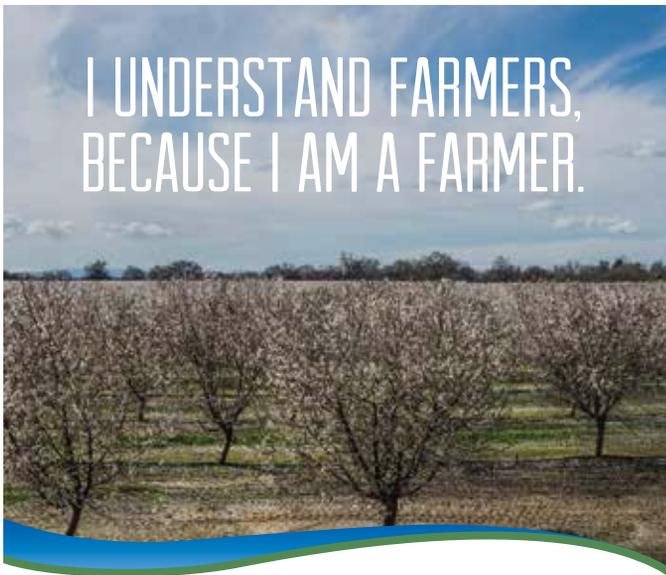
### Innovation to Commercialization

First, technologies or concepts that seek to diversify our hull and shell markets must have a timely transition from innovation to commercialization. To this end, secondly, the technologies or concepts must have near-term implications which can be scalable for longer-term, industry-wide adoption, while adding value to hull and shell co-product. Third, technologies or concepts must have the potential to make a significant impact as soon as possible, e.g., solutions must use a large quantity of hull and shell within models. Put simply, biosolarization offered the industry an opportunity to capitalize on each of these objectives simultaneously.

So, Simmons and his collaborators at the Western Center for Agricultural Health and Safety at UC Davis teamed up with the Almond Board; we needed a lab scale experiment to find out if this technology was compatible with hull and shell. In other words, we tested hull and shell in the lab with native soil from a Nicolaus Nut Company (NNC) orchard. It worked. We were ready to go full scale.

### Field Scale Biosolarization

NNC was about to plant a new almond 50-acre orchard in Chico, and we wanted to biosolarize the whole thing. That was too much to bite off given the new concept. We decided to go at a ‘field scale,’ but do so over 5–6 +/- treated acres. We did

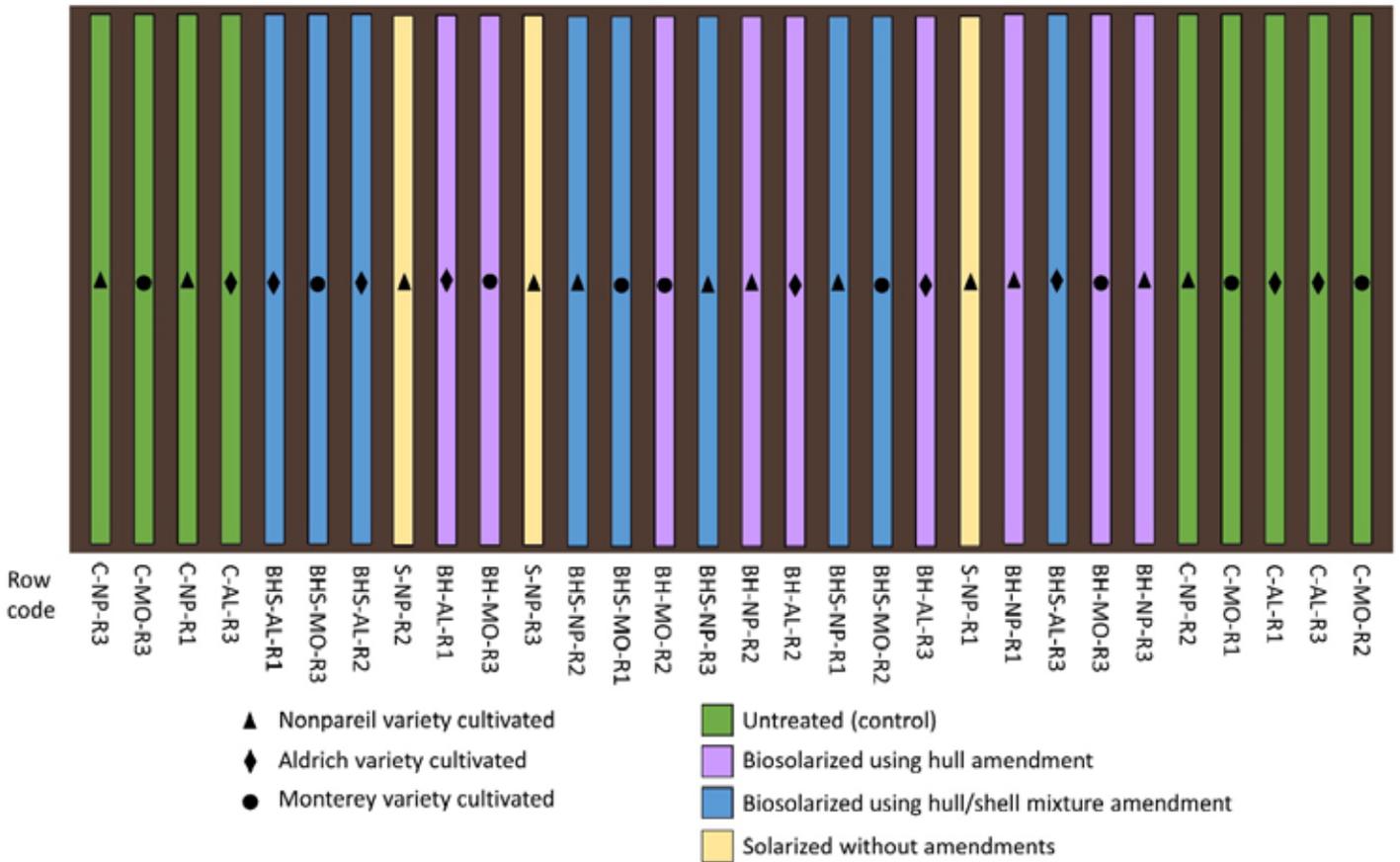


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this so that any grower anywhere could adopt the concept. The goal was basically fourfold:

1. Create a project at orchard-size scale that used current orchard equipment and techniques for the purpose of quick industry adoption.
2. Utilize as much almond hull and shell as possible for the purpose of mass deployment.
3. Replace traditional fumigation methods with a high or total degree of nematode kill and do so with little to no harmful environmental effects for communities near ag.
4. Improve the soil ecosystem for a new almond planting and not indiscriminately obliterate all good microbes. We accomplished all of these goals.

With the promises of biosolarization clear after the lab scale, Simmons and his team, with the backing of the Almond Board, went to work. Currently,

the project is complete and we are still in the data analysis phase, but there are tangible outcomes to speak of now.

### UC Davis Research

First, the research UC Davis has and is currently conducting has had important outcomes regarding properly defining 'soil health' for the almond orchards. What is being demonstrated at this stage is biosolarization is having constructive and likely long-lasting impacts on the organic matter of the soil strata, as well as positive consequences for beneficial microbiome within orchard soil ecosystems. Based on the biosolarization process implemented by Dr. Simmons and his team, the experimental plot gained 1–1.25 percent of organic matter

to the topsoil of the treated area; the implications of this for water holding capacity, as well as other nutrient uptake features, are obviously significant.

Second, biosolarization has now demonstrated to be an alternative to chemical fumigation in some important regard, and perhaps can be just as efficacious as traditional chemical methods. For example, Simmons has established that all solar-heated (i.e., solarized)

*Continued on Page 18*



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George Nicolaus with the research team from UC Davis.

*Continued from Page 17*

rows showed significant reduction in

nematode viability, including root lesion nematode, after 10 days of treatment; in other words, the sun treatment

alone kills nematodes. However, biosolarization with almond hull and shell led to accumulation of natural organic acid biopesticides in the soil. In fact, biosolarized rows utilizing just nonpareil hull amendment showed the greatest levels of organic acid biopesticides. In turn, the soils with nonpareil hull showed the greatest reduction of nematodes (complete kill, in fact) in the upper 12 inches of soil.

Chemical fumigation with products like methyl bromide and chloropicrin are becoming unavailable or more cost prohibitive for the

commercial almond grower. It is now clear that a 'natural' process like biosolarization holds promise to produce the same efficacy as these chemical treatments—particularly for the target pest of nematodes—and we are obligated to research this closely moving forward. The Almond Board, along with UC Davis, is doing just that.

**Third**, the study also tracked soil N-P-K (nitrogen, phosphorus, potassium) levels and changes. The solar heating treatments led to nitrogen transformation regardless of whether amendments were added, favoring ammonium over nitrate. This effect persisted for months and may have implications for reducing nitrogen leaching. Furthermore, biosolarized soils showed elevated potassium regardless of the type of amendment (nonpareil hull or pollinator hull/shell). So, we are seeing positive outcomes with nutrients levels in the study.

**Fourth** and finally, it is noteworthy to mention that the biosolarization study has an environmentally-conscious, circular economy narrative that has resonated with the modern consumer and our neighbors. Not only is the technology a 'natural' substitute

*Continued on Page 20*

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for soil fumigation, it goes a step further in generating a sustainable food system lifecycle assessment as one of its strategic outcomes. This, of course, is an emergent topic in commercial agriculture. Almond coproduct recycling and reintroduction embraces and embodies the ethos of sustainability at the heart of the consumers we serve.

Still, the experiment needs a few years to see the full effects. The trees are still young and not enough growth has occurred to observe major differences in the trees themselves among the soil treatments. Simmons and his team will take additional measurements over the summer and beyond.

In the years to come, Simmons' experiment will continue; he will take tree measurements that span conventional trunk diameter and height measurements as well as take more advanced multispectral aerial imaging approaches in order to try to capture a wide array of tree health metrics that could ultimately impact yield. Stay Tuned.



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# Finishing this Crop and **Protecting** Next Year's Buds

By: Rich Kreps, CCA

Bud differentiation in pistachios.  
All photos courtesy of Rich Kreps



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We've seen an increase in crop protection products on the market lately. Time and effort have produced different strategies for keeping our crops protected from the sun and the effects of heat. It's easy to react to Mother nature while looking at this year's crop and focusing on keeping it at its highest quality. There may also be another key factor to consider in formulating your approach to that protection. We may have just as much effect on next year's crop in trying to finish this one.

## Recovery v Production

Newton's third law of physics: "For every action there is an equal and opposite reaction." Of course, Sir Isaac The Great was referring to force but we do the same thing in plant biology and chemistry all the time. The biggest difference is that we may create multiple reactions with a simple action. Since trees don't seem to move much, they have to use what Mother nature and we as farmers give them, or don't, to make us a crop. Studies show that a plant begins to reduce transpiration and photosynthesis when the leaf surface temperature rises past 85 degrees F. Between 95 and 100 degrees it stops. For every hour it is shut down, it takes approximately two hours to recover. Days when leaf temps remain 95 degrees or higher for eight hours, the entire rest of the evening and dawn is spent in recovery and not production. To get maximum production, we need to limit the exposure for as long as possible and also cool the plant as quickly as possible. In turn, we need to make sure our nutrients are balanced and optimal to stimulate that recovery.



Heavy sun protection but transpiration stress in walnuts.

## Clay

It's easy to spot the walnut orchards, tomato fields, vineyards and stone fruit after a hefty splash of clay has been applied to the leaves. It brings us back to the day mom rubbed zinc all over our noses and cheeks at the beach. She'd at least prevent skin cancer in one spot on our bodies. In agriculture, with clay products we are attempting to do the same thing on a much larger scale. The white pigment of the clay helps to reflect light and avoid the impact of the ultraviolet (UV) rays. While this is beneficial for some crops and has proved to be effective at reducing the damage, we run the risk of reducing the transpiration for the leaf surface.

Clay can clog the stomata for a time. It can also block nutrient absorption and put a blanket on the leaves. This may have the effect of keeping the leaf safer from UV rays during the day. However, the thermal layer may keep the leaf from cooling quickly as the temp drops for that crucial nighttime recovery. And if the stomata are clogged, transpiration slows. The good news is, you provide some protection in extreme temps and it weathers off in a few weeks. One has to weigh the benefits of better grades without sunburned skins over lost late season oil production (weight) with reduced photosynthesis and transpiration.

## Polymers

Polymers have entered the scene in the foliar crop protection market as well. The generic term 'polymer' is simply many similar subunits connected together by a common bond. That generality can be a bit deceiving as a polymer can be based on many substances from saccharides to proteins to carbohydrates. Make sure your crop nutrition consultant understands which form you are applying and why. Many are used to assimilate nutrition into the plant while others are simply another form of a protective blanket. On a nano scale, we are attempting to create reflectivity, insulation, and even shade by using different materials. Zinc oxides, silicon and titanium dioxide also have great reflectivity and refraction. But applying any oxide in too high amount runs the risk of producing hydroxide and raising the pH on the leaf surface. All these products can have beneficial effects, but it's important to make sure you are choosing one for the right response.



Heat and water stress in almonds.

## Next Year's Buds

The biggest benefit may actually come from plant health and making sure next year's crop progresses. As plants shut down in

*Continued on Page 24*

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Continued from Page 23

summer heat many times next year's buds suffer an early death. As potassium levels move into fruit and less is available to actually open and close stomata, we become deficient. Deficiencies lead to fruit bud losses as a plant moves its resources to finishing this year's crop. It's imperative that we keep our nutrition levels high in addition to applying crop protection products. NPK (nitrogen, phosphorus, potassium) levels drop

off their spring peak while Calcium levels continue to rise throughout the season. We never seem to skimp on nitrogen levels but often neglect phosphorus and potassium. Many times, this leads to that rank vegetative growth that requires more complimentary nutrition to keep it balanced. Failure to address those deficiencies and the buds suffer again. In pistachios for example, deficiencies come on as the outer leaves at the terminal ends of bunch clusters experience that dreaded leaf yellowing.



Bud differentiation in pistachios.

Protein production in the kernels sap nitrogen, magnesium, potassium, and sulfur. Calcium, which is immobile once it has found a home in the tissue, is used up as cells divide and shells harden. Less for next year's buds. When you can walk a field, touch the new buds and if they easily fall off, we're significantly affecting next year's yields. You're cutting into your return on investment.

### ROI

Make the appropriate applications during summer stress periods. Topical crop protection may be a viable option for your orchard. Feeding proper nutrition is certainly a part of that protection. Give the trees what they need to flourish. Not only will you help get this crop to market with higher yields, you will ensure a better chance for a greater return on investment next year.

*Comments about this article? We want to hear from you. Feel free to email us at [article@jcsmarketinginc.com](mailto:article@jcsmarketinginc.com)*

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# Conference Draws a Great Crowd

By: Cecilia Parsons | Associate Editor

All photos courtesy of Cecilia Parsons.



Engaged and enthusiastic members of Western Agricultural Processors Association (WAPA) participated in the organization's annual meeting in Monterey.

The June meeting also attracted a record number of vendors.

### Regulatory Challenges

Focus of the organization, said WAPA board chairman Mike Kelley, is to assist members with regulatory challenges and seek out opportunities for business operation.

"This organization is our advocate," Kelley said, speaking for the tree nut processors and other commodity processors who belong to WAPA.

Kelley, in his opening remarks, said increasing regulations weigh heavily on the agricultural processing industry. Some of the challenges looming for processors include new rules to prevent indoor heat illness, operating fee increases and food safety issues.

The organization has 150 active members, Kelley said, and is recognized in both Sacramento and the nation's capitol as a credible and serious supporter of agricultural processors.

### Energy

California agricultural processors continue to be hit with the some of the highest energy prices in the nation. Michael Boccardo, executive director of Ag Energy Consumers Association said the upward trend of energy prices is expected to continue. The rising prices, he added are being driven by climate change policies. Even as energy prices rise, energy use is expected to climb as growers rely more on groundwater to irrigate. While use of drip irrigation is commended for water savings, Boccardo pointed out that drip irrigation used by many tree nut growers could have higher costs due to the need to pressurize systems.

A dramatic change is also occurring in time of use. Beginning in March

2021, the peak hours will change from 5 to 8 p.m. to 12 to 6 p.m.

### Food Safety

On the food safety front, tree nut growers and processors do have an advantage over fresh produce, as there are kill steps in processing to reduce risk of pathogen contamination. Dr. Jim Gorny, a senior science advisor for Produce Safety at the U.S. Food and Drug Administration (FDA), said it is important that processors comment on some of the FDA guidance documents because "DC does not understand western farming."

If a proposed rule will not work in your industry, send in your comments, Gorny urged. Though the Food Safety Modernization Act (FSMA) rules are final, the guidance documents that help with compliance will be coming out this year, he said.

### Immigration

Conflicts between state and federal government over enforcement of immigration law continue to cause uncertainty in the farm labor market said Michael Saqui, a well known labor attorney and speaker on labor issues.

Tree nut processors should be prepared for U.S. Immigration and Customs Enforcement (ICE) raids at their facilities and be knowledgeable about their responsibilities. Plant supervisors should be trained to handle visitors including confirming their identity and asking the reason for the visit.

"ICE inspectors can make your day very difficult," Saqui warned. Employers need to assign a human resources team to perform a self-audit of employees' W-9s at least once a year and be prepared to deliver original documents if asked.

When a federal immigration agency does come knocking, Saqui said no one should speak without a company attorney present. Agents should be asked to present identification and say

*Continued on Page 28*

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Continued from Page 27

why they are there. Require inspectors comply with safety rules and document the inspection. If commodity samples are taken, ask for split samples for evaluation.

### Breaks

Two situations that are causing problems for ag employers are meal and rest breaks for truck drivers and transportation for workers who must travel long distances for work.

If a driver cannot leave the truck for mandated breaks and meals, employers should pay them for an extra hour and have them sign an agreement for an on-duty meal period, Saqui advised.

Travel time lawsuits are most likely the next big target because of uncertainty in the law on what an "ordinary commute time" is. Legislation will be required to fix the problem, Saqui said. Until that time, an option is to establish pickup points for employees who would then clock in when entering the transport vehicle.

More effective messaging from the agricultural sector would help in Sacramento, lobbyist George Soares said. Urban area legislators and their staffs do not really understand agriculture and are more likely to listen when processors and growers speak about the people they employ.

Many of those in the agriculture industry continue to be "crop oriented," when they speak with legislators, Soares said. A better approach would be to highlight the benefits of agriculture to the state.

### Regulatory and Legislative Issues

An update on regulatory and legislative issues that affect WAPA members included challenges and funding opportunities. Priscilla Rodriguez, WAPA's director of food safety, said 40 hullers have been assisted in completing their food safety plans and are prepared for the

2019 inspections. The organization has also reached out to FDA to educate them about tree nut production, sponsoring a tour of production areas.

### Air and Water

WAPA has been pushing back on an air quality ruling that stockpile elevators should be classified as stationary sources, Jodi Raley, WAPA director of regulatory affairs said. The San Joaquin Valley Air Pollution is considering air permits and the Yolo-Solano Air Quality district is now trying to enforce rules. WAPA is opposing both actions and is working with both districts, Isom said.

On the contentious water storage front, Raley said that the Sites Reservoir scored high enough in the water storage rating system to be in line for \$916.2 million in funding. The Temperance Flat project, she added, has some challenges with ecosystems in the rating, but continues to move forward.

Tree nut growers were warned by WAPA director of technical affairs Christopher McGlothlin that the state water board is looking to increase Irrigated Lands Regulatory Program fees by 15.6 percent next year and waste discharge requirement fees by 14.1 percent. The increases are coming, the state said, after a four-year period of no fee increases.

He said the Central Valley Regional Board's new Basin Plan would focus on all dischargers including tree nut hullers and processors.

### OSHA

WAPA President  
Continued on Page 29



Curt Covington, executive vice president at Agricultural Finance, Farmer MAC, discusses tree nut economic outlook.

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## Economic Outlook

Curt Covington, executive vice president at Agricultural Finance, Farmer MAC, in his tree nut economic outlook, said millennials' food preferences are good news for the industry.

"They are different from the previous generation and prefer snacks," Covington said.

The current economic picture for agriculture is mixed. Farm sector solvency remains strong, Covington said, but liquidity has declined. Debt to asset ratios have risen, but remain low compared to historical values. In addition, working capital has been drawn down as profit margins have declined.

National land values may be stabilizing, Covington said. While land values declined in Corn Belt states, they were up slightly in California and Arizona. Almond land values have declined from the peak of 2015 when they approached \$45,000 an acre in the northern San Joaquin Valley.

"The issues discussed at the convention represented some of the most serious issues facing the tree nut industry today, from energy and labor to food safety and taxes. The meeting had the right people to cover the critical issues for the industry," Isom said.

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*Continued from Page 28*

Roger Isom said the organization is standing firm against several Occupational Safety and Health Administration (OSHA) proposals that affect the tree nut industry. A proposed draft on indoor heat illness would require an assessment of environmental risk factors for heat illness when temperatures equal or exceed 90 degrees in an indoor workplace.

On the OSHA proposal to require guards on non-power conveyors in processing facilities, the agency "has a solution looking for a problem," Isom said there has never been an injury reported due to a non-power conveyor.

Almond stickpiles and biomass disposal continues to be a challenge as there are fewer biomass plants in operation. Isom said WAPA is working with the San Joaquin Valley Air Pollution Control District to secure more burn permits and looking at a legislative fix for biomass plant operation. Another wood waste disposal option is use of air curtain burners. Isom said one has been permitted in the state and two are in the permitting process.

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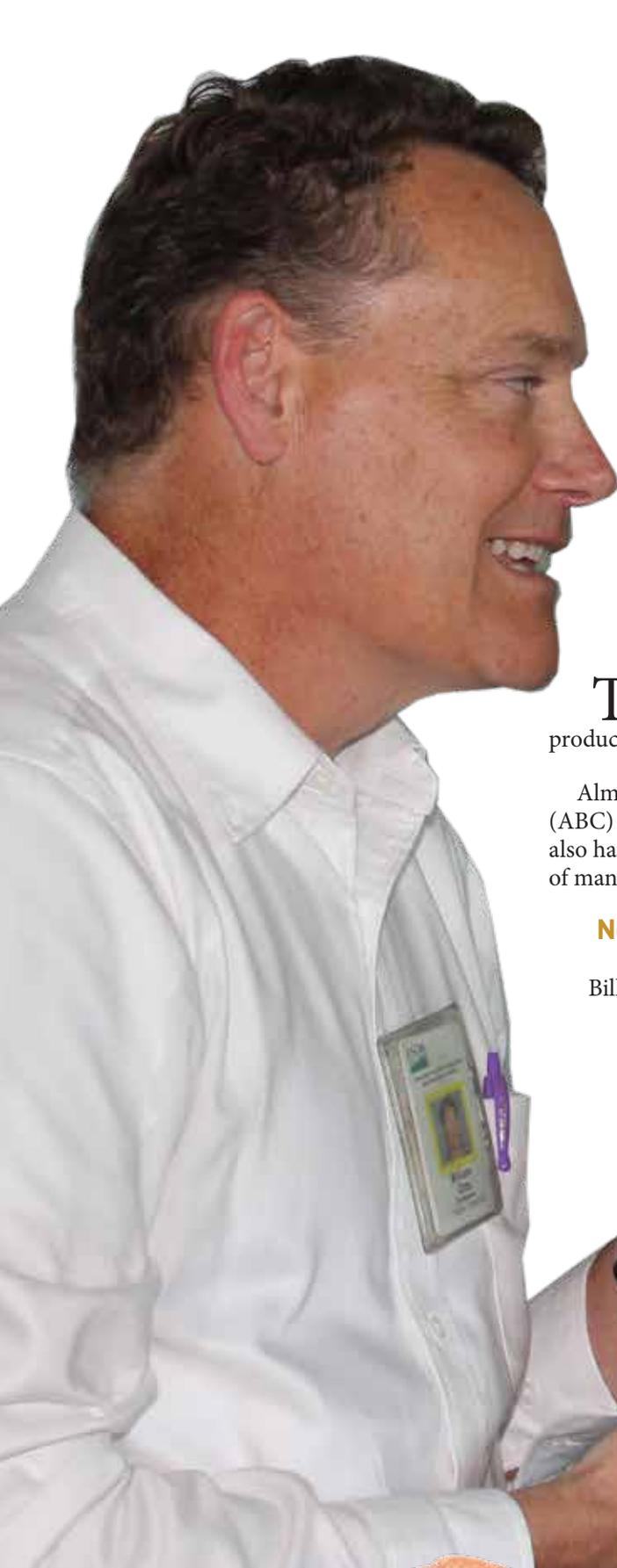
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# Almond Biomass Research Finds Potential

By: Cecilia Parsons | Associate Editor

## Almond hull beer anyone?

That offer may not be too far in the future as the almond industry sets its sights on development of innovative uses for all almond orchard products.

Almond kernels are a popular snack food, but Almond Board of California (ABC) funded research is showing the shells, hulls and wood biomass that are also harvested each year in California orchards can provide a sustainable source of many useful products.

### New Uses for Almond

Bill Orts, research leader

### Byproducts

in bio products at the United States Department of Agriculture's (USDA) Western Regional Research Center (WRRRC) in Albany, is enthusiastic about the progress made there in developing new uses for almond orchard byproducts. Both USDA and private researchers there are looking at matching inexpensive sources of agriculture carbon with appropriate products to improve sustainability and biodegradable properties.

We are on a mission, Orts emphasized, to invent our way to environmental sustainability.

Almond industry leaders, in looking at the future of almond production, realized a need to find additional uses for the tons of shells, hulls and wood waste that comes from orchards along with the tasty kernels.

Bill Orts (*above*), USDA bio products research team leader with a sample of the beer brewed from almond hull sugars.

All photos courtesy of Cecilia Parsons.

*Continued on Page 32*



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Continued from Page 30

For every pound of almond kernels harvested, there are two pounds of hulls. Last year, 2.1 billion pounds of kernels came with 4.3 billion pounds of hulls, 1.5 billion pounds of shells. Woody biomass from pruning or orchard removal also needs to find a home.

Danielle Veenstra, Almond Board communications manager said almond co-products currently have a variety of uses, but in the future, with the additional projected tonnage, the industry wants to be prepared with new choices that have the potential for economic returns.

### Research

Almond Board of California has been funding co-products research since the 1970s to both reduce the amount of waste generated and improve crop production. Over the last year alone, the industry has invested \$500,000 in co-products research.

With the loss of cogeneration plants for woody waste disposal, university researchers turned to studies on grinding whole trees and returning the biomass to the orchard soil to improve soil health and water retention. Shells have been ground and applied to orchard roads to help reduce dust. Hulls have historically been used as a valued part of a dairy ration and other livestock feed. Prices for hulls as a feed component have remained fairly stable in the past year and as of early July were trending slightly higher at \$170-\$200 per ton.

### Alternative Uses

The USDA researchers and private partners are exploring alternative uses for almond co-products that will add to their value. While co-products could be directed to biofuel or energy streams, those uses generally provide no additional value except for disposal.

Orts is excited about the progress made in incorporating almond by-products into the manufacturing of fast food clamshells and utensils and other

disposable products including pallets. He explained how bio-based plastics could become a reality in some of these applications. Companies looking to eliminate plastic waste were working on compostable dinnerware at the USDA center, but Orts said they did not hold up to heat well. A process being investigated is heating almond shells to high temperatures, transforming them into a charcoal-like product. The resulting product can be used to strengthen recycled plastics by adding stability and heat resistance.

Adding the almond shell powder can also improve recycled plastics. Recycling plastics is a trend in manufacturing, but the products do not have the stiffness or heat stability desired. Blackened almond shells can also add color to an otherwise gray-colored plastic. Adding the almond by-product also reduces the price of plastics.

Fast food companies are showing interest in the research as they try to reduce the amount of plastic waste.

Biodegradability of the packaging is an important aspect, but research has found increasing product strength and heat stability increases the time it takes for the waste to break down.

Some research and testing is also underway using the super heated shells as filler in tire manufacturing. The tire company Bridgestone has invested millions in research to replace some of the product components with bio-based products, Orts said. Using almond co-products as a component, even with additional processing, would take millions of tons per year.

Orts said for the plastics applications—using super heated shells as a filler—the aim is for large pilot operations that utilize about 10 tons per day. Ten tons, Orts noted, is hardly a drop in the bucket for the almond industry. He did say that if every pallet manufacturer in California adopted the process, the demand would reach tens of thousands of tons per year.

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## Sugar

Veenstra said hulls, which are 30-35 percent sugar, might turn out to be one of the highest value uses. Products made for human consumption are not coming in the near future, but the sugars are being tested in managed honeybee diets to replace sugars from corn. Once the extraction process is refined, Orts said the research would aim for wider adoption of the sugars.

The sugars could also be fermented for

use in alcohol products, a process that requires removing the natural bitterness from the hull sugar. Orts said really bitter IPAs can be made, but some flavor adjustments are needed for any large-scale use. Researcher Allison Flynn, on her own has brewed some almond hull beer.

*Continued on Page 34*



Greg Glenn, USDA bio products researcher, holds a sample of torrefied almond shell product.

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### Obscure Uses

A use for ground almond hulls that is a little more obscure involves black

soldier flies. The larvae of this fly species, which is not considered a pest, has been found to be a source of sustainable protein for aquaculture. The ground almond hulls provide a sustainable growth medium for larvae production.

Finding uses for almond by-products is only part of the USDA work. Orts said when they prove that a prototype or process can work, they can signal opportunities for private business. One of their most famous success stories, Orts said, was discovering a way to prevent cut apples from browning for an extended time.

“The reason McDonalds and Subway can sell millions of pounds of apples was developed in this lab,” Orts said.

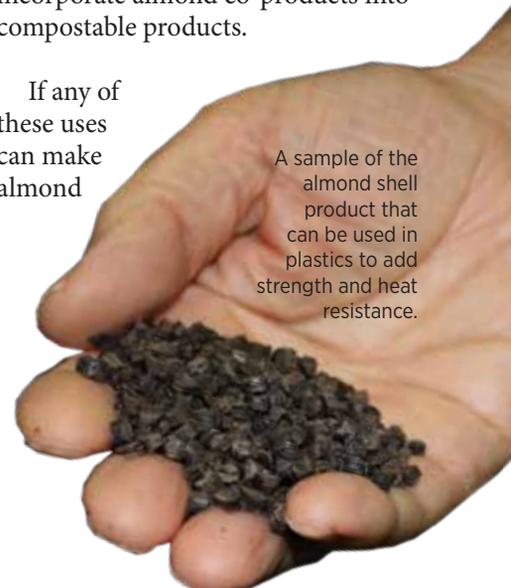
Start-ups based at the USDA lab are working on alternatives to plastic packaging and may incorporate almond co-products into compostable products.

If any of these uses can make almond

A sample of the almond shell product that can be used in plastics to add strength and heat resistance.



Greg Glenn, USDA bio products researcher and Greg Todryn of Grow Plastics share some of the developments in their efforts to use almond shells to replace plastic and add strength and heat resistance to products.



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byproducts into a marketable product, changes may be in store at hulling and shelling facilities. Extraction of food grade sugar could require a clean step in processing. Veenstra said it is possible that those changes could come about as the industry shifts to off ground harvest in the future.

“We have to analyze the economics and technical aspects. There is a lot of interesting exploratory research.”

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# The Future of Ag Tech for Agriculture

By: Cecilia Parsons | Associate Editor

**I**n a region of California where labor needs are constant, the words skills, shortages and costs were prominent in the conversation.

The 2018 Forbes AgTech Summit held in Salinas last month leaned heavily on robotic technology and its increasing role in agriculture as the human labor pool continues to shrink. Speakers tackled the issue not only on a regional basis, but globally, citing similar labor shortages and needs by growers all over the world. In addition to robotics, human resources and the skills that will be needed by the agriculture industry in the future were part of the conversations.

The AgTech Summit, described as the intersection of high tech and agriculture, showcased the latest innovations for farmers, investors and stakeholders in the global agriculture network. This year's summit was the fourth and first to be held in California. It was expanded to include 75 agriculture technology startups.

This invitation-only event included 600 participants, one third in production agriculture and one in two participants in technology fields.

Soft Robotics display with Senior Director Jim Mattis. These robotic grippers can be programmed to exert stronger or softer grips on the crop being harvested. All photos courtesy of Cecilia Parsons.

## Conversation 1: The Rise of Robotics

Josh Ruiz, vice-president of agriculture operations for Salinas-based fresh produce grower Church Bros., said the industry is facing three significant challenges: labor, labor costs and a 'skills gap.'"

The need to automate where feasible was met, Ruiz said, with the development of both a machine to harvest broccoli and new broccoli genetics that were compatible with mechanical harvest. Ruiz said Church Bros. collaboration with Monsanto over a five-year period brought them to their first successful mechanized harvest.

**“We need partnerships for these projects to work,”** Ruiz said.

With the increasing use of automation in the field, there is a shortage of people with the skills to operate or program machines, Ruiz said.

Labor shortages in the field are the number one driver of robotics innovation, said Carl Vause, CEO of Soft Robotics. Based in Cambridge, Massachusetts, this company designs and builds soft robotic systems that can grasp and manipulate items with the same dexterity of the human hand.

*Continued on Page 38*



From left, John Pursell of Monsanto, Josh Ruiz of Church Bros. and Carl Vause of Soft Robotics.



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These systems are being used in some fruit harvest trials. Successful development of robotic harvest systems, Vause said, will come when technology companies spend time in the field to see how harvest is done and then adapt the technology to meet the growers' needs.

**“You’ve got to stand in the grower’s shoes,” he said.**

Field labor shortages are a reality for growers who rely on work crews to weed, thin, and harvest highly perishable crops. The current shortages are not expected to ease, Vause said, but he stressed that human expertise in farming operations will remain an important component of success.

Vause predicted that automation would move forward at a much faster pace than in the past, pushed by fewer

hands in the field.

Ruiz said he expects fully automated harvests for field crops in the near future.

Robots and automation will be a part of the future in agriculture, Ruiz, said, but there will always be a need for boots on the ground.

### **Conversation Two: Labor, The Human Element**

Willard Lewallen, president of Hartnell Community College in Salinas shared his experience in the field—expecting to be gleaning left over crop for a food bank, he discovered the grower had been unable to find a harvest crew in time and jettisoned an entire field of lettuce.

“We were only able to harvest a small corner of the field, leaving the

*Continued on Page 40*



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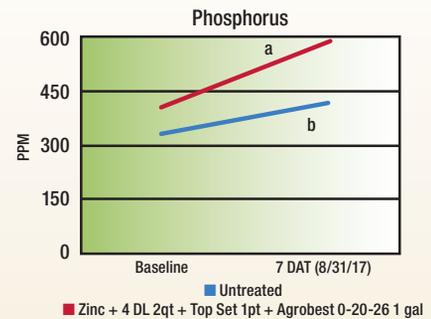
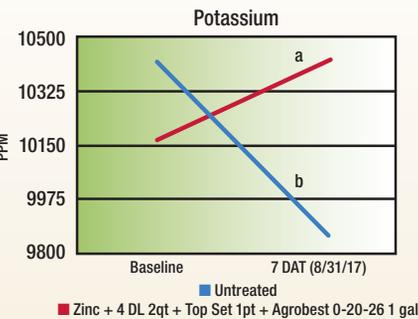
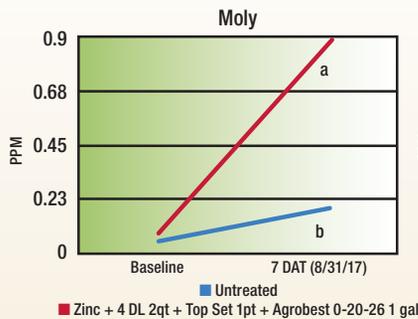
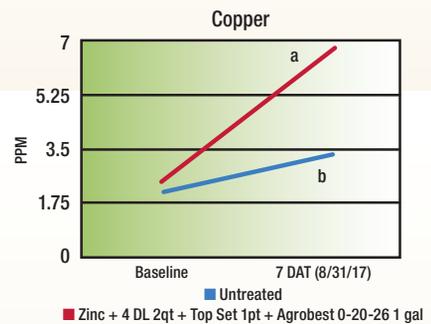
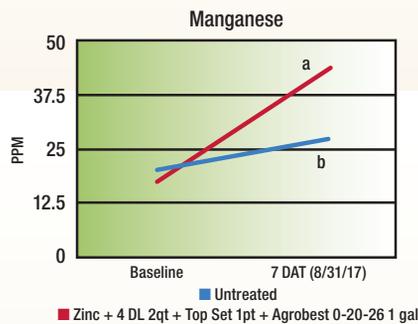
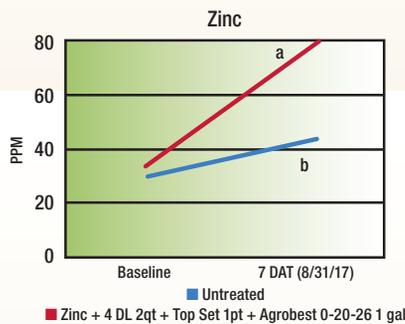
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Wells Fargo awarded Western Growers and its Center for Innovation & Technology a \$30,000 grant during the Forbes AgTech Summit on June 26, 2018. The grant enables Western Growers to create scholarships for ten start-up companies who are working to develop and enhance technological solutions to ag's biggest issues. These scholarships will be awarded to budding companies who are looking to advance their innovations by joining the Western Growers Center for Innovation & Technology—an agriculture technology incubator in Salinas, Calif.

L to R: Karol Aure-Flynn, Food & Agribusiness Advisor at Wells Fargo; Marci Davis, who leads Wells Fargo's Monterey Commercial Banking Office; and Hank Giclas, Senior Vice President, Strategic Planning, Science & Technology at Western Growers.

*Continued from Page 38*

rest to be disced under,” Lewallen said.

That experience brought to light the reality of labor shortages in California agriculture and the effect those shortages are having.

Lewallen was joined by Matt Watson, director of technical development at Mantis Ag Technology and Bart Walker with Pacific Ag Rentals.

“It is hard work and the younger generations are not following their parents into field work. They have alternatives,” Walker said.

Automation in the field is not displacing field workers, it is taking them and placing them inside machines as operators.” The technology is filling in where there are no workers, Watson said.

Watson, whose company demonstrated an automated weeding tool, said departure of field workers is accelerating and engineering efforts need to be directed in an intelligent way to fill the workforce void. The Rotovator, which can do

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the work of an 11-person crew, at a cost of \$90-\$600 per acre has a six month return on investment, Watson said.

In addition to harvest, thinning of row crops is an operation that can also be done with automation, allowing a labor force to move into higher paying work.

There has been some push back from growers, Walker noted. The problem is the lack of people with the skills to operate machinery with advanced technology. Community colleges like Hartnell could provide that training and keep young workers in agriculture. That type of education will be key to ensure machinery and technology operators, Watson said.

The agricultural community must also have a role in assisting workers whose jobs have become obsolete through technology. How do we assist them? Lewallen asked. Walker said providing training for the skills needed to operate and repair advanced technology machine, including robots and drones will give younger workers the opportunity to stay in the agriculture industry.

The shortage of field workers is not just a Salinas Valley issue, but also a global issue, Walker stressed.

Food safety concerns could be mitigated with more automation, Watson said. One of the hidden costs of labor, he noted, was that every person in the field presents the potential for contamination of food being harvested. Reducing human contact with food in the field through automation can address the problem.

### Conversation Three: Global Advancement in Robotics

Panelists from Norway, New Zealand and the U.S. reflected the global interest in robotic technology and application in agriculture with an emphasis on small start-ups. Moderator Dan Harburg of Anterra Capital noted that investments in this technology are increasing with interest coming from ag and tech industries.

*Continued on Page 42*

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From left, Moderator Dan Harburg, Charlie Anderson of Augean, Pal Johann From of Norway, Vivek Nayak of TerraClear and Steve Saunders of Agrigate in New Zealand.

*Continued from Page 41*

An example of a small start up that found a solution for a problem is TerraClear of Bellevue, Washington. CEO Vivek Nayak said a colleague working on his family's farm in Idaho noted the never-ending and unpleasant task of removing large rocks from grain fields.

The solution to eliminate the need for human labor to do this low skill job was development of a system to map rock locations, use electro hydraulics and autonomous movement of a machine to do the rock removal. Integration of those components, Nayak said, allowed for development of a tool to solve the problem. Small start ups, he added can give rise to technological advances like the rock removal system, but Nayak said that successful companies will provide a complete solution to a problem, not just address one aspect.

Charlie Anderson, CEO of Augean Robotics said potential opportunities for technology may not always be obvious to larger companies.

Innovation from small companies, said Steve Saunders of Agrigate, can come with custom design and lower labor costs. This New Zealand company was developed by Fonterra to help farmers collect data and make better and faster decisions. Robotic advances in harvesting fruit, he said, would be welcomed by New Zealand fruit growers.

Pål Johan From, head of Robotics & Control Group, Norwegian University of Life Sciences, noting the lack of markets for robotic technology in agriculture in Norway, said he is now working in United Kingdom on strawberry harvesting. Companies that are self sufficient, From said, are the best investment.

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# Walnut Huller WDR Update

By: Chris McGlothlin | Western  
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We have updated you on the past in regards to the Western Agricultural Processors Association's (WAPA) efforts to push back against the incorporation of walnut hullers into the State Water Board's Waste Discharge Requirement (WDR) program. Over the last four seasons, WAPA has contracted with four walnut hullers located around the state along with Denele Analytical to test the facilities' well water, their waste discharge water from the pond, as well as hulls that are collected after the hulling process. These samples encompass the different aspects that the Regional Water Quality Control Board (Regional Board) is concerned with. This partnership has ultimately helped prolong the inclusion of walnut hullers into this WDR program, and ultimately saved walnut hulling operations thousands of dollars in compliance costs.

### Discharge

Several years ago, the Central Valley Regional Water Quality Control Board (Regional Board) developed a draft WDR for walnut hullers that

would encompass the discharge of the wastewater as well as the spreading of hulls in the orchard. After consultation with Regional Board representatives and identifying the lack of scientific data specific to what is included in the discharged water, WAPA volunteered to develop the sampling program to try and demonstrate how small of a threat these facilities are to overall water quality. Over the past four years, WAPA has compiled the results of the water and hull samples and had several discussions with Regional Board representatives specific to the results of the study.

### Groundwater

WDR's primarily affect food processing industries that utilize water, including some tree nut hulling and processing industry. Specifically, almond blanching and pistachio processing operations must already comply with WDR requirements. Once the water is discharged, it is generally used as supplemental irrigation water for crop land located on or near the dis-

charging facility, some operations also utilize evaporation ponds to dispose of their wastewater. The State Water Board has developed criteria in order to permit these operations to discharge their wastewater, and the basis for these requirements is the protection of groundwater in the areas that the facility operates. Most associate WDR's with the yearly fees required for compliance, however, that is not the only requirement with the program. WDR's can also incorporate the installation of monitoring wells, engineering evaluations, quarterly sampling of monitoring wells as well as the installation of cleaning technologies at the point of discharge. These added requirements are all dependent on the status of the groundwater beneath the facility. WDR's ultimately add up to several thousands of dollars per year to comply with.

### Cost of Compliance

Another major area of concern for

*Continued on Page 46*



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food processing facilities that are part of the WDR program is the ever-increasing rise in the cost of compliance for this program. Programs overseen by the State Water Board have seen dramatic increases in cost, WDR Fees are set to increase by 15 percent this season alone. To that point, cost increases released by the State Water Board have shown an increase of over 130 percent to the WDR program over the past eight years. Historically, these programs were offset by General Fund monies allocated to the State Water Board to help offset staffing costs for the specific programs. This General Fund money has not been allocated over the previous seven years, and thus the cost for staffing in the WDR program has come from the pockets of those trying to comply with the rule. To this point, last season, the State Water Board lobbied the State Legislature for an additional \$1 million dollars in funding to help pay for an additional five staff members to help

evaluate data and submitted paperwork related to WDRs. That money is not continuously paid by the State Legislature, and thus must now come out of the pockets of WDR rate payers. WAPA has also made every attempt to push back these increasing costs, detailing the already high cost of compliance for the WDR program in comparison to all other regulatory requirements levied by the numerous state agencies.

### Basin Plan Amendments

Unfortunately, WDRs may still make their way into the walnut hulling industry. Over the past several years, the Regional Board has proposed several changes to their Water Quality Control Plan. These “Basin Plan Amendments” focus on several compliance arenas, and one major area is the operation of facilities within agriculturally dominated areas. This plan is named the “Agriculturally Dominated Water Bodies Evalu-

ation—Municipal and Domestic Supply Beneficial Use Project” aims to streamline compliance of wastewater dischargers in areas that are primarily considered agricultural. The State Water Board has evaluated the Beneficial Use aspect for numerous bodies of water that are located within agriculturally dominated areas. While the effort to streamline the process may come as a relief to some industries, there should also be concern from the walnut hulling industry. The State Board is going to begin looking at all industries that utilize and discharge water, and they are looking to implement WDRs for these industries. With the help of the four year compiled study, WAPA hopes to stave off any harsh or unnecessary requirements brought forth by the Regional Board. Stay tuned for more updates.

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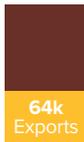
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<sup>1</sup> Economic Evaluation of the California Walnut Commission's Export Promotion Programs: An Analysis of the Direct and Indirect Impacts- pg. 6, January 2018, Harry M. Kaiser, Cornell University  
<sup>2</sup> Economic Evaluation of the California Walnut Commission's Export Promotion Programs: An Analysis of the Direct and Indirect Impacts- pg. 8, January 2018, Harry M. Kaiser, Cornell University

# Best Techniques for Managing Young Almond Orchards

By: Cecilia Parsons | Associate Editor

Just like children, young almond trees need proper nutrition and training if they are to grow into productive adults.

University of California Cooperative Extension (UCCE) farm advisors and specialists have compiled a handbook on orchard management for the first five years to help growers understand and respond to the needs of young trees.

Mohammad Yaghmour, UCCE orchard systems specialist for Kern and Kings counties said correct irrigation scheduling, adequate nutrition and training for proper scaffolding are the most important aspects of young orchard management. Meeting those needs will allow trees to reach their production potential over their life span.

## Irrigation

Possibly the most complex task in a young orchard is proper irrigation. Tree root systems and canopies are growing, so irrigation rates must be adjusted to meet their needs. In the first few years after planting, when the root systems are small, irrigation water and fertilizers can move outside the tree's small root zone, leading to inefficient use—and more importantly—a weed problem.





All photos courtesy of Cecilia Parsons.

UCCE advisors Katherine Jarvis-Shean and Allan Fulton list six steps to accurate irrigation applications during the first years of an orchard's life.

1. Know water application rate of irrigation system
2. Figure out water holding capacity of the orchard soil
3. Determine how much water the orchard is using
4. Calculate the maximum allowable time between irrigations
5. Estimate how long it will take the system to refill tree water use
6. Confirm irrigation schedule is on track with soil moisture or crop water stress measurements

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Drip systems range from 0.01 to 0.05 inch per hour, partial cover micro sprinklers range from 0.03 to 0.08 inches per acre and full coverage micro sprinklers or impact sprinklers 0.04 to 0.10 inches per hour. Irrigation distribution uniformity should be monitored.

When figuring irrigation scheduling, use available soil moisture numbers, not total soil water. Available soil moisture varies with soil texture. To avoid tree stress, UC advisors recommend plants not use more than 50 percent of soil available water. Size of the root system also makes a difference. As a general rule, first leaf trees have half a foot to three feet of root zone. Potted trees will have smaller root zones than bare root trees. Calculating how much water the soil can store and make available combines 50 percent available soil moisture with root depth.

How much water an orchard is using or 'evapotranspiration' increases over the growing season for young trees as canopy size and root growth increases. A first leaf tree in February will use 0.31 inch per month. In July, water use is up to 2.69 inches per month.

The maximum time allowable between irrigations is based on soil water storage and tree water use. An example is a first leaf tree in June on sandy loam with one foot of root zone. This calls for an irrigation every eight days (0.7 inches stored water divided by 0.08 per day equals 8.75 days).

How long to irrigate depends on the system, including percentage of the orchard area being wetted. Young orchards are typically irrigated with drip or micro sprinklers with caps to direct water in a smaller area. Length of an irrigation depends on the amount of time since the last irrigation, daily tree water use and if

any rain has fallen since the last irrigation. Start by calculating water use since last irrigation, subtract any rainfall and divide that number by the amount of water applied by the system per hour.

Tools to track soil moisture or crop water stress include tensiometers, resistance blocks, dielectric sensors, neutron probes and pressure chambers.



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## Nutrition

Nutrients in proper amount can ensure trees will reach their growth potential. Deficiencies will result in smaller trees and less vigorous growth.

Over application of nutrients can have repercussions. Excessive vigor, lanky growth and too much space between buds will lead to weaker branching structure and crop load bearing capacity.

Nitrogen (N) is the primary concern for young trees. It provides for leaf growth and development of plant proteins. Inadequate amounts will cause smaller, off-color leaves and stunted growth. An over application will cause excess vigor. Two other major nutrients are potassium and phosphorus that are used for woody tissue development.

UC trials have shown that no matter what form of nitrogen is applied, it will be transformed in the soil to a form that can be used by the tree. In almonds, a trial in Merced County applied different rates of nitrogen in one-year-old trees and measured the growth response. Based on trunk diameter and tissue samples, the study showed that applying three to four ounces per tree during the first growing season provided optimum growth. Higher amounts provided no additional benefit. The nitrogen was divided into six applications over the growing season.

For second through fourth leaf trees the rate was the same, 25-30 pounds per acre for new growth plus another 85 pounds for every 1,000 pounds harvested.

Before applying nitrogen in non-bearing orchards, there is a chance that groundwater used for irrigation may be supplying a portion of the tree's N needs. At five parts per million (ppm), the rate is just over a pound of nitrogen per acre. There may also be residual nitrogen in an orchard. Soil samples can determine the levels.

## Training

The goal of training and pruning is to create and maintain a tree that can produce optimal yields and allow for effective spray applications and harvest.

*Continued on Page 52*

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Continued from Page 51

Planting site will have some impact on training. Soil, wind, and tree spacing, along with variety and rootstock will direct training efforts. Training is important with larger trees and wider spacing because heavier crop loads must be supported.

Branches selected to remain on the tree are called primary scaffolds. Strong, well-anchored scaffolds are desired. In the second year, branches picked from these first scaffolds are secondary scaffolds.

The orientation of the scaffolds must be even to balance crop loads around the tree. A strong branch in the direction of the prevailing wind is recommended. Even spacing gives room to attach to the trunk and balance drop weight.

After scaffolds have been selected and other branches pruned out, the selected scaffolds can be pruned to stimulate side branches in the next season for secondary scaffold selection.

Goal of the second dormant pruning is to continue to shape the structure of the tree. Selection of secondary scaffolds and removal of overly vigorous watersprouts reduces corrective pruning later.

By the third dormant season, training is complete and growers can transition to minimal maintenance to facilitate cultural practices and remove diseased or dead wood.

UC trials in almond orchards over many years show that trees not pruned after the first or second year of scaffold selection showed no difference in cumulative yield and often had higher yields early on, compared to traditionally pruned trees.

### Weed management

Removing weed competition for water and nutrients is important in young orchards. Key points to consider are young trees susceptibility to herbicides and that herbicide options are limited with several weed species developing resistance or tolerance to materials that have been mainstays in weed management.



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UC advisors Jarvis-Shean and Brad Hanson recommend first identifying the weed species and then selecting a herbicide that will work on the target weeds. The material must also be applied at the appropriate growth stage with correctly calibrated equipment.

UC Davis' weed identification website is [weeid.wisc.edu/ca/weeid.php](http://weeid.wisc.edu/ca/weeid.php).

To avoid tree damage, cartons should be left on tree trunks for the first two years after planting or until trunk diameter is too large. Consider the lower branches on new trees and avoid drift by adjusting spray nozzles and direction.

To avoid moving herbicides to the root zone of young trees, make sure soil is settled before applying herbicide to the soil.

Key to avoid development of resistance in weeds is to use materials with different modes of action. Additional information can be found at [wric.ucdavis.edu](http://wric.ucdavis.edu).

The UC Young Orchard Handbook also contains information on vertebrate control, insect pests and diseases. The handbook can be found at [ccfruitandnuts.ucanr.edu/files/238596.pdf](http://ccfruitandnuts.ucanr.edu/files/238596.pdf)

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# Nitrogen Management for Almonds

By: Julie R. Johnson

An efficient nutrient management approach utilizing the “5 R’s”—right rate, right time, right place, right source and right monitoring in nitrogen (N) use and application, was presented during this year’s Almond and Walnut Nutrient and Water Management Field Day at the Nickels Soil Lab in Arbuckle, California.

The importance of adhering to the premise of the 5 R’s allows productivity to be maximized and the potential for N loss to the environment minimized, according to Patrick Brown, professor of Plant Science, University of California (UC) Davis, and Sebastian Saa, senior manager of Agricultural Research, Almond Board of California.

## Goal of N Management

“The goal of N management is to apply adequate but not excessive amounts of N,” Brown said. “You cannot enhance orchard productivity by providing N in greater amounts than is demanded by the crop.”

Saa said this new approach to N application can help growers achieve the goal of both efficiency and profitability.

Included in the presentation was a new method of tissue testing.

Much of the information provided during the field day was based on a four-site trial conducted in Kern County at which side-by-side comparisons were made between traditional N management and improved best management strategies.

Nitrogen is the most important mineral nutrient in almond production. Its application through the “5 R’s” method was presented during this year’s Almond and Walnut Nutrient and Water Management Field Day at the Nickels Soil Lab in Arbuckle. All photos courtesy of Julie R. Johnson.

Nitrogen, the most important mineral nutrient in almond production, is absorbed as nitrate or ammonium by active roots.

### Managing N in Almonds

When managing N in almonds, growers need to base their fertilization rate on realistic, orchard specific yield, account for all N inputs and adjust in response to spring nutrient and yield estimates.

In addition, it is necessary to remember, every field, every year, is a unique decision when managing the use of N in almond, Brown said.

Mature almond trees, seven-years and older, use 80 percent of their total annual N requirement between full leaf out in March to mid-May through June. If N levels are not adequate during this time, crop yield can be lost.



Young almond orchards, such as this one, require much less N application as they are not yet developing fruit.

*Continued on Page 56*

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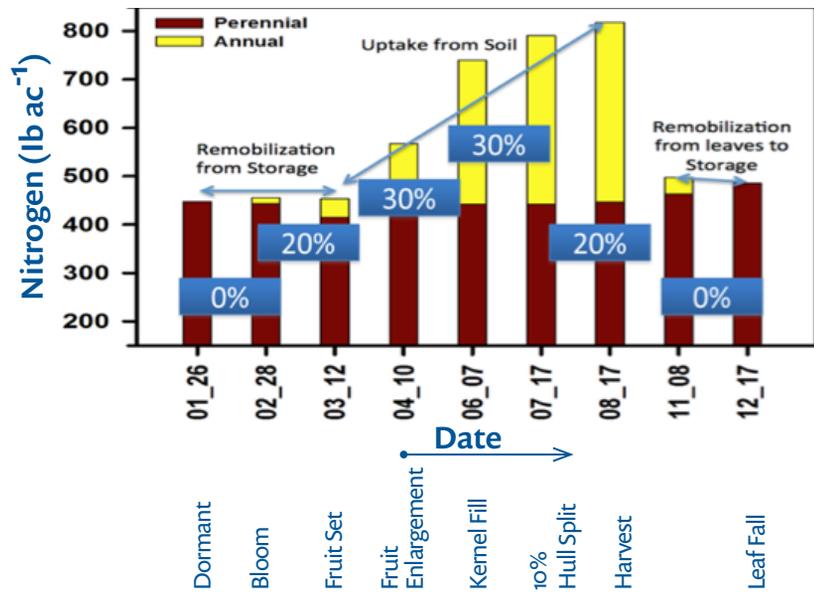
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# Total and Annual Dynamics of N in Mature Almond Tree

(data from 12 year old trees)

Figure 1. Courtesy of Sebastian Saa, Senior Manager Agricultural Research, Almond Board of California.



Continued from Page 55

“You cannot enhance orchard productivity by providing nitrogen in greater amounts than is determined by the crop,” Saa said.

In the 5 R’s N management approach, researchers recommend growers establish a pre-season N fertilization plan based on predicted yield and N contributors from water and other sources. Brown said April tissue sampling and

early-season yield estimation are then used to optimize the annual N fertilization plan by adjusting the May through July and/or fruit maturity/post-harvest fertilization rates accordingly.

He added, the goal of this approach is to ensure N fertilization rates are more closely matched to individual orchard productivity in the current year.

## Right Rate

Saa explained, the goal of selecting the right rate is to match supply with the tree demand. This can be accomplished by first determining the tree demand. For mature almond trees, nut yield in the current year is the primary determinant of N demand.

The amount of N removed from the orchard for a given yield ranges from 50 to 75 pounds N per 1,000 pounds of kernel yield, depending on the N status of the tree, Brown said. In the Kern study, it was determined the ideal N removal rate averaged 68 pounds N per 1,000 pounds of kernel yield.

According to Saa, the amount of N required for vegetative growth in a yielding tree is small in contrast to that required by the fruit, and averages 20 to 40 pounds per acre per year in orchards with 70 percent or greater orchard light interception.

“Yield is the driver concerning the addition of N,” he added.

A composite of determining the amount of N required is by crop size less nitrogen supplied from water and other N sources, including manures, composts, nitrogen-fixing cover crops, Saa said, including previous applications in excess of

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Irrigation water is an excellent source of N. The supply from water is calculated by multiplying nitrate concentration in water parts per million (ppm) by acre feet irrigation applied at 0.61, according to the Kern County research.

The ability to estimate the contribution of soil N supply to orchard N demand is limited, according to Saa. As a general rule, if soil nitrate exceeds 10-15 ppm, then N fertilization can be significantly reduced.

This “right rate” approach helps to ensure N fertilization rates are more closely matched to individual orchard productivity in the current year, reported Brown and Saa.

### Right Timing

Saa said timing in efficient N fertilization requires crop nitrogen demand is satisfied and N is applied coincident with root uptake.

Although frequent N fertigation with smaller amounts would be ideal, Saa explained less frequent fertilizations can be used effectively if irrigation and fertigation are well managed.

He said right timing, depending on factors such as location and soil type, means at least 80 percent of nutrients should be applied during the active tree growth period commencing in early spring, after leaf-out begins, and continuing through early hullsplit. This can take place through two to four fertilization events.

An additional 20 percent of annual fertilization can be provided during the period after hullsplit, pre-leaf senescence.

“This decision should be made based on current year yield, prior N fertilization rates and July leaf N values,” Saa added.

Brown said these recommendations assume fertilizers can be applied at four intervals:

- Early-spring application (end of bloom through full leaf expansion) 20 percent of total annual demand
- Fruit growth application (from full leaf expansion through shell hardening) 30 percent of total annual demand
- Kernel fill application (shell hardening through early hullsplit) 30 percent of total annual demand
- Fruit maturity/early post-harvest application (hullsplit through early post-harvest) 20 percent of total annual demand

### Right Place

“To optimize the use of N fertilizer in almonds, fertilizers must be delivered

*Continued on Page 58*

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Continued from Page 57

and present in the root system when they are most likely to be used by the plant,” Brown advised.

Saa said how a grower irrigates and fertigates determines where in the root zone N is deposited.

“Know where your active roots are, usually within the first 18 inches, which is the effective root zone,” he added. “The uniformity of an irrigation system defines the uniformity of N application.”

He advised growers fertilize towards the end of the irrigation cycle so nutrients don't accumulate below the effective root zone. This is due to the fact N in the soil moves easily with irrigation water.

### Right Source

Saa said new technologies have been developed to improve nutrient stewardship, with some of the important categories being coated fertilizers, slowly soluble fertilizers, inhibitors of biological processes, foliar fertilizers and other nutrient enhancing materials.

Brown recommends growers use compatible, soluble and balanced fertilizer materials when adding N to almond orchards. He and his fellow researchers found no differences in almond yield when equal amounts of N was applied as CAN17 or UN32.



Continued on Page 60

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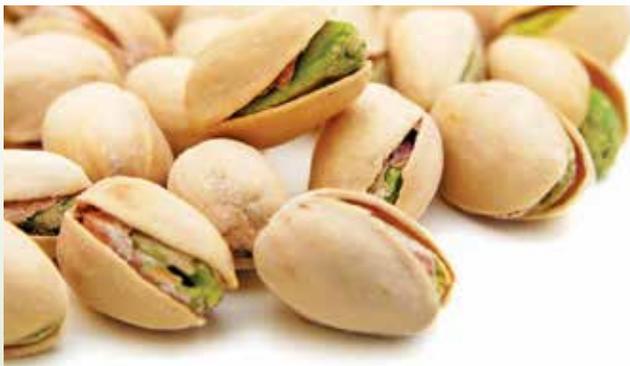
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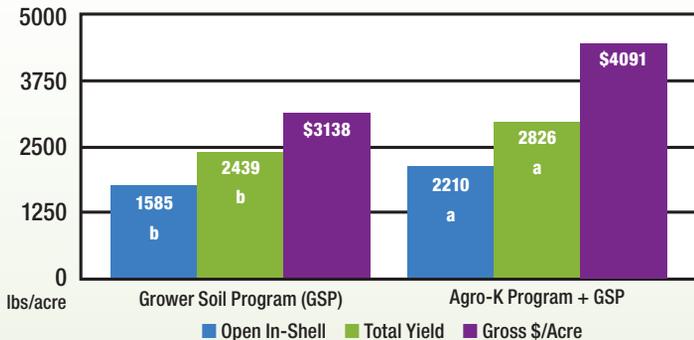
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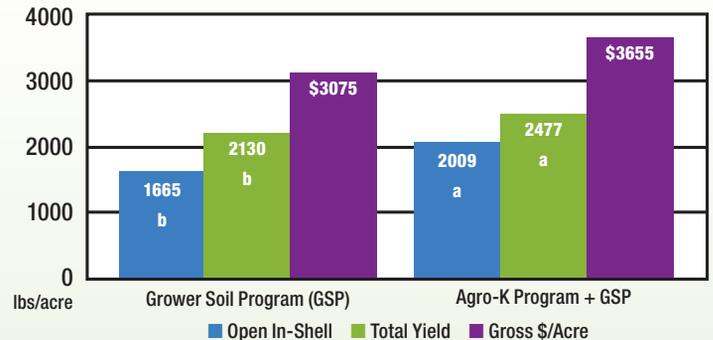


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**Yield: 'Gold Hill' Pistachio**  
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Take advantage of the free ride available with your late season Navel Orange Worm spray to apply nutrient formulations that have been tested and documented to penetrate thick waxy pistachio leaves even during the heat of summer. Applying effective nutrients based on a “Science Driven” approach will help pistachio growers maximize **nut size** and **splits** on this year’s crop, increasing per acre returns. In addition, foliar nutrient programs added with late season NOW sprays will also increase the 2019 crop. Even though this year’s crop has not yet been harvested, by mid-season the tree is already building next season’s crop.

Applying early-season peak demand nutrients like zinc, phosphorus and boron with your late season NOW spray helps build bud strength and provide critical nutrients that can be stored for next year’s developing buds so they are available when the tree breaks dormancy next spring. Agro-K’s **System Ready** – zinc/manganese phosphite provides two key nutrients in a highly systemic (phloem and xylem mobile) mix that rapidly delivers nutrition throughout the tree. Along with other materials like **AgroBest 0-20-26**, **Top Set D.L.** and **Zinc +5 D.L.** Agro-K designs specific nutrient programs tailored to meet the specific needs of your crop.

Our pistachio programs focus on the **5Rs** – Right Nutrient, Right Form, Right Time, Right Mix, Right Place. Building key nutrient

levels during summer NOW spray timing works to maximize yield this season while also benefiting the 2019 crop. Building nutrient levels in the buds this year, leads to more uniform bud break, faster early growth with larger leaves that have more photosynthetic capability and stronger flower buds for increased nut set in 2019. Ensuring peak nutrient demand timing is met leads to higher nut set and retention. The end result... larger, heavier nuts and increased yields in 2019.

Building nutrient levels this year sends trees and buds into winter with more strength and energy reserves that will be available to the tree next spring at bud break when cool soils limit uptake and nutrient availability. Applying **System-Ready** with **Zinc Plus +5 D.L.**, **AgroBest 0-20-26** and **Top-Set D.L.** at late season NOW timing will ensure the tree has all critical early season nutrients needed ahead of spring peak demand timing to support leaf and root development. By beginning to manage next year’s nutrient needs during late season NOW spray timing you will maximize this years nut size and yield, while also setting the stage for increased yield in 2019, all without requiring a special application trip.

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# Managing in Almond

Make a pre-season fertilizer plan based on expected yield less the N in irrigation and other inputs.

Conduct (properly) a leaf analysis following full leaf out.

In May, review your leaf analysis results and your updated yield estimate, then adjust fertilization for remainder of season.

At harvest, review yields and adjust post-harvest fertilization accordingly.

Every field, every year, is a unique decision.

(based on the Kern County four-site trial on N application in almonds)

Figure 2. Courtesy of Sebastian Saa, Senior Manager Agricultural Research, Almond Board of California.

Continued from Page 58

## Right Monitoring/Leaf Sampling

Saa and Brown shared the protocol for the new leaf-sampling method. For each orchard/block or sub-block a grower wants to have individual information, and do the following:

- Samples all the leaves of five to eight non-fruiting, well-exposed spurs per tree at approximately 43 +/-6 days after full bloom when the majority of leaves on non-fruiting spurs have reached full size. This usually corresponds to mid-April.
- Collect leaves from 18-28 trees per orchard. Combine all leaves in a single bag for submission to a reputable laboratory. Each sampled tree must be at least 30 yards apart. A minimum of 100 leaves per sample bag is required.
- Send the samples to the lab and ask for a full nutrient analysis (N, P, K, B, Ca, Zn, Cu, Fe, Mg, Mn, and S) and application of the UCD-ESP program.
- These techniques have been validated only for the Nonpareil variety in orchards eight-years and older. Method development for other cul-

tivars is under way. However, this current approach will result in valuable information for any cultivar.

- Repeat for all orchards and orchard regions that differ in productivity, age or soil type. Identify area of low performance, and collect samples from them independently.

- Label all samples well with collection date, field number, cultivar and within field location if needed. Note if foliar fertilizers have been applied.

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# Tackling Tractor Safety

By: Amy Wolfe | MPPA, CFRE  
President and CEO | AgSafe

In today's agricultural industry, employees spend an increasing amount of time operating tractors. Tractor operators perform an assortment of tasks from harvesting nuts, moving manure with a loader and pulling a variety of implements. Because tractor use is so common, we often forget that we are operating a piece of equipment that is two to five times heavier than an automobile, with limited visibility all while carrying heavy loads. As such, it is

critical to know the hazards associated with tractors and how to operate them safely.

## The Law

Before we can begin tackling best practices in tractor safety, it is important to understand the regulations that exist under the Department of Industrial Relations, Division of Occupational Safety and Health (Cal/OSHA) and their requirements under the California Code of Regulations (CCR), Title 8:

**Section 3440. Agricultural Equipment:** This section outlines safety features on the actual tractors and includes elements like fenders to prevent contact between the operator and the rear wheels, power take-off (PTO) guarding, placement of signs and decals, and other components that need proper guarding. For the full regulation visit: <https://www.dir.ca.gov/title8/3440.html>.

**Section 3441. Operation of Agricultural Equipment:** This section addresses safe operation and training. Employers are required to train their employees on safe tractor operation prior to operating a tractor and annually thereafter. Employees need to operate equipment according to a list of company-specific safe work practices and keep all guards in place. For the full regulation visit: <https://www.dir.ca.gov/Title8/3441.html>.

**Section 3664. Operating Rules:** This section reviews the following employee operating instructions:



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1. Securely fasten your seat belt if the tractor has a roll over protection system (ROPS).
2. Where possible, avoid operating the tractor near ditches, embankments, and holes.
3. Reduce speed when turning, crossing slopes, and on rough, slick, or muddy surfaces.
4. Stay off slopes too steep for safe operation.
5. Watch where you are going, especially at row ends, on roads, and around trees.
6. Do not permit others to ride.

EXCEPTION: to No. 6: The operation of agricultural tractor-mounted personnel transport carriers when used, operated and maintained in accordance with Section 3441(i) of these Orders.

7. Operate the tractor smoothly—no jerky turns, starts, or stops.
8. Hitch only to the drawbar and hitch points recommended by tractor manufacturers.
9. When the tractor is stopped, set brakes securely and use park lock if available.

In addition to the safe operation instructions, every employee that operates a tractor needs to inspect the tractor prior to operation each day and report any issues. Using a checklist (Figure 1, right) is a simple way to ensure compliance and safety. For the full regulation visit: <https://www.dir.ca.gov/title8/3664.html>.

### Essential Elements of Tractor Safety Program

Given that the operating rules regulation (CCR, Title 8, Section 3664) is so explicit in its directive on how to safely operate agricultural equipment, it should come as no surprise that a company needs to have a written tractor safety program that includes a number of important elements. Programs need to outline expectations of safe operation, maintenance, vehicle pre-inspection, appropriate personal protective equipment (PPE) to be worn, and the protocol for responding to a tractor-related emergency. As with any written program, employees operating these

**Pre - Use Inspection Check List - Agricultural Tractor**  
 Equipment daily checklist - perform before use and/or at the start of every shift  
 Note general vehicle condition. Clear away all collected debris, steam clean if necessary. Check for mechanical damage and loose or leaking components. Report faults to your supervisor or the maintenance department, whichever your company requires.

**Before starting engine, check the following:**

VISUAL INSPECTION	STATUS			REMARKS
	OK	NO	ADD	
Walk-around inspection (warning decals, SMV sign, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Front end/back end (visual inspection)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wheels, tires & lug nuts (condition / pressure)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Engine (check oil level and for leaks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transmission (check oil level and for leaks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Engine belts (check for adjustment / wear)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air Cleaner (check indicator, clean or change A/R)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fuel filter (service as required)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Radiator (check coolant level and for leaks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Hydraulic tank (check oil level and for leaks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Fuel tank (drain off moisture & sediment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Lubricate chassis (as required, refer to lube chart)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
ROPS/Cab (check, windows, step, doors)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

**After starting engine, check the following :**

AFTER STARTING	STATUS			REMARKS
	OK	NO	ADD	
Engine (does it sound normal?)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Instruments (check for normal readings)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Air intake system (check for normal readings)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Exhaust system (check for leaks & excessive smoke)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Wipers & lights (spotlights, turn signals, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Horn & backup alarm	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Controls (check for normal operation; loader & backhoe)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Transmission (direction and speed range)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Brakes (parking & service brakes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Steering	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Note anything abnormal or in need of repair : \_\_\_\_\_

Operator : \_\_\_\_\_ Supervisor : \_\_\_\_\_

Vehicle # : \_\_\_\_\_ Hour Meter Reading : \_\_\_\_\_ Date : \_\_\_\_\_

**Figure 1.** All employees must conduct a pre-use inspection each day prior to operating a tractor. Using a checklist can help in this area to ensure compliance and safety. Photo courtesy of AgSafe.

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*Continued on Page 64*



*Continued from Page 63*

machines need to be trained in the program's components as well as be educated in how to safely operate the tractor.

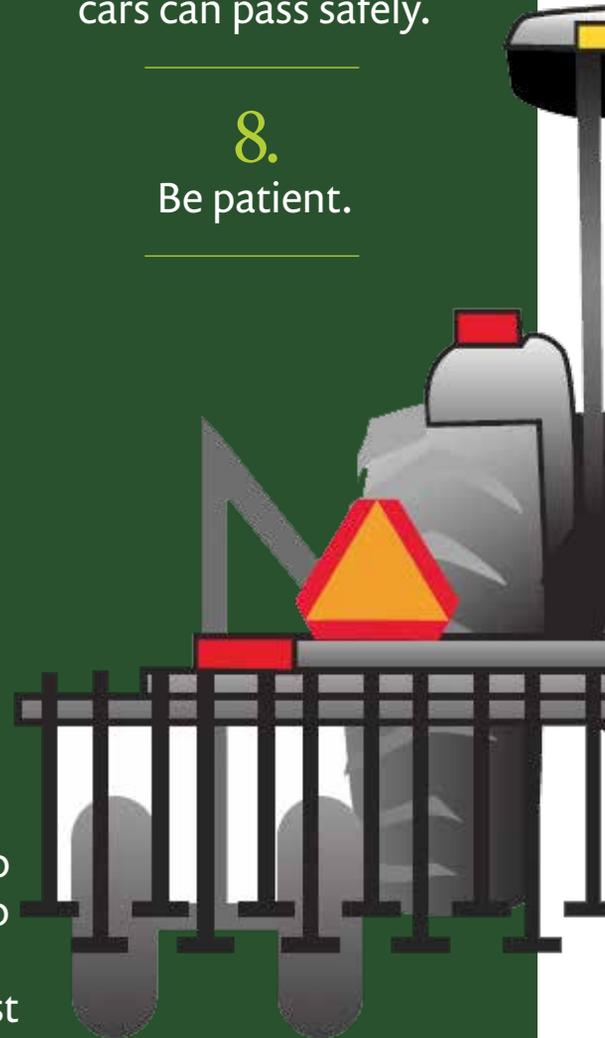
### Tractor Operation Hazards

**Overturns:** Tractor overturns are the leading cause of fatalities in the agriculture industry. Typically, these overturns happen very quickly leaving the operator with little time to respond. The chances of survival greatly increase when ROPS are in place and seatbelts are worn. ROPS provide a protective caged frame, and when the operator is seat belted in, he remains in that protective cage. Be sure to train employees to familiarize themselves with site hazards to help prevent overturns in the first place. Consider hazards like other equipment in the same field, sloped ground, stumps, posts, or irrigation boxes. In addition to the pre-use inspection on the tractor, employees should be conducting a quick site inspection prior to operation to be aware of the hazards.

**Moving Tractors on the Road:** Moving tractors from field to field is an essential part of effective farming. If we cannot eliminate the hazards, then we need to implement processes, procedures and personal protective equipment (PPE) that keep operators safe.

To ensure safety, consider the following solutions:

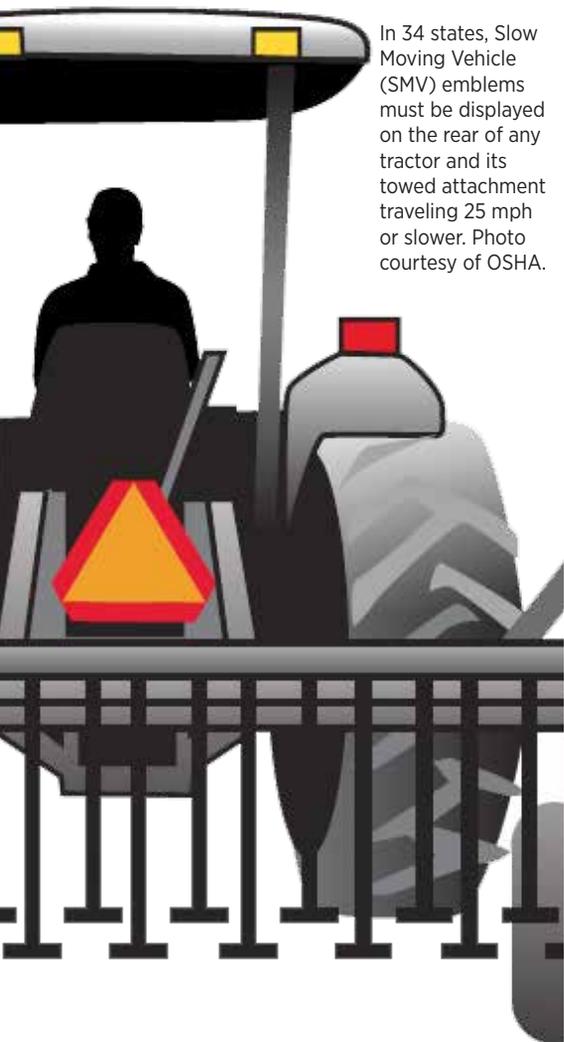
1. Train tractor operators in safe procedures for driving on the road.
2. Create company safety guidelines that ban cell phone use and earbuds while operating tractors.
3. Never allow passengers.
4. Have operators wear reflective, tear-away safety vests.
5. Map out the travel plan prior to leaving the field to ensure the safest route with the least hazards and traffic.
6. Use a pilot driver when possible, ensure slow-moving vehicles (SMV) emblems are in place and visible.
7. Leave 3-5 car lengths in-between equipment so that cars can pass safely.
8. Be patient.



## Now What?

With the busy season upon us, it is critical that agricultural operations use the precious remaining time to ensure they have a complete and robust tractor safety program in place. According to OSHA, most farmworker injuries and deaths are caused by tractor incidents such as overturns, run overs, power take-off (PTO) systems, and unintended contact with tractor attachments or implements. Do not allow your employees to become a statistic and invest the time now in creating the safest possible tractor program.

For more information about tractors, or any worker safety, human resources, pesticide safety, or food safety issues, please visit [www.agsafe.org](http://www.agsafe.org), call us at (209) 526-4400 or via email at [safeinfo@agsafe.org](mailto:safeinfo@agsafe.org).



In 34 states, Slow Moving Vehicle (SMV) emblems must be displayed on the rear of any tractor and its towed attachment traveling 25 mph or slower. Photo courtesy of OSHA.

AgSafe is a 501c3 nonprofit providing training, education, outreach and tools in the areas of worker safety, human resources, pesticide safety and food safety for the food and farming industries. Since 1991, AgSafe has educated nearly 75,000 employers, supervisors, and workers about these critical issues.

**\* Note—this article does not include a complete list of legally required**

**elements. A complete tractor safety program must include company-specific protocol, hazards, unique identifiers and other applicable processes unique to each individual operation.**

*Comments about this article? We want to hear from you. Feel free to email us at [article@jcsmarketinginc.com](mailto:article@jcsmarketinginc.com)*

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# Immigration Reform and How it Impacts YOU

By: Jenny Holtermann

California is the land of opportunity. A place to start a new future. A way to earn a decent living and have a good life. But it is also a place of onerous regulations and restrictions.

I am proud to be a fourth generation California farmer whose family came here for opportunity and to start a farm of their own. My great grandfather was looking for fertile soil, familiar climate and a better way of life. California provided for him and is continuing to provide for the generations that follow. I am raising the fifth generation but I am very worried about them having the chance to carry on the family farm. With the current state of our agriculture industry I am concerned if there will be a workforce to keep California growing.

Family farms are the heart of California agriculture but unfortunately, we are becoming fewer and far between. With the onset of increasingly more regulations, family farms will be no longer. But it isn't just the family farmer that is suffering, our labor is as well. Our labor force is the heartbeat to our farms. They are more than just employees they have become part of our families. They have been around to see generations returning to the farm. Generations of leaders, managers and friends. Some of my fondest memories of growing up on the farm, include working side-by-side with our employees. Working alongside the men and women who tirelessly



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labor for someone else, we have learned their trials and life experiences. As an employer, we have empathy and respect for them and their decisions to make a better life. I want to do what I can to make their lives better and enhance their future in the agriculture industry.

Agricultural labor is a major issue that California farmers are struggling with. Finding labor, qualified labor, is increasingly difficult. It has become a norm now to not have enough workers for the jobs that need to be completed on the farm. Employees are becoming scarce and the ones we have are aging. Agriculture labor is a skilled workforce.

## They are also a scared workforce.

They are worried they are going to be arrested and taken from their families, legal or not. We invest in training our employees to ensure they are the best they can be, for themselves and our farms. I can't even imagine what it would be like to be scared to go to work, or even just leave the house.

*Continued on Page 68*



Jenny Holtermann in DC in February discussing immigration and Farm Bill as part of an advocacy trip. Photos courtesy of Jenny Holtermann.

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Over the last several months there have been multiple legislative bills discussed to change the current immigration process. So far, nothing will improve the current process. If anything, the amendments and potential changes would make it worse for California agriculture and the work force. Farm labor will not be able to follow such stringent standards.

### Touchbacks

One proposal includes touchbacks, having the workforce leave the country for 60 days over three years and return to their home country. Touchbacks would be damaging to all of agriculture. Returning to their “home country” could mean going someplace they haven’t been in years, or decades. Our current workforce needs to be protected here. The ones that have been here for decades and lived legally. Should they

be forced to return to a country they may have not been in years? America is their home. Staying there for up to 60 days would mean they wouldn’t have an income for the duration of their trip. These laborers depend on this pay for their livelihood and their families’ well-being. Not everyone can be gone that long. Leaving their homes here, removing them from their families, expecting them to not work.

farmers. Fruit will not be harvested, trees will not be pruned, seedlings will not be planted, agriculture can’t just wait for weeks or months for them to return. Can you imagine one of your skilled and trained operators having to leave the country in the middle of harvest? It is nearly impossible to find a replacement that would be able to complete the job at hand without training and setbacks to your operation.

**They want to be in America.**  
Their countries of origin  
are not always safe places.

They may not have family or friends there anymore. For many America is their home.

This would be detrimental to more than just them. This would also hurt the

Agriculture is a perishable commodity. When the workforce leaves, it could damage the quality of the product and the farm.

### Memorandum of Understanding

Another proposal that has been discussed is, how do we know they will be able to return? A Memorandum of Understanding has been asked for, to ensure that once people return to their “home country” they will be allowed entry back into America. Nothing is certain. In the past, employees have been held up for weeks at times dealing with government instability or technology malfunctions. Without certainty to their return, why would they leave?

### Contractual Labor

Additional amendments are asking laborers to be under contract with an employer. Small family farms do not have the capability to have contractual labor. This would put too much strain on our business to ensure work all year for all employees. Agriculture has seasons. We do not use the same amount of people during our harvest time as we do the balance of the year. Harvest is heavily mechanical, but operating the machines is a very important and intricate job. Pruning takes a highly skilled workforce that has been trained extensively in the

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development of the tree. Qualifications for pruning crews is much different than harvest crews. We utilize labor throughout the seasons based on various skill sets and trained expertise. Contracts would limit the availability to these skill sets and make our labor less specialized and more general. We would not be employing people based on their strong assets.

Some farm laborers follow the harvest season. With America's diverse agriculture industry and varying climate, they are able to harvest a multitude of crops throughout the year and travel with the seasons. Contractual employers, would limit the employees' flexibility and force them to stay on one farm. This would limit their hours of work and access to other higher paying agriculture activities.

*Continued on Page 70*

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Continued from Page 69

## Government Mandated Workforce

Forcing employees to sign up for a government mandated workforce like H2A, or the proposed H2C program, would bring with it a whole new set of challenges. The H2A program doesn't work in California, it never has. We have one of the highest minimum wages in the nation and it is increasing more every year. Setting more minimum wage requirements doesn't make sense. The use of a housing voucher or the need to provide housing for employees is unrealistic. California employs roughly 480,000 agriculture laborers a year. Many of which don't want to live in apartment or dorm room style living. This is another example of not taking our current workforce into account. People have lived here for years, they own homes, they are settled into their lives.

Immigration reform needs to address the workforce that has been committed to agriculture from the beginning. We

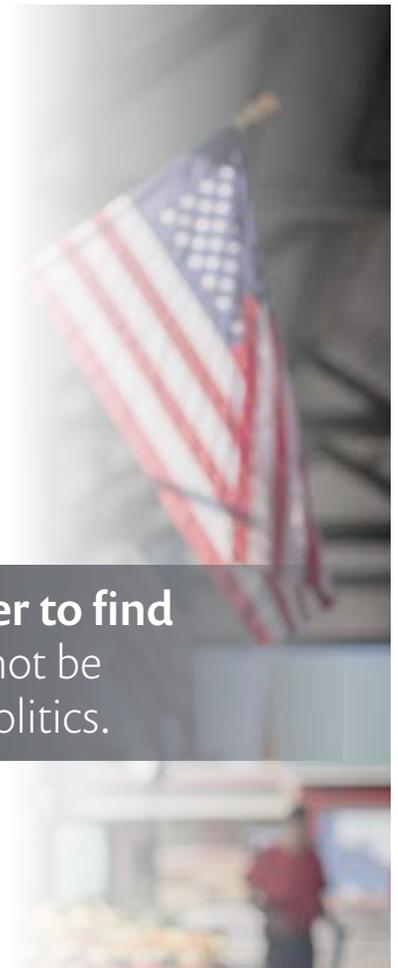
have employees living in this state that are not legal under today's standards, but who have worked here for decades, some brought to America as children. They are not going to sign up for a program that would not benefit them and force them to live in a lesser way of life. Many people would simply be scared to sign up for any program and provide their information to a government that has threatened them.

I agree what we have today doesn't work but what is being proposed will make it worse. Immigration needs a reform, but we need to consider the unique characteristics of agricultural labor as well as the current workforce in America.

**We need to work together to find a solution** for people and not be divided by commodity or politics.

- Jenny Holtermann writes an agriculture blog 'Almond Girl Jenny' and farms almonds with her family.

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**Mid-Valley Nut Conference: November 2, 2018**

Modesto Junior College Ag Pavilion - 2201 Blue Gum Ave, Modesto, CA 95358

**Kern County Ag Day: November 28, 2018**

Kern County Fairgrounds - 1142 S P St, Bakersfield, CA 93307

**Walnut Trade Show: January 4, 2019**

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# MRL Challenges in a Global Market

By: Abhi Kulkarni  
Assistant Director | Technical Support at  
California Walnut Board & Commission

Harvested walnuts. All photos courtesy of California Walnut Board.

The California Walnut Board & Commission is pleased to announce that the European Union (EU) recently adopted a new tolerance limit for phosphite of 500 PPM (parts per million). Previously, we had a temporary limit of 75 PPM. If the handler you work with supplies walnuts to Europe, chances are you have already heard about the ‘phosphite/fosetyl’ issue. So what exactly was the issue?

## Background

In late 2013, European Union (EU) classified all phosphite products (k-phite, nutriphite, potassium phosphite, and so on) as pesticides and established maximum residue limit (MRL) for various commodities. However, the real problem was the MRL was measured in terms of fosetyl, a compound not used on walnuts and allowed on only non-bearing tree nuts, if at all. Because tree nuts don’t use fosetyl, we received a default MRL of 2 ppm. But by

using fosetyl to measure all phosphite residues, the EU ignored the possibility of residues originating from sources other than fosetyl. This resulted in a significant impact on trade.

The California Walnut Board, in conjunction with other tree nut groups (almonds and pistachios), worked with EU to create a temporary MRL of 75 PPM to avoid trade disruption while research was underway at UC Davis to establish a permanent import tolerance. In addition to the technical efforts, we also involved various federal agencies—United States Department of Agriculture (USDA), United States Trade Registry (USTR), USDA/Foreign Agricultural Service (FAS), Environmental Protection Agency (EPA)—by making them understand the serious impact on trade that would have been likely had EU not created the temporary MRL. These agencies were very helpful and were engaged with their European counterparts to support our efforts.

As a result of this new tolerance, growers can now continue using phosphite containing fertilizers.

## New Challenges

Just as we successfully negotiated the phosphite challenge in EU, we have other emerging challenges in South Korea. The country has begun implementing what it calls a ‘Positive List System’ meaning only those substances on this approved list will have tolerances. For all other chemicals, the tolerance will be the default level i.e. the lowest value of 0.01 PPM.

We are carefully monitoring this list to ensure that chemicals important to the walnut industry are not left off the list. Currently, South Korea has announced that it will phase out the tolerance for Ethephon in three years. Given the importance of Ethephon to walnut industry; advancing harvest as much as two weeks, thereby avoiding exposure to



pests and negating the need for pesticide application and coincident air contamination; you can be assured that the Walnut Board will make every effort to extend the registration of Ethepon for South Korea beyond the 2021 deadline.

In general, tree nuts are an export market oriented commodities. What happens abroad in terms of regulatory changes affects us here in California. To that end, we continue monitoring regulations in our key export markets on behalf of the walnut industry and keep everyone informed.

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# Curtis Leaving a Legacy of Groundbreaking Advances in Almond Industry

By: Almond Board of California | Contributing Writer

**N**avel orangeworm. Bee colony health. Drought and water shortages. These challenges aren't solved overnight, and yet throughout his career, Bob Curtis successfully confronted each one to help improve growing conditions for almond industry members and address environmentally friendly and sustainable almond production.

While Curtis plans to retire from his job as director of Agricultural Affairs for the Almond Board of California (ABC) this July, growers will continue to benefit from his work, from his leading, groundbreaking research to his service as a public spokesman for the industry. Curtis is proficient in modern on-farm procedures and programs—he helped develop many of them.

Collaborating closely with university and governmental agriculture researchers—and growers in the field—Curtis has helped to determine and define responsible production practices whose relevance remains as strong then as they are today. His agricultural experience stretches back to his childhood, when he spent days on his grandfather's walnut and apricot farm in the Santa Clara Valley.

## Pioneering Work

Curtis' pioneering work began when he was still in college, studying zoology and entomology. He became the first graduate student funded by the Almond Board to conduct production research in the orchard, and after earning his master's degree, Curtis joined ABC on a full-time basis to manage its production research program.

"Navel orangeworm was a serious problem at the time, so it was a major focus of my work," said Curtis.

Curtis, with Almond Board-funded researchers, developed a robust integrated pest management (IPM) program for navel orangeworm (NOW), which included a foundation of orchard sanitation to protect almonds. This IPM program involves removing and destroying NOW's overwintering hiding places—mummy nut—from orchards. Growers' adoption of IPM and winter sanitation practices has significantly reduced the level of NOW infestations in California almond orchards, from 8.8 percent in 1978 to around one percent today. Since this program's development, government agencies, including the California Department of Pesticide Regulation IPM Innovator Program and U.S. Environmental Protection Agency (EPA), have awarded and recognized the Almond Board for this IPM program that Curtis helped design.





## Honey Bee Health

Another pillar of Curtis' career at ABC is his work in promoting honey bee health in the orchard. Partnering with key groups such as beekeeper associations, the University of California Cooperative Extension, and organizations like Project Apis m. and the Honey Bee Health Coalition, Curtis has worked to inform growers on how to consider pollinator wellbeing both during bloom and throughout the year.

"Pollination is critical for orchard production, so we must make sure almonds are a safe place for honey bees," Curtis said.

To assure bee safety in balance with almond production practices, Curtis and third-party collaborators developed the Honey Bee Best Management Practices for California almonds. This best-practices manual for growers includes directions on bee-safe bloom time pesticide practices and explains the benefits of diverse cover crops (forage) in or around orchards to help sustain the 2 million colonies brought in California almond orchards annually to pollinate the crop.

"I'm proud to say that we're the first commodity that put crop-specific principles together for protecting honey bees," Curtis said. "A lot of groups across the nation have copied our practices."

Curtis also has worked with specialists in ag education, environmental policy-making and regulatory agencies to increase almond production and sustainable farming. Given California's persistent water woes, increasing the almond industry's water use efficiency has been a key objective for Curtis.

## Water

Because of advanced management techniques like micro irrigation and more precise water scheduling in concert with advanced horticultural practices, "almond orchards require 33 percent less water to

produce a pound of almonds than they did 20 years ago," Curtis explained. The adoption of scientifically proven irrigation and horticultural practices has led to a doubling of almond yields in the last two decades.

## Pruning

"It used to be taken as gospel truth that growers should prune 20 percent of the wood out of a tree's canopy each season to maintain production," Curtis said. "But there was no research to back that up. Now we know that growers were pruning away profitability. Research has shown that trees need only minimal pruning, just enough to initiate and maintain a sound canopy structure, orchard access and safety."

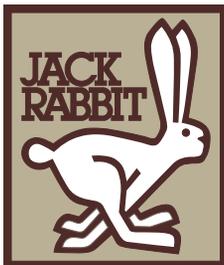
Considering the depth of Curtis' commitment to agriculture, he concedes that retiring from the Almond Board will be "a big step." And while he'll remain a close contact for ABC, he's looking forward to more time with his family and grandchildren and has already laid the groundwork for one of his next challenges: training his two Australian shepherds for "agility." The sport requires trainers to direct their dogs through an obstacle course—including tunnels, tires and seesaws.

"You know what they say about herding dogs," Curtis said. "They need a job to be happy."

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