

# WEST COAST NUT

September 2017 Issue

## SPOTLIGHT:

Subsurface Drip has Pros and Cons in Almonds

## In This Issue:

Utilizing Canopy Light Interception and Yield Potential Data to Improve Walnut Management

Diagnosis and Management of Canker Diseases in Almonds

Pistachio Pests, Crop Size, and More

Should Insectaries be on Your Radar?

October 27, 2017

*South Valley*  
Nut Conference

See Agenda Page 55

November 3, 2017

*Mid-Valley*  
Nut Conference

See Agenda Page 57

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# WEST COAST NUT

By the Industry, For the Industry

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## FEATURED ARTICLE

Subsurface drip irrigation in almonds may not be the way to go for all growers in the state, but for two almond operations, Terranova Ranch in Fresno County and 4R Farming in Arbuckle, the practice has proven to be very successful.

*See the full story on page 4*



Photo Courtesy: Julie R. Johnson



# Subsurface Drip has Pros and Cons in Almonds

By Julie R. Johnson | Contributing Writer

Subsurface drip irrigation in almonds may not be the way to go for all growers in the state, but for two almond operations, Terranova Ranch in Fresno County and 4R Farming in Arbuckle, the practice has proven to be very successful.

The use of subsurface drip irrigation (SDI) is nothing new on a worldwide level. In Israel the practice has been around since the 1960s. SDI has had many diverse uses around the world for a multitude of crops on multiple soil types in various climates.

Here in the United States, studies and research into SDI, its advantages and disadvantages, continues, as is education on the system and commercial activities. SDI is a system that provides a low-pressure water source to almonds, and other crops, through buried drip tape or hard tubing with built-in emitters.

Terranova is a diversified farm that grows more than 20 crops per season

on roughly 7,500 acres, of which nearly 1,000 is in almonds in the varieties of Nonpareil, Monterey, Butte, Carmel, Wood Colony, Aldrich and Independence.

Patrick Pinkard, ranch assistant manager in charge of farming operations, said for nearly two decades they have been using SDI in their row crops and have been so well pleased with the results they are transitioning young almond plantings into SDI this year.

Terranova General Manager Don Cameron was among an agricultural delegation from California who made a trip to Israel last year for the purpose of learning more about the Middle Eastern county's efficient irrigation practices, such as SDI, and other successful growing innovations.

Gerry Rominger, owner of 4R Farming, said his family has been farming in Yolo and Colusa counties since 1870.

"Of the 2,900 farmed acres, 2,400 are planted in almonds," he added. "The farm began subsurface drip irrigation in the orchards in 2004. Every orchard planted since then has had buried drip tubing as the sole irrigation system.

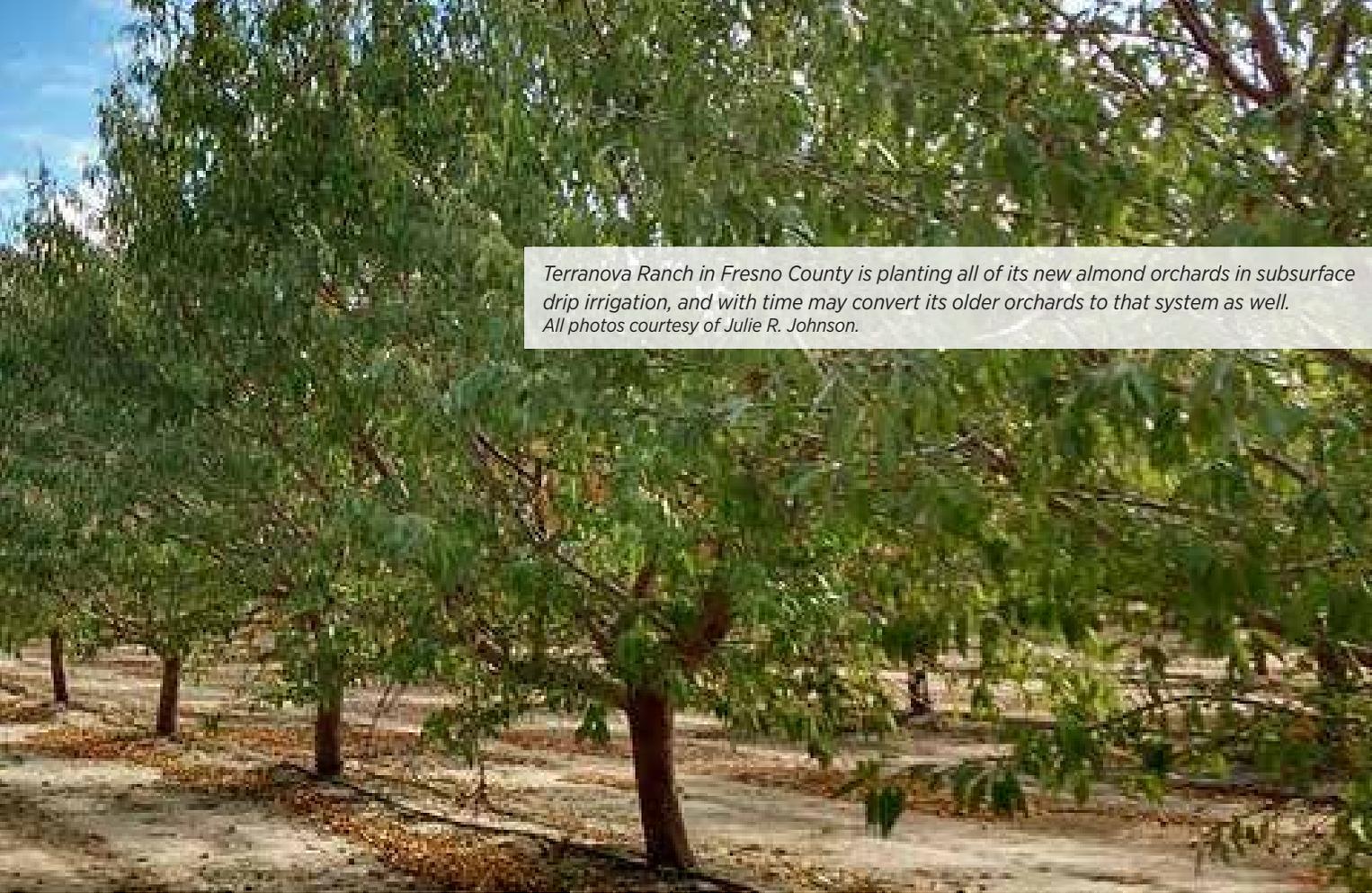
To prepare for the use of SDI, all of Rominger's orchards are laser levelled before planting.

"The orchards are planted on 24 foot x 16 foot spacing and the SDI tubing is buried 12 inches deep and six feet out from the tree row," he explained. "Emitters are .5 gallons per hour at 40 inch spacing."

For the first year of planting, Rominger uses surface tubing irrigation, then buried tubing is installed and used thereafter.

## SDI Advantages

Pinkard said with the use of SDI,



*Terranova Ranch in Fresno County is planting all of its new almond orchards in subsurface drip irrigation, and with time may convert its older orchards to that system as well. All photos courtesy of Julie R. Johnson.*

Terranova has seen higher yields with significant reduction in water usage. “We would like to convert more of our orchards the next few years and get the ranch using the least amount of water possible to continue farming in the future,” he stated.

Several studies have shown soil evaporation, surface runoff, and deep percolation are greatly reduced or eliminated with SDI.

With the use of SDI, Rominger said his operation saw a “substantial crop yield increase,” which he feels off-sets the additional cost of the system.

According to Pinkard, another benefit the ranch will see with the subsurface drip in almonds is better harvesting conditions.”

“With the subsurface irrigation tape buried you will no longer run into a sweeper hitting the drip hose or ever having to move the hose. It will also decrease the germination of weed seeds, as less water is brought up to the surface,” he explained.

Additional advantages both growers

have observed is less frequent leaks with the irrigation tubing or hose not being exposed to the elements, equipment, and both two-legged and four-legged critters. Rominger has found less herbicide use is required with SDI as there is less of a weed problem.

Because there is less of a weed problem, mowing and the costs associated with mowing is reduced.

“We are also able to irrigate during windy conditions and there is minimal hand raking during harvest,” he said.

Studies have found with SDI runoff into streams is reduced or eliminated, and there is less nutrient and chemical leaching due to deep percolation.

Other benefits of SDI include design flexibility, system longevity in some cases, placing water right where the roots are, the ability to irrigate during harvest, and a dry orchard floor helping to prevent surface diseases.

Research at Kansas State University with Dr. Freddie Lamm found damage to almonds drying on the surface during harvest when irrigation may be required

is eliminated with SDI.

### **SDI Disadvantages**

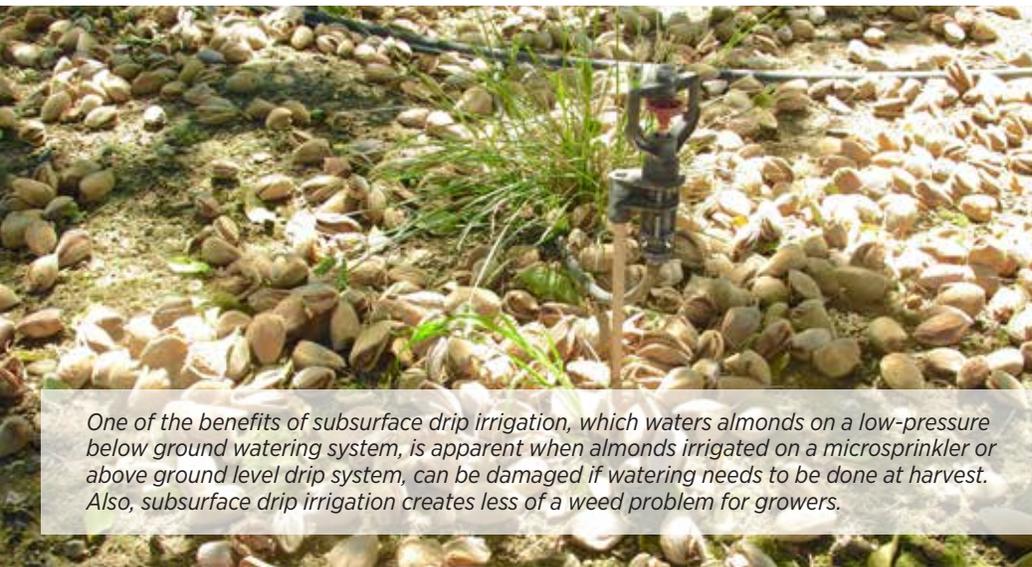
At the Terranova Ranch, Pinkard has found one drawback to SDI is plugging of emitters which are below surface and more difficult to replace than surface drip systems or equipment on micro sprinklers.

Rominger agrees, “Extra care is required to avoid emitter plugging.”

Growers can address this problem by selecting trifluralin-impregnated emitters or by trifluralin applications through the system, according to Larry Schwankl, retired irrigation specialist, University of California Cooperative Extension (UCCE). A large scale, 10-year field trial conducted at the Nickels Soils Laboratory found no significant root intrusion was found in trifluralin impregnated SDI emitters, but standard SDI emitters were plugged by almond root growth after five years of field operation.

Installation cost is another disadvantage.

*Continued on Page 6*



One of the benefits of subsurface drip irrigation, which waters almonds on a low-pressure below ground watering system, is apparent when almonds irrigated on a microsprinkler or above ground level drip system, can be damaged if watering needs to be done at harvest. Also, subsurface drip irrigation creates less of a weed problem for growers.

The lack of visual indicators of proper irrigation performance is a major disadvantage with SDI, Schwankl said.

Because of this, growers believe they need to use more sophisticated and costly management procedures with SDI.

Rominger said irrigation management requirements do increase with SDI compared to surface drip systems, but again, he feels the end results are worth it.

“Buried tubing in almond orchards is not for all soil types or land terrain,” Rominger said.

Soils with low infiltration rates pose a challenge for subsurface irrigation and drip tube spacing needs to be adjusted for clay-type soils.

### Is SDI an Option?

For some growers considering implementation of SDI many questions stand out—such as, what is the best equipment to use; how to custom design the system; is an orchard’s soil and terrain receptive to SDI; how long will the system last; is financing available to purchase all that is required for a SDI system, and so forth.

Another consideration is whether or not conversion to SDI from a currently used irrigation system is possible. According to Schwankl, it can, and has been, done.

Time, experience and research have proven that proper installation of a SDI system is critical to maximizing the system benefits and long term stability.

The performance and life of any system depends on how well it is designed, operated and maintained. Whether automatically controlled or otherwise, inspection of SDI systems must be made often and on a regular scheduled basis for the best bang for the buck.

Growth of SDI in almonds is expected to increase as system design is improved, disadvantages are remedied, and better and more failsafe operational and management procedures are developed.

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

Continued from Page 5

SDI can have a high initial investment cost compared to some other irrigation systems, but some growers, such as Rominger, believe that investment pays off in the end with higher crop yields and less water usage.

Rodents, such as gophers, can cause damage to the system by chewing on it.

Clogging can be a problem from buildup of minerals and algae. Cleanout valves installed at the end of the tube lines are important to remove blockages and draining the system.

Root intrusion and pinching off by roots can be another problem, all of which growers can’t see until damage becomes evident in the tree or vegetation around it.



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# NEMATODES: ROOT HEALTH & TREE LONGEVITY THREAT

| GROWERS CAN'T SEE |

## UNSEEN BUT FIERCE ON ROOT HEALTH

Nematodes, microscopic roundworms barely visible to the naked eye, pose a serious problem for walnut and almond growers. Even with proper sanitation and fumigation practices, nematodes can still become an issue after setting new trees. Nematode populations can build up in the soil, attack tree roots and impact overall tree health.

## NEMATODE THREATS TO ORCHARD HEALTH AND LONGEVITY



ROOT  
DAMAGE



REDUCED  
WATER &  
NUTRIENT  
UPTAKE



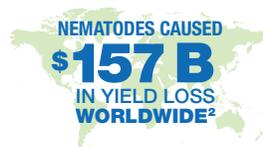
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A NEMATODE-CAUSED  
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**25** YRS  
OF YIELD LOSS  
IN YOUNG TREES

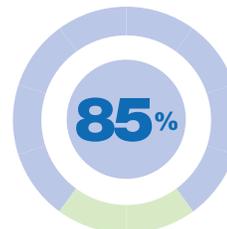
## BEST PRACTICES FOR TREATING NEMATODES<sup>3</sup>



1. Sample for nematodes to determine the presence, species and number of nematodes through an experienced lab.
2. If possible, fumigate the soil prior to planting new trees. This will reduce the number of nematodes initially, but will offer only a temporary solution.
3. Applications of Movento<sup>®</sup> in established orchards resulted in a reduction of nematode populations. Movento does offer a nematode management tool that can easily be incorporated into a tree nut grower's cultural practices.

## RESEARCH SHOWS

Applications of Movento<sup>®</sup> in established orchards helped result in:



SUPPRESSION OF  
RING NEMATODES

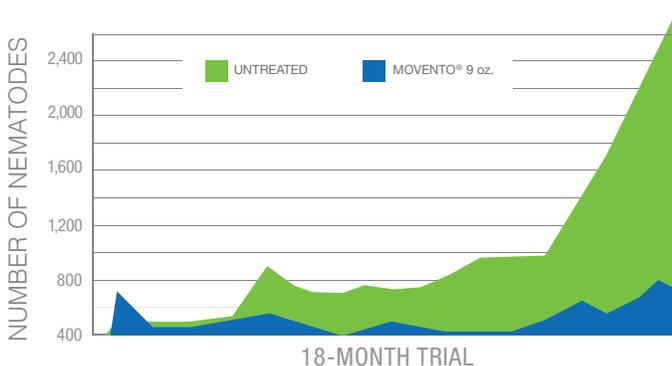


SUPPRESSION OF  
ROOT LESION NEMATODES

Trial conducted by Gary Branses, Bayer CropScience, Kerman, CA, 2009–2011.

Two-year trials show

## MOVENTO<sup>®</sup> SUPPRESSES RING NEMATODES BY 85%



Ring nematodes/500g sample in almonds (2009–2011)  
(Butte & Padre pooled, n=24 trees)

Trial conducted by Gary Branses, Bayer CropScience, Kerman, CA.

## EXPERTS SAY

*“Established orchards saw better yield where Movento<sup>®</sup> was used to treat for high nematode pressure. The tree has a lot of vigor and doesn't stress as bad.”*

*According to Tim Weststeyn, a pest control advisor (PCA) with Crop Production Services in Vernalis, CA. He consults on 4,000 to 5,000 acres of tree nuts and is in his third year of treating established almond trees with Movento for nematode management.<sup>4</sup>*

LEARN MORE AT [MOVENTO.US](http://MOVENTO.US).



<sup>1</sup>Average yield loss in lbs. per acre is based on California Agricultural Statistics Review, 2014–2015. California Department of Food and Agriculture.

<sup>2</sup>“Nematodes: A Threat to Sustainability of Agriculture,” Satyandra Singh, Bjendra Singh and A.P. Singh.

<sup>3</sup>University of California – Cooperative Extension. Department of Agriculture and Resource Economics. UC Davis, 2012.

<sup>4</sup>“The Dangers of Nematodes,” Growing Produce – 2012.

# Post-Harvest Irrigation is Cash in Your Pocket

By Kathy Coatney | Editor

From bud to harvest, irrigation is a critical aspect of a profitable crop, but post-harvest irrigation is just as important as during the growing season.

Post-harvest irrigation for almonds and walnuts is the foundation for next year's crop. It is vital that both crops receive adequate water during this time.

## Walnuts

Walnut trees require 40-42 inches (3.3-3.5 acre-feet) of water per acre annually to consistently produce economical yields with good kernel quality, according to Allan Fulton, University of California Cooperative Extension irrigation and water resources farm advisor for Tehama, Glenn, Shasta and Colusa Counties.

## Evapotranspiration (ET)

Most of the water is transpired through the leaves, but some is lost through evaporation from the soil surface. The sum of these two processes is evapotranspiration (ET).

The leaves exchange water for carbon under full sun to make carbohydrates. This is used for tree growth and fruit development—the maximum carbohydrate production occurs in the leaves that are exposed to full sunlight and that have an adequate water supply.

If there is a lack of water, photosynthesis is reduced and this will impact tree growth, walnut yield, and quality, Fulton said.

Applied irrigation water is typically less than annual ET because soil storage from winter rainfall and in-season precipitation also

supplies water to meet annual ET.

North of Sacramento, annual rainfall ranges from about 12 to 24 inches from November to May. About 15 to 35 percent of the annual ET can be supplied from soil storage and in-season rainfall.

The San Joaquin Valley and walnut orchards farther south will have less soil storage and in-season rainfall toward the seasonal ET because they have less annual rainfall—about 6 to 12 inches.

## Water Stress

Water stress and/or leaf defoliation resulting from under irrigation during the summer months has been shown to reduce the number of floral buds and walnut production for the following season, Fulton said.

Shoot growth usually decreases in late June as developing walnuts become the principal demand for carbohydrates. After harvest, healthy leaves photosynthesize and replace carbohydrates and nutrients that have been used to produce walnuts. Producing these reserves is vital so that the trees can prepare for dormancy to support growth and production the following year.

Irrigation management effects all phases of nut and tree development. In general, it's important to keep walnut trees irrigated and in a low stress status pre- and post-harvest, Fulton said.

“In walnuts, everything that we've experienced so far says that walnuts really can't tolerate stress anywhere without costing you,” Fulton said, so the strategy is to keep them

low stressed and adequately irrigated all season long.

## Harvest

Fulton advises going into harvest in as low stress condition as possible and then resume normal irrigation as quickly as possible after harvest.

Walnuts have the advantage over almonds in that they have a green harvest so the nuts don't have to lay on the ground and dry for seven to 10 days.

Within 12-24 hours after the walnuts are shaken, they're swept off the ground, and irrigation can resume, Fulton said.

Through his research, Fulton found that if growers had to withhold irrigation like in a drought situation, it was better to do so in the spring rather than the fall. For walnuts, it's important to try and maintain that canopy, Fulton stressed.

Best case scenario with walnuts is to irrigate until rainfall takes over, Fulton said.

"It's basically irrigate to maintain the canopy, and the reason that's import-

ant is it still has some influences on the formation of buds for next year's crop," Fulton said, adding it also keeps the tree photosynthesizing and storing carbohydrates for next year's push.

## Storing Carbohydrates

Fulton describes the way walnut trees store the carbohydrates as if they're going into hibernation, and then in the spring, they use these carbohydrates to

push growth, he said.

"The tree's a big storage organ," Fulton continued, so it's important to maintain a healthy canopy as much as possible and keep it from defoliating.

"If you do that, you'll have better conditions coming out of next spring," Fulton said.

"The other thing that we notice is post-harvest if you keep good irrigation and hold the canopy, you'll have less issues in the case of the real cold winters and winter kill," Fulton said, adding we think storing the carbohydrate reserves helps prevent winter kill damage to the dormant wood.

## Almonds

Water stress post-harvest can



All photos courtesy of Almond Board of California

drastically reduce fruit set and yield in almonds.

Spencer Cooper is senior manager of irrigation and water efficiency for Almond Board of California. Irrigation plays a critical role in the development of the buds, so it's important that the

*Continued on Page 12*

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Continued from Page 11

tree isn't put under undue stress when it's developing next year's crop, Cooper said.

As soon as possible after harvest resume irrigation on the trees to refill the profile, Cooper said.

There are five key areas to irrigation management that start when the tree is budding out and continue through post-harvest irrigation. To assist growers, the California Almond Board has developed the Irrigation Continuum to help growers with these five key areas.

An evaluation will provide the grower with information like plugged emitters or line pressure that isn't uniform. These variations will impact the overall irrigation performance.

Using a mobile irrigation lab (MIL) is affordable and convenient if there is one available in your area. The labs are sponsored by a local agency, county, resource conservation district,



or water district in partnership with the California Department of Water Resources.

The evaluations are done for a minimal fee or in some areas there is no charge. There are currently 12 to 15 MIL in California with five in the Central Valley. Commercial companies may also do evaluations for a fee.

Post-harvest is a great time to do an irrigation system analysis, Cooper said. "As you're wrapping up things, going through your checklist before the end of the season, this is a good time to make sure your system is flushed out and ready to be shut down for the season to help ensure a smooth start up the following spring," Cooper said.

It's important to not only maintain irrigation systems, but to understand the overall impact maintenance has on the life of the irrigation system. Evaluating and making adjustments can improve distribution uniformity and greatly improve irrigation efficiency, Cooper said.

### Plant Water Status

Using a pressure chamber allows a grower to see what kind of stress the tree is under and to ensure it isn't stressed too heavily.

There is a certain amount of unavoidable stress at harvest because irrigation has to be withheld until the nuts are off the ground, but it's crucial after harvest to get that water back on, Cooper said.

### Applied Water/Soil Moisture Sensors

Flow meters calculate how many inches or gallons of water has been applied to the orchard,

## ALMOND IRRIGATION IMPROVEMENT CONTINUUM

Use the proficiency levels and guidance below to adopt good irrigation water management practices for almonds. Each level of the *Almond Irrigation Improvement Continuum* will provide the tools necessary to obtain measurements needed to best schedule and manage almond irrigation.

Measurement	1.0 Minimums	2.0 Intermediate	3.0 Advanced
Orchard Water Requirements	Estimate orchard water requirements using "normal year" regional ETC to estimate irrigation demand on a monthly basis.	Estimate orchard water requirements using "normal year" regional ETC—adjusting for current weather and cover crop use on a bi-weekly basis.	Estimate orchard water requirements using "normal year" regional ETC to plan irrigations, then use real-time ETC data to correct the schedule on a weekly basis.
Irrigation System Performance	Evaluate irrigation system for pressure variation and average application rate at least once every 3 years. Correct any diagnosed system performance problems.	Assess distribution uniformity and average application rate by measuring water volume at least every 3 years. Correct any diagnosed system performance problems.	Assess distribution uniformity and average application rate by measuring water volume at least every 2 years. Correct any diagnosed system performance problems.
Applied Water	Use application rate and duration of irrigation to determine water applied.	Use water meters to determine flow rate and water applied.	Use water meters to determine applied water and compare to crop water use (ETc, evapotranspiration) to determine irrigation efficiency.
Soil Moisture	Evaluate soil moisture based upon feel and appearance by augering to at least 3-5 feet. Monitor on a monthly time step.	Use manually operated soil moisture sensors to at least 3-5 feet and monitor on a bi-weekly time step. Use information to ensure calculated water is not over/under irrigating trees.	Use automated moisture sensors that store data over time. Review weekly to ensure calculated water is not over/under irrigating trees.
Plant Water Status	Evaluate orchard water status using visual plant cues just prior to irrigation or on a bi-weekly basis.	Use pressure chamber to measure midday stem water potential just prior to irrigation on a monthly basis. Ensure calculated water applications are not over/under irrigating trees.	Use pressure chamber to measure midday stem water potential prior to irrigation on a weekly basis. Ensure calculated water applications are not over/under irrigating trees. Use it to assess when to start irrigating.
Integrating Irrigation Water Management Practices	Combine irrigation system performance data with "normal year" regional ETC to determine orchard-specific water requirements and schedule irrigations. Check soil moisture with an auger and/or monitor plant water status to verify scheduling.	Use irrigation system performance data with regional estimates of "normal year" ETC to schedule irrigations and adjust based on feedback from monitoring soil moisture or crop water status.	Develop an irrigation schedule based on predicted "normal year" demand, monitor status using soil and plant based methods. Adjust irrigation schedule with real-time ETC as the season progresses.

- Irrigation System Performance
- Plant Water Status
- Applied Water
- Soil Moisture
- Orchard Water Requirements

### Irrigation System Performance

Having a well performing irrigation system is very important, and it's recommended that an irrigation system be tested at a minimum of every three years to be certain it is performing at optimum level.

while sensors show how the water moves through the soil profile. These tools are used to maximize your irrigation efficiency, Cooper said.

## Orchard Water Requirements

Estimating orchard water require-



ments is based on evapotranspiration, and it can be done throughout the season using the California Irrigation Management Information System (CIMIS) stations and the crop coefficients (Kc) values or a grower can receive the information through the California Almond Sustainability Program (CASP) Irrigation Calculator Tool.

Using CIMIS will provide growers with an idea of how much water the crop has used, and how much water needs to be applied. A grower can then use their flow meters and soil moisture sensors to confirm that the desired amount of water had been applied, Cooper said.

On-farm water management uses all of these different tools, and they're a balance of check measurements for one another, Cooper said.

Putting it all together, ET calculates an estimated crop water use, the flow meter records how much water was actually applied, soil moisture sensors record how that water moved through the profile and they record the plant uptake, then the pressure chamber is used to see how the tree actually responded pre- and post-irrigation, Cooper said.

## Progress

"There's always new things coming down the pipeline, but I think right now we've got a lot of really good tools that are currently available to growers, and I think we're actually doing a great job of learning how to implement those tools,"

Cooper said.

## Post-Harvest

Not only is post-harvest irrigation critical, but it's also a good time for growers to look at the rest of their nutrient budget and finish up their post-harvest nutrition plan, Cooper said.

"They need not only to look at their nitrogen budget, but also their micro nutrients," Cooper said, and work with

their agronomist or PCA (Pest Control Advisor) to dial in their nutrition plan for developing the buds for next year.

Post-harvest irrigation is very important, Cooper stressed, and he reminded growers post-harvest irrigation and nutrition is key to paying it forward for next year's crop.

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# Cap & Trade: Is this just another gas tax?

By: **Roger A. Isom** | President/CEO  
Western Agricultural Processors Association

California and its mission to lead the world on climate change regulations - Tough to understand and tough to live with, especially when no other country or state comes close to regulating businesses the way California does. In fact, no other country or state has regulations on reducing greenhouse gas (GHG) emissions from businesses. So why would industry support legislation related to regulating GHGs? Good question! Over the past two months, there has been a lot of discussion surrounding “Cap & Trade” and the legislation to extend the program (AB 398). Some of the discussion has led to severe criticism of the state, the legislators who voted for it, and the agricultural organizations that supported it. In this particular case, that criticism is unwarranted. To understand why people supported this bill and why Republican legislators voted for it, one must understand the entire picture.

Let’s begin with the fact that AB 32 was passed into law in 2006. AB 32 mandated that California businesses reduce emissions of GHGs back to 1990 levels by 2020. Then, last year despite tremendous opposition by agriculture and business interests alike, SB 32 was passed which mandated that these same businesses reduce emissions even further, down to levels 40 percent below 1990 levels by 2030! That is a monumental task.

To achieve these levels there are two primary courses of action. The first is a very

expensive option promoted by radical environmentalists known as “command and control” that would require businesses subject to the reductions to install very expensive technology costing millions of dollars to achieve these reductions. These businesses include the usual suspects such as power plants, glass manufacturing plants, oil refineries, and agricultural food processing plants including tomato canneries, nut processors, milk and cheese processing plants, and poultry processing operations. The technologies required by this approach would replace existing combustion equipment such as boilers and steam generators. The Western States Petroleum Association (WSPA) has estimated that greenhouse gas regulations for fuel producing refineries based on “command and control” would “cost 10 times as much without a market-based approach.”

An alternative approach is Cap & Trade. Cap & Trade is a market based approach that was created in the first round of regulations to reduce emissions under AB 32. This approach allows affected facilities to purchase emission credits at a cost much cheaper than purchasing expensive control equipment. Since SB 32 was passed and the 40 percent emissions reduction mandate was already in place. From a cost standpoint, there is really no other choice to achieve compliance with the mandate. But not only did the legislation continue the ability to utilize a market based approach, there were several other important concessions in the bill. For facilities subject to the regulation, it extended the 100 percent allowance allocations



for food processors from 2018 through 2030, and it provided a price ceiling on allowances beginning in 2020 and other important adjustments to the program.

*Greenhouse gas regulations based on "command on control" would cost 10 times as much without a market-based approach."*

Furthermore, added provisions to the bill included manufacturer's partial sales tax exemption from 2022 through 2030, which is important for value added food processors.

Despite these benefits, there have been a few critics of the legislation. The issue is a difficult one to grasp and needs a good explanation of how the existing program works and what the

impacts would be without Cap & Trade. As Western Agricultural Processors Association (WAPA) President/CEO Roger Isom stated at a recent Town Hall Meeting with Assemblyman Devon Mathis, "No one here likes Cap & Trade or any of the greenhouse gas regulations. California businesses are the only ones regulated to reduce greenhouse gas emissions and it puts us at a critical economic disadvantage." However, without the ability to change or eliminate the 40 percent mandate, Cap & Trade offers the best alternative to achieve the mandate without putting food processors, and other subject facilities out of business. And that folks is the ultimate dilemma.

Forced to take the lesser of two evils, agriculture had to make a difficult decision to support this legislation. But the real issue is not the discussion of "Cap

& Trade", it is what got us there. The pendulum has swung far to the liberal left, making it very difficult for businesses in California. In the coming months, agricultural organizations will be taking on some extraordinary efforts to try and get the pendulum to come back. Much of that effort relies upon all of you reading this article. It will cost money, and it will cost time. It will take the entire agricultural community to come together to take back some of those legislative seats that voted for SB 32 and other far reaching regulations that our competitors in other states and countries don't have to face. Folks, the time is now. Time to pick up the flag and step into battle...

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# UTILIZING CANOPY LIGHT INTERCEPTION AND YIELD POTENTIAL DATA TO IMPROVE WALNUT MANAGEMENT

By Cecilia Parsons | Contributing Writer

Sunlight hitting an orchard floor could be considered a waste, because had it been intercepted by a healthy tree canopy, it could have contributed to the yield potential of the tree.

## Concept

While this concept isn't brand new, it is being used by growers and researchers as a contributing factor in estimating tree nut production. Bruce Lampinen, Integrated Orchard Management/Walnut and Almond Specialist at University of California (UC) Davis explains that potential yield is limited by the per-

centage of photo synthetically active radiation (PAR) intercepted by the tree canopy.

## Light Bar

Quantifying light interception in orchards has improved, Lampinen said, with addition of a second-generation mobile platform light bar. Mounted on a four-wheel off-road vehicle, the larger, adjustable light bar can measure midday light hitting the orchard floor at a faster rate. The light bar can be adjusted from 10 to 32 feet, versus the older model with a range of 18 to 26 feet. Lampinen said

that at six mph, the off-road vehicle can cover much more ground during the two hours of maximum midday light.

Along with the light bar, sensors mounted on the vehicle can take soil surface temperatures at a much higher resolution and a new GPS works better under dense canopies.

Walnut Research Board funding over the years has allowed Lampinen and other UCCE farm advisors to collect walnut data to support the midday canopy light interception research.

*Continued on Page 18*

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— Don Barton, Escalon, CA



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*Continued from Page 16*

### **Orchard Age**

Midday light interception increases with orchard age until years 10-12

when it becomes static and approaches a value of near 93 percent. It does not necessarily decrease with age. After the orchard's first year, about a ten percent increase in light interception per year is typical for well-managed orchards.

The rate is dependent on tree spacing, variety, rootstock, irrigation management, pruning practices and nutrition. The 93 percent interception rate has a yield potential in walnuts of about four tons per acre. Lampinen said that by

An advertisement featuring two logos: a circular green logo for Sutter Buttes Mercantile LLC with a landscape scene, and a shield-shaped logo for Montana Tractor & Machinery with a stylized 'M'. The background is a close-up of walnuts. Text at the bottom offers annual contracts, payment schedules, and contact information.

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measuring canopy light interception on a large scale, the impacts of differences in canopy development can be separated out to determine what other factors are limiting nut production. This ongoing project by the research board and UC Extension is aimed at helping growers understand growth/productivity relationships in irrigation, pruning, varieties and nutrition.

“With these measurements, we can tell a grower the yield potential. If the orchard is not producing at that level, we can look for other reasons,” Lampinen said. “Some growers don’t realize the yields are below what they should be for the age of the orchard. We can look for other reasons.”

Lampinen said irrigation management, pruning practices or nutrition are the most common areas to investigate next after yield potential is determined. Those options will not vary much in terms of walnut varieties, he said. Most of the data collected in canopy light interception/yield potential comes from the three most commonly planted walnut varieties: Chandler, Howard and Tulare.

### Light Interception

In the orchards studied over a six-year period, light interception varied from about five to 95 percent. One example is a Tulare on Paradox orchard

*Continued on Page 21*

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*Continued from Page 19*

that has yielded 4.2 tons per acre over a five-year period, which equals 0.049 tons per one percent of PAR intercepted. The orchard has a central leader tree structure with 80-90 percent light interception. Only minimal pruning was done.

Light interception increases with orchard density. Lampinen said yields tend to peak out at about 65-90 trees per acre, but he notes that soil type, rootstock, scion, and management also play a role. In regards to tree spacing, trials found that the highest yields per unit of light intercepted was found in orchards with 25 foot row spacing. Highest yield with in row spacing was at 22 feet.

Lampinen said that even though there is the potential for higher yields in years three to eight with higher density plantings, the more traditional 22 by 28 spacing would have highest yields over time. Yield per unit of light intercepted will likely be lower when pruning or hedging is done. In trials with Howard and Chandlers, pruning in the early years did not lead to yield benefits.

A summarization of the Howard pruning trial showed no significant differences in pruned versus unpruned trees in tree size, midday canopy light interception, cumulative yield, percent sunburn or quality—except for one year where unpruned trees produced larger size nuts. The Howard and the Chandler trials, Lampinen said, have shown no benefits to pruning or training in early years and that pruning leads to decreased water use efficiency in years two to six. Each pruning cut,

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Lampinen added, tends to decrease yield and generate more work in subsequent years. In addition, mechanical pruning can result in decent but not high yields and may lead to increase quality problems.

Lampinen said work is continuing on an iPhone app for estimating midday canopy light interception and yield potential in orchards. The app would give the estimated PAR and if the previous year's yield were entered, the app could plot the PAR/yield relationship.

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



# NUT HARVEST SAFETY— Where are Employees Getting Hurt?

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

It is that time of year again, timing your last pre-harvest irrigation, determining your harvest date to minimize navel orangeworm and ant damage, all while operating powerful equipment, and more importantly, keeping your employees safe in the process. As we approach nut harvest season it's important to think safety, like where can employees get hurt in the orchard? The most common injuries can be grouped into four categories:

- Operation of equipment
- Ground crew hazards
- Moving equipment on the road
- Maintenance work

## 1 Operation of Equipment

In general the equipment used during harvest varies in size, but all of it is powerful and has the capacity to hurt someone if not operated correctly. While the size of the equipment may vary, one constant is dust. Between the dust and the low profile of some harvesting equipment, your limited visibility reduces your ability to see hazards in the orchard.

So what's the solution? Effective training. Train your employees on all the equipment they will operate during the harvest season. Not only is this best practice, but it is a requirement under the California Code of Regulations, Title

8, Section 3441: Operation of Agricultural Equipment. Employees need to be trained annually and preferably given a refresher training prior to the harvest season. In addition to equipment training, train employees to evaluate each orchard in which they will be working. Assessing an orchard prior to moving equipment in can help employees identify hazards. Are there electrical lines, fences not clearly marked or irrigation valves that can be easily overlooked? If those hazards exist, consider using orange cones or flags to help better identify these hazards. Assessing the orchard prior to harvest will help minimize incidents down the road.

## 2 Ground Crew Hazards

Hitting an unmarked irrigation valve is one thing but hitting a person is quite another. Employees working on the ground around heavy equipment operated by a driver with limited visibility can be a recipe for disaster. In this situation, both the equipment operators and ground crew employees should be trained in how to reduce these hazards.

In larger orchards, it is not uncommon to have two operators harvesting at the same time. The United State Department of Labor website is full of accident reports that highlight these dangers. In one particular occurrence,

two employees were harvesting in the same orchard. One employee got out of the harvester to move a large branch. He hadn't sufficiently shut down the harvester and it ran him over. The second employee attempted to help his coworker by stopping the harvester and then became pinned between it and an almond tree. Both employees lived but suffered fractures and internal injuries.

These kinds of incidents can be avoided. Operators should be trained to shut down equipment completely if they need to leave the cab and limit their distractions. For example, a no cell phone, headphone or ear buds policy is helpful. Any employees having to work on the ground during harvest should wear reflective clothing or safety vests. And, if practical, limit the number of ground workers while harvest equipment is in operation in an orchard.

## 3 Moving Equipment on the Road

As we move equipment from orchard to orchard extra precautions need to be taken. Slow moving vehicle signs are needed and in some cases certain types of equipment are not allowed on the road and need to be hauled on a trailer. Either way, the equipment is cumbersome and not traveling at the same high speed as the cars passing by.

Some things to consider before entering a public roadway with harvest equipment:

- Always be mindful of traffic flow
- Develop, implement and enforce policies to minimize distractions such as cell phone use and texting
- Designate a route that is wide enough, less congested and in good condition
- Install slow moving vehicle signs
- Utilize a guide vehicle with lights flashing when traveling down road ways
- Train employees on best practices for travel, especially when going to make a left turn on a main road



To improve your visibility to other drivers while on a public road be sure that you have installed your slow moving vehicles signs and that they are kept clean. Courtesy of Amy Wolfe.

#### 4 Maintenance Work

It is inevitable. Harvest begins, you are under a tight timeline and your harvesting equipment breaks down. Maintenance work on equipment always comes with hazards, but those hazards become even more significant when tired employees under time constraints are performing the maintenance work.

Failure to implement lock out-tag out (LOTO) on equipment being serviced can cause entanglement, severe injury or even death. LOTO is implemented to minimize the exposure to hazards from the unexpected energization or release.

Key elements to implementing LOTO:

- Training for those that operate or use a machine on which maintenance is being performed under LOTO or work in an area in which such servicing is being performed
- Using appropriate devices that prevent the transmission or release of energy

- Using a tagging system that identifies the employee who has applied the LOTO device
- Written procedures for equipment requiring LOTO

The same danger is presented when working around an unguarded PTO.

#### 5 Why PTOs are dangerous:

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- Most PTO accidents happen when people get too close to the rotating shaft, especially if guarding has been removed or is damaged
- Hair and loose clothing, such as a pant leg or the drawstrings from hooded sweatshirts or jackets, can get caught on the shaft and wrap around it
- The chances of that happening increase if the shaft has small nicks, dried mud or manure on it
- Once your hair or clothing is caught on a PTO shaft, it is nearly impossible to escape and the more you pull away, the tighter the wrap

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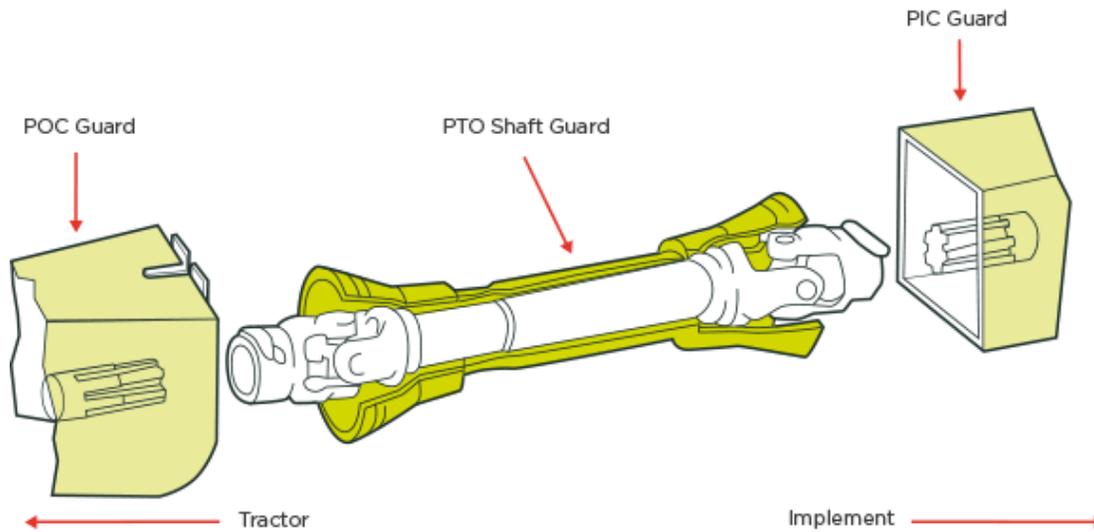
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Within fractions of a second, your hair or clothing may be torn off or your body may wrap around the spinning PTO shaft. Courtesy of Amy Wolfe.

Continued from Page 23

becomes

- Within fractions of a second, your hair or clothing may be torn off or your body may wrap around the spinning shaft

As harvest creeps upon us keep in mind the four areas of concern:

- Operation of equipment
- Ground crew hazards

- Moving equipment on the road
- Maintenance work

Training, preparation, and maintained equipment are essential to a safe harvest season.

For more information about harvest safety, or any worker safety, health, human resources, labor relations, 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). AgSafe is a 501c3

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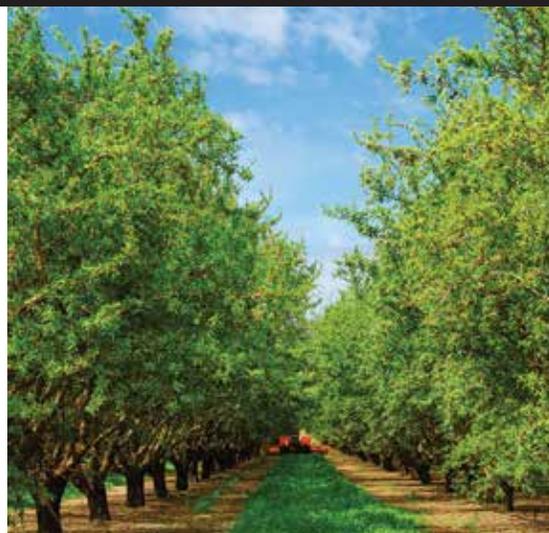
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# DIAGNOSIS AND MANAGEMENT OF CANKER DISEASES IN ALMONDS

By Florent Trouillas | Assistant Cooperative Extension Specialist

*In contrast to Ceratocystis canker, perennial Phytophthora canker symptoms include gumming throughout the infection area and infection typically initiates at cracks and pockets formed at the tree crotch. All photos courtesy of Florent Trouillas.*

article, I will provide an overview of the main canker diseases that impact almonds and how they can be diagnosed and prevented.

But first, let's review some general concepts about canker diseases...

## What is a canker?

A canker in woody plants normally refer to a lesion produced in the bark of a plant stem, twig, or branch, often resulting in an open wound. The dead area can block water and nutrient transport to portions of the plant causing the plant to die back. Most cankers are caused by fungi, which invade bark tissue on current season wood. However, some colonize both bark and internal tissues causing canker rots or wood cankers that persist for years. Wood cankers typically consist of brown to dark brown discoloration of xylem tissues and may vary in shape from wedge-shaped to round, or irregular. Typically, if you cut through a branch of a tree, canker infections will reveal vascular discoloration, which indicates a disruption in the flow of water and nutrients through the tree's vascular system.

What are the main infection pathways and disease cycle of canker diseases? In orchard systems, cankers originate usually at wounds such as pruning wounds, mechanical injuries, sunscald and sunburn lesions, and wounds caused by insect borers. In almond, canker pathogens infect trees particularly through pruning wounds made for primary and secondary scaffold selection. Cracks in the tree crotch or on the trunk as well as shaker injury are other entry points for canker-causing pathogens in almonds. Canker diseases may go unno-

Fungal canker diseases have long been known to affect almond trees in California, however, they have become an increasing concern to growers in recent years as they affect to a greater extent young trees, thus resulting in significant tree losses. Canker diseases can also become prevalent as orchards get older, significantly impacting yield, the lifespan of trees, production costs and profitability of almond orchards. Overall, trunk and scaffold canker diseases constitute the major cause of tree death in almond orchards in California.

As the University of California Cooperative Extension (UCCE) Specialist in Plant Pathology for the fruit and nut

crops, canker diseases have been the number one call I receive in almonds from colleague farm advisors, growers and PCAs (Pest Control Advisors) looking for guidance on diagnosis and treatment. Symptoms on affected trees are very conspicuous and often alarming to growers. However, field diagnosis of almond canker diseases is difficult as symptom delineation among the various canker diseases is not clear. Hence, laboratory tests are usually required to obtain accurate disease diagnosis, which is essential to the implementation of appropriate management strategies.

With support from the Almond Board of California and with the help of farm advisors statewide, my laboratory has initiated surveys to characterize canker diseases in almond orchards and get a full understanding of the various diseases and pathogens present. In this

ticed during the early stages of infection and symptoms become more visible as trees get older.

Most fungal canker pathogens produce fruiting bodies on dead wood of infected host plants and appear as small, black rounded bumps embedded in the bark or wood. When present these are an important diagnostic characteristic. However, fruiting structures are not always present and many are not easily distinguished. The spores produced by these fruiting bodies serve as inoculum for new infections, mostly during wet weather. The vegetation present in the vicinity of orchards, particularly trees in riparian areas or neighboring orchards of susceptible crops may serve as inoculum sources for fungal canker pathogens affecting almonds. Once a canker disease has been established in

an orchard, infected almond trees can provide additional inoculum for further infection. With Phytophthora cankers, causal pathogen infects from soilborne inoculum blown onto tree surfaces at harvest, during spraying, or during stormy weather.

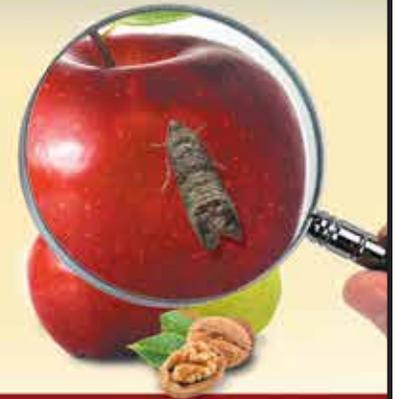
### How stress plays a role in the exacerbation on canker disease

Recent outbreaks of canker diseases in perennial crops have been attributed in part to drastic changes in production practices, the increase of monoculture farming, climate change and increased plant stress, the continuing adaptation of pathogens to new environments, and most importantly the global movement

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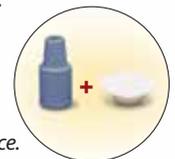
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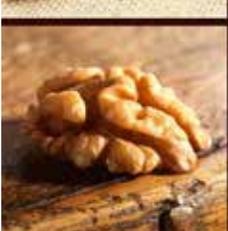
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Water-soaked injury on a young tree with darker center than the surrounding healthy tissue (left). Symptoms of an established infections with amber-colored gumballs that are produced around the margin of the canker (right).

disease and start as water-soaked injuries that are darker than the surrounding healthy tissue. Symptoms of established infections include amber-colored gumballs that are produced around the margin of the canker, where the fungus is most active. The cankers are perennial, persist over several years, and are most active during the growing season. Ceratocystis cankers are associated with shaker injury on the trunk and pruning wounds on the scaffold. Bark injuries and pruning wounds are susceptible for up to 14 days.

Botryosphaeria cankers:

Botryosphaeria are among the most common fungi to cause canker in young trees and are often associated with growth cracks on the trunk and pruning wounds. Studies have revealed there are at least 10 different Botryosphaeria species in almond with various levels of virulence. Botryosphaeria cankers

Continued from Page 27

of plant material. Trees suffering environmental stresses are more susceptible to canker diseases. Microorganisms which usually do not cause disease in non-stressed hosts may become opportunistic pathogens of stressed plants. Increases in canker diseases are common during extended periods of drought or following sudden temperature fluctuations. Drought stress can impair the plant's ability to defend against fungal invasion. Conversely, excessive watering can kill roots and predispose plants to canker pathogens.

**What are the main canker diseases in California almonds and what are their symptoms?**

Ceratocystis canker:

Ceratocystis canker caused by the fungal pathogen Ceratocystis fimbriata is a common disease of almond in California. While this disease is generally associated with shaker damage and bark injuries of trunks during harvest, C. fimbriata is also capable of infecting branches from fresh pruning wounds and if left untreated can kill branches, scaffolds and entire trees. Ceratocystis is spread by several species of sap-feeding beetles and fruit fly. This disease is unique to California almond production systems and thus far has not been found



Infection by a Botryosphaeriaceae species with gumming at a pruning wound made for the selection of secondary scaffold (right). Band canker with oozing of amber sap that forms in a ring around the circumference of the tree (left).

in other almond producing countries. Recent surveys conducted in 2015 and 2016 by our laboratory revealed that Ceratocystis canker remains one of the most prevalent canker disease of almond in California. The disease appears to be omnipresent in mechanically harvested almond orchards that repeatedly suffer bark injuries, suggesting the pathogen is ubiquitous in the Central Valley.

are characterized by gumming around pruning wounds made near the trunk at scaffold selection and generally appears in the third or fourth leaf.

Band canker also caused by Botryosphaeria fungi produce unique symptoms that include oozing amber sap that forms in a ring around the circumference of the tree. Young vigorous varieties or

Cankers are characteristic for the

Continued on Page 30

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Continued from Page 28

trees that grow quickly from aggressive nitrogen and water inputs are especially prone to band canker. Solid sprinkler irrigation or micro-sprinklers that wet the tree trunk can create conditions favorable for infection. Band canker is often an annual disease that occurs when trees are in their second to sixth leaf and usually does not necessarily reappear the following year. However, an increasing number of cases have been reported lately where cankers are being re-activated in

following year. In recent years, tree death has become more common due to the fact that multiple bands can develop as the canker continues to grow in the next growing season

Eutypa dieback:

Eutypa dieback of almond occurs sporadically in the Sacramento Valley and in the northern San Joaquin Valley. Eutypa dieback is caused by the fungus *Eutypa lata* and is a common disease of apricot, sweet cherry and grapevine. Eutypa dieback of almond

is usually being found in young trees. Cankers mostly originate from pruning wounds on limbs or trunks as well as from cracks formed at the junction of scaffold branches and the trunk, extending downward the graft union or upwards into one or more scaffold branches. Amber colored gum turning dark brown to reddish brown normally exude around cracks. Irregular shaped to wedge-shaped, brown colored cankers are observed from cross sections of limbs and trunks. Limb dieback may occur several months or years after infection.

Cytospora cankers:

Cytospora has been isolated sporadically in almond orchards in California and is generally associated with pruning wounds and sunburn lesions in the canopy in orchards in their 3rd leaf or older. Symptoms of Cytospora canker include longitudinal cankers in branches and scaffolds often associated with pruning wound, vascular discoloration of the wood and moderate gumming. Cytospora species have been traditionally thought to be secondary to sunburn and other stresses or injury in stone fruits, however their prevalence in cankers suggest that this group constitutes virulent pathogens. In almond in California, several species of Cytospora have recently been detected. Overall, this group of pathogens has become of increasing concern in recent years in many fruit and nut crops.

Phytophthora cankers:

Additional pathogens causing cankers in trunks and scaffolds have included *Phytophthora* spp., a group of soilborne pathogens of almond. In contrast to *Ceratocystis* canker, perennial *Phytophthora* canker symptoms include gumming throughout the infection area and infection typically initiates at cracks and pockets formed at the tree crotch. Perennial *Phytophthora* canker develops rather quickly and can kill an entire scaffold branch or tree within one or two growing seasons. Additional aerial *Phytophthora* diseases include “pruning wound canker”, which is recognized by its annual nature and its tendency to be initiated at large pruning wounds. Although pruning wound cankers look like perennial cankers, they are sensitive to high temperature and typically cease expansion during summer under the conditions of the Central Valley of California.

**General management guidelines for canker diseases**

Management of canker diseases rely for

*Continued on Page 32*

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*Continued from Page 30*

the most part on prevention as no chemical treatments can cure these diseases. Overall, canker diseases may be managed by avoiding bark injuries from mechanical shakers and avoid pruning trees before or during rainy weather. Management of canker diseases may rely on remedial surgery (removal of the cankered area), however, cankers are generally difficult to remove and may require multiple surgeries over several years before all of the infected tissue is removed. Removal of infected tree parts and dead trees will reduce inoculum in the orchard. When whole diseased trees are removed, the stumps should also be removed as the bark of stumps can be covered with the pathogen fruiting structures and thus serve as sources of inoculum. Adjusting sprinkler irrigation so that tree trunks and tree crotch are not wetted helps reduce the incidence of canker diseases.

Proper primary scaffold selection and avoiding stress are the most effective preventive measure to reduce risks of infection by canker pathogens. Training of young trees that creates strong branch attachment that will not split as the tree matures can help reduce infection. Scaffold branches

should be selected to avoid formation of bark inclusions at the tree crotch. Pruning should be avoided during and following rainfall that permits the release of spores of the various pathogens. Pruning wound sealers and acrylic paint that act as a physical barrier may be used to protect pruning wounds and reduce infection, especially on large pruning cuts. Almond orchards occurring in the vicinity or riparian areas, old sweet cherry and apricots orchards, vineyards, walnut or pistachio orchards may be more prone to the disease.

As for Phytophthora cankers, incidence of cankers can also be minimized by proper tree planting and training. Selected branches should be spaced out vertically and laterally so as not to create pockets that retain water and favor infection by Phytophthora. The bud union of almond trees should be planted to remain above the soil line. According to USDA (United States Department of Agriculture) researcher Dr. Greg Browne at UC Davis, phosphonate sprays can be very effective for pre-

venting and suppressing development of diseases caused by Phytophthora, but before such applications are made, growers should inquire with their pest control advisors to assess residue limitations pertaining to the treatments. Mefenoxam treatments also provide a measure of systemic protection from Phytophthora, but less is known about efficacy and economic benefits of this fungicide.

Recently, my laboratory has initiated field trials to test fungicidal compounds, biological treatments and various pastes or paints for the protection of pruning wounds and to prevent the development of canker diseases. With this work, we are hoping to identify the best products to protect pruning wounds from infection by canker pathogens.

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The internal aeration or "opening-up" of the soil also improves moisture penetration into the rhizosphere. Increased microbial activity leads to better soil aggregate formation and increased soil moisture holding capacity. Increased reliance on ground water irrigation has created salinity issues that are negatively affecting tree health. Ensuring that beneficial microbial activity and diversity is maintained and maximized is important in managing salinity levels. An "open" soil that BioMax™ Dual Action + helps promote allows for easier leaching of salts below the rhizosphere.

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# Almond Grower Helps Provide Bees with a Well-Rounded Diet

By Almond Board of California

Research shows that honey bees properly nourished with a diverse diet are better able to fend off stressors, such as pests and parasites leading to stronger hives.

## Cover Crop

Almond grower Nick Edsall believes that improving the diet of pollinators by providing cover crop forage in his orchard middles also improves pollination.

“The almond pollen provides good food for the bees, but it’s always good to have a balanced diet for bees as it is for humans, Edsall said. “If you can have other food sources out there it strengthens the colonies, so it helps crop pollination while helping improve the health of colonies at the same time.

Edsall this year planted forage cover crops in about 5 percent of the 4,500 acres of almonds he manages for Bullseye Farms in Woodland, Calif. The trial went so well, he plans to expand that acreage next year to about 20 percent of

the total acreage.

He originally looked at cover crops to improve water penetration on challenging fields, planting triticale last fall to improve soil health on heavy clay soils.

“In those fields, we had a lot of cracking and actually lost a lot of nuts in cracks at harvest and had a hard time making adjustments with our sweepers. We planted triticale and it made a big difference, so we were looking at expanding our use of cover crops,” Edsall said.

## Apis m.

After hearing about the Seeds for Bees program through Project Apis m. (PAm), Edsall decided this season to explore cover crop mixes that would provide the additional benefit of providing flowering forage for honey bees in the periods surrounding almond bloom—specifically before and after when there is a shortage of forage.

PAm has identified low-moisture-requiring seed mixes, seed suppliers, and planting regimes for various California climates specific to bee habitat in almonds, including specially blended mustard mix for fall and winter bloom and clover mix and lana vetch for spring bloom. It works with seed suppliers in bee growing regions throughout California to provide specially blended bee forage mixes that match individual growers’ operations and objectives. PAm also provides technical advice for growers looking to get started on a bee forage cover crop program.

All photos courtesy of Almond Board of California

One of Bullseye's beekeepers provided the added benefit of discounting the cost of hive rental because forage was planted.

"It all kind of worked together for us. We understand how important pollinators are for the almond crop, and this was an opportunity to plant crops for soil health and water penetration while also feeding bees when they arrive in late winter," Edsall said.



### Benefits of Cover Crops

He planted about 100 acres of vetch and 60 acres of clover mix, along with a few rows of mustard-radish mix last October. Edsall said he wanted to trial the mustard on a few rows first to be sure excess biomass wouldn't create problems interfering with orchard operations in spring or fall harvest. Even with all this year's rain, by late July Edsall found that wasn't the case.

"We planted with a seed drill in October and got plenty of moisture to bring the crop up. Then we had a wet spring to keep the cover crops going," he said. "We had plenty of moisture so we didn't have to worry about the cover crops drying the soil, and actually saw a benefit in keeping the soil from getting too saturated so we could get our equipment on the ground a little earlier with the cover crop holding the soil together."

Edsall also saw distinct benefits in water penetration on those heavy clay fields and even after bees were removed he saw several wild bees continue to fly around those cover crop orchards. Bullseye Farms mowed the cover crops early in the season two to three inches above the ground to keep growth under control. The crop still pushed flowers in the spring. To terminate the annual crops, Edsall mowed a couple more times starting in mid-May very close the ground.

"We had worried about competition of cover crop when almonds bloom, but we are seeing research that shows bees actually prefer the almond pollen so they are collecting almond pollen in the morning and forage in the afternoons once almond pollen has been worked," he said. "Having cover crops out there blooming seems to help the pollination of the crop, whether colonies are stronger because of a balanced diet or bees are working harder."

### Cover Crop Expansion

This year's crop went so well Edsall plans to increase plantings this fall with a cover crop rotation that includes alternate rows of triticale in one row and legumes or mustard on alternate rows.

"We had a good experience and are excited this fall to try doing much more with cover crops in our almonds. It's another crop out there so you have to take time to manage it,

and it takes a little extra effort, but the benefits seem to be well worth it for us."

More information on resources for planting bee forage in almonds can be found on the Pam website at ProjectApism.org. Additionally, visit Almonds.com/Pollination for more ways that almond growers can benefit honey bees year-round.

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# FROM BLOOM TO HARVEST, *Almond Growers are Seeing a Good Year 2017*

By Cecilia Parsons | Contributing Writer

**F**ire and rain, but not in that order, best describe the growing season for the 2017 almond crop.

In spite of the challenges faced by growers over the last five months, rain prior to and during bloom and the summer heat wave, California almond growers expect to harvest a record crop of 2.25 billion pounds of almond kernels this year. That total is up 2.3 percent from a May forecast and is up 5.1 percent over 2016's yield. Nut yield per tree, however, is lower than last year with Sacramento Valley averaging 5,583 and San Joaquin Valley 5,735 nuts per tree. The forecast is based on one million bearing acres, also a record.

The outlook for the 2017 harvest did not look good for growers late last winter when rain hit during bloom, and some orchards were flooded, even though precipitation totals eventually broke the drought.

The picture began to change later in the spring.

"This crop just kept looking better and better as time went on" said Hilltop Ranch field representative Rich Miller.

Some growers in central growing areas were hit with bacterial blast, but overall, tree health has been good, Miller said.

Early in the growing season, there were concerns with chill accumulation. As precipitation amounts exceeded totals of previous years, preventing outbreaks of fungal diseases became an issue. By late spring growers were watching a good size crop developing.



From the north to the south, growers and crop advisors said they found minimal impacts from winter and spring rains. Fungal and bacterial disease due to the wet spring weather was not widespread. Though now there is some concern with effects of the prolonged heat wave just prior to harvest, but even so a quality crop is expected. Kernel weights are reported higher than last year at 1.57 grams, but shrivel is up from 1.1 percent to 1.5 percent.

Merced University of California Cooperative Extension (UCCE) farm advisor David Doll said this crop is reminiscent of 2011—looking bad at the start, with a long protracted bloom and lack of bee flight hours, but good at harvest.

“This is a good crop with not many disease issues,” Doll said.

*Continued on Page 38*

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Continued from Page 37

Justin Nay, an advisor with Integral Ag said the Nonpareil crop is large and overall quality appears to be better than last year. Production in Nonpareils is estimated at 900 million pounds, up 10.7 percent from last year's crop.

In the south, Arvin area almond grower Kent Stenderup said that although the intense heat of July was a concern, overall the crop looks very good, both quality and yields.

Stenderup, a Blue Diamond grower who represents the cooperative on the Almond Board of California, said trees are in much better shape this year since the winter and spring rains replenished ground moisture and pushed salts below the root zone. High quality surface water deliveries this summer have added to tree health.

Navel orangeworm (NOW) pressure remains a question. Miller said that because orchard sanitation last winter was curtailed by rain, many believed pressure would be high. He and Nay said that hasn't been the case. Nay, in sampling orchards throughout the Central Valley said he has found the lowest mummy counts since 2008 with one worm per ten mummies. Last year, sampling found one worm per four mummies. He estimated that about ten percent of the state's growers would struggle with NOW

damage this season. Much of that is due to a lack of orchard sanitation, he said.

Nay said he has no good answer to why the NOW counts are down this season as every year is different, but with the second lowest counts statewide since 2005, he expects a higher quality crop. Doll agreed that it appears there was a smaller overwinter-



ing population, but warned NOW populations could flare during harvest.

Leaffooted bug pressure was high in early June in pollinator

*Continued on Page 40*



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Continued from Page 38

varieties, Nay said. He expects there will be some quality loss at harvest due to gumminess and brown spotting. Mite pressure was also reported to be light in most areas.



Onset of hull split, Miller said, did not appear to be as early this year. The late June through July heat wave did push NOW development, Doll said, but it did not accelerate hull split. He explained that it is the conditions in the first 20-30 days after bloom that determine hull split timing. Cooler temperatures will delay cell division, meaning a

later date for onset of hull split.

The Almond Objective Measurement Report noted that hull sprays could be slightly later due to a slower maturing crop.

Temperatures in the 105-109 degree range in July were hard on almond trees, and could have an effect on next year's crop, Stenderup said.

"The trees just go into survival mode when it is that hot," he said.

The trees are not transpiring like they should in the excessive heat and lack energy to finish off the nuts. Stenderup said growers were trying to maintain adequate soil moisture rather than letting the ground dry prior to harvest.

Nut size has already been determined, he said, the concern now is with next year's crop if the trees undergo

lengthy heat stress.

As almond producing acreage continues to grow in California, growers and farm advisors expressed confidence that production methods would also improve. Miller said he is seeing many growers adopt precise irrigation management in their orchards along with technology to help them refine nutrition and water use.

"Aerial imaging, tissue analysis to see where system is not working—they're working with companies to be more precise in their farming," Miller said.

Growers are becoming more efficient in their water use, but there is still room to grow, Doll said. Improvements in orchard management, genetic advances and the industry movement to potted trees all present challenges to growers but will add to efficient production.

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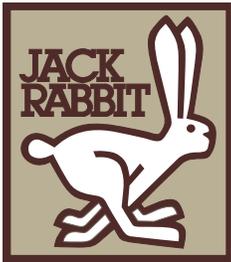
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## Well-intentioned Prop. 65 Creates Problems in Food: Glyphosate added to the list; issues regarding Acrylamide resurfaced

By **Emily Rooney** | President of the Agricultural Council of California in Sacramento

When Proposition 65 was passed by voter initiative in 1986, the intent was to warn Californians about potential exposure to chemicals in drinking water that could cause cancer or birth defects. Since then, the scope has expanded well beyond its original purpose. We now see warning signs on various items and at numerous locations—crystal decanters, airport jet ways, gas stations, even medical laboratories—and plaintiffs’ attorneys want to extend these warnings to food—including some of the healthiest foods produced in the world, right here in California.

There are almost 1,000 chemicals that have been added to the Proposition 65 list. Scrolling down the list, we can easily recognize items that are naturally occurring in the soil, chemicals used for food safety reasons and some substances required for export. To say there are regulatory conflicts is an understatement.



Many of these chemicals have been thoroughly studied and used safely in agriculture and around residential communities for decades, such as glyphosate. Glyphosate was officially added to the list in July. The State of California is currently pursuing its regulatory process, while Monsanto works on litigation.

Glyphosate is widely used all over the United States. It is our hope that despite having added glyphosate to the list, California finalizes a regulation which includes a safe harbor that reflects the safety of the product and prevents additional litigation or warnings. The final regulation will develop over the next year.

Trial attorneys’ exploit the law for financial gain. According to California’s Attorney General’s Office, in 2016 more than \$30 million in settlements were negotiated. Of that, approximately \$22 million went to “attorney’s fees and costs.” The Chanler Group, a Connecticut-based law firm with a local office in Berkeley, was the leader and had 242

settlements, cashing in more than \$7 million—in one calendar year.

Attorneys are now pursuing acrylamide, a natural byproduct of cooking, baking and roasting. Acrylamide was added to the Proposition 65 list in 1990. Throughout the months of May, June and July of this year, 60-day notices have been sent to retailers and food companies threatening litigation for acrylamide above allowable levels, if the companies don’t settle out of court. Litigation can cost into the tens of millions of dollars, so companies often settle out of court for a fraction of the price. This is how the attorneys profit.

There is an exemption in the regulation for naturally occurring chemicals, however the burden of proof is on the defendant. Additionally, there is little room for byproducts of the cooking or baking process. Therefore, food companies can be held accountable for the natural life cycle of processing food, even if processing is required for human consumption.

In 2013, Gov. Brown attempted to reform Proposition 65 to alleviate some of these problems. The list of reforms

aimed at ending “shakedown” lawsuits by putting a cap on attorney’s fees. Discussion also included requiring stronger science for initial claims of violations.

The solution would have required a two-thirds vote of the state Legislature, therefore the Governor convened a massive stakeholder process in an effort to build consensus—and this process failed. The Attorney General’s Office did pursue some of the reforms suggested by the stakeholders, but clearly, they do not go far enough.

Consumers want to know more about food and rightfully so. However, it makes no sense to establish a patchwork of labeling requirements that does nothing more than create the opportunity for lawyers to cash in at the expense of farmers, ranchers and our food producers.

Food labels should be consistent across the country and meaningful for consumers. All of us, as consumers, have the right to know about allergens and health benefits of the foods we consume in order to make the best decisions. But Proposition 65, as it currently stands, accomplishes neither of these goals.

I am hopeful that our state agencies will continue to provide incremental improvements to this law, while providing important information with fewer warnings for consumers and decrease frivolous, but expensive, lawsuits against our industry.

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# ZINC: THE MIGHTY MICRONUTRIENT

By **Jessica Goddard** | Contributing Writer

**I**n order for almonds to flourish, they require specific nutrients that aid their growth. The micronutrient zinc is included among these essential nutrients and, it could be argued, is one of the most important of the nutrients. It is vital for the plant hormone auxin and cell elongation, and is strongly correlated with plant pollinations, bud differentiations and chloroplast development.

At the Central Valley Almond Day, Bob Beede, a retired University of California Cooperative Extension (UCCE) farm advisor, spoke about the importance of not allowing your orchards to become zinc deficient. He refers to zinc as “the mighty micronutrient” because of all of the benefits it offers to almond trees and all the negative outcomes of zinc deficient trees. Without zinc, the almond crop suffers severely. Unfortunately for almond growers in the San Joaquin Valley, zinc deficiency is the most common nutrient deficiency for almond trees in the Central Valley. It often occurs if the soil is too sandy, over watered or under watered, and growers need to be sure their soil pH is does not rise above 7.0.

## Testing for Zinc deficiency

There are a few ways to test almond trees for zinc deficiency, but one of the most common is foliar spotting. Soil testing does not work well when evaluating zinc deficiency. Usually growers test their almond leaves in July, but they need to make sure they are testing leaves that have not been sprayed with zinc earlier that year because the residue of the spray on the leaf will give them an inaccurate result. John Edstrom, Colusa County UCCE farm advisor, believes that the most reliable way to check Zinc deficiency is to observe the

*It is important evaluate the leaves of almond trees to make sure they do not display any features of zinc deficiency, such as small pointed leaves. All photos courtesy of Jessica Goddard.*



*Zinc deficiency is the most common micronutrient deficiency in almond trees in the San Joaquin Valley.*

trees themselves. He thinks growers need to learn to recognize the effects in the trees.

“We’ve relied too heavily on the labs and not enough on what the trees are showing us. So, in my opinion, what we really need to do is take a look at leaf growth, leaf size lateral development

and overall vigor of the tree and whether that’s sufficient—the zinc program—is sufficient to maintain what we’re looking for there,” Edstrom said. “So, that’s the general feeling that I’ve gotten over many, many years of working with this.”

When the trees are zinc deficient, the trees will have smaller leaves and less lat-

eral growth in the shoots. The trees can develop “little leaf” or “rosetting.” “Little leaf” refers to the petite, pointed leaves seen when the tree is zinc deficient, and “rosetting” refers to when internodes fail to elongate, creating a rosette pattern of several nodes lying together.

*Continued on Page 46*



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Although growers can detect zinc deficiency through the methods mentioned above, many people recommend spraying zinc on a regular basis, with or without knowledge received from testing, as a preventative measure. It is much easier to preclude a zinc deficiency than to overcome it once the trees are already deficient. Applying zinc regularly will eradicate the possibility of a ruined crop, but if a grower allows his crop to become deficient, the crop yield and quality will severely decrease.

“It could take you two or three weeks, critical growing time...to get these trees restarted,” Beede said. “This is why I’m telling you, don’t get zinc deficient.”

### Applying Zinc

Applying zinc through the soil proves to be complicated because the grower must consider varying soil compositions, and since Zinc is an immobile element, it does not travel well through the roots to the rest of the tree. Beede recommended applying zinc foliarly, as most growers do, although a small number of growers do apply it through drip irrigation. Growers usually will apply zinc

*Zinc deficiency will significantly affect the quality and the yield of the almond crop, which is why it is vitally important to prevent deficiency with regular applications of zinc. Photo courtesy of Jessica Goddard.*



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multiple times in the spring or in one big bulk application in the beginning of autumn, perhaps in late October. Growers need to apply a large amount of zinc because the trees do not absorb the micronutrient adequately. The exact amount of zinc needed depends on each tree's requirements. There is not an all-encompassing amount. Instead, the grower must decide the amount based on his observations of his orchards.

According to Beede, applying it in the fall in one generous application is not as efficient as applying it multiple times in the spring due to the way the tree absorbs zinc.

Some of the products used to eliminate a zinc deficiency will cause leaf burn on the trees, which is unfortunate. However, contrary to what many growers believe, a small amount of leaf burn is actually a positive sign that a sufficient amount of zinc has been applied to the tree.

"Probably, if truth be known, a great amount of (the zinc applied) is unnecessary, but the negative effects of not having it now are significant," Edstrom said. "And so the insurance is certainly believed to be worth it."

### Soil Management

Zinc deficiency can spring from multiple different causes, but one to be aware of is soil composition and quality. If the

*Continued on Page 48*

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Since zinc is an immobile element, almond trees have difficulty absorbing it through their roots and bringing it to the rest of the tree. The soil composition of the orchard also largely impacts the roots' absorption of zinc. Photo courtesy of Jessica Goddard.

*Continued from Page 47*

soil in the orchard is too sandy or acidic, trees tend to become zinc deficient. If an orchard has clay like soil keeping it from absorbing zinc, the grower may need to use deep tillage equipment to loosen up the soil. An orchard is almost automatically zinc deficient if it is planted on top of an old dairy site. The manure from the cows almost guarantees a zinc deficiency in crops unless the grower does a lot of soil management and multiple zinc applications. However, it is possible to have prosperous almond orchard on a previous dairy site so long as the soil has been thoroughly cleaned and managed.

“There’s still been some successful orchards there, but it has to do with the organic matter of the manure of the cows, and it ties up the zinc in the soil and makes it less available to the tree absorption,” Edstrom said. “And so adding zinc to the soil under those circumstances, or understanding the soil and then mending the soil, or just (applying) very high powered zinc program and multiple applications from different directions can be successful, but that’s a tougher situation for sure.”

One of the ways to manage zinc through the soil is to use drip irrigation by inserting the micronutrient into the water. That has proven successful for some people, but the soil composition does continue to complicate the tree roots uptake of the zinc.

For almond growers, especially those in the San Joaquin Valley, the fate of their crops rely heavily on their management of zinc and their prevention of a zinc deficiency. Zinc makes up an essential element of almond crop’s nutrient composition, which explains why growers must go to great lengths to ensure their orchards receive the sufficient amount of zinc, the mighty micronutrient, Beede said.

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# PISTACHIO PESTS, CROP SIZE, AND MORE

By Cecilia Parsons | Contributing Writer



*Unity Farms of Terra Bella added to its pistachio acreage in August, planting a block of Kerman. Traits of this variety in California include bearing significant fruit in 6th leaf state and uniform nut maturity. All photos courtesy of Cecilia Parsons*

California pistachio growers are closing in on the start of an off-year harvest with “a really good looking crop,” according to growers and industry leaders.

With harvest set to begin by the end of August, the 2017 crop is looking to be heavier than estimated earlier in the growing season. Bob Klein, manager of the California Pistachio Research Board said that after 2016’s huge 900 million pound California crop, a much lighter nut set would be the accepted norm for this alternate bearing year.

In a phone interview in late July, Klein said the crop estimate was in the 550-650 million pound range.

Ample winter rain and the availability of higher quality surface water improved tree health since January,

Klein said. Leaf out and bloom were also not as erratic as in past years and harvest shakes could be fewer, he added.

Zack Raven with processor/grower Keenan Farms in Kettleman City said new acres coming into production are boosting pistachio production, picking up the slack for older plantings that are more alternate bearing.

“It looks more promising than we anticipated early in the season,” he said.

He agreed with Klein about the 550-650 million pound crop size.

Raven said he expects this year’s harvest start to be about 10 days behind last year’s start, and likely around September 7th. Research has shown that pistachio maturity is affected less by summer heat and more by spring temperatures. Cool

springs delay harvest, possibly because heat units for maximum plant efficiency are not attained. High blank percentage don’t appear to be a problem in this year’s crop as chill units were adequate across most growing areas.

## NUT QUALITY—PEST PRESSURE

Nut quality remains a question for this harvest. Pest control advisor (PCA) Justin Nay with Integral Ag in Chico said there was a lot of stink bug/leaffooted bug (LFB) pressure early in the season that could cause some shell staining, lowering nut grade. Navel orangeworm (NOW) pressure was low at the beginning of the growing season due to the wet winter, but numbers were building through the summer and a later and longer harvest means more threat of navel

*Continued on Page 52*



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*Continued from Page 50*

## ACRES, VARIETIES

orangeworm damage. Kris Tollerup, University of California Cooperative Extension (UCCE) specialist, said he has not received many calls this year about LFB damage in pistachios. He said growers should be vigilant in August as the third flight of NOW moves to feed on split nuts.

Raven said he has not seen high NOW numbers yet, but expects by the second shake, they could be a problem. Many growers now use mating disruption dispensers in their orchards, which can lower NOW populations, but make it difficult to monitor pest pressure.

Two shakes are common for the Kerman variety, getting early set nuts off before NOW infestations. If crop load justifies it, a second shake can be done 10-14 days later, but each day increases potential for NOW damage.

There are currently 250,000 acres of bearing pistachios in California and a total of 312,000 acres in the ground. Richard Matoian, executive director of American Pistachio Growers said that there was spike in pistachio planting between 2012 and 2014 much like the years from 2005-2009. It appeared that the normal planting level of between 7,500 and 10,000 acres per year will be common in coming years, he said.

In Arizona, Matoian said, there are an estimated 4,000 bearing acres with another 2,500 planted in recent years. New plantings are continuing and there is great interest in pistachio production in Arizona, but Matoian said that finding additional suitable locations with water and adequate chill hours is difficult. Pistachio growers in New Mexico are showing mild interest in expanding their acres.

Kerman remains the most popular variety of pistachio planted, but the newer

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varieties Golden Hills and Lost Hills are gaining ground. Nay said choices are not so much for getting away from the alternate bearing cycle, but that nut weight and size are competitive with Kerman. Golden Hills and Lost Hills nut crops also mature a week to 10 days before Kerman, which helps with NOW pressure and spreads out harvest.

Kern County UCCE farm advisor Craig Kallsen said Kerman has a 60-year long history in California growing regions, and its strengths and weaknesses are well known by growers. The strengths include good hull strength, cleaner shells and good split percentages. It does have more alternate bearing and a higher chill requirement than some of the newer varieties.

Kallsen said Golden Hills appears to alternate bear similar to Kerman, but that Golden Hills and to a lesser extent Lost Hills varieties are being planted in the same areas at Kerman. He estimated totals for both the newer varieties in excess of 50,000 acres.

In response to the growing number of producing pistachio acres, Matoian said processors are steadily expanding their operation to accommodate the anticipated crops. The industry is well aware of the expanding acres and anticipated production, he said.

Limiting factors for the pistachio industry in California include water availability, lack of chill hours in certain years and planting pistachios in areas of lesser soil quality resulting in lower production. Matoian added that bushy top syndrome and the replanting on an estimated 20,000 acres would also have an effect on total production.

Insect pests and disease, food safety issues and cost of regulations are all challenges being faced by pistachio growers, Matoian said. The industry is working to address these issues by funding research and lobbying efforts.

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**08:00 | Almond Building**

**The Burden of Compliance—Dealing with the Skyrocketing Costs of Compliance Proactively**

Panel speakers: Roger Isom, Emily Rooney, Scott Mueller, Dan Errotabere, and Robert Gulack

**12:15 | Almond Building**

**Navel Orangeworm Management—Current and Future Prospects**

Speaker: Brad Higbee, Field Research and Development Manager for Trécé Inc.

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	 <b>ALMOND SEMINARS</b>	 <b>WALNUT SEMINARS</b>	 <b>PISTACHIO SEMINARS</b>
<b>7:00 AM</b>	<b>Registration</b>		
<b>7:30 AM</b>	<b>Trade Show</b> PCA-CE Credits: 15 minutes; Other		
<b>8:00 AM</b>	<b>The Burden of Compliance—Dealing with the Skyrocketing Costs of Compliance Proactively;</b> Panel Speakers—Roger Isom, Emily Rooney, Scott Mueller, Dan Errotabere, and Robert Gulack (Almond, Walnut and Pistachio Combined Session To Be Held in Almond Building)		
<b>8:30 AM</b>	<b>How to Maximize Biological Control for Spider Mites in Almonds;</b> David Haviland; UC Davis Entomology & Pest Management Farm Advisor; PCA-CE Credits: 30 minutes; Other	<b>Advances in Spray Application Technology for Precision Chemical Applications;</b> Alireza Pourreza, UCCE Extension Advisor; PCA-CE Credits: 30 minutes; Other	<b>Anthracnose; Is it a Threat to California Pistachios?</b> Themis Michailides; Professor and Plant Pathologist at UC Davis; PCA-CE Credits: 30 minutes; Other
<b>9:00 AM</b>	<b>Management of Soilborne Diseases in Replanted Almond Orchards;</b> Mohammad Yaghmour, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other	<b>Monitoring and Management of Walnuts Pests—Codling Moth, Husk Fly, and NOW;</b> Charles Burks, USDA/ARS Research Entomologist; PCA-CE Credits: 30 minutes; Other	<b>Best Treatment Timings and Management of Large and Small Bugs in Pistachios;</b> Kris Tollerup, UC Statewide IPM; PCA-CE Credits: 30 minutes; Other
<b>9:30 AM</b>	<b>FSMA Produce Safety 101 for Almond Growers;</b> Tim Birmingham, Director, Quality Assurance & Industry Services, Almond Board of California	<b>State of the Industry Update; Jennifer Williams and Claire Lee, California Walnut Board</b>	<b>State of the Industry Update; American Pistachio Growers;</b> Richard Matoian, Executive Director
<b>10:00 AM Break/ Trade Show</b>			
<b>10:30 AM</b>	<b>Identification, Control, and Management of Ant Populations;</b> Kris Tollerup, UC statewide IPM; PCA-CE Credits: 30 minutes; Other	<b>The Latest in Spray Applications for Controlling Botryosphaeria;</b> Themis Michailides, Professor and Plant Pathologist at UC Davis; PCA-CE Credits: 30 minutes; Other	<b>Soilborne Diseases from Chemical Controls to Best Management Practices for Pistachios;</b> Phoebe Gordon, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other
<b>11:00 AM</b>	<b>Self-Compatibility: Is It Right for Your Orchard?</b> Craig Ledbetter, Research Geneticist USDA/ARS	<b>Preplant Site Selection, Planning and Designing your Walnut Orchard;</b> Mae Culumber, UCCE Farm Advisor	<b>Pistachio Rootstock Production and Selection;</b> Elizabeth Fichtner, UCCE Farm Advisor
<b>11:30 AM</b>	<b>Controlling Fungal and Bacterial Diseases in Almonds;</b> Brent Holtz, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other	<b>New Chemistries for Weed Control Pre- and Post-Emergent;</b> Kurt Hembree, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other	<b>The Latest on Winter Chill and How it Impacts Crop Prediction;</b> Craig Kallsen, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other
<b>12:00 PM - Free BBQ Tri-Tip Lunch</b>			
<b>12:15 PM</b>	<b>Navel Orangeworm Management—Current and Future Prospects;</b> Brad Higbee, Field Research and Development Manager for Trécé Inc.; PCA-CE Credits: 30 minutes; Other		
<b>1:00 PM</b>	<b>Trade Show</b> PCA-CE Credits: 15 minutes; Other		
<b>1:30 PM</b>	<b>Adjourn</b>		

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**12:15 | Lunch Area**  
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<b>7:00 AM</b>	<b>Registraton</b>		
<b>7:30 AM</b>	<b>Trade Show</b> PCA-CE Credits: 15 minutes; Other		
<b>8:00 AM</b>	<b>The Burden of Compliance—Dealing with the Skyrocketing Costs of Compliance Proactively; Panel Speakers—Roger Isom, Emily Rooney, Scott Mueller, Dan Errotabere, and Robert Gulack (Almond and Walnut Combined Session To Be Held in Workshop Area)</b>		
<b>8:30 AM</b>	<b>Advances in Spray Application Technology for Precision Chemical Applications; Alireza Pourreza, UCCE Extension Advisor; CCA-CE Credits- Integrated Pest Mgmt: 30 Minutes PCA-CE Credits: 30 minutes; Other</b>	<b>Managing Blight in Difficult Years: What Should be on Your Radar? Luke Milliron, UCCE Farm Advisor; PCA-CE Credits: 30 minutes; Other</b>	<b>Improve Your Irrigation Management with a Pressure Chamber; Allan Fulton, UCCE Farm Advisor</b>
<b>9:00 AM</b>	<b>Early Beehive Removal and Spray Timing Can Impact Pollination and Yield; Wes Asai, Pomology Consultant; CCA-CE Credits - Integrated Pest Mgmt: 30 Minutes PCA-CE Credits: 30 minutes; Other</b>	<b>Prevention and Management of Soilborne Diseases; Dani Lightle, UCCE Farm Advisor; CCA-CE Credits - Soil &amp; Water Mgmt: 30 Minutes PCA-CE Credits: 30 minutes; Other</b>	<b>Essential Facts Every Grower Should Know Before Installing a New Well; Charlie Hoherd, Director of Sales &amp; Marketing; Roscoe Moss Company</b>
<b>9:30 AM</b>	<b>FSMA Produce Safety 101 for Almond Growers; Tim Birmingham, Director, Quality Assurance &amp; Industry Services, Almond Board of California</b>	<b>State of the Industry Updates; Jennifer Williams and Claire Lee, California Walnut Board</b>	
<b>10:00 AM Break/ Trade Show</b>			
<b>10:30 AM</b>	<b>Five Key Components to Preventing Nitrogen Contamination of Groundwater; John Dickey Ph.D., CPSS, Agronomist, Soil Scientist; CCA-CE Credits - Nutrient Management: 30 Minutes</b>	<b>New Regulations for Spraying Near Schools and Day Cares; Marline Azevedo, Deputy Agricultural Commissioner—Pesticide Division, Stanislaus Agriculture Department; CCA-CE Credits - Integrated Pest Mgmt: 30 Minutes</b>	<b>Management Zone Based Precision Irrigation That Uses Leaf Monitors to Sense Plant Water Status and Improve Irrigation Efficiency; Shrinivasa Upadhyaya, Professor, UC Davis</b>
<b>11:00 AM</b>	<b>New Regulations for Spraying Near Schools and Day Cares; Marline Azevedo, Deputy Agricultural Commissioner—Pesticide Division, Stanislaus Agriculture Department; CCA-CE Credits - Integrated Pest Mgmt: 30 Minutes</b>	<b>Five Key Components to Preventing Nitrogen Contamination of Groundwater; John Dickey Ph.D., CPSS, Agronomist, Soil Scientist; CCA-CE Credits - Nutrient Management: 30 Minutes</b>	<b>New Research is Developing a Soil App to Evaluate Nitrogen Leaching; Toby O'Geen, UCCE Extension Specialist</b>
<b>11:30 AM</b>	<b>Managing Fungal and Bacterial Diseases in Almonds; Emily Symmes, UCCE Area IPM Advisor; CCA-CE Credits - Integrated Pest Mgmt: 30 Minutes PCA-CE Credits: 30 minutes; Other</b>	<b>Advances in Spray Application Technology for Precision Chemical Applications; Alireza Pourreza, Assistant CE Advisor; CCA-CE Credits Integrated Pest Mgmt: 30 Minutes PCA-CE Credits: 30 minutes; Other</b>	<b>Turning Ag Waste into Profit; Bill Ort, Research Leader USDA/ARS</b>
<b>12:00 PM - Free BBQ Tri-Tip Lunch</b>			
<b>12:15 PM</b>	<b>Navel Orangeworm Management—Current and Future Prospects; Brad Higbee, Field Research &amp; Development Manager for Trécé Inc.; CCA-CE Credits - Integrated Pest Mgmt: 30 Mintues; PCA-CE Credits: 30 minutes (Almond and Walnut Combined Session To Be Held in Workshop Area)</b>		
<b>1:00 PM</b>	<b>Trade Show</b> PCA-CE Credits: 15 minutes; Other		
<b>1:30 PM</b>	<b>Adjourn</b>		



# Should Insectaries be on Your Radar?

By **Kathy Coatney** | Editor



Most nut growers don't use bio control and those that do are generally organic growers, according to David Doll, University of California Cooperative Extension farm advisor.

But there is tremendous opportunity here, Doll continued, especially for growers looking to enhance their IPM (Integrated Pest Management) approach.

## The Lines are Blurring

Ron Whitehurst, a pest control advisor (PCA) with Rincon-Vitova Insectaries said, beneficial usage was almost exclusively in organic production until conventional PCAs started using them on conventional crops.

"In a growing number of situations, you have conventional and organic fields managed just about the same except for the use of maybe one or two restricted pesticides on the conventional

fields," Whitehurst said.

"The difference between conventional and organic is just kind of disappearing in a number of areas," Whitehurst said, and that's exciting.

## Beneficial Insects

Some companies only distribute the beneficials while others grow and distribute them. Whitehurst said they grow a short list of beneficial insects, and they also distribute insects from other insectaries.

There is a large greenhouse production, Applied Bio-nomics, located in British Columbia, Canada. They grow some beneficial insects that are useful in greenhouses and some that are useful in field, Whitehurst said.

There are also ladybug collectors that collect ladybugs out of the mountains, and for a lot of purposes, those are the cheapest bug for the buck since they are literally just scraping them up off the floor in the mountains, Whitehurst said.



All photos courtesy of Kathy Coatney

**Climate**

Raising the insects takes a specific climate, Whitehurst said.

Rincon-Vitova is on the California coast with a Mediterranean climate that is ideal for raising insects.

“We’re far enough inland so that it doesn’t get beastly hot or cold, and we’re just out of the fog belt so we’re in a really primo location for growing bugs,” Whitehurst said.

“Whenever you look at growing beneficial insects you need to look at what’s the failure mode that if it gets way too hot or way too cold you could lose your culture and have to start over again. You either need to have some really secure infrastructure,” Whitehurst said, or be able to control the climate for the insects.

**Sourdough Starter**

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*Continued on Page 60*

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flies. And then one third of the fly parasite wasp goes into keeping the culture of the wasp going,” Whitehurst said.

The colonies are built up in the spring and taken to a low level in the winter because of reduced demand, Whitehurst said.

When growing predator mites, it is also necessary to grow the pest mites, and there are a number of pest mites that very easy to

*Continued from Page 59*

to have the sourdough starter, and in the case of raising insects, you need to grow the bugs through all the life stages so that there is a complete metamorphosis, Whitehurst said.

“You have to have the right conditions for each of those different stages. So, on an ongoing basis you take about one third of your production and that goes back into keeping the culture going to continue growing the host insect. And then something like two-thirds of your production is available for sale,” Whitehurst said.

“For us, half of our business is in fly control, so we grow about four million flies every day. About a third of that production of the flies goes into producing more



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grow, Whitehurst said.

### Developing a Culture

Developing a culture of an insect doesn't happen overnight. “You're looking at something like in the neighborhood of a three-year process,” Whitehurst said.

“A lot of people come to us and say, oh yeah, I'd like you to grow this bug for us,” Whitehurst said.

But it boils down to how many insects are needed, how much are they willing to pay for the insects and how much are they willing to pay the insectary to get them into production, Whitehurst said.

“Usually it requires a commodity group or trade groups that would be interested enough in having a particular beneficial insect available to be able to pony up the money to start a production,” Whitehurst said.

### Challenges

There are many challenges to raising insects, Whitehurst said.

“Just kind of step back and see what we're

doing in a broad agricultural perspective, we're a livestock operation and have all the problems that conventional livestock operations have. It's just that our livestock has six legs versus four legs," Whitehurst said, and we're talking about producing thousands or millions of insects a day.

"We need to protect our insects from predators, disease and all that other stuff," Whitehurst said.

Food, changing suppliers and sometimes the way the food is processed can be problematic, too, Whitehurst said.

As an example, whey was used as a food source for insects in insectaries and used as an attractant for insects in the field,

Whitehurst said.

At one point the insects started dying, and it was traced back to a change in the process for purifying the yeast, Whitehurst said.

It had too much salt, which turned out to be fatal to the insects, so it's important to get good quality food at an affordable price to grow healthy insects, Whitehurst said.

## Economics

Pesticides are becoming more and more specific as far as the pests that they kill, but they're also becoming increasingly more expensive, Whitehurst said.

More and more farmers are penciling out the cost to spray versus the cost of releasing beneficial insects, Whitehurst said.

"It's coming out that it's cheaper to release the beneficial insect," Whitehurst

said.

In the past, many crops were sprayed with pesticides whether the pests were present in the field or not, Whitehurst said.

Then IPM came along where growers were advised to look and see if the pest was in the field first, then evaluate what was the simplest, least toxic, least disruptive means of controlling the pest. This could mean looking at cultural controls or releasing beneficial insects, Whitehurst said.

"We've got beneficials for a number of the tree crop pests and again a big part of what we encourage is people to build habitats so they grow their own beneficial insects by the way that they farm," Whitehurst 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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# BITS AND PIECES

EVENTS NEWS UPDATES



## USDA'S AGRICULTURAL MARKETING SERVICE AMENDS COLOR REQUIREMENTS

The United States Department of Agriculture (USDA) announced a final rule [1] to allow grade certification of the red-colored (i.e. Livermore variety) walnuts. The rule revises the U.S. Standards for Grades of Inshell/Shelled Walnuts under the Agricultural Marketing Agreement Act of 1946.

These revisions update current grading standards, which were previously limited to four color classifications: Extra Light, Light, Light Amber, and Amber. Red-colored walnut kernels previously could not be certified to a U.S. grade since the color did not fit any of the four classifications.

“The industry sees this as an opportunity to serve unmet demand in the marketplace. Enabling the red walnut (i.e. Livermore variety) to be certified will allow the industry to market a product to customers around the world in markets like China, where red walnuts are a highly desired product. Further, this gives the industry better market information, through crop acquisitions, regarding walnuts meeting this classification,” stated Steve Lindsay,

Chair of the California Walnut Board Grades & Standards Committee.

Red-colored walnuts will now have to be sold to a registered walnut handler. The California Walnut Board, through its inspection service Safe Food Alliance/DFA of California, is prepared to incorporate these new standards into their grading and inspections for the 2017 crop. The rule goes into effect on September 21, 2017. More information is available on the Federal Register [1] under document 82 FR 39655.



The California Walnut Industry's 4,800 growers account for 99% of U.S. production of English walnuts who, along with 96 handlers (companies), process and ship walnuts, serving the global market. In 2016, growers harvested 686,000 tons on 315,000 bearing acres.



## CALIFORNIA ALMONDS CONTINUE TO INSPIRE NEW PRODUCTS WORLDWIDE

According to data from Innova Market Insights, California Almonds were the number one nut used in new products worldwide in 2016, the tenth year that almonds have held the lead position for nuts used in new product introductions.

Almonds were featured in 38% of new food introductions featuring nuts in 2016, a 5% increase from the previous year, per the report[1]. Key categories for worldwide almond product launches include confectionery (23%), bakery (20%) and snacks (18%), as well as bars (12%) and cereal (9%), which together account for 82% of almond product introductions. In more than 15 forms, including almond milk, butter and flour, almonds are one of the most versatile nuts and the nut that is most top-of-mind for global consumers.[2]

In addition to the top five categories for almond product introductions, the dairy and dessert categories also saw exciting growth. The dairy category, which includes

almond milk, saw a 26% increase in almond introductions, and the desserts and ice cream category had an increase of 33% almond products in 2016.

“Manufacturers have long been tasked with tackling innovation in new food products, as consumer demand continues to grow for products that are not only delicious but are also nutritious and offer on-the-go convenience,” said Emily Fleischmann, senior director, Global Marketing at Almond Board of California. “Now, the market place is also looking for these products to align with the growing consumer desire for ‘clean’ products, while ensuring they are safe, sustainable and shelf stable,” she continued. “California Almonds are an ideal tool for manufacturers looking to deliver on these attributes without sacrificing flavor, texture or nutrition.”

The versatility and nutritional profile of almonds make the nut a particularly appealing ingredient that can help manufacturers deliver on consumer demands for healthful food products. Almonds can now be labeled “healthy,” according to the Food and Drug Administration. When compared ounce for ounce, almonds are the tree nut highest in six essential nutrients: protein (6g), fiber (4g), calcium (75mg), vitamin E (7.4mg), riboflavin (0.3mg) and niacin (1mg).

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