

# WEST COAST NUT

June 2017 Issue

## SPOTLIGHT:

### Hullsplit Sprays

Using IPM and Resistance Management  
for Best Outcome

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FSMA Is Here: Are You Prepared?

Phytophthora in Walnuts

Picture from the Past:  
New Model Helps Pistachio Growers Better Predict Yield

Treasure of El Dorado:  
Hi-Tech Packing Line a Golden Opportunity



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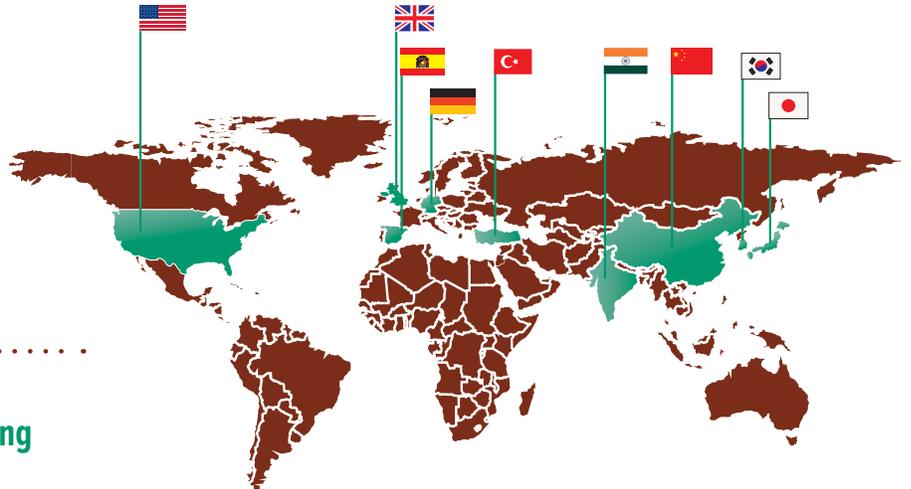
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# CALIFORNIA WALNUTS

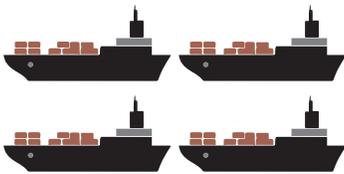
# BUILDING DEMAND THROUGH GLOBAL MARKETING

## The global market for California walnuts spans the U.S. and 8 export countries

The California walnuts' international markets include USA, Spain, Germany, UK, Turkey, Japan, China, South Korea, and India

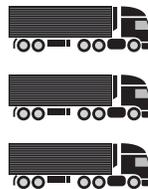


## Walnuts are California's 4th leading export commodity<sup>1</sup>



### INTERNATIONAL MARKET

**\$1.19** BILLION<sup>2</sup>

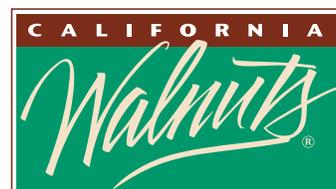
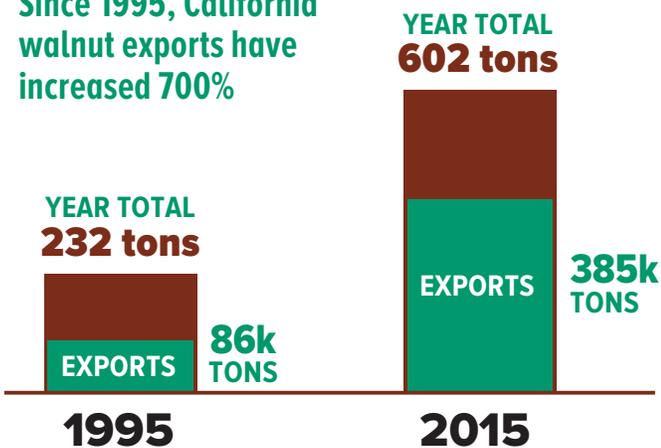


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Marketing programs have and will continue to be a key driver in building consumer demand for walnuts. Currently, marketing programs in the U.S. and eight export countries aim to expand distribution and raise consumption by communicating the distinctive quality, taste, versatility, and health benefits of California walnuts. The Industry, growers, handlers, and the Board and Commission, have made great strides by working together. Together we will continue our commitment to building demand in an ever-expanding global market.

## Since 1995, California walnut exports have increased 700%



walnuts.org



Per one ounce serving.

Source: <sup>1</sup>CDFA Agricultural Statistics. <sup>2</sup>Estimated wholesale value.



# MARKETING

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# WEST COAST NUT

*By the Industry, for the Industry*

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## FEATURED ARTICLE

As almond growers prepare for hullsplit sprays, it is time to review best practices for the most effective treatment program that follows an IPM approach and resistance management for treating navel orangeworm (NOW) and spider mites.

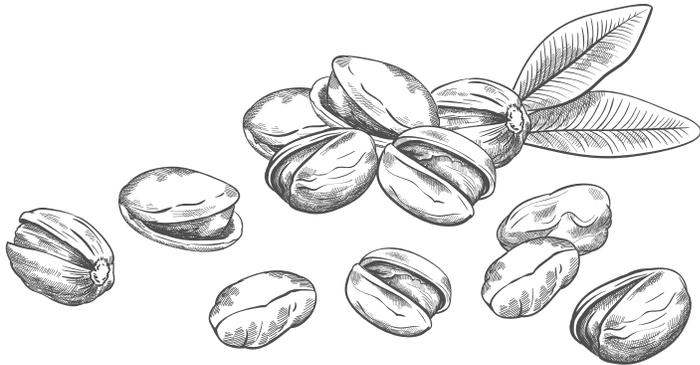
*See the full story on page 38*



Photo courtesy: Almond Board of California

# PICTURE FROM THE PAST:

## New Model Helps Pistachio Growers Better Predict Yield



By *Cecilia Parsons*, Contributing Writer

**K**ern County Cooperative Extension advisor Craig Kallsen writes: “What many in the pistachio industry want to know is not if fall and winter chilling were adequate or surpassed some threshold. What they really want to know is what their yield will be at harvest time.”

Kallsen’s research, to be published in the April issue of *HortScience*:52 (4):1-8, correlated yields in Kern County Kerman pistachio orchards with air temperature records from nearby CIMIS stations to develop a model that can provide insights into air temperature variables associated with yield in the San Joaquin Valley of California and may be useful in improving yield prediction.

He notes that the research examined Kerman and Peters orchards and the results are most applicable to those varieties that are 15 years and older and located in the southern San Joaquin Valley. The model also

assumes that crop nutrition, irrigation scheduling and pest control were above average and that water quality was adequate.

### **Predicting Yield**

In predicting yield, Kallsen said that his best input variable was yield from the previous year. With an alternate bearing crop, and a low yield in the previous year, the prediction would be for a larger crop this year. Kallsen’s research was aimed at improving predictability by adding recorded air temperatures in the model. In his study, a large number of air temperatures related variables were examined that summed or accumulated the number of hours the air temperature was above, below, or between set limit values during calendar periods of time. One of the many variables entered into the model was the accumulation of number of hours less than 45 degrees F from November 15 to February 15. Most of the variables calculated, he said, were rejected in





favor of a few that proved to be better at predicting yield.

Kallsen used forward, stepwise multiple regression to determine the top three or four variables, in addition to yield, that increased the ability to predict yield at harvest.

The regression procedure found the most useful variable for predicting subsequent yield in older Kerman orchards was previous yield.

### **Chill Hours and Portions**

What was interesting—and not surprising, based on his previous experience, Kallsen said—is that variables such as chilling hours and chill portions as measured during fall and winter preceding harvest were not very useful in predicting subsequent yield or were negatively correlated with yield in the pooled data from the three orchards studied. Kallsen said the lack of significance of variables that measured chill, in combination with significance of variables that measured warmer temperatures in the fall and winter, suggest that there is usually enough winter chilling, but interruptions of warmer temperatures during that time reverse or interrupt the dormancy period for the trees.

Of the 30 or more variables used, the four most powerful in estimating total in-shell weight were:

1. The square of previous season total in-shell weight in pounds per acre.
2. The square of accumulated hours greater than or equal to 45 degrees F and less than or equal to 60 degrees F summed from 11/15 to 2/15.
3. The accumulated hours greater than 65 degrees F from 11/15 to 2/15
4. The accumulated hours greater than 80 degrees F summed from 3/20 to 4/25.

Kallsen said the best chance for a big yield is to have a small yield from previous harvest, to accumulate as



many hours as possible between 45 degrees F and 60 F from November 15 to February 15, have no hours with temperatures greater than 65 degrees F during that same period and to have no hours with temperatures above 80 F from March 20 to April 25.

### The Model

For the three orchards Kallsen's model is based on, over the course of 31 years, for previous yield the mean was:

- **3,541 pounds** per acre for previous yield

- **1,172 hours** for hourly accumulations from 45 to 60 degrees F from November 15 to February 15
- **75 hours** for hourly accumulations greater than 65 degrees F for the same period
- **39 hours** or hourly accumulations greater than 80 degrees F from March 20 to April 25

Kallsen said if this model is used, and hourly accumulations during the fall, winter and bloom are tracked, actual hourly accumulations measured in an orchard could be compared to the mean values to give a rough indi-

cation of how the upcoming harvest yield will be impacted. Kallsen notes that the mean values are not "threshold" hourly accumulations. The results of this model suggest, he noted, that thresholds do not exist but that yield will increase or decrease linearly or curvilinearly depending on previous yield and the most significant hourly air temperature accumulations identified in this study.

Kallsen said the model predicts yield more accurately when the input

*Continued on Page 8*

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# 2017 ANNUAL MEETING

Wednesday, June 14th, 2017

## Monterey Marriott Hotel – Ferrantes Bay View

5:30 pm Associate Member Appreciation Reception  
7:00 pm Dinner “On Your Own”

Thursday, June 15th, 2017

## Carmel Valley Ranch – Carmel

8:00 am WAPA Golf Tournament & PAC Fundraiser

## Monterey Marriott Hotel – Ballroom

12:00 pm Exhibitor Set-up Begins  
5:00 pm WAPA Annual Meeting Reception & Exhibits  
6:45 pm WAPA Annual Meeting Dinner  
6:55 pm Dinner Sponsor Comments  
7:05 pm Dinner  
7:45 pm Passing of the Gavel – Recognition of Outgoing Chairman  
8:00 pm Introduction of Guest Speaker  
8:05 pm Special Guest Entertainment - Russ Stolnack, Comedian  
8:45 pm Evening Wrap-up & Closing Remarks  
9:00 pm Adjourn

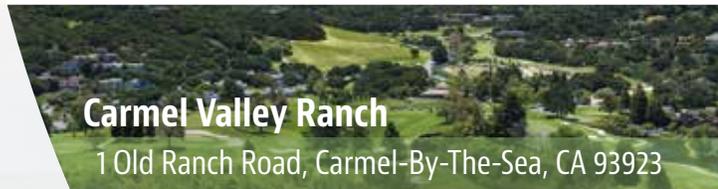
Friday, June 16th, 2017

## Monterey Marriott Hotel – Ballroom

7:30 am Continental Breakfast and Exhibit Opening  
8:00 am Welcome and Introductions - Michael Kelley, Chairman, WAPA  
8:10 am WAPA Financial Report - Todd Landry, Eadie & Payne  
8:20 am Biomass – Where Do We Go from Here?  
West Biofuels - Matt Summers  
Technikon – Jim Stewart  
9:05 am FSMA Implementation Panel  
FDA – Mary Ellen Taylor, Health Communications Specialist, San Francisco District Office, US Food and Drug Administration  
CDEA – Natalie Krout-Greenberg, Director, Inspector Services Division, California Department of Food and Agriculture  
CDPH – Jane Reick, Unit Chief, Food Safety Inspection Unit, California Department of Public Health  
9:50 am \*\*\*Break & Exhibits\*\*\*  
10:30 am Labor Update - Michael Saqui, The Saqui Law Group  
10:50 am Sacramento Update - Louie Brown, Kahn, Soares & Conway  
11:10 am Regulatory & Legislative Issues Update - WAPA Staff  
11:45 am Board Actions and Closing Remarks  
12:00 pm \*\*\* Lunch \*\*\*  
12:30 pm Luncheon Speaker – Wells Fargo Agricultural Economic Outlook  
Mike Swanson, Ph.D., Senior VP, Ag Economist and Consultant, Wells Fargo  
1:00 pm Adjourn



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*Continued from Page 6*

values for the four variables are near the mean values listed.

By using the 'standard error of the predicted value,' which is a statistic calculated by the multiple regression model, how much error associated with the yield value predicted by this regression equation can be estimated. By multiplying the standard errors of the predicted values by 2, over the range of predictions upon which the model is based, the error associated with a given yield prediction should vary from a maximum of +/- 952 pounds per acre for yield predictions based on input values near their extreme values, to a minimum of +/- 266 pounds per acre for cases with values near the middle of the range. On average, using the standard error of the predicted value, a yield prediction should be accurate within +/- 524 pounds per acre.

Kallsen said the model 'explained' about 64 percent of the total adjusted variation in total in-shell yield measured over the past 31 years. He also warned not to spend time looking for physiological importance in the variables. They are merely correlations which do not explain cause and effect as to what may be going on biologically, he said. The model should allow growers to estimate what their yields will be with greater accuracy, rather than trying to estimate whether or

not chill or dormancy was or was not sufficient.

Kallsen said the model has shown that warm temperatures during the fall and winter 'rest period' appear to have reduced yields to a greater extent than previously thought.

The use of fall and winter foliar sprays of kaolinite clay or calcium carbonate crystals to reduce orchard air temperatures below 65 degrees F, appears to be supported by the model, he said.

*Continued on Page 10*



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Poor chilling may have been blamed for poor yields in the past when the problem may have been excessively warm temperatures during bloom. Kallsen said results from this research suggest that the industry may have focused too much attention on chilling and not enough on the orchard's current point in the alter-

nate bearing cycle. Extremely low yields may be the result of a 'perfect storm' of being on the wrong side of a previous high yield and these few temperature variables, even if all management is correct. Kallsen said use of this model should give growers the ability to obtain an estimate of their yield by the end of April, assuming that all management is adequate.

## How it Works

Kallsen gave this example of how the model works:

The date used is April 26 and the grower has downloaded the orchard temperature recorder and summed the hourly air temperature accumulations of the variables required.

1. The number of hours greater than or equal to 45 degrees F and less than or equal to 60 degrees F as summed from November 15 to February 15 was 1,150 hours.
2. The accumulated hours greater than 65 degrees F from the same time is 136 hours.
3. The accumulated hours greater than 80 degrees F from March 20 to April 25 was 45 hours.
4. Last year's total in-shell yield was 2,200 pounds per acre.

When this data is entered in the model equation, the predicted yield for the upcoming harvest is estimated at 3,968 +/- 524 pounds per acre. This prediction Kallsen notes, assumes the average error value and that all management is above average and water quality is good.

Ideally, Kallsen said, this model would be used in conjunction with other yield-related information such as nut set, early and late season field measurements such as nut abortion and blanking and nut quality observations such as percent nut split, to further refine yield estimates.

Kallsen is providing an Excel spreadsheet for use in calculating. It is available at <http://cekern.ucanr.edu/files/260338.xlsx>. Kallsen also invites any questions about the model or spreadsheet. He can be reached at 661-868-6221.

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# FSMA IS HERE: ARE YOU PREPARED?

By **Priscilla Rodriguez**  
Safety Specialist  
Western Agricultural  
Processors Association

Food Safety for the Tree Nut Industry has always been at the forefront, but with the Food and Drug Administration's (FDA) Food Safety Modernization Act (FSMA) compliance date for most tree nut hullers (hullers) quickly approaching, the industry must be prepared. When the FDA passed its seven FSMA rules affecting the entire food industry, five of those rules directly impact the tree nut industry. Those rules include:

- Preventative Controls for Human Food
- Preventative Controls for Animal Food
- Produce Safety
- Sanitary Transportation of Human and Animal Food
- Intentional Adulteration

There is a clear line for tree nut processors who further manufacture the tree nuts, such as slice, dice, blanch, bake, or pasteurize, etc. Those facilities will need to comply with all but the Produce Safety Rule (and Preventative Control for Animal Food, if

not applicable). However, there is no clear divide when we consider where hullers, shellers, and dehydrators fall and that is due to the language included only in the final version of the rule that encompassed ownership as part of the criteria within the "Farm" definition.

FSMA's premise and foundation is to identify, prevent, and control risk to human and animal food. However, the applicability of the various rules of FSMA is not based on risk. The tree nut industry, Western Agricultural Processors Association (WAPA), and other agricultural industries with similar intermediate packing facilities are concerned with the inconsistent applicability of the rules and the consideration of ownership of the facility rather than actual health risk to human or animal food. This problematic approach on the definition of a farm would require identical or similar facilities to have vastly different requirements, causing great confusion for industry and regulatory agencies alike. This is often the problem when you try to write one rule

for hundreds of different commodities and agricultural practices.

Applicability and Farm definition  
WAPA surveyed its membership to determine how the current farm definition would affect the different types of operations and the applicability of the different rules. The findings show a small percentage of hullers would not fall under the "Farm" definitions and would be subject to the Preventative Control Rule for Human Food. An estimated 4 percent of hullers would be required to comply with the Preventative Control rule. These operations are identical in nature in their processes to the other 96% of hullers who would only be required to comply with the Produce Safety Rule. There is no difference in the risk to food safety in these operations.

The small percentage of facilities will be subject to the Preventative Control Rules based on the ownership of the commodity

*Continued on Page 14*

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hulled, shelled and/or dehydrated at their facility. However, ownership of the commodity does not affect the safety of the commodity nor does it justify the need for the low percentage of hullers subject to a different rule entirely.

In correspondence with the industry, the FDA has acknowledged there is no difference in risk based on where the tree nuts are hulled/shelled; however, they refer back to the ownership of the tree nuts when determining applicability, which is of major concern. They have gone on the record to say they are considering future rulemaking to modify the definition of a farm in order to address ownership issues the industry has brought to light.

### WAPA Activity with Agencies and Congressional Members

Efforts back in Washington, DC included meeting with FDA officials to discuss

the industry's issues with the FSMA rules. Ongoing discussion with officials in Washington, DC and Congressional and Senate offices has been consistent. Congressional staff participated on a tour of an almond huller, walnut huller, and pistachio processor to understand the industry and its concern. Soon we will be back in Washington DC to meet with the FDA when the new Director's appointment is confirmed.

In our discussion with our congressional members and agencies, we focused on the following:

- Our overarching concern is with the use of ownership as part of the criteria

for the secondary activities farm within the farm definition.

- For consistency on ensuring industry wide compliance and understanding of these rules, we ask that the FDA classify all hullers so as to only be subject to the Produce Safety Rule across the board regardless of ownership of the tree nuts.

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- Leading effort with FDA to ensure hullers are treated equally under FSMA
- Leading opposition to new Aboveground Fuel Storage Tank regulation
- Directly and intimately involved in push for new water storage
- Successfully obtained exemption for propane-fired tree nut pasteurizers
- Coordinated tree nut industry inclusion in economic study on state's proposed tractor regulation



Bringing a Unified and More Powerful Voice to the Tree Nut Industry

Our efforts do not end at the federal level, as the State of California has a Cooperative Agreement with the FDA to enforce the rules and provide for education, infrastructure, technical assistance, and compliance inspections. The California Department of Food and Agriculture (CDFA) will be in charge of enforcing the Produce Safety Rule and Preventative Controls Rule for Animal Food, and the California Department of Public Health (CDPH) will enforce the Preventative Controls Rule for Human Food. We have been meeting with these agencies to build a partnership and open the lines of communication.

### Compliance Date Extension

Last fall, the FDA extended compliance dates for facilities that are covered by the two Preventive Controls Rules for Human and Animal food, and are solely engaged in packing and/or holding produce or raw agricultural commodities to align with the compliance dates for farms conducting

similar activities under the Produce Safety rule. This extension includes facilities that hull, shell, pack and/or hold nuts, with the earliest compliance date being January 26, 2018. The FDA also extended the compliance dates for operations that would be considered a farm except they do not meet the ownership criteria in the definition of a secondary activities farm; the compliance dates were extended to align with the other hullers who conduct similar activities and fall under the Produce Safety Rule.

### Food Safety Plan for Tree Nut Hullers

The FDA has released several draft guidance documents to assist the industry in complying with the seven FSMA rules and will continue releasing draft guidance's for comment. While the industry is anticipating the release of the FDA's long-awaited Produce Safety Rule Guidance and Tree Nut Specific Guidance, WAPA has been working on creating a Food Safety Plan for Tree Nut Hullers to meet the requirements

of the Produce Safety Rule. Although there is some uncertainty and gray areas in the rule, we are marching forward and working with industry representatives to create a Food Safety Plan specific to each commodity that falls into the rule: walnuts, pistachios, and almonds. Our Food Safety Committee has had meetings to focus on the development of a standard Food Safety Plan for all hullers. Committee members and industry leaders have provided feedback on our draft Food Safety Plan and raised questions on certain requirements of the rule. WAPA staff is working on modifications to the plan and will need to run some testing this hulling season. Stay tuned!

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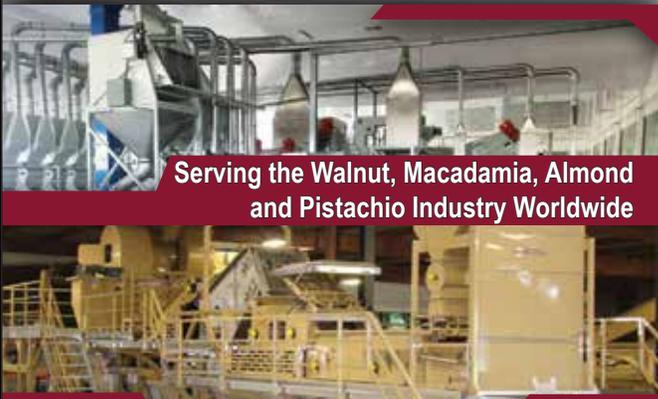
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# INNOVATION IN THE OUTBACK

By *Cecilia Parsons*  
Contributing Writer

## Australian Almond Breeding Program Has Made Great Strides

Not unlike their California counterparts, Australian almond growers desire highly productive cultivars to help them be competitive in the global market.

### Varieties

Currently, the Australian almond industry relies heavily on only three varieties, Nonpareil, Carmel, and Price. Michelle Wirthensohn, Program Leader of the National Almond Breeding Program, said Australian almond growers want new varieties developed to expand their planting choices. Wirthensohn, who is based at the Waite Campus of University

of Adelaide, was a speaker at the annual Almond Conference in Sacramento. She noted almond variety traits ranked highest by the Australian industry are productivity, self-fertility, and flowering time similar to Nonpareil and disease tolerance. Growers would also like a replacement pollinator for Nonpareil. Over the last ten years, Wirthensohn said, Carmel trees are experiencing some non-infectious bud failure.

The Riverina in New South Wales (NSW), Adelaide Plains and Riverland in South Australia, and Sunraysia in Victoria are the main almond production regions in Australia. Growers there

contribute six percent of the global almond production. There are currently about 31,115 hectares planted with eight percent non-bearing. In 2015, Australia produced 80,500 tons of almond kernels worth \$925 million. The goal for 2018 is 85,000 tons with a value of \$700 million.

### Breeding

The National Almond Breeding program in Australia is using classic breeding techniques with phenotypic selection. To date, five new almond vari-





eties have been released. Nutritive content of these selections has also been determined. The program has one of the first fully de novo sequenced almond genomes. De novo genome sequencing with next-generation sequencing enables faster, more accurate characterization of any species than using traditional methods. The full sequence of almond will allow better

market-assisted breeding and will shed light on the molecular mechanisms for nutritional and agronomic properties via linkage mapping and functional genomics, Wirthensohn said.

Wirthensohn said a perfect marker for self-fertility has been identified and more markers are anticipated as

research progresses.

The self-fertile trait in almonds is gathering interest, Wirthensohn confirmed. Beehive strength for good pollination has not been an issue, but growers would like to be ready if Varroa mite should enter the country, she said. The almond industry does expect Varroa mite, which can decimate hive strength, to eventually be found in Australia.

**Left:** An aerial view of almond orchards in Australia.

**Right:** Australian growers are seeking many beneficial traits in new cultivars, including self-fertility, drought tolerance, and disease tolerance.

**Above:** Breeders use many criteria to judge production, including kernel color, shell hardness, and shell seal.

Photos courtesy: Michelle Wirthensohn, Program Leader of the National Almond Breeding Program



Beekeepers and the horticulture industries that rely on bees report they are expecting this pest will become an international issue and would like to be less reliant on bees, but not abandon them altogether. The self-fertility trait would help in colder years when bee activity is suppressed during critical bloom time.

Australia's apiary industry is very good at getting healthy hives to almond growers, Wirthensohn noted, and she believes the relationship between growers and beekeepers will remain strong.

### Current Research

Australia's almond growers look to current research and attend field days to gather information to help them with decisions on cultivars and keep up with the latest trends in almond production, Wirthensohn said. Some of the funded research there includes:

- Performance evaluation of local selections and imports
- Breeding—hybridizations
- Virology
- Micropropagation/Cryopreservation
- Genetic fingerprinting
- Molecular markers/tools for almond breeding
- Almond transformation for self fertility
- Understanding flavour of almond kernels



*Left: These almonds demonstrate kernel size and testa color differences due to variations in morphological traits, two criteria used in evaluating production.*

*Below: The breeding program has recorded 84 parent cultivars used 315 different crosses achieved.*

- Physical mapping of almond/quantitative genetics
- Evaluation of water use efficiency
- Biochemical testing—fatty acid & Vitamin E analysis

Variations in soils and climate in the country's major almond growing areas are another reason for adding the diversity in almond cultivars. Most of Australia's almonds are grown in the Murray River area. The further east, along the river, Wirthensohn said, the soils become heavier and the climate is slightly more humid,

conditions that can affect productivity in current cultivars.

Australia's main almond cultivar, nonpareil, fits the parameters for nut quality and appearance, but the need for a better pollinizer is an important part of the almond breeding program. High productivity, self-fertilization, and superior kernel quality are three other key parts of the program. Wirthensohn said quality is necessary to meet market demand. The

*Continued on Page 20*



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Continued from Page 18

industry is aiming for larger kernels to secure premium payment. She noted that smaller kernels with good quality characteristics also have value in the market place. Evaluation of kernels in the breeding program includes taste, size (at 18-20 kernels per ounce), less than five percent double kernels, light color skins, good seal on shells and appearance.

### Disease

An important trait for almond shells is the seal, which must be tight, whether the shell is papershell or not, to minimize

insect damage. Wirthensohn said the breeding program is also measuring all selections for kernel chemical components to see if they can increase some traits such as higher oleic acid and vitamin E content.

Fungal disease tolerance, high flower density, erect branch structure, and drought tolerance are other desirable traits researchers are seeking.

Progress to date in Australia's multi-million dollar almond breeding program includes production of 34,000 progeny with 315 different crosses achieved. A total of 84 parent cultivars were used and 37

imported since 1997. There are currently sixty superior selections and secondary and tertiary evaluation blocks have been established.

The secondary evaluation phase includes cumulative yields, lipid content and Oleic acid percentage of some selections along with self-fertility, bacterial spot resistance, and effects of deficit irrigation on lipid content.

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# The Treasure of El Dorado

## Hi-Tech Packing Line a Golden Opportunity

By **Len Wilcox**, Contributing Writer

Technology can be frightening - and introducing new tech into a workplace can be a major disruption. But one local nut processing company has moved fearlessly into a high-tech environment. The company has been rewarded with tremendous labor savings.

### New Software

El Dorado Almonds are grown and processed by a consortium of





Photos courtesy: Len Wilcox



WH:	B	R:	43	Variety:	ALDRIC	Grade:	1.44
Bin Tag:	39118	Bin Number:	3030	Case Year:	2010	Net Wt.:	2.247
Bin	38	Chip & Splits	4.2	Doubles	0.4	Total S.D.	0.5
Foreign Material	0.0	Discolor	0.6	Spill & Broken	0.4	Moisture	5.1

Fresno, Madera, and Merced County growers. They looked to the future to create systems that control costs and improve efficiency. The growers began processing and marketing their own nuts in 2010 under the direction of Scott Eastom, and in 2012 hired a recent graduate of UCLA, Amy Sihto, to help initiate and execute certain processes around the plant. Within the last year, Scott Eastom took another career opportunity, and Amy stepped in to fill the role as manager.

“With new software, excellent connectivity support, and new linked machinery and processes, we have reduced our labor force and increased productivity,” said Amy Sihto, who is now El Dorado’s Plant Manager. The company’s full time off-season staff has been reduced from 54 to 35. “In 2016, we packed 437,454 pounds per

employee; this year, we’re at 579,476.” The company packed approximately 32 million pounds of almonds last year.

She is quick to add that in addition to her staff, their Internet Service Provider and software provider are critical components of the company’s success.

“Unwired Broadband is right there for us, any time we need help,” Amy said, “They provide the bandwidth and speed we need in order to make our systems work together. I can’t say enough about the quality of their support. If something goes down, they are here right away - the same day - to fix it and get us back up.” She added, “What’s more, they are being so responsive and helpful even though they have no competitors for our specific area. Still they provide same-day quality service that is outstanding.”



Almonds being transported to the loading line.



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### Unwired

Unwired Broadband is a Fresno, California, based company, successfully competing against larger, national internet provider companies for businesses and residences throughout the Central Valley, including the usually neglected rural areas. Their specialty is wireless service provided by antennas affixed to towers. The towers provide coverage from north of Stockton to the Grapevine south of Bakersfield.

Unwired Broadband is truly impressive, especially since it is not a national player in internet services. The company has the largest wireless footprint in the Central San Joaquin Valley, covering over 30,000 square miles. They provide service to cities, underserved rural areas, and small towns with reliable, high-speed connectivity. They are a full-scale broadband provider, equipped to service customers with high-speed broadband services through fixed microwave wireless technology, network consulting, wireless bridges, emergency broadband services and wireless hotspots for large or small events.

### Almond Logic

The software the company uses is Almond Logic, a program tailored for the almond industry by Steve Plummer of Divine Logic in Fresno. The program ties together the various processes by machines, and provides tracking as well as data about the almonds as they move through the facility.

The data available is especially helpful with marketing the almonds that did not pass quality control for the highest grade of shipments. These lower grades can be used for making many different products, but the size and condition of the nut is an important factor. Some buyers want specific sizes of a specific variety with

*Continued on Page 26*



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*Top: Sizing and sorting machines make quality control highly efficient. The quality control line is down to 4 people at El Dorado.*

*Above: A robotic arm loads 50 pound boxes of almonds.*

Continued from Page 24

certain quality conditions met, such as: low chipped and scratched, low split and broken, low foreign material; others may want that size and variety but do not care as much about these specifications. The system provides that information for each 2,200 pound bin.

### Automation

The company's automated packing and shipping lines move almonds quickly through their system. A robot that stacks 50 pound boxes of almonds is a tremendous manpower saver - and a safety device as it reduces the threat of back injuries and muscle strains that the workers get from hoisting the heavy boxes. But perhaps most impressive is the computerized almond sizing, sorting, and quality control system. These sorting and sizing machines take the place of dozens of human work stations. Formerly, human quality control inspectors

would be scrutinizing the conveyer lines of almonds, pulling out discolored or damaged nuts, and sorting by size. The quality control line is down to 4 people at El Dorado.

"We've tremendously reduced manpower needs in this area, with these color sorters and sizing machines," Amy Sihto said. "It makes it cost-effective to run our first-run rejects back through and clean them for various markets - milk, candies, nut butter, and so on." She said that with the cleaning and sizing that is done, they are able to provide the customer with the product that fits their needs.

Another factor in the successful implementation of technology is the staff and management team of El Dorado. The leadership of the company are youthful, well-educated women who are comfortable with technology and see its value in their work and personal lives. Amy Sihto is a 2012 graduate of UCLA;

Liz Huerta is a 2012 graduate of Fresno State; and their Packing Director, Martha Zamora, has over 35 years of experience in the almond industry. Amy mentioned that the remainder of the administrative staff is a vibrant and knowledgeable group of young ladies who've learned the industry, the El Dorado way, and largely contribute to its success each and every day.

"I absolutely believe our team is comfortable with technology--we are quick to adapt to new ideas and processes," Amy said, "However, change is difficult, and we went through our own level of pain while adding new machinery. The numbers show the value," she said, pointing to the reduced labor costs. "We're packing an extra 144,000 pounds per employee."

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*UC Davis student augers a hole to install soil moisture sensors in a walnut orchard.*

*Photos courtesy: Bob Coates, UC Davis.*



# NEW RESEARCH WILL PROVIDE GROWERS WITH TECHNOLOGY INFORMATION

By *Kathy Coatney*, Editor

**B**ob Coates, associate development engineer with the University of California, Davis, in the Biological and Agricultural Engineering Department is working on a project funded by the Department of Water Resources (DWR).

## **Project Goal**

“The overarching goal of the project is to evaluate precision Ag in a number of California crops specifically with respect to technology costs and ease of

use,” Coates said.

“The goal for all the crops is really the same—to work with the growers to evaluate where there are gaps in what the technology is doing, how much it costs, how easy it is to use and how it is or is not meeting their needs,” Coates said.

## **Changing Technology**

“The technology right now is rapidly changing in the marketplace. There

have been a number of Ag technology companies pushing the idea of precision Ag. And a lot of the technology is in developing even higher value crops like wine grapes and stuff like that that also have very unique growing needs,” Coates said.

This is starting to trickle into many other crops including nut crops—almonds, pistachios and walnuts, Coates said. “It (technology) provides a lot of

*Continued on Page 32*



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# Enterprise Ag Management:

*The next wave of Ag technology is focused on managing the business of agriculture at an enterprise level.*

By **Robert Gulack**

As Ag operations continue to scale and market volatility increases, control over bottom-line issues is a matter of survival for operators. But unreliable processes and poor communication undermine their ability to make good business decisions. To address this challenge, forward-thinking growers are embracing a new generation of technology tools designed to enhance business performance and create a sustainable competitive advantage not as a point solution but across the entire enterprise.

### When growing yield is not enough.

Good business practices are now key determinants of a grower's success. Just improving agronomically is no longer enough to drive the business forward. More than ever, growers need to be intentional about planning for profit. They need plans informed by good information. They need to enforce those plans reliably with their workers and communicate them easily to financial stakeholders. Finally, they need to see and control the thousands of small details that impact their bottom line. The need is growing for technology that can help operators manage their business as a whole, not just portions of it.

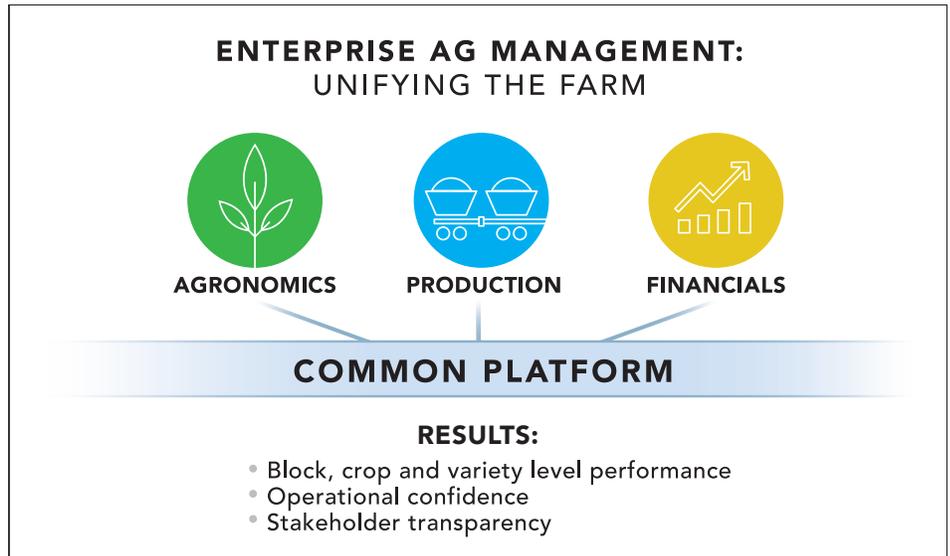
### Not knowing where the money goes.

As commodity prices fluctuate, labor costs rise, and resources like water become scarcer and more costly, inefficiencies in the farmer's operation are magnified. Making money under these circumstances isn't easy, and inadequate accounting practices make the problem worse.

Farmers frequently use guesswork to plan their year, set their operating budgets, and set up 3rd party



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**Figure 1:** Enterprise Ag Management unifies the farm by taking data from agronomics, production and financials and storing them into a single common platform safely and accessibly.

services. And once work is complete, they can't easily reconcile invoices. These blind spots can result in thousands of dollars lost in a single season.

*“More than ever, growers need to be intentional about planning for profit.”*

### Demands for greater accountability.

Today, Ag funds, asset management groups and other financial and corporate entities are entering the Ag management space. Whether as investors or stakeholders, they are demanding visibility into all aspects of the business. In a volatile price environment, those with financial interest in the farm want to see operating plans and monitor progress against those plans. But growers struggle to deliver. Banks are less willing to extend credit to operators who cannot clearly illustrate how they will make money. Tightening of credit can severely restrict operators' options and, in some cases, even shut them down. All these factors put pressure on farmers to embrace the types of systems used in the manufacturing industry to efficiently manage and report performance.

### The challenge of communication.

Sound management means keeping everyone informed, from workers in the field to managers in the office. But growers lack easy transparency between decision makers, supervisors, and workers. What's in the manager's head isn't easy to share within the organization. Unable to delegate to workers on the ground, growers are forced to make all the

minute-by-minute decisions on their own. The result is slowdowns and inefficiencies even under the best of circumstances.

### Missing the big picture.

The fragmented systems and manual methods farmers use to manage their operation day to day have evolved little in 50 years. These approaches are inefficient and prone to error; unable to capture information accurately or provide a high-level view of the business. Until now, there's been no way to easily collect information from workers, machines, processors, and other data sources into a unified system.

That lack of integration holds back growth. Growers can't easily evaluate performance or make sense of problems in time to avert losses. When new opportunities arise, farmers don't have the means to quickly analyze their options, make sound decisions, and transfer knowledge.

### The rise of a new paradigm.

These conditions are giving rise to a new paradigm in farm management. Growth-minded operators are adopting a new generation of business tools designed especially for Ag that unify the many variables in a complex operation.

More than farm management software (FMS) point solutions, “Enterprise Ag Management” or EAM, are integrated technology platforms connecting everything that happens on the farm to drive informed planning, transparent communication, and efficient decision-making at an enterprise level. EAM platforms adapt business processes proven in other industries to the farm setting, supported by hands-on training, software, and service to make it effective.

**“EAM connects everything that happens on the farm to drive informed planning, transparent communication, and efficient decision-making.”**

**Improving business processes operation-wide.**

Enterprise Ag Management complements operators Ag expertise with business processes and systems that strengthen their efforts day to day and season to season. Instead of using farm management systems that are disconnected, point solutions to manage each discipline (planning, financial management, internal and external resources, production, harvest), EAM treats them as facets of a connected whole. Operational and financial pieces are tracked systematically and the data is stored safely and accessibly. Instead of relying on guesswork and spreadsheets, EAM gives growers answers in real time, from the number of loads harvested from a given block, to detailed production costs for all resources (labor, equipment, inputs, 3rd party resources).

**Streamlined communication and information.**

Because all data is contained in a single common platform, communication is greatly simplified across the enterprise. In the people-intensive business of permanent crops, EAM helps farmers plan work easily and get the right number of workers in place to execute. Managers are connected to knowledge on the ground and are able to easily push plans out to workers and 3rd party providers. Those workers are empowered to detect problems, propose workarounds, and share information with those who need it.

This visibility extends throughout the investment chain. With EAM, growers can give financial stakeholders an investor’s-eye view of their plans and business productivity. The practice strengthens relationships with financial entities, who are better able to make informed decisions about where and how to invest.

**Making progress season after season.**

With better information at their fingertips, growers are prepared to squeeze out inefficiencies and make every block more profitable. Real-time tracking helps them respond quickly when issues are detected and avoid costly errors. The process of planning is simplified as well. Farmers can run “what if” analyses to evaluate their options, then choose the most profitable course of action.

With consistent production processes used across the enterprise, farmers spend less time on small decisions and can focus on more operation-critical activities, such as long-term profitability and growth planning. By collecting operational information year after year, EAM shows growers how to improve and where to focus investments. As new opportunities arise, growers can quickly measure future earnings potential and make informed choices. When it’s time to scale, they can onboard new properties and personnel much more efficiently. Or as the business looks to switch hands from one generation to the next, the knowledge transfer is made easier with information from years past in one system versus piecing together record logs, spreadsheets and the minds of management. All these factors contribute to a sustainable competitive advantage.

**“With better information at their fingertips, growers are prepared to squeeze out inefficiencies and make every block more profitable.”**

**Putting the systems in place.**

Enterprise Ag Management is a total investment, touching all aspects of the grower’s business and tailored to its unique team, equipment and geography. Managing that change requires deep business expertise and hands-on opera-

tional understanding

Successful EAM implementations begin with a joint planning process that brings together farm leadership, managers, and relevant stakeholders. Gap analysis is conducted to understand a grower’s specific needs and challenges and create a roadmap to achieve the grower’s specific goals. Usually, a trusted third party is involved to manage the roll out on site, including software implementation in the field and back office and hands-on training for all users.

**An approach now at work on four continents.**

Enterprise Ag Management is now being used to manage billions of dollars in land, equipment and assets across a wide array of operation sizes and types—from permanent crop to row crop growers. Companies like Minneapolis-based Conservis are leading the way in this emerging discipline, helping growers across four continents unify their operations and enhance business performance season after season.

—  
*Robert Gulack is the Market Segmentation Manager at Conservis, an Enterprise Ag Management company based in Minneapolis, Minnesota. From 2009 to 2015, Robert was a General Manager of the 2nd largest almond orchard in the world, Olam Orchards Australia. Prior to 2009, he owned and operated an agricultural consulting company out of Fresno, California for 25 years that focused on water management, fertility, and pest management. www.conserviscorp.com*



**Figure 2:** Enterprise Ag Management complements operators Ag expertise with business processes and systems that strengthen their efforts day to day and season to season.



Wireless node measures soil moisture sensors in a walnut orchard.

*Continued from Page 28*

benefits in terms of accounting for variability in the field.”

Farm advisors like Allan Fulton have actually done a number of specific studies to help growers adopt precision irrigation techniques, Coates said.

### **What Growers Want from Technology**

Coates’ work has been on the engineering and technology side, and he’s looked at the technology to see what growers are looking for, he said.

And there are a couple of things growers want from the technology, Coates said. “Of course growers want it as cheap as they can get it. Technology traditionally has been pretty expensive.”

As an example, Coates said, initially a

*Continued on Page 34*

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Continued from Page 32

radio or a telemetry unit cost over a \$1,000 each, which is unaffordable for many growers, but as the technology progressed, the price came down to hundreds of dollars each.

“That’s a big difference in terms of what a grower can afford to install in their system,” Coates said.

Growers have to look at not only what they can install now, but what they may want to install in the future, especially as they become more comfortable with using the technology. This can be anything from judging water application, stress management, timing of fertilizer, pesticide applications or record keeping, Coates said.

Once growers start to see the utility of technology, they may want to expand, but price is a big barrier to that initial adoption, and then also continued adoption, Coates said.

## The Research

“The work we did through the DWR project is somewhat sensor agnostic, meaning that we see that there are many different types of sensors that are available. Growers may have experience with certain types of sensors. Consultants may have experience with certain types of sensors,” Coates said. “We don’t want a grower to think that they have to use a specific type of sensor to be able to effectively monitor their crop,” Coates explained. “And then we also wanted to be what we call cloud agnostic, so being able to send that data to any type of service that is of the most benefit to the grower and maybe

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one that they’re already using,” Coates said.

The research looked at:

- The cost of the technology
- The ease of use of the technology
- How to get the information from the field as cheaply and easily as possible to a webserver that the grower can access and use that data

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## Types of Technology

“Another thing is the types of sensors that growers want to use. A lot of growers are going to use things that they are already familiar with. So things such as a watermark sensor, which are relatively inexpensive and have been around for awhile, growers have installed those very commonly in orchards,” Coates said.

“And the types of sensors that they want to use, many times they’re going to be dictated by what they’ve used in the past so they might want to continue using watermarks as opposed to adopting maybe an all-in-one solution where it’s a different type of sensor reading that they aren’t necessarily comfortable interpreting,” Coates said.

The other big piece of the puzzle is the interpretation, Coates said. Growers are starting to use technology and seeing a lot of this data.

Some growers may have used bits and

pieces of the technology over the years, and they have become comfortable with understanding what they’re seeing, and are okay moving forward with expanding their systems. But if they aren’t, or if it’s a different sensor than what they’re accustomed to, it’s easy to become overloaded by the amount of information that’s coming in, Coates said.

## Grower Commitment to Technology

“The other big thing we found in our work is that a grower really has to be invested in the technology, not only in terms of the money costs, but in their time,” Coates said.

Growers will have to invest some time, at least initially, into sitting down every few days and look at the data to see if the data they’re receiving matches what

*Continued on Page 36*



*Granular matrix sensor to measure soil water tension is prepared for installation.*

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they're seeing in the field, Coates said.

"That doesn't mean that if they're different that you discount the data just because, oh well, I'm seeing this. It means you need to start figuring out how to interpret that, make some management decisions and see how the data changes. A lot of times growers will find well what I thought I was seeing, isn't what is really happening," Coates said.

It may look like something is happening visually, but that isn't always the case, Coates said.

"There are things that are happening under the ground, things that are happening in the plants that are sometimes visually hard to detect, and so there's a bit of a learning curve," Coates said.

### Wrapping Up

"We're wrapping up the project, and one of the things we're doing is writing up

a document that describes different types of agricultural sensors and telemetry systems," Coates said.

"There are dozens of technology providers. There are dozens of companies that make sensors. There are dozens of companies that make telemetry systems," Coates said, adding there are lots of pieces to the puzzle and there's no one configuration that is best for a dozen different growers.

"They (growers) may all have a different solution, and again it's going to be based on what are their unique needs, how much variability do they have, what region are they in, how are they delivering their irrigation. Are they experiencing unique problems with salinity, or pests, or anything like that?" Coates said, adding that may determine the types of sensors they want to use, or the type of management needs that they have.

"That's again going to drive the type of sensors or telemetry systems they might want—in addition to their previous expe-

rience using specific equipment," Coates said.

This will give growers the knowledge and tools they need to talk to manufacturers and Ag consultants, and then make informed choices on the types of technologies that they would want to actually use to improve their farm management, Coates said.

"Different farms have different needs, and this will give growers the ability to look at all the different choices and make a decision for what is best for their specific operation," Coates said.

The research is continuing, and the document should be available in late summer, Coates said. Email Coates at [rwcoates@ucdavis.edu](mailto:rwcoates@ucdavis.edu) for information on where to obtain the document when it's finished.

*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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## Central Valley Almond Day Agenda

2.5 Approved PCA CE Credits (0.5 Laws, 2.0 Other)

3.5 Approved CCA CE Credits:

Nutrient Management: 1.5 | Soil & Water Management: 0.5 | Integrated Pest Management: 1.5

7:00am - 7:30am	Registration, Coffee, and Donuts
7:30am - 8:00am	Trade Show* (0.25 PCA: Other)
8:00am - 8:30am	Micro-irrigation System Design, Maintenance and Management for Almonds* (0.5 CCA Soil & Water) Dan Munk, UCCE Irrigation and Water
8:30am - 9:00am	Laws and Regulations Update* (0.5 PCA Laws) Gilbert Urquiza, County Ag. Commissioner's Office
9:00am - 9:30am	Zinc: The Mighty Micronutrient!* (0.5 CCA Nutrient) Bob Beede, (Retired) UCCE Farm Advisor Emeritus
9:30am - 10:00am	Identification of Pest and Non-pest Ant Species for Management Decisions* (0.5 PCA Other, 0.5 CCA IPM) Kris Tollerup, UCCE IPM Advisor
10:00am - 10:30am	Break
10:30am - 11:00am	Whole Orchard Recycling and the Effect on Second Generation Tree Growth and Soil Fertility* (0.5 CCA Nutrient) Brent Holtz, UCCE Farm Advisor
11:00am - 11:30am	Management of Almond Replant Disease & Anaerobic Soil Disinfestation* (0.5 PCA Other, 0.5 CCA IPM) Mohammad Yaghmour, UCCE Orchard Systems Advisor
11:30am - 12:00pm	Weed Control Update for Tree Nut Orchards* (0.5 PCA Other, 0.5 CCA IPM) Brad Hanson, UCCE Weed Specialist
12:00pm - 12:45pm	Industry Tri-tip Lunch Yara Sponsored Presentation: Benefit of Calcium Nutrition for Almond Production* (0.5 CCA Nutrient) Daniel Cathey, Farmer Engagement Manager
12:45pm - 1:30pm	Trade Show* (0.25 PCA Other)
1:30pm	Adjourn

\*Sessions counted toward CE credits

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*A spring spray timed for peach twig borer also provides some control of navel orangeworm.*

*Photo courtesy: Almond Board of California*



# HULLSPLIT SPRAYS:

---



As almond growers prepare for hullsplit sprays, it is time to review best practices for the most effective treatment program that follows an IPM approach and resistance management for treating navel orangeworm (NOW) and spider mites.

David Haviland, UC Cooperative Extension entomologist in Kern County, said this approach includes monitoring to determine navel orangeworm treatment timing, monitoring of mites and natural enemies to determine the need for a miticide, using selective chemistries, and rotating among pesticide modes of action to minimize pesticide resistance.

### Navel Orangeworm

Cultural practices are the first line of defense against NOW. Prompt harvest and pickup, followed by removal and destruction of mummy nuts, is an essential first step in controlling NOW; hullsplit sprays are generally only about 50% effective because larvae are protected once they enter the hull to feed. Growers may have gotten a boost in their cultural control this year following unprecedented moisture through spring.

Nearly all growers spray for NOW at hullsplit, and many spray a second application two or three weeks later, according to Haviland. The most common insecticides used for NOW include the three chemical classes: pyrethroids, such as Brigade, Warrior II, etc.; insect growth regulators, including Intrepid; and the diamides, such as Altacor.

Although efficacy is similar among the three groups, pyrethroid efficacy is slipping, and their use causes other concerns, said Haviland during a presentation at The Almond Conference last December. Almond Board of California (ABC)-funded research has documented decreased efficacy as a result of increased levels of NOW

## USING IPM and RESISTANCE MANAGEMENT for BEST OUTCOME

By Almond Board of California

Continued on Page 40



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Continued from Page 39

resistance.

“Pyrethroids are broad-spectrum insecticides that are also effective against leaffooted bug and stinkbug, but they also reduce biocontrol of spider mites and scale by eliminating beneficials,” he explained, cautioning that there are also concerns about off-site movement of pyrethroids into waterways.

Whether resistance to pyrethroids is present or not in a particular area, the potential is there, and growers are cautioned to practice resistance management by using pyrethroids prudently and by rotating chemistries.

“So while pyrethroids may still be effective, they are not as effective as when they were first released,” Haviland noted.

*“Because of resistance potential, pyrethroids should only be used once during the season at this ‘best fit’ hullsplit timing.”*

“A second concern for pyrethroids is their impact on beneficials, including those that prey on spider mites. Because of this, application of pyrethroids can lead to mite flare-ups; therefore, they should not be applied prior to hullsplit.” In addition, because of resistance potential, pyrethroids should only be used once during the season at this ‘best fit’ hullsplit timing.

In areas with moderate or high pressure or a history of NOW damage, a second application is made two or three weeks later, when Nonpareil nuts are completely split, pollinators are beginning

to split, and residues from first sprays are beginning to degrade. If making more than one spray, be sure to rotate among chemical classes.

### Mating Disruption

Another management technique Haviland discussed at The Almond Conference is mating disruption, in which the NOW pheromone is dispensed in the orchard as an aerosol. The pheromone acts by confusing males and inhibiting their ability to find females. The bigger the area treated with the pheromone the better, but research shows a benefit in plots as small as 20 acres.

Mating disruption can be used as

Continued on Page 42

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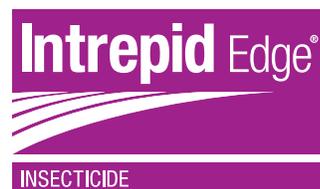
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Continued from Page 40

either a stand-alone management tool, especially in sensitive areas such as nearby schools or along roadways, or in addition to spray programs under high-pressure conditions. Typically, they provide about 50 percent reduction in damage. This year, mating disruption programs are available from Suterra, Semios and Pacific Biocontrol.

Before implementing a management program at hullsplit, Haviland urged growers to use all tools available to monitor for NOW to determine the number of treatments and treatment timing. Intrepid and Altacor should be used as the primary insecticides, with pyrethroids used "judiciously."

### Spider Mites

Web-spinning spider mites are a concern during the summer and throughout harvest. The hullsplit spray for NOW provides a cost-effective opportunity to apply a miticide if it is needed. Haviland said decisions about tank-mixing miticides with hullsplit sprays should be based on sampling for mites and their natural predators.

In many cases, there are sufficient natural enemies present in the orchard to provide excellent late-season mite control. In other cases, he pointed out, it may be necessary to apply a miticide in a tank mix with a first or second hullsplit spray.

### A View from the North

Also presenting at The Almond Conference, Dr. Frank Zalom, entomology professor at UC Davis, provided a history of NOW in almonds. "Navel orangeworm became the key pest of almonds in the late 1960s," he said, "with some Sacramento Valley growers harvesting loads that reached 30 percent NOW damage in the late 1970s and average industrywide damage reached 8.8 percent in 1978."

Continued on Page 44

# At HULL SPLIT FOR BUD DIFFERENTIATION AND ALMOND HULL ROT



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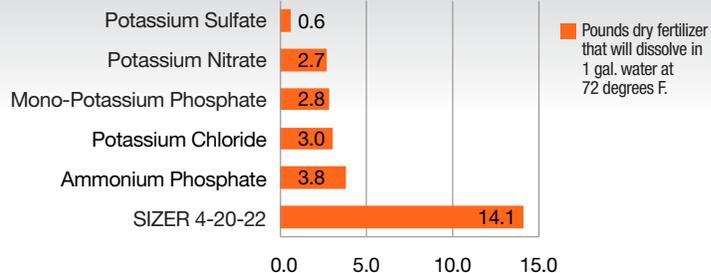
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Continued from Page 42

This number dropped to an average of 1.5 percent from 1998–2000 following implementation of the Four-Point Program for NOW control, which was developed by Almond Board of California's Bob Curtis and first published in 1978. Today, NOW damage has dropped to an average of 1 percent or less.

The Four-Point Program includes:

- Winter sanitation
- Dormant spray for peach twig borer (PTB) control
- Hullsplit spray
- Timely harvest

“These are still the most important management practices for the key

insects [navel orangeworm and peach twig borer,] and mites in the northern San Joaquin and Sacramento Valleys,” Dr. Zalom stated, adding that dormant sprays are an exception because of concerns about storm water runoff and potential effects on pollinators, depending on products used and their timing.

### Peach Twig Borer

Because managing PTB is important to prevent damage to nuts that make them more attractive to NOW infestation, Zalom suggested these alternatives for dormant sprays:

- An earlier treatment timing, in November or December, before winter rains commence
- Use of alternative bee-safe products, such as B.t., in bloom sprays
- Switching to a spring (“May”) spray.

A spring spray timed according to PTB captures in pheromone traps and degree days provides some control of NOW as well. Altacor and Delegate are effective against both insects. Intrepid is effective for NOW, but less effective against PTB.

Do not include a miticide in the spring spray unless sampling shows it is necessary, and do not use pyrethroid insecticides in spring sprays and it is best to avoid them in hullsplit sprays, Dr. Zalom warned, as this may lead to spider mite outbreaks.

Finally, remember that managing NOW does not end for the season after hullsplit; a timely harvest and rapid pickup of nuts are essential for protecting next year's crop.

*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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*Left: Phytophthora crown rot canker with defined canker margin. Above: Lethal Paradox Canker with 'Mickey Mouse' ears that appear as a secondary growth from the original canker.*

# PHYTOPHTHORA IN Walnuts

By *Dani Lightle*

*UCCE Orchard Systems Advisor, Glenn, Butte & Tehama Counties*

One of the most common topics I field as an orchards advisor are inquiries regarding Phytophthora crown and root rots. Calls so far this spring have tended to focus on trees, often on heavier ground, that leafed out poorly (or not at all) and look just generally unthrifty. I anticipate a second round of calls in July as trees with compromised root systems cannot keep up with water demand and collapse in the heat.

## Phytophthora

However, I frequently find that Phytophthora seems to be a bit of a boogie-man in the orchard world: an easy culprit to blame when a tree looks to be in poor condition. In many of these cases, Phytophthora is probably not involved at all. This article will focus on narrowing down on causes for poor vigor trees & how to manage an orchard to reduce incidence of Phytophthora.

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*- Joe Valachi, Mobster*

Joe Valachi is known for being the first to publicly admit the existence of the Mafia; the quote above is from a US Senate hearing regarding a man he accidentally killed in prison in a case of mistaken identity. While there are (hopefully) no Mafia-related deaths occurring on a regular basis in your orchard, focusing on a misidentified

*Continued on Page 49*

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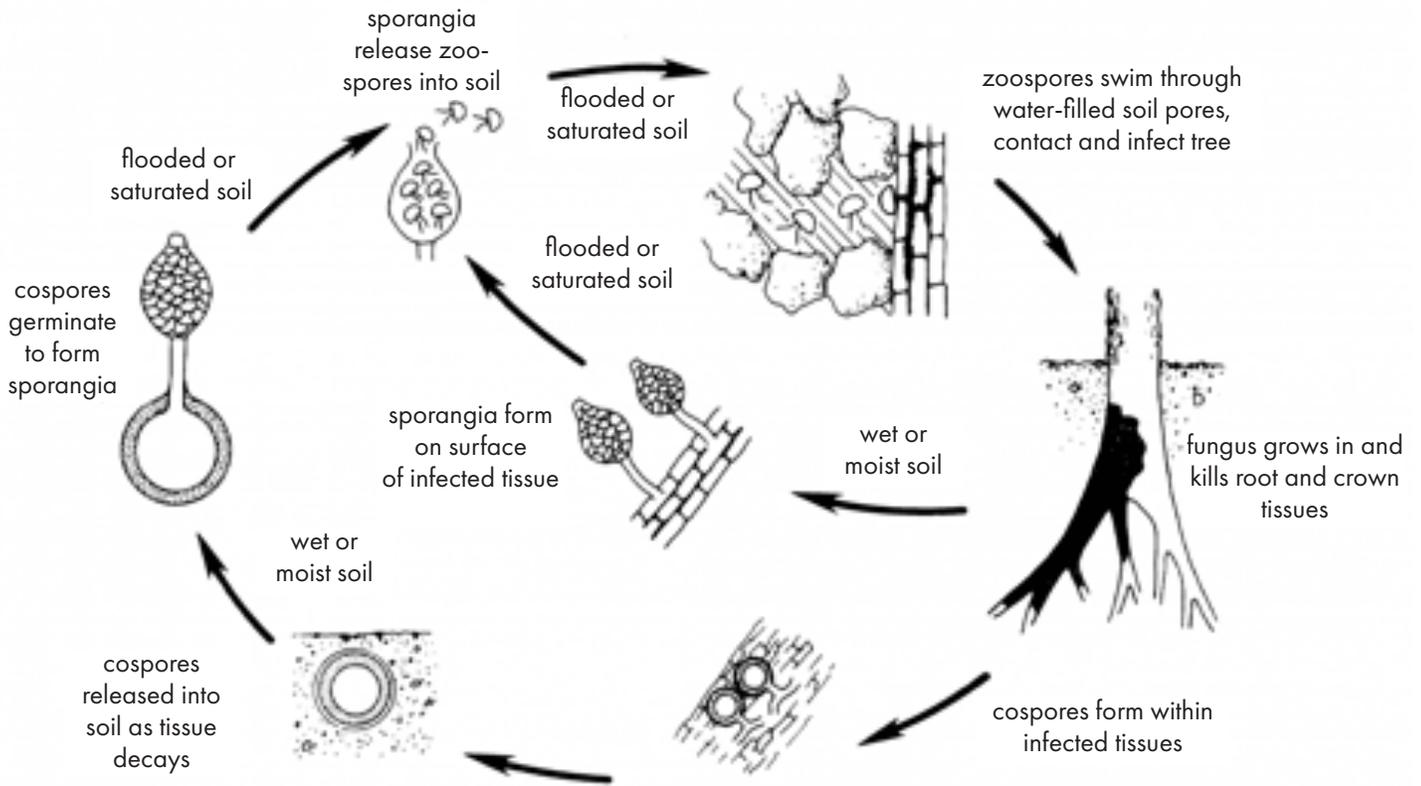


Figure 1: Phytophthora disease cycle on trees. See text for further details. Figure courtesy of the New York State Agricultural Experiment Station.

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Continued from Page 46

disease leads to a waste of resources, financial loss, and unsatisfactory outcomes.

Let's run through some of the common root problems found in walnuts:

- **Crown gall.** Caused by a bacterium, *Agrobacterium tumefaciens*, larger galls can be responsible for tree death (usually in younger trees) and reduced vigor in older orchards. Usually a crown gall can be seen at the soil surface.
- **Nematodes.** There are three nematode species of concern in walnut. Root lesion nematode can cause black lesions on the roots; root knot nematode causes small galls and swelling on the roots; and ring nematode results in stunted roots. Regardless of the species at play, trees above ground tend to look stunted and have low vigor. Affected trees will often occur in a clumped distribution. Take soil samples and send to a nematode

lab to identify the species involved.

- **Oak root fungus.** Thin canopies and limb dieback may result from oak root fungus. A giveaway is the growth of mushrooms at the base of the trunk following rain. Peel back the bark on the crown of infected trees and inspect for white-ish/yellowish mycelial mats; these infections also have a characteristic mushroom-y smell.
- **Waterlogging.** Continuous saturated conditions cause anaerobic conditions in the root zone. Like you, roots require oxygen to function. Anaerobic conditions essentially suffocate the root, leading to root death and subsequent rotting. Wet, slimy roots that smell like sewage may indicate that waterlogging is at play.
- **Phytophthora.** This pathogen leads to necrotic lesions or cankers in either the crown or roots of the tree.

Continued on Page 50

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Read more about Phytophthora below.

- **Lethal Paradox Disease.** This condition does not yet have a causal pathogen identified. It looks similar to Phytophthora crown rot, but cutting away at the bark reveals multiple lesions, sometimes referred to as ‘Mickey Mouse’ ears. See Figure 1 for a comparison of Lethal Paradox Disease and Phytophthora lesions.

*“Keep your friends close but your enemies closer”*

*- The Godfather: Part II*

*(Al Pacino as Michael Corleone)*

### Plant-Destroyer

Let’s dive into a bit more about the enemy. Phytophthora (derived from Greek, “Plant-Destroyer”) belongs to a group of organisms known as water molds. These are more closely related to plants than fungi, though they tend to be thought

of and referred to as a fungus. The most famous Phytophthora species causes late blight of potato and was responsible for the Irish potato famine. There are at least 11 species known to attack walnuts; the most virulent are *P. citricola* and *P. cinnamomi*.

As you may infer from the name “water mold”, water is an integral component of the Phytophthora disease cycle (as pictured in Figure 1 on page 48). Swimming spores called zoospores, which resemble two-tailed sperm, move through the soil when the pores are filled with water. They orient towards plant roots and infect the tree. As the disease progresses, plant tissues are killed. If the soil is moist, a fruiting structure called sporangia forms and releases new zoospores into the soil. If the soil is dry, durable double walled structures called oospores are formed and released into the soil as the root tissue decays. When soil conditions are suitable again (moist

or saturated), the oospores germinate to form sporangia, which release new zoospores.

*“I don’t want to be a product of my environment. I want my environment to be a product of me.”*

*- The Departed (Jack Nicholson as Frank Costello)*

### Management

Most of us want the health of our trees to be a result of our good management practices, rather than at the whim of the environment. Here are some of the practices you can implement to help prevent Phytophthora infection:

- Consult a soil map of your parcel and look for multiple soil types within the block. If multiple soil types exist, consider designing your irrigation system

*Continued on Page 52*



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so that each soil type can be irrigated separately.

- Thoroughly investigate your soil to minimize conditions that are conducive to standing water. Dig a backhoe pit (approx. 6 ft deep) in each soil type and look for abrupt changes in soil texture that may inhibit water drainage. Modify soil as necessary (e.g. slip plow to mix layers).
- Look at soil type and orchard history to help choose appropriate rootstocks. RX1 is generally considered to be the best clonal Paradox option for heavier, Phytophthora infested soils.
- Orchard Management:
- Follow proper planting technique. Do not bury the graft union below the soil line. If pulling berms to enhance drainage around the crown, do it before planting the trees, not after the fact.
- Improve water penetration by reducing soil compaction. If your compaction is because of high sodium,

use soil and water reports to find appropriate solutions to mitigate the situation. Mechanical compaction occurs from equipment; avoid driving down rows when the soil is saturated, and consider deep-rooted winter cover crops to help break up soil. If your compaction results from chemical soil crusting (for example, high magnesium levels), gypsum may help improve water infiltration.

- Keep the length of your irrigation sets to 18hrs or less so that the amount of time the roots and crown are saturated is below the amount of time required for Phytophthora infection. This may require more frequent irrigations to meet tree water requirements.
- Match the infiltration rate of your soil to your irrigation system application rate to reduce standing water at the crown. You may need to get creative, such as increasing your wetted area.
- Disease mitigation. Keep in mind that once a tree becomes infected, it

cannot be cured.

- Research by Dr. Greg Browne at UC Davis in 2006 showed that trees inoculated with *P. citricola* had smaller lesions when they were previously treated with phosphonates, while untreated trees developed larger lesions.
- The mechanism by which phosphonates help protect against Phytophthora is unknown, but may involve production of defensive compounds, activation of the tree systemic defense system, direct action against Phytophthora, or some combination of the above.
- Ridomil is another material that may have a role in disease management. Talk to your PCA about how phosphonates or Ridomil may fit into your orchard practices.

*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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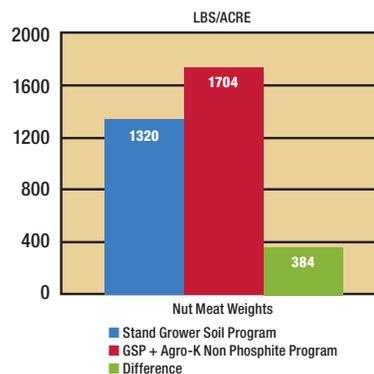
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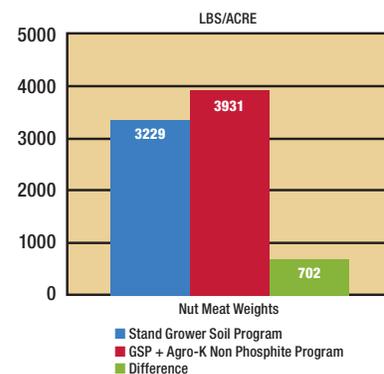
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Agro-K's "Science Driven Nutrition" approach to foliar feeding walnuts delivers the right nutrients at the right time and in the right form. Walnuts, due to their sheer size, large root system and significant foliage have heavy nutrient demands to achieve maximum yield and quality. Zinc, manganese and other micronutrient requirements are larger than for other tree crops and are also more difficult to supplement because walnut leaves are thick, leathery and harder to penetrate effectively. Agro-K's comprehensive, science-based approach to soil and foliar nutrition delivers high yields and quality nuts while improving long-term tree health and productivity.

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chelation bonds for the tree to access the nutrients. **Zinc Plus +4 D.L.** is also specifically designed to be compatible with early season copper sprays.

As bloom and nut set occur demand for calcium peaks; however micronutrient demand is still occurring as new leaf and terminal growth continues. Applying **Vigor-SeaCal** in combination with **AgroBest 9-24-3** and **Zinc Plus +4 D. L.** help growers meet a walnut tree's complex and significant nutrient demand at this critical physiological stage. Satisfying peak nutrient demand will result in improved nut set and cell division that sets the stage for large, dense nuts with maximum weight at harvest. **Vigor-SeaCal** combines calcium in a carbohydrate formulation with Agro-K's powerful seaweed extract to enhance nut cell division. Applying an energy-stimulating high phosphate NPK like **AgroBest 9-24-3** enhances seaweed efficacy helping drive more nut cell division for larger, denser nuts. **AgroBest 9-24-3** is specifically designed with minimal potassium content for early season foliar applications. Foliar spray mixes with even moderate amounts of potassium applied during cell division will antagonize calcium uptake and negatively impacting leaf cell wall integrity and nut quality. The **AgroBest 9-24-3** ratio provides more units of phosphate per dollar than most other NPK blends without antagonizing calcium incorporation into cell wall structures.



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# ORCHARD OUTLOOK

By *Kathy Coatney*, Editor

## Pistachios

Pistachio orchards that irrigate with sprinklers or flooding will have problems with alternaria late blight (ALB). Low soil infiltration and orchards that irrigate with micro sprinklers, especially in lower lying areas where humidity is high and dew formation is frequent, will also have problems with ALB.

Losses from ALB are seen from fruit staining, kernel decay, and early defoliation. The defoliation causes problems at harvest,

and if the fungus gets into the inner surface of the shell, it can cause moldy nuts.

Symptoms of ALB are seen as circular black lesions on the leaves of the male and female pistachio trees. If there are humid conditions in the orchard when the pistachio fruit is maturing, black spores will develop in the center of the leaf. Leaf infections can cause defoliation and create problems shaking the trees at harvest.

The black lesions will also be found on the petioles and the main veins of leaf blades. Lesions on the leaves and fruit will

cause leaf blight and deterioration of the hulls, which will cause shell staining. Excessive growth of the fungus can also cause kernel decay.

The first symptoms of ALB are seen in late July to early August, depending on the humidity in the orchard. By mid-September the disease can reach epidemic levels. Orchards with cover crops will tend to have more ALB than orchards that mow or chemically remove the weeds. Sunburned fruit will also be more susceptible to ALB.

Growers should check the foliage for symptoms of ALB starting in mid-July and continue through harvest.

There has been resistance seen with some fungicides, so growers are advised to rotate chemistries, avoid using reduced concentrations, and make sure they have good coverage.

ALB is difficult to control, so a combination of management approaches is advised.

- Winter pruning to improve air movement



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- Keep tall, thick weeds off the orchard floor to reduce humidity and leaf wetness
- With serious outbreaks adjust the irrigation schedule to reduce standing water from August through harvest
- Use subsurface irrigation to reduce disease
- Harvest early in orchards with heavy ALB

## Almonds

Deficiencies in the nutrients potassium, zinc, iron, and manganese are more common in soils that are wet, cold, and saturated. The reduction in root activity and nutrient uptake can cause a pale leaf color in almond trees.

Micronutrient deficiencies will frequently only show symptoms in a small section of an orchard. If it's due to saturated soils or flooding, it might only show up during part of the season.

An application of foliar nutrient sprays will improve tree color and vigor if flooding or saturated soils was the cause.

Applications of potassium and zinc are often necessary, but most soils have enough iron and manganese to meet the trees needs unless the soil is cold and wet. Root activity will increase as the soil warms and dries out, and deficiency symptoms may correct themselves as spring progresses.

When looking at orchard fertility, it's recommended to start by reviewing the leaf tissue analysis from the previous July to see if any nutrients were borderline or deficient.

A rule of thumb is, for every 1000 pounds of almond kernels removed from the orchard—hulls, shells and kernels—60-80 lbs. of potassium, 1.1 oz. of zinc, 3.0 oz. of iron, and 0.7 oz. of manganese are lost.

Trees that are low in potassium will have pale and small leaves with very little new growth when first leafing out. As the season progresses, the trees will have rolled leaves with marginal leaf burning. Foliar sprays of potassium nitrate will correct potassium deficiencies when sufficient material is applied.

Trees with a severe zinc deficiency may have dormant flower bud drop and decreased fruit set. A mild zinc deficiency will have slightly smaller leaves than normal, and young trees can be deficient without showing visual symptoms. It's important to get a July tissue analysis in young orchards, too. If a

July leaf analysis is below 15 ppm, there is a zinc deficiency.

Foliar sprays should be applied in the spring to correct a zinc deficiency. They are effective and inexpensive.

An iron deficiency will cause interveinal yellowing, but small leaf veins will remain green. A severe deficiency will cause the leaves to be uniformly yellow throughout the leaf.

An iron deficiency can show early in the season and continue until the leaves yellow and drop, or it may show in the

spring and gradually disappear as the soil warms up and dries out. Leaf analysis is not a good indication of an iron deficiency, so it's important to recognize leaf symptoms.

A manganese deficiency will appear in a herringbone pattern on the leaves with the major veins green between the yellow interveinal areas. If a July leaf analysis is over 20 ppm there is sufficient manganese. For any manganese deficiencies, make a foliar spray application.

*Continued on Page 56*

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Continued from Page 55

## Walnuts

Ideal conditions for Botryosphaeria (Bot) and Phomopsis canker and blight in walnuts is rainfall with temperatures over 50° F.

Bot kills small fruit wood and large branches, and it will infect the nut. Management includes reducing the inoculum by pruning out dead branches, branch stubs, and blighted shoots in the summer or fall when it isn't raining. Growers are advised to disinfect pruning equipment and avoid sprinkler irrigation that wets the canopy.

Timing fungicide applications by rain and temperature has resulted in the best control, and several fungicides have been effective.

Pruning recommendations:

- Heavily infected orchards, chip prunings, leave them in the orchard, and use a full spray fungicide program

- Moderate infections of 20-50 percent, remove the prunings from the orchard, burn if permitted, and make some fungicide applications
- Light infections of 1-20 percent, remove prunings from the orchard, burn if permitted, and make a single mid-June or early to mid-July spray application
- No bot infection, generally seen generally in young orchards, chip prunings, leave in orchard, and make no sprays application

## Pecans

The weather for the pecan bloom is looking good statewide this year. Perfect bloom conditions for pecans entails warm weather, in the 70-80 degree range, but not excessive in the triple digit range.

A light breeze is also good for cross-pollination, and it is needed to move the pollen.

The northstate did experience some north winds. As a result, some growers have experienced leaf burn, but it's uncer-

tain at this point if it will impact nut set. Strong winds could reduce pollination, too, but so far it doesn't look like it's hurt the crop.

Rain can also create problems during bloom. Thunderstorms in particular with heavy wind, rain and hail can knock the catkins to the ground and disrupt pollination, which will reduce crop yield.

Overall, growers experienced ideal conditions at bloom.

Some orchards had high water due to flooding, but it hasn't slowed growth and the trees are green and doing very well.

Aphids are just beginning to appear in the Central Valley and the northstate, which compared to last year, the counts are lower so far.

It's still too early to tell how the crop set will be, but so far, it is looking good.

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## Why Food Safety Matters

by The Walnut Board of California

In the fall of 2015, some Chipotle fast food restaurant locations were implicated in an E coli outbreak. The outbreak eventually spread to 14 states and sickened dozens. Needless to say, it received a lot of media attention. The consequences? Chipotle sales were down some 24% in the first quarter of 2016 and profits fell 82%. Even now, the company is struggling to get back to where it was before the outbreaks.

Blue Bell Ice Cream suffered a similar fate when it was embroiled in a Listeria outbreak in the winter of 2015. The outbreak caused 3 deaths in Kansas and resulted in a \$850,000 fine for the company, not to mention a lot of bad press.

Now, as a consumer, when you see news related to some outbreak, are you going to buy Blue Bell Ice Cream or take your family to Chipotle? Of course not! So, imagine if walnuts are implicated in an outbreak, what do you think consumer reaction would be? Case in point, look no further than the 2005 Spinach outbreak. It cost the industry \$1 million a day in lost sales and affected all companies selling spinach, not just the one company at the center of the outbreak.

This is why food safety is important. The emphasis is on preventing likely food safety outbreaks rather than reacting to it after the fact. To be sure, we cannot eliminate 100% of the risk, but having a robust food safety system goes a long way to reducing it.

And that brings me to the Food Safety Modernization Act (FSMA). FSMA was signed into law in 2011. The two im-

portant pieces of this legislation are the Produce Safety rules for growers and the Preventive Controls rules for processors. FSMA aims to ensure the U.S. food supply is safe by shifting the focus of federal regulators from responding to contamination to preventing it and represents a first significant revamp of food safety rules in decades. Requirements for growers include water testing, employee training and sanitation logs with staggered compliance dates from 2018-2020 based on farm revenue. For more information, visit <https://www.fda.gov/food/guidanceregulation/fsma/ucm334114.htm>

The California Walnut Board has partnered with DFA of California to offer FSMA grower training sessions

during spring 2017. These 7 hour training sessions for growers are required in the new Produce Rule and only have to be taken once. You can sign up on the CWB website ([walnuts.org](http://walnuts.org)) and spots are filling up fast. We plan to offer additional trainings in Winter/Spring 2018. Also, the California Farm Bureau is offering similar training sessions for those interested.

In closing, the walnut industry is proud of its Food Safety record over a century. And working proactively together, we would like to ensure that proud tradition continues.

*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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# Apollo<sup>®</sup> SC

INSECTICIDE

## Get Back on Track with Mite Control in 2017.

Mites took a pit stop early in 2016, but came back strong in the race to harvest. Keep Apollo on your pit crew for versatile application timing, ensuring you finish the race to harvest ahead of mites every year!

### Mite Control: Achieving High Performance

- 1 Label approved rate is 6 to 8 fluid ounces
- 2 Length of residual control will increase with the higher use rates
- 3 Expect 7 days of additional residual for each ounce administered
- 4 Use a ground speed of 2 mph or less to insure coverage on both sides of the leaves
- 5 Use a quality surfactant or horticultural oil per application
- 6 A pH of 5 or below is recommended to improve performance

### Beat Mites to the Finish

Apollo has great versatility when you're going out with hullsplit sprays.

Are you using a soft chemistry with low mite pressure? Add Apollo to your tank on its own to prevent flare ups, while leaving adult mites alive as a food source for beneficial predators.

Going out with something a bit more disruptive for NOW control? Add Apollo to a mite knockdown for a longer residual to get you through harvest.

Interested in learning more about Apollo?

Email [miteexperts@adama.com](mailto:miteexperts@adama.com) or call 209-629-6945.

### Product Features



**Best in Class**  
Broad mite control.  
Targets 3 stages of lifecycle.  
Easy handling. Low rates.



**Residual Activity**  
Protects up to 60 days.  
Reduces spray passes.  
Saves money.



**Application Flexibility**  
Early, mid-season, &  
hullsplit control. Tank mixes  
with adjuvants. Extends  
between sprays.



**Resistance Fighter**  
Unique mode of action.  
Breaks resistance cycles.  
Stops population flare ups.



Want This Magnifying Loupe?

**VISIT**

[surveymonkey.com/r/Apolloexperience](https://surveymonkey.com/r/Apolloexperience)  
& we'll race one over!