

From the **Grove**

The latest news from the California Avocado Industry



Getting in the Grove

Read about the value of CAC Grove Tours on page 7.

Left to right: Chef Susan Feniger, Jerome Stehly, Jan Delyser, Bill and Carol Steed, Noel Stehly and Chef Mary Sue Milliken at a recent grove tour at Fairfield Farms in Valley Center.

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Grower Profile

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From the Grove

Volume 3
Number 1

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Spring 2013

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FROM THE GROVE is published quarterly by California Avocado Commission; 12 Mauchly, Suite L; Irvine, CA 92618. POSTMASTER: Send address changes to California Avocado Commission; 12 Mauchly, Suite L; Irvine, CA 92618.

The articles, opinions and advertisements presented in this magazine are designed to offer information and provoke thought. Inclusion in this publication does not presume an endorsement or recommendation by the California Avocado Commission for any particular product or cultural practice.



Tom Bellamore

A Time for Every Season

By the time you read this column, the 2013 California avocado season will be underway. At least we hope so. Although the commission's fiscal year begins November 1, the dominance of imported fruit in the market, weather conditions, and the desire to allow fruit to size generally keep growers sitting tight until after the Super Bowl. This year, Mexico shipped a record volume of fruit in the weeks leading up to the Super Bowl, and even though demand was strong, prices were just the opposite. Understandably, growers have been reluctant to pick into a weak market.

So here we are, in March, with a classic "chicken and egg" situation. Anticipating a large crop and a long selling season, the commission's consumer advertising program is pegged for an earlier-than-usual start; radio commercials will begin in California markets the third week in March, and merchandising, public relations, promotions and online marketing activities will commence even sooner. Usually, these programs are designed to maintain momentum as the volume of California fruit builds. But the volume has been noticeably slow in coming for obvious reasons.

The commission and growers alike have been watching the season start with disappointment. We

all have a big hole to dig out of and seldom does market weakness dip so low or last so long. There is no reason to think, however, that the season is lost. Calls on key retail and foodservice accounts have been taking place since late last year, and the trade is eagerly awaiting the arrival of California fruit. The consistency and quality that our brand is known for promises to be a breath of fresh air to retailers and foodservice operators, many of whom have been less than satisfied with the recent performance of the imported supply. Combine this with the "pull" generated by the early marketing effort, and the market should be poised for price recovery. Here is the dilemma: without volume, that recovery may be prolonged, and without recovery, growers wait. Hence the chicken and egg analogy.

Lessons learned from the annals of prior seasons tell us that—at some point—it is possible to lose money waiting for a rising market. The loss may happen later, sometimes much later, but it can occur all the same. The 500 million pound Hass avocado crop presently on the trees in California will, inevitably, have to move to market by late fall, in advance of the rising tide of imports. Further compression of that harvest period, by getting a late start when there is

a significant crop to move, would not bode well for strong, mid-season returns. The commission will be doing its part, once again using television advertising and promoting aggressively during the summer holiday period, but we cannot perform miracles.

There are other considerations, too, that come into play: tree health and labor availability for example. Trees heavily laden with fruit well into the season may be under duress that manifests itself as reduced production in the year following. When the labor supply is ample, growers have more flexibility in their harvest strategy. When labor is scarce, growers may not be able to properly time their harvest to market conditions, and returns may suffer.

Your commission management and staff remain optimistic about the weeks and months that lie ahead. Our marketing spend will be strong, and our programs varied and compelling. The rest is up to the industry's packers and growers. The time for *this* avocado season is *now*, and those early to market should be rewarded for providing what the trade is clamoring for...premium quality California avocados. If we all shared such resolve, there would be little doubt about when the 2013 season was to begin. 🥑



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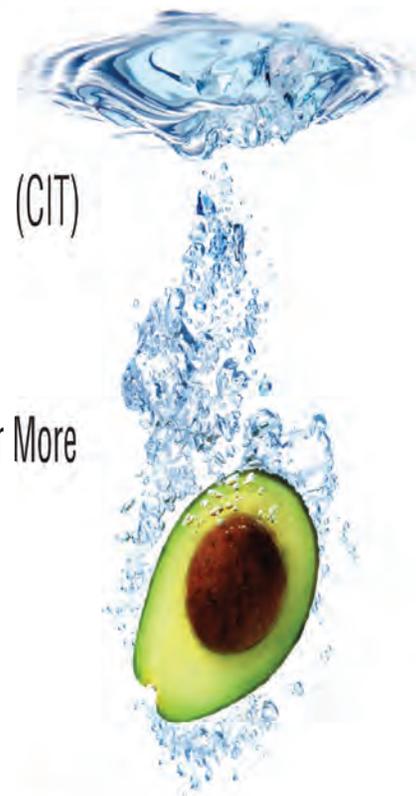


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Chairman's Report

SPRING!

I'm writing this about a month before "From The Grove" reaches your mail box. Like many parts of California, we have had a long, cold and very dry winter where I farm in Ventura County. At last count I had spent 33 nights working with my foremen to fight frost, starting two nights before Christmas. We have been busy seven of the past 12 weekends and are looking forward to a change.

Many of our California avocado growing regions had spotty damage during the six night "Yukon Express" that arrived during January. Fortunately most groves were spared from harm but in some cold areas our fellow growers suffered more serious damage. The night before last our area finished a seven night run of running windmachines, sprinklers and general lack of sleep. It is easy to tell who is an avocado grower these days; we are the grumpy ones with the dark rings around our eyes.

Today felt different. Maybe it was having a full night of sleep after a week of working nights to save our crop; maybe spring is finally on the way. Citrus and some of our native trees are starting to push out early buds. Frogs in our ditches are filling the night air with their love songs, birds are building nests and the early pollenizer varieties in our groves are starting to bloom. Like the first rays of sunlight that a tired grower sees moving up from the eastern skyline after a long night of fighting frost, Mother Nature is starting her annual change as we move into the season of bloom and growth. Many not raised in Southern California complain that "we have no seasons" here. California



Ed McFadden

avocado growers know better. Our fall colors may not be as bright and we may not shovel as much snow but we do see the seasons in our groves and feel the changing tides of nature's cycles in our bones.

At CAC, early programs are ramping up too. As you read this, March promotions and the season-long programs that have been in planning since early last year will be coming online. At the recommendation of your Marketing Advisory Committee, your board approved an aggressive plan from Vice President of Marketing Jan DeLyser's team to start promotions in March. This plan was put in place to support early harvesting by California growers. We know that we have a large crop and with other factors including harvest labor, cultural practices and weather, it makes sense for growers to start their harvest earlier than usual this year.

Talk to your handlers, take the time to read their many informative market updates. Check the California Avocado Society's Weekly Newslines for James McCormac's excellent market report. Always read the Market Trends section of The Green-sheet from CAC. Set up an organized picking plan now with your handler and let's get to work! CAC President Tom Bellamore's team has set the table for us, it is up to us to dig in and get this season started. 🥑



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Educational California avocado grove tour attended by a team from Albertsons provides hands on experience with the products they sell and allows attendees to experience the passion the growers feel about what they grow.

Getting in the Grove

The Value of CAC Grove Tours

Grove tours have been a part of the California Avocado Commission outreach throughout the organization's history. For the past few years, CAC has hosted grove tours for key consumer influencers and potential trade partners. The tours offer a firsthand look into how the fruit is grown and packed, as well as providing a better understanding of the distinctive qualities and consistent reliability of California avocados. As a result, participants from media, bloggers, publicists, retailers and foodservice operators more passionately encourage demand for California avocados through articles, posts, promotions and menu additions.

Grove Tour Itineraries

Tours generally start with a short bus trip to a California avocado grove where participants are greeted by the avocado grower who leads the group through the grove. The attendees are educated on the workings of an avocado ranch, the care and nurturing that goes into producing the fruit, the beneficial climate that produces the premium quality of California avocados and are (depending on the timing of the tour) given the opportunity to try their hand at picking some avocados. As an example, last year CAC hosted produce managers from Albertsons-SuperValu, H-E-B, Sam's Club and Whole Foods, providing them with first-hand California avocado experiences they can share with their shoppers.

Usually the next stop on the tour is a packinghouse where participants are greeted and suited up in safety gear. Tour groups then observe the fruit coming from the grove, through

the packing process, receiving information on the special care used to pack and pre-condition avocados while maintaining food safety standards in preparation for shipment to grocery stores and foodservice operations.

Most tours also provide an opportunity to showcase California avocados in a meal event and often with one of CAC's artisan chefs who prepare an avocado-centric meal and share their love of California avocados. When the location permits, CAC also arranges for cooking demos and contests with the tour groups. To demonstrate fresh California avocado versatility, CAC selects menus for the tour guests that showcase both simple ideas and elaborate menu concepts featuring the fruit. This activity has resulted in media coverage and also influenced new ideas used by retailer supermarket dietitians (SRDs) and foodservice operators.



Joanie Taylor from Schnucks Markets tries her hand at picking California avocados

The Media on Tour

One of the key audiences for grove tours is influencers from the media. Traditional and social media are both important on a tour. Bloggers provide immediate coverage as they post about the tour on their Facebook®, Instagram® and Twitter® channels throughout the tour. In addition, traditional media (e.g. newspapers and magazines) continue to serve as trusted resources for consumers and offer comprehensive readership on published stories.

A grove media tour last year included 17 attendees who tirelessly reported their experience leading up to and during the tour on social media platforms. Following the tour, beautiful, informative blog posts were written by all the attendees. Coverage included 92 brand-related tweets on Twitter reaching nearly 400,000 users; six Facebook posts, which resulted in 121,571 impressions; and 17 blog posts, which totaled 195,646 monthly visits to the posts online.

CAC's concerted effort to engage media by taking them on the farm to fork journey of a grove tour has paid off again and again with comprehensive coverage resulting in increased awareness of California avocados and the development of dozens of strong relationships with key media

and bloggers whose coverage of California avocados encourages consumers to seek out this premium fruit.

Foodservice on Tour

The number and quality of CAC foodservice tour attendees continues to grow and impress, with regional and national chains sending representatives to observe grove management and learn why California avocados are a good choice for their operations. Between 2011 and 2012 CAC hosted nearly two dozen different groups of restaurant representatives and also organized college and university foodservice and private restaurant chain tours.

California avocado menu placement encourages new ways to use avocados and additional California avocado sales. Among the grove tour successes from 2011-12 were programs at five foodservice chains whose representatives toured the California avocado groves, tested fresh avocado menu items and then put them on their menus:

Panera Bread Company, with 1,493 locations nationwide, showcased fresh avocados in two popular applications: Roasted Turkey and Avocado BLT Sandwich and Chopped Chicken Cobb Salad with Avocado.



Paul Pszybylski from California Pizza Kitchen on the packing house portion of a CAC tour.

In December 2012, Chili's, with more than 1,300 locations across the country, replaced processed guacamole product with fresh, house-made guacamole in all their stores after attending a CAC-facilitated grove tour.

El Pollo Loco, which has 415 locations, began its conversion to fresh avocado with a limited time offer (LTO) featuring the Poblano Burrito and the option to "add California Avocado." The fresh avocado option proved so popular that the chain followed with additional options on the permanent menu and switched out processed guacamole with

freshly made.

Shari's, with 104 northwest locations, started with three new fresh avocado menu items (avocado omelet, salad and burger LTO), then expanded to six as fresh avocados boosted sales. Every May, Shari's promotion calendar spotlights their fresh California avocado dishes.

Daphne's California Greek, introduced the California Greek Salad (with fresh California avocado) and with the salad's success, Daphne's later added fresh guacamole with Greek seasonings in a meze sampler and a wrap.

Retailers and Supermarket Registered Dietitians on Tour

CAC encourages retailers and SRDs to participate in California avocado grove tours to help them learn what makes California avocados the premium choice. Last year the Produce for Better Health foundation hosted a grove tour with nearly two dozen SRDs in attendance, and participants from two retailers in California avocado development markets, including two culinary dietitians from H-E-B (Texas) and the director of consumer affairs from Schnucks Markets (Missouri).

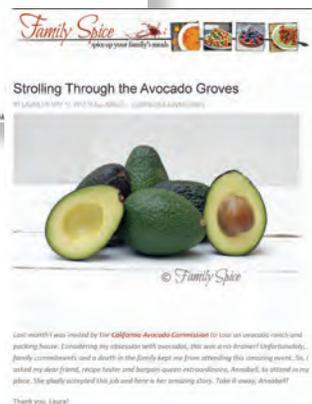
After the tour, SRDs shared the information they learned with other staff at retail, and included California avocados in store programs. Among the highlights were California avocados spotlighted in an in-store "Kids in the Kitchen" cooking class, and an SRD from H-E-B featured California



(L-R) Ana Domingo, Luz Armenta and Kristin Olszen (all from San Diego State University) on the National Association of College and University Food Service Pacific Region Conference Tour

avocados on two TV segments that aired on KENS-TV Great Day San Antonio, San Antonio's number one local entertainment and lifestyle program. 🥑

To view additional photos of past grove tours, check out CAC's Flickr account at <http://www.flickr.com/photos/californiaavocados/>



Production Research: Tackling an Old Foe with New Technology

Production research is a cornerstone of CAC's goal of achieving measurable gains in yield per acre for California's avocado growers to improve the industry's profitability. In this issue, we focus on two projects whose aim is to apply new technology to the fight against one of avocado's old enemies, *Phytophthora*.

By some accounts, *Phytophthora* costs the California avocado industry \$30 million annually. Although there is no solid data to support this figure, no one would argue that *Phytophthora* is not a major issue for California avocado growers and probably deserves more attention. A good first step to tackling this issue is to determine exactly how much of the industry's acreage is affected by *Phytophthora* and how severe the disease is in those affected areas. Two CAC-funded research projects by the USDA and the private company GeoSpatial Partners LLC aim to do just that.

Remote Sensing for Pest and Disease Monitoring

Remote sensing, in its most basic form, is simply the use of modern technology, usually aerial or satellite sensing, to gather information about objects on Earth. In agriculture, remote sensing has been gaining a foothold mostly in agronomic-type row

crops – corn, soy beans, wheat. In those crops, aerial and satellite sensing technology has been proven to be able to detect things such as drought stress, nutrient deficiency, or pest outbreaks. Based on this information, farmers are able to take corrective action (e.g., fertilizer application) only on those parts of a farm that need it. On a 10,000 acre soy bean farm in the Midwest this can be a tremendous savings that directly results in yield improvements.

Several factors have allowed this technology to be successful in agronomic crops: they are generally very uniform (spacing and plant height), they have a limited canopy (several inches to a few feet), they are grown on flat ground, and they are high dollar value crops grown on large acreage so they can afford to invest in cutting-edge technology. As these technologies have become more common and their costs have declined, there has been a growing interest to use them in tree crops. However, several factors make this challenging, not the least of which is the large, multilayered canopies that trees have. Some problems, such as drought stress, that affect a canopy uniformly are relatively easy to detect. But other problems, such as a pest outbreak, that may affect only a small part of a canopy in their early stages are more difficult to detect re-

motely.

CAC has been working with Dr. Alassane Toure, a remote sensing expert and president of GeoSpatial Partners, for several years. He has been producing CAC's avocado acreage survey and has developed methodology to accurately identify and distinguish avocados from other crops on aerial and satellite imagery. Dr. Toure was funded this year for a three year, \$70,000, proof-of-concept project to determine if the algorithms he has developed can be refined to identify avocados of different health status.

The first step in developing remote sensing for a crop is to find a reliable source of imagery with high enough resolution to identify the condition of the crop that's of interest. Currently, the USDA Farm Service Agency has a program called NAIP (National Agriculture Imagery Program) that collects 1 meter (about 3 feet) resolution aerial images of U.S. agricultural land during the "leaf-on" season. There is also a commercially available source of satellite imagery called RapidEye, which uses five satellites to collect 6 meter (about 19 feet) resolution images of the Earth. These two sources collect images in true color as well as different spectral wavelengths (e.g., infrared). As plants develop stress, their reflectance (the wavelengths of visible and invisible

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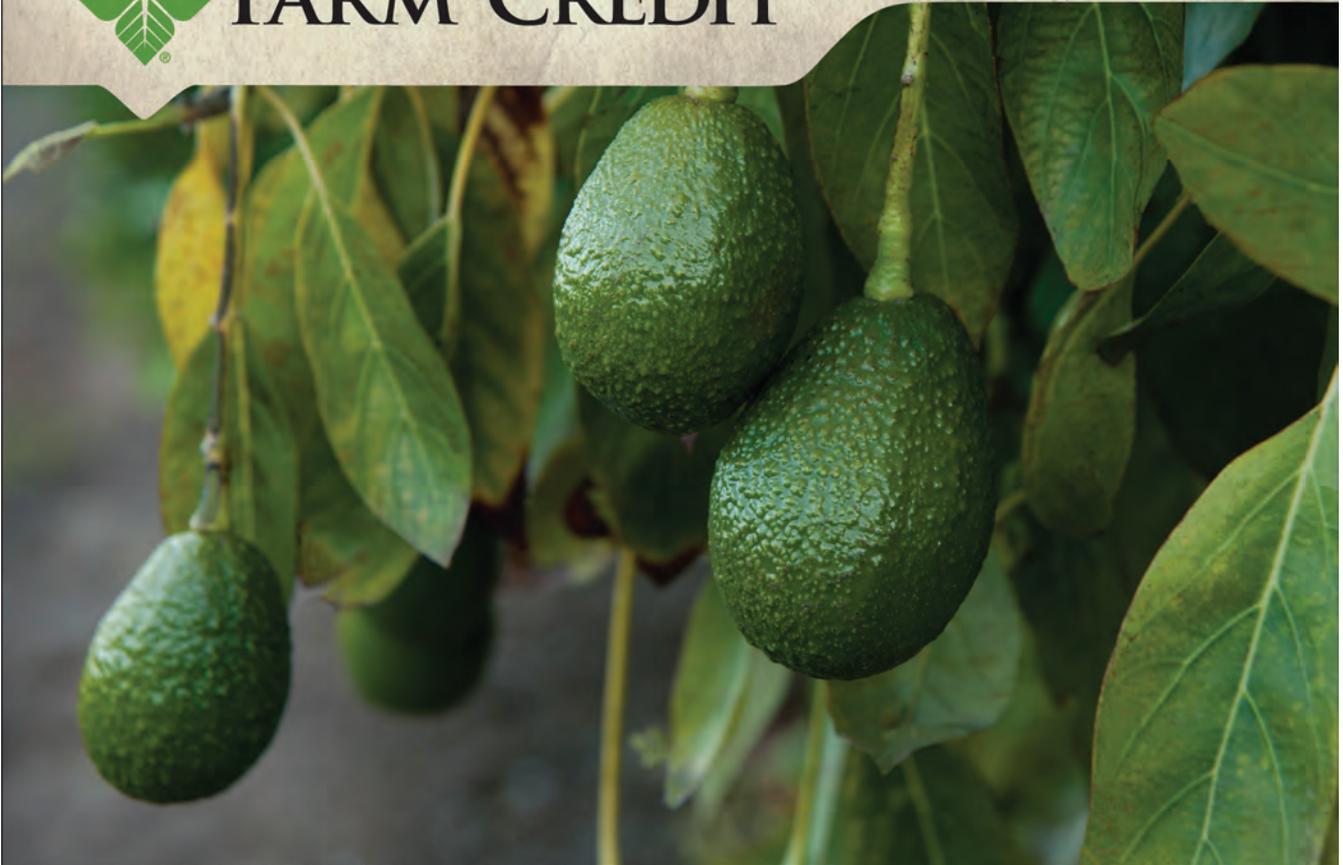
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It is very difficult to identify different species of *Phytophthora* on avocado trees.

light reflected from a leaf's surface) changes. For *Phytophthora*, which tends to affect areas of a grove rather than scattered individual trees, the 6 meter resolution images will probably be sufficient. However, since these are from a commercial company they are more costly than the NAIP images, so they will only be used during times of the year that NAIP images are unavailable.

Dr. Toure and his team will be cooperating with UC Riverside researcher Dr. Akif Eskalen to use Dr. Eskalen's lab's ground-based data for *Phytophthora*, PSHB/*Fusarium* dieback, and other pest/disease incidence in commercial avocado groves. Dr. Toure's team will use the Eskalen lab's data to calibrate their models with areas of known *Phytophthora* infection. From these models they will then try to identify other areas that may be infected. Dr. Eskalen's lab will assist in "ground-truthing" these identified areas of potential *Phytophthora* infection. Their findings on the ground will be relayed

back to Dr. Toure's team to further improve the models.

Regardless of which resolution images are used for this project, it is unlikely that it will be able to identify individual trees with *Phytophthora*. In fact, it may not be able to distinguish *Phytophthora* from other issues, such as compact soil or poor drainage, that cause avocado trees to have thin canopies. However, it is likely that it will be able to identify areas of groves that have trees with poor canopy health so that they can be carefully investigated from the

ground. This could allow growers to focus on correcting those areas of their groves with problems and spend less time trying to find them. Ultimately, a remote sensing program, such as the one described here, would be developed into an online pest/disease outbreak detection and monitoring system for avocado producing counties in California.

Diagnosing *Phytophthora*

Phytophthora is generally believed to be just about everywhere in California's avocado producing region, and decline of avocado trees from *Phytophthora* in California has been an issue since the 1920s. Despite this pathogen's status as the greatest limitation to avocado production, relatively little headway has been made in the fight against it. To make matters worse, there are many different species of *Phytophthora* that can cause disease and it is nearly impossible to tell them apart based on symptoms alone. The two most important species in California are *Phy-*

tophthora cinnamomi and *P. menzei*, but other species such as *P. citricola* (from which *P. menzei* was recently separated), *P. nicotianae* and *P. palmivora* can also cause disease problems. Because of the importance of this disease to avocado, and the fact that not all of these species affect all avocado growing areas, it is important to have a rapid, sensitive and accurate method for detecting the different species.

Historically, to positively identify different *Phytophthora* species they had to be cultured and grown in a laboratory and identified morphologically. Recently, Dr. Frank Martin, a Research Plant Pathologist with the USDA-ARS lab in Salinas, was part of a team that endeavored to develop molecular markers to distinguish *Phytophthora* species using modern technology. This federally funded project was undertaken with the primary goal of ultimately developing a field test for *Phytophthora ramorum*, the species that causes sudden oak death. Knowing the severity of *Phytophthora* in avocado, Dr. Martin approached CAC about developing a similar test for the *Phytophthora* species important to avocado, capitalizing on the huge federal investment already made. CAC has funded Dr. Martin for a two year, \$30,000, project to develop these diagnostic tools for the avocado industry.

Dr. Martin and his team will use a technique called polymerase chain reaction, or simply PCR, which is a biochemical technique used in molecular biology for creating copies of pieces of DNA. This technique is based on DNA's structure of two complementary strands of nucleic acids. This can be visualized as a ladder cut lengthwise into two long "backbones" with pieces of rungs – the nucleic acids – coming off. Each piece of ladder rung will only match up with one other one to form a complete ladder. If the ladder rungs were coded and you knew the code, you could produce a complete ladder

from just one half. That is exactly what PCR does, but figuring out the code is the key step.

Based on the extensive work already completed in the sudden oak death project, Dr. Martin's group now has a library of genetic data for all known *Phytophthora* species. From this, they know where the species are different and where they are the same genetically. This allows them to create "probes," which are essentially halves of the ladders. These probes are unique to each species of *Phytophthora*, and by extracting the *Phytophthora* DNA from a soil sample the probes can be used to determine the *Phytophthora* species in the soil. This is done by pairing the probes to their matching half under precisely controlled conditions. The probes have a fluorescent molecule (marker) bound to them, and when the probe binds with a matching DNA strand the fluorescent marker is released and it can be detected. If no fluorescence is detected, then the marker was not released, indicating that the sample species did not bind with the probe and is not the species the probe was developed from. Different fluorescent markers can be attached to the probes for different species, so several different species can be tested against a soil sample at the same time.

Technology has advanced significantly since the PCR technique was developed in the early 1980s. Today "PCR machines" are common in research laboratories, and are about the size of a large laser printer. Once the probes are developed, samples can be run quickly and easily for only a few dollars each, and the method is extremely sensitive (only a small sample is needed) and accurate. However, there are newer technologies that can be used to accomplish the same results. One of these technologies, recombinase polymerase amplification or RPA, holds promise for being used in the field. A commercial com-

pany, Agdia, is currently working to commercialize RPA for the detection of *Phytophthora ramorum*. If Agdia succeeds, the probes developed in Dr. Martin's CAC-funded project will be made available for the development of a field-based diagnostic assay for *Phytophthora* in avocado.

Phytophthora is an old problem for avocado production in California. The use of new technology prom-

ises to provide us with details about the true extent of the problem, and to more easily determine which *Phytophthora* species are most important in different areas. While this work will not result in a cure for *Phytophthora*, it will provide us with valuable tools to better understand the problem and allow growers to better manage their groves. 🥑



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Late March Should Bring Better Volume

With a total California avocado crop estimated to be in excess of 500 million pounds this year, there appears to be universal support for getting the harvest underway as soon as possible. Throughout this issue, many voices are singing that same tune, including CAC President Tom Bellamore, CAC Chairman of the Board Ed McFadden and the commission's research experts, Jonathan Dixon and Tim Spann.

And now marketers are saying the same thing.

Patrick Lucy, who is involved in sales for Del Rey Avocado Co., Fallbrook, Calif., told *From the Grove* staff during the first week of March that it seems as if most growers are on board with an early start in anticipation of marketing the big crop. "The big issue appears to be lack of size," he said.

He added that some growers were reluctant to get going because of market conditions but the handler had sufficient growers that were willing to pick if they had size, which they don't. "There are some growers that would like to get going but their fruit is too small."

Bruce Dowhan, general manager of Giumarra Agricom International LLC, Escondido, Calif., echoed the same sentiments. "We are seeing a little hesitancy in getting started for two reasons," he said on March 6. "Number one the market price has been softer than what most Califor-

nians want to see when they start. And number two most groves are having difficulty sizing. Growers like to pick when most of their fruit are 48s. Right now most of the fruit is in the 70 to 84 range."

Dave Fausset, sales/category manager for Mission Produce Company in Oxnard, said early volume from California was less than what the company had hoped for but, like the others, he blamed the sizing. "We had only light rain in January and February so we didn't get much size."

However, he said significant rain was expected over the next few days. "If that's followed by some warm soil, the fruit can size and we can get going a little faster."

Still a fourth handler, Phil Henry of Henry Avocado, also in Escondido, relayed a similar story. However, he said his company is right on target with its expectations. "For our company, we are planning to begin size picking in the third or fourth week of March and we are still on that schedule."

He said that while the California avocado industry as a whole is up well over last year, his company is not. "In the south, we see the crop on the tree being about the same as last year. Most of the increase is in the north."

Consequently, Henry said the company's picking schedule is also similar to last year. He said this year's mid to late March start is based

on logistical reasons and tree health as much as anything else. However, he did add that the market price through February didn't warrant any alteration to that plan. "The prices are not at a level that most growers want, but we did see an increase from Mexico this week (March 4-8) which should help California growers," he said.

Lucy said the early March price hike created a significant difference between size 60 and size 70 fruit and might convince more growers to open up their groves. "Today both 48s and 60s are at about \$26 while 70s are \$5 less...and we think the price is going to get stronger."

He said there appears to be a shortage of 60 size fruit coming out of Mexico and that probably will not change as they move closer to the end of their 2012-13 crop year. Though some fruit is coming from higher elevations in Mexico and it may be smaller, he said the majority of the fruit now being picked and shipped to the United States is end of the season fruit, which tends to be larger than smaller. "This could create a good marketing situation for California growers," he said.

Like others, however, Lucy said getting started on this year's crop is also important because of both tree health and the size of the crop. "Culturally it's important to get some fruit off the tree in March, April and May," he said. "The new buds are coming and we want to have a good

crop next year.”

He indicated that growers with excellent on tree crops in the 15,000 to 20,000 pounds per acre range are more willing to get into their groves and size pick to relieve some stress on the trees.

Of course, another important factor impacting when to pick, at least for handlers, is the overall size of the crop.

Dowhan said when you add California’s 500-plus million pounds of fruit to the 60 million pounds expected from Peru this summer and the increased Mexican production, “It’s safe to say we will have significant volume of avocados through the spring, summer and fall.”

Currently, Lucy said that early March saw about five million pounds from California groves on a weekly basis. “We expect that to grow to 10 million pounds (per week) as we get into March and up to 15 million pounds by Cinco de Mayo.

He said for the U.S. market to absorb all the avocados that it will have in the next six months, there will have to be some weeks where total avocado shipments (from all points of origin) are in the 35-40 million pound range

Fausset also predicted that California would be shipping about 10 million pounds per week by the end of March, with shipments peaking somewhere over 15 million pounds per week in May and beyond. “It’s amazing what Mexico can put out with their labor situation,” he said. “They were averaging 29 to 30 million pounds per week this winter. We just can’t do that. I understand we just don’t have the labor to do that.”

All of the handlers were optimistic however, about this year’s marketing situation and the potential for a strong price.

Dowhan said “I think we are going to have a market that will be better than some are predicting. We have seen demand continue to in-



crease and I think there are going to be some very good marketing opportunities out there this year.”

He said the retail promotional price of around \$1 per piece of fruit has become more commonplace this winter but it’s a good price point and a lot of avocados can be moved at that price.

Fausset agreed with Dowhan’s assessment. “I think some people have underestimated year over year increase in demand. We have seen Chipotle (restaurant) and Subway add avocados to their menus and Red Robin is coming out with a new turkey burger with avocados. There is a lot of momentum for avocados and I see it continuing.”

For this season, Fausset expects the market to chug along in the mid-\$20s range with occasional spikes

to the high \$20s and beyond during high demand periods.

As the California season gets underway, Henry said there is demand from retailers and foodservice operators to switch to a California avocado program. “We have very little California fruit at this point so I haven’t been offering it yet but I know there are many California retailers out there ready to switch. California avocados play into the locally grown movement and many retailers are looking for them.”

He added that while it is not all positive, the presence of a lot of Mexican fruit in the California marketplace during the winter months is not all bad either. “They help keep demand for avocados up and that can help when California fruit is ready.” 🥑

By Ken Melban
Director, Issues Management

This section provides an update on a few of the issues the Commission has been working on that impact the industry:

Grower and Harvester Food Safety Workshops

The California Avocado Commission hosted grower and harvester food safety training through a series of Good Agricultural Practices (GAP) and Good Harvesting Practices (GHP) workshops in December, 2012 and January, 2013. This is the second series of workshops over the last year, and based on the turnout at all six of the recent workshops, momentum is continuing to build for GAP and GHP certification. With more than 25 percent of the acreage currently GAP certified, it seems growers are accepting that GAP certification is a necessary step toward remaining competitive in the marketplace. Growers were provided instruction in the areas of worker health and hygiene, worker training, water quality, among others.

For fruit to be fully GAP certified it must be certified in three areas: Farm Review (grower audit); Harvest Certified (harvest contractor audit); and the Facility Review (handler audit). With all of the major California avocado handlers having been GAP certified, growers who have gone through GAP certification or are considering becoming GAP certified were encouraged to utilize only a harvester who has been GHP certified to ensure their fruit is truly GAP certified.

With the release of the draft Food Safety Modernization Act (FSMA) Produce Rule it will become mandatory that growers demonstrate their compliance with the standards set forth. If a grower becomes GAP certified under the CAC-GAP program, they will be in compliance



with the FSMA standards. The one exception is in the area of dropped fruit, which is further discussed in the FSMA article in this issue.

As an incentive the Commission, for the second year, is offering a rebate to growers of up to \$300 for actual audit costs. Complete guidelines may be found at: <http://www.californiaavocadogrowers.com/cac-gap-incentive-rebate-resources/>. In addition, the California Department of Food and Agriculture will make available up to \$200 for those qualified farmers who have their water and/or soil tested, or for those growers who have an informational or full GAP audit performed. (For more information contact Vonya Fetters, CDFCA, at 559-595-8000).

Between the commission and CDFCA, rebates up to \$500 for GAP audit costs are currently available to California avocado growers wishing to complete GAP certification (subject to the availability of funds). If you are interested in becoming GAP certified and would like to talk with a commission staff member for more

information, please email us at cac.iaf@avocado.org.

Meeting with EPA on Uniconazole (Sunny)

On February 14, 2013, I met with senior Environmental Protection Agency (EPA) officials to discuss the commission's interest in completing a registration package on Uniconazole for use on avocados in California.

As background, Uniconazole is a plant growth regulator used in other countries and reported to control shoot growth. The commission has been exploring the possibility of an EPA registration on Uniconazole for nearly two years. Registering a crop protection material in the U.S. is normally a complex and expensive proposition, costing as much as \$15 million. But, in the case of Uniconazole, it has been further complicated by the fact that three international companies are involved in the licensing and manufacturing of the material, and while they all finally gave the green light for support of a U.S. reg-



istration, as previously reported they are unwilling to provide any financial assistance. What they are willing to do is provide scientific data that was developed in support of other international studies, but initial estimates are that another \$3 million to \$3.5 million in studies will be necessary for an EPA registration.

Valent, who would be the U.S. distributor, has suggested the possibility for a Licensing Agreement should the material become registered in California. This type of agreement would provide a portion of product sales to be rebated back to the commission allowing CAC to recoup some of the investment costs.

The purpose of my recent meeting with EPA was to present our initial arguments for the scientific merits of specific waivers and hear their response. The meeting went very well. EPA was in agreement with the waivers we were considering and the scientific rationale for each. While this is in no way a formal commitment by EPA, it was definitely a positive indication that we are on the right track which could result in a savings of nearly \$1.7 million. The commission is set to begin two efficacy field studies this spring that will continue for one year. At the same time, we are exploring the most cost-effective options to begin some

of the necessary scientific studies. This remains a long-term process that won't result in a registration until 2016 at the earliest. In the meantime, updates will be provided as new information becomes available.

USDA Farm Bill Update

I traveled to Washington, D.C., in February and met with members of Congress on a number of issues including the Farm Bill. Although I was hopeful there would be something new to report, member after member just sort of shrugged when asked about what they expected to happen with the Farm Bill. As part of the fiscal cliff deal signed on January 2, 2013, the 2008 Farm Bill was extended through September 30, 2013. The problem with just extending the 2008 Farm Bill is that funding for key areas like the Specialty Crop Research Initiative and Clean Plant Network was not continued and these programs were allowed to expire.

The commission will continue to communicate with Congressional members the importance of specialty crops and the need for continued Farm Bill funding in areas like research and pest detection, eradication and exclusion. 🍌



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Grower Profile



To Fillmore... ...via Costa Rica

By Tim Linden

Manuel DuBon has a bachelor of science degree in agronomy and has had decades of experience working with coffee plants and other crops, but had never worked with avocados at all when he began managing a small California avocado grove in Simi Valley about a dozen years ago.

Today, he is an avocado veteran and said growing high quality avocados are not that different from growing high quality coffee beans. "Twelve years ago when I was hired to grow avocados I had no avocado experience but I had managed a 4,000 acre coffee plantation," he said. "I discovered that all that experience I had with coffee could be applied to avocados. In fact, in some ways, it is harder to grow coffee beans. Growing coffee plants is similar to growing grapes that will then produce wine."

He explained that a coffee plantation can look great, but a successful plantation has to do with the quality of the coffee beans themselves. He said the price paid for the coffee beans fluctuate greatly depending upon the quality so it is very important that the plantation manager pay very close attention to all the small details that help produce a superior coffee bean. In much the same way, DuBon said it is the many small details that differentiate one wine grape from another.

His story begins in El Salvador where he was raised by multicultural parents of Australian nationality. DuBon's name notes his French heritage. He received a Bachelor of Science in agriculture from University of El Salvador and continued his studies at the University of Adelaide in South Australia where he majored in farm management.

Armed with extensive agricultural education he went back to Central America and began his agriculture career in a coffee plantation. Over the next 25 years he worked in the coffee industry for several different companies in Central America and South America. Eventually he met his wife, Lupe, in Costa Rica, who happened to be a U.S. citizen. Because of an economic depression that hit Costa Rica in the late 1990s, he found himself out of work and he and his wife decided to move to California. "We moved to Simi Valley and three months later I found myself managing a 20-acre avocado grove for The Orchards at Legacy owned by the Jaeger family."

He made contacts in the industry as he improved his technical skills and worked on better ways to irrigate the crop. Next he began managing a 65-acre grove for Rancho Codo and the Bruce family in the same general vicinity. Eventually he hooked up with MVP Farms in Fill-



more, where he has been for the past eight years with the Mummaneni family. The 200-acre partnership farms 110 acres of organic avocados, and 33 acres of conventional avocados as well as 40 acres of organic citrus and 2 acres of dragon fruit.

DuBon said it is more expensive to grow avocados organically as the yield tends to be a bit less and inputs can be more expensive. But he said organic avocados return a higher price “so you can do well if you get good production.” In 2012, production was off because of some cultural and weather issues but he said that as they improve their techniques “we expect to harvest about 15,000 pounds per acre and we will be very happy with that.”

He said the grove has an excellent water situation with costs of less than \$148 per acre foot. “Our water is very cheap. We have a good well producing about 1,000 gallons per minute.”

However, he is currently in the process of changing the entire farm’s irrigation system including a new pipe system design, new water filters and micro sprinklers. DuBon said the ranch has also installed a crop nutrition monitoring program with three nutrient monitor stations in place and one more in the process of being added. “We test for nitrate, sulphate, phosphate, potassium, carbonate levels and more. We also test our irrigation water seven times per year

and we test our tree nutrient levels with seven foliar analyses per year.”

Currently MVP Farms has 2,000 new trees on order which it will use to create some high density acres within its groves.

DuBon said the other new endeavor of the operation is to build its own grading operation, which is currently underway. By next year, the company wants to pack its own fruit. DuBon said the avocados will still be sold by established sales organizations in the industry, but the grower group wants to have control over the packout. “Recently we sent avocados to two different packing houses. They were the same avocados from the same groves. I was 100 percent sure that they would pack out at at least 70 percent 60s or larger. One of the packing sheds packed them at 75 percent of 60s or larger but the other one came in at only 35 percent of 60s. I am not going to name the packing houses but we want to pack them ourselves. That difference means a lot of money. Sizing is a very simple thing to do. We think we can do it.”

Moving forward DuBon said the MVP Farms partnership is committed to continue to expand its presence in the California avocado industry. He said their groves are good producers and should continue to be profitable. 🥑

California Avocados Online, A Year in Review and a Look Forward



SAVE THE DATES
for our Season Opening Celebration Events:

| | | |
|---|---|--|
| <p>Jerome Stehly Monday, April 16, 12pm-1pm</p>  <p>Meet Jerome Stehly, a California Avocado grower from Valley Center, CA.</p> | <p>Emily Schiller, RD Wednesday, April 18, 12pm-1pm</p>  <p>Learn why and how California Avocados can be part of your healthful diet with facts from Registered Dietitian Emily Schiller.</p> | <p>Chef Trey Foshee Friday, April 20, 10am-11am</p>  <p>Wow your taste buds—and your guests—with recipes and culinary tips from executive chef and partner at George's in La Jolla.</p> |
|---|---|--|



The California Avocado Commission's online initiatives play an important role in reaching CAC's target consumer with relevant and awareness-building messaging throughout the day on a variety of different platforms. Online initiatives work closely with efforts made in consumer advertising, public relations, foodservice, and retail outlets to ensure that cohesive programs and messaging, designed to increase demand and highlight the premium value of California avocados, are aligned.

Website

CaliforniaAvocado.com serves as the information and content hub for CAC, a face and voice for California avocados that is available for consumer questions and viewing 24 hours a day/7 days a week. Having a constant presence allows the target audience to become familiar with California avocado messaging and branding on a regular basis.

In 2012, website visitors increased more than 50 percent over the prior year resulting in more people being exposed to information about California avocados, their lifecycle, nutrition, recipes and grower information than ever before.

The most popular content on CaliforniaAvocado.com is the nutrition section, followed by "Grow Your Own Tree" and recipes. Based on these results, the nutrition and recipes sections will be refreshed in 2013 to make the content even easier for visitors to find and share, increasing consumer engagement and interest to an even greater extent.

Mobile Website

In today's society there is a huge shift toward using smartphones in order to view content online. According to vari-

ous studies, 51 percent of millennial smartphone users (born 1983 or after) look up recipes on the phones while grocery shopping, 25 percent gather product information while in the grocery store and 61 percent use their mobile device to compare product prices while grocery shopping. CAC consumers are in-line with this trend, as there was more than a 100 percent increase in mobile website traffic from just a year ago.

Understanding that California avocado consumers use multiple devices like smartphones, tablets and computers, CAC developed a strategy to bring California avocado messaging directly to the user in the most digestible format for the 2012 4th of July campaign. CAC built a special 4th of July website in a new format called responsive design, which

automatically recognizes and adapts to the viewer's device. Tailoring the content and delivering exciting summer recipes helped spur a 20 percent increase in mobile site visits compared to the month prior (June 2012), and a 72 percent increase in visits compared to a year prior (July 2011). All trends indicate that this mobile shift is continuing and CAC will be developing mobile-specific content in 2013 to keep California avocado communication at the forefront of consumer engagement.

Social Media

CAC's social media channels "personalize" California avocados and provide the opportunity to go beyond messaging to engagement, giving consumers direct access to other

| CAC's Online Channels: | URL ("uniform resource locator", also known as "web address"); | Purpose: |
|------------------------|--|---|
| Website | CaliforniaAvocado.com | Allows consumers to engage and receive information on an ongoing basis. CAC is always available online. |
| Mobile website | m.CaliforniaAvocado.com | Gives a growing mobile market the information they need where and when they want it, in a convenient viewing format. |
| Social media | Facebook.com/CaliforniaAvocados Pinterest.com/CA_Avocados Twitter.com/CA_Avocados YouTube/CaliforniaAvocados Instagram.com/CA_Avocados | To deliver real-time California avocado information and usage ideas. Social media provides a forum for consumers to engage with California avocados on a more personal basis. |
| Email | Recipe Newsletter | Emails are delivered to consumers on at least a monthly basis to remain top of mind and provide popular content. |

California avocado enthusiasts and California avocado experts. Content is continually shared by CAC throughout the day and consumers can ask questions and get quick responses (generally within a couple of hours). The ability to engage personally and receive direct responses from CAC representatives creates an even stronger connection with users and California avocados. Ongoing messaging ensures California avocados are top of mind when the 150,000+ Facebook fans and 5,000 Twitter followers are grocery shopping.

CAC celebrated the start of the 2012 season with a campaign on Facebook to let new and existing fans know it was time to look for and request California avocados. This week-long celebration included three, one-hour, live chats on the Facebook page with various avocado experts including a California grower (Jerome Stehly), chef (Trey Foshee) and registered dietitian (Emily Schiller of Golin Harris, CAC's public relations agency). The overall campaign, as well as the chats, encouraged fans to start the conversation about California avocados through questions, highlight seasonality and specifically ask for them at their local retail locations. A similar activity is planned for April 2013 with a new lineup of guests to build demand and awareness for the upcoming crop.

To help send traffic to CAC's website and encourage new recipe/usage ideas with California avocados, CAC launched an account on the fast-growing social network Pinterest. On Pinterest, users "pin" or "repin" images that they like, including California avocado recipes, to virtual pin boards. Since each image "pinned" from CaliforniaAvocado.com retains its link back to CaliforniaAvocado.com, Pinterest has become a strong traffic driver to the website – within the top five sources along with Google and Facebook – and activities to create awareness of California avocados on the network will continue throughout 2013.

Recipe Emails

Email is an important way to stay connected with consumers on a monthly basis, allowing for CAC to remain at the forefront of consumers' minds. CAC's 180,000+ email subscribers receive information about season timing; so they know when to look for California avocados, seasonal recipes, usage tips and campaign promotions. Recent research conducted amongst CAC's email subscribers revealed that our subscribers would like to receive recipe emails more often, so CAC will be sending one to three emails each month during the season in 2013.

Seasonal Campaigns

During the season, a series of holiday-focused campaigns, coinciding with other advertising and marketing channels, are launched across the online channels in the form of microsites (or dedicated sections of the website), social media contests and themed emails to encourage California avo-

cado consumption during peak availability.

Two of the major campaigns this past season included the Cinco de Mayo and American Summer Holidays campaigns. Cinco de Mayo is a classic avocado consumption occasion that occurs as California avocado volume is increasing. CAC leverages it to encourage consumers to opt for hand-grown California avocados through a microsite that includes party tips, special recipes and in 2012 featured renowned chefs Mary Sue Milliken and Susan Feniger and their two special Cinco de Mayo-themed recipes.

Additionally, the microsite promoted a sweepstakes that took place on Facebook. The campaign exceeded expectations prompting 5,000 visitors to the dedicated microsite who spent an average of 5.5 minutes on the website and drove almost 5,000 sweepstakes entries via CAC's Facebook Page. Cinco de Mayo plans for 2013 are already nearing implementation stage, with refreshed recipes – including new recipes from chefs Mary Sue Milliken and Susan Feniger – party tips and a sweepstakes expected to launch in early to mid-April.

The American Summer Holidays campaign in 2012 introduced the 4th of July as the premier occasion for California avocados. In conjunction with a television and print ad campaign, CAC launched a microsite dedicated to the holiday with new recipes, entertainment tips, a recipe brochure and more. Additionally, the campaign aimed to increase consumer recipes in the CAC online database through a recipe contest on Facebook. The campaign garnered 50 new consumer-developed recipes, nearly 20,000 microsite visits with 55,000 page views over the life of the contest, indicating that this content is valued by visitors. CAC's 2013 initiatives will build on this success, providing users on the website and on Facebook with the opportunity to submit their prize-winning recipes to extend the reach of the contest and interest amongst California avocado fans looking for the latest and greatest recipes.

CAC's web, mobile and social media programs are able to creatively integrate with, and amplify, the potential of traditional media. By bringing California avocado recipes, nutrition information and tips to online users, the message that California avocados deliver premium quality is delivered on a far more personal level than was available 10 years ago. The online efforts continue to reach customers on their time and at their leisure, offering quality information created by CAC and its partners, and shared by trusted peers.

In 2012 the online activities drove – and continue to drive – demand for California avocados by facilitating emotional engagements, encouraging the sharing of key messaging by providing the content and opportunities for fans to do so, and introducing 4th of July as the premier summertime eating occasion for California avocados. 🥑

Food Safety Modernization Act

How it Impacts California Avocado Growers

By Ken Melban

Director, Issues Management

The long anticipated draft of the Food Safety Modernization Act (FSMA) Produce Rule outlining new standards for the production, harvesting and handling of produce sold in the United States was released in January by the Food and Drug Administration (FDA). The rule, once finalized, will require growers, harvesters and handlers to demonstrate compliance with specific standards designed to minimize the risk of adverse health consequences and death related to the consumption of fresh produce.

With quite a few high profile food safety incidences over the last few years, there has been increasing concern over food safety in the United States. As a result, in January of 2011, Congress passed the FSMA directing FDA to develop a system to mitigate the potential for microbial contamination on fresh produce through the implementation of policies and procedures that will maintain science-based standards. The Produce Rule covers the production and harvesting of raw commodities (including avocados) for all produce sold in the United States, including imports.

Under the rule, farmers and harvesters will have to verify that they have implemented policies and procedures that their workers are following that focus on identified routes for microbial contamination of produce. Key areas include worker health and hygiene along with water quality. The rule is expected to be finalized in August, 2013, and growers will have up to two years after the effective date to fully comply. Under the draft rule, farms that have an average annual value of food sold during the previous three-year period of \$25,000 or less are exempt. Although some small growers may qualify for this exemption, retailers have not indicated they will provide this same exemption. It will likely become more difficult to find a market for fruit that has not been produced under FSMA compliance.

As most of you are aware, CAC launched a Good Agricultural Practices (GAP) Program in late 2011 to assist growers in becoming GAP certified. Throughout the many GAP workshops I have conducted, many growers have communicated their belief that the avocado industry should be exempt from the FSMA requirements based on the thick skin of an avocado. I agree that avocados should be considered a low-risk fruit based on this and other factors such as the fact that irrigation water doesn't typically come in direct contact with the fruit. But, I would also argue that avocados are not completely immune from susceptibility to micro-

bial contamination, and therefore, as an industry we should take appropriate precautions (at every step) to protect the Hand Grown brand of the California avocado.

In reality, although protected by a thick skin, it is from that thick skin that bacteria, if present, could be introduced into the flesh of the fruit. In order to eat the avocado one must cut through the skin to get to the flesh, and if microbial contaminants are present on the skin they could then be transferred into the flesh as the knife enters.

While the likelihood of this scenario can be debated, the reality is avocados are covered under FSMA and that is not going to change. The good news is that overall the CAC-GAP program, when followed, meets the requirements in most of the critical areas. Under the current CAC-GAP program, though, there is one major exception that does need to be addressed. Under the FSMA, dropped fruit is not allowed to be harvested. This means that neither windfall fruit nor fruit that comes in contact with the ground during harvesting is allowed to be distributed. CAC staff is in the process of reviewing the draft Produce Rule and will provide comment, if warranted, by the May 16, 2013, deadline. In terms of the proposal though, there does not appear to be much room for negotiation. The following is the key part of the text under the Dropped Fruit section:

"Proposed §112.114 would prohibit you from distributing produce that drops to the ground before harvest (dropped produce) unless it is exempt under §112.2(b) (i.e. if it receives commercial processing to adequately reduce the presence of microorganisms of public health significance). Dropped produce does not include root crops (such as carrots) that grow underground or crops (such as cantaloupe) that grow on the ground. However, produce that grows off the ground, such as tomatoes and apples, and that drop to the ground before harvest would be considered dropped produce."

As an industry this will necessitate some changes in our current windfall and harvesting practices that will likely prove to be challenging, but inescapable. The commission will continue to assist growers who would like to become GAP certified by providing materials, trainings and a CAC-GAP Rebate worth up to \$300 to growers for actual audit costs. Information on the CAC-GAP program and Rebate may be found at <http://www.californiaavocadogrowers.com/gap/>. 

By Jonathan Dixon
Research Program Director

Growing and Presenting to the Consumer the Best Quality Hass Avocados

A number of factors explain why consumers choose California avocados over imported ones. These factors, real or perceived, can be summarized into what many people describe as quality. For California avocados to have a premium position and/or price their quality has to be better than their competitors.

The market research conducted for CAC has shown that California avocados generally sell for a premium compared to imports because they are believed to have better quality. With a quality advantage already present for California avocados, it would be easy for California to become complacent and take quality for granted. This would be a mistake since maintaining, or even improving, quality is an easy way for California to distinguish itself from the ever-increasing flow of avocado imports.

Avocado fruit quality is difficult to define precisely and consequently to measure since much of what defines quality can be subjective. The word quality has many definitions with the most appropriate for California avocados appearing to be: an inherent feature; how good or bad something is; a high level of value or excellence. (The online Merriam-Webster's Dictionary). Each of these definitions can be associated with different characteristics of the fruit. Hence, there are no easy measurements for what makes California avocado fruit quality better than avocado grown in other parts of the

| Cultural management | Stage | Description |
|--------------------------------|-------------------|--|
| Grower has the most influence | Cultivar/Location | Defines the inherent nature of the fruit: thickness of skin, skin color change during ripening, seed size, etc. |
| | Fruit set | Defines the nature of the fruit in terms of potential fruit size, growth rate, location on the tree, crop load and tree vigor |
| | Fruit growth | Defines the composition of the fruit with respect to calcium and nitrogen content, accumulation of dry matter and exposure to latent infections of postharvest rots and time to reach maturity |
| | Maturity | Establishes the postharvest quality and characteristics of the fruit in ripening, flavor and storability |
| | Harvest | Sets up the physical nature of the fruit, in particular size and susceptibility to physical damage, defines dry matter and mineral content and the amount of temperature control needed |
| Supply chain | Steps | |
| Handler has the most influence | Packing | Fruit are cleaned, sorted by grade into number ones and twos, culls removed, and placed by size into packaging then if necessary stored at cold temperatures for transport |
| | Transport | Fruit may be taken to a ripening center close to the retail market under temperature controlled conditions |
| | Ripening | Fruit are ripened by an ethylene treatment according to established protocols |
| | Transport | Fruit are taken to a retail outlet under temperature controlled conditions |
| | Retail | Fruit are displayed for sale, typically not under temperature controlled conditions |
| | Consumption | The fruit is eaten and enjoyed by the consumer |

world.

Avocado quality has a different meaning to different people depending on which part of the supply chain they occupy. In general, for growers to get the best price the fruit need to be of a certain size, shape, color, and have skin free from defects. Additionally, the fruit should have enough oil to be palatable when ripe. This is usually expressed as exceeding a minimum percentage dry matter. For the handler and retailer the fruit should also ripen evenly, be free from internal defects (discoloration) and rot, and

not develop chilling injury when stored at low temperatures. A consumer may look for fruit that is clean with no discoloration or marks when cut, have flesh that is soft and creamy, and have good flavor attributes (nutty or buttery with no aftertaste). The factors that affect quality as seen by the consumer are related to how the fruit are grown, harvested, and handled by the packer, handler and retailer.

Information on what makes an avocado fruit unique and its postharvest characteristics are covered in Dr. Arpaia's compan-

ion article. Outlined in the accompanying table are descripts of how the growing and handling environments influence the positive quality advantages California avocados enjoy, and the quality challenges in assuring California avocados retain their distinct identity from imports.

From the tree to the consumer, the quality of avocado fruit is affected by cultural management and the steps of the supply chain as described in the table on the previous page.

The highest quality avocado fruit at harvest are achieved when cultural management practices promote the best aspects of quality and minimize the negative aspects of quality. This then feeds into the postharvest chain since the postharvest characteristics of the fruit entering the supply chain are strongly influenced by the grower's cultural practices and the environmental conditions at harvest. This results in fruit that may be high risk for developing postharvest disorders or low risk fruit with high storage and shelf life potential. Looking at the bigger picture, California avocados are affected by the many factors that influence fruit quality.

Freshness Advantage

Avocados have a naturally short postharvest life, driven mainly by the fruit's sensitivity to chilling injury, which limits the time they can be kept in cold storage. At about 30 to 32 days from harvest, the postharvest disorders increase exponentially with additional time. Avocados shipped long distances must be handled very carefully to avoid rapid deterioration.

On the other hand, most California avocados are sold close to where the fruit are grown and harvested, along the U.S. West Coast, giving California avocados a unique advantage over their imported competitors. The usual time from harvest to the consumer is relatively

short at 9 to 12 days. Even when fruit movement through the marketing channels is slow, avocados are still less than three weeks old when sold to consumers. This short time gives California avocados an unbeatable freshness compared to many of the imported avocados.

Most imported avocados, Mexican being an obvious exception, take three to four weeks from harvest to landing in the United States before distribution. Maintaining fruit age to around two weeks ensures that many of the negative postharvest issues that may affect imported fruit do not have time to develop.

The bottom line: keep the time in the supply chain short for the best quality.

Dry Climate

Avocados do not ripen when attached to the tree. Once removed, the

fruit are set on an irreversible course of ripening during which they lose their natural resistance to fungal rots. It is the development of fungal rots in ripe avocados that limits their shelf life and makes them inedible. The rot is caused by fungi that live mostly in the trees and on dead plant material in the grove. Fungi are micro-organisms that like to grow in warm, humid and wet conditions and are very effectively suppressed in a dry climate. California avocado growers are fortunate to have a dry climate well-suited to producing high quality avocados with few rots when ripe. When avocados are grown in a high rainfall, humid climate the greatest challenge in handling the fruit becomes postharvest rot management during ripening. The rots come from the continual exposure of the fruit to fungal spores in the air as it grows. As these spores settle on the



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fruit, they create latent infections on the skin that remain dormant until the fruit ripen. In a low humidity, dry climate like that of California there are fewer fungal spores to create infections. At times, the number of fungal spores is so low that the fruit are effectively rot free.

A dry climate also helps to minimize a second class of avocado post-harvest rots, stem end rots. These rots are strongly correlated with harvesting practices and climate. When the fruit are harvested, the stalk is cut or plucked out creating a fresh wound. This wound is a great place for opportunistic fungal spores to land, germinate and start to grow. In high humidity growing environments there are a lot of fungal spores in the air that infect the fruit stems at the time of harvest. When stems are infected, the fungi have no dormant period and the rot grows into the top of the fruit. Once the rot appears the fruit quality becomes poor. In a dry climate, there is a very small amount of stem end rot and labor saving harvest methods like pluck picking become possible.

The downside to having a strong freshness advantage and a dry climate is that avocados are inherently more forgiving of rough handling than the fruit grown in a wet climate. There is a tendency to use handling practices that damage the skin creating small wounds that are susceptible to fungal infection. It is not uncommon to see fruit thrown to the ground, dropped into bins and scarred from the nodules on the skin being rubbed off. All this damage to the skin is an opening for opportunistic fungal rots to infect the fruit. As long as the fruit age can be kept low, the quality of the fruit is generally acceptable, but should the market slow and the fruit need to last three weeks or longer, the quality can become very poor due to rots. Maintaining a soft handling system even though the fruit are robust should be a best practice to ensure California

avocados are always the best quality.

The bottom line: avocado fruit grown in a dry climate have fewer postharvest rots and better quality, but the freshness and dry climate can lead to complacency and the fruit may be roughly handled increasing the potential for ripe rots to develop and reduce quality.

Maturity

Avocado fruit are unusual in that they can be stored on the tree long after they have reached maturity and are capable of ripening. The maturity of avocado fruit is one of the most important characteristics defining quality. The maturity of the fruit has a large influence on how long the fruit take to ripen; immature fruit can take three weeks to ripen while over mature fruit can take only three to four days. It is important to identify the minimum maturity where the fruit will ripen to an acceptable eating quality with minimum disorders. The minimum maturity is defined by the average dry matter content, which is used as a proxy for oil content, with high oil content associated with good eating quality. Knowing when the fruit can be harvested and sold with good quality is important to take advantage of potential high prices early in the harvest season. Immature fruit have very poor quality as they do not ripen properly, and have shriveling, rubbery texture, bland watery taste, stringy flesh, incomplete softening and high incidence of rot.

While the fruit are on the tree they continue to grow in size and accumulate oil. This means the fruit are constantly changing over time, which is most noticeable in the ripening of the fruit and often referred to as an increase in maturity. Avocados past minimum maturity but not over mature have very good quality when ripe. These fruit express few ripe rots, ripen evenly to a smooth creamy texture with good flavor, and are more tolerant of handling condi-

tions in the supply chain. Both commercially and for the consumer these are the best quality avocados.

Fruit held on the tree for too long become over mature and have poor quality as they ripen very quickly and store poorly, not allowing enough time to move through the supply chain. Over mature fruit can also develop off-flavors from too much oil and express high levels of ripe rots resulting in a much reduced time they can be presented for sale.

The bottom line: maturity is a key factor in determining the quality of ripe fruit. Early season and late season fruit have poorer quality than mid-season fruit.

Managing Maturity

Better management of avocado maturity, particularly in the early and late season, has the potential to improve quality at times in the harvest season when poor quality fruit can be found in the supply chain. There is the potential to define an ideal harvest window based on ideal maturity, such that high risk fruit, with respect to having poor quality after harvest, can be more easily identified. The high risk fruit could then be handled with care to minimize the expression of disorders. A significant problem with low maturity avocados is their large variability in ripening times. Slow ripening fruit are more susceptible to developing postharvest disorders, especially rots, while fast ripening fruit have fewer ripe rots. Ripening low maturity avocados with ethylene is an effective technology to even out ripening times leading to improved quality.

As previously mentioned, avocado fruit are stored on the tree and continually change over the season, but this change in fruit maturity can be influenced by cultural practices and the weather during the growing season. This results in maturity being variable from year to year, between growing regions, grove to grove

within the same growing region, and even from tree to tree. This high degree of variability makes a maturity standard very important, since for best quality the fruit should not be harvested by the calendar alone. Maturity needs to be measured accurately so the ripening and storage characteristics of the fruit are predictable in the supply chain.

There are two challenges with maturity, 1) setting a minimum maturity that consistently results in good quality ripe fruit and doesn't just define a minimum acceptable maturity, and, 2) determining a marker of over maturity that defines the harvest window for ideal fruit quality. To improve the quality of California avocados the maturity standards need to be set around a quality expectation designed to establish a premium position in the market rather than what is minimally acceptable.

The standard measure of maturity for California avocados is the average dry matter of a small number of fruit. Dry matter is an imperfect indicator of maturity and is an indirect way to measure oil content. Within the California avocado indus-

try there is a difference of opinion as to what the minimum acceptable maturity standard is and how this relates to building a quality reputation in the market. The current California standard for minimum maturity of Hass avocados at 20.8 percent dry matter is too low to be a guarantee of good ripe fruit quality. The scientific research shows it should be raised to 23 percent. If not raised by regulation, then a new voluntary maturity standard could be set based on a broader definition of quality and not the minimum acceptable eating quality. Dry matter of individual fruit is also very variable for unknown reasons. The method used to measure dry matter in California uses a very small sample of fruit that is unlikely to be truly representative of all the fruit in a grove. The flesh of each fruit is pooled together into an aggregate sample for measurement. This hides fruit that are very immature which would indicate that the fruit will have uneven ripening and poor quality. The method used to measure dry matter should be used for individual fruit with no aggregation of fruit tissue. In this way the

values can be analyzed for not just an average, but also the variability in maturity. Given uneven ripening is an important problem in the supply chain, having a standard that can determine when the variability is low would be helpful for improving quality. Customers could then be presented with fruit with a high degree of consistency and reliability.

The bottom line: maturity is very important in setting the inherent quality of the fruit and the current California standard for Hass avocados is too low. Raising the minimum maturity standard to 23 or 24 percent would result in improved ripe fruit quality. Finding a marker of over maturity would allow a harvest window for the best quality to be defined. Fruit harvested outside of the ideal maturity could then be handled in the supply chain as high risk. This would increase the reliability of a good ripening and eating experience of California avocado fruit for consumers.

Harvest Strategy

The monetary value of avocado fruit changes during the harvest sea-

Harvesting in the Heat

Historically, avocados harvested during a heat wave, as can sometimes occur during August and September, have poor quality. To maintain fruit quality, it is crucial that avocados are not harvested when air temperatures are above 90°F. This may mean starting crews early (sunrise) and stopping harvest by late-morning during heat waves, and monitoring of grove temperatures so that harvesting can be restricted to the cooler parts of a grove. Harvest bins should always be placed in complete shade, preferably under a structure, to prevent overheating the fruit. Fruit in bins that are not shaded can reach temperatures 20°F above ambient air temperature. Bins should not be left in the field more than 8 hours, whether shaded or not, and should be transported out of the grove as soon after harvest as possible so that the cooling process can begin.

Fruit exposed to high temperatures in the field are more susceptible to cold injury during storage and develop more decay and rot issues. The problems don't appear until fruit ripen, resulting in a poor eating experience for the consumer.

When forecasts call for temperatures approaching 90°F:

- Irrigate your trees the day before the heat starts to help the trees cope with the heat
- Monitor the air temperature in your grove
- Start and stop harvest crews early
- Handle fruit gently as they are more sensitive to damage due to the temperature stress
- Always shade or cover bins during harvest and transport
- Do not leave filled bins in the field more than 8 hours
- Monitor workers' health and be sure that adequate water, shade and breaks are available

son as the supply of California avocados goes from a few thousand pounds per week to millions of pounds per week. The price also varies with the time of the year and by how many pounds of imported fruit enter the market for sale. The variable price has encouraged many California growers to harvest according to the price of the fruit rather than at the best maturity for quality. If prices are high at the start of the season and the fruit have low maturity and less than ideal eating quality, growers are encouraged to harvest. Similarly, in the late season prices can be high and growers are encouraged to hold on to over mature fruit. Avocados continue to increase in size the longer they are held on the tree. This is often seen as beneficial as larger fruit usually demand higher prices. Chasing the price of fruit can be incompatible with the aim of harvesting at a maturity when the quality of the fruit will be best as it will restrict the options growers have in the timing of their harvest. Labor availability and potential oversupply of the market are further negative factors that reduce the value of a harvest window for best quality fruit.

Understanding the maturity harvest window for best quality allows for the fruit to be classified into high and low risk for developing disorders and poor quality. If such fruit could be identified, it may be possible through the appropriate postharvest handling to mitigate the negative effects of low maturity or high maturity fruit to maintain a consistent quality to the consumer.

The bottom line: chasing the price per pound or waiting for the fruit to reach a certain size can be incompatible with achieving high quality fruit. Systems are needed that identify the ideal harvest window based on quality, and that also identify if the fruit are high or low risk for developing ripe fruit disorders, so that the best returns can be achieved

within a harvest season.

Fruit Mineral Composition

Dry matter represents the reciprocal of the amount of water present in the fruit and is a proxy for oil content. The amount of oil in the fruit is associated with maturity and fruit ripening to good texture and flavor for best eating quality. The storage life of the fruit and the sensitivity to cold temperatures also depends on the mineral content of the fruit. In particular, calcium has a strong influence on the ability of the fruit to resist ripe rots. There are also interactions with other fruit nutrients; high levels of fruit nitrogen have been associated with chilling injury and the development of rot. The fertilizer program used by a grower, the rootstock and soil type all combine to set the composition of the fruit to affect the quality of ripe fruit.

The bottom line: producing avocados with high levels of calcium and low nitrogen improves ripe fruit quality. More information is needed to establish the ideal levels in California avocado groves of calcium and nitrogen nutrition that give high yields of high quality fruit.

Handling

When harvested, avocados are hard and green giving the illusion they are resistant to bruising and can be dropped without damage. The unripe fruit are in fact sensitive to physical damage, and under wet, humid conditions this physical damage leads to higher numbers of ripe rots. High quality avocados require careful handling to minimize the expression of ripe rots. It is important to avoid dropping the fruit onto hard surfaces, bouncing bins of fruit on rough roads or allowing the fruit to rub together. When harvested, the fruit should be placed into bags and then placed into clean bins and not thrown onto the ground in a pile before being put into the bin. After harvesting, the fruit in

bins should be covered to reduce water loss, start to cool the fruit, avoid contamination with leaves or other debris, and be sent to the packer as soon as possible to be packed and entered into the supply chain with the minimum fruit age.

When temperatures are high, over 90°F, the fruit should not be harvested. Fruit damaged on the tree that have dropped should not be placed into the supply chain. Fruit damaged by wind, heat stress or a freeze will ripen poorly and typically develop high levels of ripe rots due to internal or external damage. For the best quality fruit, the principle should be to only harvest fruit that are healthy and undamaged on the tree. A high quality standard and ethic is not just about the ideal maturity or mineral content of the fruit, but soft handling of blemish free fruit harvested directly from the tree is also needed.

The bottom line: physical damage lowers the quality of the fruit. For the best quality and safest fruit, the fruit should never touch the ground and only healthy fruit should be harvested and placed into the supply chain. Fruit that has fallen onto the ground through the effects of wind, heat stress or from a freeze should not be sent to market.

What Are Our Competitors Doing?

Avocados imported into the United States very often have quality problems. Fruit harvested early in the importing countries' harvest season and shipped long distances typically are less than perfect. Compared to California avocados, these fruit are inferior and achieve lower prices. However, with each season the exporters of avocados become more experienced and are learning from their mistakes. New technologies and understanding how quality is affected by cultural practices and the environment are constantly being

researched. The knowledge of how to grow, harvest, handle, ripen and sell avocados transported long distances while maintaining good quality is available. What is lacking is the implementation of systems to best use the knowledge. This is a situation that will not last forever. The closer imported avocado quality comes to the quality of California avocados, the more difficult it will be to argue for a premium position or price. This is the goal of the imports, for there to be no distinction in quality between California avocados and imported avocados. Therefore, it is vitally important that the California avocado industry continues to improve quality and the systems that ensure good quality is consistently delivered to the consumer for a reliable eating experience.

The bottom line: Is this statement, often heard at meetings and around the industry, always true? “California produces the best quality avocados. No other avocados are better.” Is it true for early and late season California fruit? Is it also true after a freeze or Santa Ana winds, a heat wave and when the market is slow to move fruit through the supply chain?

Avocados grown in California, when compared to imported fruit, are better quality, and if handled correctly should always be better because of our freshness advantage and dry climate. But is the quality good enough to realize the values of the fruit needed to keep the California avocado grower in business? At present, the values look to be marginally on the positive side and they could easily slip to the negative. There is plenty that can be done to improve quality and establish a premium position that would assure California avocado consumers they will always have a reliable positive eating experience. To

do this, California avocado growers and others in the industry will need a stronger quality ethic and to pay attention to nutrition, maturity, and harvest and postharvest handling to consistently produce high quality fruit. The rest of the supply chain - packers, handlers and retailers - also have to do their part to maintain quality through to the consumer.

A Quality-Based System

A lot of knowledge already exists about what influences and determines the eating quality of California avocados. This information is summarized above and can be used to consider what the components of a quality-based system would include. The starting point would be to have a clear, well-defined goal for customers and consumers of California avocados. This goal would be to guarantee a reliable, positive eating experience. To achieve this goal, it will be necessary to have fruit that when ripe are: free from rots and disorders when cut, the best soft and creamy eating texture, absent of off-flavor, free from chemical residues, and safe from contamination.

These fruit would constitute a new grade standard: California gold. This standard would be promoted as the ultimate avocado eating experience only available in the USA from California-grown avocados. The fruit have the greatest freshness, consistent ripeness and best food safety of avocados sold in the USA, backed by a sound system of monitoring and evaluation. Fruit that make the grade are not always available, so they command a premium position in the avocado market. The new grade is voluntary and as such carries the mystique and aura of extraordinary avocado fruit.

For the grower and the industry, the gold standard avocados will require a particular handling system backed by monitoring throughout the harvest season to define a harvest

window based on the period when maturity is at its best. A minimum maturity, based on a dry matter value and other fruit characteristics that are based on a reliable positive eating experience rather than a minimum acceptable eating experience, will define the start of the gold standard harvest. A maximum maturity, based on measurements that delimit a decline in the reliability of the eating experience, will define the end of the gold standard harvest. As the harvest window will vary from season to season, district to district and by micro-climate, a system of monitoring before and throughout the harvest season checks and acts to assure customers the best harvest window is being used for each grove. The fruit are all from groves that are GAP compliant, ensuring the fruit are the safest available to eat. The fruit age is monitored and kept to a minimum so the fruit are always freshest, minimizing the opportunity for disorders to develop. The fruit are handled using soft handling systems in the supply chain, starting with harvest. Harvest conditions are taken into account, as are cultural management and fruit mineral contents in the decision for harvesting. Fruit that are damaged by windfall, freezes and heat stress are not part of the California gold standard as they represent a food safety hazard and have unacceptable levels of disorders.

The description above may not be entirely accurate as to what may be put in place with respect to quality, but it is an example of what a system could look like. If quality was to be based entirely on technical considerations, a system like that could best use the postharvest and quality knowledge available. Such systems don't come for free, or without effort, and must result in a premium for the fruit. This is the challenge: designing a quality system that is also a good return on investment. 🥑

CAC Grower Website

Providing Growers with the Information They Need in the Format They Prefer

In November, CAC and our partner agency, TMA+Peritus (TMAP), held three Grower Listening Sessions as part of our effort to enhance grower communications and redesign the California avocado grower website, www.CaliforniaAvocadoGrowers.com. One of the key takeaways from those sessions was grower input about the kinds of information you'd like to receive and how you'd like to receive it.

Some of you prefer easy-to-print PDFs that you can carry with you. Others prefer accessing information in their grove using their tablet or cell phone. And the vast majority of you noted that you're simply too busy to routinely check the website for new information that is useful to you. Ultimately, you need relevant information delivered straight to your inbox.

The new avocado grower website is being designed around the varied preferences of our audience, helping growers to access — or receive — the information they need, when they need it, in the format they prefer.

The new website is being developed using a responsive web design approach. This means the avocado grower website will provide an optimal viewing experience across a wide range of devices — from desktop computer monitors to tablets to mo-



bile phones.

CAC will utilize notification bars on the homepage of the website to alert growers of events such as fires, pest outbreaks, water and legislative issues that require immediate attention and a higher level of visibility. Growers can also sign up to receive these alerts through email notification.

Growers can subscribe to receive emails that deliver articles based on their individual interests. Rather than having to manually inspect the avocado grower website for new content, email will deliver the latest content to your inbox.

The site is also being visually redesigned in order to provide a clean, fresh news-site look that will serve the freshest avocado industry news up front — including weekly

market information, new avocado production research, the latest marketing promotions and third party articles pertaining to the global avocado industry.

The redesigned site will also have two grower libraries. The Cultural Management library will house simple and applicable cultural management articles that can be accessed in the grove or easily printed out for later reference. The Research library will house past and current CAC funded avocado production research papers and project updates.

Together, CAC and TMAP are collaborating on a responsive website redesign that will ensure you receive the information you need in the formats you prefer. Look for the new website in spring 2013. 🥑

Small Window Open For Immigration Reform

By Ken Melban

Director, Issues Management

Now that the 2012 election year politics have concluded, an elevated conversation is emerging about the importance of immigration reform legislation in 2013. Each party is addressing this issue in a bipartisan fashion with a goal of tightening border security while establishing an opportunity for undocumented, yet contributing, societal members to be offered legal status.

At first it was the “Gang of Eight”: Four Republican and four Democratic senators including Sen. Marco Rubio (R-FL), a potential 2016 presidential candidate, announcing in January their proposal for a 2013 immigration reform bill. This was followed by President Obama holding a press conference in Las Vegas where he expressed his commitment to immigration reform by saying, “If Congress is unable to move forward in a timely fashion, I will send up a bill based on my proposal and insist that they vote on it right away.”

Nearly everyone, regardless of party affiliation, will agree that the current immigration system is broken, and that it has been broken for years. The question is with everyone saying our immigration system is broken and they want to fix it, why can't it just be fixed? The reason, though just a single eight-letter word, is extremely complex. Politics.

The president's speech created some challenges for Republican leaders who do not want to appear to acquiesce to the president. As evidenced by the 2012 election where more than 70 percent of Hispanic votes were cast for President Obama, Republicans need to gain support with Latino voters. But the more involved the president is in immigration reform, the riskier it becomes for them.

Recently Brendan Buck, House Speaker John Boehner's spokesperson, said “There are a lot of ideas about how best to fix our broken immigration system. Any solution should be a bipartisan one, and we hope the president is careful not to drag the debate to the left and ultimately disrupt the difficult work that is ahead in the House and Senate.”

In mid-February the president's proposal was “leaked” from the White House, further raising the ire of the Republicans. In addition, the president's proposal made no mention of agricultural provisions, a critical component for many. The Democratic Party has its own balancing act to perform. To maintain Latino support, it needs to deliver on its promise for immigration reform, yet somehow figure out



Congresswoman Lois Capps of California's 24th District (Santa Barbara and San Luis Obispo Counties) and Ken Melban.

a way to not upset labor unions, longtime party supporters. While labor might publicly support comprehensive immigration reform, some are resistant as they see undocumented workers as a potential threat to their union jobs.

The issue of granting citizenship is also causing some divide. The United Farm Workers are adamant that any reform must include a pathway to full citizenship, which is part of the Democrats' proposal. But most Republicans are in favor of providing legal status but not citizenship.

In February, I met separately with 11 congressional members to voice the California avocado industry's concerns regarding the need for an immigration reform bill now. In meeting after meeting Congress members seemed less than optimistic that immigration reform would be passed this year. While many of them publicly put on a positive face, privately they shared that passage will be very difficult. There is some hope it could pass in the Senate, but less hope on the House side. Within the House there is a bipartisan, not so secret, “Secret Group of Six” members who have been working on a proposal that is purportedly further along than the Senate's Gang of Eight.

The commission is staying engaged on this issue through congressional member meetings and participating in both the Agriculture Workforce Coalition (AWC) and the Agriculture Coalition for Immigration Reform (ACIR). Both coalitions are integrally involved in working with the Senate Gang of Eight and the House Secret Group of Six to ensure agriculture's needs are addressed. Immigration reform must happen this year before mid-term election campaigning begins in the fall of 2013 and probably dooms the effort. 🥑

The Road from the Grove To the Consumer

By Dr. Mary Lu Arpaia,

Subtropical Horticulture Specialist, UC Riverside

(Editor's Note: This article is a summary by Tim Spann, CAC research project manager, based on a talk presented by Dr. Arpaia at the California Avocado Society seminars in San Luis Obispo, Ventura and Temecula in February.)

There are several features of the avocado that make it a unique and high quality fruit. Most fruits undergo a period of rapid cell division shortly after fruit set, which limits the maximum size the fruit can achieve, followed by a period of cell enlargement. However, avocados continue to undergo cell division until they are harvested, which allows them to continue to increase in size the longer they stay on the tree. Avocados also contain high levels of phytonutrients – they are higher in potassium than bananas – and unusual sugar alcohols, the potential health benefits of which are currently unknown. In addition, avocados accumulate large quantities of lipids (fats) in their flesh rather than sugar. These fats are monounsaturated (good) and include oleic acid, the same good fat as olive oil.

Despite its high quality, avocado does have some limitations, most of which affect its postharvest life. Avocados have a relatively short storage life, only three to four weeks. In addition, because avocados are harvested over a long period of time, their tolerance of postharvest handling and storage changes as the fruit maturity changes. There are some postharvest problems that can develop with avocados, which can be influenced, both positively and negatively, by cultural and harvest practices.

Seasonal quality changes

Avocado fruit quality is not uniform over the harvest season. Early season Hass fruit may not fully color, may have a watery texture, and may be bland or grassy in flavor following ripening. They also require ethylene treatment to ripen uniformly and avoid checkerboarding. Early season fruit also are more prone to shriveling during ripening because of their lower dry matter and higher water content, they suffer higher levels of decay than at other times of the season, have more internal disorders, and are most susceptible to low temperature (36-41°F) damage.

Mid season fruit have the best balance of quality, flavor and tolerance to postharvest handling. They ripen uniformly in response to ethylene treatment with little or no check-

erboarding. Mid season fruit do not suffer from shriveling, have virtually no decay unless harvested after rain, and are the most tolerant of long-term (3 to 4 weeks) storage. When ripe, mid season Hass fruit develop a uniform green-black to black color, have a creamy texture and excellent flavor.

Late season fruit require little or no ethylene treatment and will generally ripen uniformly in about 2 days. Late season fruit suffer from decay which may be due to the breakdown of natural anti-fungal compounds found in less mature fruit. Due to their high maturity level, late season fruit are difficult to store for any significant length of time and they are more prone to internal disorders related to storage. Late season fruit can ripen unevenly, tending to remain firm above the seed, and the seed may begin to germinate in the fruit. Ripe late season fruit develop a full black color, but may be difficult to peel and their creamy texture can become dry and the flavor can become rancid if fruit are exposed to high temperature following harvest.

Grove inputs that affect fruit quality

Quite literally, everything that goes into grove management affects fruit quality. It is difficult to clearly define how each input – irrigation, fertilization, canopy management, pest management, rootstock, – affects fruit quality because each input interacts and influences each other.

The role of rootstocks on fruit quality is likely related to water and nutrient uptake. A rootstock that produces a larger, more vigorous root system can mine more soil volume for water and nutrients, increasing the quantity of these resources available to fruit. Rootstocks also influence the vegetative vigor of the tree, and the best fruit come from trees with a good balance of vegetative growth and crop load.

Research conducted in South Africa found that fruit from vigorous, low yielding trees suffered great chilling injury after being stored for 28 days at 42°F compared with fruit from less vigorous, higher yielding trees. The researchers found that the low yield, high vigor trees produced fruit with lower pulp calcium, zinc and manganese content. Similarly, Australian researchers found a correlation between fruit yield/tree vigor and postharvest decay from anthracnose, with the fruit from higher yielding, lower vigor trees having less anthracnose and higher calcium content.

Mineral nutrient effects on fruit quality are especially difficult to sort out because of the complex interactions among nutrients in plants. Calcium and nitrogen appear to be the two nutrients that stand out the most in avocado quality studies. Nitrogen is probably important for fruit quality because of the influence it has on canopy vigor. Calcium is strongly influenced by irrigation practices since it is non-mobile with the tree and must be taken up continuously from the soil solution to support actively growing cells.

Canopy density, which is influenced by rootstock, fertilization and pruning practices, can also affect fruit quality. A dense canopy may be a sign of a tree with high vigor, and the vegetative growth will compete with fruit growth for resources, reducing fruit quality. Canopy density is also associated with higher stem-end rot caused by the fungus *Botryosphaeria*. The spores of this pathogen live on dead wood, which tends to be more prevalent in dense canopies, so fruit from trees with a dense canopy enter the postharvest chain with higher inoculum level.

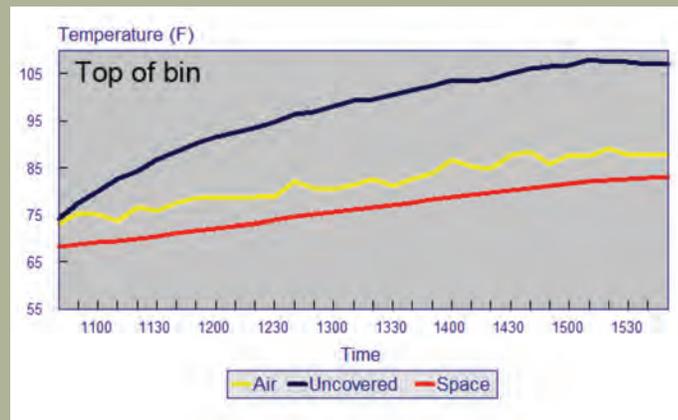
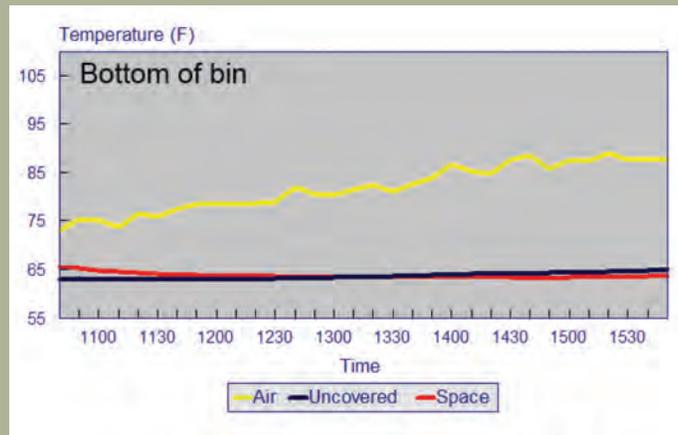
It is important to point out that fruit quality does NOT improve after harvest, so efforts should be made to maximize quality at harvest.

Harvesting considerations and transport

The first, and perhaps most important harvesting consideration, is to avoid harvesting during high temperatures. Research conducted in California has shown that when harvesting bins are left in the sun, the internal temperature of fruit at the bottom of the bins remains substantially lower than air temperature, while the internal temperature of fruit one layer down in the bin can be up to 20°F above air temperature if the bins are not covered. Under these conditions, fruit near the top of a bin can reach temperatures well above 100°F even at moderate air temperatures of just 85°F.

The later in the season fruit are harvested, the more critical temperature management becomes. If bins must be held in the field after harvesting, they should be placed in the shade to keep them out of direct sunlight. When temperatures are forecast to be about 90°F or higher, it is critical to move the bins out of the grove as soon as possible. Minimizing delays between harvesting and cooling the fruit is critical to maintaining postharvest quality.

Rainfall also needs to be considered when harvesting. Immediately following a rainfall, the cells of the fruit peel, especially those surrounding the lenticels, become very turgid (full of water), much like over-inflated balloons. It is very easy for these cells to rupture during harvesting, causing microscopic wounds through which pathogens can enter. Research showed that when fruit were harvested within 24 hours following moderate rainfall, the severity of body rot and incidence of stem-end rot increased by as much as two-fold. Furthermore, rainfall, especially short duration light rains, may help to disperse pathogen spores and wash



Graphs showing how fruit temperatures change over the course of a day for fruit near the top of a bin and at the bottom of a bin. The yellow lines represent air temperature, the dark blue line fruit flesh temperature in uncovered bins, and the red line fruit flesh temperature from bins covered with a space blanket.

them onto the fruit surface. This effect, combined with cellular damage, is the likely cause of increased fruit decay following rain. Fruit should not be harvested for 48 to 72 hours following rainfall.

Lastly, the harvesting method can influence fruit quality and susceptibility to decay. If early season fruit are snap picked, there is a chance of tearing, which can increase the fruit's susceptibility to stem-end rot and water loss compared with clipped fruit. However, mid and late season fruit actually have lower incidence of stem-end rot when snap picked. Presumably, this is because the incidence of tearing is low and the decay pathogens that naturally exist on the fruit stems in the field are left behind when mid and late season fruit are snap picked.

Transporting the fruit starts when the bins are loaded. Bins should not be allowed to remain in the grove for more than eight hours after harvest and they should not be stored overnight. During actual transport, the bins should be covered to protect the fruit from sun damage and to minimize water loss. You should also work to maintain grove roads so that bins of fruit are not excessively jostled on rough roads as they begin their trip to the packer. 🥑

Managing Pesticide Resistance Development

By Tim Spann

Research Project Manager

Pesticide resistance is the selection of individuals in a population to become better able to survive exposure to a pesticide after the population has been exposed repeatedly to that pesticide over a period of time. It results from the phenomenon commonly known as “survival of the fittest.” Some species are notorious for the ability to develop resistance (mites, thrips), whereas others appear to do so more slowly. Resistance occurs in all agricultural pest groups – insects, mites, fungi, bacteria, weeds, and nematodes. Proper management of agrochemicals to prevent the development of resistance is extremely important because the development and registration process for new chemicals is slow and expensive. If existing chemicals become ineffective due to resistance development, alternatives may not be available, may be very expensive, and/or there may be quite a delay before their registration occurs. This article focuses on pesticide resistance, but the principles discussed are applicable to other agrochemicals, such as fungicides and herbicides.

How does pesticide resistance develop?

Pesticides are rarely 100 percent effective. A few individuals will survive an application – due to natural tolerance, lack of exposure due to poor coverage or their ability to hide and limit their exposure – and reproduce. These survivors possess traits that may be behavioral, genetic or biochemical, which allow them to tolerate the effects of a pesticide. When these survivors reproduce, they pass on these “resistance traits” to some of their offspring. This results in a larger proportion of the individuals in subsequent generations being less susceptible to the pesticide. This is shown in the accompanying illustration, which shows how a population can shift from being composed predominantly of susceptible individuals (represented as yellow in the diagram on page 35) to being composed of resistant individuals (represented as red) following repeated applications of the same pesticide.

How can pesticide resistance be managed?

The basic principle of managing pesticide resistance is to never unnecessarily expose a pest to a pesticide. To achieve this, a few simple rules should be followed which are articulated below:

Never rely on a single pesticide mode-of-action

Pesticides are grouped based on how they act on a pest, which is known as the chemical’s mode-of-action. An international group known as the Insecticide Resistance Action Committee (IRAC) is responsible for classifying pesticides. Currently, IRAC groups pesticides into 27 different groups, which are indicated by a number (1 through 28 – 26 and 27 are currently not in use) or the letters “un” for chemicals of unknown mode-of-action. Some groups contain subgroups, which are indicated by a letter following the group number.

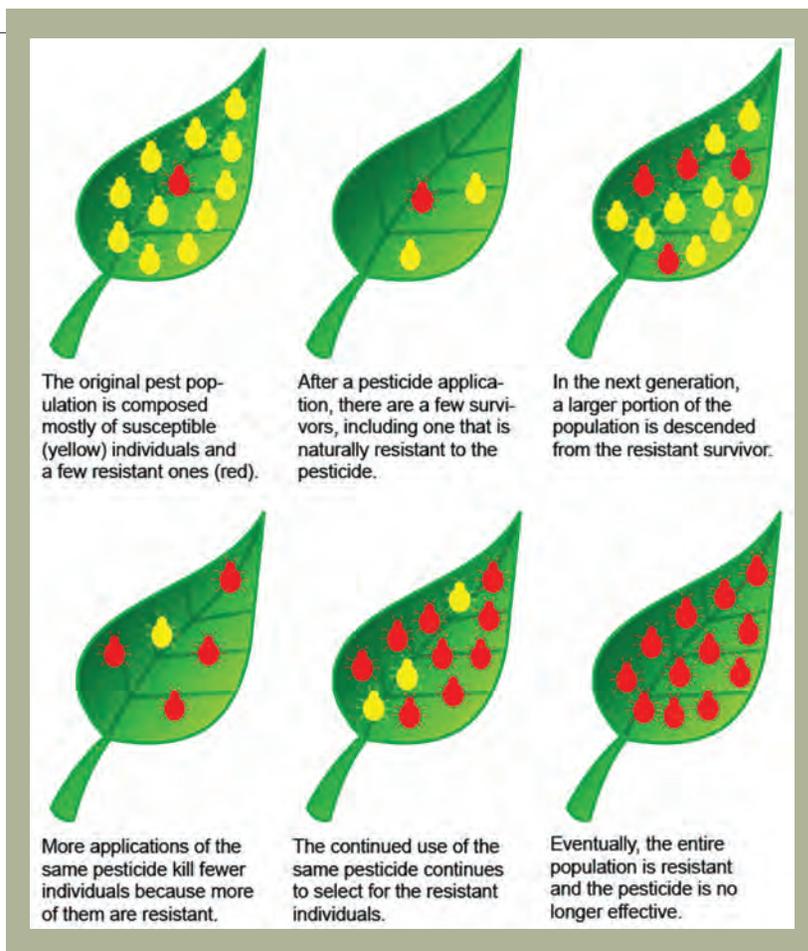
For example, group 1 (chemicals with nerve action) has two subgroups, 1A and 1B, which represent carbamates and organophosphates, respectively. It is very important to understand that, although these subgroups represent distinct chemical classes, they have the **same** mode-of-action. Therefore, when selecting chemicals to rotate mode-of-action, you must choose between different groups, not subgroups.

When a chemical of a given mode-of-action is applied to a pest population, there will be a small portion of the population that naturally has some resistance to that mode-of-action. However, it is very unlikely that they are resistant to a different mode-of-action. Thus, if the next pesticide application uses a different mode-of-action, these individuals can be killed. By using as many different modes-of-action as possible, the likelihood of resistant individuals surviving is reduced and the pest population does not develop resistance.

Integrate cultural and biological control with pesticide use; monitor and treat only when pest pressure justifies treatment

One of the cornerstones of managing pesticide resistance is to reduce pest exposure to pesticides. An excellent way to do this is by using cultural practices and biological control strategies in your pest control program.

Cultural practices commonly include things like weed management, grove sanitation by removing or chipping pruning debris and fallen fruit, and controlling alternative host plants. Weeds can serve as alternative hosts for some pests, but often act as a refuge for pests to escape pesticide applications made to the tree canopy. Once the pesticide residue has diminished, the pests can re-infest the canopy. Grove sanitation is very important for certain pests that live in the wood or fruit of the tree, including the new Polyphagous Shot Hole Borer. Pests like the shot hole borer or seed weevils (not currently present in California) can easily re-infest trees by emerging from pruned branches or fallen fruit that lay on the grove floor. By physically removing debris from the grove, or breaking it down with a chipper or mower, these types of pests can be better controlled. Controlling alternative host plants in and around the grove is another non-pesticide technique for helping to control pests. This technique, like sanitation, is beneficial for pests like the shot hole borer, which can infest numerous species other than avocado. Having alternative host species in and around your grove can act as a freeway for pests to move in. However, removing the alternative hosts can slow a pest's spread, and limit its population growth.



Biological control, or biocontrol, is a strategy for controlling pests using other living organisms, including predators, parasitoids and pathogens. Biocontrol often requires active human management to import, augment or conserve the biocontrol agents. For many insect and mite pests, biocontrol relies upon the establishment of other insects or mites (either native or imported) that feed on the pest, frequently its immature stages (e.g., the predatory mite *Galendromus helveolus* preys upon persea mite). However, many biocontrol agents parasitize pests by laying their eggs in or on the pest, and the biocontrol young then feed on the pest (e.g., the parasitic wasp *Thripobius semiluteus* lays eggs in the larvae of greenhouse thrips). A third class of biocontrol agents are pathogens of the insect pest. In managed biocontrol programs, this class is probably best represented by fungi that are insect pathogens, also known as entomopathogenic fungi.

A cornerstone of pesticide resistance management is to use pesticides only when they are needed. That is, monitor pest populations and do not spray on a calendar basis. Different pest control advisors have different methods of monitoring and different treatment thresholds, but the key point is to reserve chemical use for when it is needed. This not only saves money, but also reduces selection for pesticide resistance.

Use pesticides at label recommended rates and strive for thorough coverage

Even though minimizing a pest's exposure to pesticides is key to resistance management, when pesticides are needed it is very important to use the correct rate and application method. If pesticide rates lower than those recommended on the label are used, a large portion of the pest population will be exposed to sub-lethal doses. This exposure to sub-lethal doses can hasten the development of resistance in a manner analogous to humans receiving allergy shots where repeated exposure to low doses of an allergen leads to desensitization, or resistance in the case of insects and pesticides.

Likewise, if the correct pesticide rates are used, but coverage is poor, then a portion of the population is exposed to sub-lethal doses, or maybe even no pesticide. This can result in resistance development from sub-lethal exposure, and rapid rebound of the pest population, which will result in more use of pesticides.

Never use tank mixes of pesticides with the same mode-of-action

Tank mixes of pesticides have become increasingly common in agriculture. They allow for efficient application of multiple products at the same time. It is very common for tank mixes to include a pesticide and a fungicide, or a contact insecticide and a systemic insecticide for quick knock-down and long-term control of a pest. However, it is very important that two pesticides with the same mode-of-action are never tank mixed and applied together. This would be equivalent to simply increasing the rate of one of the pesticides to twice the label rate, for example. This "super dose" of pesticide will likely be very effective against a large portion of the pest population, but, as mentioned earlier, pesticides are rarely 100 percent effective. Therefore, the individuals that do survive this super dose will be the most resistant in the population, and resistance will be selected for that much faster.

Minimize use of persistent pesticides with long residual activity

Many of the pesticides available today are relatively "soft" compared to those used in the past. That is, they quickly break down after application to non-toxic compounds. This is considered a good thing from a pesticide resistance standpoint since it means that the pesticides will not be in the environment for an extended period, slowly degrading, and exposing pests to sub-lethal doses, which we know can lead to resistance development. An example of a pesticide with a relatively long residual that is still used today is Danitol, which can remain effective, depending on the pest, for several weeks. These pesticides should be used

judiciously.

It is important to note that pesticides with long residuals are distinct from systemic insecticides that provide long-term insect control by being "stored" within the plant. However, systemic pesticides are not immune from resistance development, and should also be rotated according to their mode-of-action.

If control with a pesticide fails, never re-treat with the same pesticide or one with the same mode-of-action

If you make a pesticide application and it fails to reduce the pest population to an acceptable level, you should **never** re-treat with the same mode-of-action. Even if you are fairly certain that the applicator mixed the pesticide incorrectly or there was an issue with coverage, it is always best to assume that the failure was due to some level of resistance development – even if this is an incorrect assumption. By making this assumption and following the rules of resistance management, you will make a follow-up treatment with a pesticide of a different mode-of-action. If there are the beginnings of resistance in your pest population, the new mode-of-action will kill the pests with the resistance to the first mode-of-action. If the failure of the first application was due to mixing or coverage issues, hopefully these issues will not occur a second time.

The bottom line on most of the above principles is to minimize the frequency with which pests are exposed to one class of pesticides – use all of the above methods to do this in concert. Pesticide resistance development is a critical issue to today's agriculture industry that we all must be vigilant about. Pesticide research and development is a slow and expensive process. New pesticide chemistries do not come on the market very often, and when they do they are expensive. If the effective products we currently have available are lost due to resistance development it could be years before new alternatives are available. Continuously using one pesticide, whether it's because it is the cheapest or the easiest to apply, will only result in the eventual loss of that product, forcing the use of newer, more expensive products. And the loss of one product puts greater pressure for resistance development on the remaining products since there are fewer products left to rotate among.

Good pesticide stewardship is the responsibility of all of us, and it will help to ensure that we can continue to grow the crops we enjoy, and produce safe, quality products for consumers. 🥑

Polyphagous Shot Hole Borer/ Fusarium Dieback Update

By Tim Spann

Research Project Manager

The Polyphagous Shot Hole Borer (PSHB) (*Euwallacea* sp.), the vector of Fusarium dieback disease in avocado, continues to be front and center on CAC's radar. CAC is currently funding three research projects on the beetle/Fusarium complex through the University of California, Riverside, which are making significant progress in understanding this important pest/disease complex.

Dr. Richard Stouthamer, UC Riverside Professor of Entomology, is using molecular genetic techniques to try to determine where the beetle originated. His work is indicating that the beetle may originate from a region of Thailand, and he is in the process of obtaining more samples from there to confirm his preliminary findings. This is important information to know as it may allow for the discovery of biological control agents that evolved with the beetle in its native habitat and could possibly be used to control it in California.

Also working on the beetle side of this issue is Dr. Tim Paine, another UC Riverside Professor of Entomology. Dr. Paine is working on understanding the life cycle of the beetle and potential control strategies. Most recently, his team has been looking at pesticides and chipping as tools for PSHB control. It is important to note that **NO** pesticides are currently registered for use in avocados against this pest. To date, three common pesticides (imidacloprid, dinotefuron, and bifenthrin) have shown positive results at reducing PSHB populations in castor bean plants. However, it must be understood that despite these pesticides reducing the beetle population in an infected tree, the Fusarium fungus can continue to grow and block the tree's vascular system.

In order to minimize the risk of spreading PSHB, we must know how to dispose of wood from dead or dying trees that are removed from the landscape or grove. Dr. Paine's team has been working on this aspect of control as well, with some encouraging results. They have been looking at the effect of chipping beetle-infested wood into coarse (>2 inch), medium (1-2 inch) and fine (<1 inch) chips, compared to intact logs, to see if the beetles survive and can emerge and infest new wood. In their trials to date, chipping (all sizes) has been effective at dramatically reducing the number of beetles that emerge and re-infest trap logs placed on top of the chips. This work has also shown that intact infested



- ▲ Positive finding *Fusarium* sp./Polyphagous Shot Hole Borer
- Negative-*Fusarium* sp./Polyphagous Shot Hole Borer

Known distribution of *Fusarium dieback*/Polyphagous shot hole borer in southern California as of December 17, 2012. Map and data courtesy of Dr. Akif Eskalen.

logs are capable of supporting the beetle for two or more months, and should never be moved from infested areas.

Dr. Akif Eskalen, UC Riverside Extension plant pathologist, has been working with his team to identify suitable hosts for the PSHB/Fusarium complex, screen fungicides for their ability to control Fusarium dieback, and track the spread of the infestation. To date, 335 different tree species have been observed to determine if they are suitable hosts for PSHB, *Fusarium* sp., or both. Of these 335 species, 213 showed signs of attack by PSHB, and the *Fusarium* sp. was recovered from 108. Many of those 108 species are not suitable hosts for PSHB; rather it "tests" a lot of different trees, and in the process can inoculate some of them with the *Fusarium* sp. In total, only 21 species have been identified as suitable reproductive hosts for PSHB. That is, species in which the beetle is capable of reproducing and the fungus can grow. In addition to avocado, this group of 21

includes such common landscape trees as box elder, English and coast live oak, California sycamore, several maple species, as well as the invasive castor bean, among others.

As mentioned earlier, controlling the beetle does not rid the tree of the *Fusarium* fungus, so effective methods for controlling both components of this complex will be necessary. Dr. Eskalen's team has collected *Fusarium* samples from avocado, box elder and castor bean for use in laboratory fungicide screening trials. As with pesticides, it must be stressed that **NO** fungicides are currently registered for use on avocado against this fungus. Of the 11 fungicides that have been tested, eight showed some level of growth inhibition against the *Fusarium* fungus in laboratory assays. Of these eight, three were significantly better than the others, metconazole, pyraclostrobin, and tebuconazole, and these have moved into preliminary greenhouse and field trials.

Recently, Dr. Eskalen's lab has identified a second fungal pathogen associated with PSHB/*Fusarium* dieback; *Graphium* sp. Dr. Eskalen's preliminary data suggest that the *Graphium* sp. may be the primary food source for PSHB larvae, whereas the adults primarily feed on the *Fusarium* sp. Both of these fungi have been isolated, and healthy avocado nursery trees have been inoculated with each of them separately. These tests show that both fungi are pathogenic,

and early results indicate that the *Graphium* sp. may be a more aggressive pathogen than the *Fusarium* sp.

Since the last update, there has been significant movement of the beetle in two areas, but the infestation is still mostly restricted to Los Angeles County and northern Orange County, some distance from primary commercial avocado growing regions. The first is along the northern edge of the known infestation, between Altadena and Glendora, along the Angeles National Forest. This area was previously known to be infested, but there has been an apparent increase in the concentration of the infestation in this area. The second area of spread is in San Bernardino County, from Pomona to Ontario, bordered by the 10 freeway on the north and the 60 (Pomona) freeway to the south. There has been little movement along the other boundaries of the known infested area.

If you notice anything that may look like multiple small holes on the trunk or branches of trees, even if it is not associated with any dieback, you are encouraged to contact Dr. Eskalen at (951) 827 3499 or by e-mail at eskalenlab@gmail.com, or the CAC office at (949) 341 1955. Do not move suspect material out of your area for identification. More information about the Polyphagous Shot Hole Borer and *Fusarium* dieback visit www.eskalenlab.ucr.edu or www.avocadosource.com. 

Researchers need your help

Dr. Tim Paine's lab is investigating which avocado cultivars are most vulnerable to the PSHB/*Fusarium* dieback complex. To do this, they need your help to obtain study material from a number of different avocado varieties. Specifically, they need:

Freshly pruned branches from infested avocado trees.

Freshly pruned branches from avocado trees outside the area where the beetle is found.

Castor bean stands for pesticide trials.

Infested branches from other tree species attacked by the beetle.

Branches are preferred to be about 2 to 6 inches in diameter, and it is important that the cultivar name be known.

If the branches are infested with the beetle, please **DO NOT** transport them out of the area. The beetle survives very well in cut wood. Dr. Paine's lab will come and pick them up, and package them for transport.

For more information or to help by donating material please contact the Paine lab:

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Growing Talent to Help Produce Companies Prosper

By Margi Prueitt

Executive Director, PMA Foundation for Industry Talent

It is hardly a revelation: college students typically don't view the avocado industry as a career opportunity. For avocado-growing families hoping to enlist the next generation, long hours and worries over weather, water and pests could scare off the potential employees. Meanwhile, handlers' ability to contribute to the U.S.'s steady growth of avocado volume largely hinges on their ability to grow a talent base to keep pace with projections.

The truth is that today the avocado industry and produce industry in general offer young people more diverse opportunities and career growth than ever before. Shouting about these possibilities from the treetops is Produce Marketing Association's (PMA) Foundation for Industry Talent, which is on a mission to attract, develop and retain talent for the global produce industry.

PMA Foundation was established by PMA's board of directors as an independent, non-profit organization in 2006. Facing a future of retiring baby boomers and industry growth, the board recognized something needed to be done to attract the best and brightest minds to the produce industry. Today that need is compounded as companies expand their global footprint, become larger through consolidation, and more complex and technical through accelerated use of information systems and speed of commerce.

Human resource needs are changing quickly in this modern global economy. If produce companies aren't paying attention to their talent pipeline, they won't be prepared in the near term, let alone the long term. Since companies often lack strategies when it comes to human resources, cultivating talent gets overlooked in the volume of day-to-day business. That's why PMA Foundation dedicates itself to helping sustain a vibrant global produce industry through its most valuable resource...people. PMA Foundation's "career continuum" offers students and industry members a spectrum of programs, networking and resources designed to support every stage of a produce career — whether that's young people entering the industry, new leaders obtaining skills or senior leaders honing skills.

The Career Pathways Program sits at the beginning of the continuum. Designed around six international, national and regional produce industry events, these programs provide university students and faculty the opportunity to attend and experience the industry first-hand. Students receive one-on-one mentoring with industry leaders serving as "Career Ambassadors," participate in career panel discussions and sometimes even tour produce operations. They

also get to network with industry professionals at workshops, social events and on the exposition floor. To date, 47 percent of the students who have participated in a Career Pathways program and have graduated from college have accepted an internship or employment in the fresh produce industry.

California Avocado Commission employees have clocked many volunteer hours mentoring college students, sharing their experiences and passion for the avocado industry and promoting produce as a choice career. CAC staff has also benefited from participating in PMA Foundation's career continuum programs.

"As a company it's great to have an industry-specific resource for personnel and leadership development," said Jan DeLyser, vice president of marketing at CAC and current chair of the PMA Board of Directors. "PMA Foundation programs allow CAC to demonstrate its support of our staff in development and the opportunity to build their network of peers."

DeLyser has a history of volunteering as a Career Ambassador and on PMA Foundation's board and committees. Most recently she attended the Leadership Symposium, an educational seminar for senior executives. The program is designed to strengthen leadership capabilities and stretch



Margi Prueitt



executive thinking through influential speakers and small-group discussions with industry members from across the supply chain and across business functions. She said the symposium facilitated deeper engagement with industry peers and delivered invaluable insight into approaches to evaluation and problem solving. She also noted CAC Marketing Communications Manager Zac Benedict's experience at PMA Foundation's Emerging Leaders Program last year.

"It was a great opportunity for Zac to build confidence and networks as well as gain skills in preparation for his recent promotion from 'specialist' to 'manager,'" DeLyser said. "Participation in PMA Foundation programs are usually game changers, especially as it relates to the participant's self-confidence and perspective on different approaches to situations."

The Emerging Leaders Program, created in partnership with Thunderbird School of Global Management, prepares high-potential leaders working in the industry for increasing levels of responsibility, challenges and opportunities that will accompany future leadership roles. The program enhances participants' leadership and critical thinking skills in the workplace.

In April, PMA Foundation will debut the Women's Fresh Perspectives Conference. The conference aims to inspire industry newcomers, executives and anyone in between to drive change within their organizations, further their leadership potential and network with peers and business leaders. It's the only industry-specific development program for women, and is being designed in partnership with Simmons School of Management, a widely recognized authority on women, leadership and management. This conference is important because women in leadership measurably help companies succeed. In fact, a study by the research-based non-profit organization Catalyst found return on equity and total return to shareholders was 34 percent higher in companies with the highest numbers of women included in senior positions. That's a competitive advantage produce companies must leverage!

Regardless of the program, "talent solutions" remain the common thread in PMA Foundation's efforts. Whether it's

marketing, food safety, traceability, technology or the global impact of trends, economics and environmental and labor issues — the modern produce industry is increasingly complex. Bright, creative women and men with varied knowledge, expertise and experience will increasingly be the competitive differentiator with the unique solutions they'll be trained to bring to the table.

By making PMA Foundation programs available, all produce companies can educate and develop a workforce with the diverse expertise necessary today. Industry members also can offer development opportunities to attract young people seeking full-time, long-term work in the numbers required to ensure advancement of future industry leaders and sustained business success.

CAC is PMA Foundation's mission in action, demonstrating the produce industry is a great place for an exciting, fulfilling career and that organizational success happens when you invest in the development of your people. At PMA Foundation, we believe by reaching out to universities to showcase produce careers and by providing development resources throughout one's produce career that the California avocado industry and produce businesses of all types and sizes, in all places, and on every level, can prosper generation after generation.



Visit pmafoundation.com for more information on PMA Foundation programs as well as to learn how to show your support through charitable gifts and volunteer opportunities. 🥑

Margi Prueitt joined the Produce Marketing Association Foundation for Industry Talent as the executive director in 2010. She comes to the position after serving as the executive director of an economic development organization and a 35-year career with the American Red Cross. She is a graduate of the University of Kentucky, has a Master's Degree from the University of Louisville and obtained an executive education certificate from Harvard J.F. Kennedy School of Government

HAB Continues to Represent Entire Industry

By Tim Linden

Emiliano Escobedo, who is the executive director of the Hass Avocado Board (HAB), said even though U.S. growers and importers pay an assessment fee to the group, many are a bit confused about what they do.

"People are familiar with us because they pay their dues, but I don't think a lot of people can actually define what HAB does," he said.

First and foremost, Escobedo said HAB represents all Hass avocados sold in the United States regardless of point of origin. In fact, the board has changed its approach a bit over the years and now it tends to work on industry and marketing issues that are very generic in nature and not tied to any specific point of origin. For example, conducting nutrition research on the Hass avocado is one of its main activities. "Nutrition is always in season. It doesn't matter where the avocado comes from," he quipped.

The Hass Avocado Board was founded about a decade ago after the passage of the Hass Avocado Promotion, Research and Information Act by the U.S. Congress in 2000. The board consists of 12 members, including growers and importers, and assesses most all Hass avocados consumed in the United States at the rate of 2.5 cents per pound. Most of that money (85 percent) is rebated to the specific promotion board representing the avocado's point of origin. For example, the California Avocado Commission receives 85 percent of the assessments paid on California production. Similar boards have been established for the promotion of avocados produced in Mexico, Chile and Peru. While each of those groups tends to run promotions touting their point of origin, HAB does not. In fact, it does not engage in direct product promotion at all.

While marketing, promotion, research and dissemination of information are all allowed under the act establishing HAB, Escobedo said that the biggest chunk of the roughly \$6 million HAB budget goes to nutrition research. For the past several years, HAB has been aggressively funding studies to help grow the body of science around the consumption of avocados. In fact, Escobedo said never has that effort received more attention than in the last few years. "From 1960 to 2009, there were 23 nutritional studies on avocados published. Eight of those were funded by the industry. Right now we have eight clinical trials going on and each of them should be published by 2015."

By then Escobedo is expecting the link between good health and avocados to be clearly made. Those clinical studies revolve around several themes including good heart health, weight management and diabetes control. As the link is being made, HAB will and is engaging in what Escobedo calls nutrition marketing. "Our vision is to have a single minded campaign to drive avocado consumption by drawing attention to the nutritional benefits of increased consumption."

He repeated that HAB is the perfect vehicle for this type of campaign because "we know the science and we don't have to worry about marketshare because good nutrition is always in season."

The HAB executive believes the nutrition campaign should be conducted without regard to country of origin and in a unified avocado voice. "We are creating easy to understand messages that we can put in a toolbox that we will make available to our member organizations."

Largely because of the good nutritional story that avocados can tell, Escobedo is very bullish about the continued growth of the avocado market. He said both the aging of the American population as well as its increasing ethnicity should also add to increased consumption.

As HAB celebrates its 10th anniversary, Escobedo said the entire industry should be very proud of what has been accomplished over that decade. "When we started, the goal was to expand avocado consumption throughout the United States and increase consumption. We have expanded tremendously both geographically and in volume. Today people in New York and Miami and all over the country consume avocados."

But he said HAB is not the same organization as it was 10 years ago because it has a different approach with its nutrition emphasis. To signify that, the board has adopted a new logo with new graphics. But while the approach is different and so is the road map to get there, the goal is still the same: increase the consumption of Hass avocados. 

Mexico Leads in Both Production & Consumption

With a per capita consumption of more than 15 pounds per person and production coming from about 370,000 acres, Mexico is both the world's leading producer and consumer of avocados.

Eduardo Serena, the marketing director of APEAM, which is Mexico's avocado growers association, said the first commercial nurseries for the Hass avocado were established in the 1960s. Throughout the 1960s and 1970s, commercial groves were planted and soon Hass avocado production surpassed and replaced the national market for both native (criollo) and Fuerte avocados, as well as other avocado varieties.

He said the motivation to produce the Hass avocado was based on the excellent quality of its flesh, as well as, its sustained production capabilities, flexible crop schedule, durable nature and its ability to tolerate transport and storage. Moreover, the growth habits of the compact Hass avocado tree allowed farmers to increase tree density and increase production.

Over the years, Mexico's production continued to increase with the majority of the production coming from the state of Michoacán. Today more than 85 percent of Mexico's avocados come from this centrally located state from about 74 percent of the country's avocado acreage. In 2012, Michoacán avocado growers grew 112,671 hectares (278,415 acres) of avocados. Some other states including Jalisco, Mexico, Morelos, Nayarit, Guerrero and Puebla also

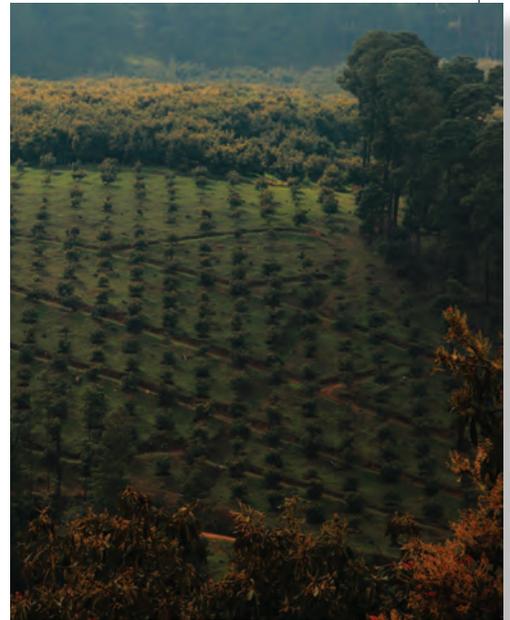
have commercial avocado groves.

Mexico exported about 361,000 tons in the 2011-2012 season and is expected to export 442,978 tons in the 2012-2013 season. These were harvested from 71,800 exportation-certified hectares. Serena said that after the United States, Japan is the second largest market for the Mexican avocado, with a volume of more than 34,000 tons in the current season. He said Mexico also exports to Canada, Europe, and Central America. Exportation of Mexican avocados first began in the 1990s.

Like California, one of the major production issues in the state of Michoacán is water. "There has been detection of reduced groundwater levels which is essential in order to stabilize the fragile ecosystem upon which the avocado industry and people of Michoacán depend on," said Serena. "Given this need APEAM has initiated a regional reforestation project that will plant, every year, 220 hectares with 220,000 trees that can naturally grow in these regions. Planting elevation will be 5,000 feet above sea level in areas that are conducive to capturing the most water that will seep back into underground rivers and lakes in the region."

He said the biggest challenge Mexican growers face is dealing with unforeseen climate issues that could affect the crop.

Because of the microclimates in the major producing region, Mexico is able to produce year round as each tree can have two blooms in one year giving the region four blooms in a



year. "Historically, the peak season begins in October and continues through May. Mexico's unique four-blooms, rich soil and microclimates allow for availability of quality fruit throughout the year in a variety of grades and sizes," Serena said.

While the APEAM executive said Mexico's domestic consumption is the largest in the world, he said it has dropped significantly in the past several years because of increased exports. "Mexicans eat around 35 percent of the world avocado production," Serena said. "The per capita consumption reached 9 kilos (19.8 pounds) in the early 2000s. However, it has been reduced to some 7 kilos (15.4 pounds) in recent years, due to the increasing volumes going to export markets." 🥑



Avocado thrips

Avocado leafroller

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KEN HENNELL
Avocado Grower



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PETE GILMORE
Avocado Grower

Contact our local field staff for a look at Index's historical returns:

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Gary Nichols (805) 659-4929

Santa Barbara & San Luis Obispo Counties:

Giuseppe Bonfiglio (805) 341-3059

Southern Counties:

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