

From the **Grove**

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From the Grove

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Tom Bellamore

The Future of the California Avocado Industry

Recently, the California Avocado Commission Board of Directors began anew the process of setting a strategic direction to guide the organization's programs and activities well into the future. Although this is an ongoing exercise, the industry's present circumstances and the forces shaping its operating environment and the U.S. market impart a level of urgency to the matter that was absent in past years. As the inimitable Yogi Berra once said: "If you don't know where you're going, when you get there you'll be lost." The tough work of the board, then, is to partner with management to build a shared vision for 2025—to know where we are going—and to craft strategic initiatives now, that are aligned with that vision, to ensure we do not get lost.

Growers need not be strategists to see the indicators of what the future holds that are surrounding them every day. In the southern counties, the retail price for district water in 2025 is likely to exceed \$2,000 per acre foot according to regional wholesalers. Regulatory compliance costs, which already account for 11 percent of capital and operating expenses in the specialty crop industry, will continue to rise. Labor will continue to

be scarce, environmental changes will bring new invasive pests and diseases, and South Africa, Colombia, Australia and Mexico—all states in Mexico, not just Michoacan—will be beckoning at the door to sell avocados in the United States.

The harsh reality that farming avocados in California is not going to get any easier as 2025 approaches is tempered, however, by the brilliance of the U.S. market and what it is likely to become. Growth in avocado consumption has been at 10 percent annually, with no sign of slowing. Demand for nutritious, high-quality foods will continue to increase as consumers seek out safe, sustainable and functional foods that promote health and security. With a U.S. population of 350 million in 2025, the U.S. avocado market could require upwards of 4.8 billion pounds annually to meet demand, if consumption maintains its present pace. Most assuredly, there will be a place for a product as desirable as ours, but will our industry be there to deliver it, or will we be "lost"?

At its November meeting, I told the CAC Board that I have a vision for 2025. My vision goes something like this:

"California avocados are highly

sought after by discriminating consumers who appreciate the fruit's freshness, exceptional taste, consistently superior quality, and healthfulness. These consumers look forward to the California avocado season and understand that supplies may be limited. Consequently, they are willing to pay a price commensurate with the premium attributes of the product, and to choose California avocados over those from all other origins. California avocado growers are highly productive, profitable, and well organized. Their production practices focus on providing the highest quality product possible to a discerning market."

One person's vision is not sufficient to support or sustain a winning strategy. Instead, the vision must be shared among *all* stakeholders, and those stakeholders must possess the collective will to implement specific strategic initiatives for survival and success.

California avocados are already held in high regard by consumers. Market research and taste panel data consistently show that consumers in our core markets prefer California avocados over fruit from other origins. If we are to survive, however, that preference must *always* be made

manifest not only by purchase, but by purchase with only a casual regard for price. How is that possible? Through the same underlying positioning strategies that fuel a host of high quality consumables, from cars and computers to fine wines: compete on product exclusiveness and differentiate based on quality to stake out a premium territory.

The opportunity lies before us. We already have one advantage, one point of differentiation that other avocados cannot match. We are closest to market, and closer means fresher. We are also American-made, and that counts for a lot today, and perhaps even more in the future. Best of all, Californians like eating California-grown products, and by 2025, the state's population will be 50 million strong, diverse, and have a median household income well above the national average. Virtually the entire crop could be sold right here at home in some not-too-distant future. If we create a market for California avocados that returns value substantially

above amounts received by all other avocados; if we sell close to home; if we differentiate based on freshness, quality, and safety; and if we leverage our American roots, our industry may well flourish.

As always, the devil is in the details. Let's assume for a moment that you agree that it is possible to differentiate based on quality, and command a better price. For some growers, it will be too late. High water prices, low yields and scarce labor will force them out of business. Average, per-acre costs of production in San Diego County right now already have many growers on the precipice. For other growers, it will be too hard. It may mean picking for optimal quality and not when fruit is over mature or the weather is too hot. Or picking early in a big crop year, when sizing is less than ideal, to minimize alternate bearing, rather than stressing their trees while waiting for the best market price. There will be other growers, though, who are ready to exploit the market opportunities of

the future. They will be highly productive. They will organize and sell regionally. They will be committed to quality. Their fruit will command a premium price and their return will be sustainable.

There is more to it, though. It gets tougher still. Even if we back up the quality claim with cultural practices that optimize the taste and freshness of the avocados we sell, there must be no confusion among consumers at the point-of-sale. Quality and California must not only be synonymous and in-

extricably linked, they must be *evident*. The pathway to the future for California avocado growers is further complicated by the absence of on-fruit labeling that consumers can clearly see. Labeling that boldly and proudly identifies the California origin of our product.

Of course, as with every vision, there are one or more alternatives. If the vision is fragmented and not shared, avocado growing in California will continue. If there is no collective will to get behind a quality improvement initiative, California avocados will still occupy a place in the market. If there is political resistance to point-of-sale labeling, the California message will still be heard, just not as strong.

I would posit, however, that if this is where we find ourselves as an industry in 2025, then we will be "lost" as Yogi presaged. Our 450 million pounds of production in a 4.8 billion pound market would mean single digit market share, and California avocados would simply be avocados from somewhere other than Mexico. If this is the path we are on, then the relevance of CAC diminishes over time. Without meaningful, supportable product differentiation, promoting the California brand will get tougher and tougher. By 2025, California growers may be better served by unifying with other suppliers under the Hass Avocado Board for true generic promotion: category-building activities without regard to brand or country of origin.

Heresy? Indeed it is, because right now the California brand breathes strong and its heart is sturdy. It is up to us to keep it that way, and your CAC management team has every intention of doing just that. It will take all of us together to get it done, however, and we cannot linger, for many are already at the crossroad. Will you stand with me to make real improvements in quality and build the California brand? 🥑



Chairman's Report

Vision for The Future



Ed McFadden

CAC President Tom Bellamore made a special presentation to the CAC Board during the November Board meeting titled “VISION 2025 - The Future of the California Avocado Industry (Part 1)”. Check Tom’s column in this issue of *From The Grove* for a print version of his presentation.

Tom gave the board (and now you) an honest, sometimes challenging look at the future of our industry. Earlier this year your commissioners had challenged Tom to use his many years of experience and knowledge of our industry to look forward and report what he saw to the board. That he did with no pulled punches.

The challenges are enormous, but there are opportunities if we can move forward together as an industry, recognizing what is now one of my favorite quotes, borrowed from Tom’s presentation:

The Stockdale Paradox:


“You must retain faith that you will prevail in the end, regardless of the difficulties...”

AND, at the same time...

You must confront the most brutal facts of your current reality, whatever they might be.”

I have this posted on the wall of my office, right below Dr. Jonathan Dixon’s “Alternate Bearing Cycle” poster.

We cannot ignore the realities of our California avocado growing environment, the U.S. marketplace and the rest of the world, and expect that the way we did things in the past can be continued into the future. This year we supplied almost a third of the 1.5 billion pounds of avocados consumed in the United States. Next year California will have a larger crop, but the total U.S. consumption will likely expand. By 2025 our country may consume as much as 4.8 billion pounds of avocados with Mexico supplying the largest portion. Today most of the fruit consumed in the United States is supplied by California, Mexico, Chile and Peru with some fruit also coming from Florida, the Dominican Republic and New Zealand. Production is expanding in most of these countries. They and others now waiting on the sidelines are looking to our marketplace as a future home for their fruit.

I believe that with the right ground, water and location we can continue to make a good living growing avocados in California. I am planting more trees while at the same time “confronting the most brutal facts” of my current reality. 



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CAC's Next Steps Along the Path to Improved Grower Communications

By April Aymami
Industry Affairs Manager

We hit the road.

It all began with a road trip in September: San Luis Obispo, Santa Paula, Fallbrook — three prominent California avocado grower regions, each with their distinct challenges, opportunities and resident personalities.

As part of our effort to enhance grower communications and redesign the avocado grower website (<http://www.californiaavocadogrowers.com>), members of California Avocado Commission staff and our partner agency, TMA+Peritus (TMAP), hit the road and held a series of three Grower Listening Sessions and Cook-Outs in order to cook-up some great ideas. The purpose was to:

- Identify the information you need
- Determine how you prefer to receive that information
- Understand how we can better facilitate sharing, interaction and ideas

We listened to road-worthy insights.

Thanks to the more than 150 people who attended the three Grower Listening Sessions, we have compiled many insights that will serve as the basis for our forthcoming communications plan and new avocado grower website.

We weren't surprised to learn that you need information — growing avocados is complicated and ever-changing. But it was compelling to hear the majority of participants characterize the growing of avocados as an "ongoing learning process." As one grower aptly summarized, "We would all like to have specific answers, but when I look at the science of growing a good tree — the growing of it is an art. And each of us is in different microclimates and soils. It's an ongoing learning process and we have to keep learning and experimenting — there isn't one answer."

That is what drives our efforts to continually improve grower communications. We understand that you need the right information in the right formats, at the right time in order to drive your productivity and profitability.



Here is a brief summary of the insights gleaned from the three Grower Listening Sessions.

You need relevant information from a trusted resource that can be delivered to your inbox. You're not only busy, you receive a variety of advice from a wide range of sources — and that advice is often contradictory. Growers made three things very clear. First, most growers look to CAC as a trusted resource for avocado information. Second, you simply will not visit the grower website unless you are given a very good reason to. Third, you will visit the grower website if you receive a compelling email alerting you to information that is relevant to you. The solution: For CAC to provide up-to-date, relevant information on its grower website, and then notify you that it is available for review.

You want a grower website that is a hub of information. Most growers could list a handful of other websites they used as resources, but they welcomed a CAC grower website that would serve as a hub of information to help them improve productivity. And you want the scope of the site to



range from CAC-funded research and easy-to-use cultural management tools to a hub for grower-to-grower networking and third-party articles sharing best practices.

To survive, we need to cooperate and share information. It is evident that many growers turn to one another for advice. It is also abundantly clear that many more of you would like CAC to help you better communicate from grower to grower — a grower directory, local grower groups and shared digital resources were top of the wish list.

You'd put Dr. Dixon in your pocket if you could. If you had your way, he'd visit your groves on a regular basis. Because that's simply not possible, growers requested more ways of sharing Dr. Dixon's knowledge — fact sheets, articles, videos, photos. While many of you have tried to utilize some of Dr. Dixon's materials that are currently available on the grower website, most of you find them difficult to understand. You want the scientific jargon to disappear in favor of grower-friendly language and clear steps that you can take in your groves.

We need to do a better job of promoting and differentiating the grower website. Many growers are unaware of the avocado grower website and some thought the consumer website (<http://www.CaliforniaAvocado.com>) and grower website were the same. That's not the case. CAC has created a unique grower website to house information specific to you. We need to do a better job differentiating the grower website from the consumer website, and we need to make the grower website much easier to use. Those who do currently use the grower website find it difficult to navigate, you often can't find what you're looking for and it's not easy to print materials from the site.

Robust grower website wish list. When asked what tools you'd like, the most commonly mentioned items were:

- Easy-to-understand research and cultural management information
- Videos that demonstrate best practices you can take in the groves
- Easy-to-understand graphs, charts, photos, summaries,

fact sheets and action items from Field Days and Seminars

- Grower directory
- Tools to improve grower-to-grower communication
- News/articles generated by CAC or third parties
- Email alerts for important and timely information

We need to engage younger growers. You realize the importance of teaching the next generation of avocado growers what you've learned and you'd like to integrate online tools that will engage the younger generations.

You value *From the Grove* and the *Greensheet* for different reasons. Growers shared numerous insights that will help CAC hone these popular publications. While you like to leisurely read *From the Grove* from cover-to-cover and like to share it with others curious about the avocado industry, the *Greensheet* is valued for concise information that can be read in one sitting.

The more we share, the better. While CAC provides a variety of learning sessions such as Field Days and grower seminars — not everyone can fit them into their schedule. You'd like a library of these assets that are simple to find and easy to understand.

You love what the marketing team is doing, but you'd like advance notice. Everyone agreed that CAC's marketing efforts over recent years have been superb. And you like to hear about the various promotions. But you'd also like to know about them in advance in order to adjust your harvest, if necessary.

Where we're headed next.

In November, CAC and TMAP completed a comprehensive grower communications plan. In addition, a complete review of the existing grower website was conducted to determine what's working, what's not and what we have to work with. Together we're collaborating on a complete website redesign that will ensure you have the information you need, that it's available in a variety of formats you prefer and that it's easy to find and understand. Look for the new website in spring 2013.

Callouts — Grower Quotes.

On the importance of continued learning.

"Success means experimenting and knowing there isn't one right answer."

On the importance of grower-to-grower communication.

"We have about five growers who meet once a month and talk about what we're doing. It's a great process because we all do things differently and get good ideas from each other. It's very useful."

Another Fallbrook grower said he had visited Australia and New Zealand and was surprised by the amount of grower-to-grower communication. "Everyone knew everyone's business and their groves. They have a tiny natural market and to survive they really have to cooperate. We're on the edge of survival. Can we do the same? We'll need to because of the low prices and high water costs. To survive, we need to cooperate and share the knowledge."

On the importance of using technology to get and share information.

"Technology is moving very rapidly in an instant information scenario, so we need to use these tools to get those instant answers. I love the meetings and we need to keep doing them, but we have to put together a communication methodology that gives us close-to-instant information."

On the most popular item in *From the Grove* — grower interviews.

"I enjoy the grower profiles in *From the Grove*. It's the first thing I turn to because they usually spill the beans about something. Grower interviews are key because they share best practices. For us to survive, we need to share information more."

On the email-to-website connection.

"I would love a weekly email that would summarize what's new or hot on the website so I could look at the email and decide if I want to go to the web and look at it."

"Email seems to be the primary means of communication — I would love email once a week. Especially if it's critical information because sometimes we have our blinders on."

On the need for easy-to-understand information from Dr. Dixon.

"I would like to see Dr. Dixon filter a lot of research down into understandable terms for us and have it on the website. I don't need to know all the percentages and probabilities, just need to know what to do and why. I know the information is all out there, but I can't understand it."

On the relationship between relevant information and improved productivity.

"CAC should help growers improve our yields because we'll always see price fluctuations. But if our yields are high

enough then we'll still make money — that will help the industry as a whole and then we'll be around for a long time. Put that information on the web."

On the importance of the next generation.

"For multi-generational and family farms it's hard to keep youth involved in this process. We need to get the younger and next generations involved and start teaching them now."

On the much-loved *From the Grove*.

"I love this publication and that it arrives in everyone's mailbox. It's a good representation of what it is to grow avocados so it can be used as a good tool for us to use in front of our buyers. We can say, 'This is what avocado farming is.' The publication is clearly a lot of work and a good thing. I read it cover to cover."

On the importance of Field Days and Seminars — and sharing that information.

"Every grove is different — so there's not one thing you can do, but you can tailor what you do to your grove. If CAC has the ideas to share with us and has seminars, we at least know about them and then can try them." 🥑

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Production Research Focuses on Grower Needs

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.

At the October CAC Board meeting, the 2012-13 business plan and budget was approved. This included approximately \$1.4 million for production research. A significant portion of this funding is for ongoing multi-year projects previously approved for funding. These include projects in the areas of rootstock and scion breeding, plant pathology, and entomology, as well as the polyphagous shot hole borer beetle/fusarium dieback complex.

There were five new projects funded this year in the areas of entomology (2), production/plant physiology (1), plant pathology (1) and precision agriculture (1). The focus of the newly funded entomology projects is sustainability and integrated pest management (IPM), with funded projects looking at identifying predatory mite species for the control of persea mite, and developing tools for monitoring pesticide resistance in avocado thrips. The horticulture project is a first step in taking a focused look at salinity tol-

erance among rootstocks. In the area of plant pathology, a new project was funded for two years to develop rapid diagnostic tools for identifying phytophthora species. And lastly the precision agriculture project is looking to develop computer technology that can identify pest and disease outbreaks in avocado groves from satellite imagery or aerial photographs.

Over the next couple of issues of *From the Grove* we'll look at each of these projects in detail. In this issue we start with the salinity study and pesticide resistance monitoring tools.

Salinity Tolerance

In the 2012-13 budget, the CAC Board approved \$232,000 to fund a four-year project by University of California at Riverside Subtropical Horticulture Extension Specialist Dr. Peggy Mauk to evaluate a selected set of rootstocks for their tolerance to salinity. The proposal that Dr. Mauk submitted was in response to a specific request by the Production Research Committee (PRC) for research on salinity, and the PRC views this as the first small step toward addressing this issue.

Avocados are among the most sensitive tree-fruit crops to salinity,

which is the term for the amount of salts found in soil and irrigation water. Salts are a natural component of soils and water, being composed of various compounds and elements that dissolve in water, but may also be introduced in agricultural settings from sources such as fertilizer. Most commonly, we think of sodium chloride when we think of salinity, but other common sources are potassium chloride, magnesium and calcium sulfates, and bicarbonates.

Because of the ever-increasing demand for water in California, water districts are increasing the pressure on agriculture to accept greater quantities of poorer quality water (reclaimed and Colorado River water). Unfortunately, reclaimed water is frequently much higher in salinity, particularly chloride and sodium, compared with other water sources because the wastewater treatment process does not usually deal with inorganic salts. As more reclaimed water is allocated to agriculture, this becomes a major issue for growers of salt-sensitive crops such as avocados.

In 1993 and 2010, the University of California imported a number of avocado rootstocks from Israel and South Africa, respectively. The Israeli rootstocks were identified as

salt-tolerant by researchers in that country, whereas the South African rootstocks were identified as phytophthora resistant, but have not been tested for salt-tolerance. In June 2011, a field trial was planted at the UC Riverside Agricultural Research Station with Hass trees grafted onto 11 of these rootstocks. The rootstocks include SA5, SA6, SA7, SA16, SA17, SA18, Zentmyer, Uzi, Steddom, Eddie, and Brandon. Trees grafted on Thomas and Dusa serve as standards for comparison.

To test the salt tolerance of these rootstocks, the trees in the trial will be irrigated with water amended to achieve different levels of quality as measured by electrical conductivity (EC) – a measure of the total salts in the water – and chloride content. The greater the EC or chloride content, the poorer the water quality is and the lower its suitability for use on avocado. In general, water for avocado irrigation should not exceed an EC of 0.75 ds/m or a chloride content of 100 ppm.

Beginning in early 2013, half of the trees in the trial on each rootstock (at least eight trees) will be irrigated with either Gage Canal Water (EC of 0.67 dS/m and about 40 ppm chloride, control) or amended Gage Canal Water with an EC of 1.5 dS/m and 175 ppm chloride. Through 2016, tree growth (canopy volume, trunk diameter), flowering, fruit set and yield, physiological parameters – such as photosynthesis and stomatal conductance – and soil characteristics – such as EC and pH, will be measured.

Starting in 2014, Dr. Mauk will host annual field tours for growers and nurserymen to see the results of the study as they develop.

Since this study is being conducted in clean soil free of phytophthora it will only assess one of the key traits (salinity) a superior rootstock must possess to become established in California's avocado industry. However, this research will help to identify rootstocks that may be used in further selection tests and/or breeding efforts to find a new superior rootstock that is salt tolerant and phytophthora resistant.

Pesticide Resistance Monitoring

Another project funded in the 2012-13 budget is by Dr. Joe Morse, UCR professor of entomology, to look at sustained chemical control of avocado pests. This project, which builds on a previous project on chemical control of avocado thrips and perseas mite, was

funded for approximately \$475,000 over five years. The goal of this project is to develop sensitive methods for assessing pesticide resistance development in avocado thrips and to educate growers and pest control advisors (PCAs) about how to avoid resistance development so that valuable chemicals, particularly abamectin, do not become ineffective.

Since 1999, avocado growers have been able to use abamectin for control of avocado thrips and perseas mite. Over the past five years, six new chemicals from five different classes of chemistry have become available for use against avocado thrips (Delegate, Danitol, Movento) or



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CAC Hires Research Project Manager

Tim Spann has joined the California Avocado Commission as research project manager with his main duties being a conduit between the researchers and the growers.

"It's very important that we make sure the information flow goes both ways," he said. "We need the researchers to be working on the problems that the growers have and we need the growers to apply the research to solve their problems."

Spann's background makes him a perfect fit for the job. "In my previous position, I trained a couple of graduate students as their advisor and I found that I really liked that work."

Spann was previously at the University of Florida working off-campus in a research facility in a tenured position. While he liked the research, he spent an inordinate amount of time writing grants and doing administrative work away from the applied research arena that he thrives in. For the past several years, he has specialized in citrus but he said many of the basic issues are similar challenges that avocado growers face concerning disease and pest control and other cultural issues.

Spann grew up in Niagara Falls, N.Y., until the family moved to Florida when he was about 15. He went to the University of Florida and got his bachelor's degree in environmental horticulture. "I always had an interest in plants and decided that is what I wanted to study in college," he said.

He figured he would have a career working in the nursery business, and he did just that upon graduation. He specialized in greenhouse production with an emphasis on floriculture. And in fact he secured a job with a large nursery and spent two years doing everything by the book. "They had a manual and a philosophy that you don't ask questions you just follow the book and do things the way they were always done."

That didn't quite sit right with Spann who discovered he wasn't learning anything by the experience. He decided to go back to school and get a masters in horticulture, also at the University of Florida. He followed that with his PhD at the University of California at Davis. He was in California for the better part of five years and loved the experience. However, he found his first job in academia as an assistant professor back at the University of Florida. That led to the tenured position off campus and eventually led Spann to look elsewhere.

In fact, he was applying for a position at the University of California at Riverside when he met CAC's Dr. Jonathan Dixon, who was an advisor to the hiring committee. One thing led to another and Spann was hired for the new position at CAC. "I really enjoy working with growers and I decided this is the direction I'd like to take my career," he said.

He said that in this position, he expects to spend a limited amount of time in the office with most of his work being done in the field either with researchers or with growers. 🥑



Tim Spann



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persea mite (Envidor, Zeal, FujiMite – likely by end of 2012). Having pesticides of different chemistry classes allows for rotation of the different chemicals to prevent resistance to one type of pesticide. However, if these new chemicals are not sufficiently rotated with abamectin, there is a real danger of abamectin-resistance development by avocado thrips and persea mite, which would cause the loss of this valuable chemical for controlling these pests.

In order to prevent this, it is important to have accurate methods for monitoring resistance to abamectin in avocado thrips populations, educate growers and PCAs about how to avoid resistance development, and to develop use recommendations for abamectin alternatives.

A primary objective of this project by Dr. Morse and his team is to develop sensitive biochemical and molecular methods to evaluate avocado thrips resistance to pesticides. While the primary focus currently is on abamectin, the methods developed will allow for the general resistance monitoring of thrips populations to other pesticides for which there is risk of resistance development.

The first resistance monitoring tools that will be investigated are in the area of insect biochemistry. Insects possess a number of enzymes that can breakdown insecticides. By developing biochemical assays to measure the activity of these enzymes in field thrips populations, shifts in susceptibility to specific pesticides can be monitored.

In addition to enzyme activity, insects can develop genetic mutations that increase their resistance to pesticides. In abamectin-resistant red spider mites a specific gene mutation has been determined to be the source of resistance. Dr. Morse and his team will develop the necessary tools to monitor for this and other genetic changes in avocado thrips populations.

Knowing that a pest population is becoming or has become resistant to a specific pesticide is not enough. That is why as part of this study a series of demonstration field trials with existing abamectin alternatives will be conducted. These trials will be used in outreach efforts to provide growers and PCAs with efficacy data and rate recommendations as well as rotation schedules to delay abamectin-resistance development. In addition, Dr. Morse's team will continue their very successful program of screening new chemistries for control of avocado pests to develop efficacy data to justify future registration of new products.

This research will help to en-

sure that California's avocado growers continue to have the tools they need to grow the best quality, pest-free fruit they can in a sustainable and environmentally sound manner.

The two projects summarized in this article demonstrate the PRC's efforts to fund research that is focused on short-term (preserving effective pesticides), mid-term (developing recommendations for currently-registered pesticide alternatives), and long-term (registering new pesticides, developing salinity-tolerant rootstocks) objectives, all with the goal of ensuring the continued success of the California avocado industry. 🥑

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2012 Fall Avocado Tracking Study

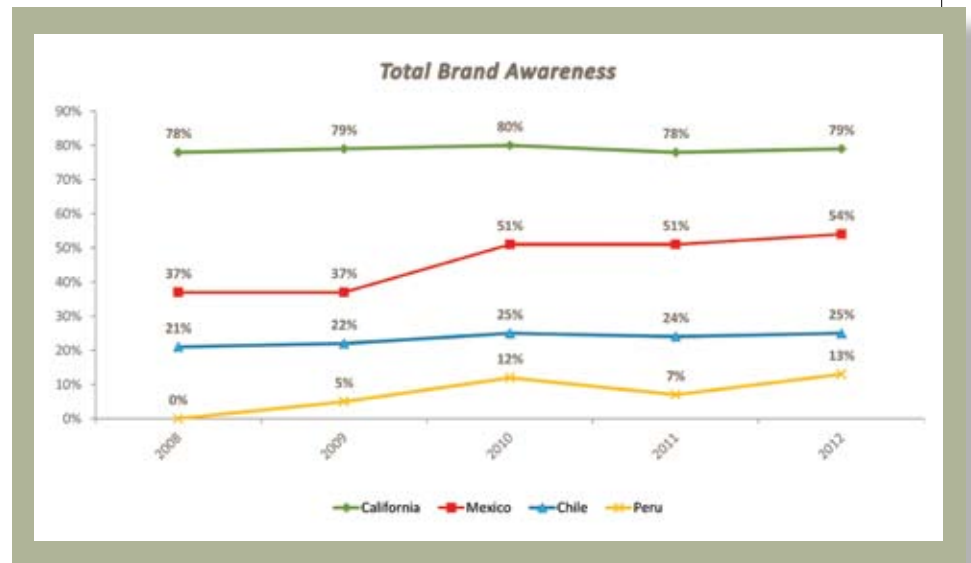
The most recent consumer research study conducted by the California Avocado Commission (CAC), the Fall 2012 Avocado Tracking Study, revealed good news for California avocado growers. Consumers reported high levels of awareness, brand preference and higher attribute ratings for California avocados compared to imported avocados. These consumer attitudes provide a strong platform for CAC to continue positioning California avocados as the premium brand of choice.

Key Learning and Insights

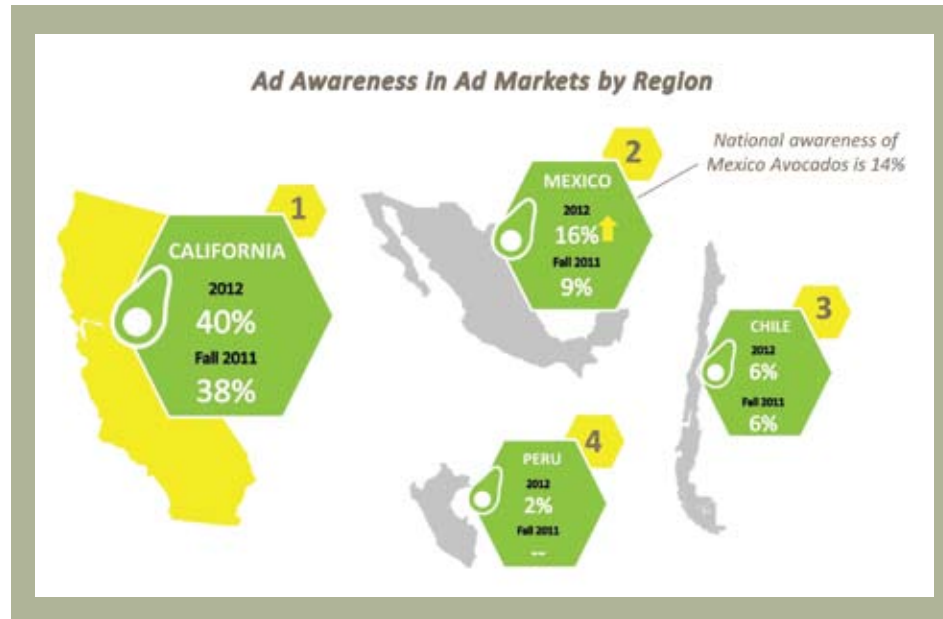
Awareness

Brand awareness in this study was defined as unaided awareness of the different avocado growing regions. As trending shows, California avocados continue to have strong and stable brand awareness over the past few years in the ad markets – defined as California, Mountain States and Pacific Northwest States. Competitors do not even come close to the same brand awareness achieved by California avocados.

Since the start of the tracking study in 1994, California avocado brand awareness has grown from 65 percent to 79 percent, while remaining stable in the non-ad markets. This improvement in brand awareness between 1994 and 2012, even with increased volume from imports, demonstrates the impact of CAC's marketing investment to reinforce California's strong brand awareness in markets where the majority of California avocados are distributed.



In CAC's ad markets, California avocado ad awareness was strong in 2012, and has stayed strong within the ad markets over the past few years. This year the Mexico brand gained some ground from 2011, but still has much lower ad awareness in comparison to California (16 percent vs. 40 percent).



Preference

Consumers Want U.S. Grown Avocados

Importance of U.S. grown has become a big factor for consumers who want to know both the face and place behind their food. Tied closely to the 'local food' movement, shoppers also gain a sense of pride when they feel they are supporting local farmers and the local economy with their purchases. This trend helps explain why we see 7 out of 10 stating that having U.S. grown avocados is important to them, reaching an all-time high this year. There are also 4 out of 10 checking 'country of origin' during the purchase process, compared with 3 out of 10 last fall.

Methodology for the CAC Fall 2012 Tracking Study

Since 1994 the Avocado Attitude and Usage Tracking Study has been a tool used by CAC to help measure its marketing initiatives and monitor consumer behavior and attitudes relating to California and other avocados. Tracking measures include advertising and growing area awareness, preference, perceptions based on growing regions and consumer usage of avocados. In recent years the Hass Avocado Board (HAB) had funded the study for use by its member associations. In spring 2012 HAB implemented changes in their Avocado Tracking Study, which removed tracking by specific country of origin to glean more information on consumer attitudes about nutrition. Because of this change the Commission decided to conduct its own Fall Avocado Attitude and Usage Tracking Study to continue, without interruption, the data collection that has been in place since 1994. This study is designed specifically to measure the impact of CAC marketing efforts compared with those of import competitors.

The Fall Tracking Study was fielded in September to coincide with the end of CAC's 2012 advertising campaign to track awareness. The study was conducted online by Bovitz Inc. with 1,500 respondents recruited from a nationally representative online consumer panel with a 70 percent/30 percent female/male split. Respondents had to meet the following requirements: age 25 or older, primary or shared responsibility for the household grocery shopping, and awareness of avocados. These qualifications are consistent with previous tracking studies and also match the primary avocado consumer target. The total sample was split evenly between respondents living in the ad markets (California, Mountain states, and Pacific Northwest states) and those living in non-ad markets in order to have enough data to analyze both markets individually. 🥑

California Still On Top for Brand Preference

California avocados continue to be the preferred brand in comparison to all other avocados. This year California held strong at 66 percent preference, and remained at the high levels that were first achieved in 2009. Mexico brand preference decreased from last year (5 percent to 2 percent), while those that stated they had “no preference” for any region increased (from 25 percent to 29 percent). The tracking study indicates that preference for the U.S. growing region, along with shopper perceptions that California avocados are higher quality in comparison to other growing regions, contribute to overall preference for the California brand.

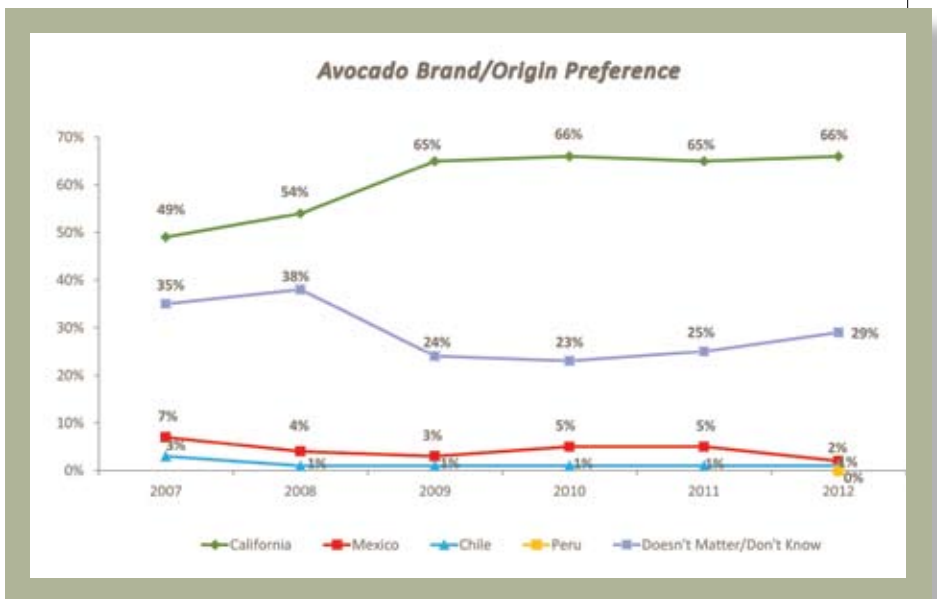
In California the preference is even higher with 75 percent stating California as their choice, compared to 69 percent last year. This significant increase in brand preference demonstrates the value of the 2012 4th of July TV campaign that ran exclusively in California.

Attributes

High Attribute Ratings for California

Attribute ratings are measured by respondents choosing what they feel is the region that best describes the following key metrics: freshness, premium quality, taste, food safety and reliability. California not only has been trending upwards for the attribute ratings in recent years, it also takes a commanding lead over Mexico, Chile and Peru combined.

Overall, the CAC Fall 2012 Avocado Tracking study confirmed that the CAC’s marketing activities are having a positive impact on consumer opinions. Since shopper opinions are at the foundation of their grocery purchases, maintaining and building brand preference and positive opinions about California avocados, it is very important for CAC to continue its branding efforts. 🥑



CAC Board Sets 2012-13 Assessment Rate; And Approves Business Plan & New Budget


At its October 18, 2012 meeting, the California Avocado Commission (CAC) Board of directors voted to adopt the 2012-13 business plan, budget and assessment rate.

The task of setting the budget and assessment rate was a careful balance of providing the most effective level of marketing, industry and research support, while maintaining a sustainable assessment rate level and ensuring adequate reserves for the following season. Adopting an assessment rate of 1.75 percent and

a budget of nearly \$17 million, for the fiscal year beginning November 1, 2012, provides CAC an adequate marketing spend to keep California branding strong in a year that is expected to see 1.6 billion pounds of avocados sold in the United States.

In addition the approved budget allocates funds towards industry affairs activities to remain engaged and advocate for the interests of California avocado growers, as well as a strong research spend for projects focused on increasing production and critical mass, grower education and

quality.

An overview of the 2012/13 approved budget is provided below, however for a look at the complete business plan and budget, visit: <http://www.californiaavocadogrowers.com/marketing-program/>. 

Marketing:	\$11,500,000
Industry Affairs:	\$1,385,000
Production Research:	\$1,374,591
Administration:	\$2,739,500
Total 2012/13 Budget	\$16,999,091

2012 CAC General Election Results

On November 1, 2012 the California Department of Food and Agriculture issued the results of the 2012 CAC General Election, with the following individuals being elected for the two-year term of November 1, 2012 through October 31, 2014:

District 1:

Member: Shane Tucker
Alternate: Jerome Stehly

District 2:

Member: Ohannes Karaoghlanian
Alternate: Henry Reed

District 3:

Member: Doug O'Hara
Alternate: J. Michael Lanni

District 4:

Member: Art Bliss
Alternate: Larry Rose

District 5:

Member: Bradley Miles
Alternate: Jim Swoboda


Handlers:

Member: Scott Bauwens
Alternate: No Alternate
Member: Gene Carbone
Alternate: No Alternate

The newly elected members and alternates were formally seated at the November 15, 2012 Board meeting, joining the 15 currently seated commissioners, where the full Board elected the following producers members to serve as the 2012-13

Executive Committee:

Chairman: Ed McFadden
Vice Chair: Doug O'Hara
Treasurer: John Lamb
Secretary: Carol Steed

For a complete list of CAC Commissioners and Alternates, please turn to page 6 or visit: <http://www.californiaavocadogrowers.com/your-representatives>. If you are an eligible handler and are interested in filling one of the vacant alternate handler seats, please contact April Aymami at aaymami@avocado.org or (949) 341-1955. 

Grower Profile



Avocado Pioneer: Linh Curtis

By Tim Linden

For about 40 years, Linh Curtis has been nurturing avocado trees in the Temecula region of California. She considers herself a pioneer and has high hopes for her current groves over the next several years.

"I've been taking care of those trees for years," she joked. "When I retire I expect them to take care of me."

Linh fell in love with the concept of being an avocado grower more than 40 years ago, and in fact, she credits or blames the avocados for her divorce. "My husband thought I was crazy to go out there and grow avocados. He hated the country. He was a city boy and I was a country girl."

That difference did lead to divorce and caused the couple to sell their 40-acre grove during their divorce proceedings in the 1980s. But that didn't deter Linh from her true love.

"I immediately started looking for another grove to buy," she said.

She lived and worked in Irvine at the time, but she would spend every weekend driving around the Temecula area looking for her next avocado project. In 1992, she found a place worthy of her devotion, which you can tell as Linh describes it.

"One day I was driving around and I got lost. All of a sudden I was on El Prado Street and I came across this one little 'For Sale' sign on a grove that didn't look that great. But it was a beautiful piece of land with a great view. I loved it."

She called the owner who told her the grove had been for sale for awhile with no takers because the avocados had bad root rot. "I told him I wanted it but I had to close escrow in 10 days. He wished me luck and it was mine."

She next contacted Len Francis, who she claims is the



Linh Curtis

best grove manager in the area. "I asked him what should we do for root rot. He suggested that we plant Texas-style Ruby Red grapefruit. So we planted 300 Star Ruby grapefruit and fenced the entire area. And then I bought 233 new avocado trees."

Today that 10-acre grove has about 900 avocado trees as well as Ruby grapefruit trees and 50 persimmon trees. In addition, she is a partner in another seven acre grove in the area with Brad Jones that has both avocados and citrus as well.

Linh said she is deeply involved in the management of her avocado trees spending every weekend in the groves. "To me it's a vacation. Every weekend I take a vacation into my groves. I love them," she said.

She calls the work a labor of love but has hopes that the trees will help her out in retirement. "Right now I work (as an accountant) to support the land. I have no children; I have no husband. I just take care of my trees."

This past year, "we put in an Ecoflow system to improve the water quality."

Every year, she said she does something to improve the

trees and improve her crop. Like other growers, she lists the cost of water and pest control as her biggest problems.

She has always been a great ambassador for the avocado industry convincing others to invest and become grove owners. "I have a lot of friends who have bought groves over the years," she said. "Most have already gotten out of the business, but my sister and brother-in-law just bought a very beautiful 24 acre grove and built a very big house on the hill. I don't know why they need such a big house but they love it and wish I would have talked them into doing it sooner."

What depresses Ms. Curtis is watching other groves being abandoned but she understands that sometimes the cost of water makes it impossible to keep an older grove profitable. "It is very sad," she said.

But she doesn't have a lot of time to worry about those issues. Every day, she gets up at 5 a.m. to begin the two hour commute to her accounting job in Carlsbad and then returns back home during the height of the traffic in the afternoon. "I don't mind it at all. I am just so thankful I have a job and I have my groves. I really enjoy it." 🥑



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Reaching Retail & Produce Industry Stakeholders through Trade Communications

An important component of the California Avocado Commission's consumer advertising message encourages shoppers to insist on California Avocados. In order for them to do so, California avocados need to be on display where they shop. Therefore a critical component of CAC's marketing effort is directed to retail trade marketing, including trade advertising and public relations, with the key objectives of increasing (retail) demand for and the value of California avocados.

Trade advertising includes paid ad placements in grocery and produce trade media outlets including newspapers, magazines and online, and is a key element in CAC's marketing toolbox. It helps position California avocados as a premium product with retailers, provides them with information about the season and communicates California avocado competitive advantages, such as consumer preference, proximity to market, reliability of quality, as well as CAC's marketing support. Advertising in trade publications reaches retail decision makers as well as produce industry stakeholders. Trade advertising enhances the commission leadership position by establishing CAC as the "go-to" resource for avocado category information.

This year CAC used a one-third page vertical ad format designed to increase the number of reader impressions through multiple ads in selected trade publications. California avocado season launched with ads in *The Packer*, *The Produce News* and *Produce Business*. Additionally, Post-It® and banner ads in *The Packer* along with a banner ad in *The Produce News* were utilized to promote the start of the sea-


CAC programs will run into October

BY RAND GREEN


With a considerably larger crop than in 2011 and with the shipping season likely to stretch much further into the fall, the California Avocado Commission will extend its programs later into the year than it did last year as well, according to Jan DeLyser, vice president of marketing. An estimated aggregate volume from all sources of 1.4 billion pounds of Hass avocados expected to be consumed in the United States in 2012, and California expects to account for 400 million pounds of that. During late summer and early fall, California fruit will be "over 50 percent of the volume" in the market, she said. Going into Labor Day this year, CAC will have some late season activities in

its key advertising markets in the Pacific Northwest, California, Colorado, Utah and Arizona. "We will be doing radio" that will run through the period leading into Labor Day and continuing into mid-September, "and there are opportunities for retail tags on promotional activity," Ms. DeLyser said. This will be "the longest that we have run the radio ads, at least in my recollection," she said. The commission will also be running print ads through September and October in such magazines as *Eating Well*, *Fine Cooking*, *Healthy Aging*, *Savuer* and *Sunset*, "so the print media will be strong," Ms. DeLyser said. Also, through October, there will be "a lot of online digital activity" featuring California avocados on "a lot of dif-

Continued on page 53



Jan DeLyser



Tom Bellamore

son in the March 26 issues. Four different creative executions with a similar ad layout featured four separate, simple headlines: Now in Season, Consumer's Choice, Celebrate 4th of July, and Consistently Reliable. Each headline was reinforced by additional information if the reader chose to spend more time with the ad, but by keeping the messages

very simple even those who simply flip through the pages of trade publications could catch the key ideas CAC wanted to communicate. Additionally, the ads leveraged the California avocado brand synergy utilizing similar imagery and fonts to CAC's consumer ads.

CAC's trade ad campaign launched in March and concluded in August with the heaviest media buys coinciding with the peak California avocado availability and tailoring off as the season ended. A total of 79 one-third page vertical ads were placed in eight print publications; these ads in combination with banner, Post It® ads and online ads garnered approximately 2.5 million trade media impressions.

Trade public relations (PR) activity complements CAC's trade advertising campaign. The key difference between advertising and public relations is that advertising is paid and the commission completely controls the content. CAC's trade PR program provides editorial content to the media and the publications may choose to use part of the content or modify it to suit their editorial needs. PR is key to gaining in depth exposure for and coverage of California avocados.

CAC's trade PR target market includes all of the publications used for trade advertising, and also reaches out to additional produce industry and retailer-focused publications. Ultimately trade PR is intended to reach two audiences: retail decision makers and produce industry stakeholders. Some monthly magazines have long lead times, and are more "feature content" oriented with deadlines months in advance of publication. Weekly newspapers and online trade publications have closer deadlines and are always in search of the latest "news" and information. Regardless of the publication's format, CAC's trade PR outreach reinforces strategic communication about California avocados.

Desk-side briefings provide the opportunity for CAC staff to meet with the editorial staffs of key trade publications. In 2012 the commission took to the road in early March to meet with two of the most widely-read produce industry publications, *The Packer* (Kansas) and *The Produce News* (New Jersey). On both visits Jan DeLyser, vice president of marketing for CAC, shared highlights of the commission's 2012 marketing plans. CAC brought in catered lunches for the staff featuring key recipes planned for upcoming marketing programs, including the Fourth of July Firecracker Guacamole, and engaged the staff in hands-on activities. Media coverage following the visits far exceeded expectations, including immediate news articles, video placement and outstanding coverage throughout CAC's season.

In advance of and during the California avocado season, CAC distributes announcements and press releases to the trade media. This year's topics included CAC's nutrition marketing activities, Cinco de Mayo, CAC contests and sweepstakes, the American Summer Holidays promotion, Downtown Disney Week, foodservice marketing and ac-

tivity with Chipotle, plus pre- and post-Produce Marketing Association Fresh Summit coverage. In addition, CAC provided the trade media with story ideas and angles that they could use to promote California avocados.

The commission receives outstanding coverage in the trade media, a result of proactive outreach through press releases and also CAC's responsiveness to trade media requests for interviews and information. Many times reporters are looking for data about avocados or information about industry trends, CAC supports these requests to build strong relations with the media and help keep California avocados top of mind. This year Jan DeLyser also authored several guest columns for key trade publications, which further increased CAC's trade press presence.

Between coverage from the desk-side briefings, announcements, press releases and media interviews, CAC's trade PR activities garnered 2,539,000 media impressions last season, plus many more on online sites that do not yet have measurement for audience reach. The commission's combined trade advertising and trade PR outreach helped encourage retail demand for California avocados by delivering more than five million trade media impressions with strategically-targeted information.

Plans are underway for the 2013 trade communications outreach with creative development of the trade ads and the trade press outreach. 🥑



Growing Avocados: Developing a Description of Best Practice

In the last issue of *From the Grove* an overview was presented of growing and producing avocados. This article describes the growth and production characteristics of avocado trees and then suggests the cultural management activities that could be used as best practice.

Growth and Production Characteristics Of Avocado Trees

The avocado tree produces a small number of nutrient-rich fruit whose seeds have high genetic diversity. The fruit appears to be designed to be eaten by a large animal in order to be spread widely throughout a rainforest. It is speculated this was the extinct giant ground sloth. Today wild avocado trees have very limited seed dispersal by animals.

In rainforests light levels are low near the forest floor, therefore seedlings of rainforest trees have evolved to grow rapidly up into the light. An adaptation of rapid growth allows the plant to be maintained in a juvenile state where flower production does not occur until the tree is exposed to high light levels that then allows the development of nutrient-rich seeds to be supported. Avocado seedling trees in the shade grow rapidly upwards until they are into high light conditions where they develop flowers. If young trees are grown in conditions of high light levels they develop flowering wood early when the trees are still small.

In the rainforest, the soils are nutrient-poor and competition for space is very intense. A nutrient-



dense seed is valuable in such an environment as it allows the new plant to become established quickly and to have enough nutrients for at least a year of growth. The soils are generally very well drained, have high air content and therefore oxygen content, hold their structure well but tend to be highly leached (nutrient poor) from high rainfall and often have high organic matter content. Avocado trees have low amounts of roots compared to the above-ground portion of the tree and the amount of roots becomes very low when root rot, wet soils and shallow soil conditions are present. The root environment of the rainforest floor is very competitive as most of the nutrients are in the leaf litter or top organic layer where the nutrients can be recycled back into plants. By having a shallow root system and rapid root growth flushes, nutrients released in the breakdown of organic matter are captured by the tree as they become available. The roots appear to have

been designed to efficiently scavenge for nutrients for much of the year. An implication is that for regular heavy cropping of nutrient-rich fruit application of fertilizer is needed if the tree is to avoid a shortage of resources. Further, the implication is that continually maintaining a supply of nutrients readily available to the avocado tree is needed by small regular applications of fertilizer.

The Importance of Roots

Avocado roots do many things: anchor the tree in place, take up water and minerals (nutrients), serve as a carbohydrate store, and provide essential plant growth regulators for controlling shoot growth. Actively growing roots produce the plant hormones cytokinins, which have as one function to promote the growth of lateral buds leading to branched shoots. On avocado trees there are two types of shoots: unbranched shoots (technical term: proleptic) and multi-branched shoots (techni-

cal term: sylleptic). Multi-branched shoots have many more flower buds than a single unbranched shoot and therefore a higher fruiting potential. A healthy active root system is necessary for the shoots to have the capacity to develop plenty of flowers. There is a feedback mechanism from shoots to roots where actively growing shoots produce plant hormones called auxins that act to stimulate the growth of roots. By having interactions between cytokinins and auxins roots and shoots can regulate the growth of one another. When the roots are unhealthy and have weak growth, trees are stunted with small yellow leaves in a sparse canopy. The effect of a poor root system is more than just a lack of water or nutrients, shoots also tend to be short and thin with poor fruiting capacity. The weak shoots feedback results in roots that are sparsely distributed under the tree and are susceptible to disease. Because roots and shoots are connected, improving the health of one should improve the health of the other. This is known as the shoot to root balance, where the most obvious symptom of a bad shoot to root ratio is a poor canopy of leaves.

Avocado roots need to be protected from disease; this is mostly good *Phytophthora* root rot management. Roots also have a role in storing carbohydrates to allow rapid growth and for a ready energy source when actively absorbing nutrients. To grow rapidly, avocado roots also need a good supply of air which explains why avocado roots do best in free draining soils with high air content, and that avocado roots can readily be found in leaf litter above the soil. A healthy root system is also needed for the best nutrient and water uptake. When the trees over-crop, relative to their resources, the trees can rapidly deplete most of their energy reserves so that the roots cannot take up the additional nutrients needed from fertilizer applications.

Maintaining conditions where there are large amounts of healthy roots is a likely prerequisite to achieve regular high production.

Setting up Fruiting Potential

A properly set-up tree has: moderate amounts of fruiting wood, good carbohydrate reserves, good nutrient reserves, the right balance between shoots and roots for good hormone levels and has moderate vigor. Trees like this can be expected to set crops in the absence of bad weather, such as a freeze or heat wave. The best fruiting wood comes from the summer shoot flush. There needs to be enough reserves of nutrients and carbohydrates at flowering to support mature fruit dry matter accumulation and growth as well as new shoot and root growth. Ideally flowering wood should have large, dark green leaves, and the branches carrying flower buds be thick and round. Flower bud initiation occurs at the end of shoot growth in July/August so there is a need for the summer growth flush to be fully developed and hardened off by the end of September. Flowering should not be excessive and the leaves adjacent to flowers have a high nutrient status so that the leaves stay green and not fall or yellow during flowering. "Over-flowering" inhibits vegetative growth and is to be avoided. Trees that are "over-cropped" deplete their nutrients and carbohydrates to exhaustion. Trees in this state can take two years or more to recover after which they become strongly alternate bearing.

Avocado seeds vary over a wide range of traits (high genetic diversity) as an adaptive strategy where some seeds will germinate over a wide range of different circumstances meaning there will always be some trees capable of establishing even in marginal sites. However, fruit with a nutrient rich seed strongly draws down the trees reserves of carbohydrates and minerals. For heavy

regular production of fruit, the trees need to readily replenish the carbohydrates and minerals lost in the fruit. The trees themselves can also control their seed production through abortion of fruit if conditions are poor for seed dispersal and establishment.

Avocado trees are relatively plastic in their ability to adapt to a wide range of environments. However, it is this very adaptability that implies there is no one correct cultural management to apply for all avocado growers. However, it is possible to estimate best practice for cultural management. This best practice could be applied and evaluated in demonstration groves.

Possible Best Practice for Growing Avocados

(Disclaimer: this next section is personal opinion and educated guesses that require testing for validation.)

Best practice: Balance between vigor and productivity

Avocado trees in their native environment will naturally alternate bear – that is have a heavy crop every second year, in a well-established two year cycle. The reasons for this are not well understood although the triggers that set off an alternate bearing cropping pattern are easy to recognize. Any event such as freezes, droughts, heat waves, fires, heavy pruning and very late harvest can cause loss of a large amount of flowers or flower buds which can trigger alternate bearing.

There is a long lag time, up to two years, between the growth of new shoots for fruiting wood and the harvest of fruit. To achieve regular production there should be a mixture of different ages of wood within the tree which help moderate flowering. The right balances of shoot ages in the tree requires active cultural management.

Based on the above, producing high yields of avocado fruit appears to be a compromise between the need

for the avocado tree to grow and produce new flowers, and the presence and development of fruit set in the last flowering period. It is proposed that best practice for consistent production of avocados is to focus on regular production of flowering wood using the cultural management aspects of nutrition, root rot control, pruning, harvest strategy, and water and salinity management. Annual production of the right amount of high quality fruiting wood is therefore the challenge facing the California avocado grower to avoid alternate bearing. The grower needs to achieve annual production of fruiting wood on summer flush that produces a good supply of carbohydrate. The trees need high light exposure, pollination and fertilization of flowers for good fruit set. The trees also need to receive a good supply of nutrients, the balance between fruiting and growth of flowering wood allows flowering each year and a moderated climate to avoid extremes of hot and cold, and finally strong water and salinity management.

The processes within the tree that lead to flowering, fertilization, and fruit set of viable fruit all requires energy, nutrients and the right hormone mix. As well as flowering and fruit set, the tree has to support the growth of a new flush, new roots, and mature fruit on the tree. This means the tree is using more energy than it is producing in spring when new leaves are developing before they become net energy exporters anywhere from five to seven weeks after the spring flush starts. The shoot growth during flowering is also competitive with fruit set and limiting spring flush can be important to maximize fruit set potential. The growth of fruiting wood takes energy from the tree which is also needed to build up a reserve for future flower bud development and flowering. The tree needs to get a sufficiently high enough production of carbohydrates

that can then be kept in reserve for flower bud development and flowering, which can be difficult to achieve consistently each year. The options to do this are limited, with the natural system of alternate bearing of “on” and “off” years where carbohydrate accumulates when the crop is light and is depleted when the crop is heavy. When it is necessary to force new growth flushes, application of fertilizer, additional water, harvest strategy, and Phytophthora control can be used.

However, manipulating growth flushes through nutrition, water, Phytophthora control and harvest strategy do not give a reliable response from the tree. As an example, when trees are in a heavy “on-crop” year, the resources of the tree are run down by the maturing fruit. This extra demand by the fruit comes at the cost of a good shoot flush and root growth. The poor shoot flush then leads to weak flowering the next year. The roots can be debilitated such that there is no response to additional applications of fertilizer. Pruning trees with roots that are affected by root rot, wet or dry soils and shallow soils can help to rebalance the amount of shoots to roots to favor roots. This in turn should result in better canopies of leaves and shoots improving the fruiting potential of the trees.

The most controlled way of forcing a new flush is to use pruning. Pruning has the potential to allow forcing of new growth at the correct time and in the correct amount. Active management through pruning, nutrition and water management can be used to achieve the best mix of fruiting and shoot growth. Pruning can stimulate growth for good flowering or be used to reduce excessive flowering. To ensure the re-growth from pruning develops flowers and sets fruit within the normal phenology cycle, pruning cuts need to be made at a time that matches the life cycle of unpruned shoots. The cor-

rect timing of pruning for summer shoot growth can be calculated by working back from when it is expected summer shoot growth has stopped and “hardened off” in time for cooler weather that induces flower bud development. For example, if it is desired to have the shoots hardened off in October and if a new shoot takes 90 days to grow from bud break, the pruning would have to occur in June. By forcing vegetative growth to occur at the best time for flowering potential and in the right amount it is possible for the trees to be managed for a regular flowering cycle. This in turn should set the trees up to have regular production.

For the tree to accumulate energy (an increase in carbohydrate) leaves of high quality are required. High quality leaves have high nutrient status, good exposure to light and are supported by a healthy root system to transport water and nutrients. As the year progresses, the leaves age and over time will become depleted in nutrients and may be shaded by new growth. Once the leaves are too old they fall off and need to be replaced. Leaves showing signs of old age are most obvious at the end of winter. In general, the colder and sunnier the winter is, the greater the decline in the leaf quality. Leaves in poor health are easy to see in that they turn yellow and show signs of other physical defects. Leaves need to be in a “high health” status for a minimum of about six months – preferably summer through to fall and over winter. In winter, the trees are not dormant, fruit continues to size and accumulate dry matter, and the trees accumulate carbohydrate but have little production of new shoots. In maintaining a good leaf condition, the maximum potential of the tree to build up carbohydrate reserves can be realized for full cropping potential. This requires a good canopy of leaves.

Another tool to use is the root to shoot ratio to maintain the struc-

ture of the tree to allow the leaves to be exposed to high light levels so that fruiting potential is maximized over the entire surface of the tree. Trees that become shaded and crowded are less productive than more open well-lit trees. In simple terms, a crowded avocado grove with a closed over canopy will only have a fruiting surface of one acre of surface area for each acre of trees while well-structured trees that are more open can have up to two and a half acres of surface area per acre of trees. Pruning and tree structure that allows more light low down on the trees is needed to keep the fruiting surface area to ground area ratio high. Trees with their roots out of balance with shoots have sparse and small leaves. The canopies are open with fewer flowering sites. Reducing the size and number of branches reduces the stress on a poor root system and allows the re-growth to develop into a better canopy, with greater flowering and fruiting potential. This then increases the root to shoot ratio.

For best production there needs to be maximum opportunity for pollination and fertilization. The best fertilization results in viable seeds in the new fruit that will not be aborted and are retained until harvest. Avocado flowering is complex and fruit set ultimately relies on the amount of time the flowers in the male and female genders overlap during pollination. Cross pollination, while not essential, helps to create stronger seeds than where only the pollen from the same variety is available. Of critical importance are insects that transfer pollen from flower to flower. For avocados in California, most avocado pollination occurs with managed honey bees. Very often poor yields can be traced to low or inadequate bee activity when the trees are flowering. While the weather conditions for flowering are often very good in California the occasional periods of hot weather over flowering can cause excessive flower



and young fruit abortion which lowers yields. Fruit set success can be enhanced by increasing bee numbers and good tree management. To minimize tree stress attention needs to be paid to: water, salt, heat and nutrients, whole tree vigor through root rot control, crop load and to use very effective pollinators like Zutano, Bacon, Ettinger and Edranol.

Tree nutrition is an important part of promoting the production of flowering wood. An adequate supply of nutrients that actively drive growth or ensure there are no deficiencies, stimulates shoot and root growth for the best balance between shoot and fruit production and root to shoot ratios. Key nutrients, such as zinc and boron assist with pollination and fruit set. Fruit size and large yields can be managed with potassium and nitrogen but care is needed to avoid creating conditions of excess growth. The production of large leaves that remain green and photosynthetically active all year, including winter, are promoted through nitrogen and magnesium. Healthy roots are produced where the levels of zinc, boron, phosphate and magnesium are adequate and cold tolerance can be enhanced with nitrogen.

Managing avocado trees to produce a consistent amount of fruiting wood each year should be achievable. By focusing on maintaining the flowering potential of the trees and

applying sound horticultural management principles, high and consistent yields are likely to follow. The level of production and the degree to which crops vary from year to year will depend on the skill of the grower or grove manager in their ability to read their trees for the amount and quality of fruiting wood, recognizing problems early so that corrective action can be taken and the ability to account for the historical growth cycle of the trees. This knowledge will allow understanding of the impact of cultural management decisions made in the present will have in the future, in particular the following two years. By the time winter starts it is essentially too late for a grower to increase the flowering potential of their trees. However, it is possible to begin to set up the trees to produce the most appropriate amount of flowering wood in the next 18 months to two years. Actively managing the trees to a clearly defined goal, such as a particular root to shoot ratio and amount of fruiting wood – through pruning, nutrition and tree health – requires a high level of skill but is necessary for growers to remain profitable.

In order to evaluate if the proposed best practice described above is valid, demonstration groves could be used as part of a larger outreach effort to assist growers to increase their cultural management skills. 🥑

New Zealand Industry Thriving But Grappling with Familiar Issues

For the 2011/12 season, New Zealand's avocado growers produced the equivalent of 6.2 million 5.5 kilo trays of avocados, and exported more than 60 percent of them. This season, the entire crop is only 2.4 million trays strong.

And that in a nutshell – irregular bearing trees – is the country's biggest avocado concern.

Jen Scoular, who is the chief executive officer of the New Zealand Avocado Growers Association & Industry Council, said along with *Phytophthora* control, the significant swing in volume is the top challenge the industry faces. She said avocado researchers have several initiatives to address the issue including a new pruning trial, and developing new varieties.

The New Zealand avocado industry has been around for many years as seed was first brought to the country about a century ago. Commercial production began sometime in the last century and the crop has grown to be New Zealand's third largest fresh fruit crop behind apples and kiwifruit.

The main growing region for avocados in New Zealand is the Bay of Plenty situated in the North Island. This area is known for its warm climate and fertile soil. Whangarei and areas in the Far North are also favorable growing regions. Small pockets of production can be found throughout the east coast of New Zealand and even at the northern most end of the South Island.

Scoular said the New Zealand avocado industry is a mature industry



but it is also in a growth mode with existing growers increasing acreage and new growers coming into the business. One factor is a disease problem that has hit the kiwi industry and caused some of those growers to replace kiwi orchards with avocado groves.

The industry consists of about 1600 growers who collectively manage about 4,500 hectares of avocados with Hass being the main variety.

New Zealanders consume about 40 percent of the fruit with a per capita consumption level of about 3 kilos per person per year. As a point of reference, Scoular said Australians consume about 3.5 kilos per year. One kilo equals 2.2 pounds so the average New Zealander consumes 6.6 pounds of avocados per year. "There is room for growth in New Zealand and we are growing the market but we only

have 4.2 million people spread out over a large geographic area."

Australia is also New Zealand's leading trading partner and takes the vast majority of its avocados destined for export. In fact, the New Zealand Avocado Growers Association collects a levy from the growers and promotes jointly in Australia with the Australian avocado group. While the product is promoted generically, there are 11 exporters of avocados in New Zealand, each of whom touts its own brand. Scoular said the association does market the crop as "Avocados from New Zealand" but that doesn't necessarily play a prominent role in the promotion efforts of each exporter.

She added that Australians tend to be provincial and prefer eating products grown within their own borders, indicating that touting the

New Zealand origin of the crop isn't necessarily an advantage.

New Zealand exporters do send some of their avocado exports to the United States when the situation warrants it, but Scoular said this season does not feature favorable conditions. The limited crop means there are higher prices domestically and in Australia than the United States price structure will allow.

The Hass avocados are harvested for export from late August to late March. Typically about 80 percent of export grade fruit goes to the Australian market with the balance mostly going to Asian markets. Scoular said her group has been building demand in Asia, especially Japan, and will continue that effort moving forward.

New Zealand growers are not faced with the difficult water situation that can plague California growers. Scoular said New Zealand has lots of rain and irrigating the crop is not an expensive proposition.

But just like in California, urban sprawl is an issue that growers have to deal with. The Bay of Plenty has become an increasingly popular area for development and some groves have been swallowed up.

Though New Zealand is a relatively small player in the avocado world, Scoular said New Zealand growers have enjoyed collaborating with those in California on mutual issues and will continue to work with the world avocado community to address common problems. 🥑



Jen Scoular



By Ken Melban
CAC Director, Issues Management

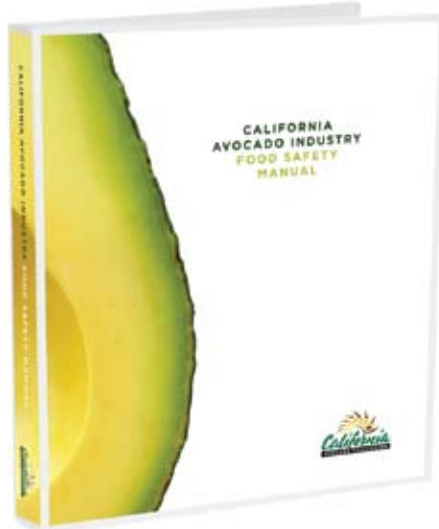
Registration Effort Continues

The following is an update on a few of the critical issues CAC staff has been working on that impact the California avocado industry:

Progress towards pursuing a Uniconazole (Sunny) registration

As previously reported the commission has been working since June, 2011, to gather the necessary information to support a Uniconazole registration in the United States on avocados. Uniconazole is currently registered on avocados in other countries as a plant growth regulator and reportedly controls shoot growth. If registered it could be a valuable tool, not only for California growers who consider transitioning to higher density plantings to increase yields per acre, but also as a way to compete with the lower labor costs of most other avocado growing countries. Uniconazole is owned by Japanese-based Sumitomo Chemical and manufactured by England-based Aquamarine, but would be sold in the United States by Valent. Considering this complex business arrangement, the commission's information-gathering has been complicated by the internal workings of each respective company, which has caused many delays.

On average it costs around \$15 million for all the necessary scientific studies that are required by the Environmental Protection Agency (EPA) and the California Department of Pesticide Regulation (DPR) to secure a product registration in the United States. The commission, working with Valent, has completed a call-in



of all existing international studies for Uniconazole and determined another \$2.65 million in scientific studies will be necessary for a U.S. registration. Obviously, \$2.65 million is an expensive price tag, but significantly less than \$15 million. Although Valent has committed support for a U.S. avocado registration, they are unwilling to expend any additional financial resources to develop the necessary remaining studies. Valent has indicated their willingness for a Licensing Agreement with the commission should a registration be issued, which would provide an opportunity for the commission to recoup some of the investment costs.

The commission contracted with a scientific group with the technical expertise to identify which of the remaining studies may be granted waivers by the EPA, and currently waiver petitions are being prepared for EPA's consideration. If all the requested waivers are granted, it could

result in as much as a 25 percent reduction in the remaining studies' costs. In addition, the commission will begin efficacy and phytotoxicity trials in 2013 to evaluate Uniconazole's performance under California conditions. Depending on the results of the field trials and the waiver requests, the commission will make an assessment on next steps based on the costs versus the potential benefit to growers. This will continue as a long-term project that will not result in a registration until, at the earliest, 2016.

Commission's GAP program brings first year success

In just over a year since the launch of the commission's Good Agricultural Practices (GAP) program, the initial grower response has been very positive. Since November, 2011, of the nearly 60,000 California avocado producing acres, over 12,000 have been GAP-certified by United States Department of Agriculture. This represents more than 20 percent of the state's total avocado acreage, and although exact figures from third party auditors were not available, it is likely those numbers would bring the industry wide total to 25 percent or more. The commission's GAP Incentive Rebate was also a success with nearly \$55,000 paid back to growers for actual audit costs. At the October 2012 Board meeting, the commission approved another \$60,000 for GAP Incentive Rebate funds for FY 2012-13. The rebate provides reimbursement of up to \$300 of actual GAP audit costs to any grower who

completes a first time GAP certification and is *also* available to growers who previously received a rebate in FY 2011-12 *with certain restrictions*. (Complete guidelines may be found at this website: <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, CDFA, at 559-595-8000.) Between the Commission and CDFA rebates a total of up to \$500 for GAP audit costs will be available (subject to the availability of funds).

Handlers report that retailers continue to make inquiries for GAP-certified fruit, and some have established firm deadlines for requiring GAP-certified fruit for mid to late 2013. Whether retailers will hold to their 2013 requirements for GAP-certified fruit is yet to be determined, but key handler and retailer members believe it is only a matter of time before it becomes mandatory. In talking with handlers, the common perspective is that it will become harder to find a market for non-GAP certified fruit in the future. Considering the fact that the importing countries are almost all certified under GlobalGAP, it becomes clear that GAP certification for California avocados will be critical to maintaining our premium market share. While some in the growing community might feel a GAP program is unnecessary based on the fact that avocados are a low-risk commodity, in reality avocados still have some level of susceptibility to bacterial contamination. It seems prudent for you as a grower to demonstrate, through GAP compliance, that every precaution is being taken to ensure the highest level of safety for your fruit. As one prominent

produce industry member said, "food safety shouldn't be seen as a cost of doing business, it is OUR business."

If you have not yet become GAP certified and would like to talk with a commission staff member, please email us at cac.iaf@avocado.org.

Federal Immigration Reform

Now that the presidential election is over there are rumblings that immigration reform might be a real possibility in the next Congressional session, albeit still a long-shot, as both parties face increased pressure to develop a solution. Some leaders within the Republican Party, upon seeing their party's Latino vote decrease in the 2012 presidential election, are calling for a system reform that would allow for a worker program but not necessarily a pathway to citizenship. First, though, they want to ensure the border is secured. On the Democratic side, President Obama had promised to introduce immigration reform in his first term, but that never materialized because he said there was not adequate Republican support. He is now sending signals that an immigration reform package will be introduced in early 2013.


"The Latino giant is wide awake, cranky and taking names," said Eliseo Medino, secretary-treasurer of the Service Employees International Union. One thing is for certain. As the Hispanic vote continues to gain strength, both parties will look for ways to increase their respective support within that growing demographic group. Hopefully, such political motivation will bring about a level of compromise and bipartisanship that has been missing in action from Congress the last few years. The commission will continue to be your voice in Washington, D.C., as we work for immigration reform that provides a solution for the employment needs of the country while

protecting our national security.

USDA Farm Bill Update*

Congress, as expected, entered into a lame duck session as it was unable to reach agreement on the authorization of a new Farm Bill before the September 30, 2012 deadline. With the increasing federal deficit and the need for fiscal cuts, Congress' inability to cut a deal centers on their disagreement of just how deep to cut, with the Senate approved version calling for a \$23 billion reduction and the House Ag Committee recommending \$35 billion. The Farm Bill provides roughly \$500 billion of funding in areas including production subsidies, agricultural conservation efforts, food aid, agricultural research and rural economic development, along with food stamps, which accounts for nearly three-quarters of the spending. The cuts center on the level of food stamps reductions. Some in the House majority leadership might look for an opportunity to separate the food stamps out from the rest of the Farm Bill, a plan to convert food stamps into state block grants, but that is unlikely. If a new Farm Bill is not authorized, Congress could extend the 2008 Farm Bill as a stop gap measure, although there are some positive signals coming from Congress that an agreement may be reached before the New Year.

The commission is working to secure funds under the Farm Bill to conduct outreach and education to increase understanding of, and support for, Ambrosia Beetle eradication and control efforts. This is but one example of how important Farm Bill funding is to the California avocado industry, and commission staff will continue to communicate to Congress the importance of the Farm Bill to specialty crop producers and the need for uninterrupted funding for critical programs.

**Based on the most current information at the time of this writing.* 



CAC's booth staff with Chefs Feniger and Milliken at Fresh Summit

California Avocados Shine at Produce Marketing Association Fresh Summit

More than 21,000 Attend 2012 Produce & Floral Convention

California avocados and the California Avocado Commission were in the limelight at the Produce Marketing Association (PMA) Fresh Summit 2012, which took place October 26-28 in Anaheim, Calif., with a record attendance of more than 21,000. Professionals from 61 different countries, including 4,000 buyers, expanded their business networking and improved their industry knowledge at the convention sessions, educational workshops and exposition, where CAC's booth was a star attraction.

The PMA is an international produce industry organization whose mission is to connect, inform, and deliver business solutions that enhance members' prosperity. Its vision is to strengthen and lead the global produce community. While PMA activities are broad-reaching and year-round, its annual Fresh Summit convention is so well-known and attended that some incorrectly call it simply "PMA." For CAC, PMA Fresh Summit provides an excellent opportunity to interact with retail decision-makers and others in the pro-

duce industry, and inform them of the benefits of supporting California avocados.

Planning for Fresh Summit every year begins even before the previous convention finishes, with activities such as determining participation and choosing a booth location. After careful evaluation of the prior year performance, CAC sets out objectives and strategies for the following convention, and then gets to work. The 2012 location in Anaheim meant there would be strong attendance by Californians in-

cluding avocado growers, handlers and local retailers, and many opportunities for interaction.

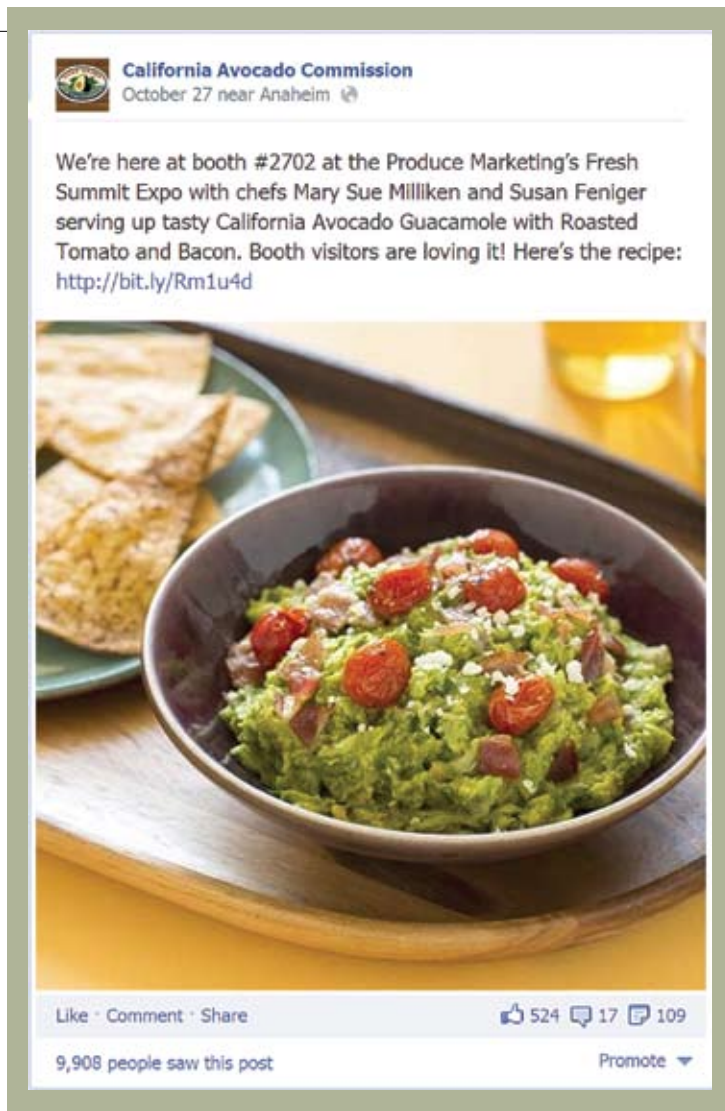
Starting in early summer, CAC Retail Merchandising Directors reached out to retailers, encouraging them to attend Fresh Summit and meet with commission staff. A trade press release announcing the commission's show plans was distributed in mid-September to garner broader awareness. Once attendees reached the Anaheim Convention center, California avocado presence was ever-present. CAC sponsored the official PMA Fresh Summit bag, which featured the *Hand Grown in California* logo and included a keepsake computer screen/glass cleaner with a design based on CAC's advertising campaign. Thousands of attendees walked the show displaying the California avocado logo on their bags.

Upon entering the expo, show visitors and exhibitors were instantly greeted by a delicious aroma wafting from CAC's booth located right next to the main entrance, where celebrity chefs Mary Sue Milliken and Susan Feniger served samples of tasty California avocado recipes right from their Border Grill food truck. The chefs are true fans of California avocados and have worked with the commission for many years. They engaged with customers and other booth visitors with a genuine enthusiasm for the fruit. Those who sampled their California avocado dishes, including *Cumin Glazed Rib Tacos with California Avocado Pineapple Salsa* and *Grilled Corn Esquite*; *Cilantro Chicken with California Avocado* and *Pickled Tomato Salsa*; and *California Avocado Guacamole with Roasted Tomato and Bacon*, raved about the food.

CAC's Marketing Manager Angela Fraser oversees CAC's Fresh Summit experience every year, including the trade show booth set up, activities and graphics that communicate the benefits of merchandising California avocados. Fraser arranged getting the food truck onto the show floor and right into the booth, which took some very careful maneuvering and negotiating to accomplish. She worked behind the scenes to develop a booth layout that would allow for the food truck, California avocado recipe sampling and booth visitors to all fit in a 20 x 30 foot space, and to ensure that safety standards set by the convention center and fire marshal were met. The truck's large propane tank had to be temporarily removed and cooking gear swapped out for electrical models, but when the show opened the booth was a hit.

Asked about highlights of the Fresh Summit in an interview with AndNowUKnow.com, PMA President and CEO Bryan Silbermann said that the CAC booth "really blew me away." He noted that CAC was using the celebrity chef's food truck as a mobile kitchen to bring the taste of the streets into the convention center for the industry to see how the product was being used.

The key objective for CAC merchandising staff at Fresh



Summit was to have meetings with retailers, both in the booth and during expo activities. This interaction was the core of the convention for the commission, as CAC staff and Board Chairman Ed McFadden shared California avocado data and consumer insights with booth visitors. More than 30 retailers came to CAC's booth, and the discussions that ensued set the stage for opportunities next season.

Fresh Summit also provided CAC with an opportunity to connect face-to-face with editors and reporters from major produce and grocery publications.

CAC staff utilized Fresh Summit to meet with current and potential marketing partners, building relationships for future programs. In addition to meetings in the booth and on the show floor, PMA hosted several general sessions, presentations and educational workshops that provided networking opportunities. CAC staff maintained a high leadership profile in these sessions. Angela Fraser served as a moderator for a workshop on social media, Zac Benedict was honored for his graduation from the PMA Foundation for Industry Talent's Emerging Leaders program, and Jan DeLyser officially assumed the role of PMA chair on Oc-

tober 25.

DeLyser, who emceed the PMA Fresh Summit Sunday General Session, is in the second of a three-year term of voluntary service on the PMA Board. She has served on the PMA Governance Committee, chaired the Brand Identity Committee and actively supports membership recruitment. In her opening comments for the session, DeLyser gave a heartfelt acknowledgement of the support of her family, thanked the produce industry and CAC for allowing her to serve as PMA “chair- man-woman-person” and pledged to continue her long-time commitment to growing fresh produce consumption.

Throughout the show, the commission leveraged Fresh Summit activities to connect with consumers via social media, posting recipes on Facebook® and tweeting about booth activities. To engage California avocado fans, CAC offered a contest giving consumers a chance to win fresh California avocados simply by submitting a question about California avocados to chefs Feniger and Milliken. The social media activities were fruitful, and after the show CAC ranked in the Fresh Summit top 10 influential Twitter® presences.



Tom Burfield, a writer for several trade publications, during an interview with Jan DeLyser in the booth.

The 2013 PMA Fresh Summit Convention and Expo will be held October 18 – 20 in New Orleans, Louisiana, and CAC has already begun gathering ideas to create another successful show for California avocados. 🥑



Shot Hole Borer Update

By Tim Spann

CAC Research Project Manager

The California Avocado Commission continues to keep its finger on the pulse of the situation with the Polyphagous Shot Hole Borer (PSHB) (*Euwallacea fornicates*; formerly Tea Shot Hole Borer), the vector of Fusarium dieback disease in avocado. Since the last update in the Fall 2012 issue of *From the Grove*, survey results show that the beetle has continued to spread.

As of October 1, 2012, there have been some new finds around Altadena, and north of Glendora encroaching into the Angeles National Forest along the northern edge of the infestation. To the northeast there have been additional finds in the Chino Hills area. Although some new finds have been recorded in the area between Anaheim and Orange, the 22 Freeway remains the southern boundary of the infestation from Orange west to the 405 Freeway. Laguna Beach remains the only location south of this area with known beetle finds. It will be interesting to see how the winter will affect the spread of the beetle.

Although there was a report in 2010 of the beetle being trapped in a nursery in downtown San Diego, continued monitoring since then by Dr. Akif Eskalen, UCR Extension subtropical plant pathologist, has not found any evidence of the beetle's establishment in San Diego County.

In our efforts to learn as much as possible about the PSHB/Fusarium complex, CAC sponsored a visit to Israel by Dr. Eskalen during the last week of October to better understand the impact this pest and disease are having on that country's avocado industry. Israel has about 17,000 acres of avocado trees and the beetle was first reported there in 2009. Estimates are that 33 to 40 percent of the acreage is affected by PSHB/Fusarium. Unfortunately, it is unclear what the specific impacts of the PSHB/Fusarium complex are on avocado yields in Israel, but some important conclusions can be drawn.

For unknown reasons, Israel does not have a comprehensive monitoring program in place to track the disease spread within the country. This prevents extension personnel from knowing where to focus their outreach efforts, and growers from knowing to be on the lookout for the disease in their area.

In addition, Israel exports up to 65 percent of its crop, primarily to the European Union, which has strict pesticide residue limits. For this reason, growers are reluctant to use the prophylactic pesticide treatments being recommended for fear that they will lose their market due to pesticide resi-

dues. Instead, growers are postponing treatments in a hope that other strategies – biocontrol, organic pesticides, pheromones, etc. – will become available, even though researchers have been warning against this.

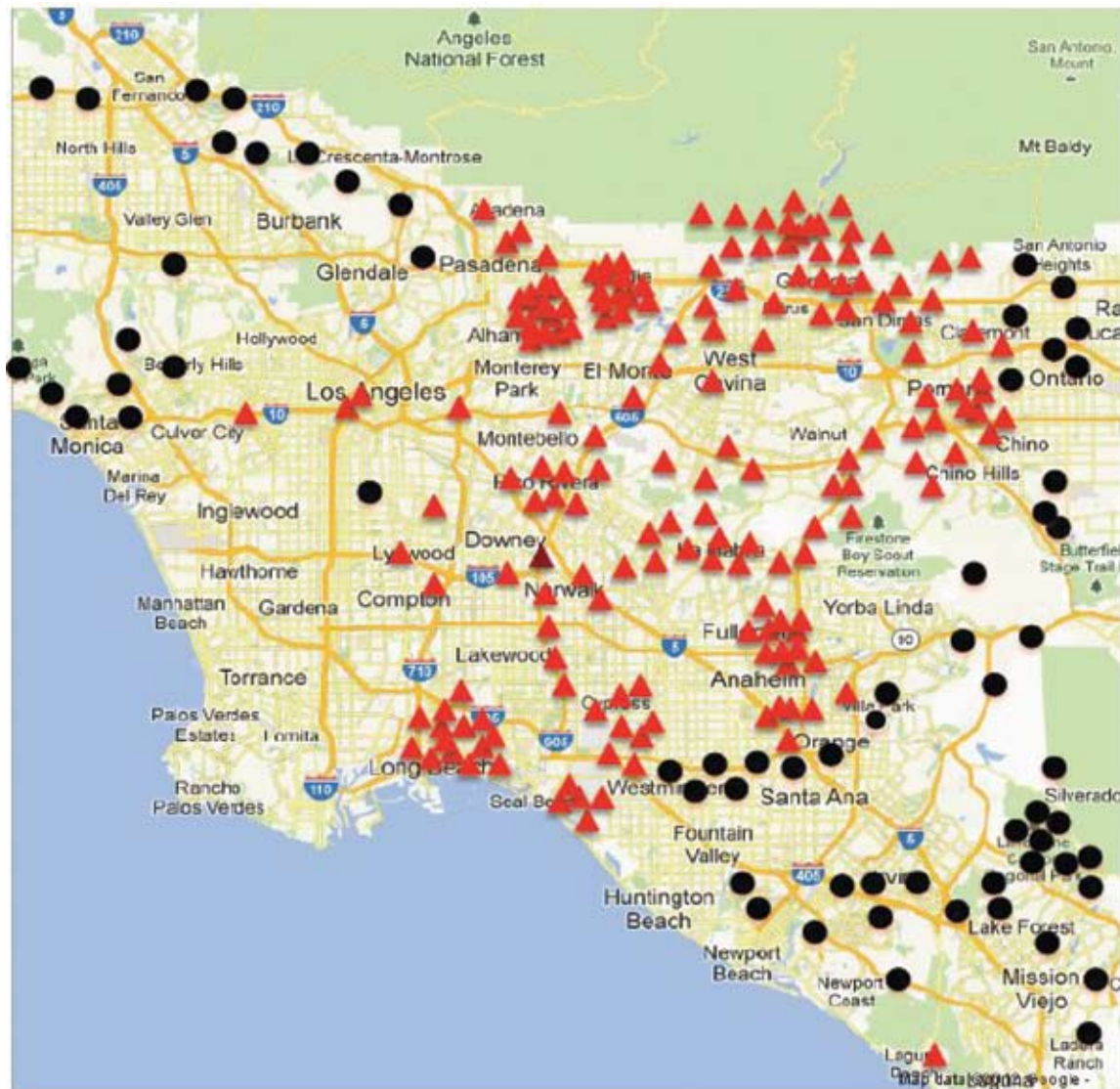
Although based on our current knowledge we cannot make predictions about yield loss or other impacts from this disease here in California, it is clear from what was observed in Israel that we must remain vigilant. We must continue to have an effective monitoring program in place to track the spread of the disease and keep growers informed. We must also be prepared to implement any potential control strategies developed when this disease reaches commercial avocado groves to preserve the California avocado industry.

Currently, CAC's efforts are focused on understanding the biology of the beetle and the previously unknown *Fusarium* sp. it vectors, as well as developing mitigation strategies for both the beetle and the disease. To this end, CAC has already invested more than \$160,000 and has allocated another \$395,000 of production research funding for PSHB/Fusarium research over the next two years (see 'Shot Hole Borer Update' in the Fall 2012 issue of *From the Grove*).

Dr. Tim Paine, UCR Professor of Entomology, and his team are in the early stages of a 2.5-year research project to better understand the biology of the PSHB and to develop control strategies. To date, much of their work has been to establish trials testing the efficacy of contact and systemic pesticides to prevent infestation or kill infesting beetles, and to develop effective sanitation methods for infested wood (e.g., chipping or solarization) to prevent beetle emergence. CAC will keep growers updated as results from these trials come in. They have also been working with CDFA to secure the necessary permits so the PSHB and its associated *Fusarium* sp. can be brought into the UC Riverside quarantine facility. This will allow life history and other basic biology studies to be initiated in early 2013.

To complement the work of Dr. Paine's team, Dr. Eskalen is researching the basic biology of the fungus the beetle carries. His work involves detailed DNA analysis that will give clues as to how the fungus spreads. He is also investigating how the fungus responds to environmental parameters such as temperature and humidity to better understand the risk potential to the avocado industry. As the work progresses they will perform fungicide efficacy studies in the laboratory and move the promising products to field trials as quickly

Known distribution of *Fusarium* dieback/Polyphagous shot hole borer in southern California as of October 1, 2012. Map and data courtesy of Dr. Akif Eskalen.



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

as possible.

These investments are made with the goal of determining the impact of the PSHB/*Fusarium* complex on California avocado groves by learning about the rate at which trees decline and the associated yield reductions so that growers will be well-informed about the impact of the infestation on their groves.

In addition, CAC is working on implementing a major outreach effort that will include both grower and public education by partnering with public parks and gardens, UC Cooperative Extension and UC Riverside. We are currently

developing a proposal to apply for USDA funding to assist us in this effort.

If you notice anything that may look like multiple small holes on branches or the trunk, even if there is no dieback, you can contact Dr. Eskalen at (951) 827 3499 or by e-mail: eskalenlab@gmail.com or the CAC Office at (949) 341 1955. The website www.eskalenlab.ucr.edu has more information on the Polyphagous Shot Hole Borer beetle and *Fusarium* disease. For some of the latest information also visit www.avocadosource.com. 🥑

A Simple Plan for Measuring Persea Mite Population

By Tim Spann

CAC Research Project Manager

In 2010, the California Avocado Commission board approved funding for a project led by Extension Specialist Dr. Mark Hoddle of UC Riverside to develop a new sampling method for estimating persea mite populations in avocado groves. The project, costing about \$50,000 over two years, capitalized on a Western Region Integrated Pest Management (IPM) grant received by Dr. Hoddle and his colleague Dr. Daniel Jeske for \$95,000. This is a great example of how a relatively small investment from CAC can be used to supplement other funding, resulting in much greater returns to California's avocado growers than could be achieved alone.

Persea mite is a pest of Hass avocado in California that at high densities can cause damage to leaves and partial to total leaf drop. The increased exposure to light increases the chances of sunburn on young fruit and tree trunks. To avoid these negative effects, persea mites are routinely controlled using pesticides. However, as part of a sustainable IPM program, it is important to know and track mite infestation levels so that pesticides are only applied when pest populations reach threshold levels at which economic damage is inevitable.

Currently, most growers and pest control advisors (PCAs) walk their groves and count persea mites on leaves to estimate populations. The threshold level at which economic damage is inevitable that growers and PCAs are looking for is an average of 100 mites per leaf. Persea mite populations at this level cause about 10 percent leaf damage, which is enough to start to trigger leaf drop. Research from Israel suggests that if persea mite populations build beyond the 100 mites per leaf threshold, yield reductions of up to 20 percent may occur; although, this has not been confirmed under California conditions. Thus, for best management of this pest, populations should be monitored and control measures implemented as populations build, but before they reach 100 mites per leaf (e.g., >50 mites per leaf but

<100 mites per leaf).

While counting mites per leaf works most of the time, it is a very time-consuming method to estimate populations. For this reason, a relatively small portion of a grove or block is actually sampled, which may result in the unnecessary application of pesticides when populations are overestimated, or it may result in populations reaching damaging levels before they are detected. Thus, the objective of the research conducted by Dr. Hoddle and his team was to develop a simple, rapid method for growers and PCAs to more accurately estimate persea mite populations. This will result in more efficient use of pesticides, helping to delay pesticide resistance development in persea mite, saving growers money and promoting IPM, which may be used as a marketing tool for California-grown avocados.

The sampling methodology developed and validated in this research is called binomial sampling or presence-absence sampling. That is to say, rather than actually counting the number of mites per leaf, a leaf is simply examined for the presence or absence of persea mites. It is immediately evident how much more quickly this type of sampling can be done compared with counting. In addition, the method requires leaves to be sampled from across a block, which ensures that its estimates are representative of the block as a



ommendation is that sampled trees should be maximally spaced in a block, with no fewer than 4 trees between sampled trees. If a block is too small to follow this rule (e.g., 20 trees) it is okay, as long as that is the size block you are considering for treatment. Spatially, the trees selected for sampling should be randomly selected throughout the block, adhering to the spacing guidelines. Do not sample trees along a straight line (transect) through the block.

From each tree, six leaves should be randomly sampled while walking around the tree. Each leaf should be examined and scored as either a '0' or '1,' where 0 indicates that persea mite is absent (0 or 1 mite per

leaf) and 1 indicates that persea mite is present (>1 mite per leaf). This rating can be done quickly using a hand lens or magnifying glass.

After all the samples have been examined from a block and the data recorded, you will need to determine the percent of leaves that are scored as '1.' If 92 percent or more of the leaves sampled are rated '1' the mite population in the block is greater than 50 mites per leaf and intervention should be considered. For sample sizes from 5 to 10 trees per block (30 to 60 leaves), 92 percent equates to 28, 34, 39, 45, 50 and 56 leaves per block for 30, 36, 42, 48, 54 and 60 leaf samples, respectively.

Dr. Hoddle and his team have worked hard to get this new sampling technique into the hands of PCAs and growers. During this past summer they conducted three training workshops, two in Santa Paula at the UC Thelma Hansen Farm and one in Irvine at the South Coast Field Station. In each workshop they reviewed persea mite biology and ecology, as well as control options. They then introduced the sampling technique to the participants who had an opportunity to practice the method in the field. At each workshop, there was strong agreement among the population estimates that each participant independently calculated. This demonstrates the consistency and repeatability of the technique.

In summary, thanks in part to CAC funding, Dr. Hoddle's team has developed a new simple and rapid method for accurately estimating persea mite populations in California avocado groves. The adoption and use of this new methodology will save growers money through the more prudent use of pesticides, which will help to delay, if not prevent, pesticide resistance development in persea mite. Presence-absence sampling should become an integral part of California avocado IPM programs. 🥑

whole and prevents "hot spots" from skewing the results.

To ensure that the presence-absence (binomial) sampling method developed is accurate and works well across California's avocado growing regions, Dr. Hoddle's team used both historical sample data they'd previously collected as well as new data collected during the study. The combined data set came from Ventura, Orange and Santa Barbara counties and represented approximately 500 trees, from which about 32,000 leaves were examined, and more than 750,000 persea mites were counted. Through statistical analysis of these data, they were able to determine that if 92 percent or more of the sampled leaves in a block had persea mites present, the population of mites in the block is greater than 50 mites per leaf.

To apply presence-absence sampling for persea mites in your grove you will need a pen and paper to record data, a hand lens or magnifying glass to examine leaves, and a calculator to determine the percentage of infected leaves.

From each block you will need to sample 5 to 10 trees. For a small block of 100 trees, a sample of 5 trees is good, but as the block size grows, say to 1000 trees, you should be sampling 10 trees. The block you choose to sample should be based on how you will apply your spray treatments. If two small adjacent blocks are managed as one from a pest control standpoint, then they should be sampled as one, but if they are managed independently then they should be sampled independently. This sampling method can be used on any size block up to 200 x 200 trees.

How you select the trees that will be sampled in each block is important. There is a strong correlation between the persea mite population on one tree and the population on an adjacent tree. Because of this, adjacent trees should not be sampled so that the population estimate better reflects what is happening in the whole block. Thus, the rec-

Potential Greenhouse Gas Emission Offsets For California Avocado Growers

By Jane Luckhardt
Downey Brand LLP

The California Avocado Commission is looking into ways to help avocado growers offset their production costs from an unconventional place: the CO₂ absorbed and stored (or “sequestered”) in avocado trees.

The theory is that in exchange for pulling CO₂ out of the atmosphere and sequestering it in avocado orchards (a natural result of photosynthesis in trees), growers could become eligible to receive greenhouse gas emission “offsets” from the California Air Resources Board (CARB). If this effort is successful, growers could then sell or transfer these offsets to entities that need to purchase emissions offsets to meet their obligations under California Assembly Bill 32’s cap-and-trade program.

While California does not currently have a program for rewarding avocado growers for the CO₂ stored by their orchards, CAC is investigating the possibility of creating such a program.

AB 32 Provides Offset Protocols

California’s AB 32, and the cap-and-trade program developed under AB 32, are viewed by industry as expensive new obligations that will make it harder to do business in California. However, AB 32 also provides opportunities to earn valuable greenhouse gas emissions offsets under CARB’s approved offset protocols. These protocols offer offsets in exchange for doing certain things that reduce the amount of greenhouse gas (including CO₂) in the atmosphere.

Offsets earned under CARB’s protocols can then be sold

or traded to entities, such as refineries, large food processors, and agencies that need to purchase offsets to comply with their obligations under AB 32’s cap-and-trade program. The catch is that greenhouse gas offsets can only be issued by CARB, and CARB will only issue them for greenhouse gas-reducing activities that qualify under one of CARB’s approved offset protocols.

CARB’s Existing Offset Protocols

So far, CARB has adopted four offset protocols. While two of these adopted protocols apply to forest projects, these protocols currently do not really fit avocado orchards. The other two protocols deal with ozone-depleting substances and livestock emissions, so they would not apply to avocado growers either.

The first forest-based protocol covers U.S. Forest Projects. This protocol requires the offset project owner to commit to monitoring and reporting requirements that extend a full 100 years after the date the last offset is issued. Complicating things further, all of the forest projects under this protocol must maintain a diversity of tree species that are native to the project area (i.e., species that occur naturally in the area, not as a consequence of human activity post-dating European settlement). Given that avocados are not native to California, and that avocados are typically the dominant species in an avocado orchard, an avocado orchard would not meet the “native” and “diversity” requirements in the U.S. Forest protocol.

The second forest-based protocol covers Urban Forest



Projects. This protocol requires the offset projects to be developed by a government entity, such as a city, local agency or special district. Like the U.S. Forest Protocol described above, the protocol for Urban Forest Projects requires offset project owners to monitor and report for a period of 100 years after the date the last offset is earned. Given that avocado orchards are mostly privately owned, and few avocado growers would want to commit to maintain and monitor their orchards for 100 years, the current Urban Forest protocol probably will not work for growers.

CAC Seeking New Offset Protocols

As described above, the existing offset protocols will probably not work for avocado growers. However, CAC has already begun working on gathering the scientific data needed to support a proposal for a new offset protocol that, if adopted by CARB, would apply to growers of avocados and possibly other tree crops.

To develop a new protocol will require hard work and solid scientific data. The commission is researching whether any offset protocols exist in other parts of the world that could help develop a California protocol that would cover avocado orchards. CAC is also working with UC Riverside biologists to measure how much CO₂ can be sequestered by avocado trees over time. Additionally, it is working to identify other opportunities for greenhouse gas reductions associated with avocado orchards, such as using alternative

fertilizers, revising fertilization and cultivation practices, and changing the way waste materials are disposed.

A major goal in creating a new protocol for growers is shortening the monitoring and reporting period. As noted above, current forest protocols require monitoring and reporting for 100 years after the last greenhouse gas offset is issued. This 100 year period is based on CARB's position that CO₂ must be removed from the atmosphere for at least 100 years to be considered a permanent offset. The commission is working on ways to bring this commitment down to a more reasonable number of years, and possibly tying the monitoring period to the periods for existing agricultural preservation contracts (typically 10-20 years).

CAC is also looking at ways to make the offset monitoring and reporting process less burdensome to growers. This may include developing standardized monitoring methods that require less measurements of individual trees.

Developing a new protocol would take a few years, since it involves scientific study as well as policy work, and possibly even new legislation. Eventually, though, it could provide a "win-win" solution that both reduces greenhouse gases and gives growers some financial assistance in this difficult economic climate. 🥑

(Jane Luckhardt is a partner in the Energy, Land Use, and Minerals group at Downey Brand LLP. Downey Brand has been serving agricultural clients throughout California since the 1920s.)

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Avocado Grower

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