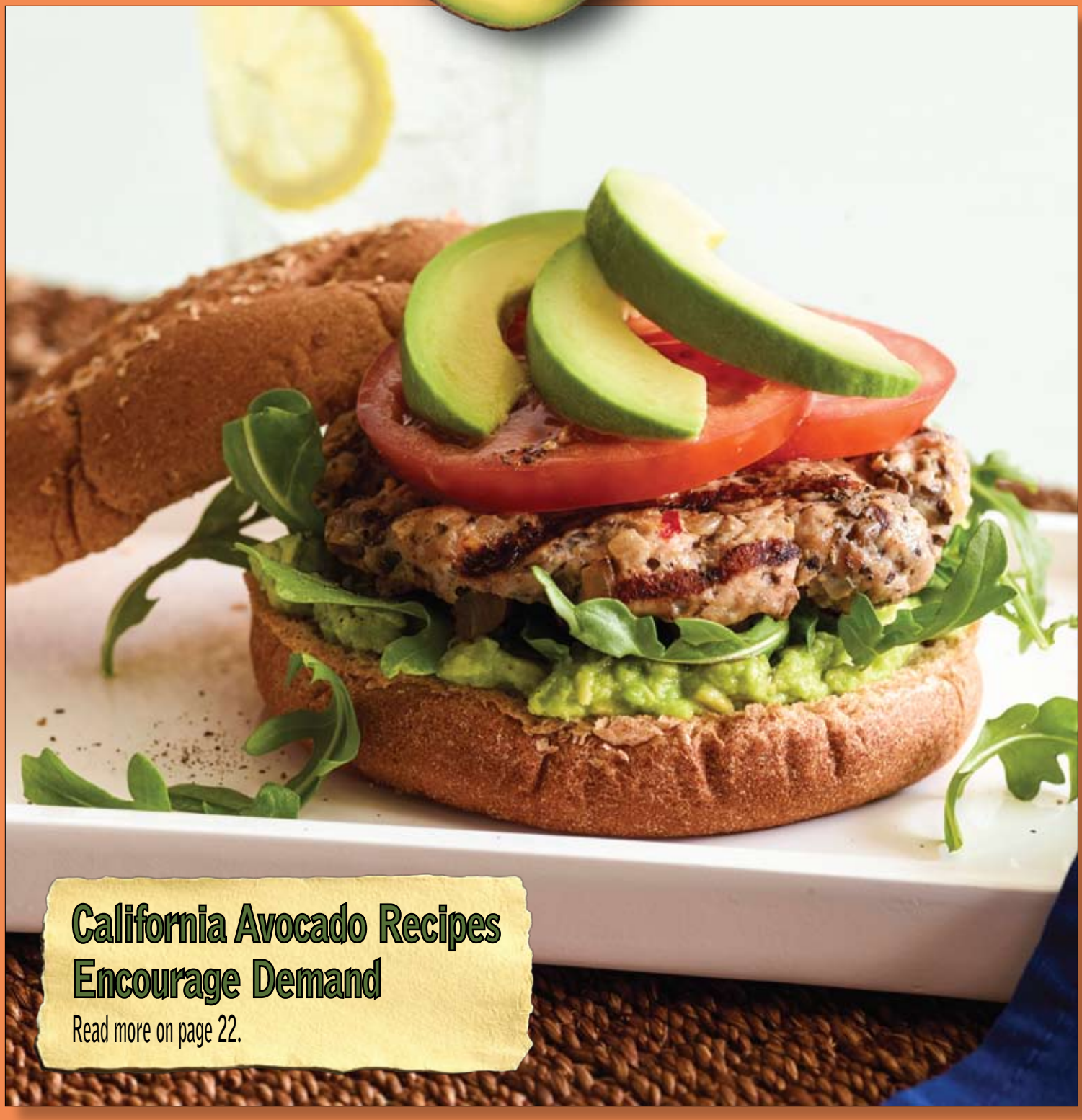
Fall 2014

From the Grove

The Latest News from the California Avocado Industry



California Avocado Recipes Encourage Demand

Read more on page 22.

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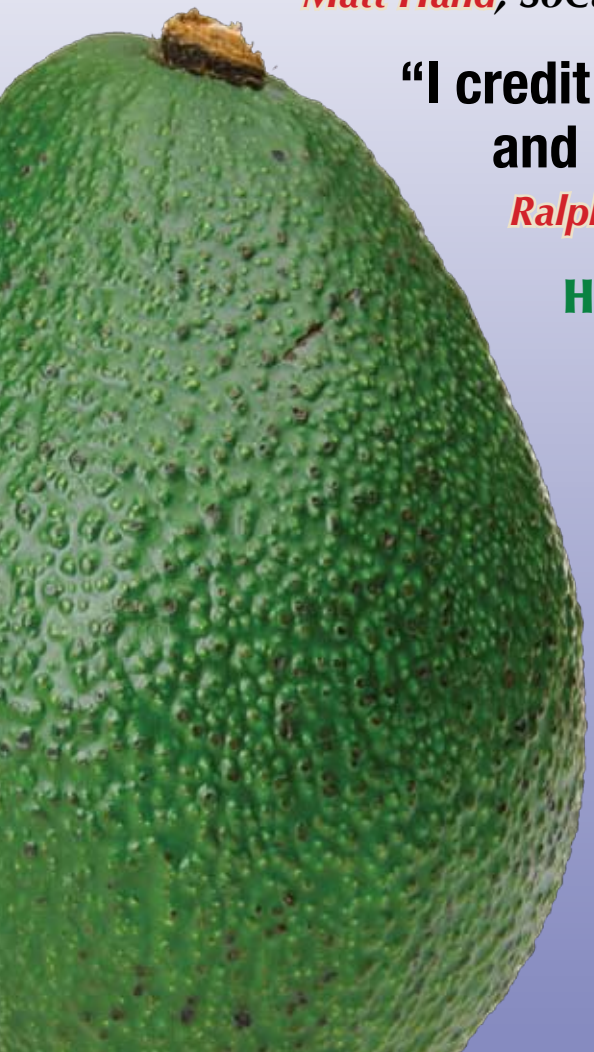
Here's what two ECOFLOW owners had to say:

"The ECOFLOW has saved me a lot of water and has reduced my soil chlorides by much more than 50%."

Matt Hand, SoCal Entomology & Grower



"I credit my ECOFLOW with additional productivity and healthier trees overall."

Ralph Foster, 2013 Winter *From the Grove:* Grower Profile

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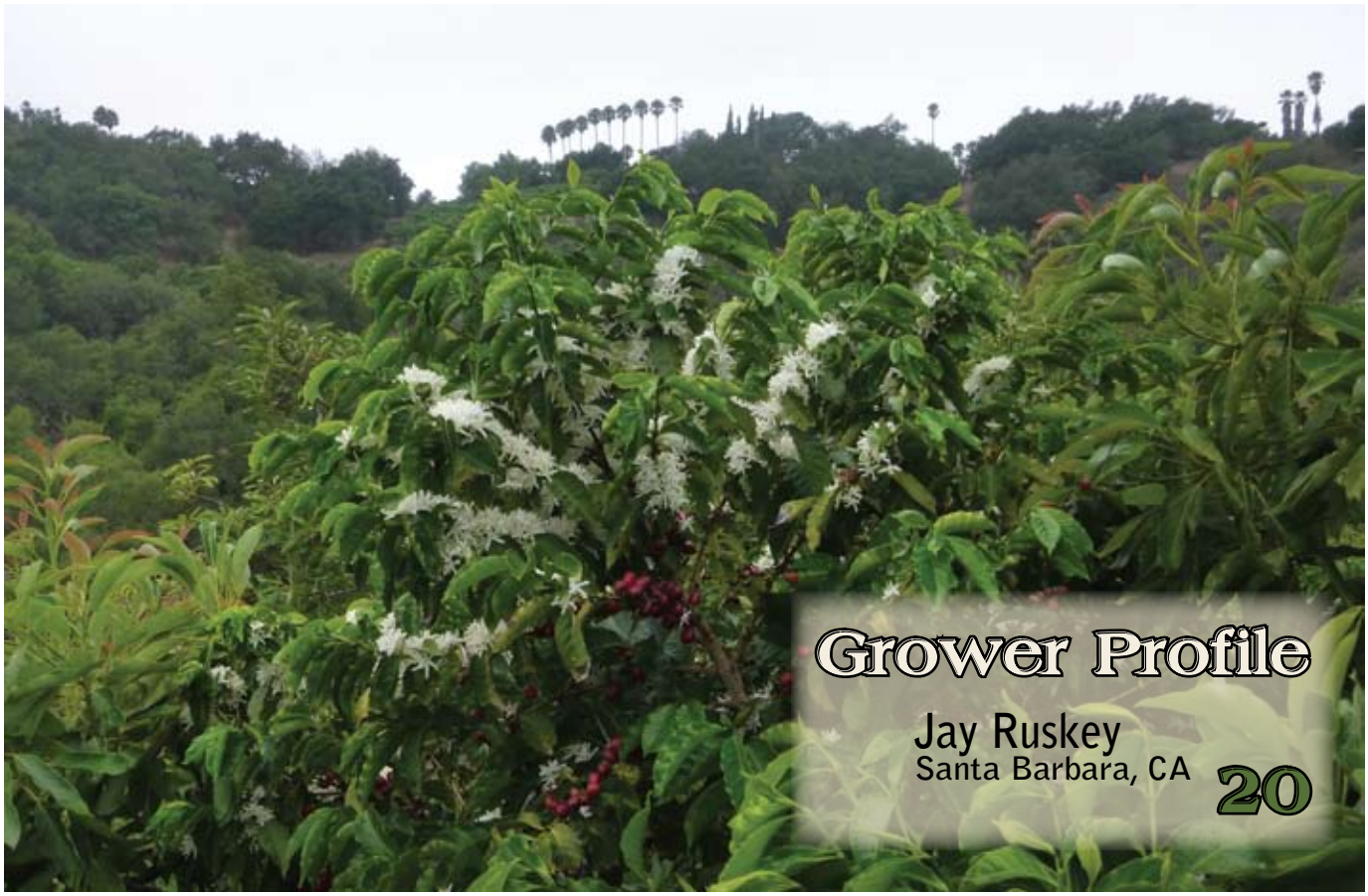

From the **Grove**

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In This Issue

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Message from the President

Tom Bellamore

A Reasoned Approach To Food Safety

As produce items go, the food safety record of whole, fresh avocados is rather enviable. Poll industry experts and no one can recount an incident where a whole, fresh avocado was identified as the known cause of a reported illness.

Some believe that the unique attributes of the fruit — the hard, green state that the fruit remains in throughout much of the distribution chain and its tough, outer skin — greatly reduce or eliminate the likelihood of fruit being a source of bacterial contamination. Add to this the best practices adopted by California avocado growers to mitigate anticipated risks, such as those associated with worker hygiene, and the absence of food safety incidents seems to be no accident.

Just weeks ago, Florida-based Brooks Tropicals voluntarily recalled more than 400 boxes of fresh green-skin avocados that potentially were contaminated with *Salmonella* bacteria. The action was likely prompted by the avocado sampling pilot program presently underway by the U.S. Food and Drug Administration (FDA). Earlier this year, FDA informed avocado industry representatives that it had selected whole, fresh avocados for a special Surveillance Sampling Program to be conducted over a period of about one year. Collection of imported and domestic fruit samples under the program began soon after, with the agency testing the surface of whole, fresh avocados for the presence of *Listeria monocytogenes* and *Salmonella*. FDA cited "data gaps" as one of the reasons behind their interest in avocados; to be fair, there is, in fact, a dearth of information about whole avocados and these specific pathogens.

Taken together, the heightened scrutiny by FDA and the recent avocado recall are part of a continuum that began with the Food Safety Modernization Act of 2011. The government's newfound commitment to ensuring the safety of the U.S. food supply through prevention of contamination has now come to roost where avocados are grown.

Simply put, our world has changed. No longer is it possible, nor sufficient, to rest on our laurels, our stellar record. The combination of targeted surveillance, increased testing and improved detection techniques means that whole, fresh avocados are being looked at differently, and will only be deemed "safe" when the results come in. It gets even more unsettling when you realize that *Listeria monocytogenes* lives in the soil and is commonly found in surface water and sediments, and that FDA has a "zero tolerance" policy when it comes to the presence of *Listeria* on ready-to-eat foods. Any such foods with detectable levels of *Listeria monocytogenes* are considered adulterated. The underlying rationale for FDA's position is linked to the potency of this particular bacterium. According to the *Emerging Infectious Diseases Journal* (1999), listeriosis — the human disease caused by *L. monocytogenes* infections — has a high fatality rate; deaths occur in about 20 percent of all cases, compared to less than 1 percent for other food-borne pathogens like *Salmonella*, *Campylobacter*, or *Escherichia coliform* O157:H7.

There are a few other characteristics of *L. monocytogenes* that make it a formidable risk. The bacterium thrives in moist, cool locations and can grow, albeit slowly, at temperatures below 40 degrees F. Bacteria counts can double within 30 hours at temperatures between 35 to 38 degrees F, giving it the ability to persist for months or even years on certain surfaces, where it can form extremely hardy "biofilms" that are particularly resistant to sanitization. Further, it does not require oxygen to survive

and grow, so it can survive in modified atmosphere packaging.

For all that we know about *L. monocytogenes*, there remains much that we have yet to learn, especially when it comes to risk management in the field or in packing facilities. Sauders *et al.* wrote: "Even though different studies have provided evidence that *Listeria* spp. are broadly distributed through the natural environment, our understanding of the ecology and reservoirs of *Listeria* species and *L. monocytogenes* is fairly limited" (*Applied and Environmental Microbiology*, 2012). This strongly argues for a reasoned approach to prevention by all involved: growers, harvesters, packers and regulators.

The California Avocado Commission has begun the process of digging deeper to better understand biological hazards like *L. monocytogenes*, where they reside, how they are transmitted and, most importantly, how they can be minimized. The Commission's Good Agricultural Practices Manual affords us a good start but we will likely have to go farther.

Current guidance published by FDA for the fruit and vegetable industry recommends: 1) identifying locations where pathogen harborage is likely; 2) conducting an environmental sampling program designed to monitor potential bacterial contamination and verify the effectiveness of cleaning and sanitizing programs; 3) establishing an action plan in the event that a microbiological test positively indicates the presence of a target pathogen; and 4) documentation of corrective actions. These responsibilities fall primarily on packinghouses and field pack facilities, but growers will have to remain vigilant as well by taking steps to minimize contamination from animal waste — domestic and wild — and water sources where animal contact is possible.

On the regulatory side, FDA must endeavor to learn more about the correlation between detection of *L. monocytogenes* (and other pathogens) and serious public health risk. At this time, without scientific data to the contrary, the agency generally errs on the side of caution by treating every detection as a potential public health risk. The avocado track record — i.e., an absence of listeriosis outbreaks linked to our product — suggests that special circumstances may exist such that FDA should rethink its zero tolerance policy, as least with respect to our product. FDA's counterpart to the north, Health Canada, has taken such an approach. In 2011, Health Canada revised its policy on *L. monocytogenes* in ready-to-eat foods. That agency concluded that foods containing low levels of *L. monocytogenes* [e.g., <100 colony-forming units per gram (CFU/g)] pose very little public health risk. Consequently, Health Canada places a lower priority on products that have limited potential for bacterial growth where levels do not exceed 100 CFU/g throughout the expected shelf life.

The California avocado industry has already demonstrated its willingness to work cooperatively with FDA to ensure the safety of whole, fresh avocados from our state (see *From the Grove*, Summer 2014, page 16). In fact, our premium positioning strategy in the marketplace makes it imperative that we do so. In return, we expect that FDA will base its actions on the best available science and remain open to policy shifts when the science indicates that change should occur. Proactive steps being taken now by industry will enable us to mitigate potential public health risks as we continue to learn more about *L. monocytogenes* and other human pathogens. Of utmost importance to our future will be our ability to ensure the freshest, high-quality premium avocado that a supplier can deliver – a *California* avocado, of course.

California Avocado Commission

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To contact a CAC representative, please visit: CaliforniaAvocadoGrowers.com/Commission/your-representatives

Chairman's Report

Thoughts from My Grove

Ed McFadden

I am looking out my office window. We made it through a dry, windy spring and hot summer, and are starting to see a nice fall flush expanding on our dusty trees. So far we have no Santa Ana winds in the forecast, which is good news.

As we approach the end of our California avocado season it seems like a good time to look back and review the past year — and what a year it has been. The ongoing drought has been difficult for everyone, even those fortunate enough to have steady water supplies. Our trees miss the normal leaching from pure winter rains and it has been the dustiest summer I can remember. Hopes for a strong El Niño condition this winter have cooled somewhat. Hopefully we will receive at least normal rainfall in the coming winter months.

Early season hopes for sky-high returns were tempered by reality, but we still had good average dollars per pound. If you want to see some beautifully done marketing, check out the CAC grower website and view the videos in "A Look Behind the Label". I want to go out and buy California avocados after I watch the videos - and I'm sitting in the middle of an avocado grove!

I'm also looking back at the three years I have served as Chair. I will term out before the November board meeting and hand over the reins to the next Chair. For me it has been a tumultuous, but rewarding, three-year run. Food safety continued to be an increasingly important part of the way we do business. Polyphagous Shot Hole Borer (PSHB) was discovered in Southern California and is gradually spreading outward toward our major growing regions. The Pine Tree Ranch was leased by the Commission and has become a center for field trials and the presentation of CAC-funded research results.

Under the leadership of PRC Chair Shane Tucker our production research program continues to make sometimes difficult choices to match the challenging needs of the growers who fund it. I believe we now understand we cannot fund everything we would like and that there are urgent concerns that need to be dealt with immediately — sometimes at the cost of long-term programs that have value. Our current PSHB program is a good example of this. The research for this dangerous pest/disease complex must be done quickly but is expensive.

Three years ago we saw the start of the current drought, which has brought serious water concerns to all of California agriculture. The drought comes on top of the ongoing challenge of increasingly-expensive imported water, particularly in the south. Some of our fellow growers have been forced to stump or abandon beautiful, productive groves in heartbreaking moves to cut costs and in hope of future rain and replenished aquifers.

In spite of these challenges, we have also enjoyed strong returns and are seeing our production per acre gradually increase. The returns are surprisingly good when you consider how much the U.S. market for avocados has expanded during the past several decades.

Serving as your Chair has been eye opening. It is difficult to see and understand everything that President Tom Bellamore and his staff do for us until you serve on the board and then serve the board as Chair. The CAC staff is the envy of the produce business and has been a pleasure for me to work with. To see the influence that a relatively small crop like California avocados has on the produce market is a tribute to Tom and the CAC staff, including his ace marketing team headed by Jan DeLyser.

The future looks bright, but challenging, for California avocados. We need to continue to produce consistently high quality, safe fruit. We do a great job but there are areas where we can improve: all of our groves need to be GAP certified to compete with most of our offshore suppliers. American buyers are starting to require GAP certification as a condition of buying our fruit.

We also have some undeniable advantages: our climate and soil allow skilled growers to produce great-tasting, nutrient-dense and inherently-safe fruit and we are located in the middle of a market that is a major target for growers around the world. I'm probably like you — I bring avocados from our groves to family, friends, business associates, doctors and dentists. People get excited when they see you coming in the door with a bag of beautiful, hand-grown California avocados. What a pleasure it is to share our favorite fruit with so many appreciative consumers.

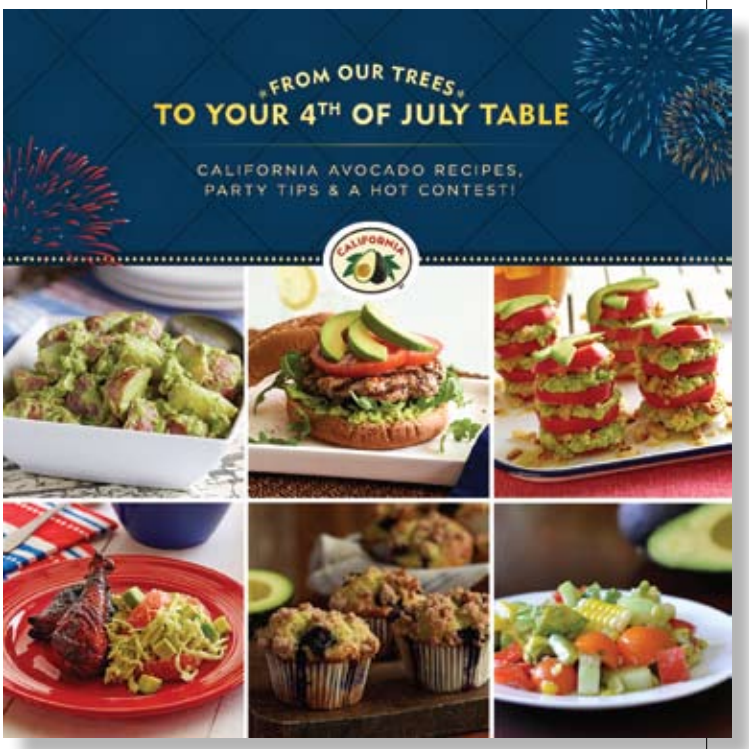
4th of July Breaks Consumption Record

The 2014 California Avocado Commission's (CAC's) 4th of July marketing campaign propelled the favorite summer American holiday to the highest avocado consumption event on record. The 4th surpassed both Cinco de Mayo and Super Bowl events with a category volume that hit 109.3 million pounds. The record-setting event occurred just three years after the Commission's initial 4th of July promotion.

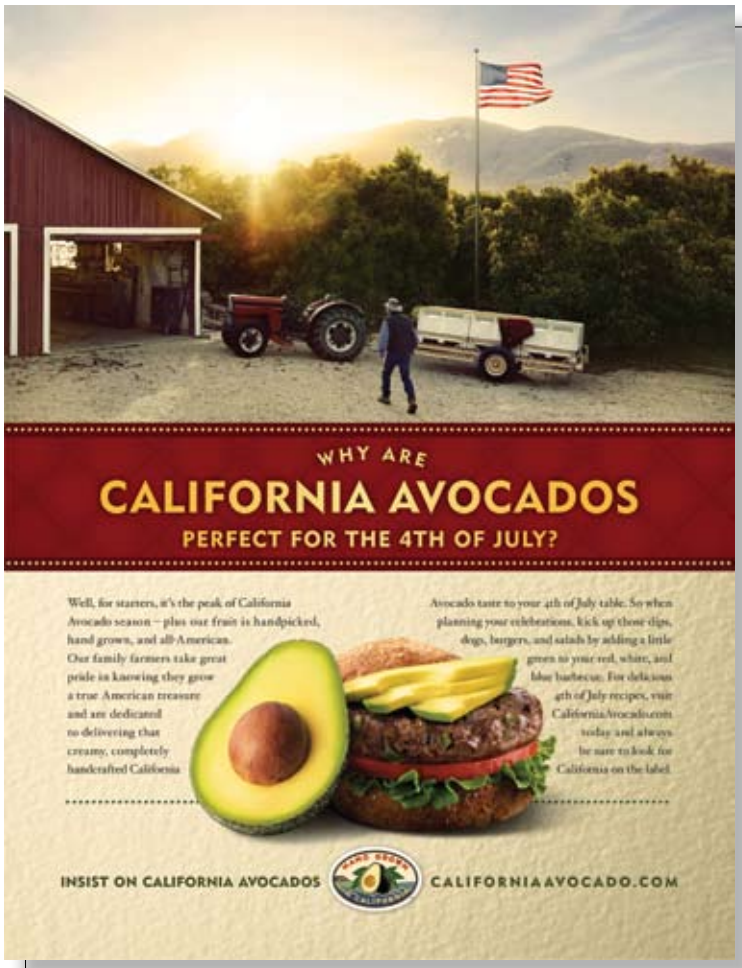
The 4th of July initiative is critical because it helps pull through supplies of California avocados during the peak season when there is a lot of competitive fruit in the marketplace. It helps increase demand and keeps prices from plummeting during the surge in supply. Further, the promotion associates California avocados with other American summer holidays and eating occasions, helping to drive volume throughout the summer.

Integrated Promotion

The 4th of July initiative is an integrated promotion that spans several platforms — print, radio, TV, digital and personal appearances — in order to broaden its exposure and appeal to consumer and trade audiences. Promotional activity occurred in CAC's key retail accounts with an emphasis in core markets during the weeks leading up to the 4th of July holiday.



Social media was used to encourage consumers to share recipes and their love for fresh California avocados.



Print ads shared a variety of ways to enjoy fresh California avocados for the 4th of July.

Print, Radio and TV

Radio and TV are an effective way for the Commission to target core markets prior to the holiday. Starting June 23, the Commission launched two weeks of television ads in California, as well as a two-week flight of general market radio in all core markets. In-store radio ads encouraged shoppers to visit avocado displays in their produce department and look for California on the label. Print ads explaining why California avocados are perfect for the 4th of July also were placed in national epicurean magazines.

Chef partners and CAC spokespersons Mary Sue Milliken and Susan Feniger developed two new avocado-centric American holiday recipes and participated in a broadcast television segment. The chef partners and their recipes also were featured in a nationally distributed press release.

Digital Promotions

Digital platforms, such as websites and social media sites, are an increasingly-important means of reaching consumers and sharing new avocado-centric recipe ideas that inspire them to broaden their use of fresh California avocados. Better yet, these platforms allow California avocado fans to share their love for avocados, as well as their ideas and recipes, thus increasing brand exposure.

As part of the integrated digital marketing initiative:

- CAC's new consumer blog *The Scoop* featured 4th of July themed posts promoting California avocados as a must-have for summer grilling
- Holiday-themed emails were sent to 220,000 subscribers
- Online display banner ads were run on popular sites such as allrecipes.com, driving traffic to the California avocado website
- Social media posts, which inspired 271,000 Facebook fans to include California avocados in their celebrations
- CAC's blogger ambassadors co-hosted the "Red, White, Blue and Green" Pinterest board

The Commission also launched a specially designed 4thof July microsite (www.CaliforniaAvocado.com/fourth-of-july) featuring 4th of July recipes and party tips, a 4th of July recipe

CAC spokespersons Mary Sue Milliken and Susan Feniger shared the new avocado-centric American holiday recipes they created with television audiences.

The Third Annual All American Recipe Contest included a new category — desserts.

booklet, a link to the newly launched "A Look Behind the Label" video series and an avocado fan newsletter. The microsite generated more than 42,000 page views.

The Third Annual All American Recipe Contest offered consumers the chance to win a Weber grill, a California Avocado Gift Bag and monthly shipments of fresh California avocados through September. The contest featured a new avocado desserts category and the six winning recipes were added to the California avocado website.

As a result of the above combined efforts, the California avocado website had more than 10,000 visits per day for the seven-day period leading up to the 4th of July.

Co-marketing Campaigns

Co-marketing campaigns encourage consumers to use California avocados in new ways, such as the California Avocado Turkey Mushroom Burger. The Commission also partnered with Naturipe Farms for a 4th of July promotion featuring a unique snack — California Avocado Red, White and Blueberry Salsa — on 300,000 packages of California-grown blueberries. Another co-marketing partner, Weber, donated three grills for the Third Annual All American Recipe Contest and supported the Commission's Sunset Celebration weekend.

Trade

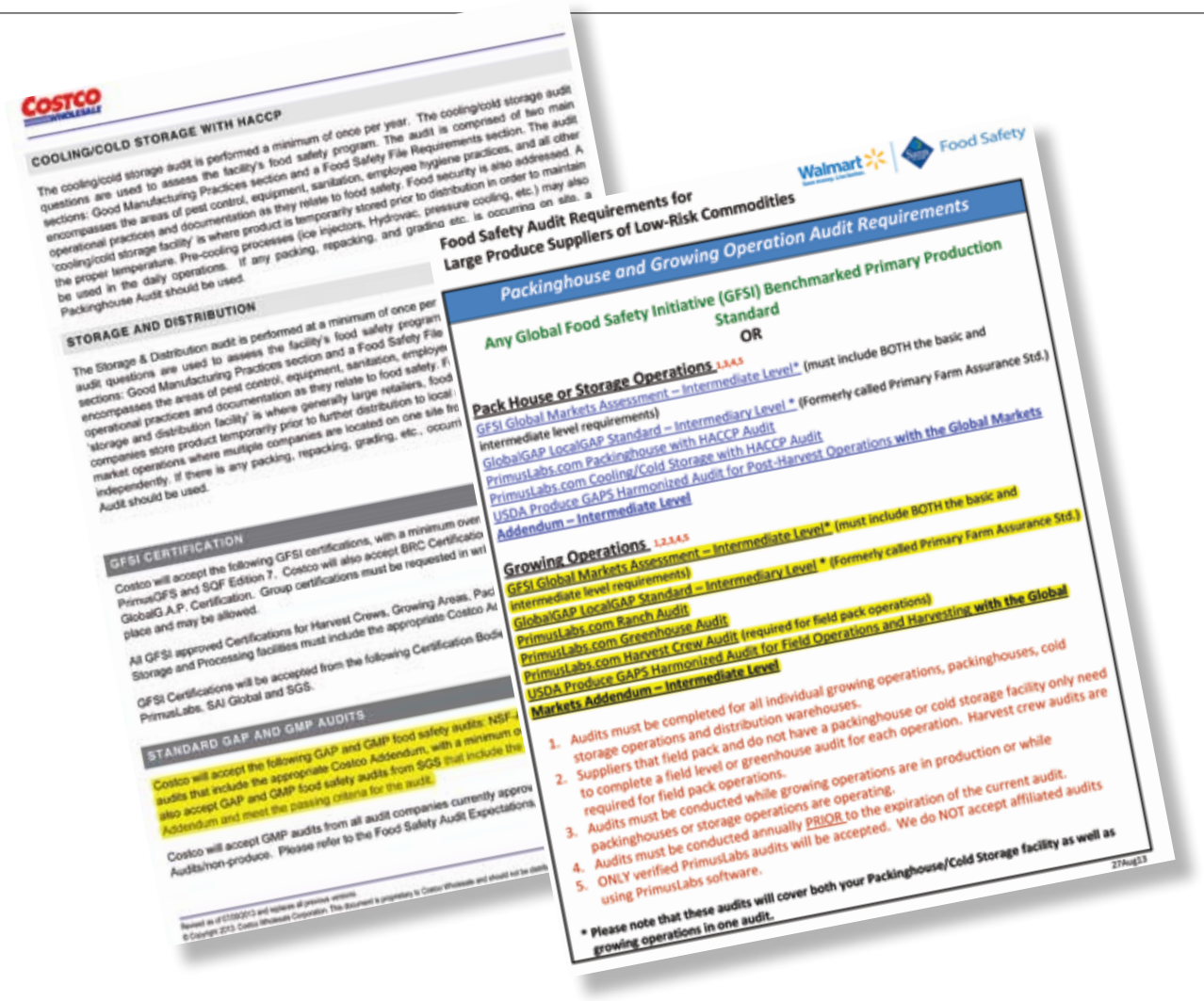
Trade advertising in grocery and produce publications was launched several weeks prior to the 4th of July. The ads illustrated the benefits of featuring California avocados in produce departments for the 4th of July holiday.

A retail trade press release was sent nationwide and garnered 214,000 impressions with a foodservice trade release garnering another 205,000 impressions.

To encourage consumers to purchase California avocados, the Commission provided retailers with Have a Blast with California Avocados recipe brochures for retail displays and use by supermarket registered dietitians (SRD). SRD in-store events were held at retailers including King Soopers, Harmon's, Hy-Vee, Bristol Farms and Ball Food Stores.

CAC partnered with Gelson's to challenge its produce managers to increase their volume of fresh California avocado sales with a California avocado promotion and sales contest. The contest was structured with Gelson's stores competing within their respective groups — lower volume, medium volume and higher volume stores. A prize was awarded to the produce supervisor who led his or her store to the best overall sales performance. The Gelson's Dana Point store earned top marks as the overall performing store with a 33 percent increase in fresh avocado units over last year.

This display helped Gelson's Silver Lake earn a 24 percent increase in avocado sales over last year.



Change on the Horizon for CAC's Food Safety Program

By Ken Melban
Director, Issues Management

In August 2011, the California Avocado Commission launched a Good Agricultural Practices (GAP) program to support GAP certification for growers. GAP is a set of practices, policies and procedures a grower (and employees) complies with to reduce the risk of microbiological contamination on fruit. Even though GAP certification is not yet required, in just three years 40 percent of California's avocado acreage has been certified. This is an impressive accomplishment, especially when you consider it was all done voluntarily!

The Commission's GAP effort was initiated in response to consumers' changing perception concerning the safety of fresh produce. Over the last few years quite a few food safety outbreaks directly linked to fresh produce have occurred, and although there were no major public health issues associated with whole avocado, society began to question, in general, the safety of fresh produce. Their confidence shaken, consumers began to demand the government and retailers take steps to ensure the safety of fresh produce. In response, retailers started developing food safety standards

for their suppliers. Candidly, this was also likely an attempt to try and mitigate future liabilities. The world was changing.

In addition, Congress enacted the Food Safety Modernization Act (FSMA) in January 2011 mandating the creation of federal requirements intended to ensure that all fresh produce sold in the United States is free of pathogen contamination. The responsibility for FSMA was placed on the Food and Drug Administration (FDA), requiring growers to demonstrate compliance with specific procedures and policies in their growing and harvesting of produce. Although FSMA has been passed, the FDA is still working to finalize the specific rules. Retailers, though, are not holding back on their requirements for GAP-certified fruit.

The current CAC-GAP program primarily supports a grower audit under the U.S. Department of Agriculture's GAP standards. The USDA GAP audit addresses many of the critical food safety areas, but unfortunately is considered an "entry level" audit by many buyers, and therefore not accepted. When the Commission's GAP Committee developed the CAC-GAP manual, it was viewed as a first step to favorably position growers with pending food safety requirements from both retailers and the FDA. Over the last three years, the Commission has attempted to negotiate acceptance of the current CAC-GAP program from major buyers, but there has been little progress. In fact, this year both Costco and Wal-Mart communicated their respective acceptable audit standards to suppliers, and the USDA GAP audit is not included.

During the last few months, the Commission has been considering possible next steps in our food safety program to ensure growers who choose to become GAP certified are meeting buyer requirements. An analysis of acceptable audits was conducted, and it was determined that a Primus Ranch audit would require the fewest changes to the existing CAC-GAP manual and place the least amount of new requirements on growers.

In August 2014, based on a review and recommendation from the CAC-GAP Committee, the Commission Board approved revising the manual to support a Primus Ranch audit. This decision wasn't easy nor was it made in haste. Serious consideration was given to "holding the line" with our current program and forcing a possible showdown with buyers. When push comes to shove would buyers soften their requirements and accept California fruit that was certified under the USDA GAP audit? Or would they look to fill their orders from other sources?

While we would all like to believe California's premium avocado positioning would work to our advantage in such a scenario, ultimately it's a risky proposition. Two factors led to the decision: import supplies during our season continue to increase; and other international producers of avocados are currently Global GAP certified (or pursuing certification), which is a much more rigorous audit. It was the board's position that it will become increasingly challenging to build on our California premium brand if we aren't at (or near) the current food safety certification level of our competitors. With shelf space at a premium and the competition beating down our door, there is just too much at stake.

In addition, as reported by Tom Bellamore in his "Message from the President" article, the FDA is currently conducting a sampling assignment specifically on avocados to test for *Salmonella* and *Listeria*. We can argue whether this is warranted or unwarranted, right or wrong, fair or unjust. But that won't change our current reality — whole avocados are under scrutiny and as an industry we need to do everything possible to maintain and build on the safe production of our fruit. Becoming GAP certified at an acceptable standard makes sense.

The Commission will be conducting a series of GAP workshops on December 2 (Fallbrook), December 3 (Ventura) and December 4 (San Luis Obispo), 2014. We will discuss the new changes to the manual, which primarily include increased record keeping for pesticide and fertilizer use, a modification to the water quality levels, and in some instances, frequency of testing. I would encourage you to attend and learn about the program and the Commission's GAP rebate — up to $300 for actual audit costs (pending Board approval).

Finally, you may want to talk with your handlers about becoming GAP certified. Many have a food safety representative who will help prepare you for a GAP audit. The CAC-GAP program is voluntary, and ultimately you are free to choose whether you pursue GAP certification or not, and, if so, under which audit. As the world of food safety continues to change, the Commission will continue to provide you with the necessary food safety tools to help you ensure the safety of your fruit while maintaining a competitive position in the market.

GAP December Workshops

December 2, 2014
9:00 to 11:00 a.m.
Grand Tradition Estates & Gardens
220 Grand Tradition Way
Fallbrook, CA 92028

December 3, 2014
9:00 to 11:00 a.m.
Museum of Ventura County
100 E. Main Street
Ventura, CA 93001

December 4, 2014
9:00 to 11:00 a.m.
Veterans Hall
801 Grand Avenue
San Luis Obispo, CA 93401

By David Crowley
Department of Environmental Sciences
University of California, Riverside

Optimizing Irrigation Management Through Soil Water Monitoring

Optimizing irrigation scheduling is one of the most critical management decisions — it determines profitability and is one of the best ways to improve tree health, avoid root diseases, improve yields and reduce water bills. But irrigation scheduling requires site-specific knowledge of the soil's characteristics in order to determine when and how much water to apply. It also requires use of soil water monitoring devices to determine when to apply water, when to leach excess salts and how to avoid overwatering that wastes money and causes a whole set of separate problems that can reduce yields or even kill your trees by waterlogging. Good irrigation management becomes even more critical when using lower quality water that contains high levels of total dissolved salts and chloride.

Based on the preliminary results from a recent survey on water management practices, soon to be published, there is considerable room for improvement in soil water monitoring. The survey of more than 100 growers indicates that approximately half of all growers do not ever measure their soil water status, and among those who do, the vast majority rely on the "feel" method in which a soil core is taken and felt by hand to gauge its relative moisture level. Although this method serves as a rough indicator of when to water, soil water monitoring equipment can provide much greater precision in determining when and how much water to apply.

As California farmers move toward practices that provide the best water use efficiency, irrigation scheduling may even be accomplished using soil water sensors that directly control the irrigation valves. Let's take a look at the basics of soil-water relations and how growers can design an irrigation water-monitoring system to get the most out of this valuable resource.

Dangers of Waterlogging

One of the greatest dangers in mismanaging irrigation is over watering to the point of waterlogging. Avocado roots require oxygen in order to function and maintain the osmotic potential in the roots that drives water uptake across the cell walls. The roots also have energy-requiring ion pumps that drive uptake of nutrients into the cells and that partition chloride into the membrane-bound compartment called vacuoles that are inside the root cells. In soils with high clay content, overfilling the soil pores results in depletion of oxygen that causes the roots to stop taking up nutrients and water and can quickly kill the roots. Lack of oxygen also causes the ion pumps that function to keep chloride in the roots to release chloride into the vessels that transport water to the leaves. Hypoxia can thus very rapidly lead to chloride toxicity in the leaf tissue. Ironically, overwatering is most likely to occur during soil leaching that is used to remove chloride from the root zone. Even short periods of low oxygen can lead to three-fold increases in leaf chloride concentrations. Leaching in poorly drained clay soils irrigated with low quality water may actually be one of the underlying reasons for chloride toxicity. The key in this situation is therefore to apply water in a manner that avoids saturating the soil and reducing the air space to less than 20 percent of the soil volume.

This phenomenon was very well demonstrated in classic experiments that were conducted by Hass in the 1940s. At that time it was already well recognized that avocado trees performed very poorly in heavy, poorly-drained soils or in shallow soils where even well-drained soils can be waterlogged by water that perches over a rock or a hardpan layer. To illustrate the effects of drainage and aeration, Hass set up an experiment in which he placed avocado trees in containers into secondary pots that had different size drainage holes that increased the time it took for the pots to drain. These experiments showed that even a few hours of waterlogging could greatly reduce tree growth and root function. It turns out that avocado is not only one of the most sensitive plants to

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salinity and chloride, but also is one of the most sensitive plants to waterlogging. Careful water management and use of methods that promote soil aeration (site selection, soil berming, mulches) are thus essential to obtain good yields.

Soil Water Holding Capacity and Water Availability

To avoid waterlogging and optimize irrigation scheduling, it is important to understand the nature of soil. While soils appear to be solid under our feet, a good soil for plant growth typically has about 50 percent air space. Soil is thus somewhat analogous to a sponge. Air space between the soil particles and aggregates provides pores and channels for diffusion of oxygen to the roots and also serves as a reservoir for plant available water (PAW) — the small portion of water that can be easily accessed by plants. The sizes of the soil pore spaces span from a millimeter to microscopic pores that are a few millionths of a meter in size that altogether comprise the soil pore volume. The pore size distribution varies with the soil texture (percent sand, silt, clay).

When a soil is irrigated to saturation, all of the pores will temporarily fill up, after which the large pores drain freely until the soil reaches "field capacity" — the point at which the soil pore space should ideally contain 50 percent air and 50 percent water. The fraction that is considered as PAW is held mainly in the medium size pores where water adheres by capillary forces (think of a wet sponge after it has been allowed to freely drain). After PAW is depleted, the remaining water is the fraction that is held in very small pores and in very thin water films on the soil particle surfaces (equivalent to a moist sponge from which water can no longer be squeezed). This is called hygroscopic water and is measured only by weighing the soil after it has been completely dried in an oven. Depending on the soil type, the hygroscopic water can comprise anywhere from a few percent of the total soil volume in a sandy soil, and up to 30 percent or more in a clay soil.

The key to determining when and how much to water depends on the soil's total water holding capacity, and how far it can be drawn down before it becomes unavailable to plants. There are a variety of instruments for measuring both PAW and soil volumetric water content. (See "Soil Moisture Technology and Irrigation Management" on page 17 for a review of soil monitoring equipment.).

PAW measurements indicate the soil *water potential* and are commonly measured in bars and centibars (cb). Water enters the plant roots by osmosis, which allows the plant to draw water from the soil when the water potential is between 0 and 1500 cb. Immediately after watering a soil to saturation, the water potential measures 0, after which the soil will drain to achieve field capacity (-5 to -10 cb). As the soil dries out, the force by which water is held in the soil increases exponentially, such that you would never want to approach the wilting point as the plant leaf stomata will close and shut down photosynthesis well before this water potential is reached in the leaf tissues. In order to provide adequate water, irrigation is normally started when the soil dries to -25 cb for sandy soils, or to -50 cb for clay soils. This provides optimal water availability that does not restrict plant growth.

Know Your Soils

One of the first steps in assessing the water holding capacity of your soil is to go to the USDA website, the Web Soil Survey (websoilsurvey.sc.egov.usda.gov), where you can enter the address of your orchard and obtain detailed information on your soils' physical and chemical characteristics as measured in the 1950s. Once the address is entered, the user marks an area of interest using a pointer tool, and then proceeds to the soil properties tab where you can obtain information on the soil texture (sand, silt, clay), soil water holding capacity, and drainage class. This will identify soils and areas of your orchard that may be particularly problematic and can help growers design soil water monitoring and irrigation blocks that require different irrigation management.

Tensiometers

The most basic instrument for measuring plant available water is the tensiometer, which consists of a water-filled tube that has a ceramic cup attached to the bottom. Once inserted into the soil, water is pulled out through the ceramic cup by the suction forces of the soil. The water column in the main tube pulls on a vacuum gage that measures the suction in units of centibars. The tensiometers are installed to place the ceramic cup portion at a depth that matches with the root zone. PAW is the water fraction over the range from field capacity (typically 12-18 cb) up to 100 cb, where all plant available water has been depleted. Because the water potential increases exponentially as the soil dries, an upper limit of -25 cb is used in sandy soils. Clay soils can be drawn down to -50 cb, at which time irrigation should be started.

Soil water potential and the total amount of plant available water vary for different soils. Heavier texture, clay soils can have 40 percent water after irrigation, of which only a small fraction (about 10 percent) may be available to the tree. These soils can thus become "dry" with no plant available water, but still have soil moisture levels of 30 percent that is not available to the tree. Conversely, sandy soils drain rapidly after irrigation to retain 10-20 percent water, almost all of which is available to the tree during soil dry-down. Water

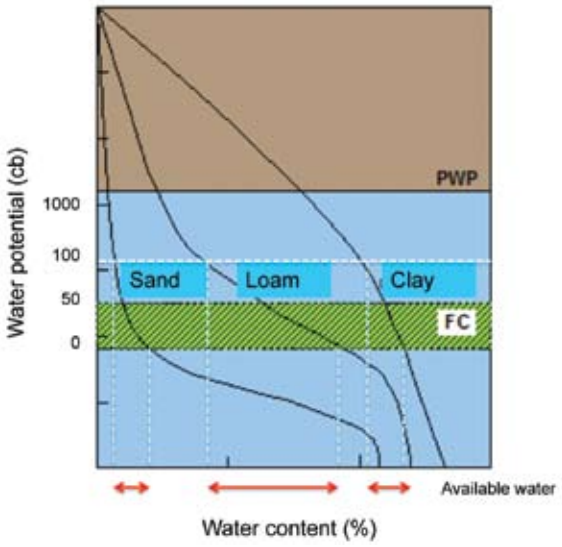


Figure 1. Soil water retention curve showing water potential versus water content for sandy, loam, and clay soils.

(FC = field capacity, PWP = permanent wilting point)

should be applied when the soil water potential reaches -25 to -50 cb, depending on the soil texture.

Because soil water content varies greatly across microsite locations in a grove, the placement of tensiometers is critical. The first step is to map the topography and soils in your grove and then divide the grove into irrigation blocks that will have the same irrigation schedule. Each block should have a minimum of one tensiometer that is installed next to a typical tree that represents the entire irrigation block.

The best placement position is in the middle of the irrigated portion of the soil where the roots are actively growing and taking up water, with a view on measuring the "average" water availability in the soil under the canopy. This is typically 1-2 meters out from the tree trunk, and in the middle of the irrigation throw zone from the emitters, and at a depth of eight inches.

Ideally, another tensiometer should be installed at 18 inches, which provides an indicator of when water has moved past the root zone. This second tensiometer provides information on how long to water. By measuring the time it takes for the second tensiometer to detect the irrigation event, you can anticipate how long you need to water. Depending on your irrigation water salinity, you will want to adjust the leaching fraction (excess water) to around 10 percent in order to prevent salt accumulation. On the other hand, excess water over this amount is largely wasted, and can result in water logging as well as high water bills.

Putting It All Together

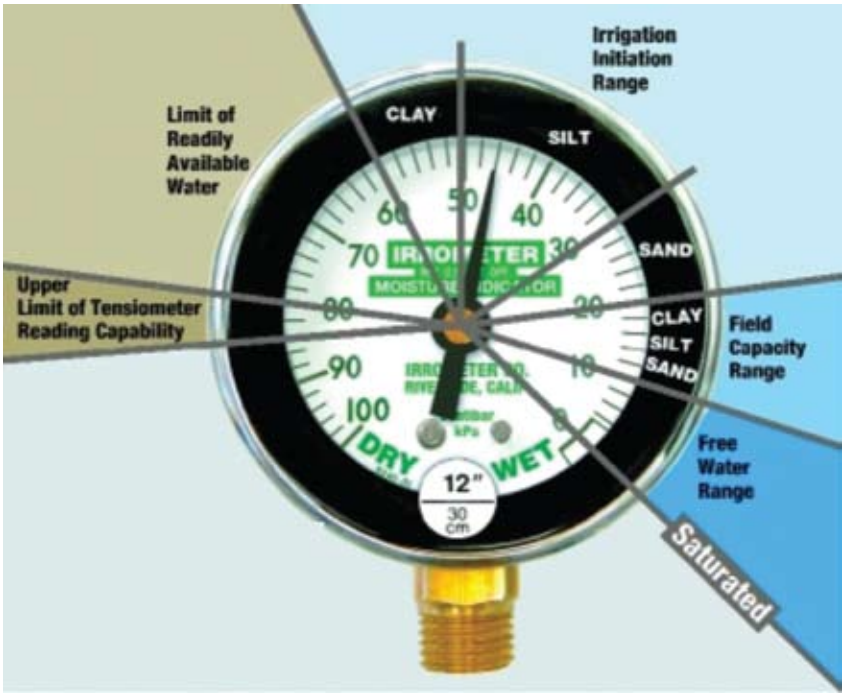
Water management is one of the most important factors affecting avocado tree growth, yields, and tree health. Combining knowledge of your soil's characteristics with the water requirement as determined by the California Irrigation Management System (CIMIS), or a local weather station, is the best way to devise a strategy for your irrigation scheduling. Remember it is important to consider the water holding capacity of the particular soils in your grove so that you avoid overwatering. For example, CIMIS may recommend three inches of water to replenish water loss after one week — but if your soil will become completely saturated by this amount of water when applied at one time, then you risk waterlogging. Conversely, a well-drained sandy soil may not retain this much water when applied in one application and the water may be wasted by rapidly draining from the root zone into the lower soil profile.

Detailed scheduling related to the length of the irrigation set can also be accomplished by use of irrigation calculators that determine how much water to apply based on your tree size, the gallons-per-hour (gph) of your emitters, and the uniformity of your irrigation system. Lastly, soil water monitoring equipment should be used both to guide and refine the development of your irrigation schedule, and to provide oversight on how well your plan is working in providing adequate water. Altogether these tools can save thousands of gallons of water, improve tree yields, and put more money in your pocket.

Specific recommendations:

- Avocado has shallow roots. Use mini-sprinklers. If drip irrigation is used, use many drippers to ensure water coverage across the entire diameter of the soil covered by the tree canopy.
- Install tensiometers in multiple locations and at different depths in the same location to monitor soil water availability.
- Obtain a free water audit from your local water management district. Irrigation uniformity is critical and should be 90 percent or better.
- Check your water infiltration rates and use appropriate gph emitters to avoid runoff. Use pressure compensated emitters on hillsides.
- Map your grove soils to determine the physical characteristics that will in turn determine irrigation management. Be aware of shallow soils, or soils containing hard pans that can perch the water and prevent good drainage (http://websoilsurvey.sc.egov.usda.gov).
- Overwatering of avocado can be a major hazard, causing root death. Waterlogging leads to rapid movement of chloride from the roots to the leaves, causing toxicity, leaf burn, and reduced yields.

• Salinity must be monitored to determine when to leach. Use a salinity pen to routinely monitor the level and location of salts in your soil profile.
• When using saline water supplies, keep the roots as oxygenated as possible by encouraging root growth near the surface — use berms, composts, and mulches to improve soil aeration and root growth and reduce exposure to salts.
• Use CIMIS (www.cimis.water.ca.gov) and irrigation scheduling calculators to determine the duration and frequency of irrigation (www.avocadosource.com).



Soil Moisture Terms

Volumetric water content — a measure of the volume of water found in a volume of soil, expressed as cm3 of water/cm3 of soil.

Gravimetric water content — a measure of the mass of water found in a mass of soil, expressed as grams of water/grams of soil.

Soil water potential — how tightly the water is held in the soil against gravity, the forces between water molecules and solid particles, expressed as MPa, kPa or Bars.

Soil tension or matrix potential — terms used to describe soil water potential. It is an indicator of how hard a plant's root system must work to extract water from the soil. The drier the soil, the more negative the water potential value and the harder the plant has to work to uptake water. As the matrix potential approaches a value of zero then all soil pores, large and small, are completely filled with water, i.e. fully saturated.

Standard Water Content Terms

Saturated water content — the point at which all of the pores, macro and micro pores, in the soil temporarily fill up with water due to irrigation or precipitation.

Field capacity — occurs after macro soil pores have drained due to gravity, it is the amount of water held in the soil by its matrix potential against the forces of gravity. The point at which the soil pore space should ideally contain 50 percent air and 50 percent water.

Permanent wilting point — the point at which water is exponentially more difficult for the plant to draw up and in which the plant leaf stomata will close and shut down photosynthesis.

Plant available water — the small amount of water that a soil holds that is easily available to plants, calculated as the difference between permanent wilting point and field capacity.

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Soil Moisture Technology and Irrigation Management

Water management plays a critical role in the productivity of an avocado tree. Water plays a key role in photosynthesis; helps create amino acids, proteins, vitamins, hormones and enzymes for the tree; delivers salts and minerals to roots and leaves; cools the leaves of trees and helps prevent leaf wilt, tip burn and leaf drop that can reduce fruit production. Despite water's importance to grove productivity, a recent water use survey of California avocado growers indicated that only 50 percent of growers use some type of soil water monitoring technology to determine when to irrigate their orchards.

Determining when to irrigate your avocado grove is difficult to do visually or by feeling the soil with your hands. In avocado, symptoms of overwatering can mimic symptoms of underwatering — both exhibit droopy leaves and decreased growth thus making it difficult to determine the source of the problem simply by looking at the tree.

Some growers feel the soil to determine water needs, but this technique does not often give a clear picture of irrigation management needs. While soil has the ability to retain moisture based on its unique texture, organic matter, porosity and aggregation, soil also has the ability to change spatially within your orchard. For instance, a soil type located on hill slopes will be different than a soil type located on level ground. To further complicate irrigation management, a soil's water holding properties change with depth making it impossible to know, without the proper tools, what is going on underneath the first couple of inches of soil. Even if your soil looks dry, it could be saturated a few inches down. In fact, in field studies we have observed that some growers have been over-irrigating their trees, which can lead to root rot and low soil oxygen that inhibits root growth.

To prevent this from happening, soil monitoring equipment is essential. Soil moisture technologies have been proven to manage growers' site-specific water requirements by estimating the amount of moisture available in the soil — determining if there is a water shortage that can reduce yields or if there is excessive water application that can result in water logging and root rot. Consistent measuring of soil moisture can build a history and knowledge of each irrigated acre that is invaluable for future planning and management. The method you choose will vary by cost, ease of use and accuracy.

Soil Moisture Technology

Gravimetric

Gravimetric moisture is the amount of moisture in a soil on a dry weight basis and is a direct measurement of soil water content. Measuring gravimetric water content does not require any specialized equipment, just a scale and an oven that can reach a temperature of approx. 220°F (105°C). A grower can dig a small hole to the depth of interest in the rootzone, typically within less than 2.5 feet from the surface (0.8 meters) where avocado roots are present in a mature tree. Remove a small soil sample approximately between 0.5 to 1-oz., weight it and place it in a kitchen oven at 220°F for 24 hours. Once dry, the soil is weighed and the difference between the pre-oven-dried soil (the moist soil) and the oven-dried soil is the amount of water in the soil on a weight by weight basis. One drawback is this method does not account for soil matrix potentials. However, taking consistent readings can help a grower track moisture trends in the root zone. This method is free and accurate, however, it is labor intensive and takes a day or so to determine results.

Tensiometer

Tensiometers measure the soil moisture tension or suction. Sometimes they are referred to as a "dummy root" because they mimic the energy that a root must put forth to extract water from the soil. A tensiometer is a long plastic tube with a porous ceramic cup on one end and a vacuum gage on the other. When placed in the soil, moisture from the surrounding soil is drawn into or out of the ceramic cup and the vacuum gage measures the pressure difference. A zero reading indicates your soil is saturated. Alternately, a (higher) negative number indicates your soil is on the drier end. For example, a tensiometer reading of -50 centibars (cbars) indicates more soil

moisture than a reading of -80 cbars. Though inexpensive, tensiometers require routine maintenance and proper installation is essential. Good soil contact with the ceramic cup is difficult to maintain especially if the instrument is disturbed. In addition, the installation location is critical, especially when difference in soil tex-

Soil Moisture Technologies Summary

Type	Advantages	Disadvantages	Cost range
Gravimetric	-Accurate -Low costs	-Labor intensive -Destructive sampling -Time consuming	-None
Tensiometer	-Continuous readings -Low costs -No calibration needed	-Maintenance required -Correct placement is difficult -Not reliable under very dry soil conditions	-$65+
Gypsum Block	-Continuous readings -Can take reading on the drier range	-Accuracy reduced in sandy soils -Data logger required -Requires calibration	-Probes $35+ -Data logger $300+
Dielectric Sensors (TDR)	- Continuous readings -No maintenance needed -Accurate measurement over a large range	-Expensive - Requires calibration -Computer software required	-Software $100+ -Data logger $300 - $800+ -Sensors $100 - $300+
Dielectric (Capacitance)	- Continuous readings -No maintenance needed -Accurate measurement over a large range	-Expensive - Requires calibration -Computer software required	-Software $100+ -Data logger $300 - $800+ -Sensors $100 - $300+
Neutron probe	-Most accurate	-Most expensive option -Computer software needed -Special training for radioactive handling	-System $4000+

ture, soil type and topography are considered. (For more information on tensiometer placement, see "Optimizing Irrigation Management through Soil Water Monitoring" on page 12.)

Gypsum Blocks

Gypsum blocks are electrical resistance blocks that use gypsum, or some similar material, to measure soil moisture between two electrodes. The gypsum block allows moisture to move in and out as the soil becomes more saturated or dries out. When more moisture is absorbed by the block it lowers the resistance reading indicating a more saturated soil. The blocks are cheap and easy to replace but require a data logger in order to get the readings. In addition, the blocks eventually dissolve and need to be replaced.

Dielectric Sensors

There are two types of dielectric sensors: time-domain reflectometry (TDR) and capacitance. Both measure the dielectric constant of the soil. A dielectric is a material that does not readily conduct electricity — in this case the surrounding soil is the dielectric.

TDR sensors use time-domain-reflectometry. TDR measures the time a small electric pulse will travel from one electrode to another. As the moisture increases, the time the electric pulse takes to travel slows down. The reading can be influenced by soil texture, gravel content, incidental metal pieces, chemistry and salt. This method is highly accurate, though expensive, and usually reserved for research.

Capacitance sensors are two electrodes that are separated by a dielectric (soil). An oscillating frequency is applied between the sensors, which are influenced by the moisture in the surrounding soil. The resulting feedback frequency can be used to determine soil moisture content. As with TDR, this method is accurate but expensive and used primarily for research.

Neutron Probe

Neutron probes work by sending out neutrons from a probe inserted in the soil. The instrument takes a reading of how the neutrons move through the soil, which can then be related to soil moisture content. Calibration is required to get accurate results. This method uses radioactive material that requires specialized training and certification. In addition, neutron probes are the most expensive option.

Grower Profile

A Shot of Java Is a Shot in the Arm

For this California Avocado Grower

By Tim Linden

Jay Ruskey has no doubt that specialty coffee farming can become a very important factor in allowing California avocado growers to profitably ply their trade.

He has been growing coffee plants on his Santa Barbara area ranch for more than a dozen years, and believes the future is bright for a niche California coffee industry. And coffee plants, he says, work perfectly as a companion crop with avocados in many locations. He said a grower can realize an additional profit of at least $5,000-$8,000 per acre by adding coffee plants under the avocado tree canopy.

Ruskey, who operates his farming entities under the company name Good Land Organics, has been in the avocado business for about 25 years. The family farm is located in the foothills of Santa Barbara at an elevation of about 650 feet, where the acreage has a warm southern exposure.

Ruskey grew up in Hollywood and went to Cherimoya Elementary School, which he said must have been a precursor to his future profession as today he is also a cherimoya grower. As a kid, his first introduction to farming was observing the flower farms in the Carpinteria area when he was surfing. He eventually had a job with a flower grower, which led to enrolling in agricultural business management classes at Cal Poly San Luis Obispo.

Simultaneously, his parents were purchasing an avocado ranch in the hills near Goleta, CA. "I went to Cal Poly to learn the business side of agriculture. I actually tried to switch to horticulture but a lot of the classes didn't transfer so I stayed with ag business."

It was the early 1990s and Ruskey became the proprietor of the family farm. The ranch had a variety of crops, including cherimoyas. The avocados were marketed through Calavo, as the previous owner had done, but Ruskey sold the other items at local farmers' markets, no doubt utilizing his ag business schooling.

By the early 2000s, he was running the family ranch as well as several others, and playing around with alternative crops. Besides cherimoyas and avocados, he planted some finger limes and coffee to supplement his all year production and thus keep a labor force active all year. The cherimoyas are a winter to spring crop; avocados go from spring to summer; coffee is harvested from the summer to fall; and finger limes are a fall crop.

By having this year-round production, Ruskey said he can keep a good cash flow and provide steady work for his employees. Though he has a 42-acre parcel spread among his crops, he likes to talk in terms of trees rather than acres. He has about 2,000 avocado trees and about 1,500 coffee plants though 500 more are about to be planted. He also has five acres of cherimoyas and three acres of finger limes.

The coffee plants are spread among 13 different varieties, which he said is very compatible with his avocado groves.

"Avocados like a companion crop and coffee and avocados share a lot of similarities."

Ruskey said the crops have the same needs with regard to soil pH, nutrients and water. And the coffee plants love the shade and shelter that the avocado trees provide. Depending upon the configuration of the grove and its spacing, Ruskey said you can plant as many as 500 coffee plants per acre in an avocado grove.

If you double plant an acre of avocados with coffee plants, Ruskey said a grower will probably use 20 percent more water and additional nutrients, which are good for both the coffee and the avocados. But the coffee plants will also use water and nutrients that otherwise would be wasted. You have created a more efficient grove and that extra cost will be easily offset by extra profits.

He is in the business of selling specialty coffees, which go for five to 10 times more per pound than the commodity coffee that is grown in abundance in Central and South America. So far Good Land Organics has sold most of its coffee beans to Asia at a rate of $60-$80 per pound. Last year, Ruskey harvested 500 pounds of coffee beans and this year he is expecting 1,000 pounds. Industry average is a pound of beans per tree but Ruskey said he has had some trees yield as much as 10 pounds of beans. He said a grower should be able to net a profit of at least $10 per tree with the coffee plants.

While Ruskey sells most of his beans to Asia he is intent on creating a specialty coffee industry in California utilizing locally-grown beans. He and Jim Shanley, of Shanley Farms in Morro Bay, have partnered in the development of a nursery designed to primarily produce companion crops for avocados such as coffee, passion fruit and dragon fruit.

Both men said the California coffee industry is like the wine grape industry was 50 years ago. "In the early 1960s, California red wine largely consisted of burgundy," said Shanley.

Over the years, growers increased their plantings of varietals and a specialty wine industry has developed that takes a back seat to no other production area in the world. The same can be done for coffee, Ruskey and Shanley believe.

"If you start with superior genetic material and better varieties, you can achieve excellent yields," said Ruskey. "And consumers are starting to recognize the differences in specialty coffees."

Shanley said Starbucks has introduced the entire country to higher quality coffee and he believes many consumers are ready to take the next step. He believes that California avocado growers are uniquely situated to capitalize on the movement.

As he sees it, there is plenty of land available to avocado growers where they can efficiently plant coffee, as well as other crops, with no additional land costs and only minimal additional cultural expenses. If a grower can truly make an extra $5,000 to $8,000 profit per acre, it would seem like a no brainer.

Coffee plant underneath an avocado tree in Santa Barbara.

But Shanley cautions that the goal has to be to produce top quality product. "Gourmet coffee is a winner economically," he said, adding that it would not be a winner to produce commodity coffee and try to compete against the huge coffee plantations of Central and South America. In that situation volume is king and the low per-pound market price reflects that.

For this reason, Ruskey said the duo is looking for only top notch growers to help launch the California coffee industry. Basically, he said if a grower isn't doing a great job on his avocados, it's not likely he is going to spend the time, energy and resources to produce a great coffee crop. Just as the California avocado industry is trying to carve out a premium price for its avocado, so will the California coffee industry take that route as it proceeds on its journey.

Ruskey and Shanley are currently trialing coffee plants from Oceanside to San Luis Obispo to find the best land and climate on which to grow coffee. In addition, Ruskey said work is now being done on a coffee manual that will provide a grower with a good guide on how to grow the crop and produce a great cup of coffee and, in the process, help preserve the California avocado industry.

California Avocado Recipes Encourage Demand

CAC develops recipes for all occasions – breakfast, snacks, lunch, dinner and dessert.

What better way to drive demand for California avocados than to appeal to the visual and culinary appetites of American consumers? Today, Americans are increasingly driven to seek new recipes, and thanks to the Internet new meal ideas are easily at their fingertips. Because of this, developing new recipes for each California avocado season is one of the California Avocado Commission's key marketing initiatives.

On the culinary side, planning and preparing for recipe development begins in the fall as the Commission and its chef partners begin working on recipes that demonstrate the exceptional taste and versatility of the fruit. Because humans also are visual creatures, a stunning, scrumptious photo accompanying a recipe is often the motivating factor for tearing out, downloading or sharing a recipe. The Commission has made it a practice to include an eye-catching photo with each newly developed recipe. In response to consumer interest in a visual representation of recipe preparation, this year CAC began taking recipe preparation photos to enhance the recipes. More are planned for the coming year.

The goal of recipe development is to offer new usage ideas that encourage consumers, media and health professionals to expand their usage of California avocados, purchase the fruit more often and share their love of the fruit via social media.

Recipes support many CAC marketing initiatives, with the results noted as follows.

Nutrition

Recipes are a creative way to share positive nutrition information concerning California avocados. CAC secures full nutrition data for each of its new recipes and highlights nutrients of value.

Public Relations

Ten recipes were developed by CAC spokespeople in support of 2014 marketing initiatives. These recipes were distributed via a variety of public relations initiatives to reach consumers and industry personnel.

Registered Dietitian (RD) Ambassador Katie Ferraro, MPH, RD, CDE, created four snacking recipes that weigh in at 100 calories or fewer: BLT & Avocado Potato Bites, California Avocado Cucumber Cups, Jicama Avocado Slaw on Rice Crackers and Power Hour Pick-Me-Up Smoothie. The recipes were included in a press release and mat release promoting healthy snacking.

Artisan chef partner Lisa Schroeder of Mother's Bistro & Bar in Portland, OR, developed a California "BLAST" Sandwich and a Crab, California Avocado and Pink Grapefruit Cocktail to promote the culinary versatility of the fruit. The recipes were included in a press release promoting June as California Avocado Month and the Crab, California Avocado and Pink Grapefruit Cocktail also was showcased at a media event in Chef Lisa's restaurant.

Artisan chef partners Mary Sue Milliken and Susan Feniger created two new American Summer Holidays recipes,

Oven Barbequed Ancho Chicken with Cabbage, Grapefruit and California Avocado Salad and California Avocado and Tomato Salad with Crispy Crumbs and Bacon Vinaigrette. Both recipes were included in a press release promoting California avocado usage around the American Summer Holidays and were featured in a Fourth of July holiday party segment on the national broadcast show, "The Daily Buzz."

As part of the Commission's Wake Up to Breakfast with California Avocados program, Avocado Pumpkin Bread with Dark Chocolate Chips and Almonds and Eggs-traordinary California Avocado Breakfast Muffins were featured in a "California Avocados, Breakfast Superfood" press release and mat release. The recipes were developed by RD Ambassador Bonnie Taub-Dix, MA, RD, CDN.

Foodservice

Year-round, the foodservice team scouts menus from restaurants, food trucks, caterers, and onsite operators in CAC's major market areas looking for interesting, innovative, and unusual dishes that feature fresh avocado. Once a menu item of interest is identified, they contact the operator and assess the operator's interest in working with CAC to promote their recipe and fresh California avocados for mutual benefit.

CAC's foodservice team then works with trade publications to place the recipe / photo in articles, recipe features and product promotions and coordinates interviews. Some of the most popular menu applications continue to get placements for 4 - 5 years and beyond.

This year's new feature recipes and placements include:

- California Avocado and Mushroom Sandwich – Bacon & Butter, Sacramento, CA
- California Avocado Chorizo Sliders – Left Coast Food Truck, Portland, OR
- Spicy Carrot and California Avocado Salad – Departure, Portland, OR
- Healthy Benedict – Red Star Tavern, Portland, OR

Supermarket Registered Dietitians (SRD)

To encourage SRDs to feature California avocados in in-store programs and via their social media channels, the Commission shares new avocado–centric recipes in the SRD Tool Kit. Pam Anderson, AARP.com food expert, seven-time cookbook author and food blogger, developed California Avocado Breakfast Taco and Farro with California Avocado, Tomato and Basil, which were featured in CAC's "Cooking for 2 or 1" themed SRD Tool Kit.

Retail

California Fresh Snacking was promoted with a new recipe brochure and a California Fresh Salads recipe tear pad was developed for in-store use. The brochure included 12 recipes, five of which contained recipes that are "100 calories or less" per serving.

Online and Social Media

Recipes are one of the top reasons consumers visit CAC's website — nearly one-third of all visitors (about 60,000 per month) go to the recipe section of the site. In addition, CAC's recipe posts on Facebook, Twitter, Instagram and Pinterest are some of the most popular posts. The top posts for "The Scoop" blog have been recipes — Mother's Day, 4th of July party tips and the Cinco de Mayo street tacos recipe

had an average of 1,418 page views and more than two minutes spent on the post.

Produce Industry and Brand Partnerships

Brand partnerships help expand the reach of recipe ideas and build California avocado brand awareness. Working with the Produce for Better Health Foundation (PBH), an Avocado Breakfast Bruschetta recipe was developed as part of their MyPlate™ program. The recipe was posted on the PBH and USDA MyPlate website and shared on PBH and USDA's social media channels with great results.

CAC also participated in a promotion with Houweling's Tomatoes that featured CAC's California Avocado Fresh Pico de Gallo on 4 million tomato truss tags. Finally, California Olive Ranch Olive Oil, Gourmet Garden and Weber shared CAC recipes with bloggers and their social media fans.

The goal of CAC's recipe development program is to create new usage ideas that support the brand's premium position and ultimately increase consumers' love for and purchase of fresh California avocados. CAC regularly receives requests for its recipes and photos from cookbook authors, website developers, brands, retailers, chefs and even nutrition experts — clear evidence that the Commission's goal is being met.

By Tim Linden

Didn't Meet Expectations... But It Was a Good Season

Going into this season, the California avocado industry was expecting a very good year with regard to market price and there was speculation that the grove price could reach $2 per pound.

The reasoning was that the 2014 on-tree crop was estimated at 300 million pounds, only 60 percent of the 2013 crop. With Labor Day in the rearview mirror and the vast majority of the crop picked, packed and shipped, early season speculation was replaced with end-of-the-season accounting.

"It wasn't a bad season," said Steve Taft, president of Eco Farms Avocados Inc., Temecula, CA. "But most people thought it was going to be better. I always thought the talk of $2 a pound (at the grove) was wishful thinking."

Taft said total volume will be around the 300 million pound level and grower returns were pretty good. He added that the grove price for organic avocados did reach the $2 per pound level.

Ron Araiza, director of sales for Mission Produce Inc., Oxnard, CA, echoed those same sentiments. Prior to the Labor Day weekend, he said California was winding down and September supplies would be much lighter than usual but perhaps a bit more than early season talk, which suggested that the industry would be finished by Labor Day. Araiza expected four million pounds of California fruit to be shipped that week and for shipments to continue to taper off through the rest of the month.

Phil Henry, president of Henry Avocado Corp., Escondido, CA, said that by mid-August, California growers were at about 273 million pounds. He anticipated shipments throughout September, albeit at a relatively low level. "Three hundred million is possible," he said. "We may get there."

One California area gearing up for that September time slot as this was being written was the Morro Bay avocado deal from California's Central Coast. Over the last several years, growers in California's furthest avocado-producing region have been creating a niche market for their fruit.

Jim Shanley of Shanley Farms in Morro Bay, CA, said a couple of growers are out of the deal this year because of drought issues but two other growers joined the program and he was expecting volume similar to what Morro Bay had last year for the eight-week shipping season. The deal was expected to kick off on Labor Day and last through October.

Shanley expects to receive a premium for that fruit in the high $30s. In fact, in mid-August and through Labor Day, California fruit was selling for top dollar in the high $30s. Throughout the summer there was a two-tier pricing system as California fruit earned as much as $10 more per carton f.o.b. than the Peruvian fruit. However, there is no doubt that the increased presence of Peruvian avocados put downward pressure on the market price of avocados.

As the industry looked forward to 2015, shippers reported that it was too early to make an accurate prediction on the size of next year's crop. Water issues are top of mind and growers are holding their collective breaths that fall and winter rains help make the crop.

Eco Farms Sold To Total Produce

Total Produce, based in Dublin, Ireland, has purchased a 45 percent share of Eco Farms Avocados, Inc., in Temecula, CA.

Eco Farms, which was started by a partnership led by Steve Taft in the early 1970s, was one of the pioneers in the development of the organic avocado sector. Taft said the company has entertained offers before but the timing was never right. He said a number of factors entered into the decision to allow Total Produce to purchase a minority stake in the avocado operation with the ability to take controlling interest at an unannounced time down the road. "Certainly the age of the partners was a factor," he said.

However, he added that there will be no immediate changes in the management of Eco Farms. Total Produce's first entry into the North American marketplace came in early 2013 when it agreed to purchase a controlling interest in the Vancouver, British Columbia-based Oppenheimer Group in two phases over a four to five year period.

The Eco Farms president expects the new partnership will result in an infusion of cash "that may allow us to do a few things," but he wouldn't reveal any specifics.

Promotions Encourage Sales of California Avocados

Long before the California avocado harvest begins each year, the California Avocado Commission meets with targeted retailers and foodservice operators to convince them to carry California avocados in season.

Throughout the 2014 season, CAC also met regularly with these accounts to create customer-specific programs that promoted consumer purchases of the fruit. Retail programs such as feature ads and display contests encouraged inventory turns and customer loyalty. Foodservice promotions stimulated new menu applications and out-of-home consumption of California avocados. Promotions in both distribution channels helped educate consumers about where the avocados they buy originate and increased California avocado brand awareness.

RETAIL PROMOTIONS

Retail programs support retailers committed to carrying California fruit during the season and reinforce CAC's overall consumer communication.

CAC developed custom California avocado signage for the Ralphs' Labor Day promotion.

Retail Ads

Feature ads draw shoppers into the chains' stores to purchase the advertised items. For California avocados, obtaining feature ads identifying the California origin of the fruit ensures that the retailer will stock California avocados in support of the ad. CAC provides retailers the resources to call out the fruit origin in-ad via the Hand Grown in California logo or other California-grown identification.

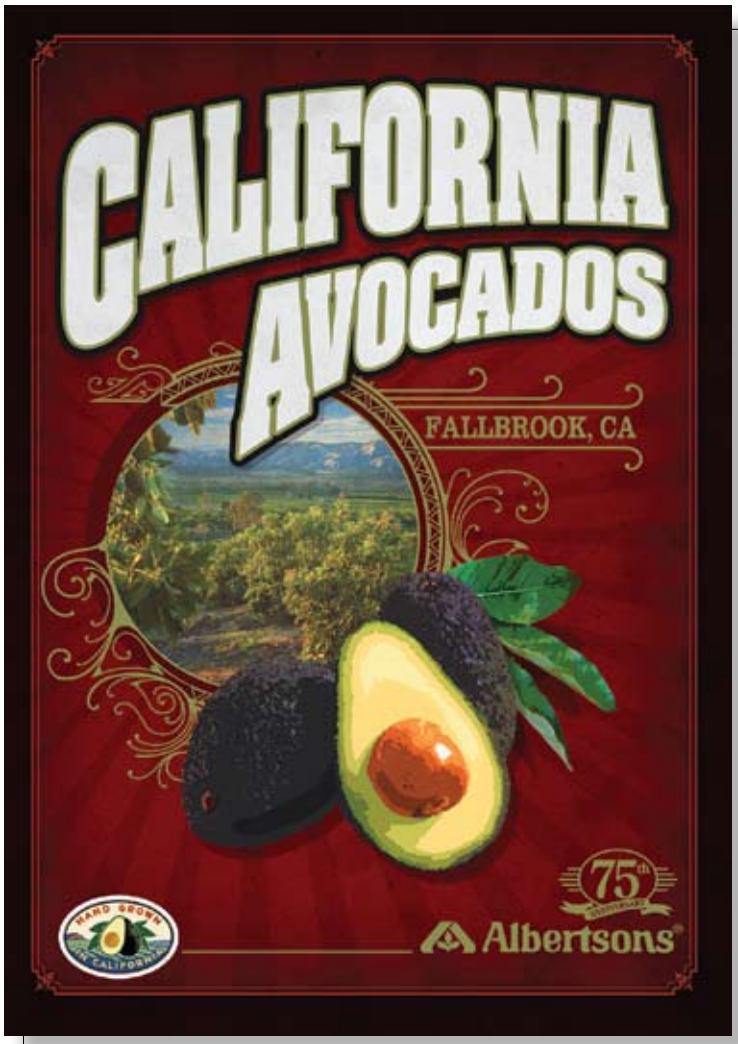
This summer California avocado grower Chuck Bandy was featured in Albertsons' ads. The ads announced that California avocados were available in Albertsons stores and encouraged shoppers to purchase avocados cultivated by California growers.

Retail Displays and POS

Retail merchandising such as displays and point-of-sale (POS) materials are effective tools for drawing attention to California avocados in stores. This year to date CAC has provided 1,896 display bins to retailers who stock California avocados, along with myriad POS materials.

Some retailers prefer to use their own POS and display materials. This season California avocados were included in the 75th anniversary celebration for the Southern California Albertsons division. Two hundred Albertsons stores showcased California avocado banners in their produce departments and kept them up through Labor Day.

Sales and display contests are an excellent way for the



Retail Support

CAC retail support this season included participation in Bristol Farms cooking schools and digital coupons with Ralphs. Consumers can download digital coupons via the internet, and this is one of the fastest growing methods for chain retailers to communicate value opportunities to their shoppers.

Example of a digital coupon supporting California avocados.

retailer to add value to the grower's returns by accentuating origin of the fruit, and doing so in a manner that excites both consumers as well as store personnel. Some of these contests allow the Commission to reward and educate the in-store produce personnel who are the contact point with consumers.

An example is the Fresh California Avocado Guacamole Sales Contest conducted with Albertsons Southwest (Phoenix). Over the 4th of July holiday, this Albertsons division promoted California avocados utilizing CAC's display bins. Additionally they ran an in-store Fresh Made Guacamole Sales Contest using California avocados. The produce manager in each of the seven districts with the highest sales increases and the top performing district's Operations Specialist all won cash prizes.

To encourage retailers to keep California avocados in their stores through Labor Day, the Commission set up sales contests with multiple accounts, including Lucky Supermarkets, Northwest Grocers, Save Mart Supermarkets and Smiths. (See also the 4th of July article on page 7 for information on the Gelson's sales contest.)

Grace Marie Johnston of Bristol Farms demonstrated California avocado handling and recipes at their cooking school events.

Large California avocado display in St. Louis.

Non-core Market Retail Events

Most of CAC's efforts in non-core markets are driven by special or holiday-timed in-store events. These can be valuable in that they provide the opportunity to accentuate California avocado origin. The Food Emporium, with stores located in New York and Connecticut, supported California avocados through advertising and customer POS for 4th of July. Additional programs with Dierbergs, H.E.B., Hy-Vee, Publix and Schnucks featured premium California avocados in the Midwest, Southeast and Texas throughout the California season.

FOODSERVICE CHAIN PROMOTIONS

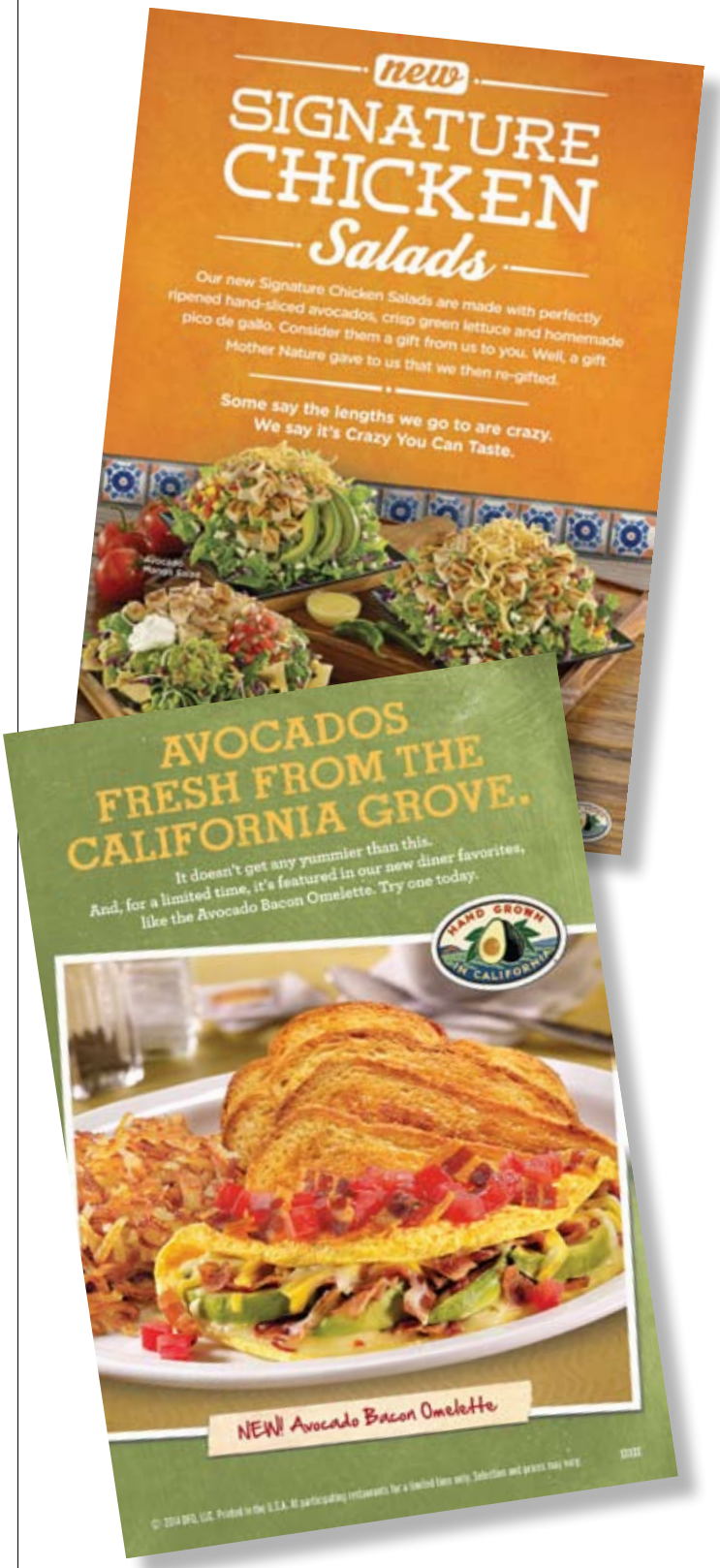
CAC's foodservice chain promotion program combines the customer's unique brand positioning and culinary offerings with the versatility and allure of California avocados. The CAC team attends select foodservice events such as the International Corporate Chefs Association (ICCA) Summit, attended by the top 200 U.S. chain restaurants, to demonstrate to targeted chains the value of adding fresh California avocados to their menus.

Spring Fast Casual Chain Promotions

Springtime promotions with El Pollo Loco and Habit Burger helped kick off California avocado season. From April 16 through May 30, El Pollo Loco (a regional chain with 400 units in California, Arizona, Texas, Nevada and Utah) ran an avocado salad promotion supported with several in-restaurant merchandising pieces, and a free standing insert (FSI) promoting the avocado salad. The chain prominently featured the Hand Grown in California logo on all promotional materials. Habit Burger, recently rated the best burger chain in the United States by The Huffington Post, had a Limited Time Offer (LTO) featuring California avocados from April 30 through June 10. The 94 Habit Burger locations in California, Arizona and Utah featured the Santa Barbara-style Charburger — a double burger served with fresh California avocado on grilled sourdough bread.

Another highlight of this season's California avocado chain promotions was Denny's, a national chain with more than 1,500 units. From April through June Denny's dedi-

The Signature Chicken Salad promotion at El Pollo Loco featuring an Avocado Mango Salad, Mexican Cobb Salad and Taco Salad ran from late April through May, 2014.



Denny's California locations promoted "Avocados Fresh From the California Grove" with their Avocado Bacon Omelette.

cated a full panel of their menu to dishes that featured avocados. In June the chain sent out an eBlast to fans focusing only on avocado menu items, and supported the program with a stanchion poster in the restaurants. Also in June, 412 California Denny's brought back their popular Bacon Avocado Omelette, Avocado Santa Fe Skillet and Avocado BLT. In-restaurant support included table tents with the Hand Grown in California logo.

Summer Sandwich Promotions

Consumers love to add avocado to sandwiches, and CAC has been very successful developing promotions with fast casual sandwich chains. In the month of July, more than 1,500 Subway stores in the greater Los Angeles, San Diego, Santa Barbara and Bakersfield areas supported the chain's national avocado promotion with a local FSI mail drop promoting the Turkey & Bacon Avocado sandwich. POS materials also were branded with the Hand Grown in California logo.

Across the nation from July 7 – August 10, the Dallas-based "superior sandwich" chain Which Wich encouraged diners to add fresh California avocados to their sandwiches with eye-catching, appetizing photos of California avocados and the Hand Grown in California logo on counter cards, table tents and in the chain's website banner ads. They also communicated to their Facebook fans with a post featuring California avocados.

The San Jose-based 250-unit sandwich chain Togo's featured California avocados in menu items with in-store merchandising and consumer advertising from July 15 through August 10. To broaden the reach of the promotion, fresh California avocados were mentioned in the chain's Facebook advertising, on the Togo's app and in email blasts directed at sandwich club members. On July 24, the chain celebrated California avocados and its classic #24 Turkey & Avocado Sandwich with a free #24 sandwich giveaway.

East-Coast Chain Promotions

The Commission developed a host of other California avocado-branded foodservice promotions this year, including campaigns with some up-and-coming east-coast chains such as California Tortilla and Just Fresh, who committed to using California avocados during the program. Other promotions included Baja Fresh, La Salsa and Shari's, among others.

In addition to encouraging out-of-home consumption of California avocados, partnering with foodservice chains provides additional exposure of California avocados through menus, merchandising tools, social media and coupon advertising. Peak California avocado season is an opportune time to feature avocado-centric menu items that also inspire consumers to try new recipes at home.

PSHB and Fusarium Dieback Update

INFESTATION SITE UPDATES

According to Dr. Akif Eskalen, UC Riverside, as of August 2014, confirmed infestation sites of polyphagous shot hole borer beetles (PSHB) are located in Los Angeles, Orange, San Bernardino, Riverside, San Diego, and Santa Cruz counties. Los Angeles County and Orange County contain the highest density of known infestation sites, with Los Angeles County containing the northernmost and westernmost infestation sites in Southern California. The easternmost infestation site is located in the city of Corona in Riverside County. A single heavily infested location exists west of Cleveland National Forest in San Diego County, but no other infestation sites have been found in San Diego County thus far. An infestation has also been found west of San Jose in Santa Cruz County, and it is currently the only known infestation site in Northern California.

Fig. 1: Distribution of known infestation sites in California.

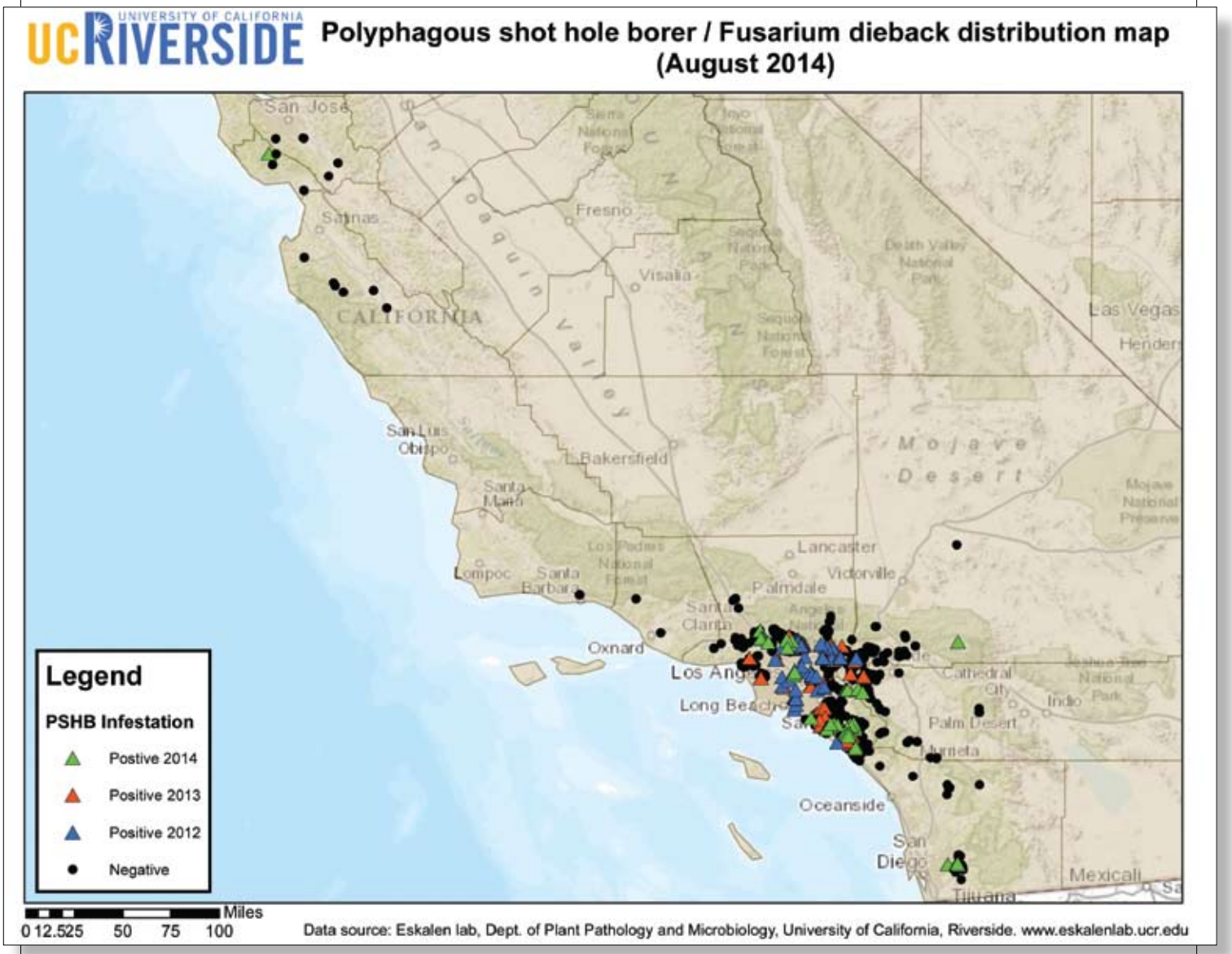
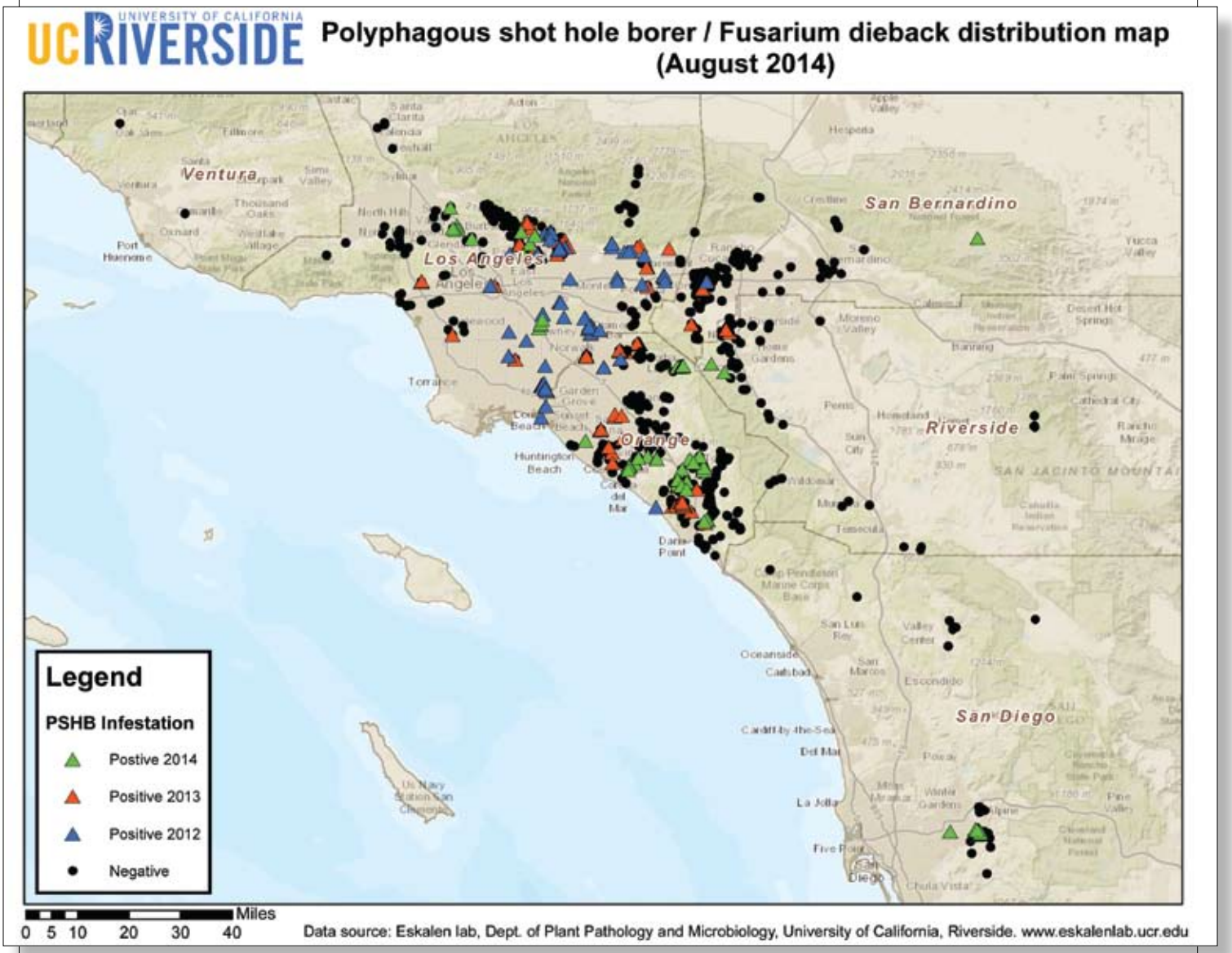


Fig. 2: Distribution of known infestation sites in Southern California.



TESTING PSHB MANAGEMENT TACTICS

According to Dr. Timothy Paine, UC Riverside, management of PSHB will require a range of effective tactics, noted below, for control of the insect.

Chipping and solarization of infested wood

Chipping and solarization of infested wood may reduce the number of beetles that could colonize new trees. While chipping, as a sanitation treatment, has significant potential to reduce the population of emerging beetle, Dr. Paine's research indicates that the chipping process of heavily infested wood must be conducted very carefully.

In an experiment to test beetle survival in chips, wood was chipped and sorted into three size classes: coarse (greater than 2 inches), medium (1-2 inches), and fine (less than 1 inch). Unchipped sections of log were also monitored as an untreated control.

Chips were placed in five-gallon buckets with emergence chambers. Since beetles often remain in host material rather than emerging, a six-inch section of clean trap log (castor bean) was placed in each bucket to survey survival and activity in the bucket. Buckets were checked every two weeks for emergence and activity on the trap log. A new trap log was then placed in the bucket. Buckets were monitored for a total of 11 weeks.

While a few beetles from coarse and medium chips attacked trap logs, the number of attacks was always significantly lower than for trunk sections. There was no beetle

activity on trap logs from buckets of fine chips.

These results, as well as results from previous trials, demonstrate that while chipping is very effective at reducing beetle survival, some beetles will survive in medium and coarse chips and beetle larvae may complete development. Therefore, unless the chipping is conducted very carefully so that the wood is chipped to a fine consistency, material should not be moved from the infestation zone. Covering chipped material will likely prevent any surviving beetles from emerging.

Insecticide application

Dr. Paine is also investigating whether applications of insecticides to uninfested trees may create a barrier protecting the trees from colonization. The insecticides Safari 20 SG (dinotefuran), Danitol (fenpropathrin), and Arena 50 WDG (clothianidin), with and without the use of the bark penetrating surfactant Pentra-bark were compared to Onyx (bifenthrin). All pesticides were applied at the high label rate. During the two weeks of beetle exposure, none of the pesticides performed better than Onyx. However, all insecticides did provide trunk protection, particularly when used with the penetrating agent.

Varietal susceptibility

In addition to direct control, Dr. Paine notes that understanding varietal susceptibility will provide a baseline for risk assessment in future insect management plans because different varieties of avocado appear to have different levels of susceptibility to PSHB.

Dr. Paine's team acquired freshly pruned branches from nine avocado cultivars located within UC Riverside groves. The branch samples were divided into 12 – 15-inch segments and placed in five-gallon buckets with beetle-infested branches for a five-week time period. For a choice test trial, five buckets contained one branch from each of the nine cultivars. Each cultivar was also placed singly in a bucket for a no-choice trial.

Data collected from buckets with branches from all avocado cultivars during the weeks while beetle source logs were present showed attack rates were highest for Zutano and lowest for Bacon, Gem and Gwen. Preliminary data comparing gallery formation among the cultivars indicates that Lamb-Hass may be most susceptible to beetles, having a high rate of gallery formation to attacks. While Feurte and Zutano had higher rates of attack, they had relatively low gallery formation, indicating these cultivars may be more resistant.

Avocado trees with an average stem diameter of 18 mm also were planted at CalPoly Pomona in April and exposed to beetles using infested box elder logs wrapped next to each tree trunk with burlap. Source logs were left in place for six weeks. Cultivars included Ettinger, Hass, Lamb-Hass, Pinkerton and Zutano. At the end of the infestation period Ettinger, Pinkerton and Zutano were more heavily attacked than Hass.

LURE TESTING

Dr. Richard Stouthamer continues to investigate PSHB lure testing at groves in Huntington. While the testing is still in the preliminary stages, one of the lures being tested indicates that the beetles are attracted to the lure. In the upcoming year, Stouthamer will test an orange oil lure at the Huntington avocado collection.

IDENTIFYING BEETLES

A recent PSHB find in a Durban, South Africa park is also considered significant because this region is an important port in South Africa. The Durban find was discovered by one of Stouthamer's team members, Paul Rugman-Jones, as he was querying the Bar Code of Life database (BOLD). This database contains a large number of DNA sequences for the mitochondrial COI gene. Each species has a unique sequence for the COI gene, and this database helps researchers identify species by comparing COI sequences within the database to determine what genus or species a specimen belongs to.

In this case the South African specimen was an unknown ambrosia beetle, but the BOLD sequence was identical to one of the three COI sequences found in the PSHB from California, to one in Israel, and to one of the many COI sequences found in Vietnam.

It has also been determined that the beetles from Sycuan have a different genetic fingerprint than those found in the greater Los Angeles infestation. While beetles with an identical genetic fingerprint for the Los Angeles infestation have been found in Vietnam, the infestation in Sycuan has a genetic fingerprint identical to beetles from Taiwan.

Stouthamer's lab will run tests to determine if the Sycuan and Los Angeles/Vietnam beetles are compatible by mating Sycuan females with Los Angeles males and Los Angeles females with Sycuan males to determine if they are the same species.

SEARCHING FOR NATURAL PREDATORS

In January 2015, Drs. Eskalen and Stouthamer will travel to Taiwan to collect beetles and fungus. Researchers will also collect nematodes that Taiwanese scientists have indicated are natural enemies of PSHB. The nematodes will then be tested against PSHB in the California quarantine facility.

Blogger Outreach Generates Millions of Impressions

Today, a whole new culinary community exists online fueled by consumers' growing interest in collecting, sharing and discussing recipes. One portion of that community consists of increasingly popular food-focused blogs and the fans who read and share the blog posts. Another portion of that community consists of social media sites — Pinterest, Facebook, Instagram and Twitter — that allow consumers to search for and share their love of particular brands, products and recipes. Together, blogs and social media sites have become today's new "cookbooks." With one tap of a finger, Americans are choosing tonight's dinner, tomorrow's bake sale recipe and this weekend's backyard BBQ side dishes.

Recognizing the potential of this new online culinary community, the California Avocado Commission developed the blogger outreach program to help differentiate California-grown fruit from other avocados in the marketplace and increase awareness and demand for California avocados in season. To harness the power of bloggers' credibility, CAC builds and maintains relationships with key blogger influencers through events, sponsorships, partnerships and product immersion. The Commission educates bloggers about California avocados' premium quality, its spring – fall season and its unique freshness resulting from the fruit being grown close to market. CAC also encourages bloggers to share their love for California avocados and develop their own unique creations with the fruit, which they can then share with their readers.

Events

Events are an effective way to educate bloggers about California avocados while inspiring them to write about the fruit. In 2014, CAC hosted a Grove Tour, allowing influential media and bloggers to gain a better understanding of the distinctive qualities and consistent reliability of California avocados.

During the one-day event, guests had the opportunity to tour an avocado nursery, meet California avocado growers, enjoy a California avocado-centric lunch and visit an avocado packing house. The event was a huge success, garnering 115 tweets, 7 Facebook posts, 24 Instagram posts and 5 blog posts, which resulted in more than 1.5 million impressions.

In addition, to help promote June as California Avocado Month, CAC partnered with artisan chef Lisa Schroeder to host a media event at her restaurant, Mother's Bistro & Bar. During the event, 15 bloggers were treated to a multi-course dinner that showcased the versatility of California avocados — ranging from an avocado daiquiri and macaroni and cheese to avocado key lime pie. Chef Schroeder also provided California avocado cooking tips and information about the fruit and answered questions from attendees. During the dinner and following the event, 85 social media posts and online stories were secured, resulting in nearly 95,000 impressions.

Dara Michalski

Diane Schmidt

Kristen Doyle

Rachel Matthews

Sara O'Donnell

Shawn Syphus

Partnerships with Bloggers

In recent years, CAC has built relationships with a number of prominent bloggers and continuously works to engage with them not only on social media, but in person through events and sponsorships. These one-on-one connections contribute to lasting relationships with bloggers who are true fans and ambassadors of California avocados. CAC has partnered with six bloggers, appointing them as ongoing ambassadors for the premium fruit. These bloggers provide monthly posts for CAC's "The Scoop" blog, each featuring new California avocado-centric recipes.

During the season, CAC continues to connect with new bloggers during key time frames, such as California Avocado Month and American Summer Holidays. These influential bloggers receive shipments of California avocados to inspire them to write about, promote and create amazing recipe posts and social media promotion about California avocados. Throughout the season, this outreach generated 18 blog posts, 24 tweets and 11 Instagram posts, resulting in more than 600,000 impressions.

Sponsorships

CAC also is able to reach a wider group of bloggers by sponsoring conferences and workshops. This year, CAC sponsored Eat Write Retreat — a three-day conference for food bloggers. As part of the sponsorship, CAC hosted a booth during the opening night meet-and-greet, coordinated a California Avocado Toast Challenge and hosted a California avocado-centric dinner at Supper Restaurant, with a special menu developed by chef Mitch Prensky. CAC representatives also participated in the entire weekend of events, allowing them to create and solidify their relationships with the blogger attendees. The event inspired 128 tweets, 9 Facebook posts, 47 Instagram posts and 12 blog posts, which garnered more than 300,000 impressions.

Additionally, CAC sponsored FitBloggin', a conference for bloggers interested in fitness, wellness, good food and a healthy lifestyle. This was CAC's first foray into outreach with fitness and lifestyle bloggers, and it was a resounding success. During the conference, chef and CAC Registered Dietitian (RD) Ambassador Michelle Dudash led CAC's wellness session, "Cutting Edge Culinary: California Avocados as a Fat Replacer, Flavor and Color Enhancer, and Nutritional Booster." During the conference, CAC hosted a Twitter contest, encouraging attendees to share their favorite ways to enjoy California avocados. Attendees loved the

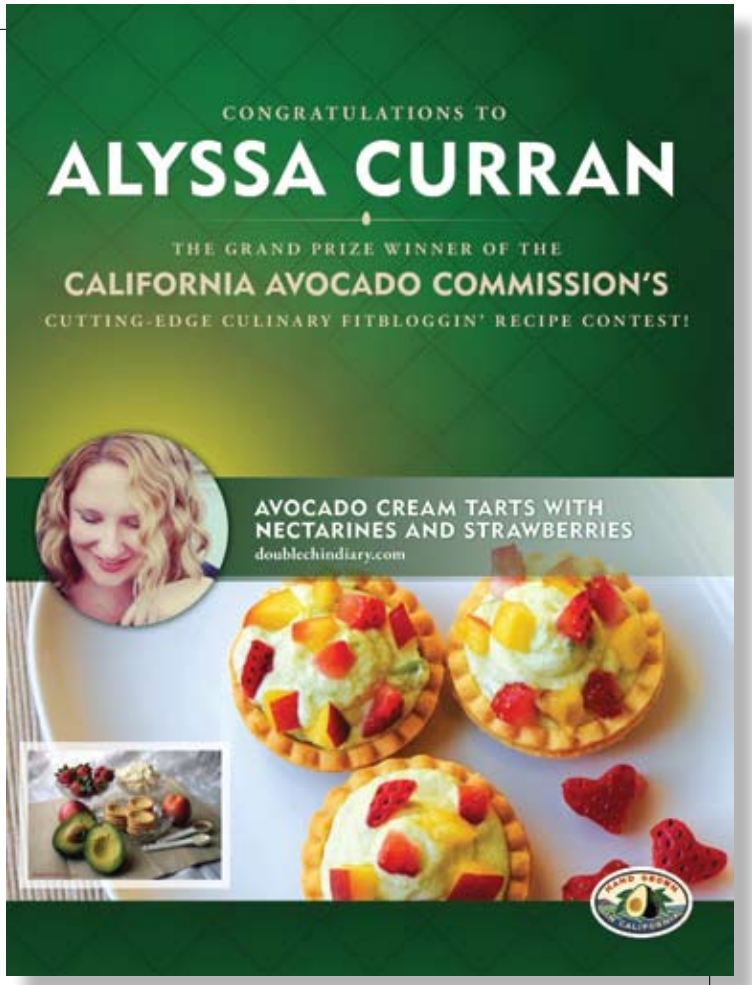
healthy recipes and snacks at the CAC booth. The event garnered 170 social media posts, resulting in nearly 375,000 impressions.

Recipe Contests

With smartphones and tablets, recipes are readily available for consumers at the tap of the screen. So consumers are frequently looking to blogs for recipe inspiration. Understanding the influence bloggers have on consumers' menus, CAC partnered with blogger group The Recipe Redux to conduct a recipe development challenge. Founded by registered dietitians whose recipe-focused blogs emphasize healthy food preparation, The Recipe Redux hosts monthly recipe challenges to inspire healthy eating and a love for food.

Top food and nutrition bloggers from across the country were challenged to develop the perfect summer get-together dish featuring California avocados. Participants also included a post with the recipe on their respective blogs and shared it on their social media channels. CAC provided fresh California avocados to all participants for inspiration. In total, 63 recipes featuring California avocados were submitted. Each was judged on taste, simplicity, dish appearance/photo quality, nutritious attributes and creativity. As a result, new recipes featuring California avocados were created and shared, encouraging the bloggers' followers to recreate these dishes with the fruit and to purchase California avocados. The contest earned a total of 399,446 impressions for California avocados through more than 60 blog posts and more than 150 social media posts.

Lastly, as part of CAC's sponsorship of FitBloggin', CAC activated a "Cutting Edge Culinary Recipe Contest" prior to the conference to secure California avocado-branded content across bloggers' social media channels and to drive excitement for CAC's wellness session. FitBloggin' attendees were encouraged to submit their favorite California avocado-centric snack recipe(s) for a chance to have their recipe featured during CAC's wellness session with RD Ambassador Michelle Dudash. The winning recipe was California Avocado Cream Tarts with Nectarines and Strawberries developed by blogger Alyssa Curran of Double Chin Diaries.



Results

CAC's blogger outreach program has resulted in positive culinary blogger coverage of California avocados that has reached millions of consumers via blogs, Twitter, Instagram and Facebook. CAC has forged relationships with hundreds of bloggers through events, sponsorships and ambassadorships, securing 943 social media posts, reaching more than 5.4 million readers. As this program continues to flourish and social media channels grow and change at a rapid pace, CAC will continue to evaluate and leverage the influence of bloggers to tell positive stories about California avocados.

CAC Leads Appeal Before MWD Board

By Ken Melban
Director, Issues Management

In early July, the California Avocado Commission organized a group of agricultural representatives who spoke before the full Metropolitan Water District (MWD) board regarding the impact of current agricultural water rates. At that board meeting it was decided to place an item on the Metropolitan executive committee's agenda to further discuss our request.

In late July, A.G. Kawamura, former Secretary of Agriculture, joined Commission President Tom Bellamore and other agriculture leaders in an appeal to the Metropolitan Water District's executive committee. The request, spearheaded by the Commission, was for the creation of a working group that would address the high cost of water for agriculture in the Metropolitan service area.

There was quite a bit of discussion among the Metropolitan executive committee members, including some support, for setting up the working group. But Randy Record, Metropolitan chairman and himself a farmer, ultimately decided against creating a working group. Chairman Record did commit to a workshop format, under the Metropolitan's Agriculture and Business Outreach Committee, to provide an opportunity for agriculture's concerns and ideas to be heard.

"While we are not completely satisfied with the decision, it was a positive step forward," said Bellamore. "We remain engaged with Chairman Record and Metropolitan senior staff to identify and develop the next steps in this challenging environment."

The "challenging environment" Bellamore is referring to is California's record drought along with the ongoing rate litigation between San Diego County Water Authority and MWD. Those two factors make an already difficult situation all the more problematic.

An agricultural group met with MWD to discuss water rates this summer.

The Commission has been successful in developing a broad coalition that includes California Citrus Mutual, California Cut Flower Commission, California Strawberry Commission, Farm Bureau of Ventura County, Irvine Valencia Growers, Orange County Farm Bureau, Riverside County Farm Bureau, San Diego County Farm Bureau, Sunkist Growers and Western Growers. The coalition has been working to identify any possible options that may help reduce the high cost of water. While the "silver bullet" continues to be elusive, there remains no shortage of ideas.

"Our short-term goal is to get Metropolitan leadership to sit at the table with us and have a genuine dialogue about our concerns and commitment to possible solutions," said CAC Water Committee Chairman Charley Wolk. "Everything needs to be put on the table. Simply telling us there's

nothing they [Metropolitan] can do is unacceptable…at least until we've been allowed to fully vet our ideas!"

Throughout our effort, the Commission has been operating under the fundamental premise that a differentiated water rate or charge for agricultural customers must be based on a differentiated level of service. In other words, agriculture can't expect a reduced rate just so we can stay in business. Any special agricultural rate will have to be tied to developing a program that is based on water industry cost-of-service standards. Water rate structures are extremely complex and involve fixed and variable costs associated with average system demands. Cost elements include supply, conveyance and aqueduct, storage, treatment, distribution, demand management, and hydroelectric. We are working to identify Metropolitan's services and associated costs that agriculture would be willing to give up, or those services we could argue (successfully) that do not benefit agriculture.

The Commission is also working to develop possible programs that would provide value to both farmers and Metropolitan. One idea is "water purchase agreements," where farmers would agree to purchase a set amount of water in a year, likely above their average purchase volume, at a reduced rate. Under this type of agreement, a farmer who opted in would have to purchase the full volume of water they committed to regardless of actual need. This program could provide more fiscal stability for Metropolitan's fixed revenues, which tend to run around 20 percent, while their fixed costs are near 80 percent.

Another opportunity worth exploring is the value agriculture provides through carbon sequestration. Under California's Cap and Trade law, utilities like Metropolitan are required to purchase carbon credits for the carbon they are generating. It may be possible to develop a protocol that would recognize the carbon sequestration avocado groves provide and offer some form of credit back to farmers. Still another idea is an improved agricultural conservation program and / or a special agricultural rate in consideration for mandatory water usage reductions when supplies are diminished.

Considering that approximately 55 percent of California's avocado growers are within the Metropolitan service area, the current attempt to negotiate more affordable water is important. However, it's not the Commission's only advocacy effort concerning water. For example, CAC remains engaged with and supportive of the Escondido Growers for Agriculture Preservation (EGAP) activities. EGAP has been diligent in its campaign with the City of Escondido to develop a reclaimed water treatment and delivery system for agricultural users. Funding has already been approved and phase one construction should be completed in early 2016. Dr. David Crowley, University of California at Riverside, is conducting a side-by-side trial comparing the use of reclaimed water with potable water on avocado trees.

As water supplies continue to diminish, alternative sources must be explored. Generally, if there is the possibility for utilization of recycled water for agriculture, two obstacles exist: developing the capacity to treat water in order to ensure the quality meets the standards for healthy production; and creating an effective water delivery system. The development of treatment facilities and delivery systems are both very costly and long-term.

As a Commission we remain committed to every possible effort that may result in a more secure water supply for California avocado farmers. As such, if you know of any opportunities where the Commission may be of some assistance, please contact us at cac.iaf@avocado.org or 949-341-1955.

By Tim Linden

Labor Issues Offer Big Challenge in Brazil

Though the acreage of Fuerte and Hass avocados in Brazil increased by 20 percent over the last two years, it is still a relatively low acreage crop with not a lot of product being exported at the current time, and that is not expected to change any time soon.

Liliana Zayas works for Jaguacy Avocado, one of the larger avocado exporters in Brazil. She recently exchanged emails with *From the Grove* giving information about the size and scope of the Brazilian avocado industry.

She said Brazil has two avocado markets. The larger segment is devoted to what she called "tropical avocados" and includes such varieties as Breda, Fortuna, Geada, Quintal and Margarida. The other segment is for the Hass and Fuerte varieties. "The Jaguacy Farm is the largest producer and exporter of avocado varieties Fuerte and Hass in Brazil," said Zayas. "Planting the first seedlings started in 1974 at the hands of the agronomist engineer Paulo Roberto Leite de Carvalho who began planting the varieties in Bauru, São Paulo state."

Of the total volume of Hass and Fuerte produced by Jaguacy, 90 percent is sold in the foreign market to more than 20 countries and only 10 percent is sold in Brazil, mostly direct to supermarkets.

She said Brazil has about 12,000 hectares (30,000 acres) of the tropical varieties and about 1,200 hectares (3,000 acres) of Hass and Fuerte plantings.

São Paulo is the largest producer of avocados in Brazil, with 20 percent of Brazilian production, according to Zayas. Other major avocado producers are located in the states of Minas Gerais and Parana, located in the southern part of the country. "The production of Hass and Fuerte happen from March to September with the months May to July providing the largest volume of fruit," said Zayas

According to Zayas, São Paul produced about 850,000 pounds of Hass and Fuerte fruit in 2013, which was almost double the production of a year earlier. São Paulo's most prolific variety was Fortuna with about 23 million pounds.

She said domestic consumption of avocados is around 100 grams per capita (3.5 ounces), though it used to be higher. "There was a time when the image of the fruit became pejorative," said Zayas. "People believe that avocado led to weight gain and had no nutritional value."

However, she said research on the nutritional value of the avocado intensified about a decade ago, and the tide is starting to shift. "The research reinforced the nutritional appeal," she said, noting that avocados have many good health benefits.

Zayas said Brazilians traditionally eat avocados in a sweet form, combining the fruit with sugar, or whipped with milk and sugar to create a smoothie. "The increase of the Mexican restaurants and Tex-Mex has boosted consumption in the salt form," she said. "But Brazilians still have a certain resistance in salty use of avocado."

Photo by Rodrigo Anholeto

The challenges for Brazilian avocado producers, according to Zayas, are closely linked to the supply and value of labor. She said the manpower is scarce and too expensive, with the average monthly cost of a basic worker being about US$500.

She said another challenge is trying to keep the Phythophtora cinammomi fungi in check, stating that it can greatly impact production. Zayas said most of the avocados grown for domestic production in tropical regions are not irrigated though the Hass and Fuerte are in groves that receive surface irrigation.

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ALDEN BROOME
Avocado Grower

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