From the Grove

Fall 2020

The Latest News from the California Avocado Industry

THE BIGGEST LITTLE FARM

Read more on page 32

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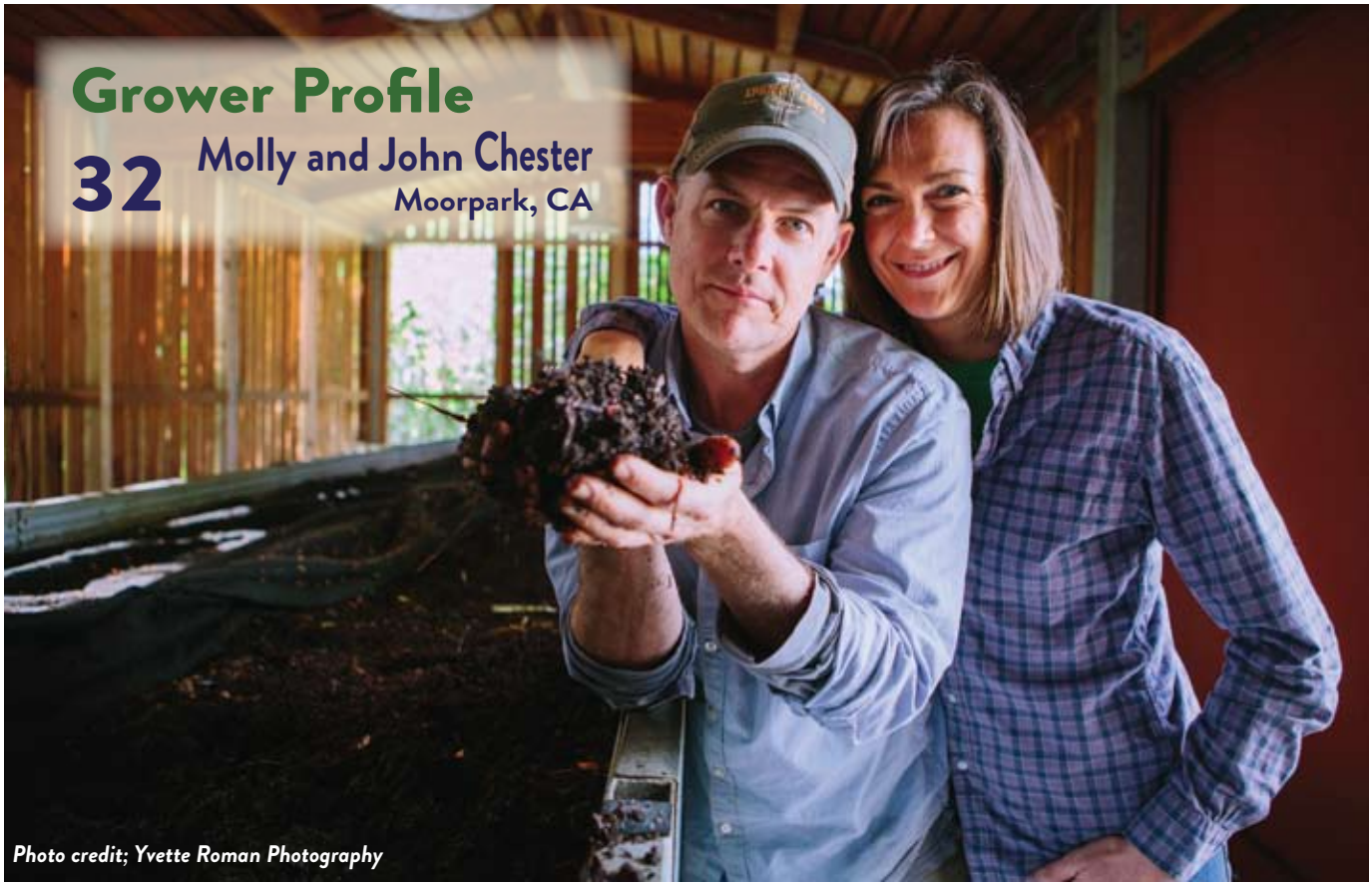

From the **Grove**

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Message from the President

Still Here, and Still Marketing

Tom Bellamore

With the cancellation of the annual meetings earlier in the year and the continuing COVID-19 pandemic, California Avocado Commission (CAC) staff are beginning to miss going out to the field. We've had grower contact, of course—calls about problems at the local water district, imported fruit volumes, and market conditions during the 2020 season still occur routinely—but it's different now. We'd prefer to have these conversations under the shade of an avocado tree.

In place of that, your staff and board have become adept at online meetings, and this same tool is relied upon to conduct business with key retail and foodservice accounts, and to plan next year's campaign with the Commission's marketing agencies. When you see a business partner on-screen, after days or weeks of not speaking with them, it's always positive and something of a relief. It's as if we are all thinking: "We are safe, well, and happy to be moving forward despite the tremendous societal upheaval we've all experienced."

The current marketing season has presented challenges and there have been market fluctuations we could have done without. Retailer enthusiasm about stocking and supporting California avocados has been refreshingly robust and the larger-than-average crop has kept the motor running well into the fall. Late season advertising and promotion have been possible this year, in part because of a stalled period in March, and those growers who held fruit for the autumn window should enjoy retail and consumer pull at a time when it typically begins to shift to imports. Examples include scheduled promotions with New Seasons Markets in the Northwest and with The Fresh Market, which has 159 stores across 15 states; both retail partners, and others, have committed to California sourcing late in the season this year.

As CAC Retail Marketing Director (RMD) Carolyn Becker reported at the August Commission board meeting, the landscape of retail promotions has been changing over the past few years, and the current pandemic has sped up its pace. Retailers now employ a multi-faceted approach to communicating with their customers and promoting various products and brands. The use of digital marketing (product offers, coupons) and social media has proliferated, reaching younger shoppers and spurring impulse buying.

These changes mesh well with the Commission's ability to provide retailers with custom content (streaming video, recipes or photo assets, for example) for their websites or social media platforms, including tailored messaging about California avocados. Although the pandemic brought an abrupt end to in-store demos or product sampling, such as those conducted by Costco, opt-in emails to a retailer's loyalty customers, digital coupons, and Instagram and Pinterest postings have swept in to fill the void, reaching consumers where they spend their time online. Veteran CAC RMD Dave Anderson, whose focus is on large national (corporate) accounts and regional retailers in the Midwest, Southeast and Texas, commented to the board that the contrast between the phone not ringing (from retail accounts) in March and the level of retail promotional activity by mid-summer was astounding and unlike anything he had ever experienced.

The struggling foodservice sector left California without a home for much of our smaller size fruit, and weakened prices as a result, but now, well into the pandemic, we're beginning to see increased promotional activity among these accounts. The Commission partnered with eight new restaurant chains this year spanning California: Ike's Love & Sandwiches, Norm's Restaurants, Mixt, Islands Restaurants, Eric's DeliCafe, Sharky's Wood Fired Mexican Grill, Super Duper Burgers and Wahoo Fish Tacos, some of whom we have been courting for several seasons. A common thread among these chains

is their alignment on the use of quality, fresh, local ingredients — a perfect fit for California avocados. Among the returning keystone foodservice partners were Del Taco, Rubio's, Habit Burger, Denny's and Flame Broiler. The loss of dine-in traffic set the foodservice industry back considerably, but the shift to online ordering and curbside delivery has opened promotional opportunities via these partners' websites and social media platforms. As with retail, there will be late season foodservice promotions to support the crop into fall, notably with Wahoo Fish Tacos and Islands Restaurants.

Retail and foodservice promotion is just one part of what the Commission does each season to support California avocado growers and move the crop. Promotions with these key trade accounts strive to influence the consumer where the transaction occurs. Other activities aim to set the stage for consumer purchases of California avocados, by keeping awareness of our product top-of-mind and ensuring that consumers perceive our brand favorably. Consumer advertising, public relations, nutrition-oriented communications and other, high-impact outreach activities round out the marketing work of the Commission each season. Courting the consumer, particularly in the digital realm and on social media, occurs throughout the year and particularly when our fruit is in season, keeping us engaged with loyal customers and those seeking California avocados for the first time.

This past spring, the California avocado growers, like many other business operators, were in jeopardy. Foodservice sales dried up, there was tremendous instability in the retail sector, and the economy seriously faltered. Hopes were high prior to the pandemic and we all looked forward to a strong season because the crop size was highly "marketable." A few months later, the industry started to turn a corner; marketing efforts adjusted to the new situation and began to gain momentum. Because of the resiliency of California avocado growers, the industry's packers, Commission staff, agencies, and our trade partners, we went from near despair to a point where we are now tracking to have the third highest crop value in the industry's history—a figure close to $417 million.

And if that's possible with a pandemic raging, then there is every reason to believe that greater gains, still, can be made when we someday get back to business as usual.

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

Chairman's Report

An Extraordinary Year

John Lamb

The avocado season is winding down with most of the fruit out of the north or far north at this point. To say it has been an interesting year is an understatement of vast proportions. All things considered, the year has turned out to be much better than I would have believed back in March when the pandemic started. Even now, sporting events are being cancelled, restaurants are serving meals outside and schools are looking at hybrid schedules or not opening at all.

For all the turmoil, it is mind boggling that this could be one of the highest crop value years ever, as Tom Bellamore, our California Avocado Commission (CAC) President, has pointed out in his column. We are all very fortunate to grow a crop that has such value in the marketplace. When I see total avocado consumption at more than 50 million pounds per week almost year-round at the values they are commanding, it is an impressive feat. California farmers are always under considerable pressure from the regulatory agencies, water, labor and certainly weather. It is amazing that we not only keep our heads above water, but hopefully profit as well.

The Avocado Commission starts looking into next year at our August meeting, trying to make educated guesses at the crop size and pricing so we can come to some kind of budget for next year. At this point, we are anticipating a smaller crop, with a higher per pound value. Last year, we were able to drop the assessment from the prior years, and I hope we can do so again. CAC will have ample reserves and they are probably higher than we really need. I will be advocating for a lower assessment rate for the 2020-21 season. It seems a bit early to estimate the crop to me; after the recent heat I am seeing a lot of drop, but mostly on trees that were loaded. When I see that type of drop, I always have to remember to look up into the tree to see that there is almost always more fruit there than the tree could hold anyway.

I would encourage you to get involved with the Commission if you have the time, or even if you don't, make the time.

This will be my final column for *From the Grove*, as I will be termed out of the board seat for the next fiscal year, beginning in November. When I became an alternate in 2005, the board was still under the prior regime. Needless to say, there were some uncomfortable moments when things changed. Tom Bellamore has been the right person at the right time and, in my opinion, has done an extraordinary job as CEO of the Commission. He has assembled a top notch staff and they work very well as a team. Jan DeLyser is, of course, the consummate professional and has kept the California avocado marketing program the envy of the produce world. I thank Tom and Jan and the entire CAC staff for making my job much easier. It is great to have that kind of support. After 15 years I will miss the people and the industry involvement, but not the drive to Irvine.

I would encourage you to get involved with the Commission if you have the time, or even if you don't, make the time. When I ran for the alternate seat, I thought it would be a good opportunity to learn more about the industry and maybe gain knowledge to make our business more successful. It has certainly been all that and more. Board members have a great deal of industry exposure that you would never get by staying at home. Getting to know many of the important people in the industry has been a real honor. Certainly, there are challenges along the way, but overall it has been a most rewarding experience. Our industry needs good people to represent it; please consider becoming part of the team. See you around the grove!

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Issues Watch

By Ken Melban
Vice President of Industry Affairs

Quality of Southern California's 2020 Water Supply Impacted

Most of the imported water supply into Southern California is delivered through the Metropolitan Water District, a regional wholesaler that provides water for 26 member public agencies to deliver to their customers. Metropolitan imports water from the Colorado River and the State Water Supply (SWP). Supplies from the Colorado River typically have much higher salinity levels than the SWP supply, which originates in Northern California.

Avocado trees are highly sensitive to salinity, which is measured based on Total Dissolved Solids (TDS) (a TDS of 1.0 = 640 parts per million (ppm) or 640 mg/L). In Metropolitan's avocado growing regions, district water generally has an average TDS of 0.7, or 448 ppm, according to Dr. Gary Bender, University of California farm advisor-emeritus. A TDS lower than 525 ppm is good, while a TDS below 175 ppm is excellent for avocado production.

Every year the Department of Water Resources (DWR) sets SWP allocation amounts for long-term contractors based on water supply availability for delivery. Supply availability is determined by the amount of rainfall, snowpack, runoff, reservoir storage, the pumping capacity of SWP facilities, and regulatory and environmental mandates on SWP operations. In a year with 100% allocation, Metropolitan, the largest SWP contractor, would receive 1,911,500 acre feet (AF). The initial 2020 SWP allocation was set at 15%, and in May it was increased to 20%. This resulted in a 2020 allocation for Metropolitan of 382,300 AF.

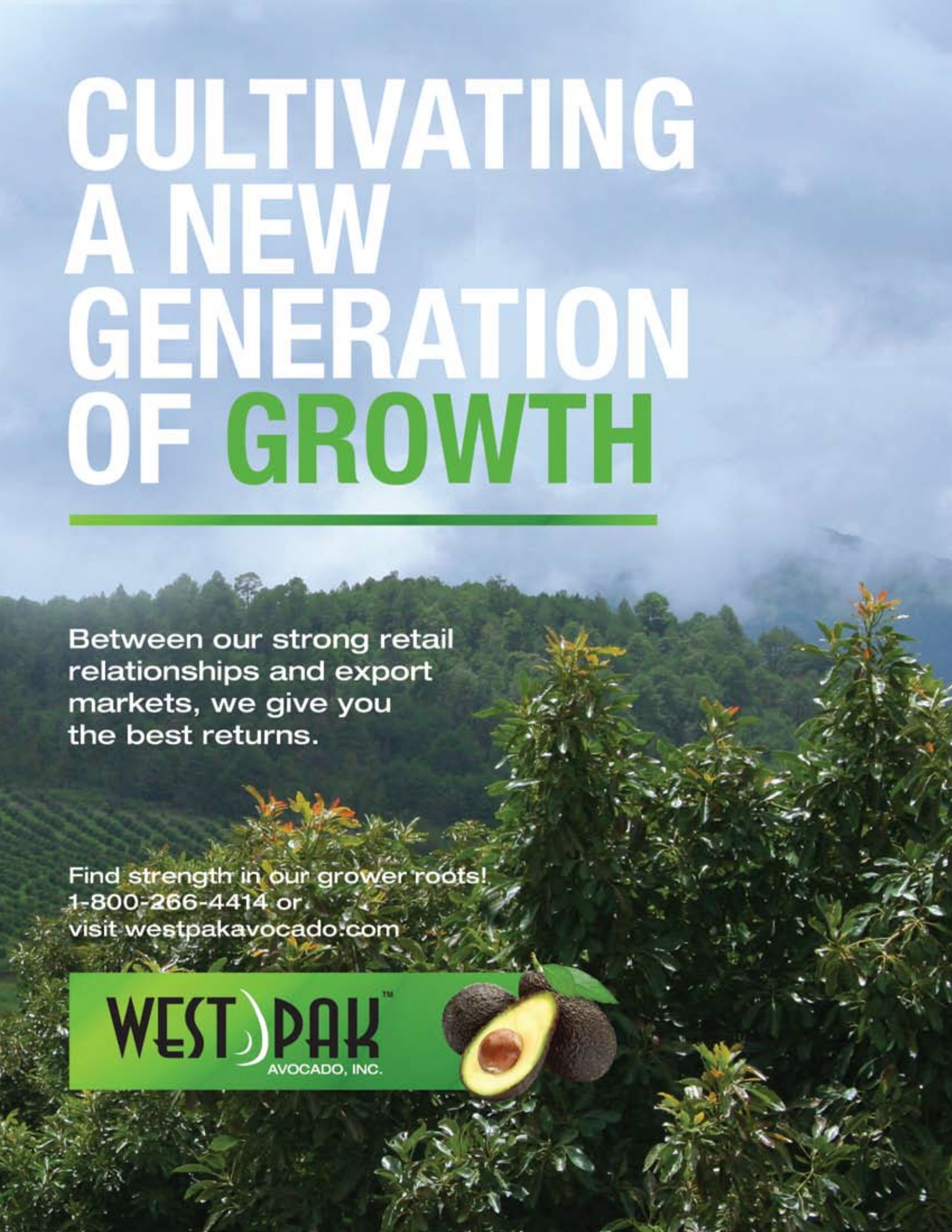
Metropolitan, in years with a greater SWP allocation, can provide a higher blend of SWP supply with Colorado River supply to help reduce salinity levels. Unfortunately, with the SWP allocation for 2020 at a mere 20%, Metropolitan's planned operations expected by March or April to have zero or near zero blends of SWP water with Colorado River water. This resulted in predicted higher TDS levels for the remainder of the year.

However, Metropolitan's Lake Skinner service area (essentially San Diego County) was receiving a better actual blend of SWP water (and lower TDS) than the rest of the blended service area because of two reasons: the higher SWP allocation from 2019 improved the blend in Lake Skinner to start the year, and Diamond Valley Lake was nearly full. Unfortunately, sampling at Lake Skinner in late July detected increasing levels of geosmin, an organic compound produced by the naturally occurring cyanobacteria. While geosmin poses no health risks to a water supply, at certain levels it can affect taste and smell. In response, Metropolitan scheduled a copper sulfate treatment for Lake Skinner in late July. The treatment in Lake Skinner forced Metropolitan's operations to bypass Lake Skinner and reduced the blends to zero. As of this writing, operations are back to flowing through Lake Skinner, which helps to improve the blends.

According to Metropolitan, the running annual TDS average at Lake Skinner has been the lowest of the blended area at 353 ppm due to the water deliveries out of Lake Skinner and Diamond Valley Lake, and the high SWP allocation last year. There can be great fluctuations at points of delivery for water, with some growers reporting TDS levels as high as 600 ppm or more.

The California Avocado Commission remains engaged with Metropolitan and local water agencies concerning the importance of delivering a water supply to avocado growers that is low in salinity. Obviously, winters that bring significant rainfall provide a nice jumpstart to the year by leaching the soils and reducing the need for purchasing water.

While we continue to push through the many challenges in 2020, let us hope for a winter rainfall that is well above average. Although success is never guaranteed, our commitment remains unwavering and we will serve as your advocates whenever and wherever possible. On that note, if any of you have a contact number for Mother Nature, please pass it along – you just never know.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Marketing in a Time of Upheaval

By Jan DeLyser
Vice President Marketing

When I think back to the February 2020 California Avocado Commission (CAC) Board meeting, I remember the excitement the marketing team felt in presenting our new advertising campaign, media plan and a stepped-up involvement in events. And when I consider all that has happened beginning just weeks after that in-person gathering, I feel an odd mix of nostalgia and regret for plans that couldn't be executed, joined with pride for what has been accomplished and enthusiasm for the future. Starting in March, the Commission, the industry and the world were hit with unprecedented challenges. Foodservice stopped on a dime. The supply chain had to become extremely nimble to meet fluctuating demand and customer needs. Our marketing plans had to be rewired with changes to, or cancellation of, programs, and above all — it was imperative that we listened to our customers and consumers.

COVID-19 came first, then social unrest kicked into high gear after the death of George Floyd in Minneapolis. The Blacks Lives Matter movement, which originated in 2013, suddenly resonated with exponentially more people, and an estimated 15 to 26 million of them participated in protests throughout the country. What an organization said and didn't say, and where they advertised or engaged on social media, became especially sensitive. The CAC team listened and learned, quickly realizing that certain social media platforms were temporarily not the best places for California avocados, and pivoted to other platforms that offered the comfort of recipes and softer content that were a better fit. The boycott of Facebook by major brands and hacks of prominent Twitter accounts have further complicated the situation and make social listening an ongoing mandate for the brand. (See the article on page 30 for an update on the social media activities this season to date.)

Albertsons Companies Network Dietitian Amrita Jayagopal showcased California avocados in a Facebook Live event.

Being a supportive partner to retail and foodservice customers has been critical. In the beginning, we needed to stand down and stay out of the way as they navigated logistical and supply issues. Then as panic-buying moderated and customers saw a clearer path, our team – working closely with their teams – quickly adopted new virtual meeting technologies to maintain contact when in-person meetings were not possible. An old-fashioned technology, the telephone, continues to be a key tool for the Commission's retail marketing directors, foodservice team and the rest of the organization, as does email, but it's clear based on what we are hearing from customers that the use of video calls is going to increase even after we navigate through these challenging times. The ability to connect remotely or virtually has actually been one of the nice surprises to come out of this situation.

Communications and the sharing of creative ideas between our team, targeted customers and handlers is resulting in a full slate of innovative marketing programs supporting the

California avocado crop this season. (See the articles on pages 18 and 26 for a summary of the retail and foodservice promotions so far.) Most importantly, for California avocado growers demand has continued to be good for their fruit. Even during these difficult times with the reduction in foodservice demand, safer-at-home rules spurring retail sales and a positive brand story have resulted in prices for California avocados that continue to outpace the price for imported avocados. This demonstrates the value of continually building brand equity and customer relations.

Years from now I think we will look back on this year as an achievement. Few could have predicted the magnitude of the challenges the world has faced. Few could have foreseen all the changes that would be needed to keep workers and customers safe, the education that would be required to dispel myths about food safety, and the pivots required just to stay in business. But the challenge is being met.

Here I am participating in a produce industry socially distanced walk.

Flame Broiler included the California Avocados brand logo on its website's pop-up message alerting diners that they are open and ready for business...and serving fresh California avocados.

We couldn't salvage everything from our plans, and for that I'm disappointed. Though a tough pill to swallow, it absolutely was the correct decision to cancel innovative ways to connect with California avocado fans in person, including the sponsorship of the Pebble Beach Food and Wine Festival and EEEEEATSCON as well as some outdoor advertising and other activities. That said, we were able to adjust plans to bring more digitally streamed ads to consumers in their homes, create a virtual grove tour and develop many other innovative programs that helped us connect with customers and consumers during the most challenging of times. A bigger disappointment for me is not being able to meet with our industry colleagues in person. I applaud industry associations for going virtual with trade shows and helping to maintain connections and learning, but I yearn for a time when we can be face-to-face again. Let's all wear those masks, keep our distance, wash our hands and get vaccinated when the time comes so we can pass safely beyond all this upheaval and move forward to a better time.

Living Well with California Avocados Program Delivers

Now, more than ever, consumers are taking a keen interest in their health and wellbeing as they cope with lifestyle changes brought about by the COVID-19 pandemic. According to the International Food Information Council Foundation's *2020 COVID-19: May 2020 Second Look at COVID-19's Impact on Food Purchasing, Eating Behaviors, and Perceptions of Food Safety,* consumers are most likely to seek guidance from dietitians, health and wellness experts and government agencies. More than half of Americans ages 45 – 64 (57%) trust a registered dietitian concerning what foods to eat and avoid.

To help consumers in their search for trusted sources of information, the California Avocado Commission (CAC) partnered with seven brand advocates, including respected registered dietitian nutritionists (RDNs) and health and wellness influencers, to communicate the health benefits of California avocados, recipe ideas for a variety of dietary lifestyles and usage tips. CAC's Living Well Brand Advocates were chosen for their authentic culinary passions and areas of expertise. With their diverse range of ages and distinct styles, the advocates appealed to a broad set of CAC's targeted audiences and garnered more than 2 million impressions with their blog and social media posts, recipes, YouTube videos, Facebook Live events and television appearances.

Each of the brand advocates were matched with a theme that aligned with their area of expertise and dovetailed with a current nutrition and/or lifestyle trend or topic. As expert spokespersons, they shared insights into how California avocados could serve as a healthy addition to one's diet, demonstrated the versatility of the fruit in a wide range of recipes and encouraged consumers to search for the in-season fruit. All seven advocates created new consumer- and retail-friendly recipes matched to their theme. The recipes were then photographed and showcased on CAC's website, as well as The Scoop blog, social media platforms, and in live social and television broadcasts throughout the season. Three of the recipes were featured in "Superfood Spotlights" distributed to CAC's retail partners. A selection of the recipes, blogs and social posts can be viewed at www.bit.ly/CAC-Living-Well.

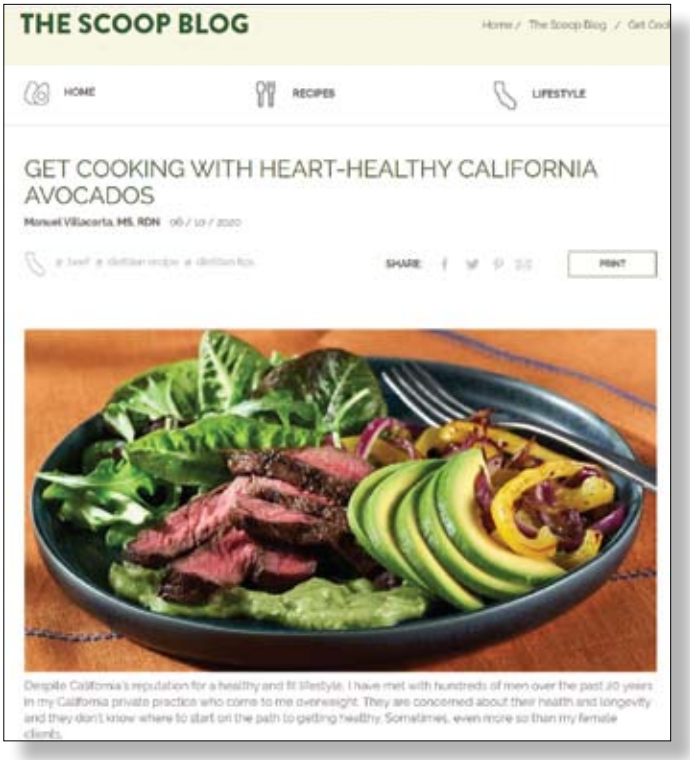
Wendy Jo Peterson recognized "locally grown" California avocado growers and the responsible growing practices of the farmers in her four-day Twitter campaign leading up to July of 4th weekend.

The season kicked off with a Mediterranean Diet blog post by Culinary Dietitian Wendy Jo Peterson, MS, RDN, wherein she shared her *Avocado and Lentil Fritters with Lemon Avocado Yogurt Sauce*. In late June, she launched a four-day Twitter campaign with 12 Tweets showcasing 4th of July-themed recipes and tributes to California avocado growers.

Food Stylist and Recipe Developer Patty Mastracco supported retailers in the Sacramento and Fresno areas with appearances on Sacramento's KTXL FOX40 and Fresno's KPMH26 FOX TV. She shared her grilling expertise with viewers demonstrating how to make her perfect-for-the-American-summer-holidays *Grilled California Avocado, Sweet Potato and Arugula Salad*.

Liz Shaw, MS, RDN, CLT, CPT provided consumers with simple snacking swap ideas – sharing California avocado

Liz Shaw shared her Simple Backyard Picnic Swaps San Diego television segment with her Instagram followers.

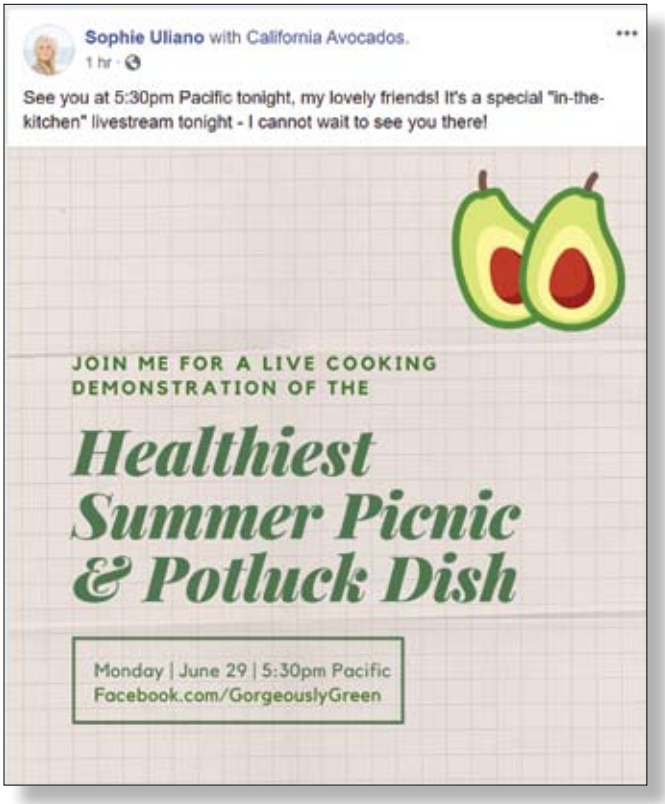


Manuel Villacorta promoted heart-healthy California avocados and men's health.

nutrient-dense snack options that consumers could choose over processed snack options currently on the market. She paired her *California Avocado Granola Bars* and *California Avocado Sticky Toffee Bars* recipes with mouth-watering photography and shared them on her blog and Instagram channel. She also gave San Diego retailers a boost with her "Simple Backyard Picnic Swaps" television segment on ABC 10 San Diego Connect during California Avocado Month.

During Men's Health Month in June, Manuel Villacorta, MS, RDN discussed men's health issues and shared his *California Avocado Steak Sandwich* and *California Avocado Steak Salad* recipes on The Scoop blog and across his social channels noting, "You can feel good knowing it's a heart-healthy fruit which provides naturally good fats, is low in saturated fat, and is cholesterol-, sodium- and trans-fat-free." In July, Manuel invited his followers into his "Caliente Kitchen" for a Facebook Live event where he again discussed men's health and prepared his signature California avocado recipe. The event was promoted in advance on his social media channels and posted after its airing to his YouTube channel.

Board-certified Holistic Nutritionist Sophie Uliano focused on plant-curious recipes, including her *Gluten Free Avocado Bread*. Heading into 4th of July weekend, she hosted a "Healthiest Summer Picnic and Potluck Dish" Facebook Live cooking demonstration that was viewed by thousands of her loyal Monday evening followers. Later in the month, she posted an informative video about "Why You Need California Avocados in Your Plant-based Diet" to her YouTube channel



Sophie Uliano pre-promoted her Facebook Live event on her popular plant-curious Facebook page.

where she has more than 100,000 subscribers.

Meme Inge, MS, RDN authored a "Cooking for One is Fun with California Avocados" blog post on The Scoop in which she discussed practical nutrition, shopping, prep and cooking tips when cooking for one's self. She shared her *Chicken with Brown Rice, Avocado, Veggie Medley* recipe and showcased the fruit's nutrition benefits, including the fact that they contain 6% Daily Value Vitamin E – an antioxidant that protects body tissue from damage and keeps the immune system strong.

Focused on a "Living Healthy and Staying Young" theme, Bonnie Taub-Dix, MA, RDN, CDN shared tips for aging healthfully with recipes that help consumers feel energized. She also highlighted the fact that avocados have 20 vitamins and nutrients and are a good source of fiber and folate in her "Say 'Spa-vacado' with Creamy California Avocado Spa Smoothie" article. She concluded the season with a social media campaign showcasing foods that help people feel youthful. Bonnie, who has partnered with the Commission for more than nine years, adds that the relationship "has been like working with family members. I love collaborating with a brand that not only cares about consumers... they truly care about each other and their partners. Visiting the groves and learning about how the trees are nurtured, planted and harvested only reinforced what I already know and love to promote, that the best avocados come from California! I am proud to say that I am a member of their team."

Bonnie Taub-Dix shared California avocado recipes that help people feel energized.

Living Well Brand Advocates support each other on social media - Liz Shaw shared Bonnie Taub-Dix's The Scoop blog post on her Facebook page as well as her Instagram feed.

The passion and expertise of the Commission's Living Well Brand Advocates are a powerful means of connecting with consumers who want to be as inspired as they are informed. By providing consumers with trusted information through third party advocates, CAC can leverage the diverse talents of culinary experts who value the unique qualities of California avocados. Manuel Villacorta notes, "I have been a spokesperson and advocate for the California Avocado Commission for six years and every year my passion for promoting California avocados grows. As a registered dietitian, author and a spokesperson, I provide science-based nutrition information explained in a way that is approachable and engaging. I love working with CAC because I am representing a superfood that, as a dietitian, allows me to touch on a variety of important nutrition topics, and because avocados are so versatile – and I love to cook – I have no shortage of inspiration for new recipes. It has been a wonderful partnership."

This season, with consumers seeking helpful tips and information, CAC's Living Well Brand advocates have been communicating the health benefits of California avocados as well as providing recipes, usage ideas and encouraging avocado consumption with a call to action to look for and purchase California avocados in season.

HOPE, GRATITUDE, AND COURAGE FOR ALL

As we face unprecedented times, we are grateful for our growers, partners and consumers and remain deeply committed to providing the best sustainably-grown avocados to nourish our communities.

CONTACT OUR FIELD REPRESENTATIVES TO LEARN MORE

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Advanced Avocado Rootstock Selections Move to Commercial-Scale Field Trials

By Tim Spann, PhD
Spann Ag Research & Consulting

Over the past several years, the California Avocado Commission (CAC) has been changing its approach to funding the rootstock breeding program. Through numerous discussions with University of California, Riverside (UCR) researchers, and independent program reviewers, it became clear to CAC that the program as it existed was not meeting the California avocado industry's needs.

There was a backlog of rootstock selections that had been made over the years, some going as far back as the 1970s, that had never been fully evaluated, some of which showed significant promise. CAC tasked Dr. Patricia Manosalva, who took over the leadership of the rootstock breeding program in 2015, to select the most promising candidate rootstocks from the backlog and move them to commercial-scale trials to determine which, if any, are worthy of commercial release.

The Candidate Rootstocks

Using historical data from lab, greenhouse, and small-scale (five to 10 trees) field trials, and supplementing with new trials where needed, Dr. Manosalva developed a list of five candidate rootstocks. These five rootstocks were selected because they have phytophthora root rot tolerance equal to or better than 'Dusa' and some showed degrees of salinity tolerance as well as other desirable characteristics. The five rootstocks and their characteristics are shown in the accompanying table.

Although all these rootstocks are listed as having phytophthora root rot resistance and most are tolerant of salinity, it is important to understand these traits are not set in stone because they are based on limited data. Some of the data used to characterize these rootstocks is from greenhouse screenings or field trials where good quality water was "adulterated"

University of California, Riverside avocado rootstocks and their known traits that have been selected for commercial-scale field trials and potential commercial release.	
Rootstock	**Traits**
PP35	Resistance to PRR and tolerant to salinity. Possibly some heat tolerance.
PP40	Resistance to PRR and tolerant to salinity. Possibly some heat tolerance.
PP80	Resistance to PRR. Possibly some salinity and heat tolerance.
PP42	Resistance to PRR and moderate salinity tolerance. Possibly some heat tolerance.
PP45	Resistance to PRR but sensitive to salinity. Possibly some heat tolerance.
***PRR = phytophthora root rot**	

to approximate known saline water profiles, and all with limited numbers of trees. There is nothing like giving trees to commercial avocado growers to really put them to the test under real world conditions. After all, for these rootstocks to be successful they will need to stand up to and perform under commercial field conditions.

Trial Sites

Because of limited budwood supply for some of the rootstock selections, these trials have been planted over the past two years (2019 and 2020) with one additional round of plantings (two sites) to be established in 2021. All rootstocks are grafted to 'Hass' and all are planted alongside 'Dusa' control trees except the two sites established in 2019, and a minimum of 100 trees of a given rootstock are planted at any given site. The goals in selecting sites were to have plantings distributed across avocado growing regions, and to have the trees planted in groves with phytophthora root rot infested soil, water salinity issues, or both. We also looked to work with established growers with good production practices — sorry, no newbies allowed.

Seven trials are now established in Temecula (two sites), Camarillo, Ventura, Carpinteria, Goleta and San Luis Obispo. All these sites are with commercial avocado growers except San Luis Obispo. The San Luis Obispo site is on the campus of Cal Poly on radio tower hill. Although not a commercial grower, the Cal Poly groves are managed to commercial standards. This site will allow easy access for grower field days in the north, and Dr. Lauren Garner, Cal Poly Professor of Horticulture, who is overseeing this site, has numerous students interested in helping with the trial — they helped plant the trees. We believe that any time we can engage the next generation in avocado research and production it is a win-win situation. There was strong local support for this site as well, with C&M Nursery, Righetti Ranch and Del Rey Avocado Company contributing to make the trial possible.

The Ventura site was selected to serve as a control. This site had no detectable phytophthora root rot and relatively good quality water. Although sites like this are increasingly rare, it is important to know these rootstocks will perform well under good conditions and not just when stressed.

Evaluation and Release

Dr. Manosalva and her team will evaluate the trees three to four times per year at each site. This will include growth measurements, tree health evaluation and continuous monitoring of soil and water conditions. In addition, each grower shares their full fertility program and other management practices with the team. Within about three years a clear picture will start to emerge as to the rootstocks' ability to tolerate the phytophthora and salinity conditions at each site. Yield data also will need to be collected to make sure there are no detrimental affects on yield. We anticipate that within five years, decisions will begin to be made on the fate of these rootstocks and the University will begin the process of commercial release of the best ones.

CAC thanks all the grower cooperators who have planted trials on their property to help advance the California avocado industry.

Westfalia Releases Two New Avocado Rootstocks

The Westfalia Fruit Group of South Africa has recently released two new avocado rootstocks, 'Leola' and 'Zerala'. Both rootstocks are jointly owned by Westfalia and the South African Avocado Growers' Association (SAAGA).

Westfalia reports these new rootstocks offer higher yields under a variety of conditions. These new rootstocks have been evaluated in various countries under a range of production conditions over the past two decades.

'Leola' was shown to outperform 'Dusa' and 'Duke 7' under heavy phytophthora infection pressure. 'Zerala', in addition to having high yield characteristics, is said to perform well under salinity stress.

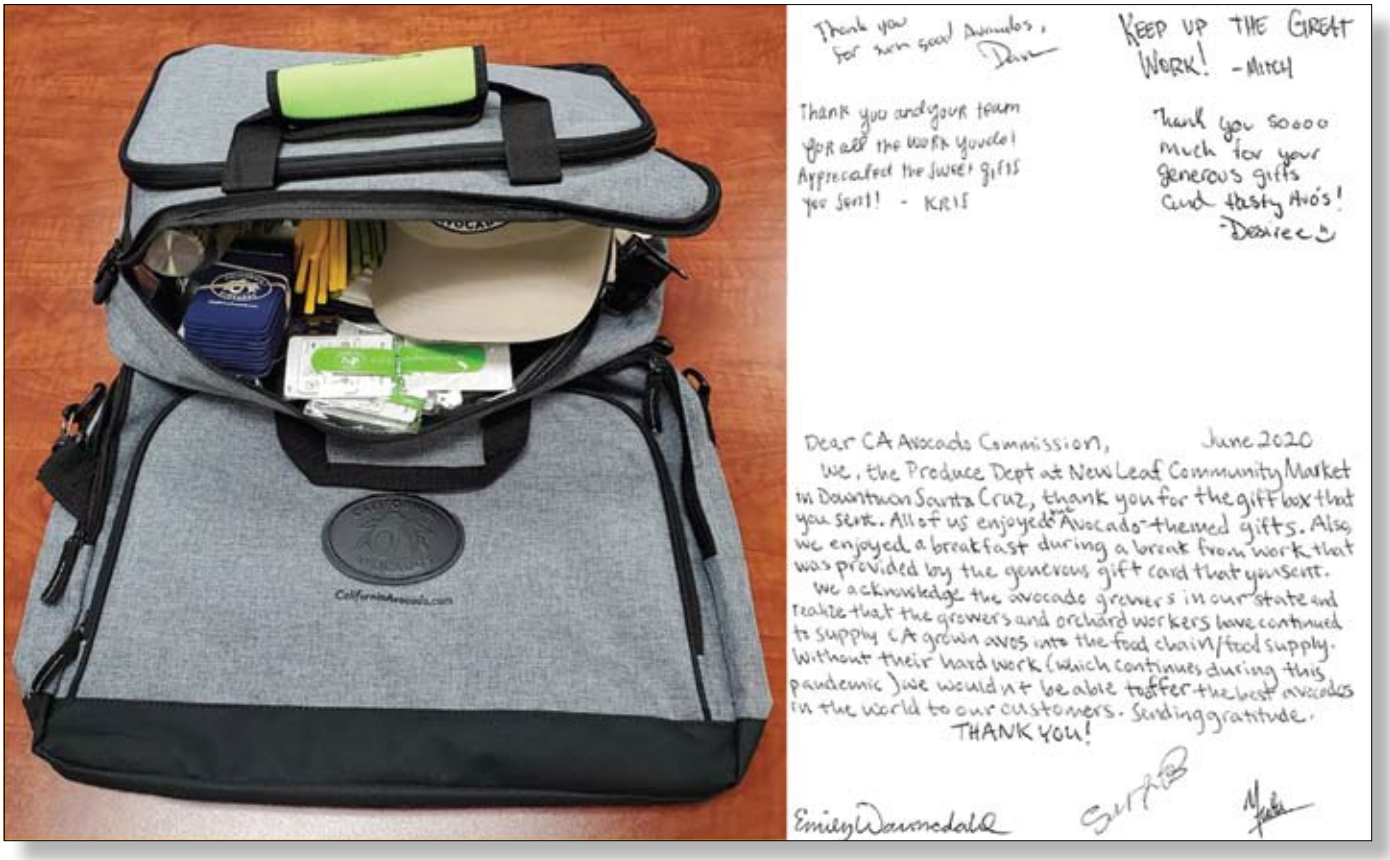
Both rootstocks are available in the U.S. from Brokaw Nursery.

CAC Retail Promotions Continue Despite Pandemic

During the springtime in past seasons, the California Avocado Commission (CAC) has sometimes sponsored retail sales and display contests to promote California avocados for events such as Cinco de Mayo and Memorial Day. With the onset of the COVID-19 pandemic and produce departments working overtime to keep up with high consumer demand, changing labor situations and fluctuating supply levels, tactics like contests would have been burdensome for retailers.

Instead, the Commission created thank you kits for some regional retailers in California and Oregon that contained California avocado-branded hats, key chains, avocado spreaders and cups, as well as gift cards that produce staff could use for a well-deserved pizza lunch or coffee-fueled breakfast. Each kit also included a personal note on behalf of California avocado growers thanking these essential workers for their extraordinary efforts during challenging times.

To lessen the workload of targeted produce managers, CAC's retail marketing directors also developed California avocado creative promotions, including digital ad promotions that made it easy for retailers to drive sales and fresh social media content to support retailer efforts with their customers. Numerous Northern and Southern California retailers ran Memorial Day ad promotions and in-store specials featuring the California Avocados brand logo that drove awareness and movement of the fruit during the first American summer



New Seasons Market gift bag for produce managers and their teams along with a thank you card.

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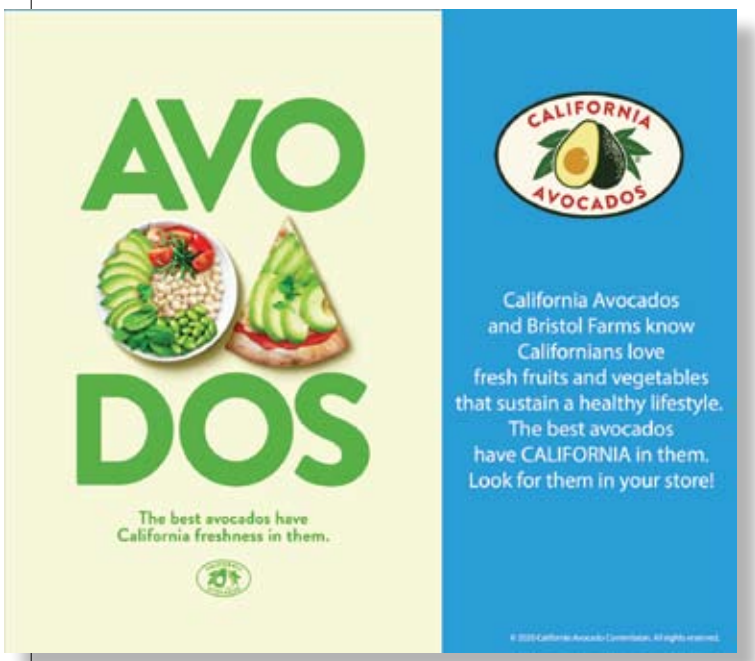
holiday. Albertsons/Vons/Pavilions featured a digital coupon incentivizing consumers to buy bagged avocados; Bristol Farms included California avocados in their Passport to Savings coupon promotion and social media "guacamole from around the world" campaign; and Gelson's, who had supported California avocado season early with Valentine's Heart-Healthy signage and a contest, also promoted the fruit with Memorial Day ads and signage. Mollie Stone's ran a Cinco de Mayo ad feature and displayed custom signs using the Commission's new "The best avocados have California in them" campaign line, along with a social media sweepstakes for California avocados.



Bristol Farms Passport to Savings Ad: More of CAC's advertising campaign used in this ad promoting nutrition.

CAC's tiered-account program focuses on retailers that demonstrate a preference for premium California avocados, whether for the quality and reliability or for their own locally-grown campaigns, and promotional activity is targeted to these accounts. By focusing goodwill efforts on targeted retailers, the Commission was able to produce impactful retail sales support for these retailers as California avocados moved into peak season.

New Seasons Market used digital e-flyers about California avocado growing regions; Nugget Markets ran a CA Grown ad feature and Safeway in Northern California featured Facebook Live recipe videos. Other retail programs supporting California avocados in the west included Save Mart and Lucky Supermarkets, who showcased a sales contest, a grower story ad feature and social media sweepstakes for California avocados. Smart Foodservice Warehouse Stores had a foodservice customer stock-up promotion and included a social media "about a grower" story and Smith's Food & Drug in Utah conducted a sales contest featuring CAC's display bins. Stater Bros. Markets had bulk and bagged avocado front-page ad features. Supermercado Mi Tierra, which caters to Hispanic shoppers, included a front-page ad for Memorial Day and used California avocado display bins.

Kroger "load to cart" promotions drove awareness of the fruit as the peak season arrived.

Kroger Company – Ralphs (Southern California), Fry's (Arizona) and Smith's (Utah) – launched digital "load to cart" California avocado coupons with more than 240,000 downloads. The promotions ran July 15 through August 4.

The Commission worked with a Walmart agency on recipe videos and ad creative featuring the California Avocados brand logo and assets. The video ads were served up on the Walmart app, Walmart.com and Walmart ad networks and generated more than 4 million impressions across multiple touch points.

In addition, Costco's California avocado recipe video, produced in partnership with CAC, generated more than 8 million impressions across the chain's Facebook, Pinterest and Instagram channels.

Walmart digital ad campaign featuring California avocados.

Hy-Vee, a "best in class regional retailer operating in the Midwest," supported California avocados during the month of July. More than 200 Hy-Vee Registered Dietitians (RDs) at 225 stores promoted the health and wellness attributes of California avocados in-store and on their social channels. Hy-Vee RDs appeared on the Hy-Vee TV channel, secured a spot on a CBS station in Minneapolis and featured CAC-attributed recipes on their websites. Working with trusted third-party advocates who position California avocados on a health and wellness platform encourages sales of the fruit during the promotion and beyond.

Additional retail programs will run later in the California avocados season. These include a sales contest, a program featuring jumbo avocados and digital coupons.

By recognizing the efforts of retail workers during the early season, the Commission was able to provide support to essential workers at a critical time. As stores and consumers adjusted to the new reality of COVID-19, CAC then moved forward with front-page flyer promotions, online weekly ads and social media posts to drive awareness of California avocados' availability and their health benefits, encouraging sales throughout the season.

In addition to the changes around the pandemic this year, the industry is experiencing a shifting of promotion types as retailers continue to get more savvy utilizing digital marketing to communicate with consumers. Shopper loyalty, habits and now online ordering are changing the platform for successful California avocado promotions. These programs bring the opportunity to focus new light on California avocados, the brand and the dedicated growers. Digital promotions also are direct-to-consumer, meaning less emphasis on lowering pricing as the means of providing value to the consumer. Online ordering and promotions also are very targeted, so the Commission can be very specific in reaching targeted California avocado consumers. Combined, these promotion and awareness-building activities are beneficial to keep the California avocado crop moving consistently within the retail category.

Save Mart Supermarkets Grower Profile: Local-grown branding doesn't get any better when retailers feature CAC's grower profiles in full-page features. This one launched for July 31 National Avocado Day.

By Tim Spann, PhD
Spann Ag Research & Consulting

Avocado Tissue Culture Within Reach

Tissue culture — the growing of plant cells under sterile culture usually for the purposes of producing clones of a plant — has been the Holy Grail of avocado propagation for decades. But until now, no one has been able to develop a technique that could be broadly applied to most avocado cultivars. A few years ago, one California nursery developed techniques to propagate a couple of avocado rootstocks in a semi-tissue culture environment, but the trees produced proved to be unthrifty and did not perform well in the field. Others have been able to develop robust techniques for a single cultivar but have not been able to get those techniques to translate to a broad range of cultivars. And some techniques have been developed privately and are not available to the public. Enter the Huntington Botanical Gardens.

Photo credit: Raquel Folgado, Cryo-preservation Research Botanist, The Huntington.

Huntington Botanical Gardens

The property that is today the Huntington Botanical Gardens in San Marino was home to some of the earliest avocado plantings in California. As a result, the Huntington has long had an interest in preserving avocado varieties. That said, traditional plant collections — especially of trees — take up considerable land area and are vulnerable to ever changing threats such as pests, diseases and now climate change. Thus, the Huntington, as part of its mission to preserve various plant species, has a robust research laboratory to develop the techniques necessary to carry out their mission of preservation.

One group of plants the Huntington is working to preserve is magnolias. To secure their magnolia collection for generations to come, the Huntington looked to cryopreservation – the process of cooling cells to very low temperatures (-320 °F) to maintain their viability. However, to use cryopreservation successfully one needs the ability to go from a few frozen cells back to a living tree. This is where tissue culture comes in. The magnolias, like avocados, were notoriously difficult to maintain in tissue culture successfully, but the Huntington research team, led by Dr. Raquel Folgado, solved that mystery. And, as it turns out, the magnolias and avocados are closely related both belonging to the clade Magnoliids.

In 2018, the Huntington approached the California Avocado Commission (CAC) to see if there was interest in avocado tissue culture research. The Huntington staff believed they could translate what they learned from magnolias to avocados without too much difficulty. Equally appealing for CAC was the fact that central to the Huntington's mission is sharing of information, which meant whatever

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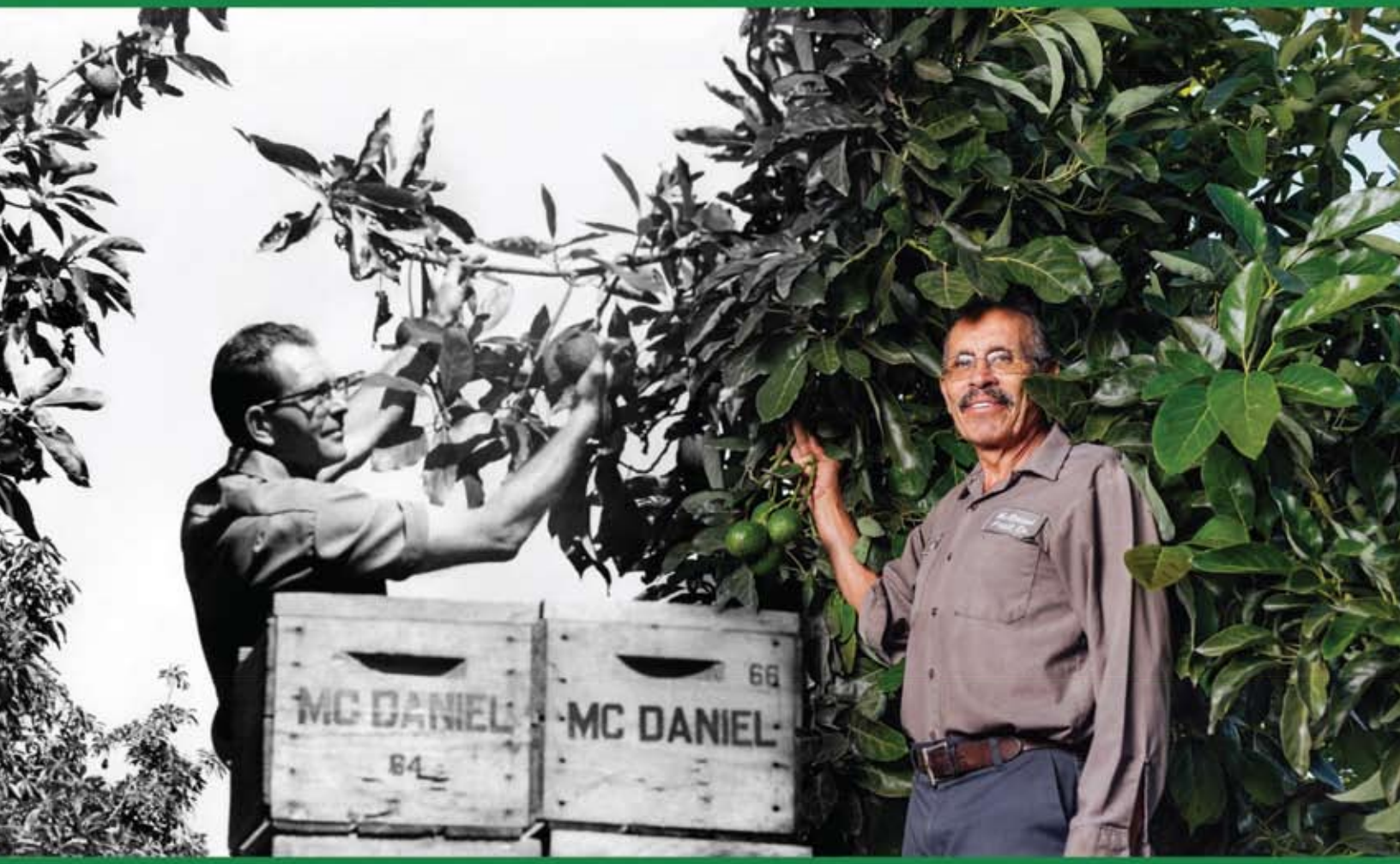

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Photo credit: Raquel Folgado, Cryo-preservation Research Botanist, The Huntington.

they learned would be in the public domain. The Huntington had no interest in patenting their techniques or profiting from them. That said, by partnering with the Commission, the Huntington would be able to serve their own interests – to preserve their avocado collection via cryopreservation. This seemed like a win-win situation and an ideal opportunity for CAC to fund.

Avocado Tissue Culture

Although simple in theory, plant tissue culture is a road strewn with potholes. The tissue culture environment must be kept sterile since the media on which the plant cells are established is full of nutrients, sugars, vitamins and other additives that fungi and bacteria find ideal to grow on. Thus, the first step in tissue culture is surface sterilization of the plant material being used to start a culture.

The Huntington has developed reliable techniques to surface sterilize tissue collected from mature avocado trees so it can be brought into culture.

After sterilization is achieved, tissue culture can be broken down into three phases: initiation, establishment, and multiplication. Initiation involves putting sterilized mature plant tissue in a culture media and getting those mature cells that exist as some tissue (e.g., leaf cells) to de-differentiate — cells change from a given differentiated state into a stem cell-like state where they can divide and multiply — and grow as a mass of undifferentiated cells known as callus.

In the establishment phase, cells of callus tissue begin to differentiate and grow into small stems and leaves. In the multiplication phase, the established cultures are physically divided so they produce more stems and leaves.

A fourth phase, rooting, can sometimes be done in tissue culture or the tiny stems also may be removed from the tissue culture environment and rooted by more standard methods used for any stem cutting.

The transition from each of these phases to the next is achieved by manipulating the culture media, typically by adjusting the ratio of different plant hormones and nutrients. This is often the challenging part of tissue culture as has been the case with avocados in the past. For example, several different labs have had success getting avocados to establish in culture but could not get them to multiply. Still others have been able to get them to multiply just to find they could not successfully get the shoots to produce roots.

The Huntington, while still having their share of challenges, has been able to successfully bring avocado tissue into culture, move it through all phases of culture, and regenerate a small plant. To date they have established cultures of 10 avocado varieties as well as two *Persea* species (*P. indica* and *P. podadenia*). In addition, they have developed several different culture media that work for groups of avocado varieties.

In their final year of work, the Huntington researchers will be working to refine the entire process to maximize efficiency of the process. They also will be working to establish additional cultivars in culture. Finally, they will be publishing their methodologies so anyone who would like to propagate avocados by tissue culture will have a solid foundation to start from.

Potential Benefits of Avocado Tissue Culture

There are many potential benefits to the California avocado industry of having sound avocado tissue culture methods worked out. First is germplasm preservation. Germplasm, both what is in curated collections around the world as well as wild avocados and their relatives that may only exist in the wild, are in danger of being lost. Curated collections are expensive to maintain due to the land requirements and personnel needed to curate them. Disease threats, such as laurel wilt disease for which there is no known treatment or cure, could easily wipe out collections. And threats such as climate change and deforestation threaten wild avocados and their relatives. Being able to move material into tissue culture and potential

cryopreserve could save these genetic resources for generations to come.

Perhaps the most obvious benefit of tissue culture is the potential to propagate avocado trees more rapidly for commercial production. Current techniques are labor intensive and slow. In addition, the use of nurse seeds has always posed the threat, albeit very small, of introducing some unknown pest or pathogen. Being able to generate rootstocks in tissue culture and produce large quantities of clonal rooted cuttings ready for grafting should, in time, reduce the propagation time for trees and possibly reduce the cost of propagation.

A less obvious benefit of having viable avocado tissue culture techniques is the benefit to other avocado research projects. For example, in current avocado rootstock breeding programs, seeds are collected from mother trees, germinated and the seedlings are exposed to phytophthora root rot or salinity. If they survive, those seedlings are propagated by conventional means to produce a handful of trees for the next phase of testing. Imagine if, instead of a handful of trees, several hundred could be produced, and more quickly, for the second round of testing. Data collection and potential selection of new rootstocks could be sped up considerably. Or screening could even move into the tissue culture environment — imagine a culture media with various salt levels to test for salinity tolerance.

These are just a few of the potential benefits that will arise from having robust tissue culture methods available for avocados. The Huntington research team is making great strides and will be concluding their research at the end of 2021. Stay tuned for their final report and the doors that will be opened.

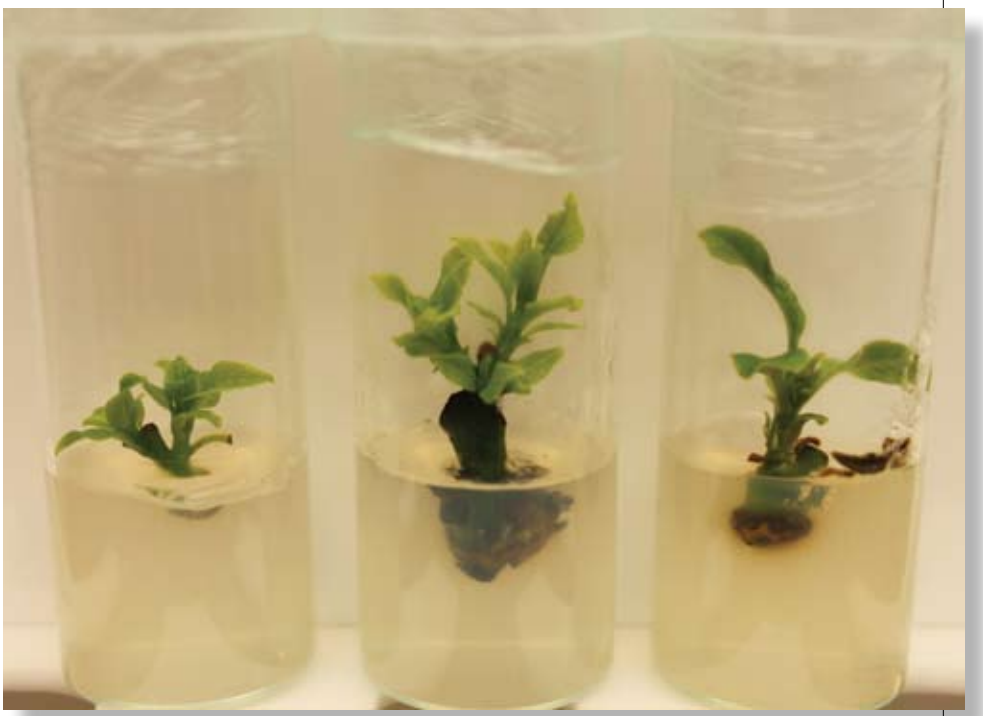


Photo credit: Raquel Folgado, Cryo-preservation Research Botanist, The Huntington.

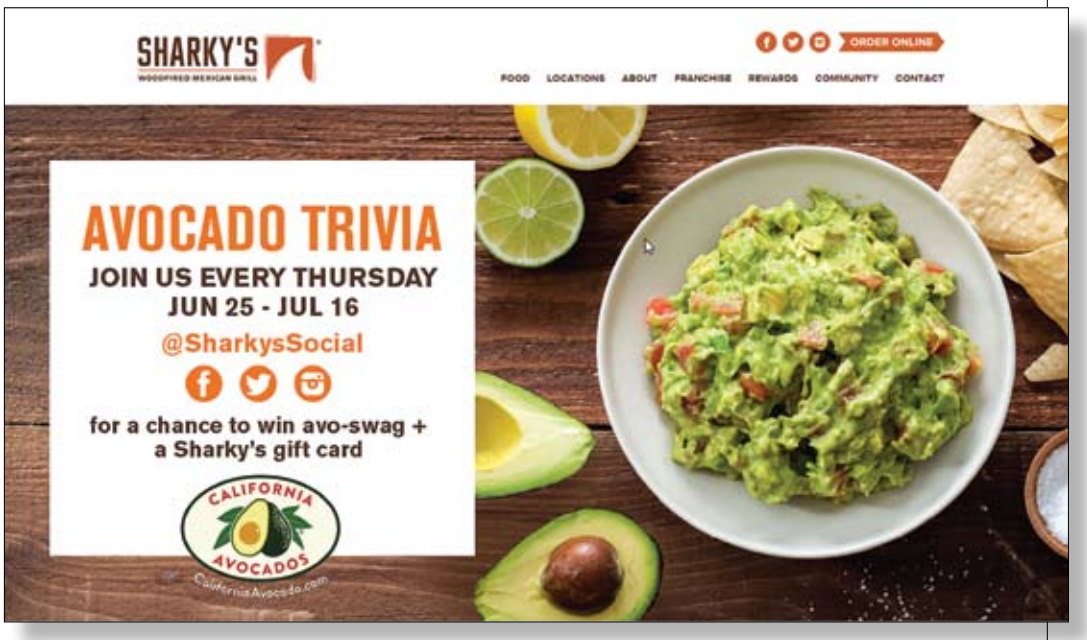
Commission's Foodservice Promotions Support a Struggling Industry During Pandemic

As the California avocado season began in earnest, across America consumers were beginning to adjust to COVID-19 safer-at-home orders that curtailed activities and led to devastating results for a foodservice industry that had to adapt — almost overnight — to the cessation of on-premise sales. Within three to four weeks of the initial shutdown of dining services, the California Avocado Commission (CAC) had worked with foodservice partners to put together digitally-based California avocado promotions that encouraged fans and prospective diners, who were mainly sheltering at home, to enjoy fresh California avocado menu items courtesy of the chains' drive through, take out, curbside pickup and delivery services.

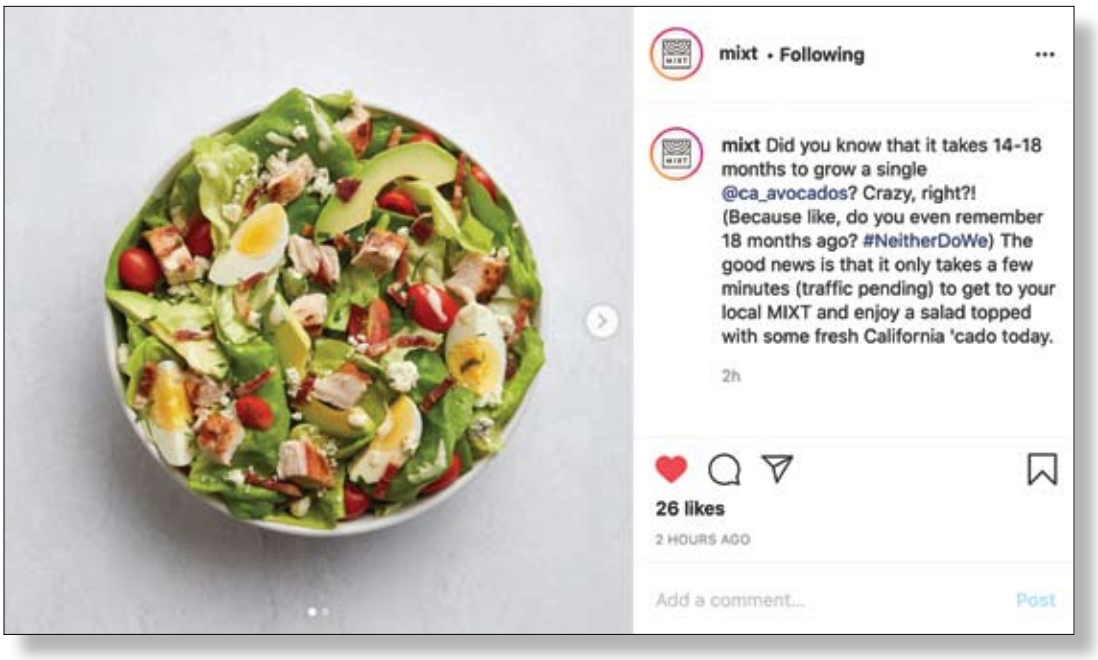
With consumers eager for a respite from safer-at-home directives, the Commission developed unique promotional opportunities that showcased the distinct menu offerings of each of 10 foodservice partners around common themes — the chance to enjoy the premium Golden State fruit as a comfort, an indulgence or a "good for me" break from meals prepared at home. The chains leveraged the California Avocados brand on their websites, e-newsletter blasts and social media posts, reminding customers the fruit was locally grown and part of their mindful sourcing.

The California Sharky's Woodfired Mexican Grill — a 30+ unit chain that strives to use fresh, natural and organic ingredients — ran a two-month California avocado-themed promotion from mid-May to mid-July centered around their popular California avocado house-made guacamole and chips. CAC provided California avocado facts and trivia that were included in the chain's e-newsletter, which reaches more than 102,000 fans. A trivia competition was showcased on Facebook, Twitter and Instagram with posts featuring California avocado prizes and Sharky's gift cards. Director of Marketing Becky Larsen Marquez noted, "Promoting California avocados on our menu supports Sharky's commitment to provide food you can 'Feel Good About Eating.' The California avocado promotion delivers this commitment by providing high quality avocados sourced locally whenever possible, adding greater value and connection with our guests."

The San Francisco-based chain, Mixt, celebrated the launch of a summer menu in which more than half of the items featured California avocados. The 13-unit chain is serious about bringing better eating to everyone and throughout July it shared those messages alongside California Avocado brand imagery on its blog and social posts. According to Mixt, avocados are by far the single most requested addition to any salad,



Sharky's California Avocado Trivia Thursday promotion.



Mixt encouraged consumers to venture out and enjoy fresh California avocados atop a fresh salad.

bowl or plate order. "As a healthy lifestyle California brand, it was a natural to partner with CAC this summer. We love to highlight our local and seasonal sourcing, and our guests love California avocados," added Matt Colgan, Mixt director of culinary.

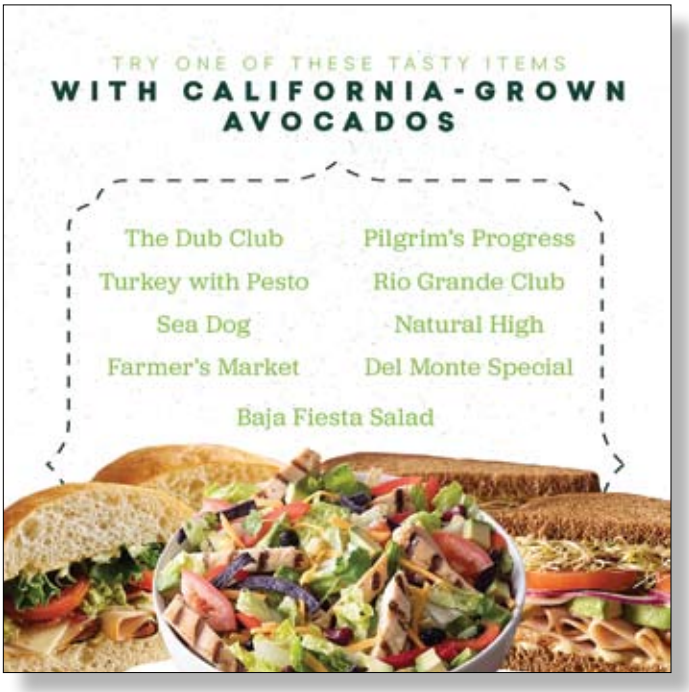
Del Taco, a national chain based in Lake Forest, CA, is a long-time chain promotion partner. This summer the chain ran its fresh guacamole made with California avocados promotion from late April through July with social media posts and a strategically placed California Avocados brand logo alongside an enticing photo of sliced avocado on their website.

CAC's new chain partner, Erik's DeliCafe, is a heavy user of fresh avocados with six sandwiches and one salad featuring avocados on the menu. The 27-unit chain, which is based in San Jose, CA, promoted fresh California avocados on its website ordering platform and proudly touted its California avocado partnership on its sourcing page.

Entering its second year as a partner with the Commission, Flame Broiler offered diners the opportunity to add fresh California avocados to any bowl or plate order. Flame Broiler, which prides itself on "Simply Healthy," showcased it was open for business and serving fresh California avocados with pop-up messages on the site's home page.

Ike's Love & Sandwiches, a 62-unit chain based in San Francisco, is #17 on the *Restaurant Business* "The Future 50 of 2020" list. In celebration of California Avocado Month, Ike's launched two new sandwiches, *Name of the Girl* and *Reading Rainbow* featuring fresh California avocados. Ike's supported the launch with social media posts utilizing celebrity sightings at local units and tongue-in-cheek humor that is right in step with the brand's personality.

Throughout California Avocado Month, Norm's — a 20-unit casual dining chain based in Bellflower, CA — leveraged the positive halo of the fresh fruit by promoting all things avocado on its menu. Loyalty club members received two California avocado-themed email blasts. The chain, which prides itself on value and service, rounded out its California avocado promotion with four social media posts that dovetailed with



Erik's DeliCafé recommended diners add California avocados to popular menu items.

Rubio's homepage showcased the California avocado brand and scrumptious avocado-themed menu items.

the chain's "keeping it fresh" style.

Rubio's Coastal Grill — a returning partner — is certainly familiar with the fact that California diners prefer California avocados and are willing to pay a higher menu price for them. More than 160 units participated in a month-long mid-July to mid-August promotion celebrating the Golden State fruit.

The 12-unit Super Duper Burgers chain also appeared on the *Restaurant Business* "The Future 50 of 2020" list of the fastest growing chains in America. Based out of San Francisco, the 12-unit chain worked with their purchasing group to bring fresh California avocados to their region to capitalize on the positive value the fruit brings to their menu. The chain's promotion paired California avocados with the chain's intent on "bringing fast food burgers with slow food values".

Across Arizona, California, and Nevada, 222 Habit Burger locations added California avocados to their Culinary Adventures of California promotions from July 17 – August 31. Chef Adam Baird singled out California avocados and his excitement for their creamy texture in two of the Culinary Adventure videos that were showcased on the chain's social media feeds.

According to proprietary research conducted by Menu Matters, more than 80% of consumers believe restaurants featuring California avocados feature fresh, high-quality ingredients. By extending a generous hand with promotional efforts that created a halo effect, the Commission was able to aid industry partners who were forced to double down on their promotions efforts in order to increase take-out and delivery sales — sales channels that normally only represent a single-digit percentage of their revenue. These goodwill gestures not only improved sales opportunities for CAC's foodservice partners, but also showcased the versatility of the fruit with menu promotions designed to inspire consumers to incorporate the fruit in meals and snacks at home. Considering how much California avocado consumption occurs in the foodservice channel, these efforts played an important role in maintaining and building relationships. As of this writing, the Commission has confirmed 12 Promotion Agreements from four returning chain partners and eight new chain partners. Additional promotions are under consideration.

Ike's Sandwiches launched two new sandwiches featuring fresh California avocados.

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CAC's Social Media Campaigns Address Consumer Concerns

The California Avocado Commission's (CAC) social media platforms have long provided the Commission with a means of engaging with consumers, joining top-of-mind digital conversations and building brand loyalty while driving purchases of the fruit. CAC's social platforms provide an interactive way to feature new campaigns, showcase the premium fruit's unique locale and share nutritional and educational content. This season, as consumers faced the unprecedented challenges of COVID-19 and cultural unrest, the Commission pivoted its social media communications to provide consumers with additional content that addressed their concerns.

The Commission launched new animated videos on Facebook, Instagram, Twitter and YouTube introducing consumers

"The best avocados have California in them" video generated more than 1.9 million views.

to "The best avocados have California in them" campaign and driving excitement around the start of the California avocado season. The videos yielded more than 6.4 million views across YouTube and other CAC social platforms. In addition, CAC created unique illustrated GIPHY stickers designed along the same campaign theme that Instagram users could share on the photos populating their Instagram Stories. The stickers have been viewed more than 115,000 times thus far.

Consumers had a number of unique California avocado GIPHY stickers to choose from and add to their Instagram Stories.

In March and April as COVID-19 began to impact the United States, CAC immediately adapted its social media communications to address the health concerns and sensitivities surrounding the crisis. The Commission shared food handling safety tips, including content that showed consumers how to wash and handle California avocados. CAC also quickly updated the consumer website to ease consumer concerns and make it clear that California avocado growers and distributors were following CDC recommended safety precautions.

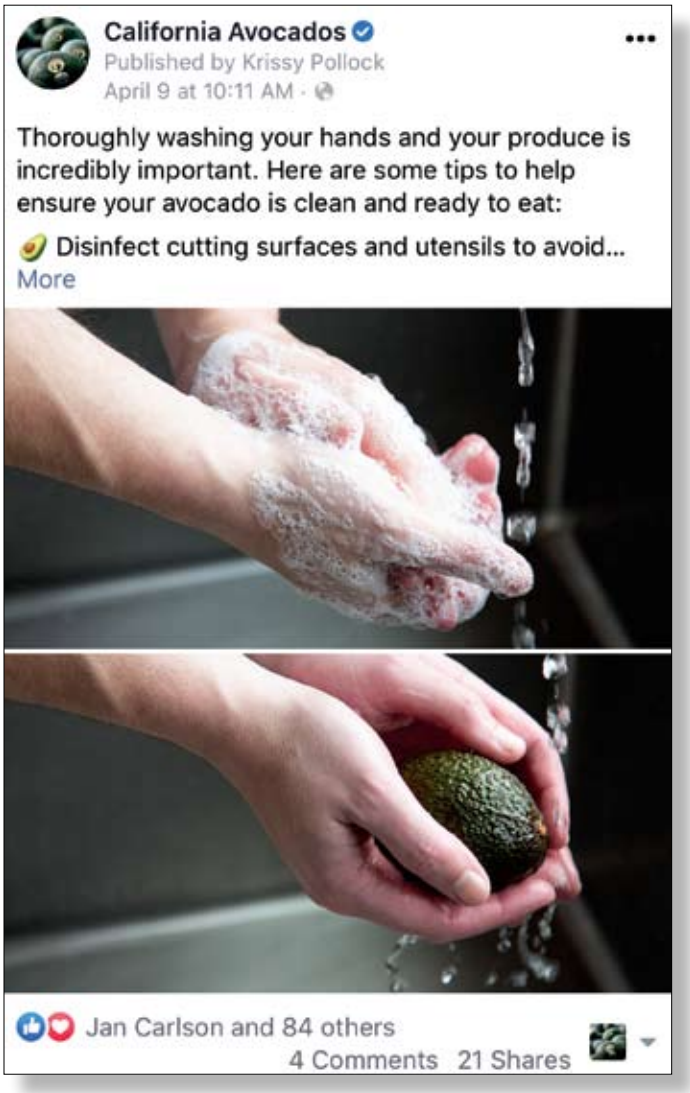
As consumers began to spend more and more time at home due to COVID-19 restrictions, CAC helped them navigate meal prep and cooking with California avocado recipe videos. With consumers making less frequent trips to the grocery store, CAC also shared a video concerning how to freeze California avocados. Consumers reacted very positively to this video as it helped them make their California avocados last as long as possible.

As COVID-19 restrictions became the "new normal" in late April and May, the Commission shared additional California avocado recipes to inspire consumers to try new things in the kitchen. This included promoting Pinterest pins, which have generated more than 6.2 million impressions (April – July), and an Instagram TV video series with Chef Jason Hernandez who demonstrated step-by step how viewers could incorporate California avocados into various recipes. In July, CAC partnered with CA Grown to work with three different California food and travel influencers for recipe content and a virtual cooking demonstration.

In addition to conducting daily monitoring to gauge consumer sentiment during the pandemic, CAC monitored the cultural conversation around the Black Lives Matter movement through social listening and adapted as warranted. Toward the end of June, CAC slowly returned to selected social platforms with positive, inspiring recipe content that focused on wellness and self-care — topics that were trending on social media as consumers hoped for a reprieve from the current uncertainty.

From February to July, CAC's posts on Facebook, Instagram and Twitter yielded an additional 1.8 million social impressions. By providing a range of relevant, informative, playful and inspiring content, the Commission was able to engage with consumers across all its social media platforms during unprecedented times.

From launching animated videos and creating GIPHY stickers with the new campaign to sharing food safety, meal prep and recipe content, CAC has adapted to this new landscape for its consumers. The ability to pivot in this current climate and reach consumers through social media has allowed the Commission to engage with them and stay top of mind during these unprecedented times. Ultimately, this support encourages purchases of California avocados and loyalty to the brand.



As consumers' concerns grew amidst COVID-19, CAC shared information concerning how to wash California avocados.

Chef Jason Hernandez demonstrated versatile California avocado recipes on Instagram TV.

Grower Profile

Avocados Take Center Stage at Biggest Little Farm

By Tim Linden

The Biggest Little Farm is a documentary released in 2018 of one couple's journey from Santa Monica city life to country farming in Moorpark, only 30 miles away but a world apart. The movie was very well received at some of the most prestigious film festivals in the United States, including Sundance and Telluride, and was an award winner at both the Boulder and the Hamptons film festival.

The film told a visually appealing and compelling story of Molly and John Chester and their incessantly barking dog who inspired the couple to chase their dream and give up urban living for a seemingly simpler life. Molly was a private chef and John was a filmmaker prior to their switch. A decade later, the reality is that it was harder and more rewarding than they imagined. "I am living the life I love," Molly told *From the Grove* in mid-August. "It is my absolutely wildest dream come true."

But she said the movie, which depicts lots of hardships along the way including the threatening Thomas Fire in 2017, did not exaggerate the challenges. "It was only the tip of the iceberg."

The "Biggest Little Farm" in real life is Apricot Lane Farms, which covers more than 200 acres northwest of Moorpark. It is a commercial endeavor marketing most of its production, including its avocados, direct to consumers through farmers' markets. The farm is treated as its own micro-ecosystem combining many different fruit crops, livestock, wildlife and plants to mimic the earth's natural ecosystem and create a soil that is rich in micronutrients to produce the flavorful food that is at the core of the farm's mission.

Molly grew up in suburbia but recalls loving the land in the few snapshots she remembers: her family's overgrown strawberry patch and an aunt's farm in Pennsylvania. But after meeting and marrying John, she was introduced to a fuller outdoor life including camping and a robust backyard garden. The film relates how their rescue dog, Todd, annoyed the neighbors and sent the Chesters on their journey to find their own utopia. They planned their escape for a couple of years, talked about their idea for an integrated farm with friends, and eventually attracted investors. About a decade ago they bought a 140-acre ranch, with some avocados and citrus as well as undeveloped land. They spent several years – well-documented in the film – developing the land, both in concert with nature and battling challenges. They have created an organic oasis with a biodynamics certification as well as a new certificate for their regenerative ag practices. Along the way, they have increased their holdings by purchasing two more adjacent properties.

Today, Apricot Lane Farms is home to scores of stone fruit, citrus and avocado trees, as well as a two-acre market garden, giving the farm year-round production for its regular jaunts to the farmers' markets that it frequents – currently four. At those markets, it sells meat raised on the farm as well as the fruit and its somewhat famous pastured eggs. To this day, the

eggs are one of the main items driving sales. The film documents how those pastured eggs became the farm's first success story and are still its signature crop. In fact, in Apricot Lane Farms' busy spring/summer season, it allows customers to buy a pre-made box of products for pickup at the farmers' markets with the promise that a pre-order guarantees them a carton of eggs. "Otherwise, they have to get there the first thing in the morning to make sure we don't sell out," said Molly.

She said the farm's avocados are second only to eggs as a customer attractant. And they also have started producing avocado oil to sell at those same farmers' markets. Molly said the key to their direct-to-consumer avocado sales is the array of varieties they offer. When they bought their initial ranch, it included several blocks of citrus and some seven-year-old avocado trees, mostly Hass. Since then, Apricot Lane Farms has added about 60 more acres of land and planted many different fruit trees, including more than a dozen varieties of avocados. Molly said Nabal is her favorite. "It's a great variety," she said. "I was told it is the variety that is the avocado grower's avocado."

She agrees stating that it has a unique flavor that makes the perfect avocado ice cream. While Hass is still the variety with the most volume, the farm also produces Fuerte, Hellen, Queen, Puebla, Bacon, Zutanos, Lamb Hass, Reed, Gwen, Pinkerton and Gem to name a few. The Gems, she said, have not performed up to expectations but she believes it is because of where they were planted. She plans to try some Gem trees in another location soon. On the other hand, Molly has been very happy with the performance of the Gwen and they also will be planting more of those soon.

"Our biggest issue with the avocado trees has been root rot, which we are trying to deal with," she said.

Yvette Roman Photography.

Apricot Lane Farms' orchard foreman Miguel Rodriguez has been in charge of the care and growth of the avocados for the last seven years, and he collaborates with Molly Chester on strategy, vision and fertility of the orchard, as well as on all the inevitable problem-solving involved with a complex ecosystem-based farm. As mentioned, the farm has a very diverse list of products with year-round production of both

Photo courtesy of Apricot Lane Farms.

Yvette Roman Photography.

fruit and livestock. As such, Molly wears many hats. As far as the avocado trees go, she calls them "somewhat low maintenance" compared to many of the other products the farm produces. The avocado groves are 100 percent organic with the farm using a number of beneficials and a "compost tea" to aid in production.

Molly and John continue to run the farm together just as they built it together. Currently, Molly is running more of the farm's day-to-day operations and John is able to put more energy toward driving the storytelling part of the farm's mission. But they talk everything over and come to an agreement on all major developments. "He is such a deep thinker," she noted.

While the vast majority of the avocados are sold through farmers' markets, Molly said production sometimes outstrips their direct sales capabilities. In those instances, they will send a bin or two to a packing shed and they also have some direct retail customers such as Erewhon Market, a five-store chain on Los Angeles' Westside. The farm's fruit salesman was in the midst of their season in mid-August and did not have the time to retrieve sales numbers, but Molly said the avocados sell very well and indicated the crop is a money maker for this unique farming operation.

Photo courtesy of Apricot Lane Farms.

Severe leaf damage caused by avocado lace bugs. *All photos courtesy of Dr. Mark Hoddle, UC Riverside.*

Avocado Lace Bug Biology and Control

By Tim Spann, PhD
Spann Ag Research & Consulting

The avocado lace bug (ALB; *Pseudacysta perseae*) is a true bug insect pest of avocados. As a true bug, ALB has sucking mouth parts, which it uses to feed on the internal layers of avocado leaves resulting in their skeletonization. The common name "lace bug" is derived from the pest's lace-like wings. ALB was first described in Florida in 1908 and was assumed to be native to Florida for many years. In September 2004 ALB was found infesting backyard avocado trees in National City and Chula Vista in south San Diego County.

Origins and Geographic Distribution

Following the original finds in California in late 2004, the California Avocado Commission (CAC) funded research with Drs. Mark Hoddle, Joe Morse and Richard Stouthamer, Department of Entomology, University of California Riverside (UCR), to investigate potential control strategies and determine where ALB came from.

For their research, ALB specimens were collected from Florida, Texas, three locations in Yucatan (Mexico), Veracruz (Mexico), Nayarit (Mexico), Jalisco (Mexico), Guatemala, Dominican Republic, Jamaica, Puerto Rico, St. Thomas and St. John, St. Lucia, St. Kitts, and French Guyana. These samples were subjected to DNA analysis to determine where the California population of ALB originated and where the native

Necrotic "islands" on the upper surface of avocado leaves caused by avocado lace bug feeding on the underside of the leaves.

range of ALB is. Knowing the native range of an invasive insect is important because that is the most likely place to find biological control agents.

The results of the UCR team were quite surprising. Contrary to what had been presumed for more than a century, they discovered that ALB was not native to Florida, but rather to central and southern Mexico. They determined this by looking at the genetic variation among specimens within a given region. In an insect's native range there are many individuals mating and sharing genes, thus the expectation is to find the greatest genetic diversity. However, when a pest is introduced to a new area it is typically through a small number of individuals, from which the population builds, thereby limiting the genetic diversity in introduced populations. The most genetic diversity was found among samples from Jalisco, Nayarit and Veracruz states in Mexico.

So where did the California population in southern San Diego County come from? Genetic analysis showed that the introduction of ALB into southern San Diego County was from Nayarit, since the California samples were nearly identical to samples from Nayarit.

California Distribution

From the original find in late 2004 until late 2017 there was no known movement of ALB out of backyard trees in the National City/Chula Vista area. However, in October 2017, there were several reports of ALB in commercial avocado groves in the Oceanside and De Luz areas of northern San Diego County. Why, after 13 years, had this pest finally decided to move? It turns out, it hadn't.

Because of the work that was done following the original find, researchers at UCR had a DNA library of ALB. Mark Hoddle collected samples from groves in the Oceanside and De Luz areas and discovered that this new ALB population did not match the original population from 2004. Rather, the population in northern San Diego County was a genetic match to populations in Florida, parts of the Caribbean, and Yucatan, Mexico meaning we were dealing with a second introduction of this pest.

Since its discovery in the Oceanside and De Luz areas, ALB has spread throughout northern San Diego County, affecting groves all along the Hwy 76 corridor, and has moved into southern Riverside County. In addition, a population was found on a backyard avocado tree in Culver City (Los Angeles County) in early 2019. The Culver City population genetically matched the original population that appeared in southern San Diego County in 2004.

Identification

Identification of ALB is quite easy since there are no other pests in California that it can be easily confused with. The first thing that usually draws your attention when looking for ALB is "islands" on the leaves. These necrotic regions develop because of the ALB adults feeding on the underside of the leaves and sucking the leaf juices from between the upper and lower leaf surfaces.

When the leaf is turned over, the adults, although only about 2 mm in length, are easily seen with the naked eye. Adults are oval, appear yellow to pale orange, and have dark heads. Nymphs are smaller than adults, oblong and are black, dark brown or reddish colored depending on their stage of development. Eggs appear as small black dots of varying sizes. What is visible is a dark sticky secretion covering the egg to protect it from predation. Under the sticky secretion, the eggs are oblong and yellowish.

Management

In the CAC work that was funded beginning in 2005, Dr. Joe Morse investigated both chemical and biological control of ALB. It should be noted that during the foreign exploration to determine the origins of ALB no parasitoids or other natural enemies were discovered. Thus, common biological control agents already in California were evaluated.

Franklinothrips, which are predators of avocado thrips and persea mite, were found to only prey on small nymphs of ALB but could control up to 60% of small nymphs. Green lacewings were found to be much more effective predators against ALB, preying on all life stages. Green lacewings were found to control up to 60% of small nymphs, 95% of medium nymphs, and slightly more than 70% of adults. *Neoseiulus californicus*, a predatory mite found naturally in California that controls various species of spider mites, was found to have no efficacy against ALB.

For chemical control, Dr. Morse looked at both systemic and contact pesticides. An Agrian label search indicates there are 62 products labeled for lace bug control on California

Avocado lace bug adults and eggs surrounding a necrotic "island" on the underside of an infested avocado leaf.

Avocado lace bug adults, larvae, and eggs on the underside of an infested avocado leaf.

avocados. Imidacloprid is the only systemic active ingredient. There are several pyrethrins and permethrins as well as five organic products labeled including one entomopathogenic (insect feeding) fungus. As with any new pest it is going to take time to determine the best control measures. Timing and coverage will need to be figured out. Growers are advised to work closely with their pest control adviser (PCA), and remember, the label is the law. Always read and follow label directions for any pesticide.

CAC and its Production Research Committee are keeping a close watch on ALB, its spread, and its potential to become a serious pest in California. Efforts are underway to undertake new research to screen more pesticides for efficacy against ALB and pursue registrations for those products that are effective. However, these efforts have been hampered by the COVID-19 situation and restrictions placed on research personnel by the University of California. Be assured that we are pursuing all efforts vigorously and will keep you updated as this situation evolves.

World avocado production prospects

California

In transition

On the following 22 pages is a report on the California avocado industry. *From the Grove* and the California Avocado Commission have received permission from the authors to reprint this report in the pages of this magazine as an important service to the California avocado grower community.

ACKNOWLEDGEMENTS

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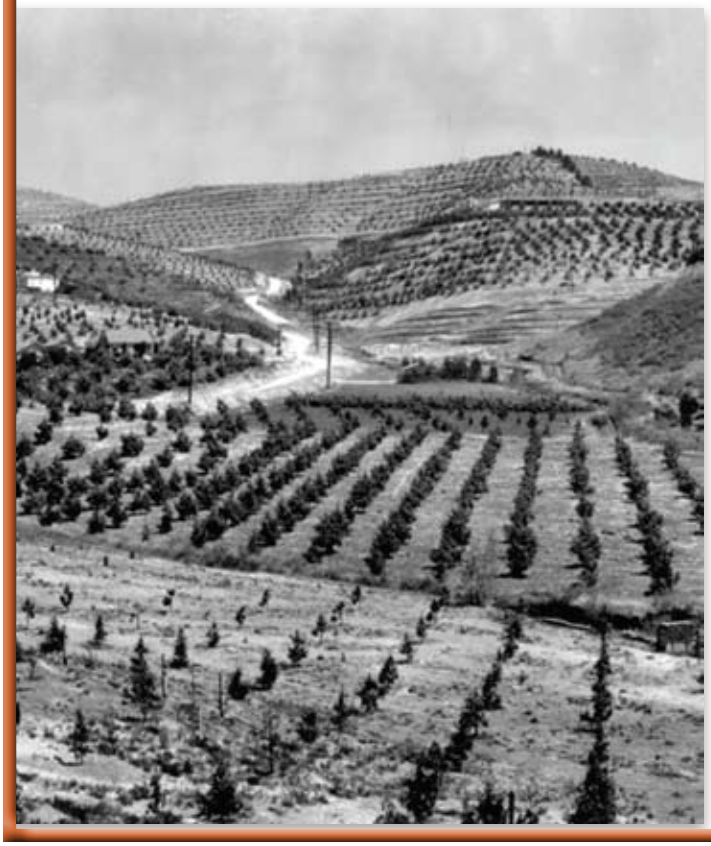
The avocado in California

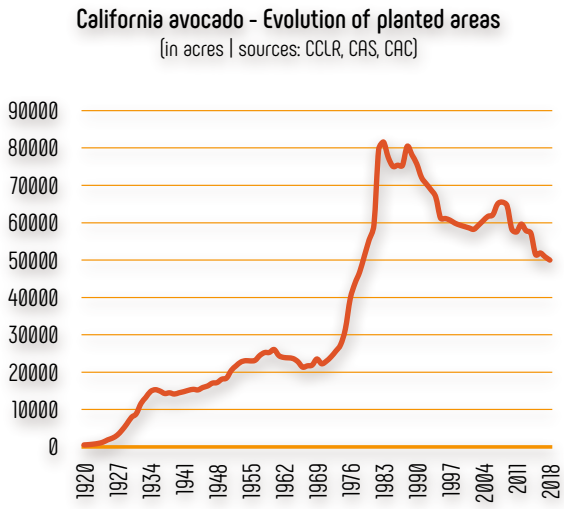
A pioneering and innovative origin in many fields, both technical and marketing, the Californian avocado industry remains to this day the world number four in terms of planted areas, extending over approximately 55 000 acres. Since the early 1990s it has faced growing problems of competitiveness, in a context of rampant urbanization. The production system and structure have remained mainly traditional, while the costs of the main production factors have boomed, to become the highest in the avocado world. Nonetheless, the drastic shrinkage trend of the 2000s has given way to stabilizing planted areas, with the production zone situated to the north of Los Angeles holding up better than the southern zone, under greater stress.

History

The Californian avocado industry is pioneering in more than one respect. First of all, let's take the literal meaning. The avocado tree is not a native plant: reports of the first documented specimen, imported from Nicaragua and planted in a San Gabriel orchard, date from 1856. However, California was one of the first zones in the world where industrial plantations were set up, starting in 1908 in San Marino (east of Los Angeles). The Californian industry was also a pioneer in technical terms, bringing major innovations in key fields such as varietal creation and propagation, with Popenoe's prospecting work supported by the USDA in the early 20th Century, the selection of Fuerte, and then of Hass by Rudolph Hass in the 1920s and the development of clonal plants thanks to the technique of etiolation. Another key field was managing the first pathology to hit the world industry, namely Phytophthora, with Zentmyer's work leading to the development of a combination of tolerant plant/chemical treatment. The Californian industry also laid the foundations of modern avocado marketing, by developing a ripened fruit offering in the early 1980s (Henry in San Diego), and then setting up a local and then federal promotion system, based on a mandatory assessment paid by industry stakeholders.

The solid bases on which the industry was able to develop were laid from the beginning of the 20th Century. On the one hand, the ban on imports, for sanitary reasons, of fruit from neighbouring Mexico, implemented in 1914, indirectly enabled the industry to take off in an uncompetitive context. On the other hand, a variety well suited to Californian winters, sometimes cool, was selected from the beginning of the 20th Century, Fuerte – a natural selection. This cultivar was the only one able to withstand the severe frosts of 1913. Finally, professionals managed to get organised at a very early stage to defend their interests and work together on marketing, promotion and improving production techniques by creating the California Avocado Association in 1915, with the support of Riverside University in terms of the technical aspects. Planted areas started to grow considerably from the mid-1920s. The industry's centre of gravity at the time was in the far south of the State: the area of San Diego and southern Los Angeles still accommodated 90 % of the cultivation area in the early 1950s. The more northern counties of Santa Barbara and Ventura made up just 370 to 500 acres in the aftermath of WW2. The cultivation area gradually expanded thereafter, at an irregular rate. New very hard-hitting pathologies appeared, such as *Phytophthora* in the 1930s, and further severe frosts occurred (1922, 1937, 1949). The dynamic also followed economic cycles, with considerable expansion in planted areas in the mid-1920s, and then the late 1940s. This expansion





California in a few figures:

With a GDP of nearly 3 trillion USD, California is the world's 5th biggest economy. It is the most populous State in the USA, and the 3rd biggest in the world in terms of planted area.

- **Population:** 39.5 million inhabitants in 2019 (source: United States Census Bureau)
- **GDP/capita:** 75 949 USD/year in 2018
- **Agriculture:** 1.5 % of state GDP (far behind finance, real estate, technology, tourism, trade, etc.) and employs 3 % of the workforce

Value of main agricultural crops
(source: California Department of Food and Agriculture, 2018):

- **Grape:** 6.25 billion USD
- **Almond:** 5.47 billion USD
- **Pistachio:** 2.62 billion USD
- **Strawberry:** 2.34 billion USD
- **Orange:** 1.12 billion USD
- **Avocado:** 383 million USD

was followed in both cases by a period of stagnation due to pressure on prices exerted by the increase in production. The industry rallied to tackle these crises, by streamlining the very wide varietal range around Fuerte (creation of a Variety Committee within the CAA), organising the marketing (creation of the California Avocado Grower Exchange in 1924, which became Calavo in 1927) and launching promotion actions, which in 1961 led to the establishment of a California Hass Avocado Marketing Order, imposing a contribution from all industry players. New markets were also opened up (East Coast from 1926, and export from 1927).

Growth greatly gathered pace from the early 1970s, when the cultivation area comprised approximately 25 000 acres. This new Gold Rush had three main origins, according to analysts: the implementation of a fiscal policy favorable for agricultural investment, higher agricultural water availability thanks to the execution of major infrastructure work, and the arrival in the USA of innovative irrigation techniques from Israel, which meant that cheap sloping terrain (Chaparral zones) could be used. A great many "gentlemen farmers", often alien to the crop and even the world of agriculture (liberal professions, Navy personnel based in San Diego, pensioners, etc.), acquired a few acres, thereby creating a wide base of very small growers with limited technical know-how, especially in the San Diego region. The industry also focused on Hass, a more productive variety with a longer season, and more resistant in the post-harvest phase. Its centre of gravity started to shift gradually northward, with large cultivation areas being set up in the counties of Ventura and Santa Barbara. The sector reached its peak in the early 1990s, encompassing more than 75 000 acres and 8 000 growers. Another overproduction cycle appeared thereafter, intensified by increased international competition, with the arrival of Chilean Hass, which supplanted local varieties, and then the gradual entry of Hass from Michoacán, from 1997. Planted areas shrank, especially with 1990 bringing a hard frost in the north and with the water stress starting to weigh very heavily in the south, as California water quota from the Colorado fell. Furthermore, new stricter rules on food safety and orchard sanitary practices appeared, driving some of the lower-tech growers to abandon the crop. The implementation in 2001 of a larger-scale promotion programme, with creation of the HAB, enabled not only a real consumption boom in the USA, but also helped halt the shrinkage of avocado planted areas in California, by providing growers with better revenue. The Californian avocado planted area has stabilized at approximately 55 000 acres since 2004-2005, and currently has approximately 3 650 growers.

Current extension of the cultivation area, and location

A huge southern cultivation area, stabilizing after a long period of decline

Extending over an estimated 55 000 acres in 2018, the Californian avocado cultivation area is the fourth largest in the world. It is currently the only one of significant proportions in the country. The Floridian industry, which specialises in West Indian varieties and covered approximately 11 500 acres at its height in the late 1980s, was practically decimated after a major spell of frost in 1989 and Hurricane Andrew in 1992. California's place as the national avocado number one illustrates this agricultural State's specialization in fruit: if the Mid-West is the breadbasket of the USA, the "Golden State" is its fruit basket, providing nearly two-thirds of the national fresh fruit and dried fruit supply (avocado, citruses, strawberry and other berries, almond, pistachio, etc.). Californian avocado production is concentrated in the south-west of the State, on the strip of land varying in width between the coastal strip and the sea, mainly between Morro Bay in the north and the Mexican border in the south. This zone has a very suitable climate, due to the predominance of a hot Mediterranean climate, with more temperate zones in the north and other semi-arid zones in the south, though the frost risk remains present. California is increasingly exposed to extreme climate risks, especially droughts, uncontrollable large-scale fires and hot winds among others. Conversely, rainfall is low, which means that irrigation is required across the board. Planted areas, falling steeply until 2015, are now tending to stabilize, with the cultivation area's centre of gravity gradually shifting northward. Hence the production area located north of Los Angeles (Ventura and Santa Barbara, with additional planted areas in counties further north such as San Luis Obispo) now encompasses approximately 30 500 acres, i.e. just over half of the State's total planted areas. Meanwhile, the historic production zone of San Diego and the other counties situated south of Los Angeles has shrunk, with the cultivation area recently dropping below the 24 000-acres mark. Alternate bearing is highly marked, resulting in production fluctuating between 220 000 and 500 000 pounds since 2010, with an average of approximately 330 000 pounds.

Avocado – California – Planted areas by county in 2018

Breakdown by county	in acres	share
San Diego	17 661	32 %
Riverside	5 175	9 %
Other southern counties	1 474	3 %
Total, South	**24 311**	**44 %**
Ventura	19 500	36 %
Santa Barbara	6 479	12 %
San Luis Obispo	4 004	7 %
Other northern counties	362	1 %
Total, North	**30 345**	**56 %**
Total	**54 656**	

Source: CAC

Production system

Highly traditional alongside high-tech

The small size of the orchards is one of the main characteristics of the Californian production system. The average planted area owned by a grower in 2019 is around 15 acres. We can estimate that only around twenty plantations cover more than 500 acres, with the latter representing approximately one third of total planted areas. The statistics from the 2017 survey reveal that more than 50 % of orchards cover less than 10 acres, with medium-large orchards (more than 20 acres) representing only just over 25 % of planted areas. Planted areas are even more limited in the south than in the north. Hence the production fabric is highly heterogeneous, based in large part on "gentlemen farmer" smallholders, often alien to the world of agriculture. They are alongside a minority of arboriculture professionals, with larger orchards and often cultivating the lemon in addition to avocado. The technical level of the plantations is proportional to their size. Cropping practices among smallholders are highly traditional. The average age of the trees is high, though the plant stock is good quality (big share of clonal plants). The planting density is rather low (approximately 109 to 130 trees/acre). Annual pruning is rather scarce, although it has tended to increase over the past fifteen years. Fertilization practices are variable, ranging from fertirrigation to a very basic system of manual application, sometimes very infrequent (once a year). Conversely, those growers with large orchards use modern production techniques (higher density, annual pruning, fertirrigation, etc.). It is reported that approximately 10 % of planted areas are organically cultivated. The technical management of this cropping mode is not very complex in the dry Californian climate (except for weed control). Conversely, economic returns are often lower than for the conventional segment.

Water resource – Irrigation: the number 1 constraint, especially in the south

Irrigation is essential in all the zones, with the limited precipitation level not covering requirements: 22 inches in the wettest part located in the north. The agricultural water supply system is complex, and involves considerable local specificities. It is based on two main sources, their respective proportions varying between regions: groundwater pumping and the public supply network. The latter is supplied by large-scale infrastructures made in the 1970s, bringing water from the north of the State or neighboring States, with the quality varying between sources. Agricultural water availability has always been under strain throughout the production zone. However this constraint, increasingly prominent since the 1990s, has become a major factor since the drought of 2014-2015. It is particularly severe in southern Los Angeles, supplied by hard-hit supply sources. In the face of increasingly restricted water sources, environmental protection measures also tending to limit their use and increasingly tough competition for use (agricultural or domestic, with the population having grown by 10 million in 30 years), the public authorities are tending to impose control measures. Water has become the main expense in calculating the variable production cost, with a price of up to 1 500 USD/acre foot in the San Diego region. This burden is endangering the economic survival of certain plantations. On top of the lack of availability, water quality is often problematic in certain zones. Requirements vary between zones (from 2 to 5 acre foot/acre). The doses applied often do not enable production to reach its full potential. The irrigation technique used in nearly all plantations is micro-spraying. It is not the most water economic, but is well-suited to the problem of salinity and to the fairly sandy nature of the soils, while requiring limited investment.

Labor: a major problem, with a two-fold negative impact

The cost of labor exerts a lot of pressure on operating expenses. The minimum hourly wage varies in agriculture between counties and, as of 01/01/2020, is 12 USD for less than 26 employees and 13 USD for 26 or more employees. However it is generally between 25 and 30 USD including bonuses: a record for the agricultural world! Labor availability remains problematic. The pay is unattractive compared to the high living costs and wages offered in other sectors of the economy. Most harvesting is done by farm labor contractors through which small growers can access the workforce. There is also the problem of replacing a high proportion of older workers about to retire. Finally, the tougher measures on receiving immigrant workers are weighing increasingly heavily, with the vast majority of employees coming from Mexico or other South American countries. These constraints have a two-fold negative impact on production costs, by directly increasing expenses and forcing growers to opt for low labor-intensive cultivation practices, which conversely reduce productivity and increase the alternate bearing phenomenon (annual pruning reduced or non-existent, low-density planting, no selective picking).

Phytosanitary problems: low constraints

There are few sanitary problems, especially because of the dry climate. The main pathology is *Phytophthora*, with two strains present: *Phytophthora citricola* Sawada, which infected approximately 20 % of trees in the late 1990s, and *Phytophthora cinnamomi* Rands, by far the most common and problematic with 60 to 75 % of trees affected at the same period. It is controlled thanks to a locally developed technique: using a combination of metalaxyl injections and resistant rootstocks (clonal rootstocks such as Duke 7, Toro Canyon and Dusa). There are other diseases present, but their spread is limited (sunblotch, *Verticillium* wilt, oak root wilt). There are also few pests: mainly thrips and the persea mite (controlled thanks to one annual treatment, generally applied in early spring). Herbicide is generally applied three times a year (February, May and August).


Metalaxyl injection

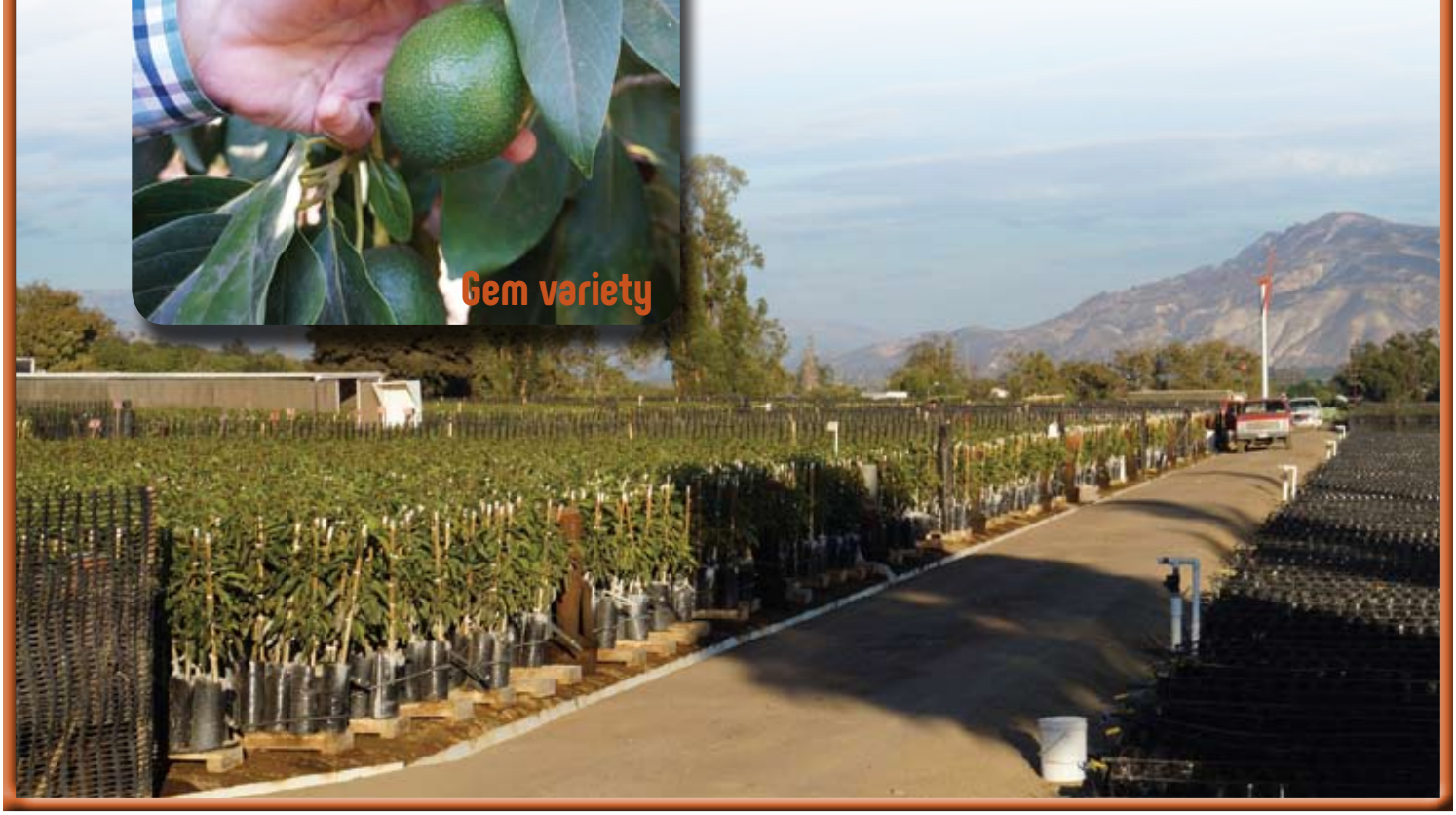
Soils

The soils vary greatly in their nature. Nonetheless, some common traits can be distinguished. They generally have low depth (often less than 20 inch). Sandy-loamy is the most common texture, though there is often a layer of clay limiting drainage. The organic matter content is generally low (1 to 3 %).

Varieties: Hass predominant

Hass is by far the dominant variety, with 95 % of planted areas planted in 2017-2018. Lamb, a later variety, comes in second position with approximately 3 % of planted areas, declining in recent years. The other varieties represented less than 2 % of the avocado planted area. Nonetheless, Gem is rising fairly rapidly, representing approximately 25 % of plant sales in 2019. This variety, developed by University of California Riverside, is patent free in California. It is of particular interest to fairly high-tech growers, who apply a high planting density. It appears to be slightly more cold-tolerant than Hass, an important asset in certain production zones in the State.


Gem variety



Yields: big margins for improvement

Despite the region's good pedoclimatic attributes, the average yield of California's avocado plantations is low, at 6 000 pounds/acre from 2010 to 2019 (ranging from 4 200 to 8.5 pounds/acre). However, there is high variability, given the great heterogeneity of the production systems. Productivity fluctuates between 8 800 and 9 680 pounds/acre on orchards with a decent technical level. It can be as high as 14 000 to 16 000 pounds/acre for the best managed systems, a level reflecting the real productivity potential of this region, blessed with good natural attributes. The alternate bearing phenomenon is generally highly marked. Control cropping practices, such as pruning, are not yet widespread. Furthermore, the harvest period is often late for marketing-related reasons (strong competition from Mexico until June) or physiological reasons in certain cool zones (northernmost production areas, such as San Luis Obispo).

Production costs

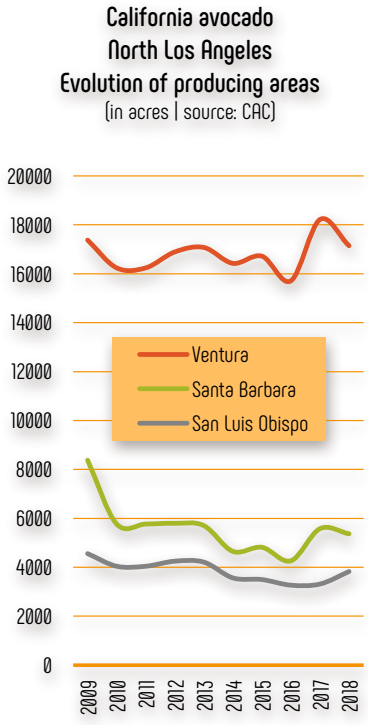
Production costs in California have set record levels for the avocado world, and are constantly rising, mainly because of the water and labor costs. The cost of irrigation water varies greatly between production zones and supply sources. In certain northern zones, where groundwater is available for free, the irrigation cost may be restricted to that of the electricity required for pumping, which varies between 250 and 500 USD/acre foot for average requirements of 2 to 3 acre foot/acre. In the southern zones (San Diego County), the cost of imported water can climb to more than 1 500 USD/acre foot for the much higher requirements, sometimes in excess of more than 4 acre foot/acre. Hence the total cost of irrigation can vary from 600-1 200 USD/acre to more than 6 000 USD/acre in the most extreme cases. Labor costs are also among the highest in the world, with an official minimum rate of 12 USD/hour, often rising to 25 to 30 USD/hour due to worker bonuses and incentives in a context of strong competition from other sectors of the economy. Conversely, because of a low phytosanitary pressure, the cost of treatments has little impact. Hence the total production cost can vary greatly according to the context: estimates for the northern regions lie between 4 000 and 5 000 USD/acre, while for the south they are in excess of 8 100 USD/acre.

North of Los Angeles production area

This zone has become the State's leading production area in recent years, now accommodating nearly 60 % of planted areas. The cropping system is traditional, and the plantations remain limited in size, through production costs are lower than in the south, especially thanks to the presence of free groundwater and to a productivity level above the State average. Furthermore, local real estate regulations have helped preserve agricultural land from rampant urbanisation. The shrinkage trend has been interrupted, with the cultivation area actually gaining a few hundred acres in recent years.

Location: Ventura, Santa Barbara and San Luis Obispo

The cultivation area, covering nearly 30370 acres (i.e. approximately 57 % of the State's total planted areas), was not spared by the general planted area shrinkage trend of the 1990s. Nonetheless, in recent years it has tended to stabilize, or even expand slightly. The California Land Conservation Act, in force in this part of California, is playing its part. Production is concentrated mainly in three counties. Ventura is by far the main production centre in this zone, and in recent years has become the country's and State's biggest too. It has approximately 20 000 planted acres, divided between three main zones: Santa Clara valley (from east Ventura to Fillmore), the Las Posas and Simi valleys, situated further south just the other side of the Santa Susana mountains (from Somis to Simi Valley, by way of Moorpark), and a bit further north in Ojai valley.



Strengths:

- Excellent climate conditions.
- Lucrative local market, and proximity of consumption areas.
- Free, high-quality ground water.
- Later production calendar, less exposed to the competition.

Challenges:

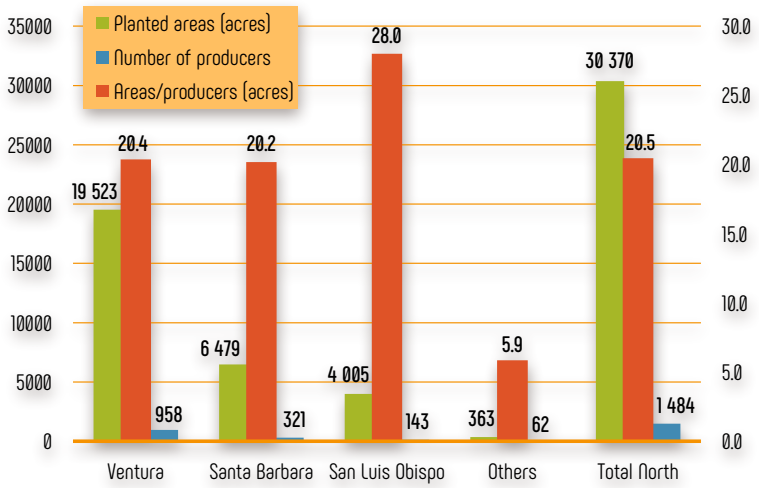
- Production costs high, and rising.
- Small plots, often on sloping ground.
- Traditional production techniques.
- Extreme climate events more frequent (drought, fires, frost).

Santa Barbara county comes in second position, with approximately 6 650 acres, with plantations concentrated in the strip of land situated between the Pacific Ocean and Santa Ynez mountains (from Goleta to Carpinteria). The rest of the cultivation area is located primarily in San Luis Obispo county (approximately 4 100 acres), mainly near the coast between Santa Maria in the south and Morro Bay in the north, by way of Arroyo Grande. Some recent plantations representing anecdotal areas are situated further north (250 acres or so around Monterey and Salinas), and in San Joaquin valley (100 acres or so in Tulare county). The climate is Mediterranean, with temperate to cool summers, in the three main counties, with average temperatures of 59 to 61°F. The rainfall level, of between 15 and 20 inches, is higher in the north than in the south, unlike the temperatures. The rainy season is concentrated between October/November and April. The mountainous barrier situated behind the production centres maintains the ocean's influence over the climate, and also provides partial protection against heatwaves or cold spells coming from the east or north. Conversely, the zone is exposed to large-scale fires which are hard to control, occurring from May and above all between September and October.

Production structure: average planted areas and a generally moderate technical level, albeit above average for the State

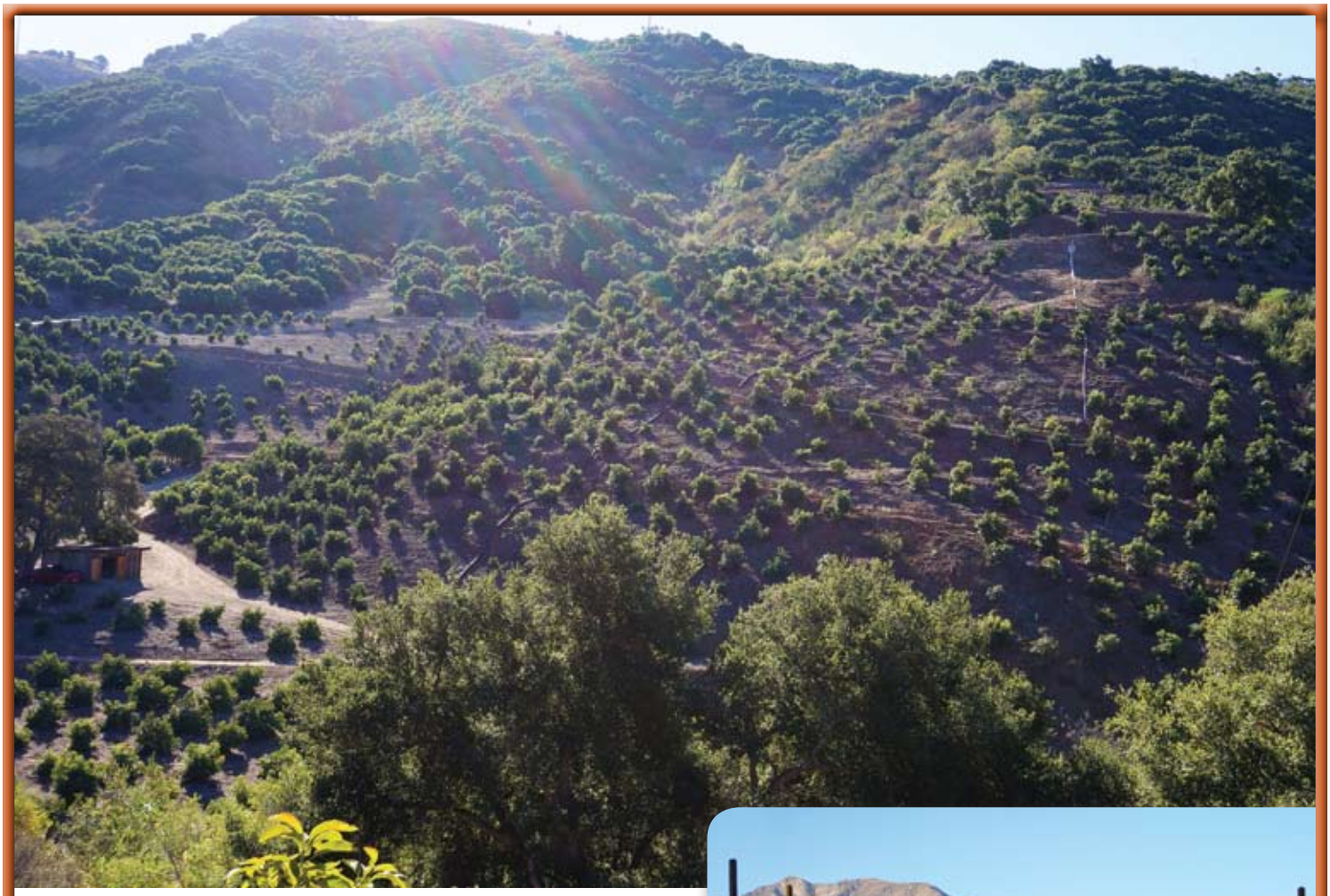
The average plantation size is above average for the State, but is still small (approximately 20 acres as opposed to 15 acres). It is slightly bigger in San Luis Obispo county than in Ventura and Santa Barbara (30 acres as opposed to 20 to 20.5 acres). Besides the historical reasons mentioned above, a law limiting land parcelling in successions has been in force since 1986. The orchards are often located in sloping zones, generally on the upper part (last zones available for this "recent" crop, often also less exposed to frost). Anti-frost machines are often installed in the lowest zones. A significant proportion of growers also produce lemons. The average technical level of the plantations remains moderate, but is still above average for the State.

California avocado - North Los Angeles - Production structure
(source: CAC)



Irrigation: a two-fold comparative advantage, in an evolving regulatory framework

The region has big comparative advantages in terms of irrigation over the production situated south of Los Angeles. On the one hand, water requirements are more limited, and around 2 to 3 acres feet/acre/year). On the other hand, while the pressure on the water resource is rising, availability is higher, the cost lower and quality better overall. Agricultural water comes primarily from groundwater pumping, itself supplied by rainfall (more than 80 % of requirements in 2013). Its cost is limited to that of the energy required for pumping (variable with depth, and around 250 to 500 USD/acre foot). The quality of this water is tending to deteriorate, due to the intrusion of salt water into parts close to the sea, but remains decent overall. In 2014 the public authorities launched a programme aimed at regulating use of this groundwater (Sustainable Groundwater Management Act). At present, there are only measures prohibiting digging new wells in so-called "stressed" zones, but the introduction of quotas is under examination. The remainder is mainly supplied by those reservoirs present (Lake Casitas, Lake Cachuma and Lake Piru). In this zone, agriculture makes little use of water from the public network, highly expensive. It comes primarily from snow melt from the Sierra Nevada, and is carried from the north by the California Aqueduct (an infrastructure built under the State Water Project – a large-scale hydroelectric project).



Calendar earlier in the south than in the north

Overall, the zone is later than in the south of Los Angeles. This is a comparative advantage in commercial terms, with the competition from Mexico stronger during the first part of the season. There is a maturity gradient going from south to north, due to a temperature differential. Schematically, in the cooler San Luis Obispo/Monterey zone, the harvest extends from April to January, with a peak from May to November. The calendar runs from March to November in the Ventura/ Santa Barbara zone, with a peak from April to October.

California avocado – North of Los Angeles – Hass production calendar

Counties	M	A	M	J	J	A	S	O	N	D	J
Ventura, Santa Barbara											
San Luis Obispo, Monterey											

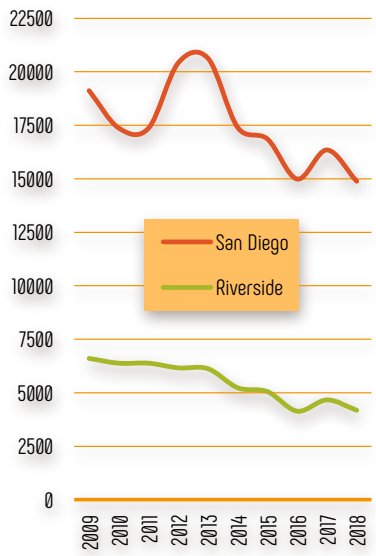
South of Los Angeles production area

This historic area, formerly number one in terms of production, has declined to become the State number two, with approximately 40 % of planted areas. Loss of competitiveness has become a major challenge, since the zone is highly dependent on irrigation water imported from North California or from other States, prices of which have soared. In addition, its production system and structure are more traditional than in the north. The sector has lost a great deal of land to the high urban pressure. Nonetheless, the drastic shrinkage trend of the 2000s has given way to a gentler decline in planted areas.

Location: a large main zone, straddling San Diego and Riverside counties

The historic production area situated south of Los Angeles has seen a big decline, with its planted area practically halving over the past twenty years. While it is no longer dominant, it nonetheless maintains a major role, with planted areas of around 25 000 acres (i.e. approximately 45 % of the State's planted areas). The cultivation area is concentrated in a strip of land 30 to 60 miles wide, between the Pacific Ocean and the coastal mountain barrier formed from south to north by the Laguna Mountains, Palomar Mountain and the San Bernardino Mountains.

California avocado
South Los Angeles
Evolution of production areas
(in acres | source: CAC)



The zone ranging from Escondido in the south to Temecula in the north, straddling San Diego and Riverside counties, is the largest. The orchards are located either side of the "avocado highway" (Highway 15), near the districts of Poway, Escondido, Valley Center, Pauma Valley, Fallbrook, Temecula and Murrieta) from south to north. There are also significant planted areas east of San Diego (between El Cajon and Alpine), and in Riverside county around Moreno Valley. The climate, hotter and drier than in northern Los Angeles, ranges from Mediterranean, with hot summers, to semi-arid, with an average temperature of 63 to 64°F. Rainfall lies somewhere between 10 and 14 inches per year, and is concentrated mainly from November to March (a few inches in April and October). The zone is often subject to hot winds in autumn (Santa Ana winds), though fires are less frequent than in the north of Los Angeles.

Production facilities: a larger proportion of smaller and lower-tech orchards than in the north

The plantations are small in size, and below average for the State (10 acres per grower, as opposed to 15 acres). Riverside county's plantations are slightly smaller than San Diego's (7.5 acres as opposed to 10 acres). Consequently, the technical level and cropping practices are on average more basic than in the north. The average slope of the plantations is greater than in the north.

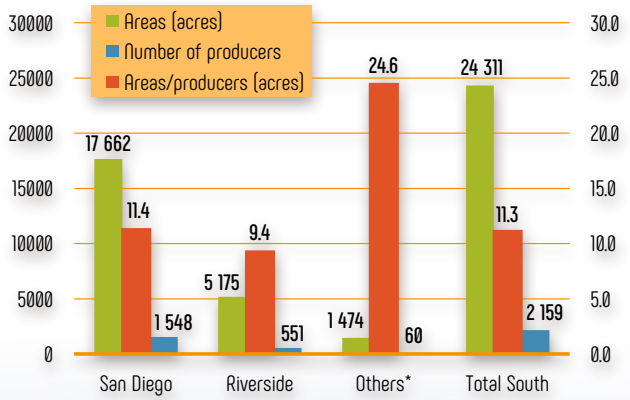
Strengths:

- Good climate conditions.
- Lucrative local market, and proximity of consumption areas.

Challenges:

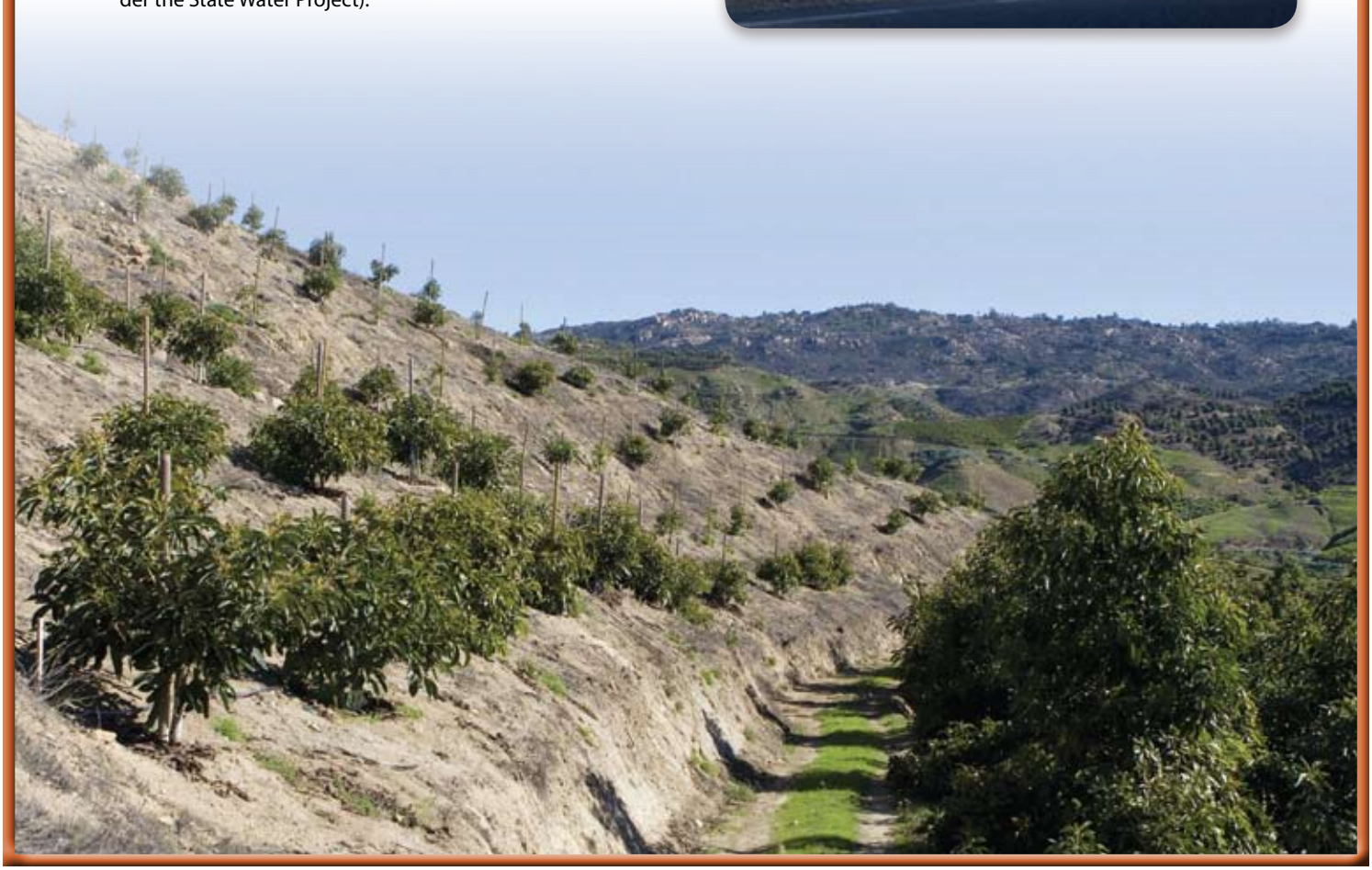
- Very high water stress.
- Production cost high, and continuing to rise.
- Small plots, often on sloping ground.
- Very traditional production techniques.

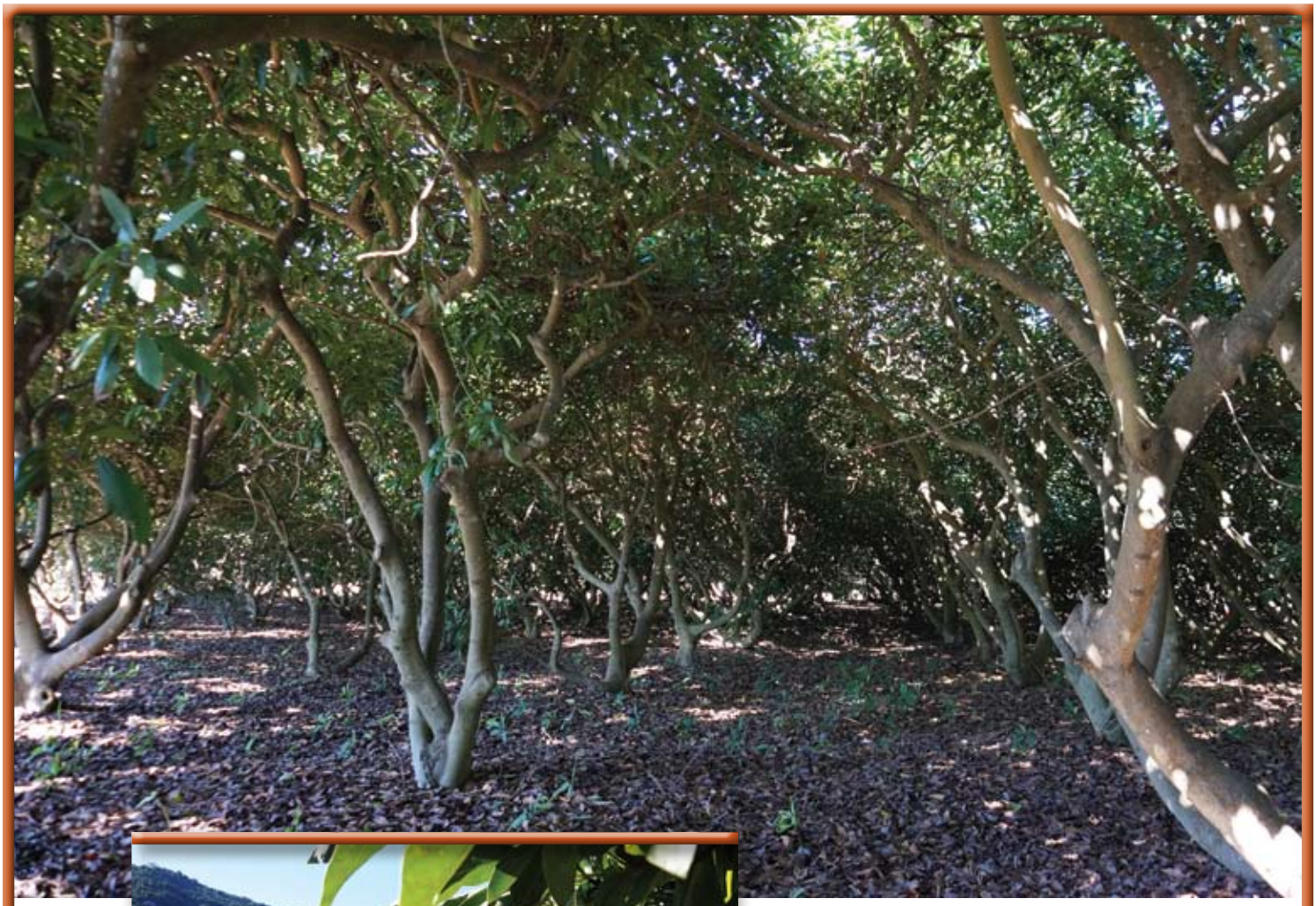
California avocado - South Los Angeles
Production structure
(*Orange and San Bernardino counties | source: CAC)

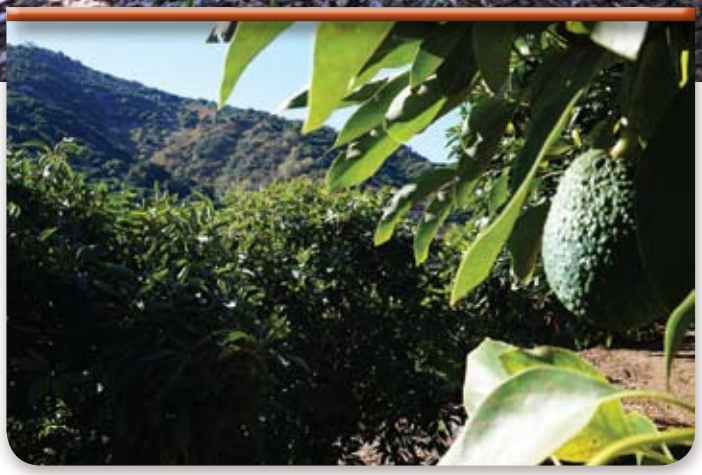


Irrigation: supply sources, and a much greater constraint than in the north

The water stress is high, both in terms of volumes available and water quality or cost. It is more of a burden for growers than in the north of the State. On the one hand, due to the lower rainfall and higher temperatures, water requirements are greater (3.5 to 4.0 acre foot/acre, or even 5 acre foot/acre). On the other hand, the local supply sources are very limited, in terms of both surface water and groundwater. Hence irrigation is based practically entirely on water imported from the north of the State or neighbouring states, via the main water systems in place (more than 90 % in 2015). Two sources are exploited: water from the Colorado, arriving mainly via the Colorado River Aqueduct, which represents approximately three-quarters of the supply, and water from the north of the State via the California Aqueduct under the State Water Project. Unlike the groundwater supply, use of which is still under-regulated, and access to which is free, imported water is paid for. Its price has soared as pressure on the resource has risen, in both California and other States using water from the Colorado. Southern California is particularly hard hit, since the region is at the end of the line. The price per acre foot can be as much as 1 500 USD, with the irrigation item representing up to two-thirds of the total production cost. Quality is also posing problems. Saline sediments, present in the Colorado basin, are dissolved in the water, affecting its quality (salinity, approximately 650 mg/l in 2014, is twice the salinity under the State Water Project).







Calendar: a hotter and earlier zone

Since temperatures are higher, the region has an earlier calendar than the north. The harvest runs from February to September, with a peak from March to August.

California avocado – South of Los Angeles – Production calendar

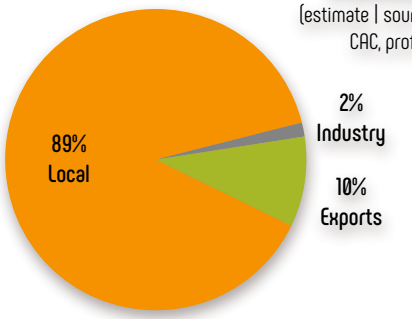
	J	F	M	A	M	J	J	A	S	O
Hass										

Marketing

A premium product, on a mainly local or regional market

The local and regional market takes in 90 % of production, forming the industry's natural outlet. Sales are concentrated in the State of California and the neighboring West Coast States: Nevada, Arizona, New Mexico, Colorado, Oregon and Washington. In the rest of the USA, California can be obtained solely from a few select supermarkets. Thanks to the predominance of category 1 fruit (95 %), the proximity between the production zones and consumption centres and to the CAC's marketing strategy focused on freshness and local consumption, California stands out from its competitors due to its top-end positioning, resulting in a price premium (sometimes + 0.30 USD/pound on average), which is essential in order to cover the highest avocado production costs in the world. Nonetheless, on its core regional and local markets, the Californian avocado can be obtained from all supermarkets, whether mid-range or top-end. Californian fruit occupies the same market segments as fruit from competing origins, with segmentation under-developed in the USA (loose, ripened or ripen-at-home, and net bag, which has seen great growth in recent years). The Californian avocado can also be found in the food service chains, which procure direct from the packers or via intermediaries.

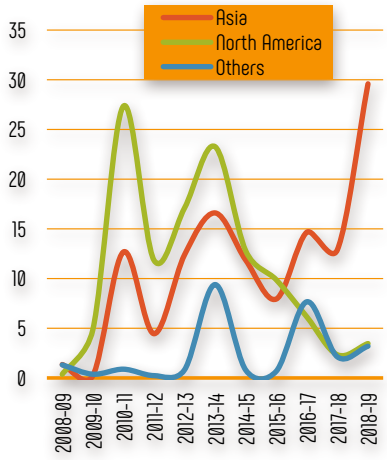
California avocado
Breakdown by outlet
(estimate | sources: US Customs, CAC, professionals)



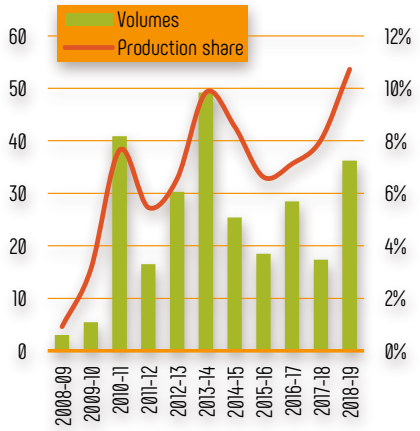
The proportion of exports is low, fluctuating between 5 and 10 % depending on the scale of production, i.e. approximately 17.6 to 37.5 million pounds in recent years. Since 2015, an increasing proportion of volumes is aimed at the highly lucrative Asian markets (South Korea, Japan, Hong Kong). These destinations represent a useful high added-value alternative, particularly at the beginning of the season (in March), when the competing import origins still have a strong presence on the local market. The export cost to Asia is 6 000 USD/container out of the port of Los Angeles, with an estimated voyage of 15 to 20 days.

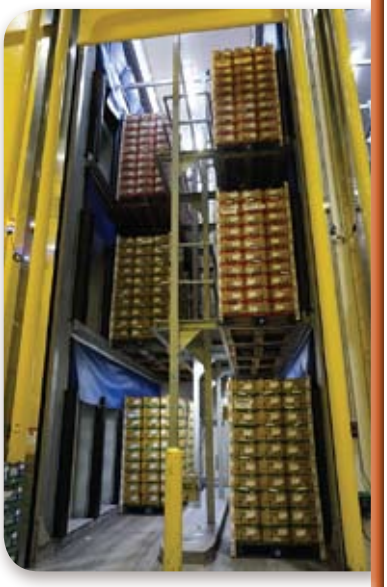
The processing sector is limited, in view of the small volumes produced. In addition, the fresh market is highly attractive and sorting rejects are low (just 1 to 2 %). The State has an oil factory.

Avocado - United States - Exports
(in million pounds | source: US Customs)



Avocado - United States
Exports: volumes and production share
(million pounds | sources: US Customs, CAC)





Packing

Whether for the local or export market, the fruit is primarily packed in 25-pound lugs, although there is also a 12.5-pound version. The sizing is shown in number of fruits per 25-pound lug, generally 28 to 84, with 40 representing the equivalent of a size 14 in 4-kg boxes. Use of RPCs (Reusable Plastic Containers) and display cartons (14-17-kg boxes with bags) is a developing trend among certain retailers. Nearly 50 % of volumes is marketed ripe and sold either in top-end supermarkets, or on the growing food service sector.

Players

There are sixteen registered players in the world of Californian packing. However, the supply is relatively concentrated, with the top three covering 50 % of the supply. Then come five intermediate-sized operators, followed by ten or so modest-sized ones.

For historical reasons, the sector's traditional big packers are also production players in California. However, their volumes are derived primarily from purchasing from other Californian producers. There is no annual contract between growers and packers. Fruit is purchased on a weekly basis. Growers assign their available volumes depending on the price lists published every week by the packers. Nonetheless, relationships are a big factor, and growers are often loyal to a particular packer (especially since certain growers are shareholders in the packing stations). The major Californian players have become major players in the world avocado trade, to harness growth in consumption in the USA while topping up their trade calendar, and to obtain a return on the often high-tech facilities. They have practically all become importers, firstly of fruit from Chile in the 1980s, and then from Mexico, Peru and more recently Colombia. The biggest have invested in production in these countries, where they are often major players.

Prospects

Methodology

The Californian avocado industry has major assets, the main two being favorable pedoclimatic conditions and a local market where the Californian origin is rated more highly than its competitors. Nonetheless, it also has to face multiple constraints, set out in the first part of this document. Hence, unlike most big producer countries on the planet, planted and producing areas are tending to shrink. Over the last decade, the producing area went from approximately 50 160 acres in 2010 to 45 467 acres in 2018 (- 4 700 acres), according to CAC statistics. This particularity increases the uncertainty of the projection. When the industry is growing, the dominant variable is the planting level. This makes it possible to anticipate, under certain hypotheses (long-term yield, rate of attainment of prime production) but with a degree of reliability, the production until the maturity of the trees (i.e. over a period of 7 to 8 years in general). Hence the planting level when the projection is made represents a solid basis for projecting the medium-term evolution of production. Conversely, when the industry is shrinking, the dominant variable is the shrinkage rate of the cultivation area. Unlike planting, the effect of this variable is not gradual, but immediate. Evolution of productivity is also a major factor for analysis.

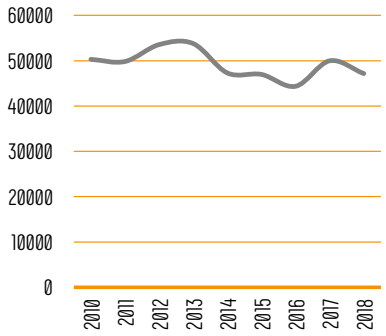
1. Estimating evolution of producing areas

This is a more qualitative than quantitative approach. It is based on analysing the trends from the last few years, and on the evolution of constraints weighing down on the industry.

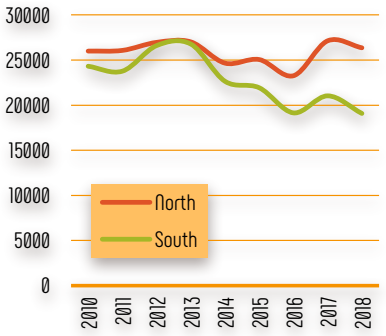
Evolution trend of the Californian cultivation area

As stated above, the producing area has shrunk over the past decade, going from approximately 50 160 acres in 2010 to 45 467 acres in 2018 (- 4 700 acres). However, the downward trend seems to have eased off since 2017. On the one hand, the decline is less intense in the south, and on the other hand a minor bounce-back has been seen in the north. This trend is in accordance with plant sales. The State's main nursery, which on its own accounts for nearly 90 % of plant stock production, has registered record sales in recent years. However, this recovery seems insufficient in scale to represent a real turnaround in trend. The plant volumes in question remain relatively modest, also in part since the production capacity of the nurseries is currently limiting. According to CAC statistics, in 2018 the State had less than 4 448 acres of young orchards (corresponding to planting carried out between 2015 and 2018, i.e. over 4 years). Hence professionals surveyed believe that these volumes are only enough to offset orchard losses, which have also increased (aggravated problems of profitability, as well as the impact of fires, devastating significant planted areas in certain zones).

California avocado
Evolution of total producing areas
(in acres | source: CAC)



California avocado
Evolution of producing areas by zone
(in acres | source: CAC)



Evolution of constraints

Water availability

Water has been a major constraint in recent years, with the State going through a severe period of drought, especially between 2011 and 2017. However, the situation appears to be very changeable, since the rainfall level in 2019 was very good. So projections seem to be a fairly complex matter. The models consulted (UCLA in particular) are reckoning on an increase in temperatures, which could cause higher precipitation levels but more concentrated in time, with an accompanying accentuation of dry periods. While evolution of availability remains rather hazy, evolution of demand is much clearer. All the demographic projections are reckoning on an ongoing growth trend in California's population, i.e. in urban water requirements. The temperature increase trend should also increase requirements, in terms of both agricultural and urban water. Furthermore, the increase in water salinity (aquifers and also water from the Colorado) should also lead to an increase in irrigation dose requirements. Finally, the regulatory framework should continue to evolve, with in particular the implementation of stricter controls on water use from aquifers in the north (quotas), under the SGMA.

Labor availability

The current administration has implemented stricter control measures on migrant workers, who make up the bulk of the agricultural workforce. In this context, there should not be any increase in the labor supply, which will continue to be attracted mainly by operators with the biggest plantations - since they are able to offer regular work, the accommodation necessary for a temporary work contract, and can deal with these additional administrative constraints. Also minimum wage will continue to increase until it reaches 15 USD per hour in 2023. There is a twofold adverse impact for small growers, who will not have the human resources required to develop their production system.

Avocado – California – Evolution of producing areas in acres
Hypothesis: zero growth in the north, and 4 % decrease in the south

Years	2018	2019	2020	2021	2022	2023	2024
Total	**47 158**	**46 300**	**45 500**	**44 700**	**43 900**	**43 200**	**42 500**
North	26 597	26 600	26 600	26 600	26 600	26 600	26 600
South	20 561	19 700	18 900	18 100	17 300	16 600	15 900

Land availability

Pressure on the coastal zones, where climate conditions are favorable for the crop, will continue to increase, with the ongoing population growth trend. The price of agricultural land is already in excess of 80 000 to 100 000 USD/acre in these zones. In this context the risk of changes in agricultural land use in favor of real estate remains very high in unprotected zones. Furthermore, big financial groups have made major investments in avocado plantations in recent years, which could eventually be earmarked for real estate.

Overall, availability of the three main production factors should not see any major changes, and will remain restricted. Furthermore, climate models are reckoning on an increase in extreme phenomena (violent winds, fires, etc.). Conversely, plant availability could be a bit less limiting than at present (up to two years' wait), with at least one major grower establishing their own nursery. So overall, we have favored a hypothesis of the current trend continuing for the north (stability), and of a slowdown in the rate of decrease in the south (4 % shrinkage instead of the 7 % registered over the period 2013-2018).

2. Evolution of productivity

The current State average yield, of around 5 300 to 6 150 pounds/acre in recent years, does not reflect the very good pedoclimatic potential of the Californian industry (8 800 to 9 700 pounds/acre, with a medium technical package, and 14 000 to 15 800 pounds/acre if the system is more advanced, not to mention cutting-edge orchards). So production has a big growth lever. There is a considerable modernisation trend in the industry, at least in medium to large orchards. Nonetheless, productivity exhibited a rather downward trend in the first part of the 2010s, with a degree of stabilisation arriving in recent years. On the one hand, cyclical factors played a very unfavorable part (severe drought). On the other hand, a good many of the many smallholdings, which to this day represent a large proportion of the production facilities, are barely modernising (gentleman farmers growing it as a cash crop, reinvesting little or nothing in the orchards). So we have adopted the following hypotheses:

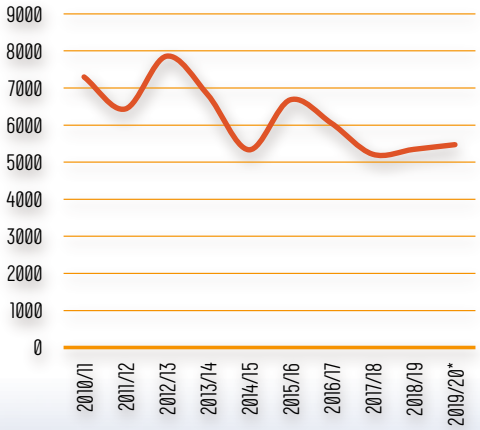
Nominal yield

We considered two scenarios, relating to the rainfall level which is evidently a crucial variable. The first reckons on ongoing drought, following the trend of recent years. The second considers a return to a less restricted rainfall level, as currently seems to be the case.

Evolution of productivity

We opted for the hypothesis of productivity picking up in the coming years, due both to the modernisation trend on medium to large plantations, and to some of the smallest and most fragile plantations closing down, in the face of increasingly tough profitability problems, in particular in the south.

California avocado - Evolution of productivity
Smoothed over 2 years
(* forecast | in pounds/acre | source: CAC)



Avocado – California – Nominal and potential productivity in 2024 under two hypotheses

		Nominal yield	Potential productivity in 2024
Hypothesis 1	Ongoing drought	5 500 pounds/acre (2015-2018 average)	6 100 pounds/acre
Hypothesis 2	Rainfall less limited	6 100 pounds/acre*	7 300 pounds/acre

* Projected yield for 2019-2020 (back to more abundant rainfall), factoring in a positive alternate bearing swing

3. Summary

According to the hypotheses above, long-term production (2024) could vary between 287 and 344 million pounds according to the rainfall, i.e. practically unchanged from the period 2015-2018, or a rise of around 60 million pounds.

However, certain factors could have a considerable impact, in the medium and long term:

Structural change in irrigation practices

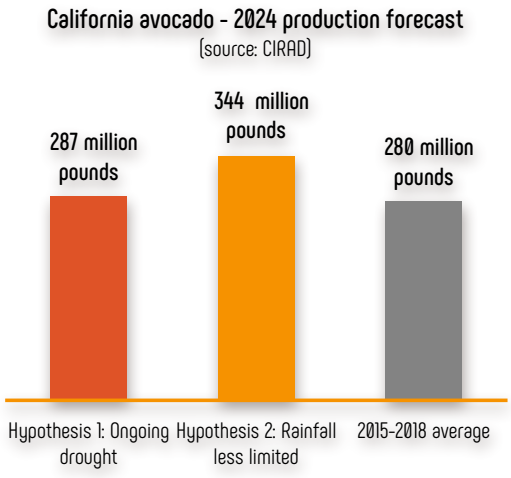
Drip irrigation, associated with cropping practices aiming for better water use (mulching, etc.), has proven effective for at least one large-scale grower (good yield level and water saving). The nature of the Californian soil requires several rows of drippers, while the salinity requires regular servicing (clogging). This technique could considerably mitigate the water constraint, which weighs heavily on both yields and production costs.

Extension of the crop to zones in the State which are cooler but with a better water supply and less expensive land

Trials are currently underway in San Joaquin Valley. For now, the results seem to be mixed with the present plant stock. Gem could maybe provide additional cold tolerance and a parallel gain in productivity.

Evolution of citrus HLB

This serious citrus pathology present in California is currently contained. Its spread could lead to conversion of some of the big citrus orchards present in the avocado zone (in particular in Ventura County). However, the lemon, which makes up the bulk of citrus plantations in this zone, is less sensitive to HLB than sweet citruses.



By Tim Linden

Africa Has Untapped Avocado Potential

Commercial avocado production in Africa has traditionally been concentrated in the warm subtropical northeast region of South Africa. Advantageous temperatures and sufficient rainfall have helped the region become a significant avocado producer and exporter. In 2018, total production was 170,000 tons (350 million pounds) with about half that total being exported, according to the South African Avocado Growers Association website.

The South African season typically extends from February to November with about 17,500 hectares (ha) (about 43,000 acres) under cultivation. The vast majority of the fruit is Hass or Hass-type cultivars. In recent years, there have been other varieties planted and there is interest and activity in increasing avocado production in other African nations to help meet global demand.

Recently, Paulina Theologou, Group Commercial Executive for Westfalia Fruit, noted that several African nations do have the potential to be larger players. Westfalia, a large multinational avocado grower-shipper founded in South Africa, has made significant investments in Mozambique, and Theologou said Kenya, Tanzania and Angola also have potential, albeit with challenges concerning infrastructure. While South Africa's peak season is during the summer, plantings of Gem have helped lengthen the South African season to almost year-round production. The Westfalia executive said the Mozambique winter production window is also complimenting and lengthening the Southern African production window.

South Africa is expected to continue to increase its production with its main advantage being infrastructure development, including roads, ports, electricity and market access. But Mozambique also is considered key to its African growth.

Based on its initial successes in Mozambique, Westfalia recently purchased another 1,000 ha (2,500 acre) farm in the country for further development of plantings. Westfalia Fruto Moçambique (WFM) has an existing 250 ha of avocados that are now coming into production. The seasonality is significantly earlier than the earliest growing areas in South Africa, which will expand the exporter's Africa-originated shipments. In a press release announcing this expansion, Zac Bard, CEO of Westfalia Fruit Africa, said the expansion project has already begun. "Our involvement in Mozambique has attracted a lot of further investment, and Mozambique is going to have a place on the global map in terms of avocados."

The fruit is mainly destined for the European market, but some also will be marketed in South Africa. Mozambique has a tropical climate in most parts of the country, but the province of Manica where WFM is based is known as the cold province, which has a winter period as well. "It is the subtropical climate in a tropical region that gives the early seasonality," Bard said.

Mozambique also is fortunate to have excellent soil and water resources, which points to the potential for increased production in the coming years. Westfalia also is involved with Zimbabwean avocado growers in the area of Chipinge. Further exploring opportunities in Africa, in the highlands of Tanzania Westfalia is working with a group of farmers to develop an industry for the late international marketing window. In Tanzania, Bard said the group of farmers expects their first crop in 2021. "It's a very remote area with excellent natural resources for the late season. We are in the process of testing new cultivars there in addition to the normal cultivars," he said.

Westfalia has announced that it has achieved significant success with the trialing of innovative water-saving irrigation technology in avocado production, which will help potentially open up new regions for avocado production. The company says it achieved water savings of up to 40% on a 180 ha section of one of its African farms where the commercial trial of its low-flow drip technology was conducted almost two years ago, and described the results as 'overwhelming.' Westfalia is convinced this technology is the way forward for avocados grown in tropical, subtropical and Mediterranean climates.

The company says that, in high-rainfall climates, dripper technology has traditionally met with limited success in avocado cultivation, as the high volume of water dispensed tended to displace oxygen in the soil, which had a negative impact on tree health. This problem has been overcome with the introduction of new irrigation technology involving low-flow drippers, which emit less than one liter of water per hour.

Westfalia says it will also be rolling out the novel technology in developing its newest 1,000 ha operation in Mozambique and across the world where it grows avocados, including trials in Chile.

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