

From the **Grove**

Summer 2020

The Latest News from the California Avocado Industry

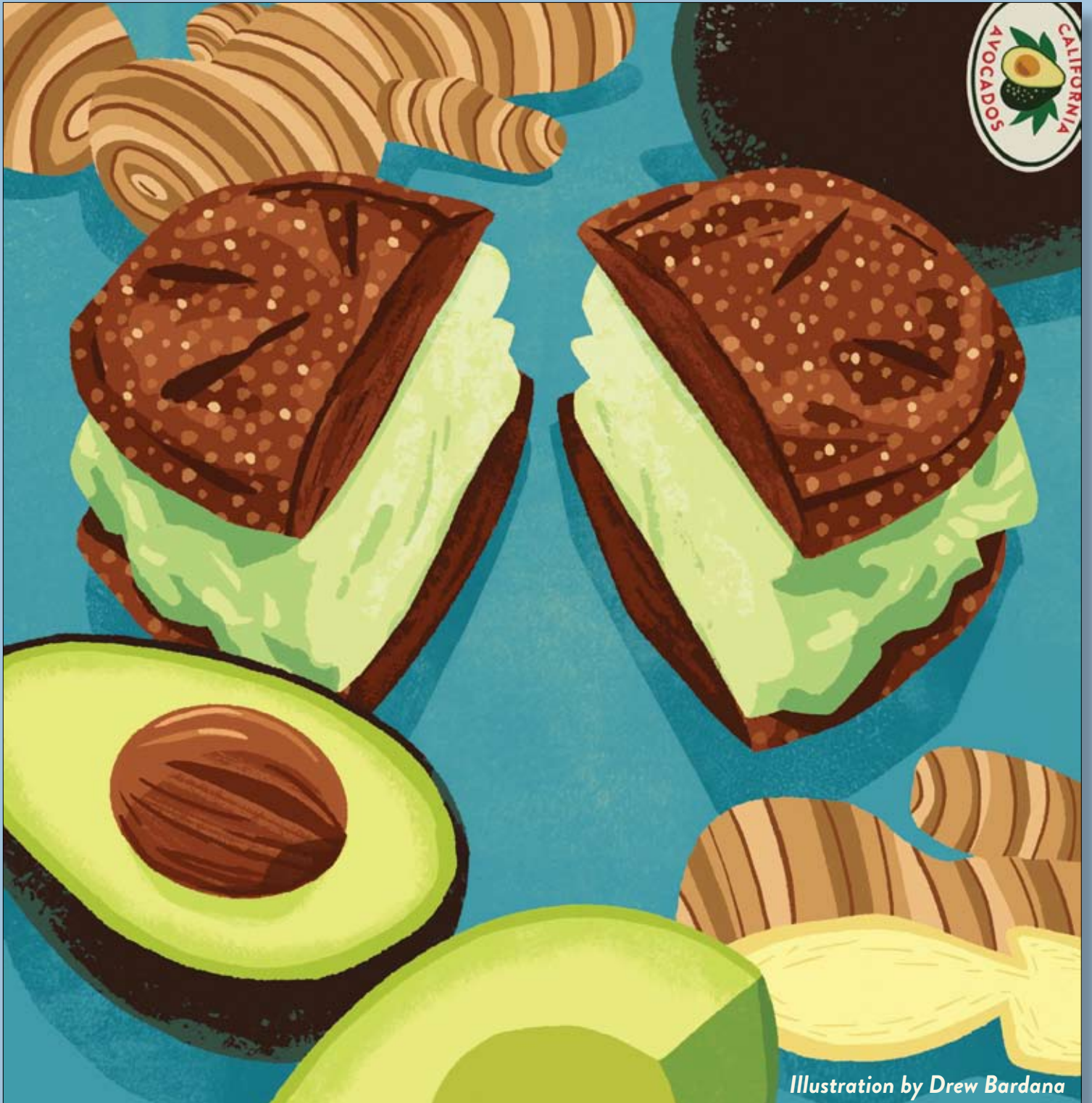


Illustration by Drew Bardana

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Grower Profile

26 Double H Avocado Ranch
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From the Grove

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Taking Stock

There are plenty of complaints in farming. Over-regulation, pests, diseases, weather, rising input costs, labor shortages, and a host of other problems are the bane of farmers worldwide regardless of what or where they are growing. For avocados, the commonalities with other commodities end there. The distinctions between crops has been brought into sharp relief by COVID-19, though the pandemic has touched us all. Troubled as these times are, those in the California avocado industry might do well to take stock and reflect on how fortunate we are compared to others.

The 2020 season got off to a strong start with February shipments well ahead of those of prior years and pricing that pulled fruit off the trees. With a projected 370 million-pound crop to move, growers seemed happy to get started early and this proved fortuitous, because a month later the coronavirus was wreaking havoc on the food sector. Demand surges at retail and the loss of a major portion of the foodservice business left suppliers on uncertain footing in a highly unstable market. Add some rainy weeks in March and April, and the avocado market and the inventories it required were anyone's guess.

The California avocado industry was remarkably quick in reacting to the problems posed by the spread of the coronavirus. Handlers swiftly deployed practices aimed at protecting their packinghouse workers, field labor contractors underscored the importance of safety measures while picking, and the California Avocado Commission (CAC) joined with Western Growers

and other organizations to ensure consideration for specialty crops in emergency U.S. Department of Agriculture (USDA) food purchase programs and H-2A workforce availability as border controls were tightening. CAC also developed a COVID-related webpage on its grower website to bring resources together regarding small business assistance, guidance from state and federal authorities, and farm safety measures. CAC's marketing programs underwent a complete reevaluation to correct for major behavioral shifts created by stay-at-home orders across the country.

By late April, the harvest of California avocados had rebounded substantially with shipments exceeding 15 million pounds per week, an indication of increasing retail demand. Although losses on the foodservice side continued to plague the industry, strong consumer pull gave rise to cautious optimism about the weeks ahead. The guarded enthusiasm was buoyed by an April 26 news article by Bloomberg, which seemed to acknowledge the silent hopes of California avocado growers.

Bloomberg observed that "the pandemic has totally transformed the way the world eats. There is no trend, exactly, other than this: People want comfort. They also want to eat their way to stronger immune systems...eating healthier than they would have at restaurants. Avocados are in." The article noted that avocados are one of the food items experiencing a "surprising" price surge over the last several weeks. "It turns out avocado toast and guacamole are proving to be stay-at-home favorites," according to Bloomberg.



Tom Bellamore

Even though all is not well, and nowhere near normal, you don't have to look far — within agriculture or elsewhere in the business sector — to find examples of industries suffering serious setbacks due to the coronavirus. We've all read the stories about potatoes being plowed under, milk being dumped, restaurants filing bankruptcy, and airlines struggling to stay aloft. Emotion swells and we're deeply empathetic of those in turmoil. And, in turn, we cannot help but feel gratitude to some degree. Gratitude for the role we play in producing and marketing a product with healthful and nutritional qualities that consumers take comfort in. Gratitude for the fact that avocados have something rare that has come to our aid more than once, to get us through some tough times — the fact that they can be "stored" on the tree until things get better, be that market conditions or a waning pandemic.

The list of farming complaints has not gone away, instead it has been made worse by the addition of COVID-19. Growers being growers, I don't expect to get too much more than a moment's reflection about how avocados have fared better than other products, other industries. It's okay, I feel fortunate, and I know my staff does, and that's enough for me. Together, we'll feel glad for you, and we'll continue to try our best to help you weather whatever comes along next. 🍌



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Adjusting to New Circumstances



John Lamb

I am relatively sure we are all tired of hearing about the coronavirus and shutdowns by now. The avocado industry has certainly been turned upside down for the past two months. Everything looked so promising back in February and early March. Amazing how fragile things can be. As I write this the week before Memorial Day, the avocado market has stayed remarkably viable, at least if your fruit had size.

With the virtually overnight shutdown of the foodservice industry, the California Avocado Commission (CAC) made a significant pivot in the way we have been promoting avocados. By early April, the market dynamics made it clear that we had to make a larger push in the digital and social platforms to promote avocado consumption at home. By April 10, the CAC team had set new priorities and allocated budgets to effectively change the tone of our marketing effort. It should be said that just a few years ago this would not have been possible. With so much of the messaging we do today from a digital platform, it is fairly easy to make this type of adjustment. If we were still in the days of print media, changes would have needed to come months in advance.

Foodservice is now starting to come back, but I think it will be months before we are back to normal. Our main

job now is marketing this crop with a smaller weekly demand and a compressed time frame. Weather has thus far cooperated, but there may be some warm weather ahead that will pressure inland growers to harvest before the optimal time.

The CAC staff has mostly been working from home. We have all been using video and telephonic conferencing with mostly good results. Our May board meeting will be a video conference for the first time. It should be interesting, to say the least.

On the farm, we are seeing set for next year and getting ready to do thrip sprays. After two years of decent rains (better in the south than in the north, but still not bad) the trees are looking great, with new leaves seemingly larger than they have been for some time. I am hearing various observations about the set for 2021, from very good to light. I am hoping for mostly good, as it would greatly benefit our industry to have strong consecutive crops.

This past week, the U.S. Department of Agriculture (USDA) issued guidelines for Direct Payments to Specialty Crop growers. While avocados are mentioned as a qualifying crop, I cannot see any instance in which an avocado grower would qualify for any of the three categories under which pay-

ments would be made. There may be a few exceptions, but the USDA must not have had any input from most specialty crops. This is most disappointing to our industry and indicative of what happens when regulations are written in a vacuum. As government typically does when rushed, it applies a one-size-fits-all system without doing the homework to make the appropriate regulations for each crop. Every category has a cutoff of April 15. Most of the damage to the avocado markets will happen well after that date. In fact, the problems are really going to arise as we market our fruit going into the summer months, with less than normal demand and a compressed time frame to harvest our crop. We can see this illustrated by the soft demand for 70s and 84s.

You will see that Tom Bellamore has a column that is positive and mostly advises us to be grateful for what we have. This is true, especially as other produce crops are being affected much worse than avocados. I recently read an article stating that avocados are one of the big winners in this deal. I guess we won't know for a while; it doesn't really feel like it to me.

I am wishing all growers have a positive year and a strong set for the coming year. May all your Coronas come in a six pack! 🥑

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Results of the 2020 Mid-Season Crop Surveys

The California Avocado Commission (CAC) would like to thank all of the industry stakeholders who participated in the recently concluded California Avocado Grower Crop Estimate Survey. Due to the pandemic, crop survey forms were mailed out at the beginning of April (a bit earlier than usual), with a return date of April 30, 2020. This year, thanks in large part to cooperation from California avocado grove managers, we received reporting representing nearly 25,600 planted acres, the highest response rate of planted acres since 2015. Completed survey responses captured the highly diverse California industry, with groves of all size, location and growing condition well represent-

ed. It is for these reasons, CAC believes the overall survey results depict a fairly accurate snapshot of the industry and the current crop.

The results of the 2020 mid-season update have yielded a crop volume of 373.65 million pounds (all varieties), just over four million pounds more than the pre-season handler estimate of 369 million pounds. As a way of cross-checking the grower survey results, CAC also conducts a mid-season handler survey, which this year also resulted in a crop

Variety	CAC Acres	Estimated Yield		Response %
		Lbs/Acre	Lbs (MM)	
Hass	47,726	7,547	360.21	48%
Lamb-Hass	1,562	5,949	9.29	49%
Other	852	4,873	4.15	44%
Total	50,140	7,452	373.65	48%

size of 373 million pounds (results are computed based on an average of individual handler survey responses). Follow up discussions with the industry regarding the results of these surveys indicate there could potentially be more fruit on the trees – possibly up to 400 million pounds.

Included here are details of the 2020 mid-season California Avocado Grower Crop Estimate Survey, which contain variety breakdowns and production by county. A few important items to note when reviewing county production details — historically the crop estimate for San Diego County has been overstated, while Ventura and Santa Barbara counties are typically underestimated. Despite these discrepancies, the mid-season estimate has proven accurate, within 3%, during the last five years.

County	Hass Only			All Varieties		
	CAC Acres	Estimated Yield		CAC Acres	Estimated Yield	
		Lbs/Acre	Lbs (MM)		Lbs/Acre	Lbs (MM)
San Diego	15,260	8,203	125.17	16,156	8,045	129.98
Riverside	4,494	5,642	25.36	4,570	5,606	25.62
Orange	904	5,910	5.34	943	4,854	5.52
Ventura	16,763	6,879	115.30	17,837	6,843	122.06
Santa Barbara	5,822	8,785	51.14	6,013	8,613	51.79
San Luis Obispo	3,890	9,042	35.17	3,948	9,051	35.73
Minor Counties	593	4,576	2.71	673	4,374	2.94

**2020 California Crop Weekly Harvest Projection
Weekly Crop Movement vs. Distribution Projections
All Varieties**

Week Ending (CAC Week)	4-Year Historical Forecast 2020 Crop Estimate	AMRIC Handler Forecast May 2020 Update	Industry Adjusted AMRIC Harvest
Through April 26	105,060,100	108,131,600	107,871,584
May 3 - (27)	16,903,500	11,154,600	
May 10 - (28)	15,823,200	14,518,800	
May 17 - (29)	16,312,500	14,992,800	
May 24 - (30)	17,923,700	16,503,300	
May 31 - (31)	17,104,600	15,730,400	
Jun 7 - (32)	15,110,000	14,006,800	
Jun 14 - (33)	16,858,300	15,688,800	
Jun 21 - (34)	17,754,900	16,487,600	
Jun 28 - (35)	17,024,400	15,751,400	
Jul 5 - (36)	17,578,200	14,163,600	
Jul 12 - (37)	16,410,700	13,601,000	
Jul 19 - (38)	15,887,500	13,216,300	
Jul 26 - (39)	12,604,900	10,511,000	
Aug 2 - (40)	10,048,300	9,870,500	
Aug 9 - (41)	8,464,600	11,130,500	
Aug 16 - (42)	7,533,300	10,346,900	
Aug 23 - (43)	6,154,000	9,714,400	
Aug 30 - (44)	5,176,500	8,160,400	
Sep 6 - (45)	3,233,000	9,397,500	
Sep 13 - (46)	2,491,000	5,722,600	
Sep 20 - (47)	2,436,000	5,724,000	
Sep 27 - (48)	2,037,600	4,783,700	
Oct 4 - (49)	1,089,700	1,507,500	
Oct 11 - (50)	640,000	894,700	
Oct 18 - (51)	270,900	396,000	
Oct 25 - (52)	266,400	388,300	
Nov 1 - (1)	155,900	224,100	
Nov 8 - (2)	7,700	8,900	
Nov 15 - (3)	3,800	4,500	
Nov 22 - (4)	40,600	47,800	
Nov 29 - (5)	24,100	28,400	
Dec 6 - (6)	23,600	1,600	
Dec 13 - (7)	52,800	72,200	
Dec 20 - (8)	263,300	65,200	
Dec 27 - (9)	230,300	52,300	
Crop Size	373,000,000	373,000,000	

In addition to total industry volume, CAC also surveys handlers on harvest distribution projections for the remaining months of the season, utilizing this data to compile weekly harvest projections. With actual harvest of about 108 million pounds (29% of the total crop volume) through April, handlers estimated that the months of May through July will see the bulk of the crop harvested (50%). Projections indicate the majority of the remaining crop will be off by the end of September, however volume from northern growing regions is expected through October.

While crop estimating can be difficult to perfect, CAC management continually reviews, monitors and evaluates the available datasets to assess the California crop in an effort to provide the industry with the most accurate and timely statistics possible. In addition to informing the industry of the coming crop volume, tracking both crop volume and timing of harvest on an on-going basis helps ensure the Commission's marketing programs are supporting California growers and their fruit while our product is in season. Whether the final harvest volume is 373 or 400 million pounds, these mid-season estimates have confirmed for CAC that the industry is on track for a sizeable crop that will provide loyal California customers with premium quality product throughout summer and into the fall.

Details of both the grower and handler mid-season surveys and projections are found within this article, with additional details found on CAC's grower website at CaliforniaAvocadoGrowers.com/industry/crop-statistics/current-crop-estimates.

2020 California Crop Harvest Projection					Apr 2020 Handler Survey Hass Distribution
Month	Hass	Lamb	Other	Total	
Jan	7,131,071	-	494,500	7,625,571	2.0%
Feb	23,974,543	-	284,300	24,258,843	6.6%
Mar	33,032,186	-	211,500	33,243,686	9.2%
Apr	48,917,600	2,200	669,300	49,589,100	13.6%
May	63,391,600	24,200	329,600	63,745,400	17.6%
Jun	62,886,500	761,400	286,700	63,934,600	17.4%
Jul	54,223,500	5,912,100	295,600	60,431,200	15.0%
Aug	41,041,600	1,727,100	83,500	42,852,200	11.4%
Sep	23,131,700	433,300	62,900	23,627,900	6.4%
Oct	3,269,700	139,700	1,200	3,410,600	0.9%
Nov	-	-	89,600	89,600	0.0%
Dec	-	-	191,300	191,300	0.0%
Total	361,000,000	9,000,000	3,000,000	373,000,000	100%

Amid the Coronavirus Pandemic, the Produce Industry Marches On

By Tim Linden

By mid-May, the novel coronavirus, COVID-19, had swept the world impacting virtually all corners of the earth. Unfortunately, the United States has been one of the hardest hit countries with the most cases and the most deaths. Safer-at-Home orders stretched from coast-to-coast impacting companies large and small, idling millions of workers and hundreds of thousands of companies.

The agricultural sector has had its challenges, but as an essential industry charged with feeding the nation and the world it soldiered on. However, the industry hasn't escaped the impact of the epidemic.

Hardest hit was the foodservice sector, which, in turn, impacted producers all over the country. There are close to 1 million restaurants in the United States and tens of thousands of institutional feeders, from K-12 schools to universities and company cafeterias. Many restaurants closed due to COVID-19, and the National Restaurant Association has predicted that 25% of those restaurants will remain closed after the pandemic subsides. Other restaurants pivoted to take-out orders that captured about 25-40% of their normal business.

Foodservice distributors tried to pivot to make up for some of their lost business. Reflective of what many companies did, Dallas, Texas-based Hardie's Fresh Foods began setting up farmers' market type events in empty restaurant parking lots selling mixed boxes of produce to consumers from the back of their delivery trucks. "We had 48 hours to put together a new business model," said CEO Greg Rowe of the overnight shuttering of most of its foodservice customers. "We are a \$275 million company and you have to do something when your account receivables come to a screeching halt."

When the pandemic first began to take hold in March, supermarkets saw a spike in business that only started to let up

a couple of months into the crisis. The Food Marketing Institute surveyed shoppers and discovered that most (89%) had changed their shopping habits and where they shopped (79%). Many shoppers (27% and 24% respectively) had increased their use of online platforms or pick-up options, and 30% were using grocery delivery services more frequently. Toilet paper was flying off the shelves, but so were potatoes and onions. For a couple of weeks, the potato industry saw prices they haven't seen in years. "I've only seen a 'hot' market like this one other time in my more than 20 years in the industry," said Lance Poole of Idaho-based Eagle Eye Produce Inc. "That was in 1998-99 soon after I started here. At that time, we were selling cartons of russets for \$35. Right now, we are at \$30 for a carton and it (the f.o.b. price) is still increasing."

Industry experts theorized that bags of relatively shelf-stable potatoes and onions were an old-fashioned way for consumers to stock up for the potential pandemic "winter" ahead.

Supermarkets were struggling to keep the shelves stocked as consumers were binge buying. A buyer for Stater Bros. Markets in Southern California revealed that the company was using some of its Southern California wholesale partners to deliver directly to stores in order to keep up with demand. David Weinstein, a produce salesman for Heath & Lejeune, a Los Angeles area wholesaler, reported in March that the produce supply chain was doing an excellent job of keeping up with the increased demand. By the middle of May, he said there were challenges caused by the inconsistent buying habits of consumers and consequently produce buyers. One week, the phone would be ringing off the hook and the warehouse would be emptied. The next week, virtually no calls and the coolers would fill up.




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All segments of the industry from east to west were reporting changes in the way they conduct business. Joe Eisenger, a produce salesman for Nathel & Nathel at New York's busy Hunts Point Produce Market, spent four weeks selling from home during the peak of hard-hit New York City's outbreak. Chalmers Carr III, who, along with his wife and business partner Lori Anne, owns and operates Titan Farms (which produces almost 8,000 acres of peaches and vegetables in South Carolina) reported that the spring is when he visits his customers to tout his home state's peaches. He got about halfway through his person-to-person calls when he was grounded. He takes a shoe leather approach to sales, but this year the phone and Internet are going to have to suffice.

Eisenger also noted the changing buying habits of consumers. He said that the bagged, grab and go items were the top sellers initially and they still are. "It seems that most people want their produce in bags or other packaging," he said.

There also were growers all over the country from Florida to California that had sales disruptions because of the coronavirus.

A survey of Monterey County growers by the county's agricultural commissioner's office revealed that 40% reported financial losses related to the safer-at-home orders. Many different vegetables as well as wine grapes and strawberries were impacted. Reportedly 3,000 acres in Monterey County were either plowed under or not planted.

Greg Cardamone, general manager of L&M Companies Inc., which is headquartered in North Carolina but has vegetable operations throughout the Southeast, said the company did have to plow under some of its Florida vegetable acreage when sales dropped immediately after foodservice restrictions went into place in late March.

And Then There's the Avocado Industry...

Of course, like every other segment of the produce business, the avocado industry was impacted by the coronavirus... but seemingly, it was a much smaller impact.

Speaking of the avocado marketing situation during the coronavirus, Giovanni Cavaletto, vice president of sourcing for Index Fresh Inc., Riverside, CA, said in mid-May: "It blows our mind how good it has been. Three of the past four weeks, we (the industry) have moved 65+ million pounds at a very good market price."

And this occurred without the foodservice business, which typically takes 25-30% of the fresh volume, according to a sampling of shippers. During the first eight weeks of safer-at-home orders (mid-March through mid-May), more than 400 million pounds of avocados were consumed in the U.S. market. That included two back-to-back weeks in early April when shipments were cut in half because of the always-slow period around the Easter Holy Week in Mexico and rain in

California that also curtailed harvest.

Ross Wileman of Mission Produce, Oxnard, concurred. "Initially the biggest problem was logistics," he said. "But since then everyone has adjusted to the new normal. We have actually been surprised at how well movement has been."

Wileman did add that another impact has been ensuring physical compliance with the social distancing regulations in California. Mission Produce is operating with a skeleton crew in its office as most employees are working from home though Wileman continues to come into the office. And protocols have been put in place for picking, packing and shipping of the fruit.

Bob Lucy, president of Del Rey Avocado Company Inc., Fallbrook, CA, noted that the protocol changes in his packing shed have reduced the weekly output and will impact the length of the California avocado season. Del Rey has shorted its packing house schedule from 10 hours to eight hours a day and has eliminated packing on Saturday most weeks. The company also is practicing social distancing, which means fewer packers at any given time. Just like the safer-at-home rules have largely flattened the virus curve in states complying with those orders, these changes at Del Rey are flattening the supply curve. Lucy said Del Rey will be packing through October and even most likely into November with its Morro Bay avocados. "This is a good thing," he said, as the California fruit will stretch beyond the peak volumes from Peru and should give growers more options to market their fruit at optimum times when overall supply could be lower.

Rob Wedin of Calavo Growers Inc., Santa Paula, CA, said the avocado industry also is experiencing the same preference for bagged fruit that its colleagues in other sectors of the industry are noticing. While bagged avocados have been on an upward trend for the last few years, Wedin believes the fears generated by COVID-19 have accelerated the pace. He theorized that shoppers are less comfortable picking up bulk fruit handled by other shoppers. In addition, he said buying a bag of avocados that contains four to six pieces of fruit aligns with new shopping habits that see consumers going to the supermarket less often. A bag can fill their avocado needs until the next time they venture out.

But he said the bagging operations at the typical packing plant are less efficient than bulk avocado packing as fewer pounds are bagged than boxed in the same time period. This also could result in less daily production and a longer season.

With May coming to a close and states around the country starting to open up their restaurants a bit, the avocado industry might see another boost in sales as the new normal, which has seen very strong retail sales, combines with the old paradigm, which typically sees solid foodservice sales, resulting in a post COVID-19 world of greater avocado consumption. 🥑



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Flexibility Is Key:

CAC Marketing Plan Adjusted for Lifestyle and Market Conditions

As the country headed into California avocado season and the reality of the COVID-19 pandemic began to alter the lifestyle of consumers, the California Avocado Commission (CAC) took swift, decisive actions to adjust its marketing plans accordingly. Media spend, messaging, custom content and the timing of advertising and public relations campaigns were altered to better reflect COVID-19-related lifestyle changes, including those that resulted from safer-at-home orders.

The first marketing action CAC took was to adjust its consumer messaging and tone to focus on being a helpful resource, including sharing content concerning how to wash and handle California avocados. With the majority of consumers now preparing meals at home, CAC's social messaging pivoted to content focused on California avocado usage ideas and recipes that are easy to make at home and do not require a lot of ingredients. Cognizant that consumers were making less-frequent shopping trips, CAC also shared a blog post and video demonstrating best practices to freeze avocados so consumers would be less concerned about food waste.

The Commission also began to assess the changing environments of Instagram, Facebook, Twitter and Pinterest, where CAC maintains accounts to engage consumers online. Facebook and Twitter became resources for COVID-19 news, and resulting conversations were often negative in tone. Understanding that those negative conversations can make their way over to the Commission's paid posts that have exposure to larger audiences, CAC decreased this season's marketing budget for both social networks. The budgets for Pinterest and Instagram were prioritized as these platforms continued to showcase uplifting, educational and lifestyle-focused content suited to the California avocado brand. Pinterest served as the primary social channel for the Commission as the en-



Drew Bardana's custom recipe illustrations will be featured on Eater's site via a custom California avocado recipe hub.

vironment remained very recipe-focused and positive. Special Instagram Stories, a short-form video sharing method, also were developed to showcase quick and easy (but delicious) California avocado recipe demonstrations featuring CAC chef Jason Hernandez from CAC's Foodservice team.

Facebook and Twitter paid posts will remain paused until later in the

summer once the Commission has determined they can again be executed safely without negative implications to California avocado growers, California avocados and ultimately the brand. Organic posts not requiring a paid spend have continued on all platforms to reach existing followers. The Commission will continue to monitor the social platforms and determine the timing of social posts and themes based on consumers' changing habits and the content focus of each channel.

With fewer people leaving their homes, CAC shifted away from its planned outdoor advertising and re-allocated media to digital video on Hulu, Condé Nast and YouTube. The Commission plans to resume outdoor placements in Los Angeles, San Diego and San Francisco during late summer.

The Commission maintained its partnerships with its custom content partners, adjusting messaging as needed. Refinery 29 shifted from the planned "Road Trip" themed custom feature to a plan exclusively focused on pre-roll video and hard-working media. Because photography studios, not considered "essential businesses", were not available for use, Eater revised its recipe hub to feature California avocado-themed custom illustrations alongside California avocado-centric recipes. The Commission also plans to provide Tastemade with custom recipe videos, with shoots tentatively scheduled for May or June. Eater's custom recipe hub is slated to launch in June and Tastemade's recipe videos will most likely launch in July.

The Commission had well-developed plans in place for a variety of innovative events and activities showcasing California



Chef Jordan Kahn developed unique and beautiful California avocado courses including this Sorrel Curd, Powdered California Avocado Cream and Spruce.

avocados to targeted influencers and consumers, but quickly found creative new ways to connect with its targets when stay-at-home orders led to event cancellations and postponements. CAC adjusted its plans and showcased an “at home” angle that engaged the targeted influencers and media members scheduled to attend the California Avocado Month media event at renowned Vespertine restaurant in Los Angeles. With the event cancelled, the Commission instead arranged for the delivery of unique California avocado-centric meals created by Chef Jordan Kahn (named “best new chef” in 2017 by *Food & Wine* magazine) to the homes of key L.A. media and influencers. Branded California avocado items also were delivered, and influencers were encouraged to share their love for their home-state fruit on their social channels.

When social distancing guidelines eliminated the possibility of hosting an in-person California avocado grove tour, CAC swiftly began constructing plans to host a virtual tour showcasing the unique story of California avocados. The video tour will highlight the rich history of California avocados, detail the comprehensive grove-to-table journey of the fruit and celebrate the fruit’s culinary and cultural impact. The 8 to 10-minute documentary-style video will take a more informational slant and feature storylines from those who play an integral role in the fruit’s cultivation.

The Pebble Beach Food and Wine Festival was postponed until the fall and the Commission will reevaluate its sponsorship for the event as more information becomes available.

Keeping in mind consumers’ new imperative to create meals at home, the Commission also shared easy-to-prepare California avocado recipes as well as the most popular California avocado recipe search trends and useful food preservation tips with media members. The Commission was able to continue its blogger advocate and The Scoop blogger partnerships as planned, showcasing California avocado recipes and preparation tips.



Chef Jordan Kahn, owner and executive chef of Vespertine created an eight-course California Avocado-themed meal that was delivered to top-tier media and influencers to generate excitement for California Avocado Month.



Cara Cifelli of Cara’s Kitchen reinterpreted a comforting classic – Loaded Baked Potato with California Avocado “Sour Cream,” Broccoli and Cheddar Cheese.

The Commission’s nimble adjustment of its social content, media plans and public relations activities ensured CAC marketing funds were used prudently and effectively on media channels that have seen the most growth and impressions during COVID-19. By seeking new ways to engage with consumers and providing them with recipes and storage methods that suit their new stay-at-home reality, the Commission successfully highlighted the availability and versatility of the fruit during peak season. Overall, the media plan across the entirety of the season is slated to garner 421 million impressions. The Commission will continue to track impressions, clicks, video views and engagements and adjust its plans as needed to maintain flexible campaigns that drive awareness of premium California avocados. 🥑

By Ken Melban
Vice President of Industry Affairs

California Avocados Granted China Market Access

The California Avocado Commission's 15-year journey to secure market access for California avocados in China has finally been completed. As part of the U.S. and China Phase I Trade Agreement, both countries committed to finalizing the California Avocado Trade Protocol by May 15, 2020. On April 17, 2020, the California Avocado Protocol was signed, and within a few more weeks a list of certified California packers for export to China was published in China, officially allowing trade.

In 2005, the Commission initiated the lengthy process with the United States Department of Agriculture's (USDA) Animal Plant and Health Inspection Service (APHIS). Upon receiving the Commission's formal request, APHIS then entered the negotiation process with China's government toward a trade agreement. The process ideally is limited to focusing on identifying phytosanitary pests of concern that could be introduced into the importing country. Once both countries agree on a list of pests, then a trade protocol is developed to mitigate the potential for introduction of the pests. Sounds rather straight forward, but unfortunately the political dynamics helped cause significant delays.

With the long process for market access completed, the real journey now begins. Based on a market assessment the Commission conducted in 2016, marketing for California avocados in

China would likely focus on Beijing, Shanghai and Guangzhou. At that time those three cities had a combined total of more than 100,000 millionaires. The market for avocados in China is relatively small but has seen exponential growth over the last few years since their introduction.

The Commission is committed to staying focused on the U.S. market and our top-tier retail and foodservice partners, but the opportunity in China may provide some complementary benefits. In talking with packers who are already in China with fruit from other countries of origin, they believe the market for California avocados will be during our early season. This could help provide a relief valve for some smaller sized fruit, creating a lift to our pricing in the U.S. market as the season starts.

With this year's season well underway, it is unlikely much California fruit will be shipped to China. In addition, under the current trade situation avocados — along with almost all commodities — face steep tariffs, somewhere around 60%. It is a possibility the United States and China will remove or reduce tariffs in the upcoming negotiations, but nothing is certain.

At this point the Commission will begin to work with packers interested in the China market to help them identify possible promotional opportunities and make appropriately timed marketing decisions based on the above referenced factors. Through the USDA's Market



Ken Melban meets with retailers in Shanghai, China.

Access Promotion (MAP) program, the Commission has received funding the last three years for trade promotions in South Korea and Japan. If the Commission is awarded MAP funding for next year, some of those monies could potentially be used in China. It will all depend on market conditions and the likely best return for growers.

Ultimately, it is better to have the option for trade with China and not utilize it than to miss an opportunity for lack of access. As we are just now able to ship to China, it will take some time to determine if that market proves to be a valuable addition to California's portfolio. We know based on our own research and the experience of other brands that U.S. brands, and California specifically, have tremendous name recognition in China. California products are recognized as premium and are highly valued in China, two attributes that fit very well with our California avocado brand strategy. Ultimately, the Commission remains laser focused on pursuing all possibilities to see the best possible return for California's avocado growers. Stay tuned. 🥑



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Soil Health Benefits of Cover Crops

Cover crops seem to be a bit of a hot topic lately, being discussed at two different grower field days at Pine Tree Ranch in the past year, featured in a UC Cooperative Extension field day at the Hansen Research and Education Center, and now being the topic of a second article within a year in *From the Grove*. This is in part because cover crops are a covered practice in the California Department of Food and Agriculture's Healthy Soils grant program (cdfa.ca.gov/oefi/healthsoils).

Alli Fish, community education specialist with UC Cooperative Extension in Ventura County, has done a lot of grower outreach about the healthy soils program (see the California Avocado Society's April 2020 virtual field day handout, californiaavocadosociety.org/seminar-presentations.html). So why does the state of California want to give you money to plant cover crops? In a word, carbon.

California has set some very lofty goals for combating climate change and a primary means of reaching those goals is to sequester carbon. Climate change is too much of a political hot potato to venture into here, but cover crops do a great job of putting carbon into the soil and that, regardless of why you do it, has a wealth of benefits for plants.

A recent article in the journal *Agrosystems, Geosciences and Environment* (<https://bit.ly/3bagezj>) sheds new light on just how beneficial cover crops can be. The research was conducted in corn and soybean fields in four different locations around Virginia using

triticale, vetch, crimson clover, radish, barley, rye and various combinations of those. What was unique about this research was that it specifically focused on the short-term benefits of cover crops — sown in mid- to late-September and terminated in early April — similar to the time that cover crops could be grown during the winter rainy period in California avocado groves.

The researchers found that these cover crops produced an average of one pound of biomass per square foot during the growing period. Despite this biomass, and the fact that cover crops need water to grow like any other plant, the average water content of the soil increased by about 7% with the use of cover crops. This is due to many factors including: the cover crop roots opening up the soil to allow better rain infiltration; the cover crop canopy physically slowing the speed of rainfall and allowing it to fall more gently on the soil surface; and, the cover crops increasing soil organic matter that can hold more moisture.

The cover crop plots also saw a shift of nitrogen from nitrate (NO_3^-) — a highly leachable form of nitrogen — to ammonium (NH_4^+) — a more stable form of nitrogen. The researchers hypothesized that this change was a result of uptake of nitrate by the cover crop and an increase in soil microbial activity resulting in greater nitrogen mineralization. Although the risk of nitrate leaching from avocado groves is minimal, many of the ground water basins in California are impacted by excess ni-

trates, so it is good to know that a relatively simple practice can help to reduce soil nitrate pools, especially leading into the rainy season.

Perhaps most importantly, cover crops increased the bioavailable carbon in the soil by 37% in just over six months in this study. This is important because in the soil carbon is life. Carbon is what soil microbes (bacteria and fungi) feed on. In fact, the researchers found that active microbial biomass increased by 64% in the plots with cover crops compared to those without cover crops. Importantly, the researchers point out that total microbial biomass was not affected by cover cropping, just the active microbial biomass — cover cropping awakened the soil microbes so to speak.

So why are soil microbes such a big deal? Soil microbes are known to affect plant growth in a few ways. First, soil microbes are responsible for the process of nutrient mineralization. Mineralization is the process of converting nutrients from the organic form (bound to carbon and hydrogen) to the inorganic form (plant available).

More importantly for avocados is the role that soil microbial activity plays in plant disease. Many soil microbes are “good guys” and compete against pathogenic microbes. This is why the practice of mulching is recommended for managing phytophthora root rot. The mulch provides a carbon source to wake up the native soil microbial community, which then competes with phytophthora for available resources. Cover crops have



Picture 1. Kamprath Seed's Gill Mix 2018 composed of fall ryegrain, common vetch, radish (daikon), field peas, lacy phacelia, Balansa clover, purple hairy vetch, crimson clover, light Persian clover, and triticale.



Picture 2. Kamprath Seed's Low Profile Beneficial Habitat Blend composed of white clover, Gosse sub-clover, Losa sub-clover, broadleaf trefoil, Persian clover, Antas sub-clover, red clover, phacelia, white yarrow, creeping red fescue, hard fescue, blue flax, alyssum, California poppy, dwarf cone flower and baby's breath.



Picture 3. S&S Seed's Xerces Mix composed of white yarrow, farewell to spring, golden yarrow, California poppy, blue field gilia, common gumplant, sunflower, whitewhorl lupine, baby blue eyes, California phacelia.



Picture 4. S&S Seed's Pine Tree Mix 1 composed of dwarf barley, clammy clover, creeping wild rye, Pacific fescue and yellow-rayed lasthenia.

the same effect and can work synergistically with mulching since mulch is typically applied under the tree canopy and cover cropping is done in the row middles.

On November 26, 2019, a cover crop demonstration was planted at the California Avocado Commission's Pine Tree Ranch demonstration grove in Santa Paula. If you have been to Pine Tree Ranch, you know that the soil is extremely rocky, which made planting the cover crop seed with a seed drill or other mechanical means impractical. Instead, the seed was broadcast and lightly covered with about ½ inch of

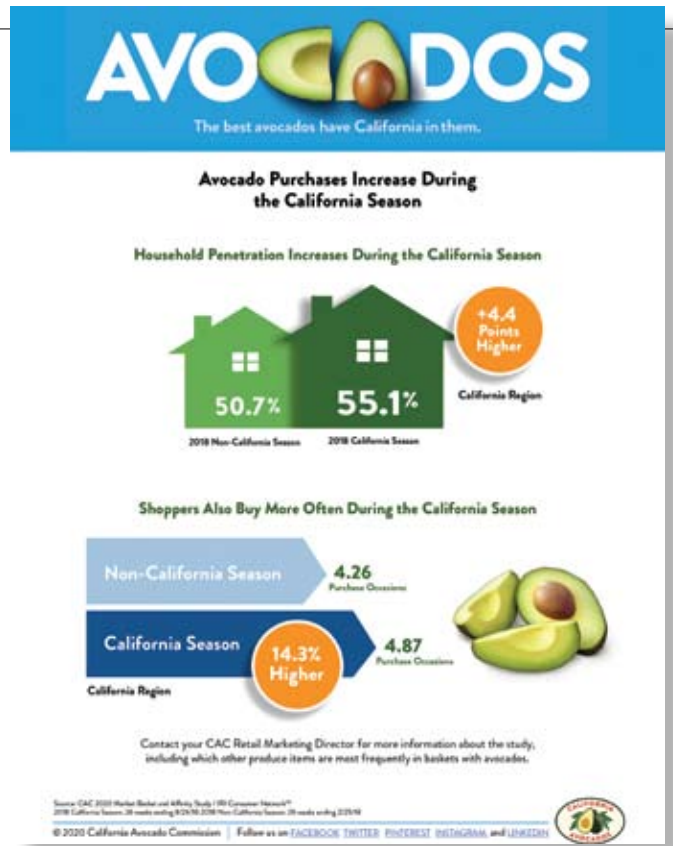
compost. Since it was a relatively dry winter until March and this was a demonstration, periodic irrigation was provided to help establish the cover crop.

Four different seed mixes were donated by Kamprath Seeds and S&S Seeds for this demonstration. Each of these different mixes and the plants making them up are shown in the accompanying pictures (photographed on March 31, 2020). We saw no detrimental effects on the trees from any of these cover crop mixes. The more vigorous mixes (pictures 1 and 4) were quite good at suppressing weed growth. Additionally, some cover crop mixes are

good pollinator attractants and may help increase fruit set by increasing pollinator activity in the grove.

Cover crop seed mixes can cost several hundred dollars per acre plus the labor to plant them. However, many of these mixes will reseed if they are allowed to fully mature, so seeding may only need to be done a couple of times to help with initial seed bank establishment.

Cover crops offer many potential benefits for relatively little investment. Have you tried cover crops in your grove? 🍷



The Commission's Market Basket sell sheet graphically represents the factors involved in the retail sales increase during California avocado season.

Market Basket Study Aids Commission in Defining Retail Opportunities and Strategies

The California Avocado Commission's 2020 *Avocado Purchase Trends and Retail Market Basket Study* utilizes comparative household purchasing data and retail market basket data to provide a deeper understanding of retail category dynamics. The study, which focuses on avocado shoppers and their purchase behaviors, showed that an impressive seven million more baskets contain avocados during California avocado season (3.8% versus 3.0% in peak and non-peak seasons, respectively).

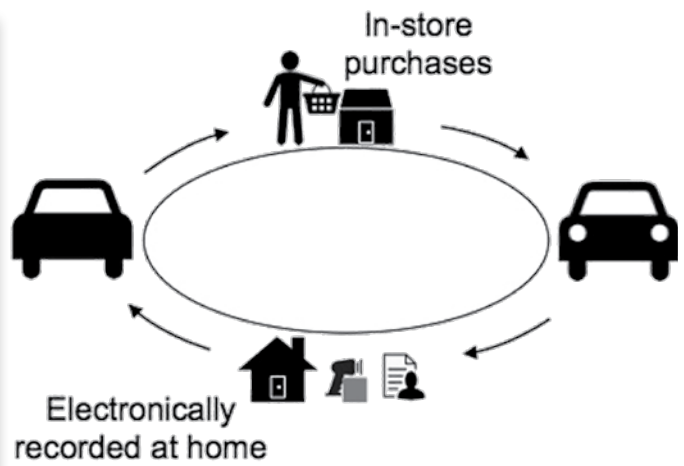
The data revealed that when and where California avocados are most plentiful at retail – during the California avocado season in the California region – shopper engagement is at its peak. Data indicates that shoppers buy more often during the California avocado season (14% more purchase occasions) and the percentage of households who purchase avocados increases from 50.7% in the non-California season to 55.1% in season. Further, data demonstrates that when avocados are in

the basket, the basket increases from \$31.85 to \$67.80 – an increase of 113%. Ultimately, higher basket rings and more baskets with avocados results in a remarkable and demonstrable increase in retail sales during the California avocado season.

The Commission's retail marketing directors (RMDs) utilize data-driven insights into shopper behavior to showcase opportunities for growth that drive retail demand for California avocados, and aid in effective retail sales and marketing decisions. For example, the RMDs share a sell sheet that summarizes the *Retail Market Basket Study* highlights to demonstrate consumer interest in California avocados, the increase in household penetration during peak season and how those avocados can help retailers sell other produce items. According to the *Retail Market Basket Study*, 12 of the top-20 items most likely to be found in avocado baskets are also fresh produce items such as bananas, tomatoes and berries.



The Market Basket report indicates which items are most frequently purchased when avocados are in the basket.



IRI Consumer Network's household purchasing data, when paired with retail market basket data, helps the Commission understand the shopper purchasing behaviors.

The items with the highest "affinity index", which are those products more likely to be found in avocado baskets than in all shopper baskets, include tomatoes, peppers, cucumbers and onions. Insights like these can help the Commission partner with retailers to develop effective cross-promotional displays and marketing programs that drive demand and sales during California avocado season.

The Commission's 2020 Avocado Purchase Trends and Retail

Market Basket Study report is based on data from IRI Consumer Network, which receives household purchasing data from the National Consumer Panel, an operational joint venture by IRI and Nielsen. To compare the California avocado season with the non-California season, data was collected for 26 weeks ending August 26, 2018 and for 26 weeks ending February 25, 2018. 🥑

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Message from CAC Leadership



John Lamb

Tom Bellamore

Commission Proactively Addresses Unprecedented COVID-19 Situation

Throughout the coronavirus pandemic, the California Avocado Commission (CAC) has continuously monitored the evolving situation and made swift adjustments to its marketing plans, office operations and grower and industry communications.

Well aware that COVID-19-related information would be critical to ensuring safety throughout the California avocado industry, one of the first steps the Commission took was to create a new COVID-19 resource page on the California avocado grower website. The resource page is a collection of key

government and industry guidance that includes:

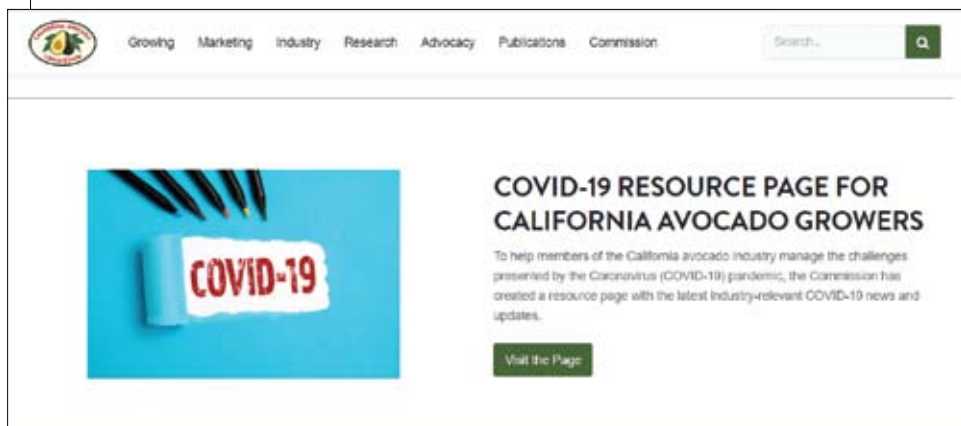
- A COVID-19 industry newsfeed
- Links to critical Centers for Disease Control (CDC), California of Public Health, United States Department of Agriculture (USDA), and California Department of Food and Agriculture (CDFA) COVID-19 resources
- Resources for agricultural employers including H-2A Visa program updates, essential worker documentation, workplace pre-

paredness tools, guidance concerning temporary COVID-19 policies related to food safety, and economic development, loan and financial assistance resources

- Families First Coronavirus Response Act fact sheets, FAQs and employee notices
- Bilingual facts sheets, posters and videos that provide CDC-based guidance for agricultural workers to ensure they remain safe while at home and on the job

The Commission will continue to update the resources on the COVID-19 page to capture the latest changes in legislative actions, funding opportunities and industry-related news associated with the pandemic.

To ensure safety across the entire supply chain, the Commission worked to reinforce the safe growing, harvesting and packing procedures already in place before the virus. California avocado growers and shippers continued to operate according to COVID-19



government regulations, incorporating social distancing and utilizing personal protective equipment (PPE). The Commission also provided packers with CDFA guidance on safe packinghouse procedures and information concerning PPE sources. In compliance with statewide safer-at-home orders, CAC staff began tele-working March 17.

The Commission provided feedback concerning the importance of limiting disruptions to the H-2A workforce caused by COVID-19. Upon the State Department taking steps to increase H-2A processing through consulates and expand interview waiver eligibility to help prevent delays for the workforce, the Commission shared timely updates with industry stakeholders.

The Commission also reevaluated the entirety of its marketing plans and activities, reallocating resources and adjusting its messaging, tone, timing and delivery to match the COVID-19-related lifestyle shifts resulting from safer-at-home orders. Advertising and public relations campaigns were shifted primarily to digital platforms focused on lifestyle, food and health content, while in-person events were replaced with targeted digital alternatives. The Commission closely reviewed its messaging and realigned its consumer talking points to focus on food safety, food preservation and easy-to-prepare California avocado dishes. The Commission continues to demonstrate its leadership role in the industry, responding to media requests and engaging with peers through phone and video meetings, including participation in the Produce Marketing Associa-

tion's weekly Virtual Town Hall video conferences. For an in-depth look at the Commission's nimble adjustments to its marketing plans, refer to *Flexibility Is Key: CAC Marketing Plan Adjusted for Lifestyle and Market Conditions* on page 14 of this issue.

With mid-March dine-in foodservice closures in place, California avocado distribution moved primarily to retail. In March and April retail distribution expanded beyond California as planned. During the early season, the demand for California avocados was significant for retail operations somewhat offsetting the reduced demand from the foodservice industry, which typically utilizes about 30% of the crop. Overall, avocados had a remarkably good early-season performance at retail, outpacing fresh fruit sales growth overall. Due to robust early-season demand — some of which could be attributed to consumer panic-buying in March — California avocado growers harvested nearly 46.7 million pounds through March 22 as compared to 5.1 million pounds for the same time last year. According to IRI data, avocado sales were up by 18.8% in the week ending April 26 while fresh fruit sales saw a 16.2% rise during that

same week. An overview of California avocado retail distribution this season to date can be found on page 36 of this issue.

Cognizant of the initial drop in foodservice volume, the Commission did communicate regularly with packers about the USDA Section 32 food purchase program to purchase surplus food and distribute it to communities. Because of high retail demand, packers were able to move the majority of the California avocados and secure better prices than would most likely have been received through Section 32 purchases.

The COVID-19 situation is constantly evolving and the Commission will continue to proactively plan and adjust its communication, marketing and distribution strategies accordingly. As the season progresses, growers will be able to capitalize on a unique characteristic of the fruit — its ability to remain safely on trees — and time their harvests to optimal market and lifestyle conditions. Despite the challenges presented by the new realities of the pandemic, the California avocado market has remained remarkably resilient as consumers seek fresh, healthy, versatile, easy-to-prepare and comforting food. 🥑



By *Tim Linden*

California Season Has Excellent Start

From day one of the 2020 California avocado season, both volume and the grove price have surpassed expectations. Of course, the two go hand in hand with the latter influencing the former.

As handlers survey the situation, they observe that this season is on track to offer more weeks with a significant volume of fruit shipped from California than any season in the recent past. By mid-May, California had sent about 140 million pounds of fruit to market. The quick pace began in February with the first more than five-million-pound week occurring in the middle of the month, and about 10 million pounds shipped by the last week of the month. Three of the four weeks in March topped 8 million pounds and a four-week stretch in April /May may turn out to be the heaviest shipping period of the season, with more than 67 million pounds.

Handlers said there are several reasons for the early start of the season including good grove prices, great early sizing, and more small fruit and No. 2's coming from Mexico. They also reported that the large size of the crop, optimum marketing strategies and coronavirus social distancing rules are combining to extend the season, with good shipments expected in October and some shipments as late as mid-November. In 2020, the California avocado season is projected to have a full 42 weeks with shipments topping the one-million-pound mark. There were 26 of those weeks in 2019, 38 of them in 2018.

Echoing the sentiments of every handler interviewed, in mid-May Rankin McDaniel Sr. of McDaniel Fruit

Co., said: "The California crop is moving very well. The prices on avocados have been very stable. The price for the premium retail sizes have been as good as we could have expected." He noted that the quality was excellent, and his company was a bit ahead of schedule on their California shipments.

Gary Caloroso of The Giumarra Companies concurred, noting that grower returns have been good. "We are very pleased with how the season has gone so far," he said, adding that Giumarra should have volume shipments of California fruit through Labor Day.

Ross Wileman of Mission Produce specifically pointed to the high percentage of No. 2's coming out of Mexico this spring as an incentive for California growers to be more aggressive in picking their fruit. "Mexico has been running at about 30% on No. 2's," he said. That created extra demand for larger fruit and a better grove price than anticipated this spring.

Rob Wedin of Calavo Growers Inc. said that by the end of April, Calavo had marketed 41% of its expected California volume and will top 50% by the end of May. He said the high grove prices convinced a lot of growers to pick early. That allowed them to relieve some stress on the trees as those trees try to set next year's crop, and it also let them lock in some very respectable prices for a significant portion of their fruit.

Giovanni Cavaletto of Index Fresh said that the grower-owned company had only shipped about 25% of its California fruit by the end of April. He said Index will handle good volumes through the summer. April rains delivered "a good shot in the arm" for grow-

ers, helping to increase the size of the fruit and extending the shelf life. He said the company will have excellent quality throughout the summer and especially noted its increasing crop of the Gem variety. "Over the years, there have been a lot of new varieties, but Hass has always outperformed them," he said. "We think Gem has the potential to come up to the Hass standards. It has a very nice oval shape, with a beautiful golden color and is an easy peeler."

Wedin expects stable prices to continue through the summer though there could be a small downward price adjustment. Reports from Peru indicate that it will ship a bit more than last season to the U.S. Mexico is expected to see its shipments steadily decline as the official end of its 2019/2020 season arrives on July 1. Its summer crop is expected to be about 20% greater than last year.

Add all three major origins together and it points to weekly summer volumes in the 60-million-pound range. While that would have been a daunting figure a handful of years ago, now it seems doable. Though handlers do say that there is more uncertainty this year than usual largely because of the coronavirus and how it might impact summer life.

Bob Lucy of Del Rey Avocado Company weighed in with one more significant impact to the 2020 season and that is COVID-19. He revealed that social distancing rules have led his firm to reduce the number of packing hours per week and consequently decrease weekly production. Lucy expects this to lengthen the season and anticipates that production from San Diego, Riverside and Ventura Counties will go into October with Morro Bay still shipping fruit in November. This could allow more of the California fruit to end up in reopened foodservice venues.

It's always a risk to hold the fruit on the trees waiting for a strong market, but this year's large crop may make that a necessity. 🥑

California Avocado Branded Merchandise Soon To Be Available for Purchase Online



In February, the California Avocado Commission (CAC) Board of Directors approved a project to launch a new California avocado e-commerce store to sell California avocado-branded merchandise. Products will include items with graphics from “The best avocados have California in them” campaign as well as favorites such as the California avocado flag t-shirt. The merchandise will be featured on the CAC Instagram and Facebook pages and integrated on a new web shop at shop.californiaavocado.com.

CAC’s overall marketing objective is to increase California avocados’ perceived value, preference and loyalty with our targets and achieve a premium price. The e-commerce promotional merchandise program will help us achieve this by leveraging brand advocates, influencers and fans and encourage sharing of “why California avocado” messages and content. The new store will respond to loyal California avocado fans who have been expressing interest for years in California avocado apparel and other branded items. It also provides a new channel to engage with consumers in a meaningful way both in and out of the California avocado season. Designed to be “buzz worthy,” the merchandise for sale will promote the California avocado brand and reflect positively on the brand’s image.

Initially the product line will be relatively limited to maintain simplicity and allow CAC to learn how consumers will respond

to the site, to different types of merchandise and pricing. Custom-designed apparel including t-shirts, hoodies, socks and a hat will be complemented by other products designed to be used and shown off by California avocado fans such as a duffel bag, a tote bag and a beach towel. Lower-priced items such as stickers and a magnet round out the starting line-up. All the products included in the launch are made in the U.S., supporting the domestic economy.

The long-term objective of the program is to have the merchandise profits maintain and sustain the funding for the project beyond the introductory year, with the merchandise priced competitively to do so. The initial expectation of the e-commerce program is to have about 500 monthly orders of merchandise from the site. At the same time, a key measure for social is to surpass social benchmarks on engagement rate and increase share of voice.

CAC is managing the e-commerce initiative as a separate program, linked to marketing but administered independently. In doing so, CAC will use third parties to manage the day-to-day e-commerce program, including order processing and fulfillment, with CAC oversight on product offerings, marketing and financials. This means the program will require minimal CAC staff time once it is up and running. At press time, the launch date was expected to occur this summer. News of the actual launch will be reported in the *GreenSheet*. 🥑

Grower Profile



Double H Avocado Ranch is a Family Affair

By Tim Linden

When Dave and Kathy Hendrickson partnered with his sister and her husband, Carolyn and John Heitzenrater, to buy a 13.5-acre ranch in Morro Bay in 1986, they had no plans to become avocado growers.

In fact, they were not farmers and were merely looking for a nice rural piece of property that could be home to their animals and their families. There was one house on the ranch and they built another. For about a decade, they raised their kids and animals, grew hay for their horses and enjoyed Morro Bay living. “As the crow flies, we are two miles from the beach. You can see the top of the Morro Bay Rock from my sister’s house,” said Dave, who is the manager of what has become Double H Avocado Ranch, a 6.5-acre parcel of the original property that is now home to about 650 trees. Last year Double H produced an average of 23,000 pounds per acre, said Kathy, who is the operation’s bookkeeper.

While that’s a remarkable statistic from a 2019 season that produced only about a half a crop for most growers, the transformation of the four relatives to impressive avocado producers is a relatively simple one.

Dave and his sister grew up mostly in Los Angeles County, with their father being employed by the California Highway Patrol. John and Carolyn, who are five years older than Dave, were the first family members to move to the Morro Bay area. Dave moved to the area in January of 1974 when his father transferred to CHP’s San Luis Obispo facility, where

he served as the office’s mechanic.

Dave went to Cuesta Community College, played a little basketball and considered becoming an auto mechanic. He did somewhat follow his father’s footsteps and became a correctional officer for the state of California. “I met Kathy in 1980, while she was a student at Cal Poly and we were married in September 1981 after she graduated,” he said.

Dave and Kathy were renting an apartment in San Luis Obispo when the two couples started talking about buying a piece of land big enough for the two families. They looked for the property together and finally found a parcel outside of town, in Morro Grange on Little Morro Creek Road. “At the time, I don’t think there were any avocados in the area,” said Dave. “We were looking for a place for our animals.”

Kathy was in banking before the birth of the couple’s son and then became his homeschool teacher through high school. Carolyn was a registered nurse working in a doctor’s office in Morro Bay. And John oversaw the paint shop at Cal Poly San Luis Obispo.

For the first decade, they dry farmed the ground and bailed hay. It was a break-even proposition as they earned enough to feed their horses for free. While Dave was not a farmer by trade, it is in his blood as his grandfather did own a cattle ranch.

As the years went on, the Hendricksons and Heitzenraters watched the area around them transform. Several avocado ranches started to develop. “One neighbor put in 1,000

trees in 1992 and had six trees leftover,” Dave said.

Those leftover trees, in fact, were the beginning of Double H Avocado Ranch. Those six trees did well, and the foursome decided to become avocado growers. In 1998, they devoted part of their ranch to avocados and planted 650 trees. By 2002, they had their first crop.

“We planted it as supplemental income for retirement,” said Dave. “We are fortunate in that all of us have some kind of a retirement plan and we don’t have to rely solely on the income from the grove. But it has been better than expected.”

Dave learned to be an avocado grower by doing it. He read publications, talked to other growers and observed what they did. He said the University of California Agricultural Extension program was a great help as it offered publications and classes. Over the years, he has relied heavily on Ken Warren, his pest control advisor, and Gabe Filipe, the area representative for Mission Produce, which is the packer that Double H uses. The six-foot, seven-inch grower jokes that he literally doesn’t have to look up to any other avocado grower, except Ed McFadden, the former California Avocado Commission chairman of the board who is equally gifted in the altitude department.

Dave notes it has been a learning experience. Over the last three years, he said the grove has produced three exceptional crops — including the 2019 record-breaker — and the return has been better than they ever expected. In the early years, he said it was not highly profitable to be an avocado grower, but more profitable than bailing hay. The ranch does have its



Photo courtesy of Eric Hendrickson.

own well, which has been extremely beneficial over the years. “I don’t think we ever showed a loss except during the freeze year of 2007,” he says.

Asked how he explains the excellent production from 2019, Dave first says he can’t explain it. But then he adds that the four owners have taken very good care of their trees over the years, with everyone helping when they can. “We’ve also made the hard decision of pruning every year,” he said. “We find there is a payoff for good pruning and good fertilizer practices.”

Dave said as difficult as it is to do, its advantageous to prune the appropriate branches every year even when they are loaded with potential fruit. At 65, he still does the pruning himself. “Twenty-two years ago nobody knew much about pruning,” he said. “But we have researched it and learned a lot.”

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He added that he has gone to many California Avocado Commission-sponsored workshops and field days over the years.

Even though there were talks about high-density plantings when the four owners put in their grove in 1998, Dave said they settled on the more traditional 20 by 20-foot schematic in a diamond pattern. While Dave is in charge of the day-to-day operations and makes daily decisions, he does consult his partners on the big expenditures. He called it an informal structure with the foursome getting together to discuss the ranch's needs and coming up with a solution.

They have utilized Mission Produce to sell their fruit every year. "Mission delivers empty bins and we hire a labor contractor to pick the fruit," he said. "We like dealing with Mission. They are globally connected and have their thumb on the pulse of the avocado deal."

In late April, when this interview was being conducted, the avocado market was very strong with an f.o.b. price in the \$40s for the most desirable fruit and the field price was equally respectable. But Double H had not yet considered harvesting its fruit. "We won't seriously think about it until August," said Dave.

He said that several years ago when the drought was at its peak, Double H did pick its fruit early to take stress off the trees. But that was an outlier. Morro Bay growers believe they produce the tastiest avocados in the industry largely because of the extended amount of time the fruit stays on the tree because of the long, cool growing season that defines the region. They are always the last district in the state to have avocados on their trees, with the harvest often extending into October. "I do believe the Morro Bay avocado is the best tasting avocado there is," Dave says.

As he discusses the path the Double H partners took, Dave said it was truly a blessing. "We've always thought that God led us to this property and we do pay it forward. We donate



Photo courtesy of Eric Hendrickson.

to the missionaries every year," he said. "We don't have one particular missionary that we send to each year. We have so many family members involved in different ministries and missionaries that our church supports that we usually give to a different person or group each year."

In late April, COVID-19 was at its peak in California, but Dave said it had not impacted their operation and was only of minimal impact personally. "It's not uncommon for us to go three to four days without seeing anybody," he quipped. "We are missing our friends at church and at the 4-H club. But I'm not just cooped up in the house. We have a shop on the farm and I do the maintenance on the equipment. I've always liked to dive into something," he said, referring back to his teens when he wanted to become an auto mechanic.

He was very hopeful that the Morro Bay Avocado & Margarita Festival, scheduled for September, would still be held. "We've been active in that for many years working in the CAC booth along with Dave Cruz and April (Aymami). We really enjoy that."

Though the two Double H Ranch couples have children, Dave said none of the offspring have expressed interest in taking over the operation. "When we decide we can't do it on our own — and we're all slowing down a bit — we will come up with a plan. We have thought about sharecropping — keeping the ranch and let someone else come in and handle the business."

But Dave has lived a very active life and believes he is still up for the task. He utilized his height in his younger years and played in many city basketball leagues. And both he and his wife played softball and senior softball. "We recently discovered pickle ball. It's a lot of fun," he said of the game that combines the elements of tennis, ping pong and badminton on an undersized court.

And they greatly enjoy their avocado trees and the richness they have brought to their post-career lives. 🥑



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The Economics of High Density Avocado Groves

By Tim Spann, PhD

Research Program Director

Planting density is something of a hot topic recently. In the Fall 2019 issue of the California Avocado Commission’s (CAC) *From the Grove*, I authored an article titled, “High Density Groves: Fact or Fiction.” And while that article has not generated the amount of feedback I expected, it has generated strong reactions – both positive and negative. The point of that article was not to say high density planting is good or bad, but to get the reader to think about what happens when trees are planted more closely together.

I believe there is a general misconception that, when planted more closely together, something “magical” happens and trees become more productive. If trees are simply planted more closely together and every other aspect of management remains the same as when trees are planted farther apart, then the trees will become crowded and yields will decline. And that was the key takeaway from the earlier article – if planting at high density, every other aspect of management cannot stay the same.

In fact, data collected from a high-density trial at Pine Tree Ranch and from other growers and researchers would support the notion that high density planting likely makes good economic sense, at least in the early years of the grove. However, growers should be aware of the potential risks as well as potential rewards associated with high density plantings before choosing a spacing for their grove.

Let’s explore some of the economics of high density ‘Hass’ plantings and see how it pencils out. I also pose some questions for you, the reader, to ponder and ask for your insights. You just may get an honorable mention in a future article.

Table 1. Pine Tree Ranch high density planting trial yield data for ‘Hass’ on ‘Toro Canyon’. The trees were planted in June 2014 and the first harvest took place in spring 2017.

Spacing (tree x row)	Yield (pounds/acre)				Average yield (pounds/ acre)	Cumulative total (pounds)
	2017	2018	2019	2020		
15 x 20	4,284	1,672	1,864	6,255	3,518	14,075
10 x 20	5,600	3,257	5,826	5,705	5,097	20,388
7.5 x 20	8,329	3,471	11,180	5,644	7,156	28,624
15 x 15	4,991	2,528	6,511	5,310	4,835	19,340
10 x 15	10,475	3,127	15,899	1,924	7,856	31,425
7.5 x 15	9,665	6,250	16,905	2,934	8,938	35,754
15 x 10	9,129	1,039	12,174	8,361	7,675	30,703
10 x 10	12,157	7,632	17,744	5,502	10,758	43,035

The Experimental Site

In June 2014, a spacing trial was planted at CAC’s Pine Tree Ranch demonstration grove in Santa Paula. The planting consists of ‘Hass’ on ‘Toro Canyon’ planted at eight different spacings with row spacings ranging from 20 feet to 10 feet, and between tree spacings of 15 feet to 7.5 feet. These spacings equate to tree densities from 145 trees per acre to 435 trees per acre. Table 1 shows the spacings, trees per acre and yields per acre since the first harvest in 2017. It should be noted that the planted area of each spacing is less than one-acre (ranging from 0.15 to 0.44 acres), and the per-acre yields were calculated from the actual yield and the number of trees at each spacing.

No pruning was done on any of these tree spacings from 2014 through 2018. In spring 2019, following harvest, the trees were pruned due to crowding in the tightest spacings. In the tightest spacings – 10 x 15, 7.5 x 15, 15 x 10, 10 x 10 – many of the trees had completely lost their interior and lower leaves and were essentially sticks after pruning. This is reflected in the generally large yield declines for these spacings in 2020. Despite these declines, the four tightest spacings had the highest average yield per acre as well as the highest cumu-

lative pounds of fruit from 2017 through 2020. Through the first four years of production, there has been essentially no difference in the fruit size distribution based on tree spacing, nor has there been any difference in the percentage of grade 1, grade 2 or cull fruit.

Some may argue that the yields in this trial could have been even higher than what we experienced if we had started to prune earlier, and they may be correct. Unfortunately, there is no consensus on the best pruning technique for high-density plantings, and we chose not to prune until year five when the trees became crowded and something had to be done.

Costs and Assumptions

Annual gross income and four-year total gross income based on the calculated per acre production for each spacing is shown in Table 2. For the purposes of this article, we have used the California industry average price per pound for 2017, 2018 and 2019 (californiaavocadogrowers.com/industry/industry-statistical-data), which is an average across all varieties, sizes and growing methods, to calculate gross returns. For 2020, the year-to-date average price per pound as of March 31 has been used (californiaavocadogrowers.com/industry/pounds-and-dollars-variety).

Some of the costs incurred from planting through harvest in spring 2020 are shown in Table 3. Tree costs were calculated based on a total tree cost of \$70 per tree, which includes the price of the tree, planting labor, staking, whitewash and above ground irrigation.

As mentioned previously, the trees were pruned for the first time in 2019 after harvest. All-in pruning costs – labor (all-in \$28/hr), equipment, brush stacking and chopping, whitewashing as needed – were \$4.88 per tree (\$2,128 per acre for the 10 x 10 spacing). This is similar to Dr. Gary Bender’s estimates (\$2,004 per acre) from a recent high density trial he conducted in Valley Center (see “Improvement of Yield Per

Table 2. Gross annual and four-year cumulative returns for ‘Hass’ trees on ‘Toro Canyon’ rootstock planted in June 2014 at eight different spacings.

Spacing (tree x row)	Trees per acre	Gross Returns				Total Gross Returns
		2017	2018	2019	2020	
15 x 20	145	\$6,863	\$1,896	\$3,202	\$7,881	\$19,843
10 x 20	218	\$8,971	\$3,693	\$10,009	\$7,188	\$29,862
7.5 x 20	290	\$13,343	\$3,936	\$19,207	\$7,111	\$43,598
15 x 15	194	\$7,996	\$2,867	\$11,186	\$6,691	\$28,739
10 x 15	290	\$16,781	\$3,546	\$27,314	\$2,424	\$50,066
7.5 x 15	387	\$15,483	\$7,088	\$29,043	\$3,697	\$55,310
15 x 10	290	\$14,625	\$1,178	\$20,915	\$10,535	\$47,253
10 x 10	436	\$19,476	\$8,655	\$30,484	\$6,933	\$65,547

Acre by Close Spacing, Pruning of Close-Spacing ‘Hass’ and ‘Lamb Hass’ Trees, Final Report” at californiaavocadogrowers.com). Note that the widest spacings, 15 x 20 and 15 x 15, have not yet required any pruning.

Harvesting costs are based on actual per pound harvesting costs in each of the four seasons, summed across all four years to determine a cumulative harvesting cost for each spacing (Table 3). Over the four years, harvesting costs have ranged from \$0.17 to \$0.22 per pound, for an average of \$0.19 over the four years.

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Table 3. Gross cumulative returns, expenses, and net returns for 'Hass' trees on 'Toro Canyon' rootstock grown at eight different spacings after the fourth harvest season.

Spacing (tree x row)	Total Gross Returns	Expenses			Net returns
		Tree cost	Pruning	Harvest	
15 x 20	\$19,843	\$10,150	\$0	\$2,582	\$7,111
10 x 20	\$29,862	\$15,260	\$1,064	\$3,879	\$9,659
7.5 x 20	\$43,598	\$20,300	\$1,415	\$5,551	\$16,332
15 x 15	\$28,739	\$13,580	\$0	\$3,717	\$11,442
10 x 15	\$50,066	\$20,300	\$1,415	\$6,219	\$22,132
7.5 x 15	\$55,310	\$27,090	\$1,889	\$7,078	\$19,254
15 x 10	\$47,253	\$20,300	\$1,415	\$5,933	\$19,605
10 x 10	\$65,547	\$30,520	\$2,128	\$8,411	\$24,488

The overall net returns — this figure does not account for all expenses, so it is not a true net return — based on the gross returns less the known costs for each spacing also are shown in Table 3.

Water and fertilizer costs were not specifically tracked in this trial because the irrigation was not divided and managed separately for each of the spacings. Some general thoughts on these costs are discussed later in the article.

Which Spacing Makes the Most Sense/Cents?

Over the first four years of harvest, the 10 x 10 spacing produced the highest average yield (10,758 pounds per acre) and the highest cumulative pounds (43,035 pounds). And even though the upfront tree costs were triple for the 10 x 10 spacing, it returned the most gross and net income over the first four harvest seasons. This is comparable to the results that Gary Bender reported for his trial in Valley Center, where he achieved an average of 14,662 pounds per acre for 'Hass' trees at 10 x 10 spacing over the first three harvest seasons.

So, if the grove lifespan were six years, that would be the end of the story. But an avocado grove can remain productive for 25 years or more. Thus the question: is a 10 x 10 'Hass' planting sustainable for the life of the grove?

In the case of the specific planting at Pine Tree Ranch, the answer is no. Through lengthy discussions with our grove manager, we concluded that the annual pruning necessary to maintain trees at 10 x 10 spacing would result in our yields pla-

teauing about where they were this year, 5,000 to 6,000 pounds per acre. Thus, we made the decision to remove every other tree on a diagonal, resulting in a 20 x 14 offset spacing.

In speaking with Gary Bender, he says the trial in his report has not been pruned in the past two years and it has "gone kinda crazy." The amount of pruning that is required on tightly spaced trees is often a tough pill for many growers to swallow — either nearly mature fruit, bloom, young fruit, or some combination thereof are going to be removed with pruning in California. Gary suggests the grove owner should take a vacation during pruning, which is not a bad idea — unless the grove owner

is the one doing the pruning.

Our experience at Pine Tree Ranch, coupled with Gary Bender's observations indicate just how critical pruning — maybe even twice per year — is to the success of high-density plantings.

Within the next four years or so, the 15 x 20 spacing can be reasonably expected to mature to a sustained average production of about 12,000 pounds per acre. This is based on production from a two-acre mature block at approximately this same spacing also at Pine Tree Ranch. True, California's average per acre production is only 5,750 pounds per acre over the past five years, but past performance has shown that at this location, with current management practices, 12,000 pounds per acre is a reasonable yield target.

Of course, there are some economies that come with high density plantings. Trees spaced closely together and kept to 8 feet tall are easier to pick than large trees so harvesting is easier and more efficient. This could possibly result in lower harvesting costs, although I was unable to confirm this. In speaking with a major labor contractor, he said it is unreasonable to expect just the labor costs for avocado harvest to be less than \$70 per bin (7.7¢ per pound, assuming 900 pounds per bin), but \$85 to \$100 (9.4¢ to 11.1¢ per pound) is more common. A quick phone survey of several field reps from various handlers indicated current harvest prices from 11¢ to 12¢ per pound on the low end to as high as 26¢ per pound on the high end. The lowest prices are for young trees on flat ground



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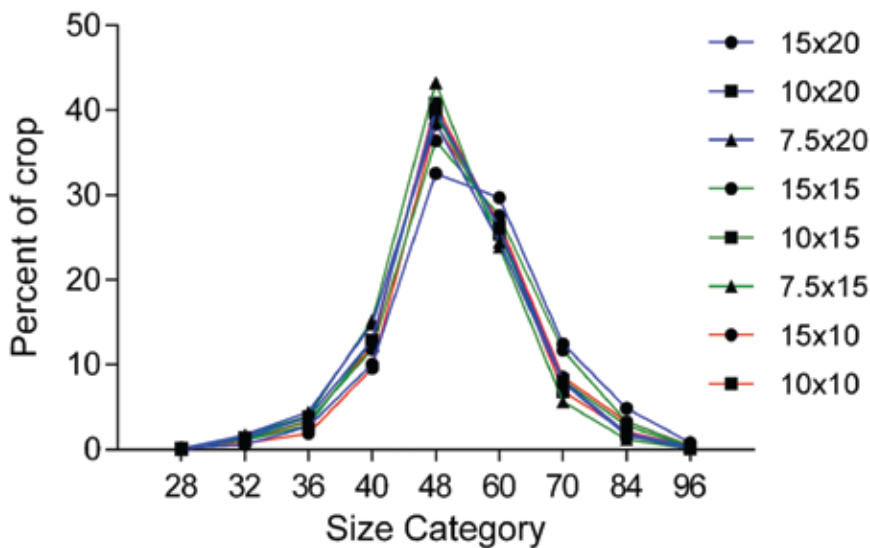
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Average fruit size distribution over four years for 'Hass' trees at eight different spacings.

- Pruning techniques
- Varieties adapted to high density
- Dwarfing rootstocks
- Plant growth regulators

What is the right way to prune 'Hass' trees planted close together? Ask 10 growers who have tried it and you are likely to get 10 different answers. There is no consensus on how to prune widely spaced trees much less those planted close together. True, some growers have figured out how to manage trees at a given spacing in their grove, but their method is not necessarily going to translate to your grove with your soil, your water, your fertilizer program, your... You get the idea.

Among all the tree fruits, avocados are the most variable from tree to tree and

and the highest prices are for tall old trees on slopes. There also is a split between north and south, with the north generally seeing prices 2¢ to 4¢ per pound lower than the south. Information shared by one of the state's largest growers revealed an average price of 14.3¢ per pound for harvesting over the past five years. With current labor costs, it may not be reasonable for the average grower to expect to pay much less than 15¢ per pound for harvesting unless they use in-house labor and deliver the fruit to the packinghouse.

What about water and fertilizer costs? There is little difference in water costs after the first couple of years. During the first two years after planting, when many growers use drip emitters on their trees, water use and cost will be directly related to the number of drip emitters per acre. Thus, water costs will be higher in the early years of a high-density planting compared with a wider spacing. However, once the trees are switched to micro-sprinklers, the usage differences diminish. This is because micro-sprinklers should be sized (output and spray diameter) to the spacing of the trees. The comparison is more, lower output micro-sprinklers per acre (high density) compared to fewer, higher output micro-sprinklers per acre (wider spacing). Fertilizer costs in the long term should be based on production — higher yields remove more nutrients so a higher yielding grove needs more fertility per acre regardless of tree spacing. If a high-density grove produces more fruit than a wider spaced grove the fertility costs will be proportionally higher and vice versa.

Should You Plant Trees at High Density

I believe that there is much more to consider than just tree density when deciding how to plant your grove. It has been said that there are four things necessary to be able to successfully grow avocados at high density:

grove to grove. They are still very similar to their wild ancestors growing in the jungles of Mexico and Central America because we haven't been selecting them for hundreds (or even thousands) of years like we have apples, peaches, and many other tree fruit. In other words, they display high phenotypic plasticity — the ability of a single genotype ('Hass') to appear different when grown in different environments. This makes managing avocados at any spacing more difficult than other tree fruit.

There have been some advancements in varieties adapted to high density plantings. 'Gem', 'Lamb Hass' and 'Reed' are all more upright, narrow trees compared to 'Hass' and better suited to high density planting. Although they may lend themselves to high density planting, varieties other than 'Hass' may have other issues such as market acceptability or premature fruit drop.

Avocado breeding is extremely difficult and slow, so advancement in rootstock development has not been rapid. And with issues such as phytophthora root rot and salinity taking center stage, there has been no focus on developing a dwarfing rootstock. That's not to say it can't be done. There are Persea species known to be of small size but introducing that trait into existing rootstocks will be a very slow process.

Plant growth regulators (PGRs) are frequently asked about. It is unlikely that the current chemicals (triazoles such as uniconazole and paclobutrazol) on the market that are used on avocados in other countries will ever be registered for use in the United States. These products have very long residual times in the environment and some data suggests they also may have some adverse human health effects. The fact is these chemicals are not registered for use on any food crop in the U.S. — except for very restrictive uses on a few select vegetable seedlings younger than four-weeks-old in containers in



'Hass' trees spaced 10 x 10 feet one year after being heavily pruned.



'Hass' trees spaced 10 x 10 feet after being thinned on the diagonal to create a spacing of 20 x 14 feet.

greenhouses. It is possible that new PGRs could be developed in the future, but this area of research has greatly diminished with chemical manufacturers in recent years.

Maybe the best option is a hybrid approach — plant trees close enough together to take advantage of high early production when there is no competition for light between trees, then thin the trees at six-years-old or so, and then remove the whole grove at 12-years old and start again. This potentially maximizes yields by only maintaining the trees for their most productive youthful years. And, it affords the opportunity to change variety and rootstock as new ones become available.

Conclusion

There is no doubt that more closely spaced trees produce higher yields and higher returns in the early years of an avocado grove. The question remains, are those high production levels and returns sustainable with the 'Hass' cultivar? Surprisingly, evidence from long term trials in California is lacking — perhaps that is an answer? However, Greg Partida, former professor of plant science at Cal Poly Pomona, said it best, "The economics are pretty straightforward. As an industry, we can no longer keep doing what has been in the past. Tree canopy management takes a commitment. Doing nothing should

not be an alternative" (in "Avocado Canopy Management for Greater Yields and Orchard Efficiency", California Avocado Society Yearbook 1996).

Smaller trees have many advantages, including increased worker safety, harvesting ease and efficiency, and better spray coverage. But there are limits to how small a tree can be realistically maintained given its natural growth tendencies and currently available rootstocks. A cultivar like 'Gem', which is naturally a narrow, upright tree, can be planted at high density (as high as 600 trees per acre), without the need to take the extraordinary measures necessary to maintain closely spaced 'Hass' trees. At modest yields of 25 pounds per tree, 'Gem' can easily produce more than 12,000 pounds per acre sustainably.

Perhaps Greg Partida was right, we can no longer keep doing what was done in the past — trying to grow a large spreading tree at high density — when good alternatives exist.

What has been your experience with high-density 'Hass' plantings? What do you think the avocado grove of the future will look like? Reach out and let me know. 🍷

The author thanks John Cornell for his thought-provoking criticisms of the Fall 2019 article, and contributions to and critique of this article.

At press time, California avocados were available at:

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Lunardi's Markets
Mercado Mi Tierra
Mollie Stone's
Nugget Markets
Raley's
Ralphs
Save Mart Supermarkets
Sprouts
Stater Bros.
Whole Foods

• **The Fresh Market** (Alabama, Arkansas, Connecticut, Delaware, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Massachusetts, Mississippi, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Virginia)

• **Hy-Vee** (Illinois, Iowa, Kansas, Minnesota, Missouri, Nebraska, South Dakota, Wisconsin)

• **New Seasons Market** (Oregon)

• **PCC Community Markets** (Washington)

• **Schnucks** (Illinois, Indiana, Missouri, Wisconsin)

• **Sprouts** (Arizona, California)

• **Sam's Club** (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming)

• **Walmart** (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming)

The California avocado online store locator tool makes it simple for consumers to locate where they can find fresh California avocados. CAC quickly updates the online store locator to reflect changes in distribution ensuring consumers have the most up-to-date information concerning the fruit's availability. While most produce promotions were on hold due to the coronavirus situation, when California avocado retail (and foodservice) promotions resume these also are updated in the store locator tool.

By maintaining communication with targeted retailers throughout the season and integrating that information with the Commission's online store locator tool, CAC efficiently and effectively grows awareness of California avocados and encourages consumers to visit retailers where the fresh fruit is readily available in season. 🥑



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ProGibb LV Plus® Plant Growth Regulator

Grower Experiences After Two Seasons of Use

By Tim Spann, PhD
Research Program Director

On March 27, 2018, the plant growth regulator ProGibb LV Plus® (gibberellic acid; GA) became available for use on avocados in California under a special local needs (SLN) registration for the purpose of increasing fruit set and fruit size. Since growers have now had a chance to potentially make three applications of GA and harvest two crops that have been treated with the product, we wanted to see what your experiences have been.

GA History and Effects on Avocados

UC Riverside Emerita Professor and Plant Physiologist Dr. Carol Lovatt spent many years studying GA and its effects on avocado yield. Her research showed that GA application improves avocado fruit set, yield and size when applied at the cauliflower stage of inflorescence development. The recommended application timing is to apply GA when 50% of the inflorescences on 50% of the trees are at the cauliflower stage. This means that 25% of the bloom will be at an earlier stage of inflorescence development and 25% will be approaching full bloom (open flowers). Being slightly late in applying the treatment affords better efficacy than being too early, but applications at full bloom are not effective.

Under the SLN registration, ProGibb LV Plus® is the only GA product that can be used. It can be applied one time per year at a rate of 12.5 fluid ounces (25 grams of active ingredient) per acre. For ground sprays, the SLN stipulates 100 gallons per acre spray volume, and 75 gallons per acre for aerial applications. The 100 gallons per acre for ground sprays was an error that arose somewhere in the registration process since all of Dr. Lovatt's trials were conducted at 250 gallons per acre. Most county agricultural commissioners have been allowing the greater spray volume upon request. The Ventura County agricultural commissioner has issued a blanket approval to use up to 250 gallons per acre. It is important to note that only

the spray volume may be adjusted, the product rate remains 12.5 fluid ounces per acre regardless of spray volume.

The current SLN registration is valid until March 31, 2023. A full registration is in process and will be completed before the SLN registration expires. Once a full registration becomes available, it is possible that generic products will enter the market and become available for use, but until then, only ProGibb LV Plus® can be used.

Grower Experiences

The California Avocado Commission (CAC) developed a grower survey that was distributed in March 2020 to learn about growers' experience using GA or why they have not tried using it. If growers have tried GA, they were asked about when they used it (2018, 2019, 2020), how they applied it, whether they tank-mixed anything with GA, and what they saw in terms of yield and fruit size. We also asked growers to share any concerns they have about the product or label changes that would make usage easier.

In total, the survey respondents represented almost 3,000 acres or about 5% of the total California avocado acreage. For those who responded that they have not tried GA, the top reason listed for not trying it was uncertainty about whether it can be used in organic production. ProGibb LV Plus® is National Organic Program compliant and is registered with the Organic Materials Review Institute (OMRI). The current OMRI certificate can be downloaded from the Agrian database (home.agrian.com).

For the respondents who have used GA, less than half applied GA in 2018, nearly 80% applied it in 2019, and 94% applied it in 2020. Across all three years, one-third of the applications were made by ground and two-thirds were aerial. For those making ground applications, all respondents used 100 gallons per acre spray volume in 2018 and 2019, and 20% said they used less than 100 gallons in 2020. Somewhat



Cauliflower stage of inflorescence development.



Inflorescence development slightly beyond cauliflower stage, but still okay for gibberellic acid treatment.

surprisingly, no one reported using more than 100 gallons per acre, despite that being a common request over the past two years.

Consistently, 20% of users have tank mixed something other than the recommended surfactant with GA in each of the three years. Boron, phosphites, and micronutrients (manganese, zinc and iron) have been the commonly reported tank mixes. It should be noted that the use of boron in combination with GA is not recommended on a large scale. Both GA and boron are bloom/fruit set enhancers and it is unknown if they work synergistically or antagonistically. In trials in Mexico, the combination resulted in flowers with double pistils and malformed fruit. The combination of GA with boron and urea is being tested in California, but a harvesting error caused the data from the 2019 application to be lost. As soon as data are available from California they will be shared. In the meantime, the combination of GA and boron or GA and urea should be used with caution.

In 2018, about 60% of users reported leaving some trees untreated for comparison, but in 2019 and 2020 only 40% reported leaving untreated trees. When using a new product like GA it is always best practice to leave some trees untreated for comparison. This allows you to see whether the product is effective under your treatment conditions. Additionally, even though GA is very safe and no ill effects were observed in trials even at very high rates, it is a precautionary step in the event something should go wrong with the application — especially if trying unproven tank mixes. Once you have used the product a few times and are comfortable with its performance, the entire grove can be treated.

To date, no users reported any negative effects of GA ap-

plication. For those who applied GA in 2018, 40% reported a yield increase and 60% reported that yield remained the same at harvest in 2019. However, for 2019 applications, 60% reported a yield increase and only 40% reported that yields stayed the same. This may be because some applications were made too late in 2018 due to the SLN registration not being available until the end of March. Increased fruit size has been reported by about 50% of users following both 2018 and 2019 applications.

The overwhelming majority of users, 86%, report that they are satisfied with GA and plan to continue trying it on their groves. For those who reported not being satisfied with the results, the lack of a response and the difficulty of timing the application were the reasons given for their lack of satisfaction. The timing is a known issue, especially when erratic weather patterns cause bloom to be protracted and it can be very difficult to determine the best time to spray.

Aside from sound data on the safety of tank mixes, factors around the application timing or the ability to make multiple applications per year were the top changes users would like to see going forward. As we work with Valent BioSciences Corporation on the full registration, this is valuable information to have.

We appreciate all the growers who took the time to complete the survey. The information you shared with us is invaluable. It appears that for most who have tried GA in the last couple of years the response has been positive. We hope this will encourage those of you who have not yet tried it to consider making some test applications in 2021. As more growers use this new tool and share their experiences with us we will report back to you for everyone's benefit. 🍋

Optimum Leaf Nutrient Concentration Ranges for the ‘Hass’ Avocado in California

It has long been recommended that growers use fall leaf analyses as a guide for making fertilizer decisions for their avocado trees. Specifically, samples should be collected from 5- to 7-month-old (spring flush) leaves from non-fruiting, non-flushing terminal spring shoots from August to October. Research has shown that these are the leaves and time during which nutrient pools are the most stable and provide the most consistent results from year to year. But what are the optimum levels of nutrients that should be in your leaves for maximum production?

Believe it or not, most of the values reported by Dr. Tom Embleton were not empirically determined for commercial avocado trees in California, like they had been for citrus and other tree crops. Rather, early avocado researchers like Embleton, “borrowed” values from citrus and tweaked them based on their research knowledge (see “Embleton’s Ranges” in Table 1). Some studies were conducted to specifically look at nitrogen (N), iron (Fe), and zinc (Zn) levels, but not the other 11 mineral nutrients essential for plant growth and productivity. Over the years, modifications to the recommendations of Embleton were made by analytical labs offering avocado leaf testing, resulting in various laboratories recommending different leaf nutrient concentrations as optimal. Thus, we were left with a variety of opti-

imum leaf nutrient concentrations, none of which had been developed based on avocado yield, fruit size, or fruit quality data. As a result, optimum leaf nutrient concentration ranges, especially for most micronutrients, were broad and imprecise.

In 2012, the California Avocado Commission (CAC) began funding a re-

search project with Dr. David Crowley, professor and soil scientist at UC Riverside, which had among its objectives to identify “optimal ranges of leaf tissue concentrations in avocado that are associated with high yields.” Dr. Crowley’s project had more than 400 ‘Hass’ trees in groves in all growing regions, for which all inputs — water, fertilizer and

Table 1. Old and new optimum leaf nutrient concentration ranges for ‘Hass’ avocado leaves sampled as 5- to 7-month-old leaves from non-fruiting, non-flushing terminal spring shoots from August to October.

Nutrient (conc.)	Embleton’s Ranges ¹	New Optimum Ranges ²	Highest Grower Frequency ³
N (%)	2.0–2.6	2.2–2.5	2.25–2.7 ✓-X+
P (%)	0.10–0.25	0.10–0.15	0.15 ✓
K (%)	0.75–2.0	0.7–1.0	0.9 ✓
Ca (%)	1.0–3.0	1.8–2.0	1.4 X-
Mg (%)	0.25–0.80	0.6–0.9	0.5–0.6 X-
S (%)	0.2–0.6	0.45–0.53	0.3–0.37 X-
Zn (ppm)	30–150	50–80	34 X-
Mn (ppm)	30–500	110–145	75 X-
Fe (ppm)	50–200	55–80	55 ✓
B (ppm)	50–100	40–65	25 X-
Cu (ppm)	5–15	4–7	9 X+
Cl (%) ⁴		0.3–0.5	

¹ Embleton, T.W., Jones, W.W., Labanauskas, C.K., and Reuther, W.J. 1973. Leaf analysis as a diagnostic tool and guide to fertilization, p. 183–211. In: W.J. Reuther (ed.). The citrus industry. Univ. California Div. Agr. Sci., Berkeley.

² Developed by D. Crowley, S. Campisi-Pinto, P. Rolshausen and C. J. Lovatt.

³ The leaf nutrient concentrations that occurred most frequently in the research orchards used in developing the new avocado leaf optimum concentration ranges. ✓ = values within the new optimum range; X- = values below the new optimum range; X+ = values above the new optimum range.

⁴ Crowley, 2017. Index Fresh Seminar Series.

yield — were monitored on an individual tree basis. In 2015, Dr. Carol Lovatt, professor and plant Physiologist, was brought on to the project. Dr. Lovatt brought to the project a comprehensive data set collected over a 20-year period that included leaf analyses (N, P, K, Ca, Mg, S, Fe, Zn, Mn, B, and Cu), total yield and fruit size distribution (packing carton sizes <84, 84, 70, 60, 48, 40, 36, 32 and >32), and fruit quality data from about 3,000 trees in commercial coastal and inland valley orchards (Pau-ma Valley to San Luis Obispo). A subset of the trees also included chloride in the leaf analyses.

The data sets were subjected to extensive statistical analysis to determine the relationships between leaf content of various nutrients and yield. For a detailed explanation of these analyses, see “Decision Support Tools For Management of Avocado Nutrition and Chloride Toxicity: Final Report,” available at californiaavocadogrowers.com. Based on these analyses, preliminary optimum ranges for leaf nutrients were published in the Fall 2015 issue of *From the Grove*. In the intervening time, many iterations of the results have been presented at seminars and have made their way onto various websites. To prevent confusion, Dr. Lovatt and I have sorted through the analyses in an attempt to clarify the results and provide a basic definitive set of optimum leaf nutrient concentration ranges for the ‘Hass’ avocado in California (see “New Optimum Ranges” in Table 1).

Since the new ‘Hass’ avocado optimum leaf nutrient concentration ranges were developed using the same leaf tissue recommended by Embleton — 5- to 7-month-old leaves collected from non-fruiting, non-flushing terminal spring flush shoots in August to October — they can be compared directly with the old standards. The leaf nutrient concentrations that occurred most frequently

in the research orchards used in developing the new optimums are shown in the last column of Table 1. The research revealed that leaf concentrations of nitrogen (N), phosphorus (P) and potassium (K) were high in the majority of orchards, (above or at the upper end of the new optimal ranges), with magnesium (Mg) and iron (Fe) at the low end of the new optimal ranges, respectively. Note that negative effects on yield result from excess N, P and K.

As reported in the Fall 2015 issue of *From the Grove*, the most significant result of these analyses was likely the discovery that leaf concentrations of calcium (Ca), sulfur (S), zinc (Zn), manganese (Mn) and boron (B) were well below the new optimum ranges (Table 1). The results documented that nutrient deficiencies in Ca, S, Zn, Mn and B are widespread throughout the California avocado industry. In addition, avocado trees in a high percentage of orchards had excessive levels of copper (Cu) in their leaves. Correcting these deficiencies and Cu toxicity, which limit avocado tree productivity, will contribute to increasing yield and fruit size of ‘Hass’ avocado trees in California. Please note: In her doctorate research on water management of ‘Hass’ avocado orchards in California, Julie Reints discovered that Mn accumulates in avocado leaves in response to episodes of hypoxia (saturated soil). Based on Dr. Reints’ work, care must be taken in interpreting Mn results from avocado leaf tissue analysis.

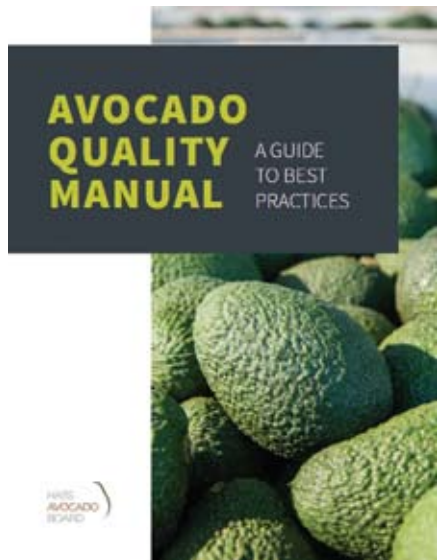
In all cases, the new avocado leaf optimal nutrient concentration ranges that are best for greatest total yield per tree also are optimal for greatest yield of commercially valuable size fruit (packing carton sizes 40, 48 and 60). The data set revealed that in California, the greatest proportion (majority) of total yield is fruit of packing carton size 48 over a broad range of yields (22 to 420

pounds per tree; up to 46,200 pounds per 110 trees per acre). Over that range in total yields, the pounds and number of fruit of packing carton sizes 40, 48, and 60 per tree continued to increase and remained 65% to 75% of the total yield. Whereas fruit of packing carton size 70 increased gradually from 12% up to 30% of total yield. Yield of fruit of packing carton size 84 did not exceed 6% of total yield.

‘Hass’ avocado trees yielding greater than 285 pounds per tree (> 31,350 pounds per 110 trees per acre) had leaf N concentrations between 2.09% to 2.6%; as N increased to greater than 3.0%, yield decreased. The highest yields were associated with N at 2.5%, P between 0.12% to 0.15% and K at 0.9%; low yields were associated with N > 3.0%, P > at 0.2%, and K > 1.2% (see Crowley’s Final Report).

In the Fall 2015 issue of *From the Grove*, the optimum range for N was reported as 2.25% to 2.9%. An upper value of 2.9% leaf N is too close the threshold value of 3%, above which yields decline. If the average value for N is 2.9% for leaves in a representative sample collected from trees throughout the orchard, then some trees will have leaf N levels > 3% and concomitantly have reduced yields. Moreover, in orchards with high chloride levels, leaf N needs to be between 2.0% to 2.5% as leaf chloride concentrations increase above 0.6%. Interestingly, higher yielding trees had leaf Cl concentrations between 0.3% to 0.5%; trees having < 0.2% Cl or > 0.6% had reduced yields (see Crowley’s presentation “Decision Support Tools for Fertilization of Avocados” available at indexfresh.com/seminar-series).

It is recommended that growers utilize these new optimum avocado leaf nutrient concentration ranges to help determine their trees’ nutrient needs. 🍌



HAB Publishes User-Friendly Quality Manual Online

The Hass Avocado Board (HAB) is dedicated to expanding demand for avocados in the United States and making it America's most popular fruit. In support of this mission, HAB provides the global avocado industry with supply and market data, conducts nutrition research, educates health professionals and collaborates with industry stakeholders to drive consumption of avocados in the U.S.

To maximize returns for stakeholders and ensure avocados supplied to the consumer are of acceptable quality, HAB produced the *Avocado Quality Manual: A Guide to Best Practices*. The manual is designed around each step in the supply chain, with recommended handling protocols for each step in the process as well as holistic quality management system principles that take into account prior and successive steps and allow operators to flag deficiencies within the supply chain. Importantly, the manual provides supply chain operators with handling protocols specific to the fruit's origin, maturity level, destination and intended sales format.

To make it easier for industry stakeholders to access this critical information, HAB has published a new *Avocado Quality Manual* webpage (HassAvocadoBoard.com/avocado-quality-manual/) with a layout based on the supply chain process. The webpage features a downloadable PDF version of the complete 61-page manual, as well as PDF versions of individual sections of the manual, each dedicated to best practices for a specific distribution chain step. In this manner, stakeholders can easily access and/or print specific portions of the manual without having to page through the entire document.

Highlights from the individual sections of the manual are as follows:

- **Packing Houses — California:** Provides best practices for harvesting the fruit based on the varied climactic conditions across the state, recommended picking

practices, ideal bin structures, determining the maturity of fruit, assessing dry matter to determine optimal packing and delivery logistics, pack line protocol, the importance of proper fruit cooling, storage, ventilation, cleaning and loading of transport trucks and quality management administration

- **Packing Houses — Outside California:** Examines the physiological differences of fruit from Mexico, Chile and Peru, and how the shipping times and conditions of the fruit from each country affect packing house procedures
- **Transport:** Focuses on transportation of the fruit within the U.S., with particular emphasis on the importance of maintaining the correct temperature within the truck's storage area, limiting transport of avocados with other product except for short distances, and avoiding the transport of avocados with ethylene-producing produce
- **Distribution Centers:** Provides guidance concerning off loading fruit, checking fruit temperature, cold storage room protocols, sanitation and record keeping
- **Re-packers and Fruit Ripeners:** Details the five stages of avocado ripeness and provides specific best practices for ripened fruit and unripened re-packed fruit
- **Retail Sales (Green and Ripened Fruit):** Covers recommended ordering and inventory control practices, storage of fruit, displays, and staff and consumer education on proper handling of the fruit throughout the retail process
- **Common Fruit Defects —** Details how to properly check fruit softness, visually evaluate fruit and provides a detailed listing of external and internal defects complete with photos

HAB's *Avocado Quality Manual* is designed to supplement packing house operations and food safety protocols, highlighting supply chain issues of particular importance to maintain the quality of avocados from field to fork in an easy-to-understand manner. With the launch of this new webpage, HAB hopes more industry stakeholders will gain access to critical information that will ensure our fruit maintains the highest quality at all points across the supply chain. 🥑



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