

Winter 2018

From the **Grove**

The Latest News from the California Avocado Industry

CAC'S 40TH YEAR
Read more on page 20



NON-GMO

BIOSTIMULANT FERTILIZERS, PEST CONTROL & BIO FUNGICIDE

**INCREASE FLOWERING
& FRUIT PRODUCTION
WHEN USING PURE
PROTEIN DRY**

**PURE PROTEIN DRY
15-1-1
PRIMO AMINOS**

**7.5-1-25
5-7-14
11-8-8**

99% OF NITROGEN DERIVED
FROM FISH PROTEIN
HYDROLYSATE, INCREASES
WEIGHT OF
FRUITS & VEGETABLES

**18 TYPES OF AMINO ACIDS
CONTAINS 80% + AMINO ACIDS
100% WATER SOLUBLE**

**ORGANIC AVOCADO
NUTRITION FOR ALL
STAGES OF GROWTH**

AVOCADO FERTILIZER PROGRAM

Apply as a Foliar Spray or Through Irrigation



**PRE BLOOM – APPLY 2 LBS/ACRE OF 15-1-1
AT BLOOM – 2 LBS/ACRE OF 15-1-1**



**FRUIT AT DIME SIZE – 2 LBS/ACRE OF 15-1-1
FRUIT AT HALF TO DOLLAR SIZE – 2 LBS/ACRE OF 15-1-1**



**APPLY 2 WEEKS LATER – 2 LBS/ACRE OF 7.5-1-25
THEN REPEAT IN 2 WEEKS**



**2 WEEKS BEFORE HARVEST 2 LBS/ACRE 7.5-1-25;
CAN APPLY EXICUTE WITH FERTILIZERS FOR PEST CONTROL**



**AFTER HARVEST APPLY 2 LBS/ACRE 15-1-1
THEN REPEAT IN 2 WEEKS**

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SALES CONTACT INFO:

ED ZYBURA
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edzybura@charter.net

JOE HASLETT
(805) 748-4033
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Grower Profile

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Carpinteria, CA

From the Grove

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President
Tom Bellamore
CA Avocado Commission

Editor
Tim Linden
Champ Publishing
925.258.0892
tim.linden@ymail.com

Ad Sales
Tom Fielding
626.437.4619
tomfielding1@mac.com

Design/Layout
Heather Gray
User Friendly, Ink.
userfriendlyink@gmail.com

April Aymami
Industry Affairs Director
949.754.0738
aaymami@avocado.org



www.californiaavocadogrowers.com

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

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The Economist's View

Measuring success for commodity boards like the California Avocado Commission (CAC) is not straightforward like that of a typical business organization involved in the avocado industry. The Commission promotes California avocados without direct involvement in the commercial transaction. Packers buy the fruit from growers, and their sales force negotiates with trade customers and follows through on the sale. Profit or loss is the paramount measure of the packer's efforts. There is considerable interaction, of course, between packers' sales teams and CAC's marketing staff, but control of the deal is not in Commission hands. So how do we know CAC's programs are working?

An array of key performance indicators is often relied upon to gauge effectiveness. These are regularly tracked as programs are implemented while the season progresses. Consumer media impressions are a standard means of evaluating the impact of conventional print or broadcast advertising, as well as online and social media campaigns. The number of impressions also lends meaning to the effectiveness of consumer and trade public relations outreach efforts. Online, the number of web site visits and an ever-increasing amount of data from web analytics paint an accurate picture—in almost embarrassing detail—of who is accessing the information the Commis-

sion disseminates via digital means.

Then there are the measures that growers most often notice, the ones that seem to carry the greatest weight. In this category are f.o.b. lug prices, by size and grade, information that growers receive at or soon after the time of first sale of their product to a handler. Growers are quick to spot, too, avocado prices at retail. I cannot tell you how many times growers have contacted the

**“...a dollar invested
by growers promoting
California avocados
returned \$2.63 in
additional profits.”**

Commission office to convey their own observations of fruit price or quality at retail, or to relay a similar report from a family member or friend in a distant city. Prices command attention, whether high or low.

The selling price for avocados, however, often requires context. Our immediate, emotional reaction to a low-priced piece of fruit is that it is inherently worth more than the retailer is willing to ask, and oftentimes that may be true. The fact that we are not alone



Tom Bellamore

in the marketplace complicates things immensely. As the aggregate supply of avocados swells, varying by source and quality from week to week, prices fluctuate. Trying to account for these variables while thinking about whether marketing programs are working is enough to spoil anyone's day. We willingly surrender such a daunting undertaking to those best equipped to separate the relevant from the background noise—agricultural economists.

Recently, Dr. Richard Sexton, distinguished professor of agricultural and resource economics, UC Davis, and his colleagues conducted an evaluation of the economic impacts of the Commission's advertising and promotion programs spanning the five-year period encompassing 2013-17. In November, he reported the team's findings to the Commission board. Many people would hesitate to call economics riveting, but Dr. Sexton made a compelling case for the success of CAC's programs and the return on investment growers have realized based upon his econometric modeling. Depending upon the model specification, Dr. Sexton's analysis produced benefit-cost ratios for California avocado grow-



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

ers ranging from \$1.64 to \$3.62. Put another way, if we take the midpoint of the range, a dollar invested by growers promoting California avocados returned \$2.63 in additional profits. The report also noted: "Results from estimation of the models showed that CAC promotions had a highly statistically significant (at the 99 percent level of confidence) positive impact on per capita consumption. The estimated elasticity of per capita consumption with respect to promotional expenditures was highly robust to model specification at around 0.015, meaning, for example, that a 10 percent increase in promotion expenditures in a market area would be associated with a 0.15 percent increase in per capita consumption."

About two weeks prior to the November board meeting, and four months after supplying Dr. Sexton with the raw data on CAC's promotional expenditures needed to conduct the investigation, Jan DeLyser asked me if I had heard from the economist. I said no, adding that if I did not hear from him until the day of the meeting that would be okay. Let the results speak for themselves, I thought, and so they have.

Several other things in the report also warrant mention. Dr. Sexton and his colleagues acknowledged how distinct and remarkable the avocado market in the U.S. has been. We know this, of course, but per capita consumption of avocados increased 344 percent from 1.6 pounds in the 1990s to an average of 7.1 pounds for 2014-16, while the fresh fruit category grew by only 9.4 percent over the same period. Under almost any circumstance, the rapid growth in imported supply could be expected to bury the domestic industry. That did not happen. Dr. Sexton showed the board a graph depicting per capita production and producer prices (which, not surprisingly, are highly volatile) over 15 years, explaining how, on aver-

age, the real (deflated) producer price has remained steady or even increased over this period. This shows "quite conclusively that the expansion of sales in the U.S. market has been achieved primarily through rising demand—rising consumption and constant or rising real prices at the same time can only be achieved through demand expansion." The steady building of that demand has come at the hands of the Commission, Avocados from Mexico, and other avocado marketing organizations.

Dr. Sexton also observed that in the face of the enormous growth in supply, "CAC has focused heavily on key Western U.S. markets and timed promotions to the peak availability of California avocados from late spring through Labor Day. Whether marketing direct to consumers, key influencers, or the trade, the CAC has sought to position California avocados as a premium product and to create loyalty for California avocados relative to avocados of other origins. This, in our view [Dr. Sexton states] is a very sensible strategy emphasizing: (i) natural advantages of California production in the market place, (ii) marketing most heavily in the U.S. West, where those natural advantages are strongest, (iii) promoting the California avocado as the premium avocado product, and (iv) turning its emerging status as a niche product into a marketing advantage."

It may be a bit immodest to admit that it was gratifying to hear a distinguished economist validate the board's strategic direction for California avocados, but there it is. The full report is available online at www.californiaavocadogrowers.com/commission/accountability-reports/marketing-economic-impact-reports, and it is a worthwhile read if you are interested in the efficacy of your assessment dollars when it comes to marketing the California brand. 🥑

New Leader Takes the Reins

I am honored and humbled to be your new California Avocado Commission (CAC) Chairman. For those of you who do not know me, I am a fifth-generation farmer (third-generation in avocados) from Ventura County. I have served the CAC board as a member and alternate for about as long as you can consecutively serve on the Commission. I would like to welcome the new executive committee: Vice Chairman Ohannes Karaoghlanian, Treasurer Rob Grether and Secretary Jessica Hunter. We and the rest of the board will do our best to serve the growers' interests in the next year.

I have frequently heard that no two years in the avocado business are the same. I hope we never have a repeat of this past year. Growers in California suffered drought, fires, floods, freeze, extreme heat, extreme winds, high water costs, supply disruptions, labor shortages, more winds and fires. Other than that, it was a great year. We are certainly a resilient bunch!

Due to many of the extreme events listed above, our upcoming year will be very challenging. Crop estimates at this point are 160 million pounds, or roughly half last year's crop. To put this in perspective, the Hass Avocado Board's (HAB) initial 2018 estimate for the total Hass market was 2.65 billion pounds, compared to nearly 2.2 billion pounds the year before, an increase of more than 20 percent. At this level, California will only be about 6 percent of the market in 2019. And yet we are determined to remain relevant and get a premium for California fruit.

The challenge facing CAC is how to differentiate California fruit, to be sold at a premium, in a world awash in avocados. Your Commission has been planning for this since the heat hit us in July. Certainly we won't have the budget to do promotions outside of our core market, which is mostly in the west. Jan DeLyser and her team have developed a tiered marketing plan that targets retailers and food service accounts that will maximize grower returns. This approach has worked quite well over the past few seasons, and we are confident in CAC's ability to deliver again.

Every five years the Commission employs Dr. Rich Sexton, professor of Econometrics at UC Davis, to perform a study to review the efficacy of the Commission's marketing expenditures. Dr. Sexton reported at the last board meeting that the return to growers was between \$1.62 and \$3.64 for each dollar spent in promotion of our fruit. There is nothing in the produce industry that can come close to the growth in avocados over the past years. In most commodities, the growth can only come as a result of reduced pricing. The avocado industry has enjoyed steady-to-rising prices over the past 15 years (with variability within seasons to be sure). Per capita consumption has gone from less than 3 pounds in 2003 to more than 7 pounds by 2016. My conclusions from the study are that the California avocado grower is getting tremendous return on our marketing and promotion efforts.

For those of you who do not know the staff at the Commission, I would en-



John Lamb

courage you to get to know them. Tom Bellamore has assembled a top-notch group of professionals to work for you, the California avocado grower. From marketing to industry affairs to production research, finance and support, the key people have a proven track record as leaders in the industry. Please consider getting involved. I got on the Commission because I thought it would help my understanding of the avocado industry and help me make better business decisions. While that has certainly been the case, even more important are the friendships and connections I have made with growers throughout the state. I would like to thank two outgoing board members: Rick Shade, the past chairman who has done an exemplary job, and Gene Carbone, who has been a handler member on the board for years. His insight and statistical analysis will be greatly missed.

As I conclude writing, a gentle rain has begun falling in Ventura County, and hopefully throughout the state. I know we all hope for a wet, warm winter. Our trees need it and so do we. Despite all of the challenges facing our industry, I remain confident that the California avocado growers can and will be able to compete and overcome these difficulties to continue to produce the finest avocados in the world. 🥑



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By Ken Melban
Vice President of Industry Affairs

Plethora of Activity Underway

- Power Shifts in Congress
- Food Safety Ramping-Up
- GEM Release Dates and New PLU
- SoCal Edison's Public Safety Power Shutoff
- Canada's LBAM Avocado Quarantine Requirements to be Removed

Will Mid-Term Congressional Changes Bring New Opportunities?

The 2018 mid-term elections resulted in a shift in power in the House of Representatives to the Democrats. With Republicans retaining control of the Senate, 2019-2020 should make for some interesting legislative times, to say the least.

The California Avocado Commission (CAC) works hard to develop and strengthen relationships with congressional members of both parties and keep them informed of issues critical to our industry. When power changes from one party to the other, the leadership shifts to the ranking party. This means the Democrats will now control the agenda within all House committees and decide what legislation is brought to the House floor.

Labor availability remains one of the most critical issues for the California avocado industry. Any meaningful resolution to the current labor challenges in agriculture will require a federal legislative solution. With the current situation — a diminishing pool of eli-



CAC's Ken Melban and April Aymami flank Rep. Salud Carbajal (D-Santa Barbara County) and Chief of Staff Jeremy Tittle

gible workers, existing enforcement requirements and no real option to secure guest workers (the H2A program does not work for most avocado growers) — a status quo approach is not tenable for the long term.

Commission staff has strong rapport with key House members in both parties and will continue to stress the dire situation and need for an agricultural guest worker program soon. Hopefully, the divisive, partisan gridlock that has dominated Congress for the last few years, under control of both parties, will begin to diminish. Congress needs a renewed commitment to doing its job — creating legislative solutions to complex problems. It's undeniable the immigration issue is at the forefront of work that

has been left unresolved for the last few decades. Hopefully, both parties will decide to finally work towards a solution that addresses the need for an agriculture labor force in the United States. Commission staff will continue to advocate for a guest worker program that works for California avocado growers.

Food Safety Requirements Ramping Up

The California Avocado Commission is in the process of updating the Commission's Food Safety Manual to version 4.0, which will align with the Primus GFS version 3.0 audit. The Primus GFS version 3.0 audit is expected to comply with the Food Safety Modernization Act's (FSMA) Produce Safety

Rule (PSR) requirements. As a reminder, as legally required under the FSMA, deadlines have been established (see text box for specifics) for growers to be able to demonstrate compliance with the PSR. The Food and Drug Administration (FDA) has contracted with the California Department of Food and Agriculture (CDFA) to conduct on-farm inspections beginning in January 2019. California avocado growers are strongly encouraged to talk with their packing house representatives about becoming food safety certified. At a minimum, growers can ensure preparedness for a CDFA PSR inspection by requesting a Commission Food Safety manual and complying with the necessary policies, procedures and reporting requirements. The Commission has Food Safety information available on its website: www.californiaavocadogrowers.com/growing/food-safety.

One of the mandatory PSR requirements is for growers to participate in a one-time Produce Safety Alliance (PSA) training. The Commission, with support from packers, is planning to host PSA trainings on February 5, 2019, in Fallbrook and February 7, 2019, in Ventura. The trainings cost \$35 per person, run from 8 a.m. to 5 p.m., and attendance is limited to 75 for each training. To register, put this link into your computer and follow the directions:

FALLBROOK: www.eventbrite.com/e/psa-grower-training-fallbrook-ca-tickets-53574592047

VENTURA: www.eventbrite.com/e/psa-grower-training-ventura-ca-tickets-53574469681

GEM Maturity Dates and New PLU

Based on requests from California avocado industry members, the Avocado Inspection Committee (AIC) is in the process of reviewing the release dates for the GEM variety. AIC is fund-

ing a GEM maturity release project for the 2018-19 season (November 1, 2018 through October 31, 2019) to confirm appropriate release dates. For the 2018-19 season the California Department of Food and Agriculture (CDFA) has established “provisional” GEM release dates as follows:

Size 32: 01/14

Size 36: 01/28

Size 40: 02/11

Size 48: 02/25

Size 60: 03/11

Size 70 & smaller: 03/25

Additionally, through the efforts of California avocado industry members, a PLU (Price Look Up code) has been established specific to the GEM variety. The new GEM PLU is 3509. The separate PLU for the GEM variety was approved in October 2018 by the International Federation for Produce Standards (IFPS).

SoCal Edison’s Public Safety Power Shutoff Protocol

In late 2018, Southern California Edison (SCE) announced a Public Safety Power Shutoff (PSPS) protocol that would shut power off during extreme weather events to mitigate the poten-



Rep. Julia Brownley (D-Ventura County) and Chief of Staff Lenny Young

tial for wildfires. CAC met with SCE representatives to learn more about the program and to communicate potential impacts on avocado farming if power is cut. The Commission staff fully support efforts to ensure public safety, but believes it is important SCE realizes the potential impact on avocado growers should power be cut. The service area for SCE includes parts of Ventura County and farther north.

In a PSPS protocol, SCE will proactively shut off power in high fire risk areas to reduce the chances of fire during extreme and potentially dangerous fire conditions. SCE defines extreme fire conditions as “conditions in which a fire would grow rapidly, burn intensely, and/or erratically.” SCE stressed that turning off the power to customers is not something the utility takes lightly

PRODUCE SAFETY RULE DEADLINES FOR PRODUCERS ARE AS FOLLOWS:

- January 26, 2020 deadline for very small businesses — more than \$25,000 but no more than \$250,000 in average annual produce sales during the previous three-year period
- January 26, 2019 deadline for small businesses — more than \$250,000 but no more than \$500,000 in average annual produce sales during the previous three-year period
- January 26, 2018 deadline for all other farms



Rep. Jimmy Panetta (D-Monterey County)



Rep. Devin Nunes (R-Tulare County)

and would only be used as a last resort option to mitigate fire risk.

In November 2018, CAC hosted an information meeting for growers concerning the PSPS protocol. At the meeting, SCE officials outlined their efforts to develop a robust system that allows them to track critical weather conditions such as low relative humidity, strong winds and hot temperatures in combination with dry fuels.

During the meeting, growers expressed concerns regarding the need for SCE to improve its vegetation management efforts. If you are part of SCE's service area and have vegetation management concerns, you can contact one of the following: Jon Pancoast, vegetation management group manager, phone: 310.608.5216, email: jon.pancoast@sce.com; or, Matt Saddler, vegetation management technician, phone: 805.497.5683, email: matthew.saddler@sce.com.

Growers also noted that they believe it is important for SCE to provide timely and accurate PSPS notifications. If you are an SCE customer and would like to ensure SCE has your current contact information, the following two options were provided: phone:

800.655.4555; or, log on to www.sce.com/, go to the "My Account" link and update your contact information.

Lastly, farmers questioned the validity of SCE's standby demand charges. The standby charge is levied on customers who have their own generating facility and is intended to ensure SCE can provide electricity to them if they need to roll on to SCE's power grid. However, with the establishment of the PSPS, SCE is now unable to guarantee this standby power will be available and that electrical service will be uninterrupted. The Commission has made an initial inquiry of SCE for further justification of this standby charge. As of this writing no response has been provided.

Canada's LBAM Avocado Quarantine Requirements to be Removed

The Light Brown Apple Moth (LBAM) is an invasive pest first detected in California in Santa Cruz County in 2007. Over time, LBAM has spread and in 2018 was detected in avocado producing regions of Ventura County. These detections prompted the Canadian Food Inspection Agency (CFIA) to begin requiring phytosanitary cer-

tification for California avocado shipments from the quarantined areas. CFIA's listing of California avocado as a host for LBAM was erroneous and in direct conflict with previous rulings from both the United States Department of Agriculture's Animal and Plant Health Inspection Service (APHIS) and the California Department of Food and Agriculture. Both agencies have concluded that avocado is not a host for LBAM. Over the last few months, the Commission has been working with APHIS to secure alignment with APHIS and CFIA on this matter, recognizing that avocado provides a low-risk pathway for movement of LBAM. In late 2018, the Commission received confirmation that CFIA agreed with our request to remove avocado as an LBAM host. CFIA is in the process of making the necessary revisions in their directive and it is anticipated the process will be completed by January 31, 2019. This will remove Canada's unnecessary (and burdensome) phytosanitary certificate requirements for California avocados ahead of the 2019 California avocado season. 🥑

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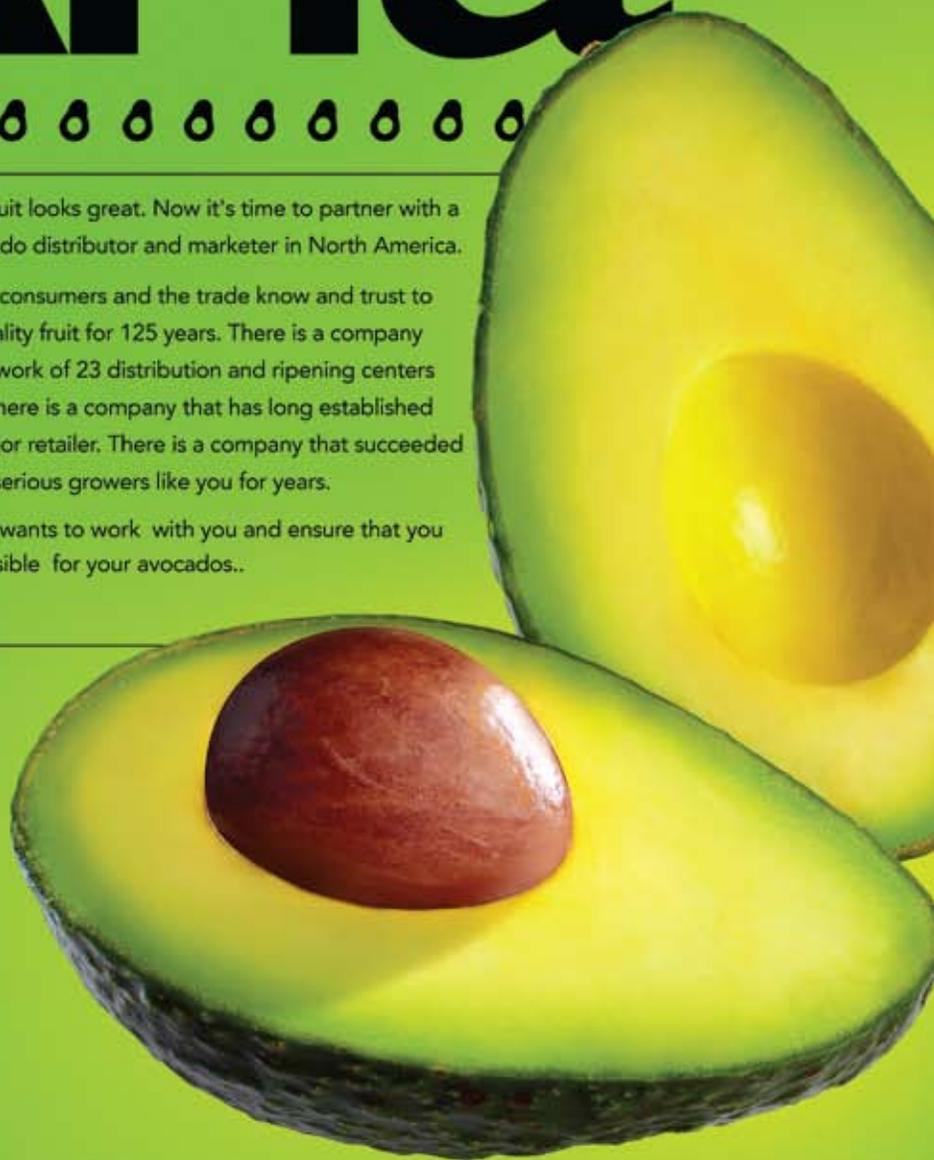
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CAC's Digital Advertising Tactics Hit the Mark

In recent years, the California Avocado Commission (CAC) has increasingly shifted marketing funds from traditional, broad-reaching media vehicles such as radio, to very targeted digital media vehicles such as online and audio (Pandora, Spotify) advertising. Measuring the effectiveness of these newer advertising media requires a different approach than traditional consumer research projects that study advertising awareness and consumer perceptions against a broad market base.

Therefore, in 2018 CAC engaged independent researcher The Nielsen Company (US), LLC, to evaluate the effectiveness of the current advertising campaign using a methodology that isolates the impact of digital ad exposure. The overall conclusions from the study are that attitudes about California avocados among avocado buyers during California avocado season remain high, and the shift from traditional mass media to more targeted digital media is working.

The advertising research was fielded between April 4 and September 4. Unlike traditional tracking studies that are usually fielded at the end or mid-point of an advertising campaign, this type of study is directly correlated to the ads being served and was fielded throughout the time of advertising. This is done by placing digital “tags” on the ads that

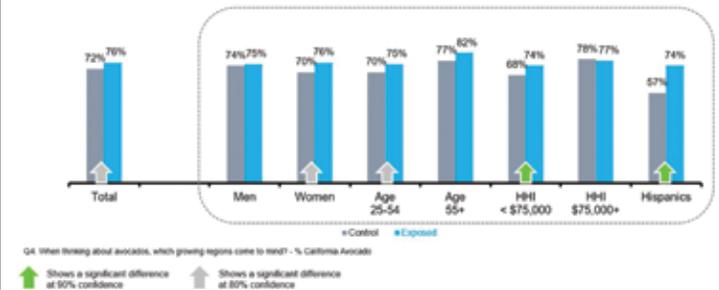
identify if consumers are exposed to a California avocado ad; participants are offered an opportunity to take the survey within 24 hours of ad exposure. The research was conducted among adults 18 and over who purchased avocados in the past month and reside in western states (Arizona, California, Colorado, Nevada, Oregon, Utah, Washington). It should be noted that more than half (52 percent) of the sample was California residents, and 82 percent of the sample said they eat one to two avocados per week. This means that most of the participants in the study were from the valuable “super user” segment of the avocado category. The research had a large sample size of 988 consumers. Half of the participants were exposed to CAC’s 2018 digital advertising (the exposed group) and half had not (the control group). For comparability, the control group was selected with a demographic composition that matched the exposed group.

Key Study Results

As part of the study, participants were asked, “When thinking about avocados, which growing regions come to mind?” More than 70 percent of them answered “California”. This is known as “unaided awareness”. “Unaided awareness” of the California growing region, already very high among avocado

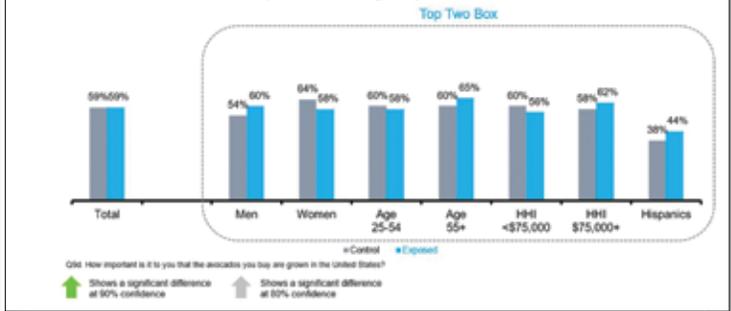
UNAIDED AWARENESS

Unaided Awareness increased amongst several groups with the campaign generating results comparable to those at higher baselines



IMPORTANCE OF BEING GROWN IN US

Roughly six in ten said it is important that the avocados they buy are grown in the United States, however, it wasn't as important among Hispanics



purchasers in the Western region of the U.S., increased after exposure to California avocado advertising –most significantly among households with incomes under \$75,000 and Hispanics. It also increased among women and CAC’s principal age target of 25 to 54.

Among all study participants, both the control group, who was not exposed to the digital ads, and the exposed groups, who did see them, California avocado aided awareness, favorability, purchase intent and willingness to recommend levels are all very high. This is a reflection of the 40 years of California Avocado Commission marketing in this region. When a brand scores in the 80 to 90 percent range on these types of measures, it is difficult to realize improvements on these already high ratings; in some cases, a goal may be set simply to maintain these highly favorable opinions. Nonetheless, when compared to the already high scores of the control group, women, adults ages 55 plus and Super Users (not shown on chart) who saw California avocado advertising were significantly more likely to say they would be “somewhat” or “very likely” to recommend avocados from California com-

pared to those who did not see the ads.

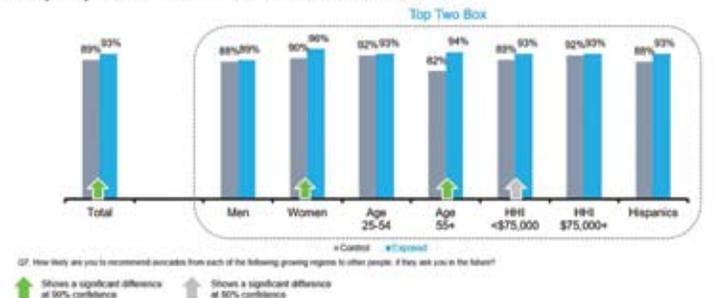
About 60 percent of respondents think it is somewhat or very important that the avocados they buy are grown in the United States. Though exposure to California avocado advertising did not increase this perception, nearly half of respondents (46 percent) said they check where their avocados originate.

After answering the perception questions above, all of the study respondents were shown one of several California avocado online ads used in 2018 and were asked to evaluate the ads on a series of attributes. In general, consumers liked all of the California avocado advertising they saw, with “appealing” the highest rating received on all of the various CAC ads evaluated. A video of a coastal California avocado grove that was filmed by a drone was the ad most well liked.

In addition to researching the effectiveness of CAC’s 2018 overall media plan, consumer responsiveness to California avocado advertising was evaluated for each of the digital media channels CAC used in 2018. The very detailed results from this study will inform the media plan for 2019. 🥑

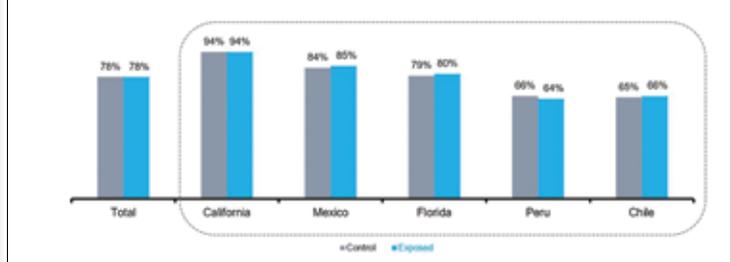
RECOMMENDATION

Following campaign exposure, women and adults ages 55+ were significantly more likely to say they would recommend avocados from California

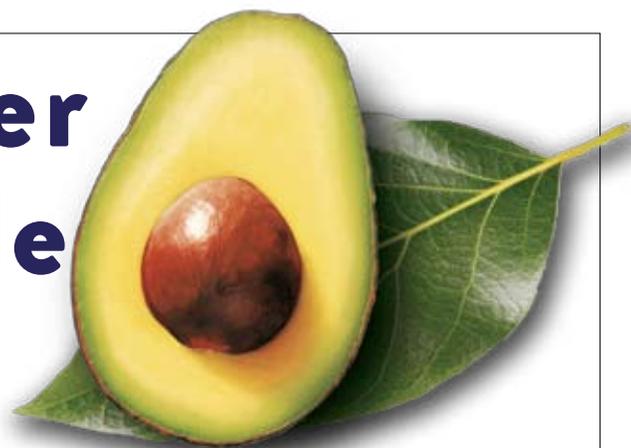


FAVORABILITY

In terms of avocado origin, California had the highest favorability amongst all the regions



Grower Profile



Dutch Flower Growers Find Success with Organic Avocados

By Tim Linden

The wing of the Van Wingerden family that is currently growing organic avocados in Carpinteria, and partially utilizing direct-to-consumer sales via Amazon, emigrated to this region a half century ago to grow flowers.

In fact, the family's flower-growing tradition can be traced back 15 generations in the Netherlands to 1699 and Cornelius Van Wingerden. Several Van Wingerden families came to the United States in 1967 taking their flower, as well as fruit and vegetable, expertise to California's Central Coast. Among the group was a young Eduard Van Wingerden. As he grew into adulthood, he first worked with his father at the family nursery and then started his own operation under the Ever-Bloom moniker in 1979.

Within a few years, Ever-Bloom began specializing in the Gerbera daisy, which includes hundreds of different varieties. "Our claim to fame is that we became the largest gerbera daisy grower in the country," said Ed.

In fact, Ever-Bloom is still a thriving operation and could very well be considered the Van Wingerdens' day job. Today that operation includes several family members, including son Ivan, who is integrally involved in the avocado business with his father, mother (Nadia) and wife (Kristin). Ed said the foray into avocados actually began in 1980 when he planted two rows of Bacon variety avocado trees to act as a windbreak for his flower-laden green houses.

The family clearly wasn't yet in the avocado business with only a handful or two of trees, but that is where they cut their eye teeth as avocado growers. It was in 2002 that the oppor-

tunity arose to buy the Twin Pines Ranch, a 34 acre plot located in the hills above Carpinteria on a gentle slope heading toward the ocean. "It's a beautiful property with both ocean and mountain views," Ed said.

He explained that a well-known software company envisioned creating a campus for its operation on the land. The California Coastal Commission nixed the idea as the parcel was not zoned for such a purpose and it was back on the market. "We paid \$3.5 million for it and the first thing we did was put in a well that could pump 200 gallons per minute."

Soon avocado trees were dotting the landscape and several years later, the Van Wingerdens purchased the 11-acre Sage Hill Farms avocado ranch nearby and increased their avocado holdings. Today, the avocado production consists of the two ranches plus another five acres on the Ever-Bloom property. The two ranches are certified organic while the five acres on the nursery have not been certified. In 2018, the 51 acres of avocados produced about 600,000 pounds of marketable fruit.

Like all avocado growers, the Van Wingerdens have had their challenges but they have learned how to farm organically very successfully. Though the inputs are more expensive than for conventional growers, they have been able to achieve yields that any grower would envy. "We've had some hiccups along the way," said Ivan and Ed in tandem, noting that one year they burned a lot of trees with too much fertilizer.

They mentioned experimenting with several different organic fertilizers to find one that worked well for them. Ed credited their excellent foreman for helping to shepherd the

crop each year, especially as father and son need to devote a fair amount of time to the flower business. “Like most growers, every other year we get a great yield,” said Ivan. “Over the years, our yield has fluctuated from 8,000 to 15,000 pounds per acre. For 2019, it looks like we could get about 10,000 pounds (per acre). We have a very good looking crop.”

Ed said the company’s ranches are located in an area with a very advantageous micro-climate. “We have a pretty foggy summer,” he said, noting that the trees were not exposed to that terrible 100+ degree heat wave that swept through some of the avocado growing regions in July damaging trees and both 2018 and 2019 fruit.

The Van Wingerdens call its effort to go organic both a passion and a marketing decision. “We believe in it,” said Ed, “but if it didn’t make economic sense, we wouldn’t do it.”

It also was an economic decision to launch AvoGanic in 2015, which is an effort to market organic avocados directly to consumers. Ivan recalls that it was in early 2015 when the market price on avocados – even organic avocados – fell well below \$1 per pound. “We had a desire to take control of our own destiny,” he said. “We decided to try out the e-commerce space and see what we could do.”

Ivan and his wife, Kristin, launched the AvoGanic website and began marketing directly to consumers. Kristin is in charge of the online operation. After experimenting with several different options, today AvoGanic sells its online avocados through Amazon. While Amazon does take a healthy cut of the revenues, Kristin said it is a much easier fulfillment operation, which is very important at this time of her life as she has a very young child at home. “It’s quite simple,” she said. “You sign up as a vendor and once you’ve taken care of the initial paperwork it’s pretty much on cruise control.”

The avocados are shipped via UPS with AvoGanic determining size and price. It currently offers a six and 12-count place-packed box as well as a five pound loose filled box. The price ranges from \$24 to \$40 per box, plus shipping. They also offer a subscription option. The fruit typically arrives within three days with instructions concerning how to ripen it to perfection.

Kristin said the family very much enjoys the opportunity to expose consumers to great-tasting organic avocados, directly from the farm. “We pride ourselves on providing our customers with a perfect avocado that is blemish free,” she said. “They really are beautiful.”

Consumer reviews on Amazon sing the praises of the “best avocados I’ve ever had” and being “creamy, flavorful and delish.”

The Van Wingerdens sell their avocados via Amazon 12 months of the year as they hold back some trees from harvest for this specific purpose, and also count on off-blooms to run this part of the business.

The e-commerce sales represent a small part of total volume – about 125 pounds during an average week, but they



Nadia, Ed, Kristin and Ivan Van Wingerden

expect AvoGanic to grow over time. “We see it as a niche for our fancier organic fruit,” Kristin said.

The vast majority of the fruit is shipped through regular channels as the company uses different packers throughout the season. They also sell a bit of their production via the Santa Barbara Farmer’s Market route. That’s where Nadia comes in, selling organic avocados and other farm-produced products (eggs, poultry and flowers) at the local outdoor event. Ed said the family operation typically sells 50-75 pounds of avocados at the weekly event. Nadia has been participating in the event for 35 years and recently penned an article in the Santa Barbara newspapers (along with Ed) touting both the economic and social impact on Santa Barbara. The city is considering closing the parking lot home to the Saturday market to make room for a new police station. “... the cost of displacing the farmers’ market is too high,” Nadia wrote. “It would undermine the city’s health.”

As far as avocados are concerned, the Van Wingerdens expect their entire operation to continue to grow. Ed called it “the fun part of their business” and noted that he has his eye on another parcel of land that could successfully grow 15 to 18 acres of avocados. The Van Wingerdens are bullish about the future of avocado growing, especially in their area. Ed said the farm has access to great well water, which he says geologists call the “golden zone” as it is fresh water with no salt water intrusion despite its close proximity to the ocean. Underground geological formations protect the water supply from the sea water.

But like virtually every other avocado grower in California, as the family spoke to *From the Grove* in mid-November, they were hoping for some rain (which did come late in the month). Ed said in 2018 they had to go deeper down in their 1,000 foot well than ever before. But unlike other growers, the Van Wingerdens are looking at basically a full crop on their trees. As mentioned above, barring unforeseen calamities, Ivan expects a harvest per acre of close to 10,000 pounds, much like 2018. According to reports, this is expected to be an off-year for most California avocado growers with production much lower than 2018 in aggregate. 🥑

The California Avocado Commission 40 Years - From the Outside In

By Jan DeLyser
Vice President, Marketing

Tom Karst, editor-in-chief of *The Packer* newspaper recently wrote an editorial on the remarkable story of per capita avocado gains noting the per capita use of avocados in the U.S. was 0.8 pounds in 1979, climbing slightly to 1.5 pounds by 1998 and to the latest rate of 7.5 pounds per capita in 2017.

Over the course of that time there have been significant changes in market share for origins supplying the U.S., with California going from a dominant market share to a more niche position. A laser sharp focus on consumer trends driving a strategic approach to market conditions has been key to the California Avocado Commission's (CAC's) success over the past 40 years — details of that approach are chronicled in the anniversary article in this issue. In looking at the 40-year track record of the Commission, it was apparent that one of the constants throughout my career in the produce industry was indeed California avocados.

When I took my first job out of college with the Kansas City-based *The Packer* newspaper in 1976, I had no idea what the future held. The severity of two consecutive winters in Michigan (e.g. a 34-inch snow storm in late January 1978 sealed the deal) paved the way for my openness to the opportunity to be transferred to California. While wrapping up my responsibilities in the North Central region, I distinctly recall one of my last retail store checks in Grand Rapids and looking at the avocado display ... a whopping three avocados in a basket that I could barely reach ... all three were totally firm. I remember thinking that it would not be long until I would have California avocados on a regular basis as well as a plethora of other fresh fruits and vegetables grown in the Golden State.

In mid-September 1978 I arrived in California and began working out of *The Packer* office on the Los Angeles Wholesale Produce Market. It was about the same time as the California Avocado Advisory Board was transitioning to the California Avocado Commission. As a representative of *The Packer*, I was



In the early 1980s: Jon Bartelme, CAC; Angie Dickinson, actress and spokesperson; Ralph Pinkerton, CAC, and Doug Giddings, Del Rey Avocado

invited to cover various trade events hosted by the Commission. Ralph Pinkerton, president/CEO, was a creative marketer and invitations to the events he orchestrated were always in demand. *The Packer* experience, particularly with California avocados, provided insight into the importance of effective trade communications.

In August of 1979 I was hired by the Fresh Produce Council (FPC, now Fresh Produce and Floral Council) to manage their communications and publication (then a tabloid, transitioned to a magazine, now known as *Fresh DIGEST*). Pinkerton had

been one of the founding fathers of the FPC and as a past chair remained actively involved with the organization. He made sure I was included in the assorted CAC promotional events, including a couple of trade dinners with Angie Dickinson, the actress featured in CAC's "Would This Body Lie to You" campaign designed to debunk myths regarding avocado nutrition in the early 1980s. The Commission was always a big sponsor of FPC events, a commitment that continues today. At one of the luncheons in the early 1980s, then-CAC Vice President of Merchandising Ron Hughes arranged for an appearance by the USC Marching Band as part of their luncheon sponsorship... such a memorable event. Not only because of the magnitude of the band playing at Luminaria's Restaurant but also because as the photographer in charge of "capturing" the event with 35 mm film —24 exposures — I was so caught up in the photos that when the pic counter hit 42 I checked to see if I had ever loaded the film. I had not. Some kind of scrambling ensued as I backtracked and retook the priority shots.

As executive director of the FPC, there are vivid memories of working with key staff at the Commission from Pinkerton to George Schulman (the Golden Lion) to a long list of merchandisers who called on our key retail members. There also are some great memories of conventions in the CAC suite featuring Pinkerton on the piano as well as some trade event outings on boats in New Orleans, LA and out of Balboa Bay, CA. The Commission held a leadership position even then with a focus on communicating versatility of usage and accurate avocado nutrition information, a decades-long focus that has paved the way for the super food status of avocados. During that same period, we hired Champ Publishing to manage *Fresh DIGEST* — Tim Linden and Tom Fielding — another connection that continues today as they now work for the Commission on CAC's *From the Grove* magazine. The FPC experience provided invaluable insight into the value of volunteer organizations. It brought to life the opportunities for leadership development while connecting with key customers and giving back to the industry, not to mention an appreciation for innovative consumer marketing.

In the early '90s, I took a merchandiser position that later led to a marketing director position with Sun World International and once again avocados were a part of the story. At the time, Sun World handled the Irvine Ranch sales, including



From the early to mid-1980s: Harland Heath, Heath and Lejeune; Ralph Pinkerton, CAC; Charles Gilb, Charles E. Gilb Company; Jan DeLyser, Fresh Produce Council, and Rod Jenkins, Certified Grocers

avocados. We had some outstanding promotions with retailers featuring California avocados. A number of the retailers in my territory were managing their own ripening and, though avocados were popular, they have come a very long way since then. It was a time when supply could outpace demand as with the 1992-93 California crop at 569.8 million pounds. There was an ad with a major Southern California retailer featuring avocados 10 for a \$1.00. A successful promotion in moving volume but difficult to be proud of based on the abysmal grower returns. The Sun World experience validated the importance of industry support of organizations that our customers participated in while providing the opportunity to get in the trenches with promotion to support the demand pull for fresh fruits and vegetables.

The mid-'90s led to Westlake Distributors, a produce broker distributor in Los Angeles who hired me with an eye to marketing and sales responsibility for avocados, grapes and kiwifruit. Learning the ins and outs of the buy-sell of produce and managing inventory provided an invaluable experience. It was during my time with Westlake, while at a City of Hope fundraising event, that Robert Verloop, then CAC vice president of merchandising, approached me about a position they were creating —Southwest Merchandiser. While at Westlake I realized my passion was for marketing, so the opportunity to join the Commission in October of 1998 was one I could not pass up; it provided the chance to go from the outside in with the Commission.

At that time Chilean avocados were a fairly new origin ship-



The CAC/HAB Retail Merchandising Team circa 2006

ping avocados to the U.S., and Mexico had recently gained access to the 19 northeastern states. The Commission's senior management and Board were involved in creating the Federal Promotion Order that led to the creation of the Hass Avocado Board in the early 2000s. In 2000, I became CAC's vice president of merchandising and we hired a team of produce merchandisers located around the U.S. with responsibility for representing the California avocado marketing program as well as the U.S. marketing programs for the Chilean Avocado Import Association and the Hass Avocado Board. It was a busy time and provided an excellent opportunity to work with the origins shipping to the United States.

At the same time, it was becoming increasingly clear that the Commission had an opportunity to differentiate California avocados within the greater avocado category, and in 2003 I transitioned into the role of vice president of marketing for CAC. In 2007, we put our sole focus on marketing California avocados and launched the California Grower Campaign with the Hand Grown in California thematic. This campaign put the face and the place on who and where our avocados are grown and was well timed with consumer interest in knowing more about the food they eat.

Fast forward to 2015 and the Commission rolled out the Made of California Campaign with California by Nature thematic designed to integrate across the evolving media platforms from traditional to digital to social.

The 40-year history of the California Avocado Commission is testimony to the commitment of volunteer leaders on the Board from the grower and handler communities, staff and agencies to maintain a focus on programs that provide value throughout the marketing channels, especially grower value. There is great pride on the part of all in the role the Commission has played in the meteoric rise of popularity of avocados ... those grown in California, as well as the overall category. There is little doubt that year-round availability, accurate nutrition information, consistent availability of ripe avocados, bagged programs supporting secondary displays and, of course, effective marketing programs have been key to the growth from a little known "specialty" item to a top performer in the produce department.

It has been a true pleasure for this native Kansan (and adopted Californian) to work on behalf of California's avocado growers with such qualified staff and agency teams during these past 20 years and there is every indication that the future is bright for avocado consumption. 🥑



Connie Stukenberg, CAC; Ed Odron, Produce Marketing and Consulting; Ed McFadden III, Rancho Simpatica; Michael Schutt, Raley's, and Jan DeLyser, VP Marketing CAC at a 2017 produce industry event

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For the past 20 years, our lead attorney, Robert Jackson, has focused his practice on representing fire victims and has helped supervise and consolidate settlements of over \$1.8 billion against the responsible parties. An avocado grower himself with six avocado ranches spanning over three hundred acres in San Diego county, Robert has a keen and unique understanding of the losses felt and the recovery efforts that lie ahead for avocado growers affected by the Thomas Fire. Let Robert Jackson and his team of lawyers, experts and consultants put their experience and expertise to work for you.



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CAC 40th Anniversary

Looking back at the California Avocado Commission's (CAC) 40 years, it is easy to get caught up in the minutiae of each year — the push and pull of supply and demand, the swells and dips of the weather, the press of pests and diseases, and the unique timbre of that season's advertising and public relations campaigns. But what is more telling is the view from farther afield. When you view the broader timeline, the minute pinpoints of success and failure blend into larger swaths of coherent, intentional, proactive, well-planned and well-executed actions that plot an expansive and progressive path — measured steps that slowly, but surely, gained traction and gathered momentum.

Those steps, from a marketing perspective, are visible in the 40-year timeline on these two pages.

When you look at trends across time, you witness the progression of the Cali-



fornia avocado from suspect appetizer (consumers believed guacamole was fattening) to a healthy fruit that is a versatile and much loved ingredient in any meal. You see Hass avocados skyrocket from 51 to 96 percent of volume in tandem with per capita U.S. avocado consumption that explodes by 344 percent from the 1990s to 2016. You discover that the Commission's daily market demand databases, consumer tracking studies, economic models and research-driven collection of scientific facts inform everything from maturity and quality standards, to harvest timing, pricing, agricultural water rates, legislative advocacy, integrated pest management, cultural management practices, marketing strategies, advertising, nutrition messaging, and targeting to the trade and consumers. And you watch the Commission wrestle with – and redefine – its place (and that of the California avocado) in the industry as it transitions from being the majority volume supplier to a premium niche player.

Harnessing Avocado Market Data

In 1978, optimism ran high as the newly minted Commission assumed general responsibility for and the authority to make final decisions concerning California avocado advertising, promotion and market research. The crop set a new record at nearly \$80 million, secured the second highest per acre gross returns for California fruits and celebrated a 7,000-acre increase in avocado plantings. However, these formative years would bring mixed returns for growers in an era characterized primarily by an unfavorable “buyers’ market” in which increasing avocado acreage, a surplus of handlers and packers, the consolidation of retail chains, distribution challenges and supply that

outpaced demand routinely provided weak grower returns (often in the 27 – 28 percent of retail range). In response, the Commission began working to find a means of securing accurate inventory information, f.o.b. price reports and precise crop estimates that would provide growers with the data they needed to time harvests, implement controlled picking and secure favorable pricing.

In 1984, the CAC-commissioned Land Report confirmed what many had been thinking: the high number of handlers and packers had contributed to the downward spiral in avocado prices. That same year, CAC launched the Avocado Marketing Research Information Center (AMRIC), providing industry members with essential daily market demand data.

Throughout the next dozen years, AMRIC underwent a series of updates that helped growers and handlers make informed decisions and improve harvest timing and market coordination. Improvements included the addition of major packers who reported prices, shipments and inventories; converting to an off-site operator for daily reports; improving accessibility to data by updating report formats, upgrading the system's speed and allowing remote personal computer access; and adding destination categories. At the same time, the Commission significantly improved its Avocado Crop Estimating (ACE) program. By 1990, ACE was within 3 percent of actual crop volume; by 1995, ACE reported 99 percent accuracy. ACE was even used to assess the impact of the 1990 freeze – proving its value in adjusting estimates based on major weather events. These early developments of both systems paved the way for the programs that continue to operate today and provide the industry with timely and relevant industry statistics.

AMRIC also provided key destination data and U.S. shipment trends – data that became critical to CAC in its marketing decisions. Beginning in the late 1980s, the Commission launched a series of initiatives built on AMRIC and Commission-funded market research data to define targets, measure success, support messaging and identify key partners in a concerted effort to build demand. In 1992, CAC commissioned the development of an economic model to measure the effect of economics, crop size and CAC's programs on the market price of California avocados. The model clearly illustrated that for every dollar spent by CAC, three dollars were returned to the grower. Data indicated

1978-1984

Marketing Campaign Summer Promotion



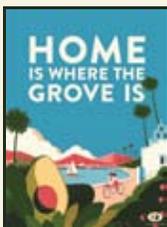
2015

Distinctly Californian Campaign



2016

Big Game “Add”



2018

Close to Perfect Thematic

2016

Marketing Campaign



the Commission's marketing efforts led to increases in demand — by 1996, 10 million more households purchased the fruit than the previous year and retail distribution of avocados reached 100 percent in high-consumption Western markets. In 2018 a five-year economic evaluation conducted by UC Davis concluded that “CAC promotions had a highly statistically significant positive impact on per capita consumption” and “a substantial return on California growers' expenditures to promote fresh avocados in the U.S.” In addition, CAC has utilized independent research firms to study the effectiveness of its advertising, periodically conducting similar research to ensure advertising is on track with Commission objectives.

The Long Path from “Fattening” to “Healthy”

From its inception, CAC focused on overcoming negative nutrition concerns by promoting positive avocado nutrition news and facts. The effort was a mixture of art, science and focused outreach that began with 1983's *Would This Body Lie to You?* campaign featuring cultural icon Angie Dickinson, which was designed to overcome consumer beliefs that avocados are fattening.

In the mid-'80s and '90s, sustained efforts supported by CAC-funded research helped the Commission establish itself as a trusted resource for nutritional information. CAC's Nutrition Advisory Committee developed updated nutrition information for the FDA. CAC participated in Avocado Nutrition Advisory Board meetings, helped with California Avocado Media Bureau nutrition messaging, and partnered with the National 5-A-Day program, American Dietetic Association, City of Hope and more. In the public sphere, misconceptions about avocados were addressed with messaging that focused on their cholesterol-free status and a “Before and After” nutrition campaign.

In 1997, CAC's website became a potent megaphone for nutritional messaging — with a 258 percent increase in nutrition-related hits just one year after its launch. The Commission initiated complementary nutrition-focused media-outreach efforts, created a *Healthy Times* newsletter for nutritionists, showcased ads that addressed specific medical conditions and secured a “Nutrition Superstar” nod from the American Diabetes Association. As a result of this outreach, by 2002 62 percent of consumers reported purchasing avocados because they are “good for you.” By 2003, California avocados were featured as a “good fat” in a *TIME* magazine cover story, firmly positioning the fruit for positive exposure by the time new dietary guidelines were released in 2005 recommending Americans replace “bad” trans and saturated fats with “good” monounsaturated fats like those found in avocados. CAC-funded research at Ohio State University and UCLA yielded additional USDA-approved nutrition messages, including avocados being designated as a “nutrient booster” and

a source of four additional carotenoids. As these nutritional wins piled up, CAC expanded partnerships with trusted nutritional advocates including registered dietitians, supermarket dietitians, and health and wellness bloggers to get the word to consumers.

Cognizant of the positive impact its groundbreaking nutrition-oriented research and messaging could have on the Hass avocado industry worldwide, around 2005 the Commission passed the nutrition research baton to the Hass Avocado Board (HAB), which then assumed responsibility for managing avocado nutrition research. Today, funding from all countries of avocado origin who market their fruit in the U.S. support HAB avocado nutrition research and initiatives that powerfully impact avocado nutrition messaging. Most recently, the FDA announced a new avocado serving size that then qualified avocados to be called healthy, and California avocados are Heart-Check certified by the American Heart Association®.

From Majority Share to Premium Niche, Tracing the Marketing Path

CAC's early years (1978-83) marked the start of its efforts to differentiate California avocados as a standout “premium” product by “cleaning up” the fruit and establishing quality and maturity standards. When research determined that oil content was a poor criterion for harvest maturity, CAC embarked on a three-year breakthrough research program, settling on the dry matter method in 1981. New efforts were initiated to repackage the fruit, which until 1983 was sent out in “drab tan cartons.” The marketing team also identified a strong Western market with high consumption and a base willing to pay “nearly any price” for avocados — this target market would remain a critical base throughout CAC's 40 years.

From 1984-1996, the Commission initiated a variety of efforts that laid the groundwork for future advertising, marketing and public relations campaigns.

- **California avocado season.** CAC developed promotional programs to focus on the specificity of the California avocado season — football, Cinco de mayo, summer salads
- **Defined users.** Advertising campaigns were built around avocado “personalities” and the volume of avocados they consumed
- **Versatility.** The mid-'80s *Beyond Guacamole* campaign encouraged consumers to use avocados in other ways. CAC continued to expand its versatility messaging — pairing it with a “California” brand image by 1996 — using targeted TV and radio advertising in key markets and alliances with marquee California restaurants that promoted avocados as relevant and essential to everyday living

- **Influencers.** CAC launched the first of its baby-focused campaigns, partnering with Dr. William Sears, a well-known pediatrician. Identifying key influencers who could share accurate information with consumers became a vital part of the communications program

- **Media relations.** CAC developed a new approach to public relations by conducting annual editorial planning meetings with magazine editors, freelance writers and publishers in an effort to gain valuable, free editorial exposure. In 1985, CAC secured more than \$50,000 worth of free publicity; by 2005, CAC racked up five consecutive years in which avocado coverage exceeded one billion media impressions due to aggressive outreach efforts

In 1997, as the U.S. opened its doors to avocados from Chile, the Dominican Republic and Mexico, it became even more critical for the Commission to grow demand for the fruit in order to ensure that hard-earned grower returns didn't plummet in light of massive increases in supply. Thus began an era of fiercely competitive markets and markedly collaborative efforts to drive demand for the entire avocado category.

In 1998, CAC developed a joint radio campaign with the Chileans and three years later forged an alliance for a \$1 million generic avocado marketing investment to complement CAC's marketing. By 2000, the Hass Avocado Promotion Act — which authorized marketing assessments on all Hass avocados sold in the U.S. — was passed and CAC began strategically collaborating with importers to build year-round demand for the category.

To set itself apart from the competition, CAC also launched aggressive "Genuine California" campaigns — with stronger California branding than previously — focused on taste and the versatility of the fruit. The 1998 Avo Bowl campaign, a descendant of the first 1982 "Big Game" promotion, generated 67 million media impressions. By 2002, when the avocado category hit a then-record of 44 percent household penetration, CAC had elevated brand awareness in 78 percent of advertised markets and increased shipments in Southern development markets by 64 percent.

In the late '90s, information technology became increasingly important as advances in technology made it easier to distribute key information, correct misinformation and expand marketing. In 1997, CAC expanded its year-old consumer website and it quickly became a hub of information across the industry with a 74 percent uptick in web traffic.

In the early 2000s, the Commission developed campaigns to cultivate consumers' affinity for avocados and encourage them to enjoy their favorite fruit with any meal. The *Irresistible* campaign sought to make consumers love California avocados and by 2005, data indicated that almost half of all avocado consumers were now considered "heavy users".

During the last decade, CAC began to differentiate California avocados as a premium niche product in an increasingly crowded market suffused with imported fruit. Here is where decades of consumer tracking studies, measured assessment of retail and foodservice partners, persistent efforts to recalibrate nutrition messaging, proactive digital marketing, strategic media relations and partnerships with influencers paid off. Backed by years of data-informed insights, buttressed by collaborative relationships, emboldened by avocado demand and strengthened by a reputation for leadership, CAC's marketing team stepped up its *premium California* differentiation with a series of award-winning campaigns that often broke industry molds.

As more consumers began to express interest in knowing where their food came from, the Commission launched the *California Avocado Grower Campaign* with the *Hand Grown in California* thematic to connect consumers with farmers and the land. Executions initially focused on growers, then evolved to differentiate California avocados and their exclusive season. With avocado usage spanning all meals and snacks, and the growth of a robust foodie culture, CAC launched a *Distinctly Californian* campaign in 2015 communicating that a dish is not "California" without California avocados. Beginning in 2016, the *Made of California* campaign focused on California avocados as part of a California lifestyle, showcasing the fruit with iconic California landmarks and its proximity to market for local audiences.

To supplement these campaigns, and showcase the seasonality of this uniquely American fruit, CAC introduced California Avocado Week (2010) and then expanded that to California Avocado Month (2012). In addition, CAC decided to "stake a claim" to the 4th of July in 2012 with the highly successful 4th of July campaign. This later evolved into the *American Summer Holiday* promotion, bookending a summer of California avocados with Memorial and Labor Day celebrations during the sweet spot of the California avocado season.

By the mid-2000s, the Commission began to transition its marketing dollars from traditional vehicles — print, radio, TV, outdoor — to non-traditional platforms — websites, foodie bloggers, consumer events, social media, digital radio, emails and social influencers. In 2010, CAC created Facebook, YouTube and Twitter accounts; in 2012 it added Instagram, and Pinterest in 2013. Integrated marketing campaigns that combined traditional and digital platforms resulted in record consumer engagement: by 2015, California Avocado Month alone secured 100 million impressions. Engagement with CAC grew exponentially as consumers flocked to the website for nutrition information, engaging blog posts, recipes and usage ideas, and shared their love of California avocados on their favorite social media channels.

CONSUMER MEDIA EVOLUTION

A QUARTER BACK ON AVOCADOS.
Save 25¢ on California Avocados for your Big Game Bash!

Two crowd-pleasing party recipes:

Game Day Guacamole

Ingredients:

- 1 medium avocados, halved
- 2 cups of onion
- 1 cup of tomato, diced
- 1/2 cup of jalapeno, sliced
- 1/2 cup of cilantro, chopped
- 1/2 cup of lime juice
- 1/2 cup of salt

Directions:

Using a sharp knife, cut the avocado into the flesh leaving about 1/2" to 3/4" of the green part that stays. To avoid an oily mess, use the green skin. Slice the onion and combine with 1/2 cup of lime juice. In separate bowl mix the 1/2 cup of cilantro, 1/2 cup of salt, and 1/2 cup of lime juice.

Kick-off Quesadilla

Ingredients:

- 1 medium California avocado
- 1/2 cup of onion, chopped
- 1/2 cup of tomato, diced
- 1/2 cup of jalapeno, sliced
- 1/2 cup of cilantro, chopped
- 1/2 cup of lime juice
- 1/2 cup of salt

Directions:

Using a sharp knife, cut the avocado into the flesh leaving about 1/2" to 3/4" of the green part that stays. To avoid an oily mess, use the green skin. Slice the onion and combine with 1/2 cup of lime juice. In separate bowl mix the 1/2 cup of cilantro, 1/2 cup of salt, and 1/2 cup of lime juice.

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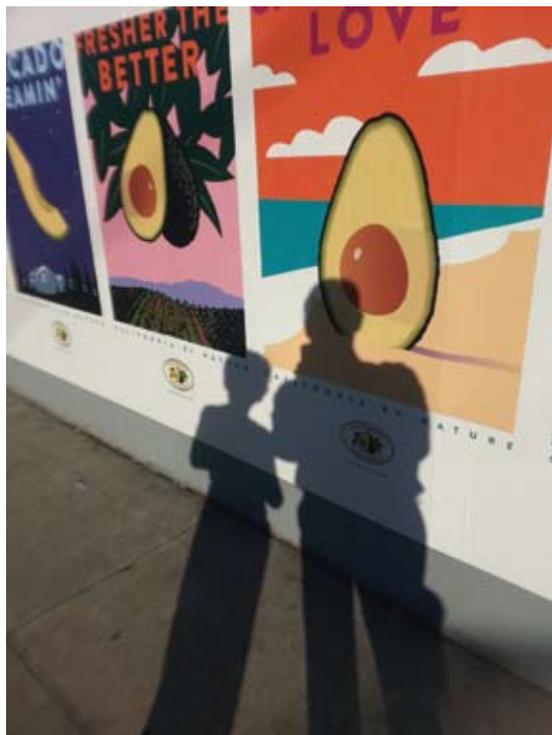
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The Local's Guide to California

Whether you've been a Californian for life or you're just one at heart, keeping up with the land of collagen coffee, healing stones and super-food trends (What? Kale isn't cool anymore?) can be a full-time job. That's why we've created a local's guide to California just for you, written by our West Coast staff, brought to you by California Avocado and just in time for road-trip season.

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CALIFORNIA AVOCADO SEASON IS HERE

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Driving Demand at Retail and Foodservice

As Hass avocados began to gain dominance (rising from 51 to 61 percent from 1978-83), the retail marketing team implemented the Ripe Fruit program in an effort to increase sales volume and meet year-round demand. The retail Ripe Program provided technical assistance, brochures, manuals, films, posters, seminars, merchandising assistance and in-store “ripe” display kits to ensure quality fruit was on display.

Backed by data indicating that ripe avocados could increase sales by more than 30 percent, the Ripe Program became increasingly important. By 1988, CAC deemed it the “most important merchandising tool” as participation skyrocketed across the nation and expanded to Midwestern and Eastern regions. “Ripe for Tonight” stickers were sent to retailers beginning in 1989. By 1990, Ripe expanded to include wholesalers and foodservice, and in 1993 “Ripe on the Road” brought the message to key Texas markets in time for Cinco de Mayo. In 1996, RipeMax! was launched with promotional incentives shifted to handlers. As a result, the availability of ripe avocados was expanded to 90 percent of all stores stocking the fruit — a five-year high for the quality of fruit displayed at retail. As category competition and retail consolidation began increasing in 1997, CAC worked to further set itself apart as a high-value retail partner with category management programs, high-quality RipeMax! Displays, a new AvolInfo Planner and customized promotions with targeted accounts.

The development of targeted accounts began in the mid-’80s, when CAC created a database of retail chains by California avocado volume. In so doing, CAC learned that not all accounts are equal in their buying patterns and set out to develop customized promotion and merchandising programs for influential retailers who were selling the bulk of California fruit. With declining market share and the objective of maximizing grower return, in 2015 the Commission significantly increased its focus on targeted accounts with a tiered marketing program that secured extensive partnerships with “sweet spot” retailers and provided customized programs, planning, execution and performance tracking.

The Commission further integrated its tiered marketing program with its premium messaging by successfully launching its California avocado labeling initiative in 2014. By 2015, nearly 150 million California avocado labels were on fruit. To ensure consumers could easily find California avocados near them, it launched a digital store locator tool in 2017.

In the foodservice channel, the Commission pursued a three-pronged marketing approach of culinary education, menu development and seasonal promotions (limited time offers or LTOs). This work has helped marry the word “California” and avocados on menus to the point that now 70 percent of restaurant patrons in the U.S. think that if a dish on a menu includes “California” it will have avocados in it. (See the article

on page 44 for more information.) LTO promotions with a wide array of restaurant chains, many that are a good outlet for smaller size fruit, have been valuable for building California avocado sales and brand awareness in season as well as broadening consumer experiences with creative avocado usage.

The Power of Data and Science

In 1984, CAC established a new position — the vice president of industry affairs whose domain was AMRIC, industry communications, research and industry relations. This was a turning point that spurred the Commission’s ascension as a powerful and trusted voice in the industry, backed by sound data and science that gave gravity to its advocacy, research and outreach.

In the mid-’80s, it became clear that imports were a likely eventuality. To prepare, CAC established a commanding presence at federal hearings armed with data and research to back its concerns about the risks pest infestations posed to the California avocado industry. CAC testified concerning Mexico’s accession to General Agreement on Tariffs and Trade (GATT), helped reverse the California Department of Food and Agriculture’s (CDFA) decision to allow Mexican avocados to be shipped through California on their way overseas, defeated Mexico’s request to eliminate the 6 percent tariff, opposed transit of untreated Sharwil avocados from Hawaii to the U.S. mainland, inspected phytosanitary procedures in Hawaii, led the industry to protest the U.S. Department of Food and Agriculture’s (USDA) proposed rule to allow imports of Mexican avocados and delayed the lifting of the USDA Mexican quarantine until 1997. CAC also proactively began monitoring international avocado acreage and yield data.

During North American Free Trade Agreement (NAFTA) negotiations, CAC representatives visited Washington, D.C. repeatedly to argue that scientific evidence should not be forgotten in the rush to sign the trade agreement. As part of the NAFTA negotiations, CAC successfully opposed entry of Mexican avocados to Alaska and succeeded in keeping the USDA quarantine against Mexican avocados out of NAFTA.

From 1984-1996, the Commission expanded its research partnerships with the University of California Riverside and began consulting with representatives of other avocado producing nations — South Africa, Mexico, Australia, Chile, Israel, France — to examine opportunities for joint research projects and data sharing. CAC initiated the RadarScan Issues Management Project (IMP) to identify issues early and respond in advance to industry-threatening issues such as pests, water pricing and supply, labeling or imports.

In an effort to share its research with growers CAC established the *Growing Times*, the *GreenSheet*, a 1-800 number for daily crop information and annual grower meetings. A Food Safety Crisis Response program also was established.

To address water availability and rising rates, CAC initiated a four-part strategy: establish an industry water team, utilize the expertise of legal counsel, establish an information database and mount a public relations campaign addressing the importance of agriculture and the economic impact high rates have on growers. This strategy created a relationship between CAC, the agricultural industry and the Metropolitan Water District, among others, that remains vital today. In 1994, CAC negotiated a historic water rate reduction — a critical first step in securing grower sustainability for the future.

In light of increasing demand and prices in the '90s, avocado theft increased substantially. To combat theft, the Commission partnered with the CDFA's Avocado Inspection Committee and local law officials to establish an anti-theft and reward program, distribute anti-theft signs and remove stolen fruit from the market — initiatives that remain in place today.

By 1997, escalating grower costs reinforced CAC's mission to conduct production research to maximize long-term productivity and profitability. CAC research began to focus on projects that ensured growers could produce a differentiated premium product while collaboratively advancing cultural management practices for the industry as a whole. In the following years, the Commission secured permits for products to address avocado thrips, determined snap harvesting was equal to clipped fruit harvesting, hosted well-attended grower seminars, released a root rot resistant Mersky II rootstock, concluded a six-year perseia mite study and reduced product shrinkage at retail.

Cognizant that Mexican imports to all areas of the U.S. would one day become the norm, CAC launched its Avocado Pest Security System in 1997 to monitor compliance with USDA import rules. For the next few years, CAC also provided scientific data to successfully challenge the USDA's proposed rule to expand Mexican imports and worked with the USDA to improve phytosanitary import standards.

Over the past 10 plus years, as the Commission launched its premium marketing campaign, industry affairs launched a multifaceted quality initiative to ensure California growers remained the "preeminent

suppliers of quality" fruit: implementing a "Grower Communication Revolution," worked toward developing a California Sustainable Avocado Program, initiating Good Agricultural Practices and Good Handling Practices programs and incentives, joining forces with the International Avocado Research Consortium, hosting grower seminars and field day series, establishing the Pine Tree Ranch demonstration grove, implementing online Decision Support Tools, securing six-figure Specialty Crop Block grants, establishing a Grove Database System, commissioning innovative research projects to ad-



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RELATIONSHIPS
FOR OVER**

45
years



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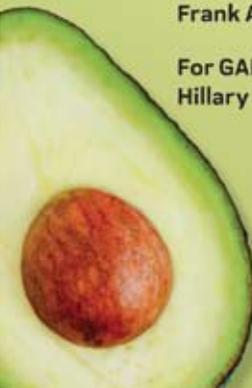
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Wayne Brydon, wayne@delreyavocado.com
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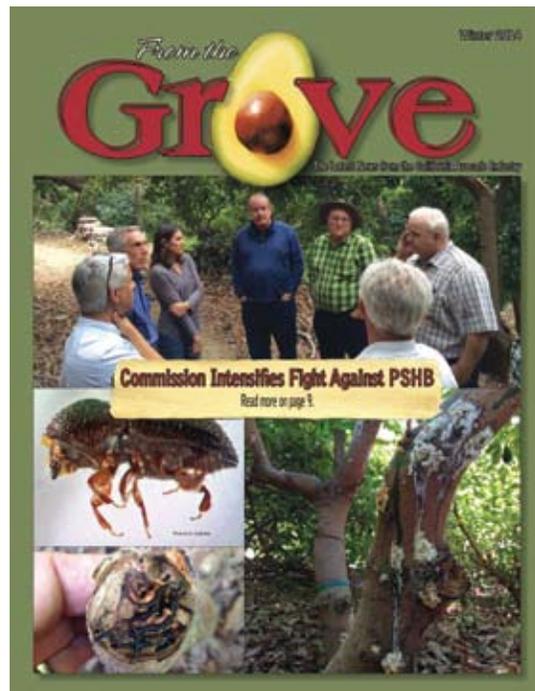
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INDUSTRY AFFAIRS HIGHLIGHTS



By establishing relationships with legislative members, the Commission has been able to successfully advocate on behalf of growers' more pressing concerns while demonstrating the value of agriculture to the state.



Due to proactive and collaborative research projects, robust communication and growers' diligent grove monitoring the threat of the polyphagous shot hole borer was substantially minimized within five years.



A critical step in negotiating for trade access to China was informative grove and packing house tours where officials learned first hand about California growing, food safety and handling practices.



The Pine Tree Demonstration Grove has provided growers with hands-on learning opportunities from a variety of cultural management experts.

dress challenges presented by a changing climate, debuting *From the Grove*, examining pesticide resistance and evaluating research investments to ensure the projects yield actionable, practical grower tools.

Support networks established and refined over the last several decades came to fruition from 2003 to the present day as CAC demonstrated its ability to act quickly and decisively on behalf of its growers. Buffeted by years of proactive research practices, established partnerships with experts around the globe and digital tools that made it easy to disseminate critical information to growers, the Commission ably managed the arrival of the polyphagous shot hole borer (PSHB) pest-disease complex and substantially minimized the threat within five years. As record droughts impacted growers, CAC's established relationships with water districts, secured advantageous water rates (a noted \$300 million in grower savings in 2008) and helped launch conservation programs. Years of advocacy, grove tours and a routine presence in the halls of D.C. and Sacramento ensured legislators were open to hearing the concerns of growers as the Farm Bill, the Trans-Pacific Partnership and new immigration laws were prepared for review. Cognizant of the increasingly crowded U.S. market, CAC continued to forge relationships with foreign nations — China, Mexico, India and Thailand — to explore export opportunities that might provide profitable avenues.

Streamlined Restructuring and 40 Years of Experience Bode Well for the Future

Throughout its history, the Commission has realigned funding and structurally reorganized itself to be mindful of grower concerns, fiscally responsible, and efficient and effective in its actions. Reorganizations took place in fiscal years 1983-84, 1987-88, 2008-09 and 2015-16. The first reorganization put into place a much-needed Industry Affairs sector during the Commission's fledgling years. The second restructuring, subsequent downsizing and move to Santa Ana allowed CAC to funnel resources where they were needed most — marketing. The third resulted in another significant downsizing, greater transparency, additional efficiencies and a long-term Vision 2020. The most recent restructuring, which streamlined board composition, also provided a financial break for smaller growers by redefining the definition of an assessment-paying "producer."

The combined forces of a nimble and fluid Commission, robust advocacy, industry leadership, growers committed to producing a premium avocado, proactive and collaborative research, staunch advocacy for California avocados' premium price, one-of-a-kind consumer engagement with the brand and award-winning marketing campaigns have led to some of the greatest gains in California avocado history. In fiscal year 2015-16, California avocado growers secured the third great-

LOGO PROGRESSION



est crop value in history; in fiscal year 2016-2017, growers garnered the highest ever, average price per pound for California avocados with CAC's help.

As long as the California avocado industry continues to build on the successes and lessons learned from the past, there's no reason to think we — the growers, researchers, handlers, board and staff members — can't weather any of the challenges before us. Here's to the next 40 years. 🥑

2018/19 Business Plan and Budget

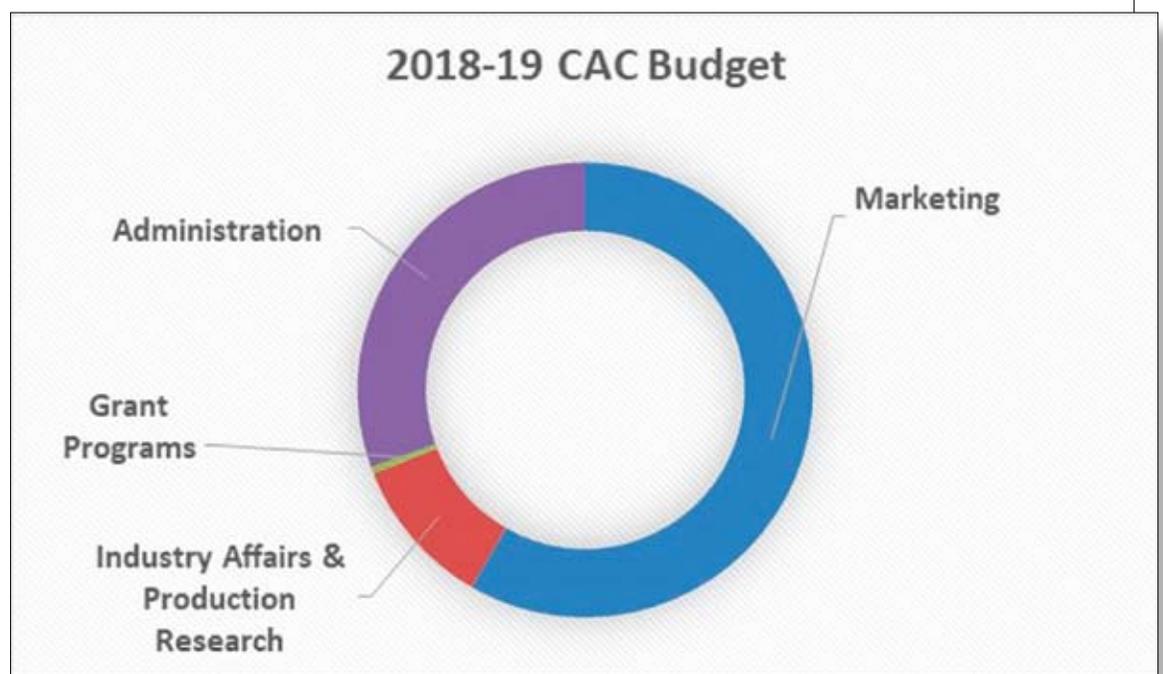
In October 2018, the new California Avocado Commission (CAC) Board of Directors took up the annual task of approving the budget, business plan and setting the annual assessment rate for the upcoming 2018-19 fiscal year. As you can imagine, faced with a crop volume (and revenue stream) of less than half the current year, the task set before the Board was quite daunting. As part of the in-depth analysis, the CAC Board reviewed the anticipated ending 2017-18 financial position, as well as discussed the 2018-19 crop year to come and projected 2019 ending reserve balance. This year the Board also went so far as to look two years out and projected potential ending reserve balance scenarios for 2020.

Based on the various scenarios, it was determined early on in discussions that the CAC assessment rate should re-

main at the current level of 2.3 percent of the gross dollar value. At this point, the Board turned to management's proposed \$11.4 million dollar budget and business plan to review activities and potential cost savings. With the proposed budget already reducing expenditures by nearly \$4.3 million, areas to further cut spending, while continuing to remain relevant in an ever-increasing market, were limited. In the end, the Board approved the proposed business

plan and budget with the understanding that management would carefully watch crop volume and the ending reserve levels throughout the season and initiate budget cuts if necessary, to ensure the organization remains in strong financial health.

The approved 2018-19 budget, while a significant reduction from the prior year, continues to dedicate the majority of spending to marketing, with \$6.7 million committed to programs



and activities that differentiate the premium attributes of California avocados. In addition, the budget allocates \$1.2 million to industry affairs and production research activities, with \$3.5 million for administration and operations. Included here are just a few of the business plan highlights for the 2018-19 fiscal year. The complete business plan and budget can be reviewed online at the following locations:

Business Plan: www.californiaavocadogrowers.com/commission/accountability-reports/business-plans

Budget: www.californiaavocadogrowers.com/commission/accountability-reports/finance

Consumer Marketing

- Continue the Made of California advertising campaign, focusing on seasonal availability and the advantages of locally grown and the unique terroir of California
- Reach CAC's Premium Californian target consumer, including Baby Boomers, Gen X, Millennials and Gen Z, utilizing highly targeted media
- Develop tactics to target avocado super users in California based on lessons from 2017-18
- Leverage third-party advocates to spread key brand messages, including artisan chefs, food blogger advocates, registered dietitian nutritionists, retail registered dietitians, health and wellness blogger advocates, retailers and foodservice operators
- Build integrated programs including Pre-Season Anticipation, Season Opener, California Avocado Month and California Avocado Summer Entertaining, creating new assets and recipes, working with chefs and blogger advocates, using press releases, social media posts, public relations activities and a

food hall sponsorship

- Develop integrated social concepts that support CAC programs and encourage sharing of key California avocado messages
- Optimize website performance, conducting a technical search engine optimization audit and redesigning sections of the website

Trade Marketing

- Utilize CAC's tiered-marketing approach by targeting retailer and foodservice operators, primarily but not exclusively in California, who are willing to pay for premium California avocados
- Create customized menu concepts and promotions for existing and new targeted foodservice operations
- Reinforce CAC's position as the trusted resource for avocado information by continuing to sponsor and participate in select retail and foodservice events
- Build anticipation for California avocado season using targeted trade advertising and support pre-season and in-season activities with trade public relations

Industry Affairs

- Conduct 2018 and 2019 avocado acreage surveys, including an in-depth analysis of acreage impacted by the Thomas Fire and July 2018 weather events
- Process 2019-20 grower exemption status using production data from 2016, 2017 and 2018
- Offer seminars and field demonstrations to update growers and industry stakeholders about relevant and critical industry issues, food safety, the CAC Decision Support Tools, research and cultural management practices

- Expand the reach of industry communications through CAC's grower website, *From the Grove*, and the *GreenSheet*
- Explore possibility of registering gibberellic acid for Special Local Needs
- Monitor water issues, explore federal actions that would improve agricultural water supplies, explore efficiency technologies and represent industry stakeholder interests related to water conservation and pricing
- Monitor regulatory, legislative and trade issues relevant to the industry and advocate on behalf of growers concerning food safety/regulation, immigration reform, APHIS/ARS funding for invasive species, conservation/water efficiency, free trade agreements and emerging and foreign market development
- Work to identify sustainable production practices for the California avocado industry
- Utilize Pine Tree Ranch for grower outreach and education field days
- Develop and improve CaliforniaAvocadoGrowersDST.com
- Attend seminars and join coalitions to broaden support and awareness for industry-wide initiatives and develop collaborative advocacy and research opportunities

Production Research

- Examine the extent, causes and symptoms of Botryosphaeria branch canker and dieback and anthracnose blight disease
- Conduct avocado micropropagation studies
- Develop rootstock breeding opportunities 🍷

By April Aymami
Industry Affairs Director

2018 CAC General Election Results and A Newly Elected Executive Committee

On November 13, 2018, the California Department of Food and Agriculture announced the results of the California Avocado Commission's (CAC) recently concluded 2018 General Election and seated the new board members for commencement of the 2018-19 CAC fiscal year. The CAC Board consists of 19 members and alternates, of which 15 are producers representing the five growing districts throughout California (10 members and five alternates), three are handlers representing operations that handle at least 1 percent of the California crop (two members and one alternate), and one public mem-

ber who is appointed by the California Department of Food and Agriculture (CDFA). Board members and alternates are elected for two-year terms, with half of the producer and handler member seats up for election annually. Producer and handler alternate member seats are elected in odd years.

Below is a summary of the results of the 2018 CAC General Election. A listing of the full Board of Directors can be found on page 5. Please take note of who the current commissioners are that represent your district. If you are unsure of which district your grove resides in, please contact the Commission or locate your city/zip code on the following

chart: www.californiaavocadogrowers.com/commission/district-map

In addition to CAC's annual election, each year the newly seated board takes up the task of electing the Commission's Executive Committee at their November meeting. The following individuals have been elected to serve as the Commission's Executive Committee for the term ending October 31, 2019: 🍌

Chairman: John Lamb
Vice Chair: Ohannes Karaoghlanian
Treasurer: Rob Grether
Secretary: Jessica Hunter

District 1:

2-Year Member Seat
Member: Jessica Hunter

District 2:

2-Year Member Seat
Member: Charley Wolk

District 3:

2-Year Member Seat
Member: John Lamb

District 4:

2-Year Member Seat
Member: Ed McFadden

District 5:

2-Year Member Seat
Member: Salvador Dominguez

Handlers:

2-Year Member Seat
& 1-Year Member Seat
2-Year Member: Gary Caloroso, Giumarra
1-Year Member: Peter Shore, Calavo



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Meet Dr. Monique Rivera— New Subtropical Fruits Entomologist at UC Riverside

Dr. Monique Rivera began her career at the University of California, Riverside (UCR) in July 2018 as an entomology extension specialist. Prior to joining UCR, she worked in many different cropping systems along the East Coast. As a post-doc, she worked in the laboratory of Dr. Lukasz Stelinski, University of Florida, Citrus Research and Education Center, where her research focused on vector-borne diseases such as huanglongbing (HLB/citrus greening) in citrus and laurel wilt in avocado. In California, she intends to work on the entomological issues growers find most important with a focus on vector-borne diseases, perseia mites and others, as well as pollination enhancement. She looks forward to working with California avocado growers and is interested in hearing what problems most concern them. She can be reached at monique.rivera@ucr.edu, 1.951.827.9274 (office) or 1.323.628.5234 (mobile).

We asked Dr. Rivera a series of questions as a means of introducing her to California avocado growers. Her responses are below.

1. How did you become interested in entomology?

I didn't know what entomology was until I started college and was looking for majors. It seemed different and interesting. I took my first class and then secured an internship the following summer with the integrated pest management (IPM) specialist in my home state of Delaware. I learned that I liked entomology, but I also loved agriculture. From there I knew I wanted the focus of my career to be in agriculture.

2. Where did you get your PhD and what was your research focus?

I finished my PhD in 2016 at Rutgers University in New Brunswick, New Jersey. The focus of my PhD was plant domestication in highbush blueberry and how that impacts below-ground biological control of root-feeding insects with entomopathogenic nematodes. I was able to compare domesticated plants to wild plants in the Pine Barrens that have been preserved since the domestication of highbush blueberry in New Jersey.

3. Can you tell us a little bit about the research you did in Florida for your post-doc and how that has prepared you for your current position?

My experience in Florida was perfect preparation for this position. I worked with two vector-borne diseases, HLB in citrus and laurel wilt in avocado. These two diseases are major threats to the California citrus and avocado industries, respectively. I not only gained hands-on experience working with these two systems, I also made relevant and dependable connections that will be highly valuable going forward.



Dr. Monique Rivera

4. Were you involved in any laurel wilt research and what are your thoughts on how the California industry can prepare for this disease?

I was directly involved in laurel wilt research. We were able to generate compelling data on push-pull management systems in the field to help repel and kill incoming beetles. In terms of preparing for the disease, right now the focus should be on monitoring all surrounding states, not just within California. It is important to know the distance from the nearest infection. Furthermore, educating growers about the disease will be key to preparing them for this potential threat.

5. What attracted you to the job opportunity at UC Riverside?

Honestly, in the academic job market, you go for what is available and what is a fit for your work. Without question the position was a fit for my experiences and interests. I just happened to get lucky — the entomology department at UCR is prestigious and filled with great people to work alongside. I never expected that I would end up in California! 🍋

By Gary Bender
Farm Advisor Emeritus
UC Cooperative Extension,
San Diego County

High Density Avocado Production

A Method to Improve Yield per Acre

How does a grower in California make a profit when the water prices keep increasing and yet, mostly due to foreign competition, market prices remain fairly static?

This was the question we were facing back in 2011 when growers in the Valley Center and Fallbrook areas started to turn off their water and were letting their groves dry up. Yield per acre that year in our county was about 5,000 pounds per acre, and the water requirement in the inland valleys was about 4.5 acre feet per acre. At that, the grower was losing money just by paying the water bill. As the farm advisor for San Diego County, this was the complaint that came into my office every day, and there didn't seem to be a good answer.

Since we couldn't seem to do much about reducing water costs, the answer simply appeared to be increase yield per acre so that water bills and other costs could be paid, and (hopefully) there would be enough left over to make the grove profitable. That sounds simple, right? A lot of growers thought there could be some type of fertilizer or microbe one could buy at the fertilizer store to dramatically increase production, but that didn't seem to be the case. On the downside, the grower could

dramatically decrease his or her yield if enough nitrogen and minor elements weren't applied.

What else is out there that could increase yields? For some time, there had been research going on in Chile and South Africa where they were experimenting with higher density production. This was reported to us by Fallbrook grower Reuben Hofshi in 1999. They weren't sure about the exact spacing but many of the trials were on 3 meter x 3 meter spacing (about 10' x 10'). A few of our growers had tried this spacing and John Cornell in Temecula showed me that he produced more than 32,000 pounds per acre in the sixth year, and Steve Howerzyl in Escondido produced more than 24,000 pounds per acre in the fifth year. But both were having problems. John had done his pruning and had apparently cut all of the fruiting wood off for next spring (and his trees were in alternate bearing) and Steve was not pruning and his grove became impenetrable for the irrigator to check the sprinklers, and his yields were declining.

So a high density spacing looked possible, but we had to work out the pruning system. But I thought the increase in yield was still too slow; in or-

der to save groves in our county we had to increase yields faster than that. The only other method that could increase yields might possibly be cross-pollination. Fortunately, Mary Lu Arpaia had run a cross pollination experiment in Ventura County and determined that Zutano was one of the best for increasing production in Hass. And from personal experience, I had seen many Hass trees next to Zutanos that were always loaded with fruit. But these trees were always side by side. Walking away from the Zutano tree I could see that the yield on Hass usually dropped off fast.

There also was an important paper from Israel that showed that Hass fruit pollinated by a B-flower avocado had a lower drop rate; Hass fruit pollinated by Hass had a higher drop rate.

So the thought was: in order to increase yields as fast as possible, why not combine these factors and plant on a 10' x 10' spacing with a pattern of eight Hass trees surrounding a Zutano, and include a lot of beehives near the trial. We also had the nursery graft our Hass and Zutanos onto clonal Dusa rootstocks because these were the best root rot tolerant rootstocks available at the time. And they apparently have some salt tolerance and looked to be a

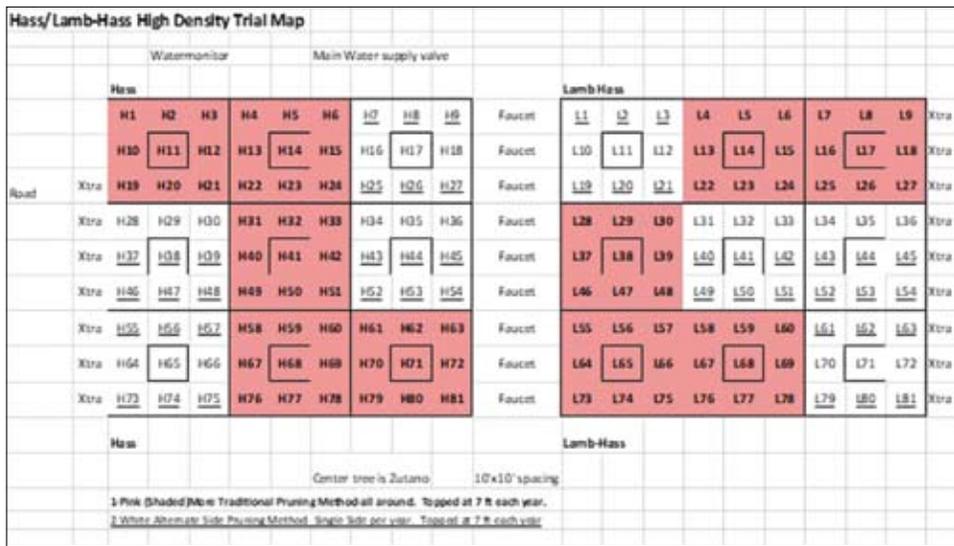


Figure 1. High Density Trial Map

good high-yielding rootstock.

From research done in South Africa, we knew that the height of the trees should be about 80 percent of the spacing. Therefore, our 10' x 10' planting should have a height of eight feet. (A 20' x 20' spacing should have a height of about 16 feet.) This height allows sunlight to pass over the top of a neighbor tree and shine light on the lower canopy of the next tree. This arrangement tends to keep leaves on the trees all the way down to the ground, which in turn allows us to keep our fruit low in the tree and pick without using ladders.

From work done by Carol Lovatt at UC Riverside, we knew we shouldn't be pruning in the summer as it tends to remove fruiting wood for the following spring. So the pruning method for high density was still unknown.

The trial proposed to the California Avocado Commission in 2011 was to compare two pruning styles. The trial was funded in 2012 with the following objectives.

Project objectives: 1. Set up a high density Hass grove and a Lamb Hass grove with B-flowered pollinizer trees (Zutano) in order to maximize production. The density chosen for this project was 10' x 10' with topping at eight feet

(later reduced to seven feet due to rapid growth of the trees). An important component for this trial was the grower/cooperator. The grower/cooperator for this trial was the Nick Stehly Ranch in Valley Center. This family had participated in several previous trials and I knew from experience they were interested in research and were very helpful taking care of the trees and helping us with the harvest data collection.

2. Compare two styles of pruning in order to keep avocado trees growing effectively in a high density pattern, but keep the maximum amount of fruiting wood on each tree. Yield per tree and fruit size would be used for data collection.

3. Keep track of hours for pruning labor to determine if high density is cost effective.

4. Keep track of irrigation amounts to determine if high density results in less, more or the same amount of water use compared to nearby tall trees on a 20' x 20' spacing on the same ranch.

Setting up the high density planting: The primary objective for this project was to produce the maximum amount of fruit per acre on a sustained basis. As noted, we set up the planting in nine-tree units, eight Hass

trees surrounding a Zutano tree. The Lamb Hass side of the planting was set up the same way. In addition, because there was a lot of avocado root rot on the Stehly Ranch, we ordered the trees grafted onto clonal Dusa rootstocks, which were the most root-rot tolerant rootstock at the time of planting.

We asked for a hillside at the Stehly ranch that did not have a history of avocado root rot, and they gave us a gentle slope that had never been planted. The soil was a clay loam with a large amount of granite rock.

The trees were planted in August/September of 2012. There was a heat wave during planting and we lost 10 trees, but they were immediately replaced. The irrigation was set up as spot spitters aimed at the base of the trees. These were changed to full circle 14 gallons per hour micro-sprinklers in 2014.

The trial was planted with 72 Hass/Dusa with 9 Zutano/Dusa trees on the Hass side of the project, and 72 Lamb Hass/Dusa and 9 Zutano/Dusa on the Lamb Hass side of the project. The planting pattern is shown in Figure 1. Sterilized metal stakes were installed and the top branch was tied to the stake in order to make a quasi-central leader. It should be noted that avocados normally come from the nurseries without central leaders, which makes it difficult to form a true pyramid shape.

The pruning trial: The traditional method of pruning high density trees is to prune all sides and top each year. Some growers don't prune at all and after a few years they give up because the groves get too crowded. So we knew the pruning was necessary, but there is disagreement as to how to prune. Pruning avocado is difficult because there is always young fruit, maturing fruit and/or flowers on the trees. We chose to compare two styles. We had enough room for five nine-tree units of Style 1 and

four nine-tree units of Style 2.

Style 1: Harvest fruit in early March and prune the trees similar to a fat Christmas tree shape, with topping at seven feet. The idea was to keep the tree height in the eight foot range in order to achieve the ideal height at 80 percent of the tree spacing (10') as proposed by Stassen in South Africa. Trees also were skirt-pruned at this time keeping the skirts one foot off the ground. This pruning began in 2014.

Style 2: Harvest fruit in early March and alternate-side prune starting with the south-west side in the first year. The side that was pruned was heavily pruned creating a 60-degree angle from the lowest branch on the pruned side to seven-foot height on the tree. The non-pruned side was left alone in order to preserve as much fruiting wood as possible. The following year the north-east side was pruned severely, and back to the south-west side the following year. Trees were skirt pruned at this time to one foot off the ground. This pruning began in 2014.

Clearing the aisles: Starting in 2015 it became necessary to clear the aisles in late July and late September. This was done each year during the trial. This allowed enough room for a worker to walk around each tree unimpeded and allowed sunlight to reach the lower branches.

Harvesting

Comparison of yield for two pruning styles: Each tree was harvested separately in March of each year (2014-2017). The actual data for the harvest comparing the two styles of pruning is being prepared for a journal article and will be presented in this magazine in a future article. However, results thus far have indicated no significant difference in yield per tree be-

tween the two pruning styles. Likewise, there was no significant difference in numbers of fruit per tree between the two pruning styles.

Yield per acre in the high density trial: This trial had 72 Hass trees and 72 Lamb Hass trees. A 10' x 10' spacing would have 430 trees per acre,

but this trial also had 18 Zutano trees, which would be equivalent to 43 Zutano trees/acre. Therefore, the yield for 72 trees from both pruning styles from our trial, divided by 72 gave us yield per tree. Multiply yield per tree times 387 would give the yield per acre of Hass or Lamb Hass based on the yield from this trial. In our trial from years 2014-

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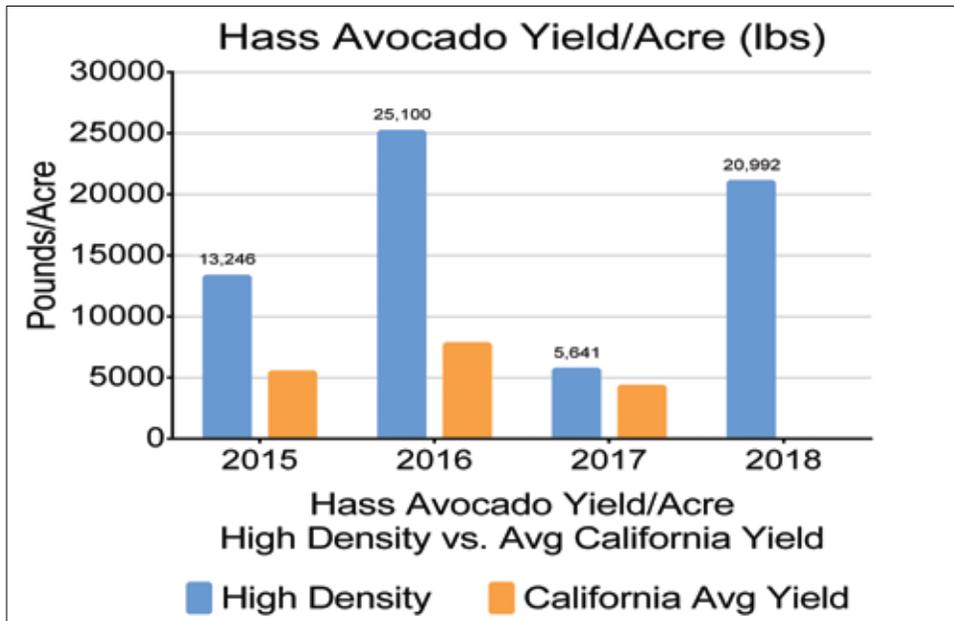


Figure 2. Comparison of the yield from this high density trial (387 Hass trees/ac) vs California average yield/ac (commonly 109 trees/ac).

2018 yield per acre in Hass has been 480 pounds per acre, 13,246 pounds per acre, 25,104 pounds per acre, 5,641 pounds per acre and 20,992 pounds per acre, respectively. The 2017 harvest was an off-year due to high temperatures in June 2016 and typical alternate

bearing. From years 2014-2018 yield per acre in Lamb Hass has been 975 pounds per acre, 8,796 pounds per acre, 15,243 pounds per acre, 10,274 pounds per acre and 11,706 pounds per acre, respectively. Charts for this data are in Figures 2 and 3.

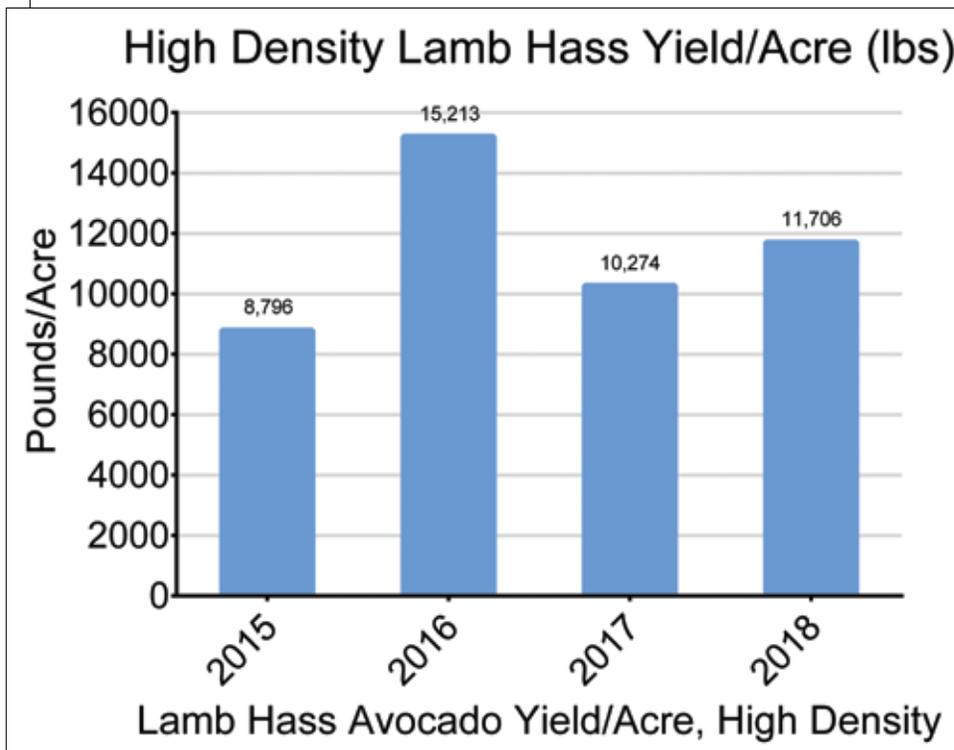


Figure 3. Yield per acre for Lamb Hass (387 Lamb Hass trees/ac) based on data from this trial.

Irrigation, water requirement

In late 2012 Watermark soil irrigation monitors were installed at the edge of the root balls, eight inches below the soil surface. These were hard-wired to a battery-powered box for monitoring. Watermarks were located at the top of the plot, mid-plot and in the bottom row of the plot. Because the soil had a high clay content, the trees were irrigated when the Watermarks averaged 35-40 centibars (cb). They seemed to work perfectly and our trees never had any tip-burn. Watering was done by the grower with guidance from us, but there were some mistakes made by both parties. For instance, we left the water on overnight and the grower also left the water on overnight in the summer of 2016. This is reflected in the high water use in 2016.

Monthly water use readings were taken on the last day of each month. Water use for each year is shown in Table 1.

Pruning labor

Because trees were being pruned in order for light to reach the bottom branches, and aisles were being cleared for workers to walk around trees, it was suspected by some growers that high labor costs might dramatically reduce the benefit from higher yields from high density plantings. We kept track of pruning labor and this data will be published in a journal and in a future article for this magazine. However, it can be said that the alternate side pruning took about two-thirds of the labor hours compared to the all sides pruning. And it was necessary to skirt prune about one foot off the ground to keep low hanging fruit from touching the ground. It also can be said that the increase in yield more than made up for the high pruning costs.

Table 1. Water applied to the 162 trees in the trial was recorded monthly. Yearly summations are presented below. Gallons/acre and acre feet/acre are calculated based on 430 trees/acre planted on a 10' x 10' spacing.

Time Period	Gallons applied per 162 trees	Gallons/acre	Acre feet/acre
2/15/2013 - 10/31/2013	14,388	381,926	1.17
11/1/2013 - 10/31/2014	405,232	1,075,615	3.30
11/1/2014 - 10/31/2015	353,610.5	938,595	2.88
11/1/2015 - 10/31/2016	591,991.7	1,571,336	4.82
11/1/2016 - 10/31/2017	46,501.8	1,234,293.3	3.79

Harvesting labor

Because trees were being kept below eight foot, ladders were not required and harvesting was much less expensive. We kept track of our hours for harvesting labor but we rarely had use of professional pickers. Also the harvesting we did was slower than normal because we required the fruit from each tree to be brought to the weighing scale. In addition, we used various people on the ranch that did not have experience with harvesting. Therefore, the hours are not considered reliable and are not presented in this report.

Conclusions

1. Earlier reports indicated that growers need to produce at least 10,000-11,000 pounds per acre to break even in conventional Hass avocado production in San Diego County. Our project showed that a high density planting is able to produce Hass avocados at 13,246, 25,100, 5,641 and 20,992 pounds per acre over a four-year period for an average of 16,245 pounds per acre per year. In this trial Lamb Hass produced at 8,796, 15,213, 10,274 and 11,706 pounds

per acre for an average of 11,497 pounds per acre per year.

2. The comparison of alternate side pruning and topping at seven feet versus all sides pruned and topped at seven feet each year did not indicate a significant difference in yield between the two methods.

3. There is a significant cost for pruning and, for Hass, we think it should be done right after harvesting in early spring. There should still be enough flowering left after pruning to go ahead and set a good crop. Heavy pruning later will remove young fruit that have just set. Pruning in the summer will remove fruiting wood for the following spring.

4. If a grower decides to try high density plantings there must be a commitment to a pruning program. If not, the trees will drop the lower leaves and become quite leggy.

5. Although cost and return data will be presented in a future article, it can be said that, based on information developed from this trial, there was an increase in dollars per acre from yield minus pruning costs in three out of the last four years.

6. Water use per acre was 2.88 acre feet per acre, 4.82 acre feet per acre and 3.79 acre feet per acre for an average of 3.89 acre feet per acre during 2014-2017, less than the 4.5- 5.0 acre feet per acre used by the Stehly Ranch for their big trees on 20' x 20' spacing (normal for Valley Center). Water use on the high density trial was probably less because our trees do not have branches with leaves up in the wind which drives heavy water use.

7. Lamb Hass yield was okay but not as good as Hass. Lamb Hass is harvested in the summer and we had difficulty trying to prune these trees and not remove fruit during the pruning. Lamb Hass also had a high drop rate in the heat.

8. It appears that high density production for Hass is a viable way to increase income per acre and can help the growers in high water-cost areas to stay in production. However, I question whether we can spread the harvest out through the year and not affect the yield with pruning.

9. Are all those Zutanos necessary? We often get that question. Unfortunately, we did not have a comparison trial without the Zutanos, but my feeling is yes, I think they help increase the yield. But I cannot support that statement with data. That will be up to the grower. But please don't expect to support cross-pollination with just a few Zutanos, Bacos or Fuertes on 10 acres of Hass... it's not going to happen!

Research funding: We appreciate research funding from the California Avocado Commission.

Cooperating personnel:

Sonia Rios, UC Cooperative Extension Farm Advisor, Riverside and San Diego Counties; Gary Tanizaki, UC Cooperative Extension Staff Research Associate, San Diego County; and Nick Stehly Ranch, Valley Center 🍌

2019: Another Unique Year on Tap

A common agricultural industry adage is that no two years are alike. A discussion with a handful of handlers reveals that the 2019 California avocado crop season is going to prove that theory in spades.

"I've been in the business for 35 years and I think I'm no better at predicting what's going to happen...maybe worse," quipped Jim Donovan, a senior vice president at Mission Produce Inc., Oxnard, CA.

As 2018 heads for the exits, there are many questions circulating about the upcoming California season. How big is the crop going to be? Will the season be truncated because of the smaller crop? Will California fruit be much higher priced because of the lower volume? Will the fruit from the Golden State continue to enjoy a premium in the marketplace? What are the other sources of supply expected to send to the U.S. market? And the million dollar question... When is the best time to market the California production?

Growers are asking these questions but so are the handlers.

How big is the California crop going to be?

For budget purposes, the California Avocado Commission has set the size of the crop at 160 million pounds. Around the first of the year, a more accurate number is expected to be attached to the crop once all the survey reports are in and winter weather can be better assessed. Of course, the weather will play an important role in both siz-

ing what's on the trees and maximizing the marketability of that fruit. In early December, handlers appeared to be comfortable with the budget number CAC is using. "We know we are going to have reduced volume this year, certainly much less than last year," said Gary Caloroso of the Giumarra Companies. "At this point it is too early to tell but we think the early estimate is accurate."

Phil Henry of Henry Avocado Corp. reported that the southern district, which is home to all of their company-owned fruit, has a much lighter crop on the trees than last year. He said that was always going to be the case as last year's crop on the trees was a good sized one with weather, fire and heat reducing the marketable portion considerably. Though growers do what they can to combat it, the general nature of an avocado tree is to be alternate bearing. On the particular day that Henry was being interviewed, it was raining in San Diego County. He said a good deal of rain during December will greatly help this year's crop. Not only will the rain help size the fruit, but Henry said it will improve the health of the trees, which will have a big impact on the length of the season. He noted that a healthy tree allows the grower more flexibility with regard to harvesting and allows the fruit to be held on the tree longer, if that proves to be advantageous.

One very positive observation that Henry has made is that the trees themselves – at least the ones that Henry owns and manages – don't appear to

have been damaged by the very high temperatures in July. He said that statement is highly dependent on the health of your trees going into that heat wave. But the trees in good shape going in, appear to have survived the furnace-like temperatures that hit in early July.

Will the season be truncated because of the smaller crop?

While intuitively that seems to make sense, handlers didn't necessarily see it that way. Donovan said regardless of the size of the crop, the first thing any grower should do "is optimize the weight of the fruit and the tonnage you have on your trees. Weight is money."

So from that perspective, each grower should try to harvest his own fruit when it is at its best and heaviest. But others factors have to play a role. First and foremost is each individual grower's own situation. If you have a light crop and only one harvesting pass makes sense, timing is going to be critical to maximize your volume while minimizing the harvesting costs. A grower with fuller trees might see great results this year from size picking the grove two or three times during the season to maximize production of the most desirable sizes.

Caloroso said customer demands are also going to play an important role. "We have some customers – especially in California – that want California fruit as soon as they can get it and then they take it as long as they can."

Extending the season from January through August for these retailers is

seemingly the best strategy. He does believe that the vast majority of fruit will be harvested from March to July but it could be very advantageous for growers who can to work one end of the marketing season or the other.

When is the best time to pick?

In general, the handlers agree that this is an impossible question to answer, especially four months before any appreciable volume is being picked on a weekly basis. “With the fruit we own, we don’t try to time the market,” said Henry. “That’s a very hard thing to do.”

Instead Henry spreads out its volume over as much of the year as they can and harvests at a steady pace. With this strategy, they do expect to participate when the market gets hot. “But ultimately each individual grower has to make that decision for himself,” he said.

Donovan said logistically, it is very difficult to time the market because handlers like to schedule those picking dates four to six weeks in advance. One might anticipate a strong market at a particular time in the summer, for example. But that market will be materially impacted by factors that the grower has no control over – such as supplies from another country. “There are just too many factors involved in the avocado industry to know for sure what’s going to happen,” he said.

Going into the 2019 year, Donovan said there are no known supply holes that will exist during California’s harvest season. Mexico has a good crop and Peru is expected to send a good deal of volume to the U.S. market during much of the California season.

Caloroso agreed that each grower should make the marketing decision based on their own groves. “Some groves are historically prone to wind. You are going to want to pick those early. The number one factor should be when

is it best for your fruit to be picked.”

Will California fruit be priced well and will it get a premium?

Caloroso did go out on a limb and predict a strong market throughout the season for California avocados. He reasoned that the crop is light and “there are a lot of buyers that like California fruit. For that reason, it is going to be more valuable this year.”

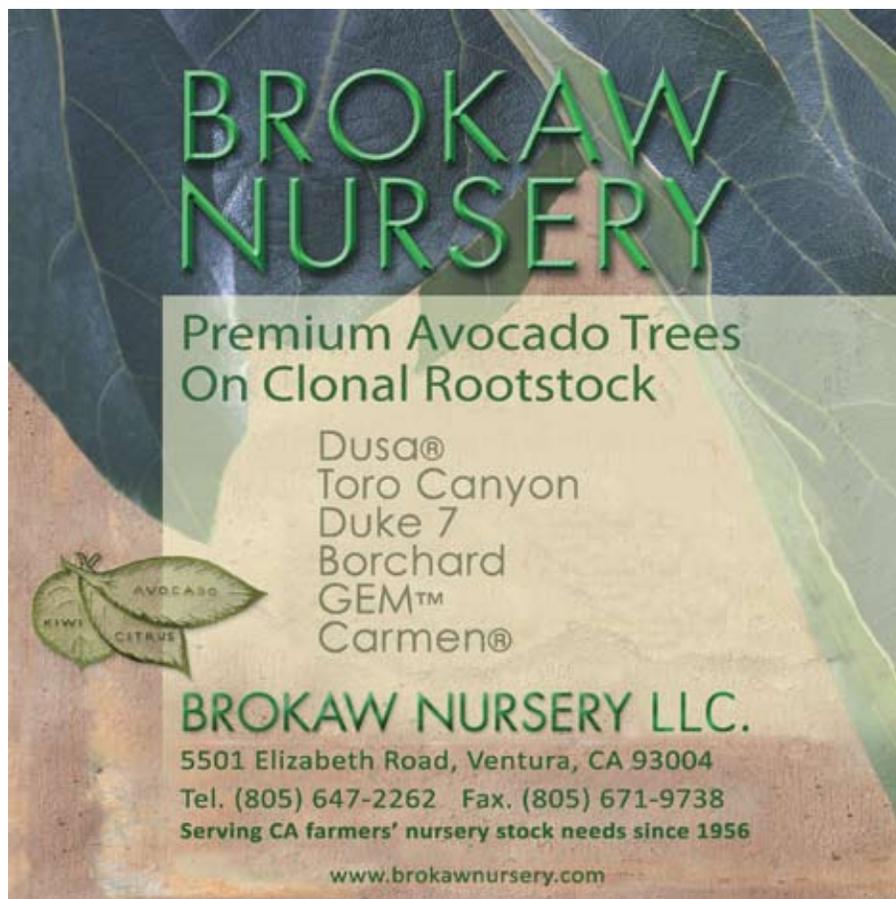
That prediction also fuels his belief that growers should harvest when their fruit is ready and not be overly concerned about the market. “We think there should be a good market for California fruit throughout the season.”

Henry also “anticipates a pretty good year” for California. He said the industry has received a premium for its fruit the last few years and with a smaller crop that should again be the case.

Donovan of Mission was a bit more cautious. He said California

fruit will most likely sell for more than fruit from other countries a good portion of the time, but he stopped short of predicting that it would be a strong market. He again reiterated that there are many factors to pricing that are out of the hands of the California growers with the most important being the total volume of avocados on the market in any given week.

A fact that could give growers both pause and optimism as they look ahead is the situation that occurred during the last two weeks in November of 2018 following the grower strike in Mexico earlier in the month. During those two weeks, Mexican growers reportedly harvested about 80 million pounds each week. More than 68 million pounds were sent to the U.S. during the week ending Nov. 25. “That points to the size of the market and what it takes to fill up the pipeline,” Donovan said. 🥑



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CAC Crew Kicks off 40th Year Celebration at PMA Fresh Summit

The California Avocado Commission (CAC) kicked off its 40th anniversary at the Produce Marketing Association (PMA) Fresh Summit 2018. The event took place in Orlando, Florida, from October 18–20, 2018. Commission staff met with retailers, avocado handlers and growers, registered dietitians, educators, trade media representatives and other produce industry stakeholders, discussing the upcoming California avocado crop, customized marketing support programs, avocado nutrition and more.



CAC Retail Marketing Director (RMD) Dave Anderson with Rick Prodoehl of Kroger Corporate.



CAC's representatives accepted Produce Business magazine's Marketing Excellence Award from publisher Ken Whitacre; the graphics on the wall behind them showcased CAC's advertising, merchandising and nutrition milestones from the past 40 years.



Jan DeLyser and Connie Stukenberg met Daniel Bell, Grocery Outlet, in one of two well-used meeting spaces in the CAC booth.



Raley's Michael Schutt, center, with CAC's Connie Stukenberg and David Cruz.



CAC RMD Cece Krumrine met with Denise Dryzga of Hannaford Bros.



CAC RMD Carolyn Becker showed Jeff Fairchild of New Season's Market an article in *From the Grove* magazine featuring an interview with him while CAC Board Secretary Jessica Hunter and Patrick Lucy looked on.



CAC's Jan DeLyser and Ken Melban learned about traceability initiatives from PMA Vice President of Supply Chain Efficiencies, Ed Treacy.



Bonnie Taub-Dix, MA RDN, CDN shared California avocado nutrition information as part of her "Benefits of In-season Eating" presentation to groups of retail dietitians in the second-story conference room of CAC's booth.



Sam's Club representatives Jeremy Coleman and Doug Cahoon met with Jan DeLyser in the CAC booth.

Foodservice Represents a Golden Opportunity for California Avocados

In the fall, the California Avocado Commission (CAC) conducted a multilevel foodservice research project to get a bead on the opportunity for California avocados in foodservice for the near future. The project investigated trends in avocado inclusion on restaurant menus, usage trends, patron and operator opinions about avocados in general as well as California avocados specifically, and the associations with California branding. This research will be used to create impactful and targeted marketing and advertising campaigns for the foodservice channel.

Study Methodology

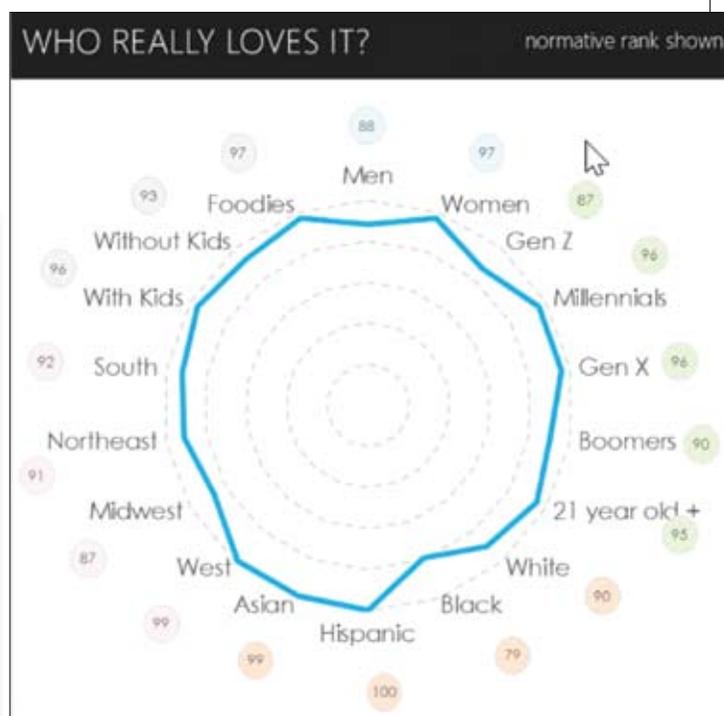
The three-part foodservice study utilized methodologies that combined primary research among consumers and foodservice operators with secondary menu trend research. CAC worked with Datassential MenuTrends, the industry's most accurate system for tracking trends at commercial and non-commercial restaurants. Datassential's primary U.S. Chains & Independents database is comprised of 4,800 restaurants, which are balanced to the U.S. restaurant landscape. MenuTrends measures penetration (percent of restaurants that serve a particular food) and incidence (percent of menu items that feature a food).

Datassential also included California avocados in an omnibus survey of 406 foodservice operators nationwide, 257 of whom purchase avocados. This eight-question operator survey was fielded in October 2018.

Research firm Menu Matters also worked cooperatively with the Commission to design and field a consumer/restaurant patron survey online to a nationally representative sample. Consumers qualified for the survey based on an affinity for avocados, with 1,635 qualifying (1,448 qualified for one section of the survey based on ordering avocados away from home). Sub quotas were set for California residents (n=469) and patrons visiting each of the commercial segments at least one time per month or more often (n=421 to 1361). These sub quotas allow analysis of the data also just for California and for each of the foodservice types. The survey was in field from September 17 to September 21, 2018.

Key Study Results

Consumers really do love avocados, almost universally among various age groups, ethnicities and regions. Certain groups have a particularly strong affinity for avocados, including Hispanics, Asians, consumers in the West, "foodies" and women.



Usage of avocados in the foodservice arena is growing, yet has opportunity for continued growth. More than half of restaurant menus nationwide include avocados and/or guacamole. In the past 10 years, this has increased 26 percent and is projected to continue growing. Fast casual and fine dining segments have experienced the greatest growth, and breakfast is the most developed meal occasion for avocado inclusion on menus, at 37.1 percent

A key reason for avocado growth in foodservice is the breadth of usage in a variety of dishes and types of cuisine. Datassential rated avocados 75 out of a possible 100 on versatility. (See penetration by item and cuisine types in chart on page 45.)

While the research on menu inclusion showed about half



if “California” is in the menu name or descriptor. In California and the West, almost 8 in 10 consumers feel that way. Other associations with the word California on menus are very positive, such as “includes fresh produce”, “fresh”, “healthy” and “premium quality.”

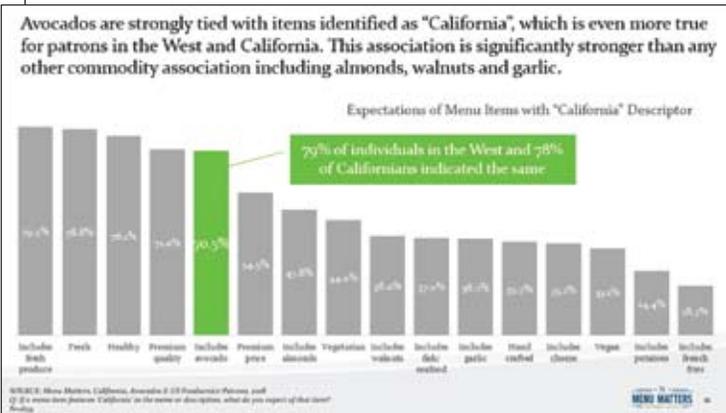
Consumers also have positive perceptions about the restaurants that serve “California” items, believing the restaurant “features fresh ingredients” (83.4 percent) and “sources high quality ingredients” (80.2 percent), along with other positive attributes such as “caring about the environment” and “caring about the economy.”

Consumer association with California having higher quality avocados is strong. When consumers were asked if they believe some fruit and/or vegetables are higher quality if they come from a specific state or region and were prompted to say which fruits/vegetables and which states/regions, nearly 1 in 5 came up with California and avocados. Note, these consumers were asked about any produce (not avocados specifically). There is opportunity to strengthen this association even more.

of menus mention avocados, 63 percent of foodservice operators surveyed say their operations purchase avocados. The majority of those who buy any avocado (82 percent) purchase fresh, whole avocados. This means that just over half of foodservice operators buy fresh, whole avocados, which is excellent penetration in this channel. It also indicates a tremendous opportunity to increase fresh avocado sales to the foodservice operators (nearly half) who do not buy them currently.

The key reason (58 percent) some operators do not buy avocados is they believe “they don’t fit with my menu”. Other top barriers to purchase are “too expensive” (22 percent), “they ripen too quickly” (19 percent) and “concerned about waste” (19 percent).

The foodservice research project also explored consumer and foodservice operator attitudes toward foods and beverages from California (in general and avocados specifically). Restaurant patrons have very positive expectations for foods/beverages identified as being from California.



Based on field observations, for years CAC has asserted that if a dish on a menu says “California” in the name, then there is usually avocado in the dish. Now research confirms that restaurant patrons feel the same way. More than 70 percent of restaurant patrons identify avocados as a component

The research also pointed out development areas with foodservice operators. Operators need to be convinced that calling out California avocado origin is important to consumers. Most who purchase California avocados don’t call it out on their menus mainly because they don’t think their patrons care about it (but consumers indicated in the research that they do care). Also, operators may have an opportunity to increase prices when menuing California avocados because consumers expect higher pricing and say they are willing to pay more for California avocados.

In conclusion, with avocado penetration in foodservice expected to grow, room to expand avocado inclusion in various cuisines and day parts (such as breakfast, lunch, happy hour, dinner), operator under-utilization of California branding and outstanding consumer perception of California avocados/the California origin, the outlook for California avocados in the foodservice sector is very bright. 🥑

Severity of *Fusarium* Dieback – Shot Hole Borers Analyzed

By: Shannon C. Lynch,
*Department of Environmental Studies,
UC Santa Cruz*

Joseph D. Carrillo,
*Department of Plant Pathology,
UC Davis*

Richard Stouthamer,
*Department of Entomology,
UC Riverside*

Akif Eskalen,
*Department of Entomology,
UC Riverside*

Introduction

The emergent *Fusarium* dieback – Shot Hole Borers (FD-SHB) pest-disease complex has been a source of concern to the avocado industry since its discovery on a backyard avocado tree in the Los Angeles basin in 2012. The dieback is caused by the combined effects of two ambrosia beetles, polyphagous shot hole borer (PSHB), *Euwallacea whitfordiodendrus* and Kuroshio shot hole borer (KSHB), *Euwallacea kuroshio* and the specific fungal pathogens each beetle carries (*Fusarium euwallaceae* and *Fusarium kuroshium*). In addition to their fusaria symbionts, each beetle carries *Graphium euwallaceae* and *G. kuroshium*, respectively, and *Paracremonium pembeum*. The adult female tunnels galleries into a wide variety of host trees, where it lays its eggs and grows their symbiotic fungi.

Although PSHB rapidly spread throughout urban-wildland forests in the Los Angeles basin, it was not detected in commercial avocado groves until after a KSHB attack was confirmed in commercial groves shortly after its detection in San Diego County in late 2013. As KSHB became well established in avocado groves in San Diego County, PSHB subsequently spread into Ventura County and was detected on trees in a handful of groves in late 2015. Given that San Diego and Ventura counties produce 70 percent of the U.S. domestic

avocado crop, it has become critical to understand patterns of spread and severity of attack to inform best management practices of the problem. The need for recommendations guiding the long-term management response to the threat FD presents is recognized as a top priority for a variety of land managers and agencies throughout the state. The cur-

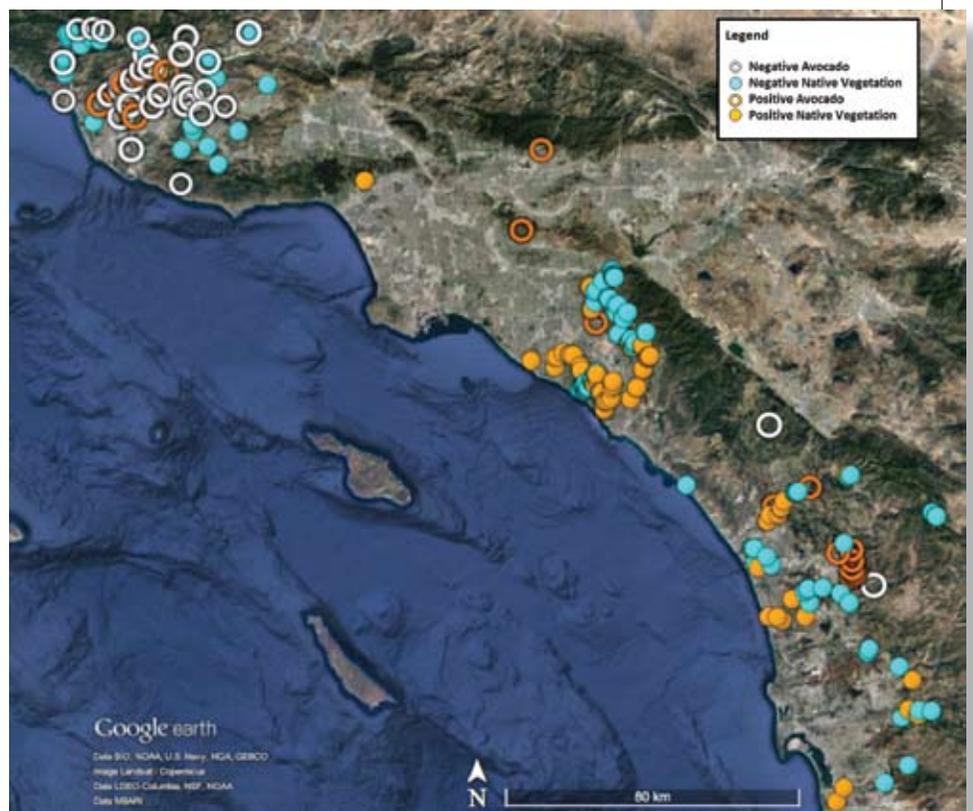


Figure 1. *Fusarium* dieback – shot hole borer monitoring plots established throughout San Diego, Orange and Ventura counties, including those in native vegetation.

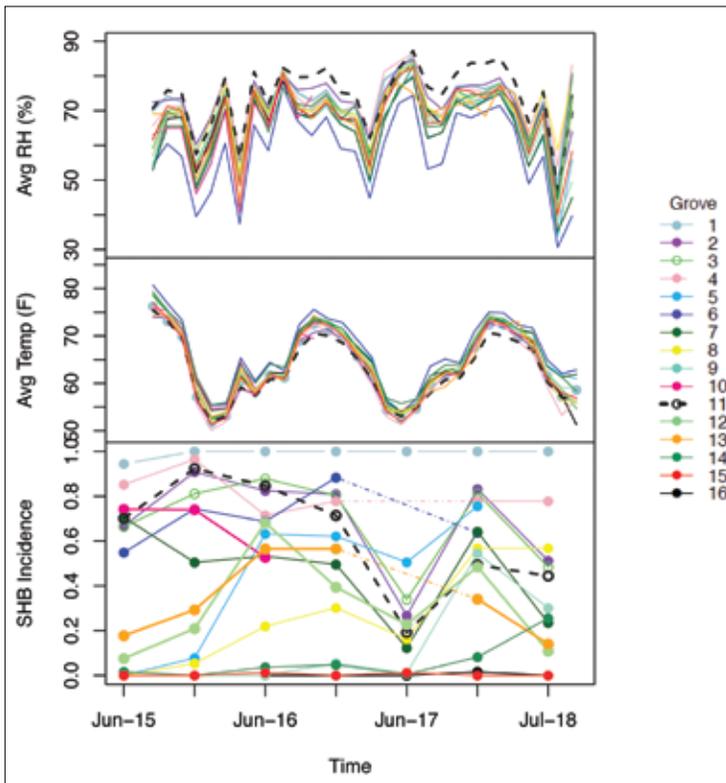


Figure 2. Average relative humidity (A) and average temperature (B) and SHB incidence (fraction of infested trees per grove, between 0 – 1) (C) for sixteen groves surveyed in San Diego County between 2015 and 2018.

rent project herein is the initiation of a multi-phased effort to develop essential building blocks for Integrative Pest Management (IPM) to address the FD threat, which involves identifying the scope of the problem throughout the avocado growing range in California and the development of a policy and management response in line with the magnitude of the identified problem.

Our objectives were to 1) Determine patterns of spread of SHB on avocado trees and across groves; 2) Identify potential environmental factors that contribute to the distribution, establishment, and spread of SHB; and 3) Provide initial management guidelines in light of ongoing experiments and monitoring studies.

Methods

In June and August 2015, we established 16 one-hectare monitoring plots in 13 infested and five non-infested groves in San Diego and Orange counties (Fig. 1). Plots were visited every six months for a total of eight visits. Each plot contains a Hobo data logger that measures temperature and relative humidity every 30 minutes. For each of the 3,346 trees surveyed, we assessed their health, overall SHB severity, attack severity by plant part, and recorded the presence of other diseases (e.g. bacterial canker, botryosphaeria canker, black streak, phytophthora root rot). The proportion of groves infested increased from 70 percent to 87 percent by the fourth

visit and did not change in the two subsequent surveys. Interestingly, the proportion of trees infested (SHB incidence) fluctuated over time (Fig. 2 C), with a striking drop in incidence in five of the heavily infested plots in June 2017 (20 – 88 percent decrease), followed by a spike in December 2017. Multiple logistic regression analyses revealed that incidence trends were not associated with microclimate (temperature and relative humidity, Fig. 2 A – C), tree density, or tree size, suggesting that spread is mostly driven by host availability in this early phase of the epidemic. However, an assessment of whether these factors influence *Fusarium* dieback spread over a broader geographic area – combined with long term monitoring and landscape considerations – will likely reveal a clearer picture as to what is driving these dynamics. To that end, with additional funding granted by CDFA and the Farm Bill we established an additional 36 plots in avocado groves in Ventura County and 5 plots in San Diego County (Fig. 1) in June 2017. Five of the 36 plots in Ventura (14 percent) were infested in locations in proximity to the Santa Clara River, with an incidence ranging from 2 – 20 percent (Fig. 4). In addition, we established 200 plots in infested and non-infested native vegetation throughout the infested range from July – October 2018 (Fig. 1). All 260+ plots, including avocado and native vegetation, are being monitored to address our broader questions concerning which locations are most vulnerable to *Fusarium* dieback-shot hole borer establishment and most important in its spread.

Trapping data reflect the number of beetles caught in funnel traps equipped with the attractant lure Quercivorol. The beetles often show peak in-flight activity – and with that, trap catch numbers – in winter and spring that reflect specific temperature ranges in the afternoon. The ability of beetles

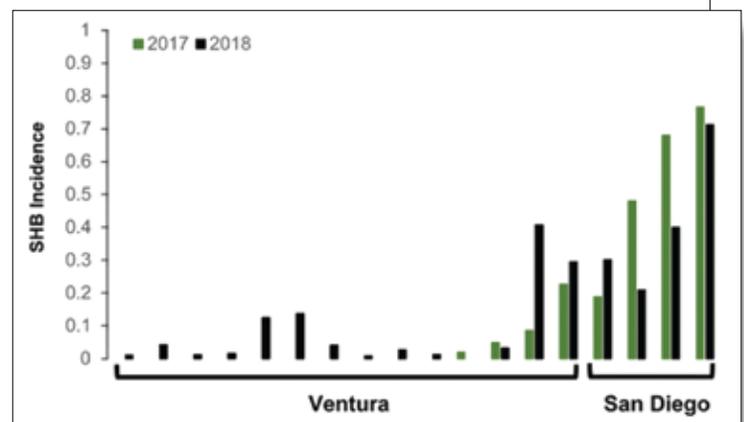


Figure 3. SHB incidence (the fraction of trees infested in each plot, between 0 – 1) for 14 of the 36 avocado groves that were infested in Ventura County and four of the five groves that were infested in San Diego County in 2017 and 2018 (green and black respectively).

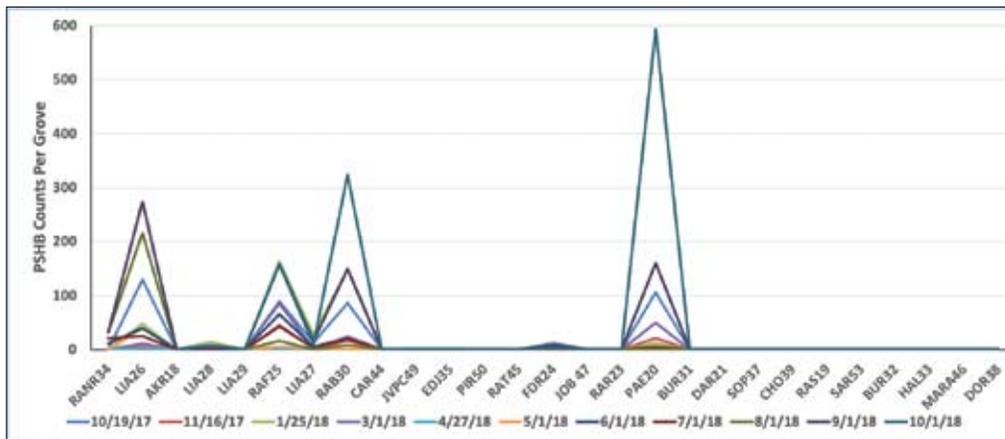


Figure 4. Number of beetles trapped over time in Ventura County avocado groves.

to develop depends on the temperature. If the temperature is above 59°F and below 90°F, the larval and pupal stages of the beetle can develop. However, adult beetles can only fly if the afternoon temperature is above 68°F. In winter and spring the peaks in trap catches can be explained by the fact that many beetles develop and become adults in the tree and accumulate, waiting to emerge and fly when temperatures are adequate. When a warm spell arrives, the “back log” of adult beetles will start to fly resulting in a peak in trap catches during these seasons.

Branch Assessment

To understand attack progress and impact of SHB on individual trees, we assessed 1,995 branches on 660 avocado trees in San Diego, Orange, and Los Angeles counties between 2015-2018. For each tree, we counted the number of entry holes for beetle establishments that were and were not successful on different tree parts including the trunk, primary, secondary and tertiary branches, and twigs. The beetle was able to establish on 1,013 of these branches (50 percent). Significantly more established hole counts were observed on smaller, tertiary branches ranging from 4-6 inches in diameter (Fig. 5; general linear model $p = 0.01386$). We did not observe tree death on established plots.

Strategies for Management of SHB in Avocado Groves

Pruning is a common management practice in commercial avocado groves as it prevents breakage from upward growth, reduces cost of harvesting and increases sunlight penetration to the lower canopy. Pruning also may serve as a potential strategy to remove SHB infested branches from the tree in an attempt to reduce beetle populations and further colonization of the tree. Data from our survey study show that beetle galleries are most common in the vicinity of branch collar regions on avocado (Fig. 8). Given that pruning infested branches — in combination with spray treatments to protect the branch collar from further attack — is a promising management

strategy to control the new beetle attack, we conducted a field trial to test a commercially available *Bacillus subtilis* (Serenade®) with/without a surfactant against *Fusarium dieback* associated with SHB. We randomly selected five eight-year old trees (Hass cv.) in an infested avocado grove for each treatment. Spray treatments included: *Bacillus subtilis* (Serenade®) at max field rate (1.5 percent), Serenade® (1.5 percent) with a surfactant (Pentra-Bark®) (1.5 percent), and a water control treatment. The treatments were applied once, directly to the branch collar, with a standard spray bottle immediately after pruning the branch. Beetle activity was quantified by

counting new entry holes in monthly intervals after branch removal on the pruned surface. All treatments were compared to the control for efficacy over the six-month period.

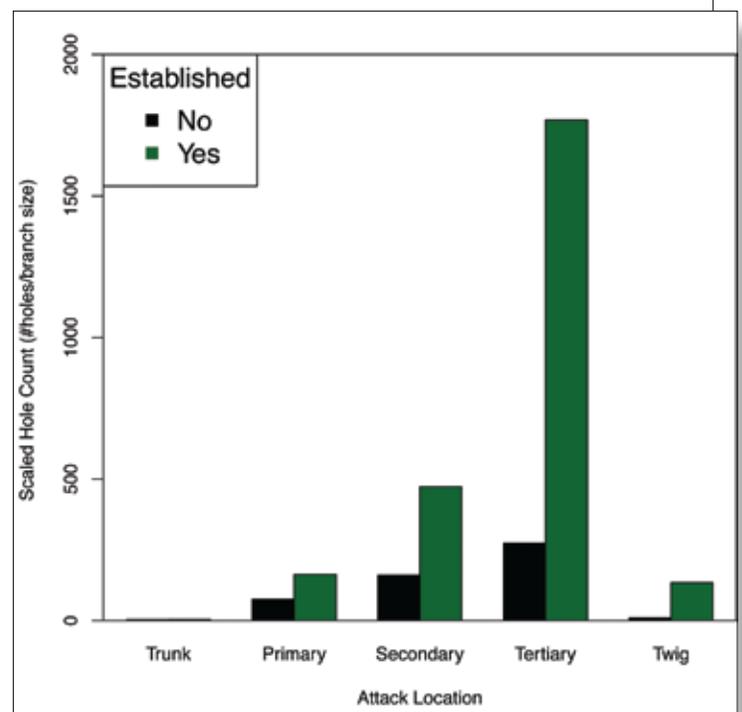


Figure 5. Attack frequency of SHB on infested trees by plant part.

After the six-month period, water-based latex paint was applied over the pruning surface and branch collar to evaluate which beetle holes were active. Using a method developed by our lab (<https://ucanr.edu/sites/eskalenlab/files/292756.pdf>), the beetle entry holes were covered with the paint, allowed to dry and then evaluated the next day to see if the beetles

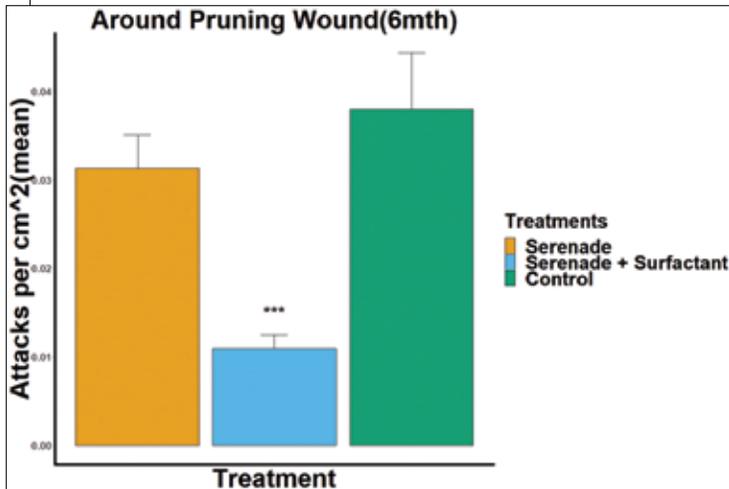


Figure 6. Six-month average count data per cm² of entry holes from the 30-cm area around the site where the infested branches were removed. Serenade® and surfactant mix was shown to be significantly effective compared to the control treatment ($P < 0.001$).

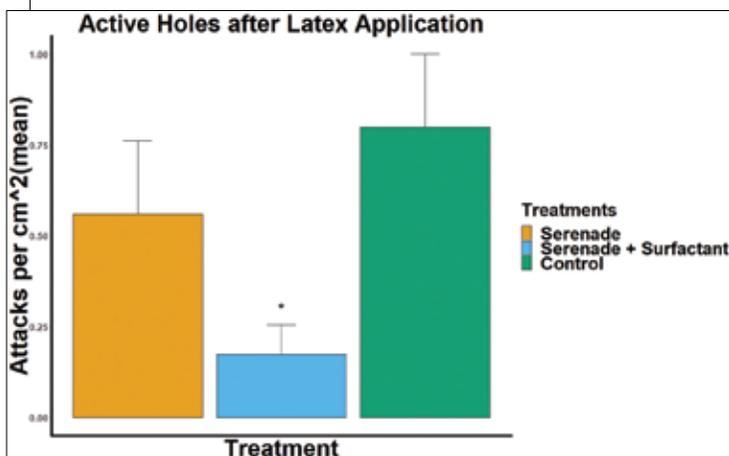


Figure 7. Six-month counts per cm² after water based latex paint application onto treated areas. Serenade® and surfactant mix was shown to be significantly different compared to the control treatment ($P < 0.05$).

opened the entry of the gallery. This allowed us to determine which galleries were active in the treated areas. Results revealed that pruning wounds treated with Serenade® plus surfactant had approximately four-fold fewer beetle attacks than either Serenade® by itself or the water control (Fig. 6).

Summary and Guidelines

Monitoring and experimental results show that SHB-FD is causing less damage to avocado trees compared to other hosts in native vegetation (e.g., box elder, willows, sycamores). Given that incidence fluctuates between sampling periods,

long term monitoring is essential to understand which factors are driving the disease dynamics. The beetle seems to prefer primarily the branches of avocado — in particular the tertiary branches. Hence, removal of infested branches and orchard sanitation is essential to control the population size of the beetle. Below are the revised best management practices that we recommend for avocado growers in California.

What to Do

1. Inspect branches and branch collar for signs of SHBs and FD symptoms in avocado.
2. If the beetle has not colonized (produced a gallery), there is no need to make pruning cuts.
3. If the beetle has colonized, or a cluster of attack is observed on branches, remove the entire branch.
4. If the beetle/fungus has colonized on the branch collar, remove the infested branch, including the branch collar. According to beetle flight activity (Fig 4.), the winter months (Dec-Jan) are the best time for pruning in SHB infested groves.
5. Spray pruning wound with *Bacillus subtilis* (1.5 percent Serenade ASO®) plus surfactant.
6. Chip and then solarize pruned wood using a clear plastic tarp for several months.

Pruned Plant Debris

1. To avoid beetle flight during pruning and reduce population pressure, conduct activities during the winter months (December and January) when the beetle population is building up in trees.
2. Do not move infested plant material without chipping the material.
3. Chip infested wood on site to a size of one inch or smaller.
4. If the branch is too large to chip, solarize using a clear plastic tarp on site for several months. (Winter — at least 3 months; Summer — 6 weeks.)
5. After plant material is chipped, it may be safe for using as mulch in the grove.

Equipment Disinfecting

1. Sanitizing equipment after pruning each tree will reduce the spread of fungal pathogens.
2. Prior to cutting/pruning, remove organic debris from equipment used for cutting (e.g., hand and power tools such as pruning shears, chainsaws), then spray or wipe with either Lysol® or 70 percent ethanol. Clorox® bleach diluted to 5 percent may be used.
3. Never use disinfectants on pruning wounds, as they could be phytotoxic. 🍌

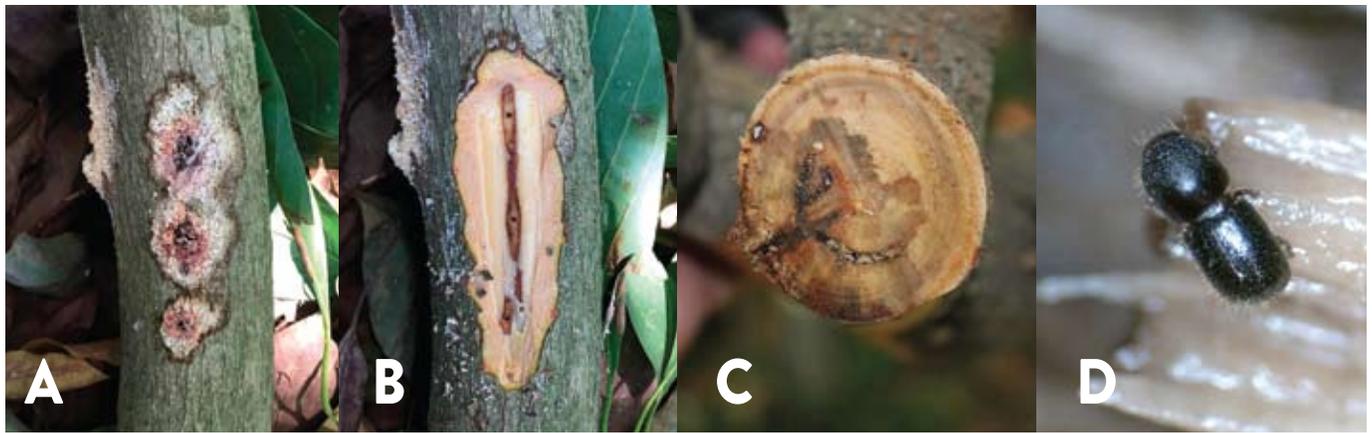


Figure 8. White ring of sugar exudate surrounds the beetle entry/exit hole (A), wood discoloration caused by *Fusarium euwallaceae* (B), beetle gallery formation (C) and female PSHB (D).

SIGNS AND SYMPTOMS:

The combined effects of tunneling and fungal growth cause *Fusarium* dieback (FD) disease, which interrupts the transport of water and nutrients in more than 64 tree species that are suitable for beetle reproduction. Once the beetle/fungal complex has killed the host tree, pregnant females fly in search of a new host.

Attack symptoms, which are a host tree's visible response to stress, vary among host species. Staining, sugary exudate (Fig. 8A), gumming, and/or frass may be noticeable before the tiny beetles are observed (females are typically 1.8-2.5 mm long) (Fig. 8D). Beneath or near these symptoms, you also may see the beetle's entry/exit holes, which are ~0.85 mm in diameter. The abdomen of the female beetle can sometimes be seen sticking out of the hole. Sugary exudate on trunks or branches may indicate a PSHB attack, but also could be the host response to tree injury. Note that exudate may be washed off after rain events and therefore may not always be present on a heavily infested branch. *Fusarium* dieback pathogens cause brown to black discoloration in infected wood (Fig. 8C). Scraping away bark over the entry/exit hole reveals dark staining around the gallery, and cross

sections of cut branches show the extent of infection (Fig. 8B). Advanced infections eventually lead to branch dieback (Fig. 9) and death of the tree.

HOSTS:

SHBs attack hundreds of tree species, but they can only reproduce in certain hosts. These include: avocado, box elder, California sycamore, coast live oak, cottonwood and willows. Visit <http://pshb.org> for the full list of susceptible tree species.



Figure 9. Branch dieback caused by *Polyphagous shot hole borer-Fusarium* on a Hass avocado tree in Azusa, CA.

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