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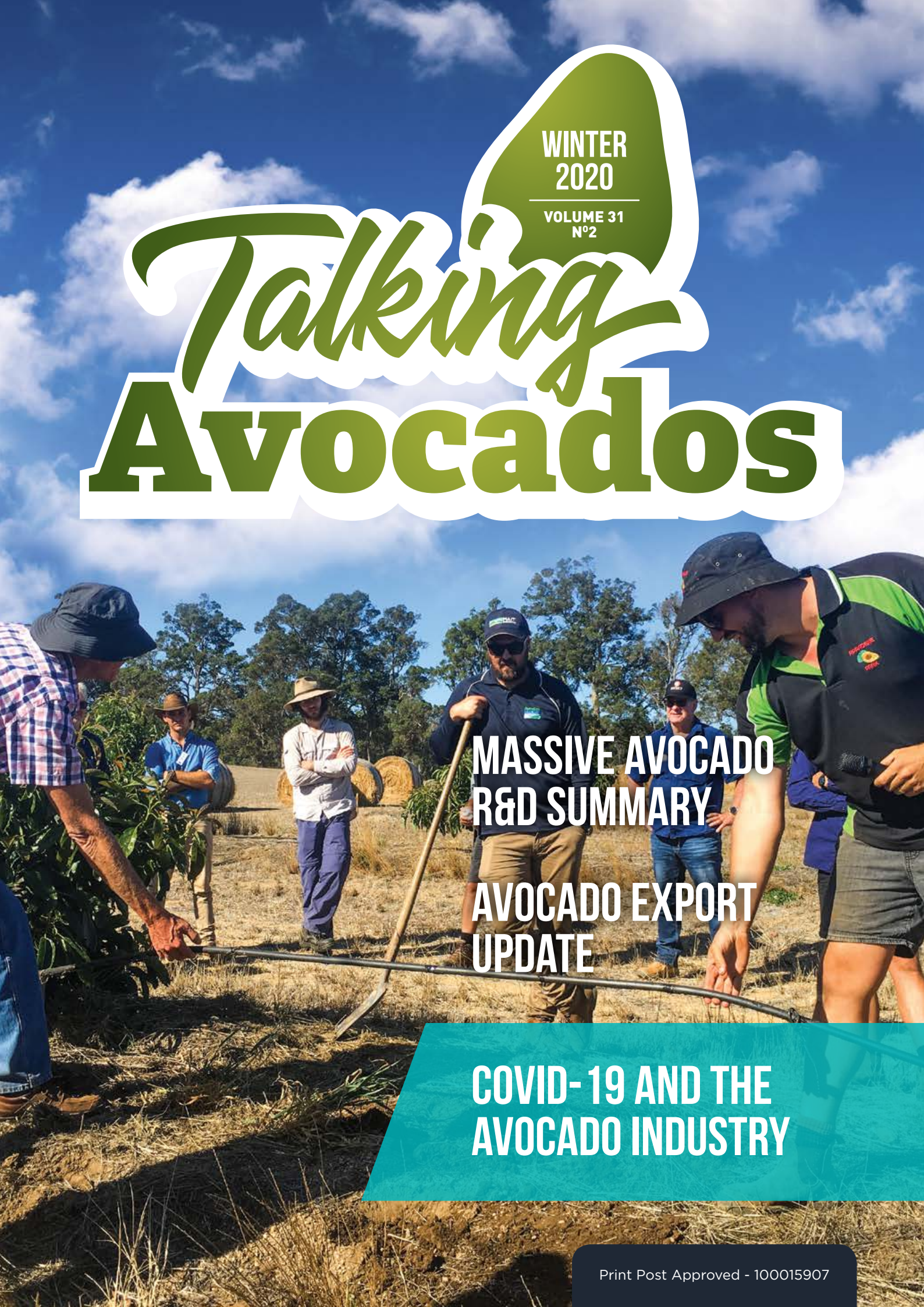
Talking Avocados



MASSIVE AVOCADO R&D SUMMARY

AVOCADO EXPORT UPDATE

COVID-19 AND THE AVOCADO INDUSTRY

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Talking Avocados

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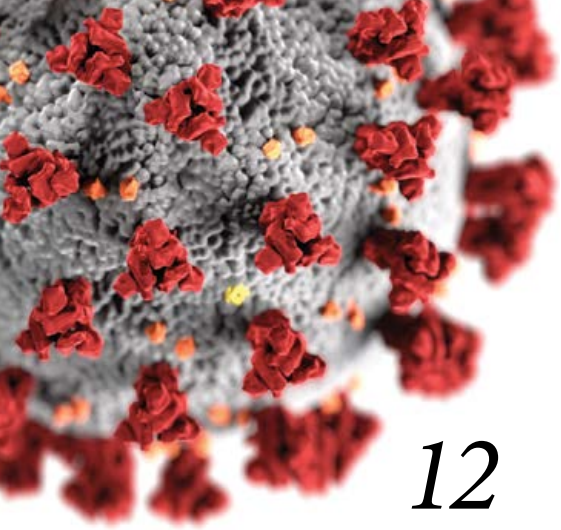
Hort Innovation
Strategic levy investment

AVOCADO FUND

Wherever you see this logo, the initiative is part of the Hort Innovation Avocado Fund. Like this publication itself, it has been funded by Hort Innovation using the avocado levy and, in the case of R&D, with contributions from the Australian Government. Some projects also involve funding from additional sources.

Avocados Australia



Contents

COVER IMAGE: The March AvoSkills event in Manjimup, Western Australia, attracted interest from across the country. The next event is tentatively scheduled for North Queensland later this year.

CHAIR'S PERSPECTIVE

Jim Kochi, Avocados Australia Limited

Has anyone seen the advice from the Japanese theme parks keen to re-open their rollercoasters but also make sure they minimise COVID-19 spread? Please scream in your hearts.

What an absolute rollercoaster of a year 2020 is turning out to be.

For all of the hard news and difficult decisions we've had to make so far this year, it's not all doom and gloom for the Australian avocado industry. What in any normal year would have caused public consternation – our smaller than expected harvest in a number of regions – has turned out to be a boon as reduced supply kept prices steady, even as demand dropped (and then recovered).

As an industry, we've done a good job of keeping in touch with those further down the supply chain, taking their advice on what to pick and when. We've maintained our focus on providing quality fruit to our customers, most of whom continue to look for Australian-grown, affordable comfort food.

According to Hort Innovation's new Category and Consumer Impact Monitor project, delivered by FiftyFive5, the importance of "Australian grown" has gradually increased to overtake the usual drivers of ease, taste, and price in May and early June this year. The pandemic also led to more cooking from scratch.

As noted in the project's June snapshot (available here: *bit.ly/ST19031*) this increase in cooking at home opens up the opportunity to encourage people to try new recipes, and we already provide excellent Australian-grown avocados. Two ticks there.

There are, however, a few wrinkles, and the first is making sure our consumers can easily identify Australian-grown. I do sometimes check in on "the social media" and it may surprise you to learn there are still people out there who think avocados are imported from all over the world to Australia. We know that's not the case, but using the Avocados Australia Kangaroo Label will help our consumers recognise our locally grown fruit. I've talked about that before, so I'll move onto the next wrinkle: labour.

We know our working holiday makers are heading home as they can, and there's every chance it's going to be tough finding orchard and packshed workers not just this year but potentially until the medical researchers find an effective treatment regime or a vaccine for COVID-19.

We are going to have to be a bit innovative in filling that labour gap, whether that's extending the Pacific labour scheme or encouraging Australians into agriculture. I know I'm not the Lone Ranger with these concerns, and Avocados Australia is supporting input into a range of local, state and national initiatives. If you are asked to fill out a survey, or put forward your ideas, please do.

You can read more about the Fiftyfive 5 work and every piece of avocado-related research in our annual R&D wrap-up, which starts on page 36.

CEO'S REPORT

John Tyas, Avocados Australia Limited

Season outlook

The July 2020 Quarterly *Infocado* Report has been produced and distributed to contributors. It shows what a record year 2019/20 was with almost 16 million trays of fruit produced in Australia (87,546 tonnes). While this is only a few percent above the previous year, it's a solid performance and again, the market held up well.

The outlook for the rest of 2020 estimates the supply of Australian fruit will steadily decline, with very light crops in the Tristate and Western Australian regions. New Zealand will help fill the gap again this year and hopefully the total supply in the Australian market across the remainder of 2020 will be sufficient to meet demand. It's important that avocados are on the shelf in sufficient quantities every week of the year as it helps to maintain purchasing behaviour.

Exports

Exporting for all industries has been challenging and will continue to be for quite some time with limited air freight and restrictions on international travel. We have been building good momentum in the past few years with increasing export volumes, access to a new market (Japan) and increased industry investment in export development. We are continuing to lay the foundations for greater exports and have been successful in securing two grants from the Australian Government to support industry with an online export registration process and better guidelines for protocol markets. These initiatives will add to our pool of resources to assist growers and exporters when the environment is more favourable for export growth. More export news on pages 18-22.

Regional Forums

We hoped that we would have been able to have regional forums and other extension events again by now but its difficult to know when we can do this again. Our current plan is to hold a forum in North Queensland in November in conjunction with the Avocados Australia AGM. However, this may not be possible depending on what changes are made in response to COVID-19 management. You can read more about our online forums on page 13.

In this issue

This issue of *Talking Avocados* is once again jam packed with great information. We are finding it a challenge each quarter to contain the size of the magazine. As usual you will find lots of great articles covering a range of topics but the feature article in this edition is a complete summary of the R&D that is underway in relation to avocados, funded from your avocado levies and other sources.

Do you know a new grower?

Do you know a new grower who isn't receiving industry communication? We encourage you to recommend they subscribe (for free) to the fortnightly *Guacamole* newsletter, for the monthly *Avo Alerts*, and for this magazine.

As we all know, new growers have joined the industry in every region in the last few years. It is important that new growers stay well informed about industry matters and we are very keen to engage with them.

Encourage new members of our industry to make contact via admin2@avocado.org.au or by calling 07 3846 6566 for more information about our various publications and activities.

AROUND AUSTRALIA

TRISTATE

By Kym Thiel

Well, if a week is a long time in football then three months can be a lifetime in horticulture!

During this time, we have just about seen it all. The onset of the COVID-19 pandemic has been the biggest effect on everyone's lives in one way or another. What was looming as a disaster for the industry and growers in the loss of the food service industry and loss of sales in general has not materialised. This is in part due to some very good management and marketing that has been carried out behind the scenes. Tristate growers are now eagerly awaiting this year's harvest with renewed confidence, all be it with half the crop of last season.

In March/April water and drought was looming as the big factor but thankfully widespread rain in the Murray-Darling basin catchment has seen opening allocation rise in South Australia from a prediction of 2% to 77% at time of writing. It is expected by October we will be on 100% allocation.

Cold frosty mornings continued throughout June and July with minimal damage being seen at the time due to temperatures not reaching any real extremes although it will be interesting to see the effect this has on next year's buds and flowering this spring.

The online regional forum was a real success and something that I hope industry and our extension team continue with. Although we all love getting together and kicking the dirt at field days the opportunity to listen to well-regarded international speakers and scientists is something that we should continue to pursue and get interested in when the topic is right (read more on page 13).

CENTRAL NEW SOUTH WALES

By Ian Tolson

Harvesting in this region has begun. Challenges have been thrown at growers from all angles this past growing season.

Rationing or no irrigation during the drought saw a large fruit drop and fruit failing to fill, that combination initially leading to lower than expected crop.

Thankfully not all was lost from the devastating hailstorm which struck Comboyne in September 2019. The worst affected orchards will manage a small crop this season, and recovery for these orchards will take time and perseverance; hopefully they will return to their previous production quickly.

An orchard on the Comboyne Plateau that was left with major damage after an inferno threatened the region for months on end has also managed a small crop.

The lower than forecasted production figures nationally have seen prices remain high, which will be some compensation for those with smaller crops than they hoped for.

And now, having moved through hail and fire and the start of a global pandemic, restrictions have started to lift, giving the nation a false sense of normal.

Food service businesses again buying fresh produce was a great boost to the horticultural sector. Home cooks and promotions around fresh produce have done a wonderful job through COVID-19, utilising and adapting recipes to keep a healthy lifestyle and bringing out our inner chef. Unless the new outbreak in Victoria is contained quickly, we, as a nation may very well be back in lockdown. Premiums will find a home in chain stores but once again the concern will be the lower grade fruit.

As always, aim to provide the consumer with the best possible avocado to ensure repeat purchasing.

SUNSHINE COAST

By Robert Price

Well, what a drastic turn of events that has descended on the industry in the last few months. The climatic season in the south east of Queensland was not favourable to horticulture with temperatures in January reaching the highest on record yet rainfall only producing 100mm (averaged). Further the BOM's records show that since 2018 this general area has had 'severe deficiencies' of rainfall, resulting in depletion of residual soil moisture.

All of this resulted in a reduced tonnage, while being made up of a higher quantity small fruit. However, as circumstances would have it, the market value increased, unexpectedly, due to the pandemic and consumers not being able to 'eat out', the public were preferring smaller fruit than what would have been supplied to the service industries.

Having referred to the pandemic (sic COVID-19) there have been some interesting advancements in doing business via technology and communication methods.

People can interact with one another through electronic mediums and this has paved the way for corporations and businesses to connect better with partners and employees. Technology has enabled us to seamlessly connect with people of our choice anytime anywhere in the world via, amongst other things, video conferencing. Video conferencing helps to break barriers of distance in organisations. Video conferences remove the necessity for heavy and lengthy travel and accommodation.

It is convenient, meetings can be held at more flexible times and does not necessarily remove the participant from their current work location. Video conferencing helps to improve communication and re-establish relationships. During a video conference you get to see the body language and facial expressions of the participants. This leads to a more effective and faster collaboration. It helps to make the participants feel that they are close to the head office also and part of a team.

Thanks to COVID-19, video conferencing and associated technologies have unleashed a new medium for doing business which is unstoppable.

So, why the interest in video conferencing? Well the Avocados Australia Board has been holding video meetings over the last few months since 'lockdown' and the consensus is that it has been successful. It makes sense that that now that Avocados Australia has gained experience in this manner of collaboration it be expanded to include other opportunities where all members may be able to join information sharing and participation, which because to the geography the organisation's members, has never been achievable before.

TAMBORINE AND NORTHERN RIVERS

By Tom Silver

The 2020 Tamborine and northern New South Wales avocado harvest is in full swing, with some growers already finished. Most growers are reporting a slightly down to an average crop with small fruit remaining an issue, especially amongst those growers whose irrigation program was restricted in the past summer. Skin blemishes and internal quality issues have been minimal.

Following the slump in prices on the back of the initial shut down of food service in response to the COVID-19 , prices have steadily climbed mainly due to a decreased crop volume across all growing areas. Trees are already budding up for next year with some Shepards already in flower.

The region has been receiving good regular rainfall with some significantly larger drops. Hopefully these conditions continue, in contrast to the last two years where the rain tap was turned off at the start of July and wasn't turned back on til Christmas! Night time temperatures have also been above average.

The year 2020, I believe, will continue to be a terrifying roller coaster for our industry as it will be for others! The ominous threat of further and possibly more severe lockdowns and the effect on our biggest domestic markets is at the front of the Avocados Australia agenda. Further issues of expected labour shortages and restricted cross boarder worker movements are also being addressed by your industry peak body. Our industry's ability to respond to problems lies in identifying them early, or even better, before they happen and dealing with them accordingly. It's for this reason that if any avocado grower foresees a problem, especially if they believe it's not yet being dealt with, contact your Avocados Australia grower representative, get heard and we can get it sorted.

Mulching underway at Tom Silver's Alstonville orchard in July 2020.

WESTERN AUSTRALIA

By Brad Rodgers

In the west, we have had a real mixed bag, weather wise. An early start to winter and our wettest May in about four years or so. We have had two to three significant storm fronts, followed by cold winds and some frost in some regions. This has caused fruit loss to some growers, when we were already coming into a lighter season in Western Australia. All that said, overall, it has been a mild winter so far with warm days. I am even seeing some potential flowering on some trees.

Western Australia was fortunate to have regional forums earlier this year, just ahead of the global pandemic shutdowns. It was very encouraging to see so many new growers and industry entrants at these events. (See page 16 for more on the very well received AvoSkills workshop.) This interest in avocado growing is not just evident at our industry events, as I have been contacted by a few interested new punters re growing or investing in avocados, mostly from a non-farming background. They just know that they love avocados, and want to know more about the industry's ongoing potential.

This isn't to say there aren't concerns present. Here in the west, there is a growing concern about the potential impact of imported fruit, especially now that Chile could potentially dispatch fruit this coming summer. Avocados Australia has just compiled the latest quarterly *Infocado* (for July 2020), but it would appear we can expect about 3.2 million trays from New Zealand over summer, and production of about three million trays here in Western Australia.

With the continued increase in hectare plantings we should ultimately see production lift in Australia. With the interest in Australia from other avocado exporting nations, there has never been a better time to look at how we can use good marketing to boost domestic consumption to parity.

How can we do this? Glad you asked. Avocados Australia's move to appoint a Market Development Manager is an important part of protecting the future of our grower members. This new role, appointed by your board earlier this year (we had a full rundown in the Autumn edition of this magazine), will help us enhance the marketing work being done on behalf of levy-paying growers by Hort Innovation. The latest Nielsen Harvest to Home data for avocados shows three-quarters of Australian households purchase our fresh avocados. That gives us scope for a growth in demand of up to 25%, but to achieve that we will need to leverage industry and retailer investment in promotion, make the most of our crop forecasting and dispatch monitoring system, and continue to improve the quality of our avocados. These are the three key areas for our new Market Development Manager, Hayleigh Dawson, with the full support of your Avocados Australia board.

Here in Western Australia, we also have some significant export opportunities, and our local Department of Primary Industries and Regional Development (DPIRD) is very keen to communicate with and organise meetings for anyone with an interest in exporting.

Avocados Australia and DPIRD recently hosted a workshop for those interested in exporting to Japan this season. More on page 20.

This is the sort of collaborative approach, alongside a focus on quality, the supply chain and promotions, that will help us thrive and become more profitable in the future.

SOUTH QUEENSLAND

By Daryl Boardman

For something different, let's start with the weather! Here in South Queensland we really do need some decent rain, as local fruit size has been down due to the drought conditions, which is really affecting yields. The majority of harvest in South Queensland will be done by the end of August and, so far, pricing has been excellent due to lower supply and good demand.

Positively, our trees seem to be setting themselves up well for flowering, so rain any time soon will be very beneficial for that. Another piece of good news is that the region has come through the winter fairly unscathed by frost so far.

COVID-19 is still in the back of all our minds that we could see some effects. The avocado industry has been very fortunate to date, even though our businesses are absorbing additional costs related to compliance measures, as we work to ensure the safety of our staff, communities, families and food supply.

Here in South Queensland, several avocado businesses have taken advantage of IFAM (the Australian Government's international freight assistance mechanism) to dispatch avocados to Singapore from our local airport at Toowoomba. Obviously, these supported flights will come to an end, but shows there is capability from the region as volumes increase in future years.

Our next concern will be staffing. As a region, we are winding down and there are still backpackers looking for work. The concern will be the next season, as some of these young internationals head home.

I'd also like to mention that the Avocados Australia elections are coming up, where members will vote on their directors for South Queensland, Tamborine/Northern Rivers, Tristate and the Sunshine Coast. I would encourage anyone who is interested in becoming a director to put their hands up when nominations are called soon.

CENTRAL QUEENSLAND

By Eric Carney

It feels repetitive and cliché to say, but what a season 2020 was. Dry weather, a drop in demand, fears of a massive oversupply, limited markets for lesser grades, fertiliser input costs increased, COVID-19 compliance confusion, worker shortage fears, then an overabundance of applicants, now – a shortage of supply yielding excellent late season returns. It was certainly a thrilling rollercoaster ride this year.

Although actually not over just yet, Central Queensland is nearing the end of the season with the vast majority of the fruit picked. As a region, when looking back to March 2020 with our pre-season forecast of roughly 3.5 million trays compared to our current (mid-July) dispatches of 1.5 million trays, we can see a very large gap between estimates and actuals. Yes, there is more fruit to come, perhaps 400-700k based on current trajectory? But not two million trays worth. Why such a disparity? One contributing factor was low rainfall which did affect some fruit size. However, our February/March 2020 pre-season estimate should have been MUCH closer than it was. This highlights an issue of concern. Without accurate forecasts, our region and the wider industry is not able to maximise opportunities nor properly combat challenges. The timing of advertising is set months in advance, if our production estimates are inaccurate then we could be in a situation of trying to sell something we don't have, or worse, having too much product with not enough buyers. As a region, we need to do better with our estimates as potentially we will be down more than one-third from our February/March pre-harvest estimates.

COVID-19 has affected how people gather which has created some challenges. However, it has brought opportunity. Forums scheduled to be held prior to COVID-19 have now been held online. As such, growers can access the presentations at their leisure from the convenience of being… anywhere. I encourage growers to check out the BPR (*www.avocado.org.au/bpr/*) , take a look at the regional forum additions as well as other updates to the BPR library such as the new phytophthora video. There are also older articles regarding crop forecasting that are worth a look. Time will tell if/when Central Queensland is able to hold a face-to-face forum later this year, please keep an eye out for updates in the usual channels.

Paradise Dam remains a major concern as a source of quality irrigation water. There is no guarantee from the Queensland Government that the wall will be returned to its original height (or allowed to be filled to original height). The government is "working" on plans to replace the lost water, however, there is no singular source. Therefore, there is a large likelihood of inefficiencies or high costs, both in construction as well as long term service costs which will potentially be borne by users. Of note, recent communications from the government are highlighting concerns in regard to the foundation, whereas in the beginning of the communications campaign the concern was in regard to the roller compacted layers and the bond between them.

NORTH QUEENSLAND

By Jim Kochi

Well, well, well what a year it has been so far. North Queensland had expected to have a lighter crop due to the cold conditions at peak flower last September and therefore the expectation was for some reasonable returns from the reduced supply. We now know the COVID-19 shut down the market for Class 1 fruit and slowed the market for premium grades. Expectations were high and we had a workforce of willing backpackers and Pacific Islanders who were already in North Queensland when the COVID-19 restrictions came into place. We had lots of healthy workers who were stranded in North Queensland and their efforts to work and stay heathy were greatly appreciated. A lot of these foreign workers are now leaving North Queensland and Australia, and returning home to be with their families.

The past is now history, but our next challenge is to understand where we are likely to get the labour we need for North Queensland, and all the other regions for next year. Already the signs are for increased cost of airfares and travel restrictions that will likely be in place between countries. There will most likely be a critical shortage of foreign workers for all of horticulture and the prospect of encouraging Australian locals to take up this work seems an even more remote possibility. For North Queensland, the first glimpse of the strength of the available workforce will be in November when the mango harvest starts. If there is a shortage of workers at that time, then that shortage will likely extend into the avocado harvest beginning in mid-February.

I have fielded telephone interviews from Federal Government and Queensland Department of Agriculture and Fisheries people about labour requirements but most of the discussions have been about the issues/problems encountered during the current harvest. My comments were that the past was handled correctly and we made it through, and my question to them was "what is the government, both Federal and State, planning to do to encourage a labour force for the future, in other words, as soon as November for the mango and avocado industries in NQ"……answer, silence.

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NEWS

General News

COVID-19 and the avocado industry

Lisa Yorkston, Avocados Australia Communications Manager

Avocados Australia is carefully monitoring instances of COVID-19 in agriculture in Australia, to help the avocado industry be prepared and stay safe.

Even if a specific COVID-19 plan or workplace health and safety plan that includes COVID-19 isn't mandatory for your business (more on that below), please consider putting such a plan in place, for the continued operation of your business, and the safety of your family, workers and community.

You can always read our latest learnings here: *bit.ly/CV19learn*.

Unfortunately, here have been instances of COVID-19 cases being found in agricultural operations, including a case at a strawberry farm in Queensland, and several meatworks in Victoria.

While these are not avocado operations, there are some key lessons for avocado industry businesses from these outbreaks, the major one is to do your planning.

Have a plan, and be ready

The major learning from the confirmed case at the Queensland strawberry farm in June 2020 was the importance of having a COVID-19 plan. In this case, the presence of a Health Management Plan (this is mandatory in Queensland for agricultural businesses utilising seasonal workers) for both the farm and the accommodation centre reportedly expedited Queensland Health's track and trace activities. This worked so well, we understand the farm was able to resume picking within days.

In some states and territories, the requirement to have this planning done and registered, is mandatory. We have collated a list (with links) at *bit.ly/CV19learn*.

If you do not have a health plan in place, or your state does not require one, Avocados Australia encourages you to develop a Health Management Plan for your orchard regardless.

Sometimes the planning isn't enough

One of the more high-profile clusters in agriculture has been at Cedar Meats in Victoria, and it would seem that in this case, the business also had a plan, and was taking additional safety measures.

The key learning here is one of communication, alongside a plan covering both risk reduction measures, and clear steps about what to do in the case of both suspected/potential and confirmed cases.

Communicate your plan with your team, communicate any updates, if staff members do report illness (hopefully from home!), have immediate steps in place to take the necessary steps with regard to close contacts while waiting for test results.

National resources

bit.ly/CV19avo

On this website page, you will link links to health information, export, food safety, federal financial assistance, labour, and workplace information.

Staying safe in the packshed and orchard

bit.ly/CV19shed

This is a more detailed collection of resources, from general tips to assessing the market before picking, additional staff management and sourcing information, workplace health and safety, industrial relations, transport, and audits.

More information

Avocados Australia is endeavouring to keep its online resources as up-to-date as possible, including the above articles, the latest news on the website, via Guacamole and for urgent updates, via Grower and Industry notices.

All members of the commercial avocado industry in Australia can sign up for our various communications, check what's available here *avocado.org.au/connect/*, or contact us on 07 3846 6566.

Regional Forums go digital!

Liz Singh, Avocados Australia Industry Development Manager

The Avocado Regional Forums have gone digital to maintain the learning momentum the project *Avocado industry development and extension* (AV17005) is developing and keep avocado growers and industry member engaged with one another.

John Tyas, Avocados Australia CEO, has continued to update the industry on the impacts of COVID-19 to seasonal supply and marketing. John encouraged growers to update the Australian Tree Crop Industry Engagement map (*https://arcg.is/Tzvrr*) specifying the location of avocado orchards across Australia and explained that Chile now has official market access to Australia.

Central NSW led the way with 55 avocado stakeholders attending the first digital Regional Forum on Wednesday 29 April. The forum targeted fruit spotting bug and the damage it causes to fruit with information presented by Dr Ruth Huwer and Craig Maddox from NSW Department of Primary Industries.

Ruth and Craig have extensive experience with both species of the pest, fruit spotting bug (FSB) and banana spotting bug (BSB). Ruth told participants that under warm conditions the FSB could develop from an egg to an adult in 5-6 weeks. She said that the current management of FSB in the orchard was heavily reliant on sprayer set-up and getting good coverage but that monitoring of monitoring hedges would be the key to determining when the threshold of greater or equal to 30% of the 5th instar nymphs was exceeded, giving growers approximately a 10 day winder for treatment.

Craig told forum participants that targeting FSB flight time was important for control and reducing unnecessary chemical use in the orchard. Area wide management and looking for hotspots in your orchard will provide important information for FSB management. Craig spoke about chemical control effectiveness and additional resources that growers could use to help manage fruit spotting bug in their orchards.

Eighty-nine participants joined the **Tristate Regional Forum** on 27 May to hear Spanish Researcher Dr Iñaki Hormaza speak about research being conducted on flower development and pollination. Dr Hormaza told participants that low fruit set in avocados in comparison tree flower numbers was partly due to inadequate pollination, with hand pollination shown to increase fruit set.

Environmental factors at flowering are important for good pollination and fruit set.

- Temperature – the optimal temperature for pollination occurring is between 20-25°C but temperatures below 15°C or above 25°C reduces the amount of pollen sticking to the stigma and inhibit pollen germination. Temperature is also important for pollen tube growth, if the temperature is 10oC then the pollen tube does not reach the ovule even within 48 hours after pollination has occurred, this is too slow, and fertilisation of the ovule will not occur. If the temperature is 30oC the pollen tube reaches the ovule approximately eight hours after pollination but this is too fast and the ovule is not yet receptive and often fertilisation will not occur. At 20°C the pollen tube reaches the ovule for fertilisation between 10-18 hours after pollination. Some varieties will have variations in how their pollen is affected at different temperatures, Hass pollen for example germinates well from 20-30°C.
- Relative Humidity - the optimal relative humidity for pollination in avocados is >75%. Anything below this and the stigma is not receptive to receiving pollen for pollination.

An adult fruit spotting bug. Image courtesy NSW DPI.

Iñaki went on to tell participant that not all flowers are made equal and that carbohydrate and boron levels at flowering significantly affect which flowers set fruit. The flowers with higher carbohydrate levels were shown to be better quality flowers for fruit set. In comparison work done in New Zealand, it was shown that flowers that had higher boron levels also set fruit, though this was not the case in Spain where Boron deficiencies are not common (Figure 1). Overall Iñaki said that "most avocado flowers have lower quality and they will not produce fruits after pollination" and there is opportunity to build carbohydrate reserves during flower development to improve fruit set.

If the flower quality can be improved then Iñaki said that we need to focus our efforts on increasing the biodiversity of insects that can pollinate the avocado flowers and examine the Type B polliniser trees (variety, ratios, distance, necessity?) that are planted in your orchards to maximise fruit set.

The AV17005 project team would like to thank all speakers for contributing their time to the online forums. Their dedication to the avocado industry has provided a great information resource. Until the restrictions are lifted on the numbers allowed for gathering, keep an eye out for future online forums. Everyone is welcome to attend even if the event is not targeted at your region.

If you missed any of the online regional forums, you can view them in the BPR Library under Events.

More information

Check the fortnightly *Guacamole* newsletter and the events calendar at avocado.org.au for future event dates.

If you would like more information on the project, contact Avocados Australia Industry Development Manager Liz Singh, 0499 854 111 or idm@avocado.org.au (Mon-Thurs 9am-3pm), or at Queensland DAF, contact Simon Newett, simon.newett@daf.qld.gov.au or 07 5381 1326, or Bridie Carr, bridie.carr@daf.qld.gov.au or 07 5381 1327.

Acknowledgement

The *Avocado industry development and extension* (AV17005) project has been funded by Hort Innovation, using the avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, and contributions from the Australian Government.

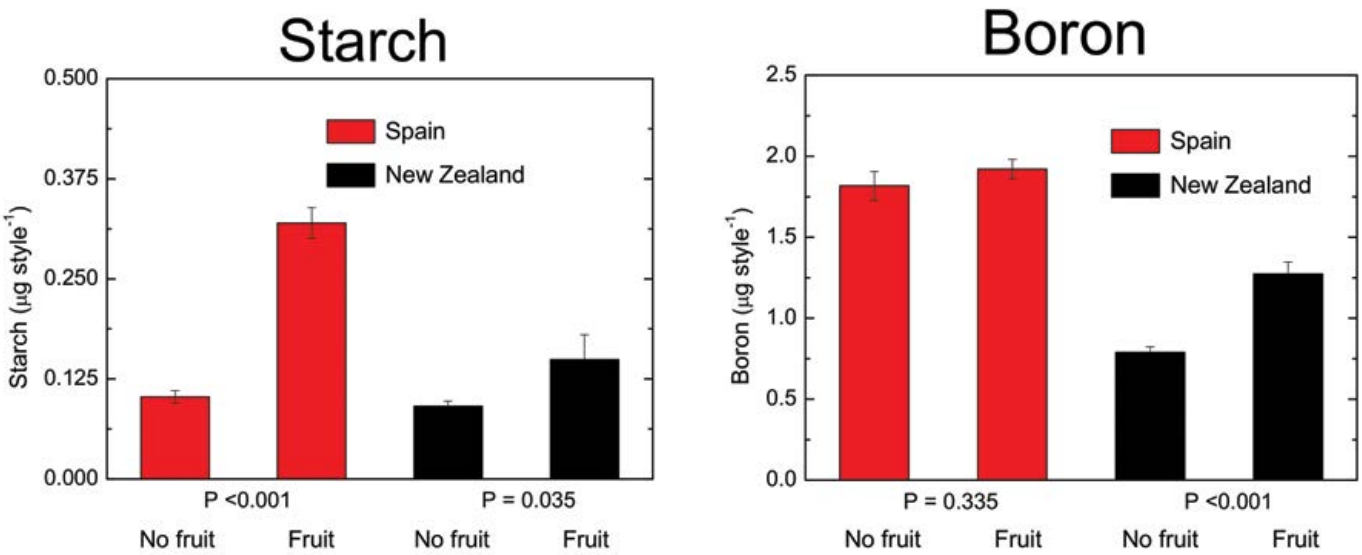

Figure 1. Starch and boron flower levels in relation to fruit set. Work conducted in Spain and New Zealand. (Source: Dr Iñaki Hormaza, Tristate Avocado Regional Forum, BPR Library, www.avocado.org.au)

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Brushing up on our AvoSkills

Ebony Faichney, Queensland Department of Agriculture and Fisheries

The AvoSkills program continues across the country with the most recent course held in Manjimup, Western Australia (WA) in March as part of the *Avocado Industry Development and Extension* project (AV17005).

AvoSkills provides a comprehensive overview from ***A to O of Avocado Orchard Management*** and is designed for growers, re-sellers, farm supervisors and farm managers who have recently joined the avocado industry or want to brush up on the basics.

The aim of these workshops is to provide industry newcomers with the information they need to grow good quality fruit from productive and profitable orchards.

The AvoSkills workshop is held over two days with the group split into teams, each representing a major avocado producing country. The morning session is held inside, classroom style, with presentations, games and quizzes. Friendly competition between the teams creates a fun learning environment. In the afternoon, students attend a field walk at a local experienced grower's farm to see the theory put into practice.

The topics covered in the course include planting, rootstocks, mulching, irrigation, nutrition, diseases, pollination, pests, pruning, harvesting and awareness of information and materials available for growers such as the *Avocados Australia Best Practice Resource* and *The Avocado Problem Solver Field Guide*.

In Manjimup, the project team of Simon Newett (Nambour), Bridie Carr (Nambour) and Ebony Faichney (Mareeba) from the Queensland Department of Agriculture and Fisheries (DAF) co-ordinated the workshop and covered general topics important to growing avocados.

Guest speakers added great value to the workshop by adding their local knowledge and expertise. Dr Liz Dann from Queensland Alliance for Agriculture and Food Innovation (QAAFI) covered managing phytophthora and other diseases. Declan McCauley from WA Department of Primary Industries and Regional Development (DPIRD) spoke about quarantine issues and Interstate Certification Assurance (ICA) for transporting fruit within Australia. Alison Matthews (DPIRD) gave an overview of local insect pests and ran a practical exercise on identifying mites. Dudley Mitchell (local grower and Avocados Australia WA Director) shared his insights on canopy management following his recent travel to overseas orchards as part of his Nuffield scholarship.

Some of the best learning happened in the orchard. Joel and Rahela Winfield, owners and managers of Appadene Park hosted the day one farm walk where the group learnt about phytophthora management, canopy management and drip irrigation. Mo Brokenshire, manager of Tunoadowns hosted the second day field walk and educated the group on her experiences with managing salt, high-density plantings, effective irrigation, and the importance of mulch.

Educational games reinforce learnings and promote friendly competition between the teams (pre-COVID).

The AvoSkills course will be delivered in other parts of the country with three courses left to run over the next two years. The WA and North Queensland courses were a great success. The team is always improving the course through feedback received after each event. Comments from course participants in Manjimup included:

- *"Very informative couple of days"*
- *"Super excited to roll out improvements on my existing orchard, thank you so much"*
- *"It's been great to be able to learn more about the fruit and to take notes to be able to pass on to other growers down the track".*

Evaluation forms revealed that 98% of participants found the course either useful, very useful or extremely useful, 78% said that the course improved their knowledge either significantly or very significantly and 93% intended to make changes to their practices as a result of participating in the course.

The next course is tentatively scheduled for Central Queensland in November 2020. Keep an eye on Avocados Australia communications for updates and remember to register your interest as soon as possible as places are strictly limited.

Special thanks to all presenters and farm walk hosts for sharing your knowledge, experience and passion—the course would not be the same without your participation.

More information

Did you miss attending? Don't worry, you can view all presentations given at AvoSkills on the Best Practice Resource in the library section.

Contact Ebony Faichney via *ebony.faichney@daf.gld.gov.au* or 0491 212 948.

Acknowledgement

The AvoSkills course is delivered as part of the strategic levy investment project *Avocado industry development and extension* (AV17005), which is part of the Hort Innovation Avocado Fund. The project has been funded by Hort Innovation, using the Hort Innovation avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, and contributions from the Australian Government.

Queensland Government

Hort Innovation Strategic levy investment | AVOCADO FUND

Mo Brokenshire (Tunoadowns) speaks about her experience with high density planting.

Ebony Faichney (Queensland DAF) congratulates Paul Good and his team who had accumulated the highest number of points at completion of the course.

Simon Newett (Queensland DAF) and Joel Winfield (Appadene Park) discuss the benefits of drip irrigation.

AvoSkills participants at the Manjimup event in March (pre-COVID-19).

Progressing Australian avocado exports

By Joy Tang, Avocados Australia Export Coordinator

Australian avocado production has increased significantly from 46,446 tonnes in 2008/09 to 85,546 tonnes in 2018/19, in response to domestic demand.

Based on production forecasts developed by Avocados Australia, national avocado production is likely to exceed 115,000 tonnes by 2025.

This rate of growth is well above previous consumption growth and the expectation is that significantly more fruit will be marketed to offshore markets as domestic market saturation increases.

This may also be impacted by imports from other countries, as Chile has now gained access, and Mexico and Peru remain interested in gaining access to Australia. It is imperative for the industry to access and develop new markets to ensure the long-term sustainability of the industry.

The *Avocado Export Readiness and Market Access* project (AV17000) was established in 2018 to ensure the avocado industry was prepared to export, maintained a robust industry capacity to pursue new and improved market access, and provide necessary support to the government in their market access negotiations.

In the past two and a half years, there have been significant achievements in the avocado export development and market access. Australian avocado exports have increased 32% per year over five years, to a record level of 4,272 tonnes last year. It increased 71% from the previous year and was valued at AU$24.55 million.

To support continued increase, the export project has been focusing on four key areas: market access and maintenance, export trade development, branding and positioning and building industry capacity.

AV17000 has had some significant outputs since it started.

New export plan

A review of the *Avocado Industry Export Development Plan 2014-2019* was undertaken and we then developed the *Avocado Export Strategy 2019-2021*. This new plan lays the foundations for the export market development and market access activities and can be accessed here via the Best Practice Resource Library (visit avocado.org.au/bpr/). It can also be found as a Related Resource within the Export section of the BPR, at avocado.org.au/best-practice-resource/export/.

Market access and maintenance

As part of AV17000 and previous foundational work, Avocados Australia was heavily involved in securing the first protocol market access, for Japan. This 2018 achievement has set a precedent as we pursue access to other protocol markets. As part of this work, we:

- continue to manage the annual Japan export registration for the industry. More than 30 growers with more than 170 avocado blocks and five packhouses in Western Australia were accredited for export to Japan in 2019
- facilitated a Japan export registration on-line workshop in June 2020 to help growers and packhouses to utilise the Japan protocol (more on page 20)
- reviewed, updated and developed compelling business cases to progress market access negotiations for India, Thailand, New Zealand and Japan, the priority markets identified by the industry
- established the Avocado Market Access Advisory Group with DAWE to support the development of robust, workable market access protocols for both new market access and market improvement.

Trade Development, branding and positioning

As part of AV17000, we have participated in and represented the Australia avocado industry at major international trade shows and trade missions. We have promoted Australian avocados at events such as Asia Fruit Logistica (AFL), Foodex Japan, and the China Fruit & Vegetable Fair, as well as participating in the Indian market insight mission in 2019.

In addition, we have also invested in grower/packer participation in AFL and Japan Foodex, to broaden the knowledge of industry participants regarding market requirements, and provided avocado industry input to the Taste Australia program and Export Retail Training program operated by Hort Innovation.

Building industry capacity

An important addition to the industry's available data has been the development of the Global Trade Data Framework. This framework captures, analyses and reports data on Australian avocado exports and imports, Australia's avocado export markets and export competitors for priority markets, and Maximum residue limits (MRL) for prioritised avocado importing countries.

In addition, the information available via *avocado.org.au* has been expanded with the addition of a Global Portal on the public site, and expanded information within the Export Module of the Best Practice Resource. The Global Portal provides information and resources for use by our industry's international customers, while the Export Module helps the Australian industry assess and prepare for exporting.

The future

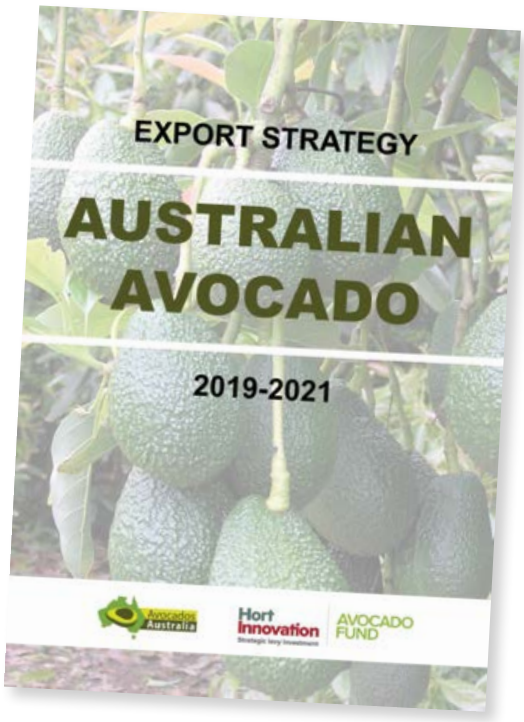
The current project (AV17000) will finish by the end of October 2020. Avocados Australia looks forward to a new export project to continue servicing our industry to strengthen the export business and prepare the industry for further growth in international trade.

More information

Sign up for Export Coordinator Joy Tang's regular email updates on avocado export related news and activities. Email your contact details to *export@avocado.org.au* to subscribe. (Note, you must be a participant in the Australian avocado industry to subscribe.)

Acknowledgement

The *Avocado Export Readiness and Market Access* (AV17000) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.



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Upskilling for Japanese export

A special registration workshop for the 2020/21 export season to Japan was held on 24 June, in a combined online and in-person event.

Avocados Australia and the Western Australian Department of Primary Industries and Regional Development (DPIRD) hosted the event, from Manjimup in Western Australia with presentations also from the Australian Government Department of Agriculture, Water and the Environment (DAWE).

Avocados Australia CEO John Tyas said as avocados for the Japanese market must be sourced from officially recognised areas free from Queensland fruit fly, the event was targeted to the industry in Western Australia, the Riverland region in South Australia, and Tasmania.

"In this 2.5 hour session, we heard an overview of Western Australia avocado exports and markets from DPIRD, and an overview of the Japan registration process and how to prepare for an audit from DAWE," he said.

Avocados Australia has updated the Export module in the Best Practice Resource with a recording of the session, and links to a large number of relevant resources, visit *avocado.org.au/bpr-articles/export-japan/*.

Registration applications for the 2020/21 export season closed on 3 August, 2020.

More information

Contact Export Coordinator Joy Tang via *export@avocado.org.au* or call 07 3846 6566. You can also find out more about exports to Japan from DAWE's Manual of Importing Country Requirements (MICoR) here: *https://micor.agriculture.gov.au/Plants/Pages/Japan_JP/Avocado.aspx*.

Acknowledgement

The *Avocado Export Readiness and Market Access* (AV17000) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.

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New resources coming for exporters

Two new projects secured by Avocados Australia will help support the industry's growing export efforts.

Avocados Australia CEO John Tyas said the two Australian Government Package Assisting Small Exporter (PASE) grants would help streamline the registration process for protocol markets, and provide specific information for those seeking to access the Japanese and New Zealand markets.

"Export represents less than 5% of our production at the moment, but global pandemics aside, we fully expect to see a growing interest in coming years," Mr Tyas said.

The first of the two projects involves the adaptation of an online export registration system for use by the avocado industry.

"At the moment, growers and packhouses register for exports to protocol markets with Avocados Australia via a time-consuming process of completing and scanning paperwork," Mr Tyas said.

"Adapting the existing Australian Table Grape Association (AGTA) online system will make that system more efficient."

Mr Tyas said the project would include a training program for current and potential avocado exporters on how to use the online system.

This project will deliver improvements to the current export registration process by providing:

- an online registration, mapping and phytosanitary data recording platform
- an improved, consistent approach for generating and collecting map information to enable traceability of avocados from the tree to the table, that complies with the current export requirements for protocol markets
- an improved, consistent approach for documenting and collecting phytosanitary data (such as information related to pests, diseases and treatments) that complies with the current export requirements for protocol markets.

The ATGA in conjunction with Avocados Australia will provide on-going support for the platform of on-line registration, mapping and phytosanitary data collection support to small exporters to complete the process each year.

Mr Tyas said the second PASE project would allow Avocados Australia to develop two new modules within the Best Practice Resource, to provide clear guidance to export capable growers and packhouses with regard to exporting to Japan and New Zealand.

"We will be adding information such as registration requirements, the export process, online registration system, maximum residue limits, export packing requirements, and inspections and audits," he said.

The Department of Agriculture, Water and the Environment's PASE grants are designed to support small exporters overcome the barriers they face when exporting.

Tariffs on Indonesian exports to go

A new trade era with one of the world's fastest growing economies began on 5 July 2020, and includes some potentially good news for Australian avocado exporters.

The Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA) is now in place, and includes provisions for the elimination of tariffs on avocados from Australia in 2026.

Australian Agriculture Minister David Littleproud said almost 100% of Australian goods exported to Indonesia would enter duty free or under significantly improved and preferential arrangements from today.

"By 2050 Indonesia is projected to be the world's fourth largest economy, with per person consumption predicted to be greater than China for key commodities such as cereals and beef," Minister Littleproud said.

"Securing this breakthrough with our sixth largest agricultural export market will help turbo charge trade opportunities in both countries and propel our post pandemic recovery.

"The benefits will be across the board and are a reminder of how our farmers and the agriculture sector will continue to be the bedrock of our recovery from the COVID-19 crisis."

Avocados Australia CEO John Tyas said Indonesia was already part of Australia's export mix for avocados.

"In 2018/19, 2.68% of our exports were destined for Indonesia, which is itself a significant producer," he said.

"As per the *Avocado Export Strategy 2019-2021*, our goal is to be exporting at least 15 tonnes of high-quality Australian avocados to Indonesia by 2021. We realise COVID-19 will definitely impact on that goal, but knowing the tariff will be reduced from the current 4% to zero in 2026 may encourage more exporters to consider the Indonesian market."

As noted in the *Avocado Producers & Market Suppliers 2019* report (available in the Best Practice Resource library), Indonesia was the world's fourth largest avocado producer in 2017, with 6.1% of global production. This production is primarily green skin varieties destined for the domestic market where avocados are often consumed in drinks

More information

Read the IA-CEPA here: *www.dfat.gov.au/trade/agreements/in-force/iacepa/Pages/indonesia-australia-comprehensive-economic-partnership-agreement*

Acknowledgement

The *Avocado Export Readiness and Market Access* (AV17000) project has been funded by Hort Innovation, using the avocado research and development levy, and contributions from the Australian Government.

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IA-CEPA creates a framework for Australia and Indonesia to unlock the vast potential of the bilateral economic partnership, fostering economic cooperation between businesses, communities and individuals.

Indonesia has been a growing market for Australian goods and services exporters. In 2018/19, total two-way trade in goods and services with Indonesia was worth A$17.8 billion, which means Indonesia is Australia's 13th largest trading partner.

As one of the fastest growing economies in the Indo-Pacific, Indonesia presents a significant opportunity for Australian businesses. By some estimates, Indonesia will be the world's fifth-largest economy by 2030. As strategic partners and the two largest economies in South East Asia, the agreement also complements and supports a shared interest in fostering a secure and prosperous region.

Australia's arrangements with Indonesia under the ASEAN-Australia-New Zealand Free Trade Agreement (AANZFTA) remain unchanged. While IA-CEPA builds on outcomes in AANZFTA, the two agreements will co-exist after IA-CEPA enters into force. Businesses will continue to be able to use AANZFTA.

2020 OrchardInfo tree census and productivity survey

By Daniel Martins, Avocados Australia Data Analyst

The 2020 *OrchardInfo* tree census and productivity survey will soon be open, and the Avocados Australia data team is looking forward to yet another great response this year.

OrchardInfo is a vital program for the avocado industry, collecting and reporting key statistical information about the industry's growth and productivity levels. This information is essential for industry planning, as it provides base data to estimate future changes in supply. This helps us prioritise everything from what research to advocate for on behalf of industry, to the domestic marketing effort, and developing export markets based on future production estimations.

The program also provides direct benefit to contributors, who are provided with a report showing where their business fits within their region and nationally. Therefore, we encourage all growers to participate fully in this program for the long-term benefit of the entire avocado industry in Australia.

Avocados Australia maintains this data on behalf of all avocado growers. The individual's data remains entirely confidential; for reporting, data is aggregated to regional and national levels. Your individual information will remain confidential.

The Avocados Australia team will be standing by to answer any questions you may have about the tree census and the productivity survey, the details of which will be emailed to each grower later this year.

The *OrchardInfo* Tree Census report for 2020 will be sent to all contributors later in the year.

2020 Facts at a Glance

We are now ready to start preparing the yearly national statistics snapshot, Facts at a Glance, for 2019/20. We will be sending a notice once the publication has been made available on our website.

Each year, we provide this update of the industry's key statistics, covering:

- national production figures by region, tonnes, and trays
- harvesting periods for Shepard and Hass
- production by variety
- avocado consumption
- export markets.

Check out the current report by going to *bit.ly/AALfacts*.

Data system refresh: a brief update

Avocados Australia's new data system is currently being tested internally. We are testing the new features and functionality and will be seeking stakeholder feedback before the development stages are finalised.

The rollout will extend through to the first half of the 2021 financial year with varying degrees of activity. The bulk of it will be taking place within the coming three to four months while we ensure proper functionality of the system and a smooth industry transition.

Once the system is fully functioning with the current participants, we will be actively encouraging new users to come on board. The more complete the data, the greater the value for everyone.

Acknowledgement

The *Avocado industry market data capture and analysis* project (AV16006), has been funded by Hort Innovation, using the avocado industry research and development levy and contributions from the Australian Government.

Hort Innovation Strategic levy investment | AVOCADO FUND

What is funded under the Smart Fruit Fly Management measure?

In November 2018, the National Fruit Fly Council welcomed the Australian Government's announcement of the $16.9 million Smart Fruit Fly Management measure.

The measure acknowledges the importance of managing fruit fly to protect Australia's horticulture industry and supports maintaining a strong, effective and harmonised fruit fly management system.

The Australian Government Department of Agriculture, Water and the Environment (DAWE) is leading the management of the measure which supports a wide range of activities that fall into five priority areas:

- systems capability
- national policy development
- technical and scientific advice
- communication and extension
- research and development.

For example, to improve system capability the measure supports the modernisation of Australia's National Fruit Fly Management Protocols. The protocols include a series of guidelines and references that set the standards for the national management of fruit fly. This ensures the Australian Government can provide assurance to international trading partners that Australia's management of fruit fly is coordinated, consistent and meets international obligations.

The measure also supports the development of national policies for fruit fly management. One of these is a national policy for use of the sterile insect technique (SIT) in fruit fly management. It will outline principles to assist state and territory governments to consistently apply SIT in Australia.

In the technical and scientific advice area, a technical feasibility and economic analysis for the eradication of Mediterranean fruit fly from Western Australia is being undertaken by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES).

As well as promoting the measure and its achievements, activities in the communication and extension area aim to ensure that all participants are aware of their shared responsibility in strengthening Australia's fruit fly management system.

Finally, the measure establishes a research program to fund research, development and extension activities that strengthen Australia's fruit fly management system. The total funding for the research program is $13 million, comprising $6.5 million from the Australian Government and $6.5 million co-contributed by the state and territory governments. Projects that will be funded under this program will be announced soon.

The National Fruit Fly Council believes the activities supported by the measure will play a vital role in strengthening Australia's fruit fly management system. The Council will continue to support and collaborate with all stakeholders to progress work in each of these priority areas.

More information

For more information about the council visit *https://preventfruitfly.com.au/* email *FruitFly@phau.com.au*.

The state of plant biosecurity in Australia

The National Plant Biosecurity Status Report for 2019 was released in July by Plant Health Australia (PHA), bringing together contributions from more than 100 government, industry and research organisations, including Avocados Australia.

Avocados Australia CEO John Tyas said the report provided a comprehensive view of the state of plant biosecurity in Australia for the previous calendar year.

"It's important for industry to know the current state of play when it comes to biosecurity," he said.

PHA Chair Steve McCutcheon said 2019 was challenging for agricultural industries in Australia with extreme climatic events impacting production across the nation.

"Fortunately, our crops and native plants continue to be largely protected from the consequences of pests that affect plants overseas by a highly effective biosecurity system."

In 2019 there was also a renewed focus on plant health both nationally and internationally with the launch of 2020 as the International Year of Plant Health.

"This edition of the report is the twelfth in a series of high-quality professional documents which play an important role in monitoring the health of our plant biosecurity system," said outgoing PHA Executive Director and CEO, Greg Fraser.

The report captures the efforts being made by governments, industries, research agencies and the community to support Australia's biosecurity system.

For example, it details more than 680 plant and pollinator biosecurity research, development and extension projects and 112 plant pest surveillance programs undertaken in 2019.

The report also lists nearly 400 high priority pests of Australia's plant industries, identified through biosecurity planning facilitated by PHA. For the first time in 2019, there's also a list of high priority pests of the environment.

Another key feature of the report is the profiles of more than 35 plant industries. Each profile highlights the industry's economic value, major growing regions, key exotic pest threats and biosecurity initiatives.

They also track the value of each industry over time, painting a picture of the growth of some industries and the challenges faced by others.

Read more

The National Plant Biosecurity Status Report for 2019 is now available from: *planthealthaustralia.com.au/national-programs/national-plant-biosecurity-status-report/*.

Credit: Plant Health Australia

As of July, Plant Health Australia (PHA) has a new CEO, Sarah Corcoran.

PHA Chair Steve McCutcheon said Ms Corcoran brought a wealth of experience to the role, with more than 20 years working in biosecurity, including leading responses to exotic pest and disease incursions.

PHA is the national coordinator of the government-industry partnership on plant biosecurity.

In her previous role as Executive Director, Biosecurity and Animal Welfare; Infrastructure and Major Projects with the Northern Territory Government, Ms Corcoran was at the forefront of leading the response to the citrus canker outbreak.

Prior to that, she held a number of senior plant biosecurity positions with the Queensland Government and led the largest invasive ant eradication program ever undertaken in Australia.

Ms Corcoran said she was eager to take on a broader role in the national system.

"In the past I have worked with PHA on a number of projects and responses to incursions. But there's much more to PHA, including work in the areas of preparedness and training. In my role as CEO I look forward to building on the good relationships we hold with our stakeholders and continuing to bring people together to create solutions from a national perspective."

Sarah takes over the role from former long-serving PHA CEO and Executive Director, Greg Fraser.

Mr Fraser was appointed to this role in 2008 and, in the following 12 years, made a significant contribution to the growth of the organisation and Australia's plant biosecurity system.

New PHA CEO Sarah Corcoran

The latest in your BPR

The Best Practice Resource is currently undergoing a content review and update, so expect to see more changes in the coming months. In the meantime, here's what's been added recently.

Have you viewed the new phytophthora video?

The *Protecting your avocado trees from Phytophthora* root rot video demonstrates the steps needed for the effective use of phosphorous acid, as part of an integrated management approach. The application of phosphorous acid forms an essential part of the integrated management of phytophthora, however, it must be done correctly. This video demonstrates the steps to be followed to achieve the effective use of this valuable fungicide. This video, produced via the industry extension project (AV17005), has been added to the BPR Library, under the video category. It's also been embedded in the article about phosphorous acid, which sits within the material on phytophthora in the Growing section of the BPR.

Regional forum materials

Did you miss the Tristate or Central New South Wales Regional Forum? These online events were recorded and you can find the videos, handouts and presentations in the BPR Library, under the Event Proceedings category. For Tristate, the guest speaker was Spanish researcher, Dr Inaki Hormaza, whose work is around understanding flowering and maximising fruit set. For Central New South Wales, Craig Maddox and Ruth Huwer from NSW DPI provided an update on spotting bug management. They have also produced a handy collection guide, which is available as part of the meeting materials.

Avo Alerts

Growers can find the two latest editions of the *Avo Alerts* – checklists of useful orchard tasks organised by growing region – in the Australian Agronomy category of the BPR Library. The latest editions include links to various video content, and COVID-19 resources.

COVID-19 resources

While not in the BPR, Avocados Australia has collated a host of resources to help you manage your orchard and packshed during the global pandemic. There are lists of national resources, a guide to staying safe in the packshed/orchard, and lessons we can all learn from outbreaks in other ag industry businesses. These have been specifically collated with avocado orchards in mind. You can access these resources directly from the homepage of the public website, without needing to log into the BPR. Visit *avocado.org.au*.

Registering for the BPR

Avocados Australia welcomes new applications for the Best Practice Resource from all businesses that are part of the Australian avocado industry. This includes, growers, packers, wholesalers, ripeners, transporters, retailers, exporters, researchers, consultants, input suppliers and other relevant stakeholders.

Information has been sourced from the latest research, development and industry investment, checked by industry experts and carefully structured to allow quick and easy access to information including a search function. Information and resources are updated as new content becomes available.

Can you apply for registration via *avocado.org.au/bpr/*. It's free!

Staying safe in the orchard

Flammable liquids in your workplace

Safe Work Australia has published a new guide on the storage of flammable liquids. The guide is for small to medium sized businesses and describes the risks of flammable liquids and explains, step by step, how to manage those risks.

This includes working out how flammable the chemicals you store are, which other chemicals they're safe to be around, how to make sure there is proper ventilation, and ensuring you have the correct fire-fighting equipment.

The guide also includes an example of a business that uses and stores flammable liquids, and provides advice about workplace placarding for businesses storing large quantities of flammable liquids. You can find the guide here: *safeworkaustralia.gov.au/doc/storage-flammable-liquids*.

Safe Work Australia has also published a new case study for businesses using and storing flammable hand sanitisers in response to COVID-19. The case study discusses some simple steps that need to be taken when storing or rebottling hand sanitiser, such as making sure you have the chemicals safety data sheet and making sure you store it in a safe place. Read the case study here: *bit.ly/TA312san*.

Quad bike safety factsheet

The ACCC has produced a new quad bike safety standard fact sheet to answer questions received in relation to the quad bike safety standard: *productsafety.gov.au/publication/quad-bike-safety-standard-fact-sheet*.

This is in response to concerns that some quad bike manufacturers have indicated they will cease supply of utility quad bikes to Australia once the quad bike safety standard becomes mandatory, and the effects this will have on future quad bike supply.

The ACCC takes these concerns seriously and recognises that quad bikes are a vital piece of machinery for farming. However, the reality is that quad bikes are also very dangerous due to their inherent design limitations and a single mistake can have tragic consequences.

After a two-year investigation, the ACCC concluded that the main risk to farmers and consumers is due to quad bikes' propensity to roll over and their lack of rider protection in these circumstances, which can result in farmers receiving serious crush injuries and dying from asphyxiation when the quad bike pins them underneath.

The fact sheet contains information about: the frequency of deaths and injuries associated with quad bikes, the ACCC investigation, the standard, operator protection devices, other safety measures, Israeli regulations, and the dangers of side-by-side vehicles.

Tasmania: quad bike safety rebate scheme

The Tasmanian Government will continue to provide the quad bike safety rebate for approved purchases until 10 October 2021, before the mandatory requirement for rollover/crush protection devices on new utility (general purpose) quad bikes comes into effect under the Australian Consumer Law on 11 October 2021. Read more: *bit.ly/312tas*.

South Australia: elevating work platforms

In early July, Safework SA inspectors were focussing on the use of mobile elevating work platforms (EWP), with a continuing safety campaign and audits across a number of industries.

A guideline is available from *safework.sa.gov.au/resources/free-resources* to help understand and control identified hazards and risks in South Australia. The guide includes information on ground support personnel, the minimum standards for training, along with a checklist to ensure training requirements are being met. (If you would like a printed copy, call 08 8204 8881, or download the order form from the link above.)

You can find links to a range of EWP resources from a range of agencies (including national bodies, WorkSafe SA and SafeWork NSW) in the BPR Library, under WHS Resources.

Queensland: record labour hire fine

A rogue labour hire provider has received a huge fine and conviction for operating without a licence under Queensland's Labour Hire Licensing Act 2017.

Yellow Hoa Pty Ltd has been convicted and fined $120,000 in the Caboolture Magistrates Court, the highest penalty imposed to date under Queensland's labour hire licensing laws. Director ThiHoa Duong was also convicted of aiding, counselling or procuring that offence and given a fine of $60,000, with six months' imprisonment in default of payment.

The court action followed a compliance swoop on a berry farm by officers from Queensland's Labour Hire Licensing Compliance Unit, Australian Border Force and Workplace Health and Safety Queensland, who had been tipped off by a member of the public about the exploitation of workers at the property.

Investigations found workers were paid in cash at rates well below the award and weren't paid superannuation. WorkCover Queensland confirmed that at the time, Yellow Hoa had no workers' compensation policy in place to safeguard employees. As a result, Yellow Hoa and its director benefitted financially from deliberately failing to comply with a range of laws.

Yellow Hoa did not apply for a labour hire licence in Queensland, but still illegally provided labour to the farm for a six-month period until 18 June 2019.

Queensland: working near electric lines

The Queensland Government has recently revised the Electrical Safety Code of Practice for working near overhead and underground electric lines.

Queensland's work health and safety laws require risks to be managed in accordance with a hierarchy of risk controls, which the code of practice shows can be effectively applied to the risk of contact with overhead powerlines.

As a first step, risks should be eliminated by arranging for power to be switched off during work periods, changing the farming activities or by re-routing powerlines. Redundant powerlines may be removed.

If it's not practicable to eliminate the risk, other options include replacing overhead powerlines with underground cables, raising the height of powerlines, or establishing overhead powerline exclusion zones. Read more here: *bit.ly/3exEHQx*.

NSW: free SMS mental health service

The NSW Government has announced funding for a free SMS service providing mental health counselling in rural and regional areas.

VirtualPsychologist is free for anyone living and working in rural and regional NSW, just text 0488 807 266.

NSW: amendments to WHS laws

The Work Health and Safety Amendment (Review) Act 2020 recently passed by the NSW Parliament has enacted the following key changes to NSW WHS laws:

- enhancement of the Category 1 offence by including "gross negligence" as a fault element – To make it easier to prosecute and create a stronger incentive for duty holders to manage WHS risks
- prohibition of insurance and indemnity arrangements - To ensure people cannot avoid responsibility for paying WHS fines
- increased penalty amounts for all WHS offences in line with the Consumer Price Index – To ensure penalties retain their deterrent value
- extension of time in which a person can ask the WHS regulators to start a prosecution in response to a Category 1 or Category 2 offence from 12 to 18 months and addition of a requirement that the WHS regulator provide updates every three months to the requester until a decision to prosecute is made - To ensure that during investigations of workplace accidents, families are kept informed and have access to an effective review mechanism for decisions not to prosecute
- clarification that a Health and Safety Representative (HSR) can choose their course of training - To avoid unnecessary delays which can affect an HSR's ability to fulfil their role and exercise their powers.

These changes, which came into effect 10 June 2020, will assist in improving compliance and enforcement measures for the NSW WHS Regulators, to make the lives of workers and business owners healthier, safer and more productive.

Victoria: new era for workplace health and safety

From July 1, employers that fail to meet health and safety obligations face tough new penalties should their negligence lead to a worker dying on the job. This includes up to 25 years in prison for individuals or $16 million in fines for corporations.

The new laws will be enforced with support from WorkSafe's specialised Fatalities Investigations Team – a dedicated unit that will be responsible for investigating workplace deaths.

As part of these health and safety reforms, WorkSafe has also broadened the criteria that define a workplace death.

Those killed on the road while working, suicides attributable to a workplace health and safety failure, deaths from industrial diseases such as silicosis, and workplace deaths resulting from a criminal act, will now be recognised in WorkSafe's fatality toll.

There have been 41 deaths in Victoria in 2020 under the expanded definition.

Preventing injury and keeping those people that work for you safe is important for your business.

Avocados Australia proactively addressed this issue in 2014 by working with the Australian Centre for Agricultural Health and Safety (ACAHS) to develop a specific avocado-tailored module in the Best Practice Resource on work health and safety.

This module provides a step by step guide to assist avocado growers and packers to develop a WHS Policy and Plan for their own business.

It includes a lot of useful resources such as guides, templates for inductions, checklists and other management tools These specific resources have been developed for the avocado industry which will help you to manage Work Health and Safety and meet your legal obligations: *avocado.org.au/bpr/*.

Guidelines for using labour hire providers

By the Fair Farms Initiative

Growers all around Australia rely on labour hire providers for the engagement of seasonal workers. Contrary to widespread belief, using a labour hire provider does not entirely release the grower from their legal and ethical duties to ensure compliance and workers' welfare. Therefore, it is important to have good processes in place to manage the outsourcing of labour and mitigate the risks involved.

Here are some key recommendations around the use of labour hire providers.

Do your due diligence up front

Before you choose a labour hire provider, it is important to do your due diligence. Steps for selecting a professional provider and identifying dodgy operators may include:

- reference checks (asking around for experience with a provider)
- check if the provider has the appropriate license (if applicable) and examine the restrictions and history of that license
- look for a provider with StaffSure certification (*www.staffsure.org*)
- check for unusual patterns that could point towards a sham operator, for example:
  - frequent changes to business name or ABN
  - no physical business address or phone number
  - no track record of GST
  - an ABN check that reveals the entity was registered very recently.

Sign a written contract

Your business relationship with the labour hire provider should be documented in a written contract that outlines each party's legal and ethical obligations to one another and towards workers. The contract should also cover off on how adherence to these obligations will be monitored. Further guidance on what should be included in the contract is given in the Fair Farms Standard (*www.fairfarms.com.au*).

Monitor what goes on

Continuous monitoring is critical for ensuring that your labour hire provider sticks to their side of the bargain. After all, that's what you are paying them for. You should put robust monitoring practices in place that suit your circumstances.

Ways to monitor the provider should include:

- asking to review a random selection of worker pay-slips periodically
- asking the provider for evidence of paying super
- inspecting worker accommodation or requesting photos
- educating workers about their legal rights and entitlements
- providing a grievance process for workers.

Pay a reasonable fee

You should ensure that the fees charged by your provider are enough to cover their costs plus a reasonable profit margin. The provider's costs should normally include:

- minimum wage for workers (keep in mind overtime and piecework provisions if applicable)
- superannuation
- WorkCover and other insurances
- payroll tax
- admin overhead.

Always remember that if a price seems too good to be true, it probably is. Such a proposition is often built on underpayment of workers.

Avoid further subcontracting

Finally, one should be cautioned against further subcontracting of labour (ie, your provider engaging another provider to send you workers). Experience shows that extending the labour supply chain increases the risk of workers being exploited, as each business in the chain takes their cut, often not leaving enough for the worker to get a legal wage. While further subcontracting can be legitimate in certain circumstances, for example for contingency workforce planning, as general guidance, it requires additional due diligence and should be avoided.

These and other topics around ethical employment are covered in the Fair Farms Standard, which outlines the accepted principles of fair and ethical employment in Australian horticulture. Employers who wish to get trained and certified against the Standard can join the Fair Farms Initiative here: *www.fairfarms.com.au/registration*.

More information

Visit: *www.fairfarms.com.au*
or email *fairfarms@growcom.com.au*.

All three major retailers now endorse Fair Farms

Coles endorsed the industry-led Fair Farms training and certification program at the end of May, and will now accept Fair Farms certification as a way by which fresh produce suppliers can demonstrate compliance with the Coles Ethical Sourcing policy.

Fair Farms National Program Manager Thomas Hertel said he was pleased to receive the support of one of Australia's major retailers.

"Coles contributed to the original design of the Fair Farms Standard alongside other retailers and stakeholders so it's great to see the supermarket giant is now joining the group of Australian produce buyers who support the industry-led initiative," he said.

Coles General Manager Fresh Produce Craig Taylor said the supermarket was proud to give the Fair Farms training and certification program the tick of approval.

"Coles is pleased that we can now offer a choice in the path our suppliers follow to become approved under the Coles Ethical Sourcing Program," he said.

"The Fair Farms program has been designed with input from Australian farmers and retailers and offers local training support to participating farms."

Previously, Coles accepted SEDEX certification but did not accept Fair Farms certification as part of its Ethical Sourcing Program. Coles will now accept either program.

Fair Farms certification is now accepted by the three major retailers in Australia: Coles, Woolworths and Aldi.

Mr Hertel said Australian horticulture producers can choose Fair Farms and thereby meet the ethical sourcing requirements of all three retailers.

"Having an industry standard for ethical employment practices agreed across the different supply chains within horticulture should make compliance easier and less costly," he said.

"This means that more farm businesses are likely to adopt the Fair Farms Standard, leading to improved conditions for workers on farm.

"The Fair Farms program supports all members of the Australian horticultural supply chain. It is built on the idea that compliant and ethical employers should be recognised and rewarded for their efforts by their customers and consumers, who may choose to buy Australian produce from ethically verified sources."

Fair Farms is developed and delivered by Growcom with support from the Fair Work Ombudsman, the Federal Department of Agriculture, Water and the Environment and AUSVEG.

BACKPACKER TAX RULING RELEASED

The Full Federal Court of Appeal has found in favour of the Commissioner of Taxation, ruling the Australian Government's backpacker tax is no discriminatory.

This decision concerns whether an individual that entered Australia as a working holiday maker was a resident of Australia for tax purposes, and whether that individual was required to pay tax at the minimum 15% tax rate applying to working holiday maker income or at the rates that otherwise apply more generally to Australian residents (which incorporate the tax-free threshold).

"This decision upholds the ATO's current view meaning that employer obligations have not changed, and employers should continue to apply the appropriate tax tables when determining the amount to withhold for working holiday makers," Deputy Commissioner Jeremy Geale said.

The parties have until 3 September 2020 to seek special leave to appeal the Full Federal Court's decision to the High Court.

Transform®, the "soft" option for controlling spotting bugs in avocados

Nick Koch, Corteva Agriscience Horticulture & Insecticides Marketing Manager

Fruit-spotting bug (FSB) and banana-spotting bug (BSB) have a similar effect and either one or both species are found in coastal and sub-coastal avocado growing areas of Queensland, northern NSW, the Northern Territory and north-western Western Australia. These are serious pests which can cause serious economic losses if not controlled.

Both adult and nymph spotting bugs can damage avocado fruit. Smooth and thin-skinned varieties such as the Fuerte are most vulnerable. Fruit smaller than 5cm in diameter (golf ball size) are usually dropped soon after being stung by spotting bugs. Young fruit can show 'blind stings' – dark sunken spots without noticeable cracking. Larger avocado fruit usually remain on the tree after being stung, damage appears as either lesions that show up as craters or star-shaped cracks that form as the fruit expands around dead tissue. Lesions can become infected with the fungus Glomerella cingulata, causing anthracnose disease leaving fruit unmarketable. A 'blind sting' is the term for damage where the feeding site is almost or totally invisible externally (especially on thick-skinned varieties such as Hass) but lesions are visible when the fruit is peeled. Stings can result in small, hard, woody lumps in the fruit (often referred to as stones) in the flesh just under the skin.

Over the years, FSB and BSB have been controlled by using broad spectrum chemicals which can cause significant disruption to beneficial insects. More recently, growers have realised that maintaining the natural balance of beneficial insects is imperative for reducing the dependence on chemical controls.

An integrated pest management (IPM) approach has proven successful for growers wanting to reduce their dependency on broad spectrum insecticides and promote a healthier, more sustainable farming practice. Maintaining beneficial insect populations can be particularly effective at reducing the number or frequency of sprays needed during a season by keeping low to moderate insect infestations below threshold limits. Beneficial insects should be considered the ultimate mode of action against insect pests as they will not develop resistance, they are free, and self-sustaining.

Transform Insecticide from Corteva™ Agriscience is active on many species of sap-feeding bugs and is registered for control of fruit spotting bug and banana spotting bug. Transform contains a unique active ingredient known as Isoclast™ which is known to have minimal impact on key beneficial predators and parasitoids. Given its low toxicity to beneficial insects, Transform is the ideal IPM tool for the control of spotting bugs.

An additional benefit of Transform insecticide is that is has a favourable ecotoxicology profile that is not persistent in the environment. Workers can re-enter the orchard as soon as the product is dry. This is reassuring to orchadists who are concerned about the safety of their workers and neighbouring properties.

Repeated field trials conducted across New South Wales and Queensland demonstrated that Transform is fast to knock-down and control spotting bug populations below economic thresholds compared to current commercial standards. Refer to Figure 1 below.

Growers and consultants have been particularly impressed with the introduction of Transform for spotting bugs, which until now has been a difficult pest to control whilst maintaining beneficial insects. When used in conjunction with other IPM compatible products such as Prodigy® and Success® Neo for caterpillar and thrip control, Transform offers farmers a sustainable alternative.

For more information on Transform insecticide contact Corteva Agriscience on 1800 700 096.

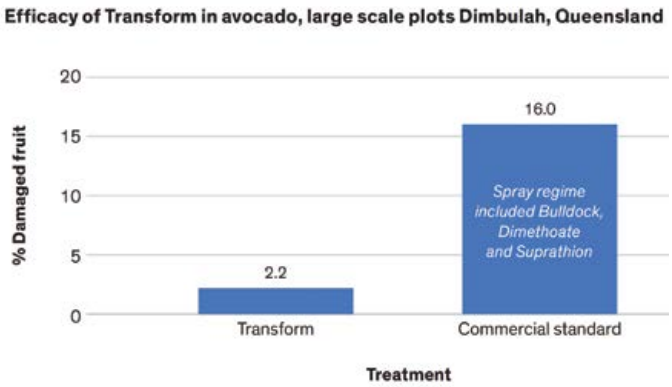


Figure 1. The above trial was conducted at Dimbulah, Queensland, between September 2014 to February 2015 to evaluate Transform insecticide for the control of banana spotting bug in avocados (Shepard). Treatments were applied using a commercial air blast sprayer at 700L/ha water volume (3 bar). Four Transform treatments were applied approximately three weeks apart. The trial was established in large plots (3 rows x 50 trees) with trial trees approximately 4m tall. At the completion of the trial, 500 fruits were assessed for BSB damage. Transform applied at 40mL/100L gave excellent control of FSB with only 2.2% of fruit damaged and was superior to the standard treatments with 16.0% damaged fruit.

Canopy management important

Intermercato Grapples

Canopy management is best practice in today's avocado industry. It makes harvesting and spraying easier, enables the cultivation of higher density orchards and aims to optimise the production of high-quality fruit.

But what's the best pruning equipment to tackle the job safely and efficiently?

Wielding a chainsaw on top of a cherry picker has traditionally been the fallback method for growers. But this approach is inefficient and hazardous, leaving the operator vulnerable to accidents.

So is there a better way? The use of a shear attachment on an excavator has recently proved itself a more effective and safer option.

Lachlan Donovan is part of a third generation family farming enterprise in Central Queensland, one of Australia's biggest avocado producers. The Donovans manage around 80,000 avocado trees over 400 hectares.

The Donovan orchards have used a range of equipment for pruning over the years. But Mr Donovan believes his Intermercato shear attachment, used on an excavator with the operator securely protected in the cab, has proven itself a safe choice for pruning.

"We still do some pruning with a hydraulic saw on a cherry picker. It does basically the same thing as the Intermercato shear does," Mr Donovan said.

"But what the Intermercato shear does is create a much safer environment for everyone. The pruning is a lot easier and it's a hell of a lot quicker and more efficient."

With labour a key cost, he said the shear method also "takes a lot of labour out of the equation".

"The main thing is we can get over our orchard a lot quicker, with less people, and prune it up. It's all about efficiency at the end of the day. Investing in the right technology is critical."

Intermercato Grapples Australian manager Cameron Moir said the excavator shears were popular with avocado growers.

"The limb is cut and held so it doesn't fall into the canopy, causing the extra damage that can happen with implements like pole saws," he said.

"A shear is just a massive cylinder pulling the limb onto the Hardox blade, so it consists of very few moving parts. Most people own them for years before they buy any spares."

More information

www.grapples.com.au

MARKETING UPDATE

Promoting avocado at home

By Australian Avocados, Hort Innovation

Times may be a little strange for our avocado consumers but sentiment on the Australian Avocados' Facebook page continues to be overwhelmingly positive.

Fans have continued to share their love and a lot shared their favourite ways to use avocados throughout this global pandemic.

New team member

Adele Nowakowska has joined the Hort Innovation Marketing Team in the role of Marketing Manager. Adele will support the delivery and strategy development of key industries and will work with Hort Innovation Group Marketing Manager Matt Dwyer on avocados.

New Australian Avocados Marketing Manager Adele Nowakowska.

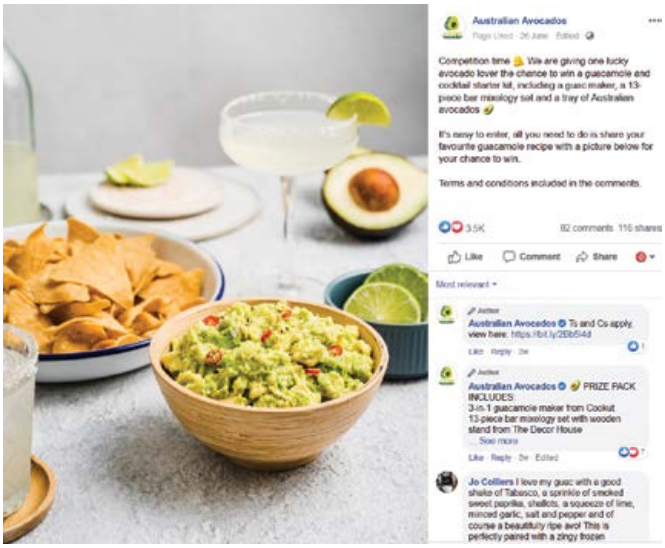
Adele is a senior marketer with more than 20 years' experience across advertising and FMCG marketing. Most recently Adele was Global Senior Brand Manager at Pernod Ricard Winemakers where she spent the past 9.5 years working across the Australian and New Zealand wine portfolio, including Jacob's Creek, George Wyndham and Brancott Estate. In the last two years Adele's achievements have included the launch of a new global brand positioning for Jacob's Creek, the development of the brand's product innovation pipeline and a retailer exclusive range of wines, a world first for the brand.

Adele is an expert in new product development including concept development, packaging design, production and execution and specialist in 360 degree/through the line (TTL) brand and product communication campaigns and asset development including point of sale, PR campaigns, sponsorship, digital and experiential marketing.

Social media

As well as continuing to work with influencers, Australian Avocados ran a guacamole competition in July, encouraging fans on Facebook to share their favourite guacamole recipe, with picture. Entrants were competing for a guacamole and cocktail starter kit, including a guac maker, a 13-piece bar mixology set and a tray of Australian avocados. This competition supported the #smashanavoathome activity; on the next page.

There were more than 3,500 interactions on the competition post, and some excellent guacamole suggestions from our ardent avocado lovers.



A Facebook competition in July encouraged avo lovers to share their favourite guacamole recipe, for a prize that included a tray of Australian avocados.

Varieties campaign

The season has now fully switched to Hass, and Australian Avocados secured more than 163 pieces of media and social coverage to support the transition from Shepard to Hass.

Avocado consumers had more than 28 million opportunities to see, hear or read about avocados during this campaign, including interviews with Avocados Australia CEO John Tyas on 4BC, 2GB and 2SM, articles in Mindfood, Kidspot and Body + Soul online, and a cooking demonstration with Luke Hines on Studio 10.

Luke Hines has been out and about talking about the perfect avocado, including an appearance on Studio 10.

#smashanavoathome

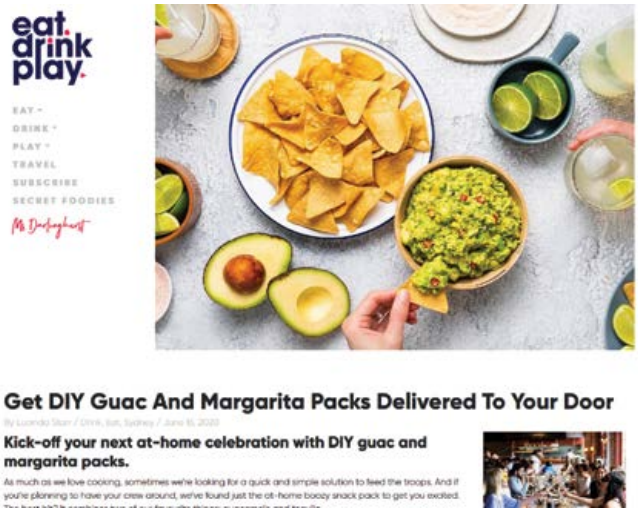
Extending on the work of avocado growers to share their favourite ways to smash an avo at home (check them out in the Autumn edition of *Talking Avocados* or on the Avocados Australia Facebook page), there have now been more than 15 million chances for consumers to see #smashanavoathome.

Coverage appeared across *Kidspot, Broadsheet*, the ABC, *Sydney Morning Herald* and in the *Woman's Day* magazine (pictured right).

Partnerships

To continue to drive in-home consumption while Australians are still in some sort of social distancing, Australian Avocados secured a partnership with Sydney-based drinks delivery company Boozi during June. This concept evolves the avocado toast at home concept and allowed Australian Avocados to pursue a different occasion and keep pace with the ability for small groups of people to get together.

As well as media outreach, Australian Avocados also sent packs to Sydney-based media and influencers to drive excitement and awareness.



Australian Avocados partnership with Boozi allowed Sydney residents to have a DIY guacamole and margarita pack delivered to their door, and media outreach included this article in eat drink play.

Acknowledgement

This activity is managed by Hort Innovation, on behalf of the industry, and is funded by the avocado marketing levy.

Hort Innovation
Strategic levy investment
AVOCADO FUND

Avocados on the menu

New South Wales avocado growers Katrina and Tim Myers from Barham will feature as part of Hort Innovation's new partnership with Channel Ten's *My Market Kitchen*.

Hort Innovation is sponsoring *My Market Kitchen* to showcase grower stories, their produce and the research-driven innovations and practices that growers use on farm to deliver healthy, nutritious and sometimes unique fruit, vegetables, and nuts to plates and lunchboxes across Australia.

Examples of innovations and on-farm practices audiences can expect to see include trial breeding sites for new varieties of custard apples, use of new technologies, treatment and prevention of diseases, and the value that industry leadership programs have provided to growers.

The segment with Barham Avocados was due to air in July, but was delayed by urgent COVID-19 news from Victoria. The program was rescheduled to 10 August, at 3.30pm.

Each grower's produce is transformed into easy and delicious meals. The key nutritional benefits are highlighted, and Hort Innovation Research and Development Manager and Accredited Dietitian Jemma O'Hanlon inspires viewers showing them how easy it is to enjoy nature's produce through a range of recipes highlighting more than 27 industries, from almonds through to vegetables.

Hort Innovation CEO Matt Brand said they wanted to build and reinforce the connection between Australian consumers and their growers.

"It's about connecting people with growers and the fresh produce that ends up on their plate, to enhance both physical and mental health," he said.

"It's also a great chance to see Australian-led innovations and how growers use them on a day-to-day basis. We hope the end-result is that people want to eat more fruit, vegetables and nuts."

More information

For more information, grower videos, research and development projects, and recipes go to *horticulture.com.au/growers/my-market-kitchen/*. You can watch one of the Barham Avocados videos via the Hort Innovation Facebook page: *bit.ly/MMKavo*.

Avocado growers Katrina and Tim Myers (and an avocado chocolate mousse) will feature as part of the Hort Innovation/My Market Kitchen partnership.

RESEARCH AND DEVELOPMENT

Avocado Strategic R&D Levy Investment – Program Overview

Funded by your grower levies and contributions from the Australian Government, the industry's research and development activities are extensive.

The industry has long invested in research and development programs to support the sustainable development of the industry.

Hort Innovation manages these funds, investing in projects addressing the industry's strategic priorities. The Australian Government also provides additional funding for avocado R&D through Hort Innovation.

Avocados Australia is the Prescribed Industry Body (PIB) that requested, on behalf of the industry, the Australian Government implement the R&D levy. This levy provides essential resources for ongoing avocado R&D and has helped to address various industry issues over many years.

Avocados Australia plays a key role in supporting Hort Innovation with its delivery of the avocado levy-funded R&D program, to ensure it continues to meet the needs of the industry.

This includes identifying R&D priorities, providing strategic advice through advisory panels, assisting with project planning and project reviews. With its extensive networks across the industry and R&D community, Avocados Australia assists Hort Innovation to deliver the best possible R&D outcomes from the levy.

Avocados Australia also collaborates with relevant agencies to undertake some R&D activities for industry that align with our capabilities and priorities. This may be as a service provider to Hort Innovation, or through other funding sources such as government grants.

Currently, Australian avocado growers pay a levy of 2.9c/kg for research and development. You can find out more about your levies here: *avocado.org.au/industry-programs/levy-information/*.

Investments are aimed at addressing levy payer priorities as set out in the Avocado Strategic Investment Plan 2017-2021. In the following pages, you will find summaries of projects undertaken in the last 12 months, funded through a variety of mechanisms, including funding secured by Hort Innovation through successful applications for Australian Government grants.

AV	Projects funded through avocado levies only
MT	Multi industry projects to which avocado levies may have contributed, along with those of other industries
Hort Frontiers	Hort Innovation's strategic partnership initiative, where projects use funding from a range of co-investors – which sometimes includes levies. These projects are typically focused on big-picture and longer-term issues critical to the future of Australian horticulture as a whole. This includes the Pollination Fund (PH), Advanced Production System Fund (AS), and Asian Markets Fund (AM)
ST/AI	Projects funded by Australian Government grants, or across industry funding
HA	Across industry projects are funded through all horticultural industry R&D programs, including avocados.

Not all the projects we've included are funded via the Avocado Fund, but are of interest to the industry. We have marked projects involving investments from the Hort Innovation Avocado Fund with this icon .

The current projects are reported on under the strategic investment plan objectives. Please note some projects meet more than one objective.

The Avocado Strategic Investment Plan 2017-2021 addresses the industry's major opportunities and challenges under four key outcomes:

- by 2021, increase domestic demand for Australian avocados by 20%
- by 2021, over 90% of avocados received by consumers will meet or exceed their expectations of quality
- by 2021, over 10% of production will be exported to markets where customers have a willingness and a capacity to pay a premium for Australian avocados
- by 2021, productivity (marketable yield per hectare) has improved by 15% on average, without increased production costs per kilogram.

You can find full details of the strategic investment plan online: *avocado.org.au/industry-programs/about-industry-programs/*.

Acknowledgement

The projects presented in this summary are investments under a variety of Hort Innovation funds, or other sources. Information for this summary has been drawn from a variety of sources, including the Hort Innovation website (*horticulture.com.au* – search via the project code for the latest information), directly from researchers, from various editions of this magazine, and final reports.

Hort Innovation Strategic levy investment | AVOCADO FUND

Hort Innovation

hort frontiers Strategic partnership initiative | FRUIT FLY FUND

hort frontiers Strategic partnership initiative | POLLINATION FUND

hort frontiers Strategic partnership initiative | ASIAN MARKETS FUND

hort frontiers Strategic partnership initiative | ADVANCED PRODUCTION SYSTEMS FUND

Objective 1:

By 2021, increase domestic demand for Australian avocados by 20%

Avocado industry and market data capture and analysis (AV16006)

Service Provider	Avocados Australia Limited
Project Leade	John Tyas
Start Date	21/04/2017
End Date	31/07/2020
Funding Type	Hort Innovation Avocado Fund

Avocados Australia Data Analyst, Daniel Martins, knows that making informed decisions about harvesting and marketing for growers, and supply and demand for the Australian avocado industry relies on the collection of robust and quality industry and market data.

This project works with growers, packhouses and the market place to develop relevant information in the form of long-term industry production forecasts, real-time supply and retail pricing data and monitoring Australian orchard productivity over time to evaluate changes.

As this project comes to an end, the industry has benefited from:

- access to up-to-date, relevant, and scalable information concerning past, current and forecast seasonal product dispatch to inform in-season marketing and supply chain engagements for avocado growers and producers
- informed medium to long term outlook for production through annual forecast reports to support strategic planning
- informed decisions with regards to export and import schedules through the availability and analysis of trade data and intelligence
- a culture of data use and objective decision making by the avocado industry
- access to reliable industry data to assess changes in orchard plantings and orchard productivity performance
- a balanced domestic market where supply meets demand to provide optimum returns to the value chain and high quality for consumers.

You can find more information about *Infocado*, *OrchardInfo* and retail price reporting here: *avocado.org.au/our-programs/supply-chain-data/*.

To improve the process further, a user-friendly upgrade to the data collection and reporting platform will soon be introduced making contribution of data from industry to the project simple. The ideal project outcome is 100% industry participation in the project, improving data reliability. Packers that don't currently participate in the *Infocado* program are encouraged to get involved (*admin2@avocado.org.au*). The benefits of having access to the data collected by this project could make a significant difference to the way you run your business and market your fruit.

You can read more on page 23.

Consumer behavioural and retail data (MT17015)

Service Provider	Nielsen
Project Leader	Elisa King
Start Date	02/04/2018
End Date	31/03/2021
Funding Type	Hort Innovation Avocado Fund

This multi-industry investment is tasked with providing regular consumer behaviour data and insight reporting to a range of industries, including the avocado industry. This information is intended to assist growers and supply chain partners in decision-making for their businesses and, for the wider industry, the data and insights are available to support strategic activities, as well as Hort Innovation Avocado Fund marketing plans.

The latest report covers the 52 weeks to 22 March 2020, and shows an increase in the volume of sales (up 2.4% when compared to the previous period), however, the dollar value did reduce very slightly (by 0.3%) even as that for total fruit rose (by 2.9%). About three-quarters of Australian households continue to buy avocados.

You can access the reports here: *harvesttohome.net.au/fruitmushroomnuts/latest-highlights/avocados* and levy payers can request access to more detailed reports.

Category and consumer impact monitor (ST19031)

Service Provider	FiftyFive5
Start Date	May 2020
End Date	September 2020
Funding Type	Hort Innovation risk management reserves

Hort Innovation is working with research company Fiftyfive5 to provide the Australian horticulture sector access to regularly updated information about consumer attitudes and behaviours during this time of COVID-19 disruption, through Fiftyfive5's Category and Consumer Impact Monitor.

Each week, this monitoring service provides an update on changes to consumer mindset, attitudes and behaviour from surveys with main grocery buyers from a representative panel of the Australian population, including information on the current and emerging commercial implications of these changes. Hort Innovation has also secured tailored content for the fresh produce sector, including insights into fruit and vegetable consumption, snacking, meal preparation and more.

You can read the reports here: *bit.ly/ST19031*.

This Category and Consumer Impact Monitor activity is funded through Hort Innovation's risk management reserves, as part of the organisation's response to assist the horticulture sector through the effects of COVID-19, drought, floods and bushfires.

Foodservice custom research reports (MT18002)

Service Provider	Food Industry Foresight
Project Leader	Sissel Rosengren
Start Date	01/10/2018
End Date	30/04/2019
Funding Type	Hort Innovation Avocado Fund

COMPLETED PROJECT

This market research investment delivered key insights around the foodservice industry for the avocado, mushroom and onion industries. It was to deliver information such as the total foodservice market sizes for these products, along with details on trends and opportunities. The information should be available for use in any future levy-funded projects and programs targeting the foodservice sector, from commercial businesses and staff to related training institutes and their students.

This project also involved contributions from the mushroom and onion funds.

Objective 2:

By 2021, over 90% of Avocados received by consumers will meet or exceed their expectations of quality

Monitoring avocado quality in retail (AV19003)

Service Provider	Applied Horticulture Research (AHR)
Project Leader	Adam Goldwater
Start Date	20/12/201
End Date	20/12/2022
Funding Type	Hort Innovation Avocado Fund

Surveys of avocado quality up until 2015 found 20-25% of fruit in stores have significant levels of bruising, internal rots, or other disorders. Poor fruit quality reduces consumer satisfaction and sales. Avocado supply continues to increase, so customer satisfaction with Australian avocados is critical to help demand meet this increased supply.

The avocado industry continues investing to improve fruit quality, and this project will help measure the effectiveness of those investments, as well as provide quality feedback to suppliers and retailers.

Regular assessments are made at retail stores in Sydney, Melbourne, Brisbane, Perth and Adelaide (at the same stores each time to reduce variability). The timing of 560+ annual collections is staggered so that the industry receives feedback from at least one location nearly every week throughout the year, capturing change of supply regions.

Hass and Shepard avocados are purchased from retail displays, as presented to consumers. The quality of store displays is assessed, and fruit supplier details, including pack-date are recorded. Fruit samples are returned to the laboratory for assessment of firmness, dry matter (Sydney only), bruising, rots and other internal defects.

Retail sampling recently commenced, and is providing rapid feedback to growers, packers, retailers, and marketing groups through real-time reports on fruit quality at retail. The reports are a one-page PDF summary, that compares the quality of the supplier/retailer's sample with weekly and long-term industry averages. This continuous feedback mechanism enables problems to be addressed in real-time to help improve the quality of avocados.

At the end of each growing season, results will be confidentially benchmarked against other suppliers, and retailers, providing a ranking for the season. Regional and national averages are reported on the AAL website and Guacamole Newsletter, and also presented at regional forums. The project will provide an objective measure of how well the industry is tracking on their mission to improve the consumer eating experience of avocados.

The project only recently commenced and continues for three years. Over time the project will collect information to help identify key fruit quality issues for future industry focus. Data collected will provide significant insights into how fruit quality is affected by factors such as retail display formats, fruit age, ripeness on display, type of retailer, and price.

Implementing best practice of avocado fruit management and handling practices from farm to ripening (AV18000)

Service Provider	Queensland Department of Agriculture and Fisheries
Project Leader	Noel Ainsworth
Start Date	07/02/2019
End Date	03/01/2022
Funding Type	Hort Innovation Avocado Fund

The project aims to identify and promote improvements to practices in supply chains between the farm and the retail distribution centres. This feedback will include details of the cool chain temperatures, periods in storage and resultant soft-ripe fruit quality.

In 2019, 40 supply chains across five production districts were monitored, with the data collected and shared with those supply chains and more broadly with industry. The project team certainly appreciated the participation of all those in the 40 supply chains.

In relation to supply chain temperatures:

- 25% of supply chains were achieving best practice temperatures at pack shed departure
- 35% of the supply chain were achieving best practice temperatures during transport
- 30% of supply chains were achieving best practice temperatures during storage
- 80% of supply chains were achieving best practice temperatures during ripening.

In relation to fruit quality, in 2019 there was really good quality with generally dry growing conditions and short supply chains. Only 20% of supply chains monitored had a level of fruit quality that would cause concern to consumers.

All industry members are encouraged to utilise the available best practice resources and to use temperature loggers where possible to monitor temperature and manage the supply chain.

When COVID-19 travel restrictions are eased, the project team members are looking forward to re-engaging with supply chain staff in the Central Queensland and Central NSW districts to recommence the monitoring of supply chains. It has been critical to keep those participating supply chain personnel informed through regional project staff. It has been equally important to engage the broader avocado industry predominantly through the regional forums. This has involved presentations at seven regional forums in 2019 and three (Western Australia, South Queensland and Sunshine Coast) so far in 2020.

Noel Ainsworth provides an update on one of the industry's latest supply chain improvement projects, AV18000.

With the regional forums transitioning to virtual webinars during COVID-19, the following videos have been released to provide an update on the findings and progress of the project and to temporarily take the place of updates at regional forums:

1. Temperatures through the supply chain: *https://youtu.be/Nc3kM66RZj8*
2. Time in supply chain stages: *https://youtu.be/uPlx2VhNUCg*
3. Packshed departure temperatures: *https://youtu.be/uxEV5oTEM1U*
4. Fruit quality reaching retail: *https://youtu.be/DH-isHTzL1A*
5. Ripeness and fruit quality: *https://youtu.be/-3IU6gvu-i8*.

The project team are also considering a range of recommendations raised at project workshops in each district late in 2019 and in early 2020. These include the introduction of tracebacks to investigate consignments with serious fruit quality problems, monitoring firmness data using Bareiss durometers, collecting NIR-based dry-matter data and collecting benchmark information from preharvest spray diaries for anthracnose management. Each of these will require additional resources and will be considered in consultation with Hort Innovation and industry representatives on the avocado Strategic Investment Advisory Panel (SIAP).

Industry can get involved in the project by sharing their supply chain data such as temperatures through the supply chain. This data will remain confidential and will help Hort Innovation ensure that the range of data collected is representative of other industry supply chains. Conversely, industry members interested in the de-identified 2019 data, please contact Noel Ainsworth, Principal Supply Chain Horticulturist, Department of Agriculture and Fisheries on 0409 003 909 or *noel.ainsworth@daf.qld.gov.au*.

Improved fruit robustness and quality in avocado supply chains (mineral nutrition) (AV19004)

Service Provider	Queensland Department of Agriculture and Fisheries
Project Leader	Daryl Joyce
Start Date	19/06/2020
End Date	14/11/2020
Funding Type	Hort Innovation Avocado Fund

This investment is exploring how to improve the robustness and quality of avocado fruit entering supply chains. With a focus on pre-harvest mineral nutrition and the effect it has on post-harvest fruit quality, the goal is to provide avocado growers with proven methods to ensure that their fruit reaches consumers consistently. Through conducting a desktop study of existing scientific knowledge on pre-harvest mineral nutrition, the project team will identify and review management strategies that could improve avocado post-harvest storage and handling outcomes in an Australian production environment. At the conclusion of the project, recommendations will be presented to industry for both immediate action and consideration for future research.

Objective 3:

By 2021, over 10% of production will be exported to markets where customers have a willingness and capacity to pay for a premium for Australian avocados

Avocado export readiness and market access (AV17000)

Service Provider	Avocados Australia
Project Leader	John Tyas
Start Date	01/11/2018
End Date	20/10/2020
Funding Type	Hort Innovation Avocado Fund

This project acknowledges that a rapid increase in avocado production in Australia has created a need for the industry to access and develop new markets. It will ensure that the industry is prepared to export, that there is capacity to pursue new and improved market access, and will provide necessary support for government negotiations with intended markets. Activities in 2019/20 were wide ranging and included participating in various other projects, including AM17010, MT18017 and AV16006, coordinating the avocado industry's participation in international trade shows such as Asia Fruit Logistica, and taking part in the July 2019 in-country visit to India.

You can read the latest from this project on page 18.

Avocados Australia CEO John Tyas visited India in July 2019, as part of project AV17000.

Taste Australia trade shows (AM17010)

Service Provider	Hort Innovation
Project Leader	Julie Willis
Start Date	This is an ongoing project
Funding Type	Hort Innovation Asian Markets Fund

The avocado industry has a presence at key international trade shows – including Asia Fruit Logistica in Hong Kong and the FoodEx in Japan – via ongoing Hort Innovation projects. Most recently, these activities occurred under the Taste Australia banner.

In 2019, Avocados Australia had a presence at Asia Fruit Logistica in Hong Kong, and the China-Australia Fresh Produce Forum in September 2019. Planning is underway for Asia Fruit Logistica (Singapore 2020), COVID-19 permitting.

Australian Avocados were included in a July 2019 promotion in select Malaysia supermarkets, including influencer outreach. In December 2019 avocados were also part of a Taste Australia promotion in Japan.

Taste Australia is the whole-of-horticulture brand used by industry and Hort Innovation to help increase the profile, sales and consumption of premium Australian horticulture products in key export markets, particularly Asia and the Middle East.

Through Taste Australia, Hort Innovation undertakes export market development activities including trade shows, trade missions and retail marketing activities.

This investment is a parent program, under which further event-specific Taste Australia investments may sit.

A Taste Australia promotion in Malaysia in July 2019, featuring Australian Avocados.

Taste Australia retail program (MT18017)

Service Provider	Produce Marketing Australia
Start Date	This is an ongoing project
Funding Type	Hort Innovation Asian Markets Fund

This multi-industry investment is targeting key international retailers with training and educational resources about selecting, storing, handling and displaying Australian fresh produce in store, including avocados. This work is an R&D component of Hort Innovation's Taste Australia retailer engagement efforts in international markets. Other R&D work under the Taste Australia banner includes Taste Australia trade shows (AM17010) – a parent program that supports attendance at relevant international trade shows, to further develop export opportunities in key Asian and Middle Eastern markets.

Taste Australia is the whole-of-horticulture brand used to increase the profile, sales and consumption of premium Australian horticulture products in export markets, and is a central component of Hort Innovation's Hort Frontiers Asian Markets Fund. Learn more at *www.horticulture.com.au/hort-frontiers*.

Objective 4:

By 2021, productivity (marketable yield per hectare) has improved by 15 per cent on average without increased production costs per kilogram

Avocado industry development and extension (AV17005)

Service Provider	Queensland Department of Agriculture and Fisheries
Project Leader	Simon Newett
Start Date	20/04/2019
End Date	31/03/2022
Funding Type	Hort Innovation Avocado Fund

This project connects growers with current and relevant information to support the informed decisions required to produce quality avocado fruit for consumers. The project is co-delivered by the Queensland Department of Agriculture and Fisheries (DAF) and Avocados Australia (AAL) with collaboration from the Western Australian Department of Primary Industries and Regional Development (DPIRD).

Since commencing in 2019, the project team has travelled to all Australian avocado growing regions, delivering grower selected topics at the Avocado Regional Forums. The project didn't stop when COVID-19 arrived but went on-line, you can read more about this on page 13. Capital city wholesaler meetings also kept agents and wholesalers up-to-date with recommended fruit handling procedures and relevant industry developments.

The project team received an outstanding response to the AvoSkills held in North Queensland and Western Australia (read more on page 16), with workshop capacity not large enough to accommodate everyone who wanted to attend the best practice intensive workshops. If you missed out, keep an eye out for future events, there are still three left to run.

Understanding grower needs is a top requirement for the project. Grower suggestions have led to the release of the project's first video reviewing Phytophthora control in the orchard (*bit.ly/AV17005*). Growers have also been receiving monthly reminders for orchard action through the *Avo Alerts*.

The project team travelled with growers to California in September 2019 and on to the IX World Avocado Congress in Colombia. Information about these trips, regional forum outcomes and general best practice information can be found on in the Best Practice Resource (BPR) located on the Avocado Australia website (*www.avocado.org.au/bpr/*)and maintained by this project as an information resource for all growers and industry members participating in the Australian avocado industry.

Growers are encouraged to get in touch with the project team, your feedback makes this project better.
Liz Singh – *idm@avocado.org.au*,
Bridie Carr – *Bridie.Carr@daf.qld.gov.au* and
Simon Newett – *Simon.Newett@daf.qld.gov.au*.

Avocado industry capacity building – Western Australia (AV17006)

Service Provider	Department of Primary Industries and Regional Development, Western Australia
Project Leader	Rohan Prince
Start Date	30/06/2018
End Date	31/05/2021
Funding Type	Hort Innovation Avocado Fund

This project has been supporting avocado research capacity in Western Australia with the appointment of Research Scientist, Declan McCauley. Declan has played a support role for the avocado projects *Implementing best practice of avocado fruit management and handling practices from farm to ripening* (AV18000) and *Maximising yield and reducing seasonal variation* (AV16005) operating in Western Australia.

Additional to this, Declan has been seeking to develop an avocado germplasm block at the Manjimup Horticultural Research facility and has focused on reducing fruit drop through application of plant hormones.

The research to reduce fruit drop applied Glycine betaine (GB), Aminoethoxyvinylglycine (AVG) and Maxcel®. GB is a compound that occurs naturally in plants and is naturally accrued to provide stress protecting effects, trials with GB in South Africa have been promising. The product used in the South African trials that contains GB is called Greenstim®. Both Greenstim® and purer lab grade GB were used in the experiments. AVG is a well-known ethylene biosynthesis inhibitor and since ethylene has been suggested as a regulator of fruit drop, it could have an application for avocados. Maxcel® is a synthetic cytokinin normally used in the apple industry to induce fruit drop. Cytokinins are plant hormones with roles in regulating cell growth and the development of various organs in the plant, such as the roots.

Lab grade GB was foliar applied to trees that were droughted to assess the retention effect on fruit stressed to abscission. One application of lab grade GB increased (Figure 1) the retention of fruit (7.1%) in relation to the drought tree control (3%). Two applications of lab grade GB in a second shorter droughted trial showed more promising results (Figure 2), yet the application of the commercial GB product Greenstim® did not show the same fruit retention results.

A complete defoliation trial dipping fruit twice with lab grade GB, lab grade AVG and Maxcel® demonstrated that the commercial product Maxcel® retained fruit better than the other treatments. The impact of full defoliation however was too powerful to obtain a commercial orchard response to stress causing fruit abscission. Further trial work is planned, for more information contact Declan McCauley (*Declan.McCauley@dpird.wa.gov.au*).

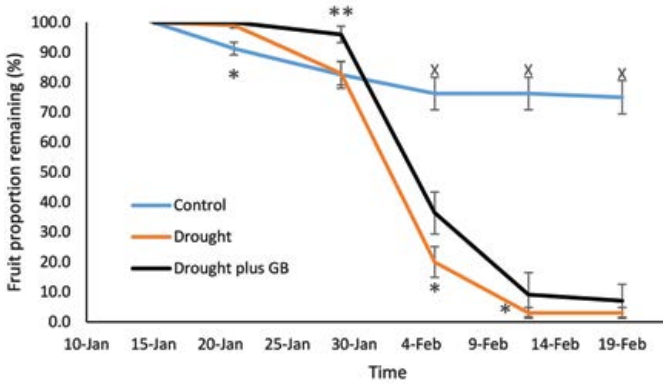


Figure 1. Fruit retention - one foliar application of lab grade GB to drought trees

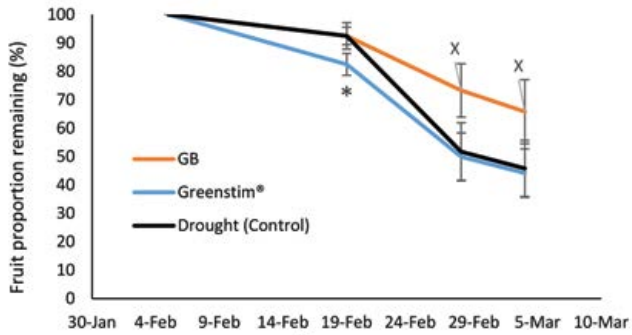


Figure 2. Fruit retention – two foliar applications of lab based GB and Greenstim® to droughted trees

Implementing precision agriculture solutions in Australian avocado production systems (AV18002)

Service Provider	University of New England
Project Leader	Andrew Robson
Start Date	01/06/2019
End Date	30/03/2022
Funding Type	Hort Innovation Avocado Fund

This investment is refining and working towards commercialising technologies and innovations to help the avocado industry improve production and efficiency. There is a particular focus on delivering solutions to help growers predict yield, look at yield variability and map factors such as disease to, in turn, support on-farm decision making.

The work builds on the previous project Multi-scale monitoring tools for managing Australian tree crops initiative, supported by Hort Innovation under the Australian Government's Rural R&D for Profit program.

Specific project activities include, but aren't limited to:

- keeping the Australian Tree Crop Rapid Response map (*bit.ly/ATCRRmap*) and its associated app (*bit.ly/AARSCapps*) updated with information on commercial avocado orchards. At a top level, it's designed to assist with natural disaster recovery efforts and biosecurity work, but when combined with other innovations such as remote sensing and analytic technologies, it can be used to support on-farm decision making, and
- developing a mobile app to provide avocado growers with up-to-date, high-resolution satellite imagery and other capabilities to support pre-harvest yield forecasts and mapping of tree health and vigour, yield parameters including fruit size, and disease with a focus on phytophthora.

The location and extent of avocado orchards for natural disaster response and recovery was successfully applied in response to the national bushfire crisis during the 2019/20 summer. The Australian Bushfires Rapid Response Map (viewed more than 5,000 times) was well publicised across numerous media channels.

In addition, the national mapping update of commercial avocados orchards has progressed with the update of the Bundaberg region to 2020, now published in the Australian Tree Crop Rapid Response Map. Draft mapping for the Wet Tropics and Tablelands regions are currently in peer review.

Due to COVID-19 travel restrictions, the field program for this project has been postponed

During the 2019/20 growing season, sampling was conducted on four orchard blocks in the Bundaberg area and three in Mareeba. Accurate counts are essential for achieving strong calibrations to canopy reflectance and ultimately accurate predictions.

(You can read more about this in the Autumn edition of *Talking Avocados*.)

Maximising yield and reducing seasonal variation (AV16005)

Service Provider	CSIRO
Project Leader	Harley Smith
Start Date	31/5/17
End Date	30/08/2021
Funding Type	Hort Innovation Avocado Fund

Irregular bearing is a major challenge for the Australian avocado industry as it increases variability in supply and weakens market development achievements. The two major drivers of irregular bearing are poor fruit set and high fruit abscission. To gain greater insight into irregular bearing, this

project is focused on understanding the physiological basis of fruit abscission, in order to develop new management tools to increase tree productivity.

Understanding better the early processes of fruit development and the physiological drivers that promote fruit abscission are required to limit fruit drop. To date the project has been working with defoliation and drought stress to induce a massive fruit drop event in order to capture events of fruit abscission. Results show that defoliation and drought stress cause a significant decline in tree carbohydrate levels, which correlates with a massive wave of fruit abscission. AV16005 has demonstrated that a cessation in fruit growth occurs before abscission indicating that management tools must be aimed at maintaining fruit growth.

A method was developed to capture fruits abscission at an early step in the process allowing the AV16005 team to not only isolate fruit from trials that induce fruit drop but also collect fruits that abscise under natural conditions. Currently, molecular and physiological studies are being performed to identify the early physiological drivers of fruit abscission.

For long-term success of the avocado industry, there is a pressing need to understand the physiological drivers of high fruit abscission and how climate events influence these physiological drivers in order to develop innovative management tools to increase tree productivity. Therefore, knowledge developed from the physiological studies will be leveraged to trial and develop new management solutions to increase yield. In addition, this knowledge will also be translated to address the role of tree carbohydrate status on flowering, fruit set and abscission.

Transforming subtropical/tropical tree crop productivity (AI13004)

Service Provider	Queensland Department of Agriculture and Fisheries
Project Leader	John Wilkie
Start Date	20/11/2013
End Date	30/09/2019
Funding Type	Horticulture Transformational Industry Fund

COMPLETED

This project investigated the potential for orchard intensification in tropical orchard production systems, and the team is now preparing the final report.

The goal: small trees, high productivity. Trial blocks for trial crops including mango, avocado and macadamia were established in Queensland and northern New South Wales. The Key Research Components (KRCs) were: vigour management, architecture, canopy light relations, and crop load.

The knowledge from these diverse research components was integrated using planting systems trials (assessing the effect of rootstock, planting density, pruning and training, and crop load on performance), genetic and physiological analysis, and functional-structural modelling.

This ambitious research initiative was inherently a long-term proposition, due to the plant breeding/germplasm selection component, the long-term nature of any tree crop research, and the requirement to integrate multi-disciplinary research findings.

The outcomes of this project, and any subsequent projects, will be further explored in future editions of Talking Avocados.

High density production: Global practices key to boosting avocado productivity (Nuffield Australia)

Service Provider	Nuffield Australia
Project Leader	Dudley Mitchell
Start Date	2018
End Date	November 2019
Funding Type	Nuffield Australia, Woolworths

COMPLETED PROJECT

The Australian avocado industry is approaching a tipping point where supply could outstrip domestic demand and in the absence of any significant export activity, producers could face declining profitability. In addition, increasing land prices and decreasing availability of good quality water resources are forcing industry stakeholders to search for more productivity from existing assets. This has been identified by the industry as one of four pillars of their Strategic Investment Plan, with the outcome being a 10% increase in productivity per unit land area. One of the ways that this could be realised is through intensification of production. Australia lags behind other countries in this regard having an average of 219 trees/ha compared with the Chilean industry average of between 800 and 1,000 trees/ha and some plantings of up to 6,000 trees/ha. Intensification is not without its challenges and the purpose of this study was to investigate the current state of global high density production and to assimilate that knowledge into a simple integrated model for implementation in Australia given the unique challenges that the local industry faces. You can read Dudley's report and watch his video presentation to the Nuffield conference here: *https://www.nuffield.com.au/dudley-mitchell-2018*.

National tree genomics project (AS17000)

Service Provider	The University of Queensland and Queensland University of Technology
Project Leader	Professor Robert Henry, Professor Roger Hellens, Dr Craig Hardner
Start Date	21/06/2019
End Date	01/12/2023
Funding Type	Hort Innovation Advanced Production Systems Fund

This program is about harnessing genetic technologies for the benefit of Australian tree crop industries. These technologies can be developed and used in breeding (to deliver cultivars with key productivity and profitability traits) and to deliver improved management techniques, however, this is an area that's still in its infancy for tree crops, due to their unique challenges such as long generation times.

This program involves separate components working together to deliver a deeper understanding of the relationship between tree crop traits (phenotypes) and their underlying genetics (genotypes) and genetic mechanisms. This will then feed into the ultimate development of tools and opportunities for rapidly and more efficiently addressing current and future needs of industry. Each program component is developing a genetic toolbox for this use, with a genomics toolbox, a genotype prediction toolbox and a phenotype prediction toolbox.

Crops that will be used as case studies in the program include almond, avocado, citrus, mango and macadamia.

Managing flies for crop pollination (PH16002)

Service Provider	Department of Primary Industries and Regional Development, Western Australia
Project Leader	Dr David Cook
Start Date	01/05/2017
End Date	01/09/2023
Funding Type	Hort Innovation Pollination Fund

This project is part of the Hort Frontiers Pollination Fund and involves levy funds from the avocado industry. It is looking into the potential of using flies as alternative crop pollinators, including considering the effectiveness of specific fly species in pollinating avocado.

The second year of surveys and monitoring of insects visiting avocado flowers in large orchards 210km south of Perth gave an insight into what insects are specifically found on avocado flowers as the flowering period progressed from October into November is shown below (Figure 1). Bibionids or love bugs were prevalent early in the flowering along with hoverflies and the blowfly Calliphora vicina. As flowering progressed there was a shift towards more hoverflies on flowers (>50%) and bibionids being the predominant insects.

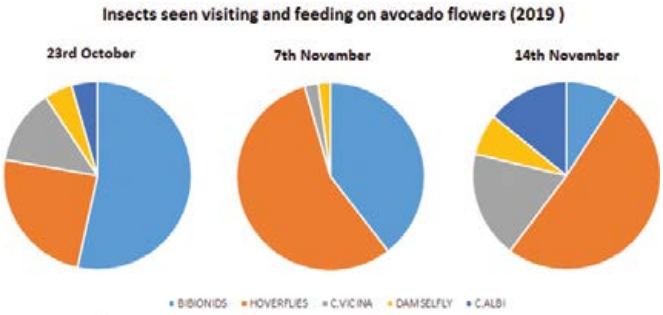


Figure 1. A pie chart representation of the insects feeding on avocado flowers across the flowering period.

Although this data does not provide an accurate measure of pollination efficiency, it indicates that at least four fly species could play a significant role in avocado pollination in addition to honey bees. Those fly species are in order of frequency found feeding on flowers, hoverflies (two species to be identified), lovebug bibionids (Bibio imitator) and blow fly Calliphora vicina (fly is distributed worldwide).

The study is also enclosing avocado trees in the field and examining the pollination by blow fly species C.albifrontalis and Calliphora dubia (Figure 2) in comparison to open pollination by bees and other insects (Figure 3) and examining these fly's attraction to avocado flower nectar (Figure 4).

Figure 2. An adult *Calliphora albifrontalis* (Top) and *Calliphora dubia* (Bottom) fly, which are both just over 1cm in body length. *Calliphora albifrontalis* is endemic to south-west WA, whilst *C. dubia* is present throughout much of Australia.

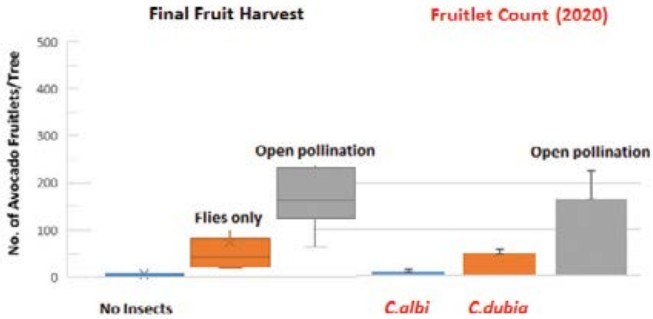


Figure 3. Avocado final harvest (2019) using C. albifrontalis (Enclosure Trial #1) on LHS of chart and the first fruitlet count comparing the two fly species (C. albifrontalis and C. dubia) versus open pollination trees in 2020.

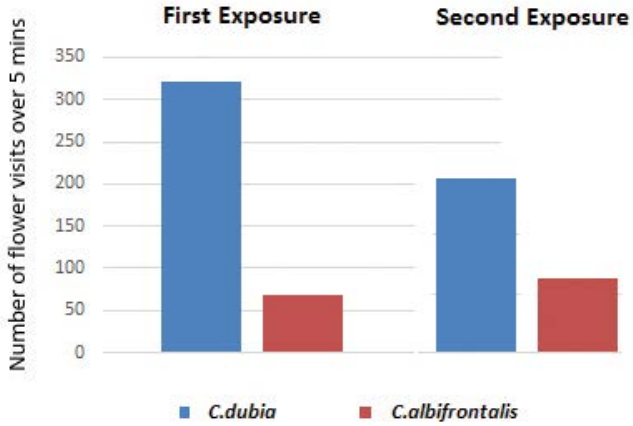


Figure 4. The number of adult Calliphora dubia and Calliphora albifrontalis adult flies visiting avocado inflorescences over two separate exposures in the laboratory.

Strengthening and enabling effective pollination for Australia (PH15000)

Service Provider	Plant and Food Research NZ
Project Leader	David Pattemore
End Date	15/05/2021
Funding Type	Hort Innovation Pollination Fund

This project is delivering sustainable pollination services for Australian crops by improving the understanding of pollination requirements. It is also looking at key threats to honey bees and provide crop-specific resources to encourage growers to improve their pollination practices.

Information regarding best practice is currently limited for many crops and, in particular, little is understood about the degree to which crops are dependent on managed versus feral honey bees or other, unmanaged pollinators for this ecosystem service. Honey bee pests and diseases, including Varroa mite, have potential to dramatically alter 'passive' crop pollination. Therefore, this research program aims to determine key pollinators across a range of Australian crops and provide pollination management recommendations to maximise sustainable yields and reduce risk of pollination failure.

In July 2020, the project released a pollination brochure for avocados, and you can read it here: *bit.ly/PH15000avo*.

Increasing yield and quality in tropical horticulture with better pollination, fruit retention and nutrient distribution (PH16001)

Service Provider	University of Sunshine Coast
Project Leader	Stephen Trueman
Start Date	23/06/2017
End Date	01/07/2023
Funding Type	Hort Innovation Pollination Fund

This program aims to increase the productivity, profitability and global competitiveness of Australia's horticultural industries by helping to optimise crop pollination efficiency. Key objectives are to increase yield and quality through better understanding of crop nutrition during crop pollination and through improved understanding of the effects of cross pollination on fruit quality.

The project team will develop non-destructive tools (using hyperspectral imaging) to quantify nutrient concentrations and produce guidelines to help growers maximise crop pollination efficiency, optimise fertiliser applications and increase fruit set.

New knowledge and technologies developed from this research will be relevant to both tropical and temperate fruit industries, and nut industries. Field work is set to involve the following crops: avocado, almond, custard apple, lychee, macadamia, mango, and strawberry.

The program will also support capacity building in Australia by developing new international collaborations among pollination and plant physiology science groups in Australia, New Zealand and Germany, and support new students into the horticulture sector.

Stingless bees as effective managed pollinators for Australian horticulture (PH16000)

Service Provider	University of Western Sydney
Project Leader	James Cook
Start Date	22/09/2017
End Date	30/08/2022
Funding Type	Hort Innovation Pollination Fund

This project is examining Australia's native stingless bees for their suitability as alternative pollinators to honey bees in horticulture crops.

While honey bees are excellent pollinators in many situations, their availability as both managed and wild pollinators faces various threats. This includes Varroa mite, which could lead to the collapse of wild honey bee populations if it establishes in Australia. The industry therefore needs to consider alternative pollinators, investigate their performance in different crops, and find better ways to propagate and deploy them.

The leading alternative pollinator candidates are stingless bees, which live in large colonies like honey bees, pollinate a wide variety of plants, and can be kept in managed hives. There are indeed a growing number of stingless beekeepers, and stingless bees are already used in macadamia farms. Managed stingless bees may therefore have wide but underdeveloped potential for crop pollination. Stingless bees (particularly Tetragonula species) are also used in crop pollination in several Asian countries, including in India and Thailand, so there is good scope to exchange knowledge and expertise on bee biology, husbandry and deployment in horticulture.

In looking at stingless bees, this investment is conducting studies across a range of fruit and vegetable crops – testing first if the bees visit the flowers and transport the crop pollen. Where they do, the effectiveness of stingless bee pollination and its impact on crop set, yield and quality is set to be examined. For the most promising crop/bee combinations, the project team will then conduct studies of the potential of stingless bees to be effective managed pollinators in glasshouse conditions.

Specific crops involved in field work include: avocado, almond, lychee, macadamia, mango, and vegetable crops.

Managing vegetation on farm targeting pollinators and farm resilience

Service Provider	South West Catchments Council (SWCC)
Project Leader	Wendy Wilkins
Start Date	2018
End Date	2023
Funding Type	National Landcare Program

This Western Australian project is not funded via Hort Innovation or grower levies, but is of interest to the state's avocado industry.

The project, which started as a one-year project but has now secured a four year extension, will document pollinators and their role in production for farmers, and to educate farmers.

A survey of avocado growers in the South West Region found that three-quarters of the 20 respondents encourage pollinators such as insects and birds onto their properties, mainly by maintaining 'weeds' in their inter-rows. Only 5% of those surveyed described their understanding of pollination of their crop as 'poor'.

SWCC Project Manager, Wendy Wilkins, who is working with avocado growers at Balingup and Winnejup, said the survey was designed to gauge producers' current knowledge and attitudes to pollination and integrated pest management, remnant vegetation and revegetation and farm resilience. The survey will be undertaken again at the end of the project to see if knowledge and attitudes have changed.

"The majority of respondents believe the key pollinator for avocados is the honey bee, although hoverflies and flies also appear to be considered important," Ms Wilkins said.

"Nevertheless, only a tenth of the respondents bring honey bee hives into their orchards when their avocados are flowering for pollination services," she said.

Seventy percent of avocado producers surveyed also practice Integrated Pest Management (IPM) with the most common practice being assessing the number of pests prior to spraying and when numbers reach critical levels, using more selective sprays or predatory insects, such as ladybirds.

This project is supported by the South West Catchments Council with funding from the Australian Government's National Landcare Program, and you can find out more at *www.swccnrm.org.au*.

Development and implementation of protocols to enable importation of improved honey bee genetics to Australia (MT18019)

Service Provider	CSIRO
Project Leader	John Roberts
Start Date	28/06/2019
End Date	15/06/2021
Funding Type	Hort Innovation Avocado Fund

The overall objective of this project is to develop a framework for the effective importation of desirable honey bee germplasm into Australia that mitigates the risk of exotic pests and pathogens with a focus on viruses. This will enable safe access to Varroa-tolerant germplasm, which is a priority strategy for Australia's Varroa preparedness.

The project has established a collaboration with Arista Bee Research based in the Netherlands as a project partner to supply Varroa-tolerant honey bee stock. They are currently navigating through the bee semen importation process and have resolved some significant obstacles to obtaining import permit compliance, scheduling the first bee semen importation for July 2020 and queen bee importation into Post Entry Quarantine (PEQ) for September 2020. There was a successful trial importation at Mickleham Post Entry Quarantine (PEQ) using Australian queens. This was very successful in building capacity and knowledge of the importation process for PEQ staff and the project team and importantly highlighted issues we can address to ensure successful queen survival through the PEQ process.

Following importation of virus-free Varroa-tolerant bee semen, the process will be to artificially inseminate Australian queen bees that are selected for hygienic behaviour (a disease tolerance trait) and monitor these colonies for productivity, continued absence of exotic viruses and retention of Varroa-tolerance/hygienic behaviour traits.

Similarly, after successfully managing imported Varroa-tolerant queens through PEQ and ensuring they are free of exotic viruses, the project will graft daughter queens and monitor these colonies for productivity, continued absence of exotic viruses and retention of Varroa-tolerance/hygienic behaviour traits. The knowledge gained from these imports will be used develop a logistical framework to facilitate the bio secure importation of honey bee germplasm into Australia.

This project also involves contributions from the avocado, almond and melon funds.

Enhanced National Bee Surveillance Program 2016-2021 (MT16005)

Service Provider	Plant Health Australia
Project Leader	Sharyn Taylor
Start Date	12/12/2016
End Date	12/12/2021
Funding Type	Hort Frontiers Pollination Fund

Australia is free of many of the serious bee pests and pest bees that have contributed to declines in bee populations overseas. Declining bee populations can adversely impact the production of honey and bee products, and the delivery of pollination services.

The National Bee Pest Surveillance Program (NBPSP) is an industry/government biosecurity partnership between pollination-reliant industries, all state and territory governments, the Australian Government, port staff and beekeepers. The program delivers nationally coordinated bee pest surveillance activities which support the early detection of, and thus the chance of successfully eradicating, high priority pest incursions of the honey bee industry.

Surveillance activities undertaken every six weeks by the NBPSP continue to confirm Australia's freedom from exotic viruses, bees, and pests.

You can read more about this year's activities on page 71.

Several levy industries are contributors to this work, including the Avocado Fund.

Avocado sunblotch viroid survey (AV18007)

Service Provider	The University of Queensland
Project Leader	Andrew Geering
Start Date	21/06/2019
End Date	30/09/2019
Funding Type	Hort Innovation Avocado Fund

Avocado sunblotch viroid (ASBVd) has the potential to disrupt trade in fresh fruit, particularly to pest-free countries such as New Zealand. As such, this is a new biosecurity surveillance project (AV18007) for demonstrating pest-freedom from ASBVd.

This project aims to map all avocado orchards and nurseries in the country, testing thousands of trees and conducting statistical analyses to demonstrate pest-freedom at farm or regional-level, so that growers can meet export conditions and nurseries can obtain ANVAS accreditation.

Project team members are collaborating with experts in epidemic modelling from Cambridge University in the UK and in disease management from South Africa.

In collaboration with CSIRO, they are also trialling a novel surveillance strategy using honeybees, which do the leg work by collecting pollen samples from dozens of trees. If the viroid is present, it should be detectable in the pollen samples using our highly sensitive molecular diagnostic tools. Outcomes of the project will be that the Australian avocado industry can enter new export markets and will be better equipped to respond to all types of biosecurity threat.

Xylella coordinator (MT17006)

Service Provider	Wine Australia
Project Leader	Dr Greg Chandler
Start Date	14/05/2019
End Date	14/03/2023
Funding Type	Hort Innovation Avocado Fund

This multi-industry and multi-sector investment supports the role and activities of a national *Xylella* coordinator, through the Plant Biosecurity Research Initiative (PBRI).

Xylella fastidiosa (Xf) is an exotic bacteria that prevents a plant from feeding by impeding the movement of rising sap. While Australia is currently free from the pathogen, it has the potential to threaten more than 350 commercial, ornamental and native plant species across the country.

The coordinator role includes developing R&D priorities and projects to help protect Australia's horticulture and wine sectors from *Xylella*.

Industry and community awareness has grown greatly due to direct engagement by the *Xylella* coordinator, Craig Elliot. Many industries really were not all that aware of the severity of the threat that Xf poses to their industry.

Industry are strongly encouraged to engage with the project: the sheer number of already-identified host plants means that there is a lot of cross-sectoral learning that can be applied.

This project is a multi-industry and multi-sector/organisation investment, with funding from a range of levy industries, including the Avocado Fund.

Improving preparedness of the Australian horticultural sector to the threat potentially posed by *Xylella fastidiosa* (a severe biosecurity risk) (MT17006)

Service Provider Plant	Biosecurity Research Initiative
Project Leader	Dr Greg Chandler
Start Date	14/05/2019
End Date	14/03/2023
Funding Type	Hort Innovation Avocado Fund

Xylella fastidiosa is the #1 plant pest in the world, and ranks #1 on Australia's Top 42 list of exotic High Priority Plant Pests. This bacterium can infect more than 590 plant species ranging in severity from severe to symptom-less. In avocado it can cause chlorotic mottling, marginal scorch and leaf deformation, defoliation, and branch dieback. It is vectored by xylem-feeding, sap-sucking insects where it persists in the xylem in varying concentrations. It is the restriction or blocking of these water-conducting cells that makes *Xylella fastidiosa* (Xf), and its sister species, X. taiwanensis, so devastating to plants. It is extremely difficult to detect in its early stages of infecting plants and can take anywhere from a few months to several years to become apparent to the naked eye.

Through a major national and international collaboration, including the appointment of a national *Xylella* coordinator, Craig Elliott, this project seeks to characterise all of the known sequence types of Xf and X. taiwanensis, update and expand the National Diagnostic Protocol for Xf to include optimal DNA extraction, methods for identification ranging from rapid, in-field tests for a fast result to reliable laboratory tests for confirmation, and whole-genome-sequencing to determine sequence type. The project will develop a register of Xf isolates, currently housed by the Plant Health and Environment Laboratory in New Zealand, to give Australian researchers and diagnosticians access to crucial positive control material, including samples of Xf extracted from avocado from Costa Rica, where it was first reported infecting avocado. A project to study local sap-sucking insects that may spread Xf is about to commence and this will inform control and mitigation plans. Vector management is going to be critical to successfully containing any outbreak of Xf. There is a lot of research being undertaken overseas and the project team have developed good linkages into the projects in the USA and Europe, particularly Spain and the UK.

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This project is a multi-industry and multi-sector/organisation investment, with funding from a range of levy industries, including the Avocado Fund.

Review of national biosecurity plans (MT17003)

Service Provider	Plant Health Australia
Project Leader	Rodney Turner
Start Date	10/11/2017
End Date	30/11/2020
Funding Type	Hort Innovation Avocado Fund

The revised Biosecurity Plan for the Australian Avocado Industry has an increased focus on biosecurity implementation activities at a strategic level for both Avocados Australia and the state, territory and the Commonwealth governments.

The Biosecurity Plan has been endorsed by Avocados Australia and by state, territory and the Commonwealth governments through Plant Health Committee. Through the development of the Biosecurity Plan, the High Priority Exotic Pest list has been updated and a Biosecurity Implementation Plan has been developed.

The next steps involve planning for the first Biosecurity Reference Panel. This is the first in a series of four annual meeting to ensure the High Priority Exotic Pest list remains up to date and to prioritise the Biosecurity Implementation Plan for action in between formal reviews of the biosecurity plan.

Industry involvement occurs through Avocados Australia. Growers interested in playing an active role in supporting the Avocado Biosecurity Plan should speak with Avocados Australia CEO John Tyas.

The avocado industry has two biosecurity planning documents critical to protecting Australian avocado production against exotic pests: 1) a revised *Industry Biosecurity Plan for the Avocado Industry* (V3.0), and 2) the *Orchard Biosecurity Manual for the Avocado Industry* (V1.0). These documents are located in the Best Practice Resource in the BPR Library, in the Education material section.

Avocado industry biosecurity capacity building (AV16010)

Service Provider	The University of Queensland
Project Leader	Dr Andrew Geering
Start Date	06/11/2017
End Date	05/11/2021
Funding Type	Hort Innovation Avocado Fund

Biosecurity serves a dual purpose of preventing exotic pests from entering the country, as well as allowing exports of produce without restrictive quarantine conditions. There is a

need for accurate diagnostic tests to detect exotic pests at the border, and to provide evidence of absence of these organisms within Australia. The faster a pest can be detected in the event of an incursion, the greater the chance of eradicating the pest. This project, which draws to a close at the end of 2020, aims to build diagnostic capacity to support biosecurity.

The first activity of the project related to an endemic pest, avocado sunblotch viroid (ASBVd), which has been present in Australia for at least 50 years but has been gradually eliminated through implementation of the Avocado Nursery Accreditation Scheme (ANVAS). A review of the status of ASBVd in Australia was undertaken, which involved detective work to determine locations of historical detections of the pathogen. An outcome of this review is that regions have been identified to undertake surveys with the aim of identifying the last pockets of infection and to finally demonstrate pest freedom. A related activity was to review the diagnostic test for ASBVd, and improvements have been made using new technologies that are now available.

The second activity of this project was to develop a diagnostic test for *Elsinoë perseae (syn. Sphaceloma perseae)*, the cause of avocado scab. Avocado scab causes rough, cracked, scabby lesions on the fruit and increases fruit drop and is now common throughout the Americas (except Chile), Central and South Africa, the Philippines and Morocco. *E. perseae* is difficult to diagnose using conventional diagnostic methods, as the fungus is very slow growing on artificial media. A real-time PCR assay has been designed that enables detection of as little as 15pg of fungal DNA within a few hours. The diagnostic assay is now ready to use.

The third major activity of this project has been to investigate the diversity of *Fusarium spp.* associated with branch dieback in Australia. These *Fusarium spp.* are carried by shot-hole beetle borers in the genus Euwallacea. The shothole borer has a symbiotic relationship with the fungus. As the beetles cultivate the fungus in their brood galleries, the fungus breaks down the heartwood of the tree and the fungal hyphae becomes the food source for the borer larvae. *Euwallacea spp.* have broad host ranges including components of the native vegetation, ornamental plants and tree crops such as avocado and macadamia. They are native to south-east and southern Asia and possibly Australia but are invasive pests in the USA, South Africa and Israel.

This study has involved a major collaboration with DAF Forestry pathologists and entomologists, as a native rainforest plant, the Coastal Tuckeroo (*Cupaniopsis anacardioides*), has been suffering severe dieback in South East Queensland from a disease associated with borer activity. We have also resurrected a large number of *Fusarium* isolates from the DAF Pathology Herbarium to include in the study. In total 115 *Fusarium* isolates from seven different plant species have been genotyped, and three new fungal species associated with shot hole borer-vectored dieback have been discovered that are new to science. The fact that these fungal species are novel and not found anywhere else in the world supports the hypothesis that the studied shot hole borers and *Fusarium* symbionts are indigenous to Australia. Interestingly, the type of *Fusarium* isolated from the dying tuckeroo is the same species as that isolated from a diseased avocado on the Atherton Tableland several years ago, establishing a disease link between these tree species for the first time. Studies are continuing and during the remainder of the project, the virulence of each of the *Fusarium* species will be examined, on both avocado and tuckeroo. The project team has also have engaged an Honours student to investigate whether the borers have a feeding preference for a particular *Fusarium* species, and to study correlations between the borer and *Fusarium* populations. A molecular diagnostic assay is also in development for being able to detect and sequence *Fusarium* DNA from shot hole borer specimens. This will enable researchers to study the lineage of *Fusarium* symbionts associated with shot hole borers stored in older entomology collections.

Investigation into citrus blossom bugs in avocados (AV19000)

Service Provider	Queensland Department of Agriculture and Fisheries
Project Leader	Ian Newton
Start Date	01/04/2020
End Date	31/07/2023
Funding Type	Hort Innovation Avocado Fund

The citrus blossom bug, Austropeplus sp., is a native mirid that while considered a minor pest of the Australian citrus industry, is thought to cause significant reductions in avocado crop yield by feeding on, and damaging, avocado flowers. It was first noticed in avocado orchards on the Central NSW coast and during the past decade grower reports of its presence in avocado orchards have increased. It has since been recorded in avocado growing regions along the east coast of Australia, up to the Atherton Tablelands in North Queensland. Little is known about the insect and there is currently limited information available to growers for monitoring and controlling this potential pest.

This new project will investigate key aspects of citrus blossom bug biology and determine its pest status within the avocado industry. PhD student, Dalton Baker, will conduct the research at the University of Queensland (UQ) under the supervision of Mike Furlong (UQ) and Ian Newton from the Queensland Department of Agriculture and Fisheries (DAF). The project team will begin by determining the taxonomic status of the bug, as it has never been formally classified to species, and conducting small trials over the coming flowering period to investigate the impact of the bug on avocados.

As the project progresses, Dalton will study the biology and ecology of citrus blossom bug in order to generate data that can be utilised to develop management strategies for inclusion within existing avocado IPM. By the end of the project, the team aim to have produced a number of reference materials to aid avocado growers in identifying and monitoring for

the insect. Finally, the team will work towards developing effective methods for managing citrus blossom bug that can be adopted by the industry.

The project is just getting started, however, growers interested in participating by helping monitor for citrus blossom bug, collecting samples (*bit.ly/312citrus*) or allowing the project team to visit their properties are encouraged to contact Dalton Baker by email at *dalton.baker@uqconnect.edu.au* for more information.

Review and extension of avocado arthropod pests and their management (AV19001)

Service Provider	IPM Technologies
Project Leader	Jessica Page
End Date	15/9/2021
Funding Type	Hort Innovation Avocado Fund

This new project aims to develop an understanding of any pest management issues that the avocado industry is currently dealing with or may face in the future. The focus will be on the main pests of concern in each growing region and the management practices being used to control them.

Program Leader Jessica Page program said they wanted the Australian avocado industry to be the world focus in effective orchard pest management.

"We are asking all avocado industry members (growers, consultants, pest scouts, resellers) to provide the base data we need to make this project relevant and practical to use."

You can take the survey at: *https://www.surveymonkey.com/r/Ipmtechnologies*.

For further information about the survey or the project AV19001, contact Jessica Page from IPM Technologies at *jessica@ipmtechnologies.com.au*.

Management of six-spotted mite in WA avocado orchards - Phase 2 (AV19002)

Service Provider	Department of Primary Industries and Regional Development (DPIRD), Western Australia
Project Leader	Alison Matthews
Start Date	21/11/2019
End Date	31/08/2022
Funding Type	Hort Innovation Avocado Fund

The role of this project is to identify effective options for management of six-spotted mite (SSM) in avocado orchards, including optimising monitoring methods and determining the role of mass reared and naturally occurring predatory mites, optimal use of miticides and tree health. Integrated pest management guidelines will be developed based on this work and extended to growers.

The project team has been doing regular monitoring on a dozen properties to determine seasonal trends in mite numbers and also to identify suitable orchards for more intensive monitoring and/or field trials.

This monitoring has shown that there is a high degree of variability in mite numbers between and within orchards which reinforces the need for monitoring to be done before management decisions are made. We have also done some intensive leaf sampling on individual trees to determine where best to sample leaves from within the canopy and how many leaves per tree to collect. More results from sampling at different times of year needs to be done before we have any recommendations from this, but the team did find big variations in SSM numbers within trees as well.

SSM numbers tend to drop off in winter but come spring numbers tend to rise rapidly and then team members will be undertaking a number of management and monitoring trials, including:

- more intensive within tree leaf sampling and intensive whole of block monitor to help determine a sampling technique that best combines practicality with reliability of results
- release of mass reared predatory mite species that have not previously been studied to determine if they can have an impact on SSM numbers
- study the relationship between leaf nitrogen levels and the size of the SSM populations and defoliation.

As more field work starts to take place and restrictions on gatherings ease growers can also expect us to run the first of several field walks/workshops planned for this project.

For further information on this project please contact Alison Mathews at DPIRD *alison.mathews@dpird.wa.gov.au*, (08) 9777 0122.

Improving avocado orchard productivity through disease management (AV16007)

Service Provider	The University of Queensland & Murdoch University
Project Leader	Dr Elizabeth Dann & Giles Hardy
Start Date	09/11/2017
End Date	05/11/2021
Funding Type	Hort Innovation Avocado Fund

The project has been underway for 2.5 years. The analyses of phosphorous acid residue in fruit has largely concluded, and together with additional testing of leaves, seed and roots of glasshouse seedlings, has provided new information around accumulation in tissues following phosphonate applications as demonstrated in Figure 1 and Figure 2.

The three major field trials assessing effects of various soil amendments are progressing well. A comprehensive set of data has already been collected from the two trials in Pemberton/Manjimup, Western Australia, and one trial at Childers, Queensland, including canopy health, yield, packout percentages, leaf and fruit pulp nutrient analyses and postharvest anthracnose and stem end rot assessments.

Fruit quality, particularly stem end rot, is also being assessed in a field trial in South East Queensland, where different fungicides and "biofungicides" have been applied at late flowering and early fruit set. The results of this trial are pending, with harvest planned for mid-June 2020. Some of these products have shown efficacy in glasshouse trials reducing severity of branch dieback following inoculation with one of the main fungi associated with branch dieback and fruit stem end rot.

A significant component of the project involves responding to the many enquiries from growers, orchard managers, nursery operators, agronomists and extension specialists, regarding pathology (disease) issues and other pest or physiological disorders. These are sometimes easily resolved after looking at photos of affected trees, and discussing the situation by phone, but mostly require samples to be sent to the lab for more extensive testing and diagnosis. Presentations at industry workshops and field days, and various other extension material ensures that accurate information regarding diseases affecting avocado and their management is communicated directly to industry as appropriate.

You can read an update from Murdoch University on page 65.

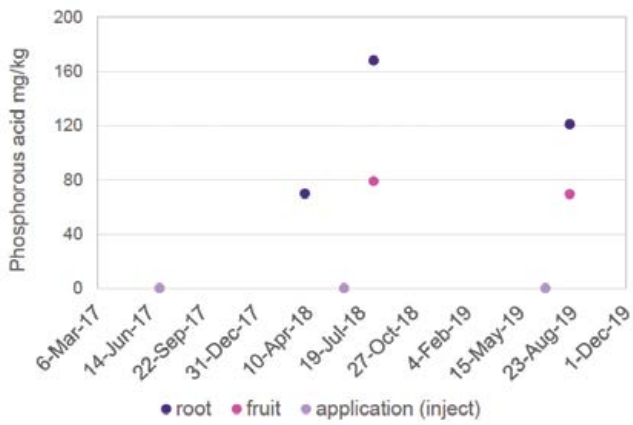

Figure 1. Twelve-year-old Hass on Velvick in South East Queensland, receiving one phosphonate injection inject per year.

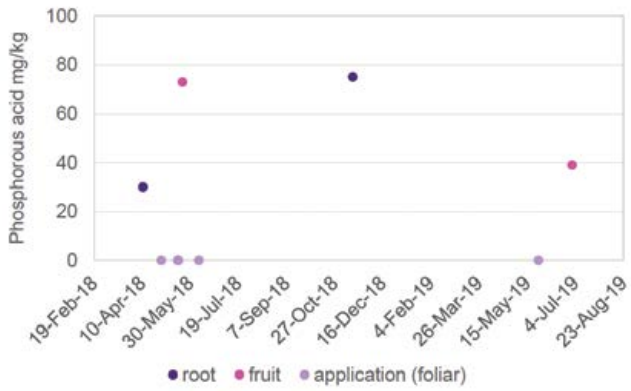

Figure 2. Twenty-year-old Hass in Childers, Queensland, receiving three foliar phosphonate application.

Generation of data for pesticide applications in horticulture crops 2018 (ST17000)

Service Provider	Peracto & Eurofins
Start Date	27/04/2018
End Date	30/11/2020
Funding Type	Hort Innovation Avocado Fund

The generation of pesticide residue, efficacy and crop safety data is required to support label registration and minor use permit applications made to the Australian Pesticides and Veterinary Medicines Authority (APVMA) which, when approved, provide access to safe and effective chemicals for the management of pests, weeds and diseases. For the avocado industry, this multi-industry investment will produce the data required to support a Bayer DC-163 label registration, for the control of Lepidoptera including avocado leafrollers and loopers, and flower-eating caterpillar.

Avocado industry minor use program (AV16002)

Service Provider	Hort Innovation
Project leader	Jodie Pedrana
End Date	ongoing
Funding Type	Hort Innovation Avocado Fund

Through this project, levy funds and Australian Government contributions are used to submit renewals and applications for new minor use permits for the avocado industry, as required. These submissions are prepared and submitted to the Australian Pesticides and Veterinary Medicines Authority (APVMA).

Permits secured in 2019/20 have included PER89241 (Spinetoram), PER89281 (Chlorantraniliprole), PER89293 (Methomyl). The project is also working toward renewing several permits due to expire in 2021, and generating data for new label registrations including efficacy and residue trials.

All current minor use permits for the industry are searchable at *https://portal.apvma.gov.au/permits* or via *bit.ly/312minor*.

Strategic agrichemical review process (SARP) – updates (MT19008)

Service Provider	AGK Services
Project Leader	Doug McCollum
Start Date	01/12/2019
End Date	27/07/2020
Funding Type	Hort Innovation Avocado Fund

This project updated the Strategic Agrichemical Review Process (SARP) for avocados.

The process:

- assessed the importance of the diseases, insects and weeds that affect the avocado industry
- evaluated the availability and effectiveness of fungicides, insecticides and herbicides to control pests
- determined any gaps in the pest control strategy, and
- identified suitable new or alternative pesticides to address the gaps.

An online survey was conducted to establish the current pest priorities for the avocado industry. There were 18 responses received for this survey, and the identified priorities have been included in the new SARP Report, which is currently available via: *bit.ly/MT19008*.

Disease was predictable – Phytophthora is still top of the list and it is obviously a concern in all regions. Insect problems were particularly variable between regions. Western Australia reported considerably less insect and mite issues than Queensland overall. The only pest that came up on the radar for Western Australia was six-spotted mite (see AV19002 for more on the current levy funded project). There are different pests of concern in North Queensland compared to Southern Queensland, although fruit spotting bug was identified as a high priority by many Queensland growers. These differences are outlined in the SARP report, along with current and future options to address these problems.

Weeds were similarly related to regional differences, although there was not a lot of feedback about the need for more herbicide options required for the avocado industry. This is assumed to be partly because the use of non-herbicide options is favoured in orchards, with mulching and ground cover being critical strategies to keep on top of weeds.

The new SARP report will help to guide investment strategy for obtaining new registrations and minor-use permits for the avocado industry.

This process is also being carried out for various other industry funds.

Underpinning projects

National avocado industry communications program (AV18003)

Service Provider	Avocados Australia Limited
Project Leader	John Tyas
Start Date	17/12/2018
End Date	06/12/2021
Funding Type	Hort Innovation Avocado Fund

This investment ensures the Australian avocado industry remains up-to-date with the latest R&D, marketing, emerging information, trends and issues both in Australia and overseas. By providing a consistent flow of relevant information, it keeps growers and other industry stakeholders in a position to make informed business decisions and best-practices changes. A number of communication channels are produced and maintained by this project, including but not limited to the Talking Avocados magazine; Guacamole newsletter; the Avocados Australia website, including its Best Practice Resource (BPR); industry social media channels; video content; and media releases and other industry articles.

If you are a levy payer or member of the avocado supply chain in Australia, you can review the full range of Avocados Australia's communication products and how to subscribe here: *https://avocado.org.au/public-articles/connect/*.

Industry annual reports & industry advice and grower consultation

Service Provider	Hort Innovation
Project Leader	Paul Lilwall
End Date	ongoing
Funding Type	Hort Innovation Avocado Fund

Hort Innovation has ongoing projects to fund the advisory mechanism under Hort Innovation. This includes the strategic investment advisory panel (SIAP) and attendance by growers at meetings to provide advice on strategic R&D investment and marketing investment through individual project committees, such as evaluation panels and other meetings. It includes the strategic investment advisory panel flights, accommodation and attendance and also evaluation panel time and attendance and input into various project steering committees by growers and industry stakeholders as needed.

In addition, Hort Innovation produces and Industry Annual Report, available at *www.horticulture.com.au/growers/avocado-fund/*.

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Australian Horticulture Statistics Handbook 2018-19 to 2020-21 (HA18002)

Service Provider	Freshlogic
Project leader	Adam Briggs, Hort Innovation
End Date	ongoing
Funding Type	Hort Innovation

The Australian Horticulture Statistics Handbook is the leading resource for Australian horticulture statistics and market information.

The 2018/19 handbook was released in March 2020, and is available here: *bit.ly/HA18002*.

In 2020, the handbook was extended to an online dashboard format for the first time using Tableau data visualisation, further increasing the value proposition and engagement potential.

Additional data metrics expanding the fresh supply volume and value to retail and foodservice were included for the first time in this publication will continue to drive interest and engagement.

Ex-post impact assessment – industry specific (MT18009)

Service Provider	AgEconPlus
Project leader	unknown
End Date	reports published 22/10/2019
Funding Type	Hort Innovation Avocado Fund

COMPLETED PROJECT

During 2018/19, Hort Innovation engaged independent consultants to evaluate the impact of various R&D investments. This included looking across a random sample of all Hort Innovation R&D projects completed in the 2017/18 financial year, plus a specific look at the impact of work within the Hort Innovation Apple and Pear, Avocado, Mushroom and Table Grape Funds, with a focus on projects completed within the five years to 30 June 2018, aligned to the current industry Strategic Investment Plans.

The assessments revealed a range of economic, social and environmental impacts being generated for growers, supply chain participants and the community at large. The results also highlighted the value of these benefits in monetary terms.

Results and information on the whole-of-R&D impact assessment, facilitated through the project Ex-post impact assessment (MT18011), can be found here:

- *bit.ly/TA303impact1*
- *bit.ly/TA303impact2*.

In short, a random sample of seven projects was assessed in the avocado industry, with an upper-bound benefit-cost ratio estimated at 3.78 to one. These projects are expected to deliver some $8.39 million in additional value to the industry and community over the next 30 years. Specific impacts that have been identified range from additional profitability due to improved fruit quality through to increased knowledge relating to pests and flow-on effects for communities in avocado growing regions.

The project specific reports are available via the link above, for:

- *Mechanisms of cultivar- and race-based disease resistance in avocado* (AV09024)
- *Reducing flesh bruising and skin spotting in Hass avocado* (AV10019)
- *An analysis of fruit spotting bug activity in avocado crops from fruit-set to harvest* (AV11021)
- *Data collection to facilitate supply chain transparency* (AV12007)
- *Health professional education and research program* (AV13010)
- *Achieving more consistent yields of quality fruit in the Australian avocado industry* (AV14000)
- *Supply chain quality improvement - cool chain best practice guidelines* (AV15010).

Upcoming projects

Hort Innovation has either recently called for proposals, or closed the application period, for a number of projects that may be of interest to avocados. We will provide updates on these projects in future editions of *Talking Avocados*.

Biosecurity preparedness for oriental fruit fly and other exotic fruit flies (FF18001)

The objectives of the services being sought are to increase the likelihood of eradication, containment and management of exotic fly incursions through increased knowledge of the pest, improve preparedness for exotic flies by having immediate access to national and international expertise and experience, and better understand the potential impacts of oriental fruit fly on Australian horticulture. The proposal period for this project closes on 24 August, 2020.

Avocado industry data capture and analysis 2020-2023 (AV20000)

You can read more about the current project (AV16006) in this article. The objectives of the services expected in the new project are to help Hort Innovation and the avocado industry: produce high quality industry and market data to assist both short- and long-term industry planning and decision making; support seasonal harvesting and marketing decisions by avocado growers and supply chain participants through the collection of robust, relevant and verifiable supply throughput, trade and retail pricing information; and help maintain a supply and demand balance to optimise value for growers and quality for consumers. The proposal period for this project closed on 12 June, 2020.

Non-tariff measures of commercial significance to horticulture (ST19021)

The objectives of the services being sought are to assist Hort Innovation: support Australian horticulture in coordination of industry priorities regarding non-tariff measures (NTMs) and guide government engagement on NTMs, support Australian horticulture in understanding the impact of NTMs, and support Australian horticulture to identify NTMs that align with other agricultural sectors. The proposal period for this project closed on 8 May, 2020.

Carbohydrates monitoring to predict yield and understanding fruit set (AV19006)

This project is examining the methods and tools needed to monitor carbohydrate status in avocado orchards, as a way of predicting yield and understanding fruit set. A recommendation will be made to industry on a viable pathway for the development of a method to rapidly assess avocado carbohydrate status at scale in the field. It is being delivered by Dr Harley Smith, at CSIRO.

Understanding the mode of action of phosphite in avocado for enhanced management of Phytophthora root rot (AV19005)

This project is improving industry understanding of how the fungicide phosphite is metabolised by avocado trees infected with Phytophthora root rot, so that applications of phosphite can become more targeted and effective, resulting in healthier and more productive orchards.

Through this research, the project team is answering the following questions:

- how does phosphite activate avocado defences to inhibit Phytophthora root rot?
- how does phosphite move around within the avocado tree?
- what is the optimal timing of phosphite applications to achieve maximum efficacy as a crop protectant with acceptable fruit residues?
- what are the optimal application regimens specific to different growing regions?

This project will complement existing research into Phytophthora root rot conducted by levy-funded project Improving avocado orchard productivity through disease management (AV16007). AV19005 is being delivered by Dr Elizabeth Dann, The University of Queensland.

More information

For further details on specific projects, we encourage you to contact Paul Lilwall on *paul.lilwall@horticulture.com.au* visit *www.horticulture.com.au* or check for final reports in the Best Practice Resource Library.

Harvesting during wet weather – consider all the risks

Ebony Faichney, Queensland Department of Agriculture and Fisheries

High quality fruit is paramount for the success of our industry. Fruit must always leave the pack shed in optimum condition to maintain high quality throughout the supply chain. Harvesting avocados during wet weather is risky and detrimental to fruit quality. Avoid harvesting in wet weather. Prolonged periods of intermittent wet weather can be disruptive to business; however, farm managers need to consider all the risks before deciding to continue with harvest.

Risk #1: poor fruit quality

Picking in the rain will decrease fruit quality, both internally and externally. Wet fruit are more susceptible to mechanical abrasion and lenticel damage, which promotes the development of postharvest rots (for example, stem end rot and anthracnose).

- The skin cells of wet fruit are fully turgid (swollen from water uptake). They will easily break when rubbed against another piece of fruit or edge of a bin. This can cause lenticel/nodule damage and increase susceptibility of other mechanical damage, resulting in downgrading skin defects.
- If you are packing turgid fruit, pay extra attention to your pack line. Always check for any stiff cleaning brushes and hold-ups that may prevent a smooth flow of fruit.
- Fungal disease spores move in free water, through individual contact and in wind. Wet fruit rubbing against each other in a bin or on the tree, or splashing water from bare soil under trees to low hanging fruit, are ideal conditions for the spread of disease.
- Any external damage to fruit is a potential 'open wound' susceptible to infection by fungal disease spores. These spores thrive in wet weather and will spread rapidly within a tree or picking bin.
- Bacterial infections are hard to identify in their early stages. Fruit often appears in good condition when packed; however, the infection will develop and spread rapidly in transit. Rejections at market due to Erwinia soft rot are regularly traced back to harvesting after a rain event.

Risk # 2: workplace health and safety

Working in wet weather is dangerous.

- Wet surfaces are slippery. Workers are at greater risk of slips and falls when working in wet conditions.
- Vehicles account for 75% of workplace deaths in the agriculture sector (Safe Work Australia, 2020). Heavy rain and cloud cover can reduce visibility in the orchard, making it difficult for vehicle operators to see pickers and ground crew.
- Under workplace health and safety (WHS) regulations, owners and managers need to ensure farm workers are NOT EXPOSED to health and safety risks (Safe Work Australia, 2020).

Risk # 3: damage to the orchard and your business

Harvesting in wet weather can have long lasting impacts on your business too.

- Machinery working in saturated soil can cause irreversible damage to the orchard.
- When bog holes and ruts caused by orchard traffic dry up, they leave uneven and compacted areas of ground which are subject to water logging.

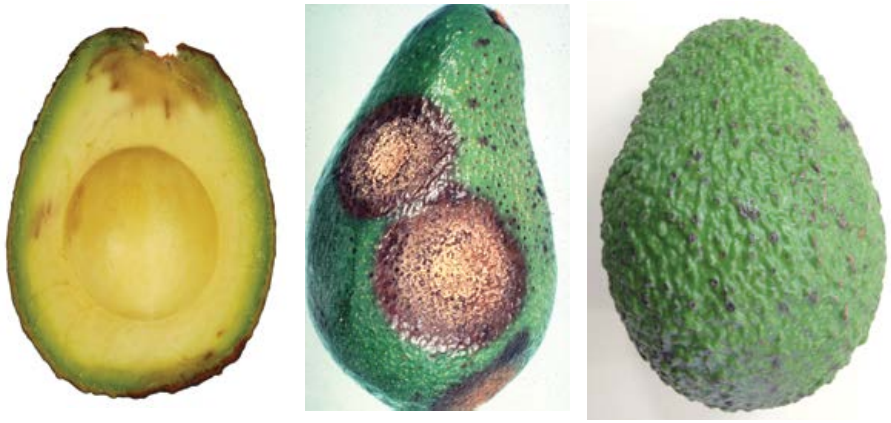

Figure 1. Internal and external rots and lenticel damage are more likely to occur when fruit is harvested wet.

How long do I have to wait after rain before I can pick?

After heavy rain (>20mm in 12 hours), delay harvest for 48 hours

After any rain (<20mm in 12 hours), delay harvest for 24 hours

- Reputations with agents are damaged when quality is not guaranteed, having lasting implications on your business success.

Make the right choice

Everyone along the supply chain is responsible for maintaining high quality standards. Fruit that leaves the pack shed in below average condition, will only deteriorate down the supply chain. Therefore, it is critical that high quality standards are achieved at the farm level first. Always consider the risks associated with picking in the rain and where possible, always avoid harvesting in wet conditions.

More information

Avocados Australia Best Practice Resource: *www.avocado.org.au/bpr/*

Safe Work Australia: *safeworkaustralia.gov.au/agriculture*

Acknowledgement

This information has been collated as part of the strategic levy investment project *Avocado best practice fruit management and handing farm to DC* (AV18000), which is part of the Hort Innovation Avocado Fund. The project has been funded by Hort Innovation, using the Hort Innovation avocado research and development levy, co-investment from the Queensland Department of Agriculture and Fisheries, the Department of Primary Industries and Regional Development, Avocados Australia and contributions from the Australian Government.

Queensland Government

Hort Innovation Strategic levy investment | AVOCADO FUND

Best Practice Tips

- Do not harvest wet fruit
- Always handle fruit carefully
- Hass can be plucked, other varieties must be clipped
- Prune trees to have an open canopy & always apply mulch
- Apply a post-harvest fungicide as soon as possible (within 24 hours) after harvest
- Maintain WHS standards
- Maintain good drainage in the orchard

Managing Phytophthora root rot

Dr Kay Howard, Murdoch University

Project undertaken by the Phytophthora Science and Management group at Murdoch University, Western Australia and led by Professors Giles Hardy and Treena Burgess. The team, including William Dunstan, Annie Farooq, and Kay Howard, are due to complete the project in mid-2021.

Our aim

The aim is to develop robust, rapid and cost-effective ways to manage Phytophthora root rot, caused by *Phytophthora cinnamomi*, for the Australian avocado industry. We are focussing on the effect of phosphite and the concentration used, looking for evidence of tolerance to phosphite in *P. cinnamomi*, and if we find tolerance, where and why it is occurring. We are also investigating the pathogenicity of other species of *Phytophthora* and related oomycetes, as they were recovered in surveys of Western Australian and Queensland orchards. To help the understanding of an integrated management approach, we are investigating the suppressive potential of soil microbes with different soil amendments. In addition, we are working toward a cost-effective enzyme assay for determining phosphite concentrations in avocado tissues. To achieve our aims, we have four sub-projects, of which two are now completed.

Our approach

In surveys of avocado orchards with different phosphite application histories, in the southwest of Western Australia, south-eastern and far north Queensland, more than 200 isolates of *P. cinnamomi* were recovered, along with two other *Phytophthora* species. Of these isolates, we tested 109 *P. cinnamomi* isolates for growth responses to a range of phosphite concentrations on agar plates, classing the isolates as either sensitive or tolerant to phosphite, as determined by ED50 values. (ED50 is the dose that produces the desired effect in 50% of the population is referred to as the "median effective dose".)

Based on the results of the plate tests, 30 isolates, both tolerant and sensitive, were selected and used to inoculate avocado plants in a glasshouse trial where plants were either untreated or treated with one foliar application at 0.25 or 0.5% phosphite in one-year-old plants. In a second glasshouse experiment, ten isolates from the previous experiment, were tested a second time using two-year-old plants where phosphite treatments included one application at 0.25%, or two applications at 0.5% phosphite.

In another experiment to determine the effective concentration of phosphite in avocado roots over six months, we treated seedlings with the two rates of phosphite (foliar) and then harvested and rated roots for disease and had roots analysed for phosphite on a monthly basis. Finally, the pathogenicity of *P. citricola, P. multivora, P. niederhauserii* and *Phytopythium vexans* was tested in two-year-old avocado plants with *P. cinnamomi* as the positive control.

Further glasshouse trials will investigate the manipulation of microbial consortia in soil using amendments for managing *Phytophthora* in avocado. In the first experiment, five types of treatments were tested. These included a top dressing only, of chicken manure, jarrah bark, avocado mulch, or the following, each combined with this top dressing: a silicon-based mulch, five different types of probiotics, and phosphite, metalaxyl and glyphosate (used on wheat grown around the base of avocado saplings). The most suppressive treatments from this experiment were applied in a second experiment which will also have metabarcoding to examine the effect of the soil amendments on the microbial assemblage in the soil. This will enhance our understanding of the effective microbes and allow an integrated management approach. Measurements were made on plant height, stem diameter, shoot and root dry weight, and root damage.

In all glasshouse trials, we compared different types of assessments (disease ratings, fine root and whole root dry weights, and shoot dry weights) to see which was best to measure the efficacy of the treatments.

Our findings

Pathogenicity of avocado isolates

- Avocado isolates are more pathogenic on avocado than isolates recovered from natural ecosystems. This implies that *P. cinnamomi* isolates are adapting to avocado.
- The lowest disease ratings were caused by isolates obtained from native plant species from areas of untreated native vegetation and from the orchard where there had not been any phosphite application for 20 years.

Phosphite treatments and tolerance

- Using one phosphite application we found *Phytophthora cinnamomi* isolates from orchards tolerant to phosphite.
- Increasing the phosphite treatment (2 x 0.5% applications), fewer isolates appeared tolerant, but some remained so.
- There were improvements in dry weights of roots and shoots in non-inoculated plants indicating a nutrient effect of the phosphite treatments.
- Although the numbers of isolates are small, the consistency seen in the results between glasshouse experiments strongly indicates the presence of phosphite tolerant isolates of *P. cinnamomi* in avocado orchards.

Measuring disease and determining phosphite tolerance

- We consider that the root dry weights are a more precise measurement than root damage ratings.
- We conclude that *in vitro* ED_{50} solid medium assays for phosphite tolerance are poor predictors of tolerance in plant-pathogen systems.

Other *Phytophthora* species and *Phytopythium*

- Sequencing of 12 unknown species from WA revealed one isolate of *P. citricola*, three *P. multivora* isolates, and eight isolates of *Phytopythium vexans* (which was also isolated in Queensland orchards).
- All isolates of the *Phytophthora* species (including *P. niederhauserii*) and *P. vexans* caused root rot in avocado.
- One of the two *P. vexans* isolates tested, caused significant root damage and was comparable to a highly pathogenic *P. cinnamomi* isolate (Figure 1). The two *P. multivora* isolates tested also caused significant disease.

Enzyme bioassay to test phosphite concentrations in plant tissues

- The bioassay has not yet worked on avocado roots due to interference from compounds in the root material which may be inhibiting the enzyme and/or interacting with other reaction substrates.

The effect of the soil amendments on the microbial assemblage in the soil

- The best results were produced by mineral mulch and phosphite. Each were combined with chicken manure, jarrah bark and avocado mulch as a top dressing.
- Molecular analysis should shed light on the effect of the treatments of the current study on the effect on microbial profile in relation to the degree of root damage caused by the pathogen.

Future directions

- Determine the effectiveness of phosphite on other *Phytophthora* species and *Phytopythium vexans*.
- Determine how different *Phytophthora* species and *Phytopythium* species interact with each other in avocado and contribute to the severity of root rot.
- We would like to continue working on the phosphite bioassay on avocado tissues. This will involve developing ways to overcome the inhibition of the assay caused by sugars or phenolic compounds in the roots. A cost-effective robust assay would be a huge factor in allowing critical questions around phosphite budgets in avocado and inhibition of *Phytophthora* to be answered.
- We would like to understand the minimum concentrations of phosphite required in roots to control the more phosphite tolerant *Phytophthora cinnamomi* isolates *in planta* and how these phosphite concentrations might impact on phosphite residues in avocado fruit.
- We will conduct microbial metabarcoding to determine which groups of microorganisms contribute to suppressive soils, and how the microbial community functions and structural diversity are modified when soils are treated with pesticides or amendments

Can industry get involved?

Avocado orchards should be encouraged to develop stronger hygiene/quarantine management to minimise movement of *Phytophthora* isolates between orchards and into natural ecosystems.

Care should be taken to ensure new planting material is pathogen-free, as we cannot continue to rely on phosphite in the long-term.

Acknowledgement

The *Improving avocado orchard productivity through disease management* (AV16007) project has been funded by Hort Innovation, using the avocado research and development levy and contributions from the Australian Government

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	Least amount of damage	Greatest amount of damage
Non-inoculated control		
Phytophthora cinnamomi (isolate CPSM18-338)		
Phytopythium vexans (isolate CPSM18-340)		

Figure 1. Range of damage caused in non-phosphite-treated two-year old avocado plants four months after inoculation with *Phytophthora* species (n = 10). Half root systems shown. Images courtesy: Rajah Belhaj and NewCircleFilms.

Ensuring consumers get the ripeness of fruit that they want

Noel Ainsworth, Queensland Department of Agriculture and Fisheries

The skin colour in Hass changes from green to purple. Using skin colour can be unreliable with some fruit developing colour when unripe and even whilst still on the tree. Many retailers have used fruit firmness tests for some time, this has largely been through the use of hand-feel or destructive tests using penetrometers. This type of testing is regarded as either subjective or wasteful.

In an effort to improve this process, most retailers have switched to measuring fruit firmness objectively and non-destructively. They have included these testing methods and specifications in their distribution centres. This ensures that by the time the fruit reach the retail stores, they are at the correct stage of ripeness to promote purchase. Objective measures of fruit firmness has also been critical to consistent assessment of fruit quality in the avocado supply chain feedback project (AV18000).

Chris Hajos, Operations Manager at LaManna Premier Group, has a focus on consumers and works with his supply chains to ensure that those expectations are met.

Chris said consumers wanted to be able to select an avocado that they are either going to eat that day or one that might be eaten in the next couple of days.

"Hence the stores want to ensure they do not have under ripe or over ripe fruit on the shelf for their customers. That means our ripening sites bring the fruit to the stage where the ripening process has started but there is also enough time for the rest of the supply chain through the DCs and to store level to ensure shelf ready fruit.

"The art of ripening fruit is a challenge that the team love coming to work for every day."

There are a number of fruit firmness durometers available to monitor fruit ripening. The durometer being used commercially is the Bareiss durometer with a 5mm diameter ball indenter. The durometer measures the force required for the indenter to reach equilibrium with the avocado skin/flesh. The Bareiss durometer measures on a 0-100 Ffs shore scale and its calibration is checked using a set of rubber standards. There are two versions, the analogue and the digital (Figure 1).

The process used at distribution centres is to position the fruit on a steel bench and press the device against the equatorial part of the fruit recording the force reading. The reading is then repeated on the opposite side of the same piece of fruit and the readings are averaged.

Most wholesalers and ripeners are now familiar with the specifications required by the major retailers.

LaManna Premier Group Ripener Bijendra Thapaliya said they received avocados year-round for ripening from different parts of Australia.

"Fruit from different regions and at the beginning and end of a season ripen differently," he said.

"We check different lines of avocados every day using digital and analogue durometers. We assess the fruit pressure to then manage the temperature and gas levels in the ripening rooms to have the fruit ready on the day of delivery to the customer in the specifications they require."

Depending on the retail customer specifications, LaManna try to deliver fruit to DCs between 65 and 85 Ffs.

"The fruit should be firm to touch with a give when pressure is applied," Bijendra said.

Other commercially-available portable non-destructive durometers you may have heard of, include the Turoni durometer (53215 TT) and the Turoni FruitFirm meter (53225), Figure 2.

More information

For more detail on durometers, visit the DAF website to access the 'Assessing fruit firmness through supply chains' fact sheet and for more information on the supply chain innovation research program: *bit.ly/TA312DAF*.

Acknowledgement

The *Avocado supply chain feedback* project (AV18000) has been funded by Hort Innovation, using the avocado research and development levies and contributions from the Australian Government, the Queensland Department of Agriculture and Fisheries and the Western Australia Department of Primary Industries and Regional Development.

Figure 1. Bareiss durometers, analogue (left) and digital (right).

Figure 2. Turoni durometers.

Figure 3. Chris Hajos (left) and Bijendra Thapaliya (right) inspecting a consignment of avocados at LaManna Premier Group in Sydney.

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National bee pest surveillance update

Dr Jenny Shanks, Plant Health Australia

Australia is free of many of the serious bee pests and pest bees that have contributed to declines in bee populations overseas. Declining bee populations can adversely impact the production of honey and bee products, and the delivery of pollination services.

The National Bee Pest Surveillance Program (NBPSP) is an industry/government biosecurity partnership between pollination-reliant industries, all state and territory governments, the Australian Government, port staff and beekeepers. The program delivers nationally coordinated bee pest surveillance activities which support the early detection of, and thus the chance of successfully eradicating, high priority pest incursions of the honey bee industry.

Surveillance activities undertaken every six weeks by the NBPSP continue to confirm Australia's freedom from exotic viruses, bees, and pests. The program coordinates surveillance across nine government jurisdictions (including Norfolk Island since the end of December 2019) at 33 ports.

Activities at these locations have captured data for 16 high priority pests and three regionalised pests. This project has supported improved networks and better communication between jurisdictional field officers and Plant Health Australia to improve the consistency and accuracy of the surveillance taking place.

As of 30 May 2020, there were 156 sentinel European honey bee hives operating in the program. Regular surveillance activities performed at these sentinel hives aim to detect varroa mites, tropilaelaps mites, braula fly, exotic beetles, tracheal mites, and bee viruses (including deformed wing virus, acute bee paralysis virus and slow paralysis virus). This scientific evidence-based data allows Australia to report on the absence of these exotic bee pests and viruses to our trading partners.

Swarms of honey bees travelling on cargo and vessels are a high risk to Australia's pollination-reliant and bee industries as they may be carrying mites. Empty catchboxes are strategically positioned in suitable locations around the riskiest of ports to target these swarms. In total there are 167 catchboxes deployed, and 569 inspections for the presence of European honey bee (EHB, *Apis mellifera*) or Asian honey bee (AHB, *Apis cerana*) have taken place throughout the program. EHB swarms were captured in catchboxes on three occasions since the start of 2020. AHB swarms were also captured twice despite these catchboxes not being particularly suitable for this species. In addition, biosecurity officers active on port grounds are ready to respond to any new swarms at the ports. Since January 2020, there have been 16 swarm captures across Australia at our main seaports, with all swarms captured, destroyed and inspected for pests.

With 18-months of the project remaining, Plant Health Australia will support jurisdictions to ensure surveillance activities are continued. In addition, discussions about a sustainable program model will commence in the second half of 2020 to identify future bee surveillance program needs and design.

Can industry get involved?

If you see anything unusual, call the Exotic Plant Pest Hotline on 1800 084 881 and you will be put in touch with your local department of primary industries.

Further information about the NBPSP is available at *bit.ly/312bee*.

For more information on bee biosecurity including the Australian Honey Bee Code of Practice, pollination agreements, bee biosecurity officers, videos, and factsheets on exotic bee pests visit *beeaware.org.au*.

Acknowledgement

The NBPSP is jointly funded by the Australian Honey Bee Industry Council, Hort Innovation, Grain Producers Australia and the Australian Government Department of Agriculture, Water and the Environment. In-kind contributions for the implementation of the program are provided through each Australian state and territory as well as volunteer beekeepers. At a national level, Plant Health Australia coordinates and administers the program.

Data-driven water management in Manjimup

If you ask farmers what water is worth, they might say 'a livelihood'. In an Australian first, a new study in Manjimup, 300km south of Perth, aims to drill down to a dollar figure by calculating the economic returns for every mega litre of water used for irrigation, including on avocado orchards.

The Food Agility CRC project is led by Curtin University in collaboration with the Western Australian Government, Southern Forest Food Council, local farmers and technology companies like Perth-based SWAN Systems.

The project aims to support farmers to use data to make decisions about water use and irrigation, as well as to demonstrate the value that irrigation generates for farmers and the regional economy.

The three-year project targets avocado, apple, wine grape, stone fruit, vegetable and truffle farms, which make up about 90 per cent of horticultural production in the Warren-Donnelly catchment.

Food Agility CRC CEO Dr Mike Briers said it was hoped Manjimup would become an example of data-driven water management for other regions.

"We want to show how the value of water flows through farms into local communities, supporting the businesses and services that make up life in a regional town," he said.

Curtin University Centre for Crop and Disease Management Director Professor Mark Gibberd said on farm water use efficiency was highly variable and there were many opportunities to improve the adoption of new technology and to develop the industry capability for strategic irrigation management.

"This project will clearly demonstrate the potential economic returns to farmers of improved irrigation efficiency. At a broader level, we want to also understand how water use for agriculture contributes to the economic sustainability of a regional community, such as Manjimup," he said.

Speaking to *Farm Weekly*, Professor Gibberd said they saw the assessment of return on investment and agribusiness risk as being an important research and development frontier for all of ag industries.

"Looking at return on investment on inputs like water for irrigated horticulture is a really important part of that. To be able to break it down across different commodities across the region in order to understand the economic significance for an individual farm and to the region itself, is a critical step to take," he told *Farm Weekly*.

About the project

Researchers will install digital water flow meters and soil moisture probes on multiple blocks of each produce type, measuring how much water is being used in real time.

Participating farmers will be able to see, via an online dashboard, their daily water use and soil moisture. They will also be able to compare their irrigation with cumulative evaporation over the season and see data on recent and forecasted rainfall.

At the end of the season, researchers will calculate water productivity for each commodity type (profit per megalitre). Farmers will be able to see their water data and how their block performed compared with other de-identified farmers in their group. Farmers will only be able to see their own data, with researchers applying best-practice data privacy methods.

After two seasons, the team will aggregate the data to create a regional model of water use for agriculture and its flow-on economic benefits, for example to local businesses, health and education.

The data will help farmers make short and long-term decisions about farm management, targeting the practices that help them get the most value out of their water. The project will benefit not only the Warren-Donnelly catchment but will also be a pilot for other horticultural production communities.

More information

Project participants include the Food Agility CRC, Curtin University, WA Department of Primary Industries and Regional Development (DPIRD), WA Department of Water and Environmental Regulation, Southern Forest Food Council and 30 farms in the Warren-Donnelly catchment, and technology companies SWAN Systems and WildEye.

You can read more at: *foodagility.com/projects/on-farm-water-demand*.

Curtin University Researchers overlooking the dam at Wine and Truffle Co Manjimup and discuss the project.

Snapshots – International Avocado Research Update

This series of research snapshots is compiled from abstracts of published scientific papers accessed through CAB Direct as well as Google Scholar searches. Dates provided reflect the date research was published.

PRODUCTION

Induction of flowering by girdling to advance the Hass harvest in Nayarit, Mexico

Mexico (2020): Among the difficulties of the Hass production in Nayarit are the low prices derived from seasonality of the harvest in the months ranging from September to November. The objective of the research was to identify the girdling date capable of advancing the flowering and thereby advancing the harvest season. Four girdling dates (treatments) were evaluated in 10 replicates under a completely randomised experimental block design, generating the following treatments (T) during 2017: T1 = August 15, T2 = September 15, T3 = October 15, T4 = November 15 and T5 (without girdling). Each ring was 0.5 cm wide and disposed in 50% of the branches. The variables evaluated were the following: concentration of N, P, K, Ca and Mg in vegetative and flowering stages, days at the beginning of flowering, number of flower buds per m3 of canopy, days at the beginning of fruiting, panicle length, panicle thickness, fruit production per tree and dry matter of mesocarp. The analysis of variance showed significant differences for days at the beginning of flowering, days at the beginning of fruiting, panicle length, dry matter in mesocarp and fruit production. There were no differences in nutritional concentration at the phenological stages. We concluded that August 15 was the girdling date that advanced flowering by 52 days compared to T5, and allowed the harvest to be performed in May. Read the paper here: *bit.ly/312gird*.

Biochemical changes in response to canopy position of avocado during growth and development and relationship with maturity

South Africa (2020): In the current study, biochemical changes of Carmen and Hass were evaluated during growth, development and maturation. The aim was to determine if exposure of fruit to sunlight could vary the biochemical compounds associated with maturity, and hence be among the causes of uneven maturity, and ripening. The current study also seeks to evaluate if the mesocarp C7 sugars, oil and DM content have a relationship with fruit maturity. The study was conducted in a commercial orchard at Everdon Estates in the KwaZulu-Natal, South Africa. Nine avocado fruit (cv. Carmen and Hass) per canopy were sampled bi-weekly for assessment of mesocarp dry matter (DM), oil content, D-mannoheptulose, perseitol and total C7 sugars. The significantly ($p < 0.001$) higher DM and oil content in fruit that were sampled from the outside canopy in both cultivars suggested an early maturity, and vice versa inside canopy. The higher D-mannoheptulose and perseitol in fruit sampled inside canopy as a storage reserve was associated with the rate of respiration, which is slower inside canopy due to cooler temperatures. This results in accumulation of higher overall C7 sugars that are slowly used up as a substrates of respiration for synthesis of overall DM, oils, proteins, C6 sugars and other biochemical constituents associated with ripening. In terms of maturity, higher D-mannoheptulose and perseitol implies that fruit from the inside canopy will take longer to mature and to reach edible ripeness when harvested. This then causes uneven maturity of fruit, only characterized by uneven ripening.

NUTRITION

Biochar increases soil organic carbon, avocado yields and economic return

Australia (2020): The use of biochar in avocado orchard soils has not yet been investigated in rigorous scientific experiments. Researchers determine the effect of wood biochar on avocado growth, fruit production and economic benefit. Biochar was applied at 0%, 5%, 10% and 20% volume by volume basis. Biochar significantly improved the growth of avocado seedlings and increased fruit yield in the first three years after planting. There was an overall increase in soil carbon, fruit yield, tree diameter and height in all biochar treatments relative to the control over the seasons. Trees planted with biochar had 18-26% greater growth rates (in terms of height and stem diameter) than the control. Tree diameter was significantly greater with biochar (145.4 ± 3.3 mm) relative to the control treatment (125.0 ± 2.7 mm). Tree height was also significantly greater with biochar (3.7 ± 0.1 m) relative to the control treatment (3.4 ± 0.1 m). The fruit count from the biochar row was significantly greater (97%) in 2018. Heavy bearing trees typically have a lower yield in

the subsequent year but despite this, the 2019 fruit counts were higher in aggregate for the biochar amended trees (20%) relative to the control. A cost-benefit analysis indicated that if yield surplus of fruit trees continued for three years, and assuming avocado prices remain at similar levels, then the discounted net benefit over a hectare would amount to US$8581, or US$105 per metric tonne of biochar applied.

HARVEST

Non-destructive discrimination of avocado fruit ripeness using laser Doppler vibrometry

UK (2020): Consumers increasingly desire ready-to-eat avocado fruit, yet if supplies fall short of customer expectations, complaints follow, incurring considerable cost and waste. In the avocado sector, wastage due to destructive testing and inaccurate assessment of firmness is significant. The aim of this study was to evaluate whether non-destructive laser Doppler vibrometry (LDV) was capable of assessing avocado ripeness. Data were sourced from two trials using preclimacteric imported Hass avocado originating from Chile and Spain, ripened at 12 and 18°C, respectively. Standard force-deformation measurements, and either single or simultaneous dual vibration time signals were recorded during shelf-life, and assessed against respiration and non-structural carbohydrate content. Resonant frequencies measured from fruit by means of LDV decreased two- to four-fold during ripening and this corresponded with a concomitant decrease in firmness (253 N -2 N). The capability of the LDV system to non-destructively discriminate between ripeness stages was demonstrated.

More information

If you would like more details on any of the snapshots, please contact Avocados Australia on 07 3846 6566.

Acknowledgement

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INTERNATIONAL NEWS

New Zealand domestic consumption up

The New Zealand avocado industry expects returns for the 2019/20 season will again exceed $150 million, according to the country's peak industry body.

"There are excellent returns on the New Zealand market and solid returns from export markets," NZ Avocado Chief Executive Officer Jen Scoular told FreshPlaza in July.

"A record volume of avocados was sold in New Zealand, demonstrating kiwis growing love of the wonderfully healthy avocado. New Zealand doesn't import any avocados, all fresh avocados available are grown here. The new crop is looking strong, with a 10-15% increase expected in volume for the 2020/21 season."

It comes as New Zealand responded strongly to the COVID-19 crisis and is fortunate to currently have very low cases in the country.

Ms Scoular told FreshPlaza international trade lanes had been impacted, so the industry continued to evaluate the risks to shipping, container flow and airfreight to our priority markets.

"Our horticulture industries were deemed essential services so continued to grow, harvest, pack and market-fresh produce," she added.

"They responded very well to the crisis and invested heavily to ensure that workers were able to operate safely, and the industry could keep growing and harvesting, so that consumers within New Zealand and overseas customers, could continue to buy fresh, safe, and healthy fruit and vegetables."

The peak industry body says New Zealand industries across the horticulture sector have collaborated to ensure horticulture plays a key role in New Zealand's post-COVID-19 recovery.

"Avocados are a part of this collective and are working with key government departments to deliver an industry-led, government enabled post-COVID horticulture recovery strategy," Ms Scoular said.

This year's strong season comes after NZ Avocado won the bid to host the 2023 World Avocado Congress (WAC) event in New Zealand, at last year's event in Columbia. A key theme will be NZ Avocado' ongoing efforts to understand the sustainability of its product, environment and community.

Horticulture helps New Zealand's COVID-19 recovery

All parts of New Zealand's diverse horticulture sector have worked with key government departments to develop an industry-led, government-enabled strategy that will ensure horticulture spearheads New Zealand's post-COVID recovery.

"During lockdown, horticulture worked closely with government to ensure that the industry could keep growing and harvesting so that New Zealanders and overseas customers could continue to buy fresh vegetables and fruit," Horticulture New Zealand Chief Executive Mike Chapman said.

"The outcome we are all looking for is growth, jobs and regional economic prosperity, within the context of the broader recovery."

The New Zealand horticulture industry employs 60,000 people and is worth a total of $6.39 billion. The industry exports to 130 different countries and these exports are worth $4.2 billion.

The new strategy covers trade and market access, labour, capability and skills, climate change and natural resources, improved and sustainable production systems, telling the horticulture story, partnership with Maori, technology and innovation, diversity, big data and removing barriers to growth and success.

US and Spain collaborating on advanced scions and rootstocks

UC Riverside has entered into a $2.25 million partnership with Spain-based Eurosemillas to help the university bring to market the most promising and advanced avocado scions and rootstocks in its collection.

If successful, these varieties would meet diverse regional growing requirements, exhibit better post-harvest characteristics, increase yields, provide resistance against disease, and expand consumer market diversity.

"Eurosemillas has successfully commercialised citrus varieties developed at UC Riverside in the past," UC Riverside's director of technology commercialisation in the Office of Technology Partnerships, Brian Suh, said.

"They have the global network and expertise to do the same with the next generation of avocados," he said.

Eurosemillas will obtain access to a small subset of the overall university avocado variety and rootstock collection for evaluation and testing on various continents to see if they perform as well as they do in California. At the same time, they will forge partnerships for commercialisation that could lead to global market penetration of some of these selections.

UC Riverside's 70-year old avocado breeding programs house one of the most elite germplasm collections of scion and rootstock breeding material in the world.

The goal of the variety breeding program is to develop trees with high eating and market quality while increasing yield efficiency.

Ms Arpaia said for the California industry to remain viable, growers must have new varieties that yielded more than Hass, was more tolerant to environmental stress, and could be produced reliably under high-density planting systems.

The variety improvement program has four selections being readied for release that can augment the Hass variety in terms of seasonality and have potential for expanded environmental adaptation within California.

Meanwhile, the UCR Rootstock Breeding Program is selecting rootstocks that can resist Phytophthora root rot, the most common avocado disease worldwide, as well as salinity, drought, and heat, all of which are expected to become worse. In collaboration with the California Avocado Commission, five UC Riverside advanced rootstocks exhibiting resistance to these major challenges are being evaluated by growers throughout California.

For more information on this avocado program contact Joyce Patrona: *joyce.patrona@ucr.edu*.

Niwala Abeysekara uses a leaf sensor on avocado plants in the Manosalva lab at UC Riverside. (UCR/Stan Lim)

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