



Citrus Fund

Annual Report 2018/19

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The projects in this report have been funded by Hort Innovation using sources including the citrus levy, Australian Government contributions and, in some instances, co-contributions from a variety of sources.



Just some of the things your fund delivered in 2018/19:

- ✓ **Industry communication and extension work**, delivering the *Australian Citrus News* magazine, *Citrus eNews* emails, industry forums, and the industry website, www.citrusaustralia.com.au
- ✓ **The citrus Harvest to Home dashboard** providing regular consumer behavioural data and insight reporting, at www.harvesttohome.net.au
- ✓ **New and ongoing market access and development work**, including the critical market development, access and quality program (p10) and a new project to engage retailers in export markets (p11)
- ✓ **A host of key biosecurity activity**, including projects to protect the industry against Huanglongbing and other high-priority threats (p14)
- ✓ **A highly visible and multi-pronged international marketing campaign** (p19)
- ✓ **New final research reports and grower resources**, with 55+ now available from www.horticulture.com.au/citrus, including new online tools for tackling gall wasp and red scale

2018/19 SNAPSHOT

**\$4.02
MILLION**

INVESTED
IN R&D

**\$406
THOUSAND**

INVESTED IN
MARKETING

40

ACTIVE R&D
INVESTMENTS

Welcome

Hort Innovation is the grower-owned, not-for-profit research and development corporation (RDC) for Australia's horticulture sector. It's our job to work with industry to invest the citrus R&D and marketing levies, as well as Australian Government contributions, into key initiatives for growers.

The 2018/19 financial year was another great year of growing better, together – with strong investments, closer connections and critical collaborations being forged.

There was more than \$4.02 million invested into R&D through the Hort Innovation Citrus Fund across the year, to support the industry in being as productive and profitable as possible. This included the establishment of 14 new investments, including work allowing the citrus industry to join forces with other horticulture industries for maximum efficiency and impact across shared issues and opportunities.

Meanwhile in marketing, the Hort Innovation Citrus Fund saw some \$406,000 invested in 2018/19 into a range of activities to raise the profile and consumption of Australian citrus in major export markets.

Read on to learn more about all of this work. And remember to take advantage of the Hort Innovation website at www.horticulture.com.au/citrus, where you can search and find information relating to investments, past and present, at any time. The new site and its Citrus Fund section were launched in 2018/19.

Finally, during the year there were many opportunities for Hort Innovation to connect with you, the growers. A big thank you in particular to everyone who came to our early-2019 regional roadshows to feed into the development of the new Hort Innovation Strategy 2019-2023 (read more at www.horticulture.com.au/strategy-2019-2023).

You can reach out to us at any time to learn more about our work, to submit ideas for investments, or to simply have a chat about your industry. You'll find details of specific staff at www.horticulture.com.au/get-in-touch, or can otherwise email communications@horticulture.com.au or call our general line on 02 8295 2300.



Additional value in the year

During 2018/19, Hort Innovation was proud to deliver extra value to the citrus industry, outside of levy-funded initiatives within the Citrus Fund. Here's a quick look at just some examples.



The new Hort Innovation website, with dedicated Citrus Fund section

You can now visit www.horticulture.com.au/citrus to quickly search and find citrus investment information and updates, project resources, and growing tips and advice from Hort Innovation's R&D work. You can also download full final research reports direct from the site, access key contact information, share your ideas and feedback, and so much more.



The Australian Horticulture Statistics Handbook

Each year Hort Innovation delivers an *Australian Horticulture Statistics Handbook* packed with horticulture statistical information and analysis for use by specific industries and the wider sector. The handbook combines all available data on production, international trade, processing volumes and fresh market distribution for some 75 categories. The 2017/18 edition, released in early 2019, is available from www.horticulture.com.au/horticulture-statistics-handbook.



Hort Frontiers projects

With seven investment areas, Hort Innovation's Hort Frontiers strategic partnership initiative is about collaborative, cross-industry work to address longer-term, complex issues and opportunities identified as critical for the future of Australian horticulture. While the citrus levy has been co-invested into some Hort Frontiers projects, the bulk of funding continues to come from broad-reaching funding relationships secured by Hort Innovation, plus support from the Australian Government. Learn about all of the projects and what they're delivering for you at www.horticulture.com.au/hort-frontiers.



Grant funding

In 2018/19, Hort Innovation delivered \$6.7 million worth of investments involving grant funding across the horticulture sector. To do so, we applied for and secured a range of competitive grants on behalf of industry, including through the Australian Government's Rural R&D for Profit program, Improved Access to AgVet Chemicals initiative, and Agricultural Competitiveness White Paper. With projects across everything from biosecurity to agri-technology, there's plenty in there to directly and indirectly benefit the citrus industry.

Making investments in 2018/19

Hort Innovation is dedicated to making the right investments at the right time and in the right areas, in line with identified priorities for the industry.

Where the funding comes from

The citrus industry's grower-raised statutory R&D and marketing levies are collected by the Australian Government and entrusted to Hort Innovation as the RDC for Australian horticulture. It's then our responsibility to work with the industry to invest these levies – together with Australian Government contributions in the case of R&D – into strategic initiatives for the benefit of growers.

Additional funding streams can also come into play, such as co-investment dollars from sources including project partners, and grant funding that Hort Innovation secures on behalf of industry.

How decisions are made

Investment decisions in the Hort Innovation Citrus Fund are guided by the industry's Strategic Investment Plan (SIP). This document was developed through close consultation with growers and other industry stakeholders, and outlines specific investment priorities, strategies and themes. An at-a-glance version can be found at www.bit.ly/citrus-plan, or find the full version at www.horticulture.com.au/citrus.

The SIP is currently used like a 'roadmap' by the citrus Strategic Investment Advisory Panel (SIAP) – a panel made up of growers and other industry representatives that's tasked with providing advice to Hort Innovation on potential levy investments.

Turning ideas into investments

Great investments start with great ideas, and Hort Innovation encourages all growers and other industry participants to share their thoughts and suggestions for the work they want to see. Ideas can be submitted any time via Hort Innovation's investment idea form at www.bit.ly/concept-form.

Ideas that are selected for investment are worked into project proposals by Hort Innovation. These are then made public for potential delivery partners to submit responses. Current opportunities are always listed at www.horticulture.com.au/delivery-partners.

Responses are assessed, often with the assistance of industry, and the best delivery partner for the work is chosen. A contract is then issued and the work begins.

Keeping track of investments

All investments in the Hort Innovation Citrus Fund are detailed on the 'Your investments' page at www.horticulture.com.au/citrus. We also send news and alerts to Hort Innovation members and contacts – if you haven't already, you can sign up for free at www.horticulture.com.au/sign-up.

Importantly, the industry's levy-funded communications program is tasked with providing growers with regular information on levy-related activity. See p13 for more.



New investment analysis

You can now clearly see how investments in the Hort Innovation Citrus Fund align to the industry's SIP, with new and interactive investment analysis information available from www.bit.ly/citrus-investment. The analysis currently shows the allocation of funding against each of the citrus SIP outcomes from the start of the SIP (2016/17) to the end of 2018/19, and gives an indication of the projects that are aligned to each outcome.

R&D project list 2018/19

NEW INVESTMENTS IN 2018/19		ONGOING INVESTMENTS IN 2018/19	
CT17005	Citrus fruit export China and Japan*	CT15010	Australian Citrus Postharvest Science Program
CT17007	Improving diagnostics and biosecurity for graft-transmissible diseases in citrus	CT15017	Building a genetic foundation for Australia's citrus future
CT17008	Protecting Australia's citrus genetic material	CT16000	Citrus industry minor use program
CT18000	Citrus industry communications program	CT17000	Improving citrus quality with regulated deficit irrigation
CT18001	Citrus agrichemical and export MRL program	CT17001	Improving biosecurity preparedness of the Australian citrus industry
CT18002	Citrus market development, market access and quality	CT17002	Evaluation of new rootstocks for the Australian citrus industry 2017-2022
CT18003	First Detector Network: USA Huanglongbing and citrus canker	CT17003	Maximising the biosecurity of the Australian Citrus Industry Budwood Facility
FF18003	SITplus: Port Augusta Qfly SIT factory pilot operation	CT17006	Evaluation of new citrus varieties 2017-2022
MT17006	Xylella coordinator	AM17001	Developing a national systems approach for meeting bio-security requirements to access key Asian markets
MT17006	Improving preparedness of the Australian horticultural sector to the threat potentially posed by <i>Xylella fastidiosa</i> (a severe biosecurity risk)	AM17010	Taste Australia trade shows [†]
MT18005	Improving plant industry access to new genetics through faster and more accurate diagnostics using next generation sequencing	MT13059	SITplus: Developing and optimising production of a male-only, temperature-sensitive-lethal, strain of Qfly, <i>B. tryoni</i>
MT18011	Ex-post impact assessment [^]	MT14052	Essential market access data packages
MT18017	Taste Australia retail program	MT16010	Horticultural trade data 2017-19
ST18001	Generation of data for pesticide applications in horticulture crops	MT17005	Improving the biosecurity preparedness of Australian horticulture for the exotic spotted wing drosophila (<i>Drosophila suzukii</i>)
		MT17015	Consumer behavioural and retail data for fresh produce
		ST16006	Generation of residue, efficacy and crop safety data for pesticide applications in horticulture crops 2017
		ST16008	AgVet collaborative forum

* This flagged project both began and ended in 2018/19

[^] This multi-industry project was a key monitoring and evaluation investment during 2018/19 – we encourage you to find the full details at www.horticulture.com.au/mt18011

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

INVESTMENTS COMPLETED IN 2018/19

CT15005	Protecting Australia's citrus genetic material
CT15006	Development of national strategies to manage citrus gall wasp
CT15008	Development of phenology models and a timing guide for the management of California red scale in Australian citrus
CT15009	Citrus industry communications
CT15012	Australian citrus industry innovation and market development program
CT15013	Citrus Quality Standards – stage 3
CT15015	Citrus Australia Limited – communication support on CT15009
CT15016	Agrichemical residue monitoring program for Australian citrus exports – stage 2
CT16700	Citrus technical forums

During the 2018/19 financial year, all levy paying horticulture industries also contributed to a small selection of across-industry projects addressing issues that affect horticulture as a whole. Details of all investments that Hort Innovation manages can be found at www.horticulture.com.au.



But wait, there's more. To see what Hort Innovation delivered across the entire horticulture sector in 2018/19, download the full Hort Innovation Annual Report 2018/19 from www.horticulture.com.au/annual-report-portal.



R&D report

Take a closer look at some of the key investments in the Hort Innovation Citrus Fund during 2018/19. Any resources from these and other levy-funded projects – such as fact sheets, guides and more – are published on your grower page at www.horticulture.com.au/citrus as they become available.

Development of national strategies to manage citrus gall wasp (CT15006)

NOW COMPLETE

Key research provider: NSW Department of Primary Industries

This project investigated new management options for the control of citrus gall wasp, an endemic pest of citrus in Australia that can cause yield loss and reduction of fruit size. The work ran from 2015 to the end of 2018 and developed phenology models to guide timing for control options including cultural control, biological control, repellents and alternative insecticides.

Key findings from the project included:

- » Removing galls by pruning reduces local wasp populations. To ensure no adult wasps emerge from pruned galls, pruning should be done at least 56 days before expected adult wasp emergence if pruned galls are left in the shade, or at least 28 days if left in the open. Otherwise, pruned galls should be burned or mulched.
- » Pruning encourages growth of young shoots which are the preferred egg laying site for wasps, so excessive growth of shoots should be treated with a registered systemic insecticide.
- » Using trap trees to manage citrus gall wasp is not a promising option, as the wasps do not appear to favour one citrus variety over another for laying their eggs.
- » Two parasitic species attack citrus gall wasp, *Megastigmus brevivalvus* and *M. trisulcus*. Following repeated releases, both species are now prevalent in the southern citrus regions, however further releases are needed to broaden their establishment.
- » Several foliar insecticides readily kill adult wasps, however they are also highly disruptive to beneficial arthropods and do not always provide satisfactory control.
- » An alternative option to insecticides is the use of repellents. A kaolin-based product was found to be highly repellent to the adult wasps and is a potential future option for control of heavily infested citrus blocks. Further work is needed in this area.

An interactive online tool based on the phenology models developed by this project is now available via www.bit.ly/gall-wasp-tool, to allow growers to use local weather station data to predict when adult gall wasps are likely to emerge and when eggs laid by the wasps are likely to hatch.

Full details of the gall wasp research can be found in the project's final research report, available from www.bit.ly/ct15006.

Development of phenology models and a timing guide for the management of California red scale in Australian citrus (CT15008)

NOW COMPLETE

Key research provider: NSW Department of Primary Industries

This investment developed a timing guide for the management of red scale, a major pest of citrus crops in Australia that can infest all above ground surfaces of trees and cause fruit to be downgraded or sent for juicing.

The project ran from 2015 to 2018 and, to help citrus growers time their red scale control, it collected data on the seasonal patterns of red scale populations in the southern citrus regions, conducted chemical timing trials and ultimately developed the timing guide available at www.bit.ly/red-scale-timing for peak periods of adult males and crawlers. A red scale population model was also developed to investigate the underlying mechanisms for the observed seasonal patterns.

Red scale populations are normally kept below damaging levels by their natural enemies. When interventions are needed they can involve chemical controls, including petroleum spray oils, and biological control in the form of parasitoid Aphytis wasps. However, timing is important in red scale management. Many registered chemicals for red scale control are only or mostly effective against crawlers (newborn scale nymphs) and whitecaps (newly settled crawlers) which do not have fully developed wax covers to protect them.

The project team found that individual seasonal patterns of adult males and crawlers varied considerably between monitoring sites and seasons, ranging from small, isolated

Continued >>

peaks to broad, merged peaks. Despite these variations, the project team made the following observations:

- » Red scale adult males and crawlers are more likely to peak during certain time periods. Crawlers are likely to be most abundant in November and least abundant during June to August. Adult males are likely to be most abundant in October and March and least abundant in May to August and November.
- » The timing of spring male and crawler peaks can be predicted using local temperatures.
- » Red scale can complete at least four generations per year in the southern citrus production regions of Australia.
- » Red scale populations increase from spring to autumn.
- » Aphytis wasps prefer to parasitise virgin red scale females. The timing of spring adult male peaks can be used for Aphytis releases as it is also the time when virgin females are abundant.

These observations were used to develop the timing guide tool that predicts the abundance of the red scale life stage and thereby can help growers time their control options. In general, it is recommended that red scale controls be timed at spring crawler peaks, as this will reduce the size of red scale populations in subsequent generations.

The project also found that pheromone traps are useful tools for monitoring red scale populations, though they are not widely used in Australia. They can be used to detect male flights, which in turn can be used to predict crawler peaks and therefore timing of red scale controls. The size of trap catches provides a measure of local red scale infestation levels.

Full details can be found in the project's final research report, which can be downloaded from www.bit.ly/ct15008.

Citrus Quality Standards – stage 3 (CT15013)

NOW COMPLETE

Key research provider: Citrus Australia

Established in 2011, the Australian Citrus Quality Standards program has a focus on improving and maintaining the eating quality of Australian citrus – ensuring fruit consistently meets or exceeds consumer expectations. The overarching goal is to increase consumption and ensure the price of Australian citrus is maximised.

This stage of the program, which ran from 2016 to 2018, set out to improve the standard of oranges and mandarins. To achieve this consistency, the project defined six areas of activity.

These included:

- » Testing and reporting maturity levels of fruit for sale in Australian wholesale markets
- » Developing and implementing a maximum granulation standard for Imperial mandarins

- » Increasing knowledge in the supply chain to achieve greater adoption of quality improvement practices
- » Developing a standard operating procedure for commencing harvest
- » Conducting pre-harvest field testing and communicating results to industry participants
- » Collaborating with the research community to improve the quality of Australian citrus.

As citrus fruits don't develop sugars after harvest, harvest must be timed precisely for best quality. To help growers to get the timing right, the team investigated the best practice for harvest, and modified protocols for fruit testing to produce a more accurate guide for growers. Traditionally, juice from several fruit is extracted and combined to measure sugar and acid content to judge harvest readiness, but this underestimates the effect of variation between fruit. The team modified in-field and market testing protocols so that testing was conducted on individual fruit within samples. This gave a better understanding of the variability within orchards and commercial consignments. Given the variation in samples, protocols were also changed to sampling 30 fruit rather than 10, to provide reliable ratings.

Regarding a commencing-harvest standard operating procedure, 'Pass to Pick' guidelines were developed to allow growers to reliably assess fruit maturity, preventing immature fruit from being consigned to market. The guidebook can be downloaded from www.bit.ly/pass-to-pick-guide. The standard operating procedure was developed in consultation with Citrus Australia's Domestic Leadership Group and incorporates industry best practice and existing procedures used in California and New Zealand.

Regarding granulation (internal dryness, which be a problem in Imperial mandarins), the project developed a granulation standard that market testing agents and retailers can use to visually detect, grade and report granulation. A sensory evaluation study by the University of Queensland concluded that mandarins granulated at the 35 per cent and 45 per cent levels are acceptable to consumers, but not above 55 per cent. Accordingly, a visual guide was developed that shows the entire spectrum of granulation with acceptable limits, available from www.bit.ly/visual-granulation-guide. A short fact sheet about the maximum granulation standard is also available from www.bit.ly/granulation-standard.

Further information about the project is available from www.bit.ly/ct15013, with this link also including a download of the investment's full final research report.

Citrus market development, market access and quality (CT18002)

NEW IN 2018/19

Key research provider: Citrus Australia

This investment is helping the Australian citrus industry continue its strong presence in the global market, remaining competitive and in a place to reliably supply product that satisfies international requirements. It has three focus areas: maintaining and improving market access, delivering market information, and quality improvement.

To this end, the project brings together and builds upon the industry roles and activities previously delivered through the now-completed **Australian citrus industry innovation and market development program (CT15012)** – which you can read all about at www.bit.ly/ct15012 – and **Australian Citrus Quality Standards – stage 3 (CT15013)**, described on p9. This includes roles and activities of a market development manager and market development officers, to help the Australian industry facilitate reliable supply, seize new market opportunities, overcome challenges and barriers, access timely information on supply, market conditions, shipping movements, and more. Between them, they also maintain the industry's export strategy.

Specific project activities are many and varied, and just some of them include:

- » Maintaining the Australian Citrus Quality Standards
- » Capturing and disseminating information of the maturity levels and quality of fruit for sale in the wholesales market during the season, as well as pre-season on-farm quality testing
- » Continued delivery of Season Updates for growers in the *Citrus eNews* newsletter, which provide a summary for the major citrus growing regions including seasonal outlooks and advice of nutrition, irrigation, pest and diseases and more (see www.citrusaustralia.com.au/season-update-archive)
- » Provision of weekly in-season reports on shipping volumes and conditions in export markets
- » Provision of production data via InfoCitrus during the season (www.bit.ly/infocitrus)
- » Delivery of the annual Citrus Tree Census, available from Citrus Australia
- » Delivery of market-related regional workshops and forums, and participation in the industry's biennial Market Outlook Forum and Citrus Technical Forum
- » Work towards annual crop forecasts, plus fruit density and sizing surveys to help inform the industry of the quantity and quality of fruit
- » Delivery of training for registered crop monitors, who are responsible for surveying orchards for pests and diseases as part of the process of exporting to Korea, China and Thailand
- » Facilitation of the industry's online export registration system



- » Participation in and facilitation of export, variety, agrichemical and domestic/quality leadership groups, as well as Japan, China and US exporter groups
- » Provision of technical assistance to the Australian Government regarding market access and Free Trade Agreement negotiations
- » Participation in relevant trade events and missions.

Citrus agrichemical and export MRL program (CT18001)

NEW IN 2018/19

Key research provider: Citrus Australia

The Australian citrus industry requires access to modern and effective chemicals to control pests, diseases and post-harvest quality and, at the same time, must ensure that any residues on fruit remain within the regulatory limits set both in Australia and overseas. This program is facilitating work with product registrants to ensure the industry is able to maintain and gain access to critical agrichemicals, is responsible for a residue monitoring program, and is conducting trials and residue testing to gain a better understanding of product degradation.

It is also maintaining information on importing country maximum residue limits (MRLs), and providing updates and advice to industry on them. This includes updating of the MRL tables that are available to industry via Citrus Australia, and the revision of the industry's *Guide to Achieving Citrus Export MRLs*, also available from Citrus Australia.

Agrichemical residue monitoring program for Australian citrus exports – stage 2 (CT15016)

NOW COMPLETE

Key research provider: Citrus Australia

Running from 2016 to the end of 2018, this project worked to ensure exporters had effective residue risk-management strategies in place and continued, improved and expanded on the Australian Citrus Pesticide Residue Monitoring Program (ACPRMP).

The ACPRMP commenced in 2011 as a collaborative arrangement between industry and the Australian Government – involving the testing of Australian citrus for a range of chemical residues and potential contaminants, to ensure the meeting of regulatory requirements in domestic and international markets.

Under CT15016, citrus exporters were provided the opportunity to have citrus samples analysed for the presence of agrichemical residues. The freight and administrative costs were covered by the project, and the costs of analyses were covered by the participating business.

The project team reported that for each season of the project, approximately 400 samples were submitted for analysis. A high level of compliance with Australian and overseas maximum residue limits was seen, which the project team acknowledged as “highlighting that Australian citrus growers and packers adopt good agricultural practices with responsible use of agrichemicals”. Through this work, they said, the industry gained a greater consciousness and awareness of maximum residue limit requirements. Top project outcomes included the maintenance of market access into key markets and also access to new agrichemicals, with the system being used to support new product regulatory approvals for registrations and minor use permits.

Ongoing activities are now continued under CT18001, described on the previous page.

Taste Australia retail program (MT18017)

NEW IN 2018/19

Key research provider: Produce Marketing Australia (PMA)

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 citrus.

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.

Citrus fruit export China and Japan (CT17005)

NEW IN 2018/19 & NOW COMPLETE

Key research provider: Added Value Australia

The results of this research investment have helped develop a clear and strong positioning for Australian citrus in key export markets, that will be able to be used to command a premium in both the Japanese and Chinese markets specifically – particularly in the face of rising exports from other nations.

The project’s insights have already begun feeding into the citrus trade and marketing activity that takes place under Hort Innovation’s Taste Australia export-market umbrella, and will continue to facilitate targeted, sophisticated and effective approaches to guide overall investment in citrus export marketing.

Continued >>



Some of its key findings included:

- » While traditionally the message of ‘clean and green’ has been used to differentiate premium product, in both China and Japan safety and quality of produce are increasingly a requirement, and are being met by most competitors. ‘Clean and green’ messaging may not support a differentiated offer, nor a premium price point into the future.
- » For both Chinese and Japanese consumers, the positivity of the Australian lifestyle carries very strong appeal. There is opportunity in leveraging Australia’s lifestyle and its associations to engage with end consumers more effectively and to drive a new premium point of difference.
- » Focusing export marketing around the point of consumption (that is, ‘what you’ll get from eating Australian citrus’) is a new target as opposed to activity targeted at point of purchase (that is, ‘this is what you should buy’).

Full details can be found in the project team’s ‘Harvesting the elixir of Australis’ presentation, available from www.bit.ly/ct17005-presentation.

Protecting Australia’s citrus genetic material (CT17008)

NEW IN 2018/19

Key research provider: Auscitrus

Access to healthy planting material is essential for the Australian citrus industry, with supply of disease-free, true-to-type propagation material of key importance. While diseases such as Huanglongbing and citrus variegated chlorosis (CVC) remain exotic to Australia, there are a number of graft-transmissible viruses and viroids in Australia that can cause stunting, yield loss and even death in some scion and rootstock combinations.

With this in mind, this investment is continuing funding for the long-term National Citrus Repository (NCR) program for publicly owned citrus varieties. It is supporting the maintenance and disease testing of foundation trees in the NCR, as well as the disease testing of new Australian citrus selections entering the repository system.

The NCR is an important part of an integrated biosecurity system designed to protect the health and economic viability of the Australian citrus industry. From foundation tree budwood, Auscitrus creates daughter trees and multiplies large numbers of buds for industry. New varieties can enter the program if no known diseases are detected after pathogen testing and elimination.

Investment CT17008 carries on from the now completed **Protecting Australia’s citrus genetic material (CT15005)**, which supported the work of the NCR from 2015 to 2018 and has a full final research report available for download at www.bit.ly/ct15005.

Improving diagnostics and biosecurity for graft-transmissible diseases in citrus (CT17007)

NEW IN 2018/19

Key research provider: NSW Department of Primary Industries

This project is responsible for supporting the NSW DPI Citrus Pathology Program in strengthening biosecurity against graft-transmissible diseases, in collaboration with other bodies including Auscitrus. The team’s activities include:

- » Working towards improved detection and diagnostics of graft-transmissible pathogens of citrus, including through assessing, developing and validating lab diagnostic procedures
- » Understanding the risk posed by newly discovered or reported graft-transmissible diseases
- » Responding to industry requests for diagnostic support.

The work ties into other investments including *Improving biosecurity preparedness of the Australian citrus industry (CT17001)*, described on p14.

Improving plant industry access to new genetics through faster and more accurate diagnostics using next generation sequencing (MT18005)

NEW IN 2018/19

Key research provider: Queensland University of Technology

This investment is tasked with supporting the adoption of ‘next generation sequencing’ in the screening of imported horticultural plant material in post-entry quarantine facilities. The technology has the potential to allow plants to move through the quarantine process much more quickly – allowing industry speedier access to new genetic stocks.

Currently, new plant material entering Australia can spend up to three years in post-entry quarantine facilities undergoing pathogen testing. Next generation sequencing offers a fast, reliable and cost-effective method to identify all known plant pathogens in a single test.

Previous research has demonstrated the approach’s success and efficiency in testing for viruses and viroids in imported plants, with next generation sequencing subsequently being adopted in the testing of imported ornamental grasses. This investment will provide the evidence and protocols needed for the technology to be adopted for further plant commodities, including horticulture crops.

Citrus industry communications program (CT18000)

NEW IN 2018/19

Key research provider: Citrus Australia

Following on from previous project *Citrus industry communications (CT15009)*, which drew to a close towards the end of 2018, this investment is responsible for delivering effective and timely communications to ensure Australian citrus growers and other industry stakeholders are kept up-to-date with the latest R&D and marketing activities, and other industry news and information.

Like its predecessor it's responsible for producing and maintaining a number of regular communication channels, including but not limited to:

- » The quarterly national magazine, *Australian Citrus News* (www.citrusaustralia.com.au/media/australian-citrus-news)
- » Fortnightly *Citrus eNews* e-newsletters from Citrus Australia
- » YouTube videos, delivered via the Citrus Australia YouTube channel
- » The industry website, www.citrusaustralia.com.au.

Citrus technical forums (CT16700)

NOW COMPLETE

Key research provider: Citrus Australia

This investment was responsible for planning and delivering the industry's biennial Citrus Technical Forums in 2017 and 2019, which provided the opportunity for growers and other supply chain participants to come together to learn about the latest technological developments and updates on current R&D projects. The events combined presentations, workshops and field trips and covered a variety of topics including biosecurity, integrated pest management, orchard best management practice, farm tech, variety evaluations, rootstock trials, post-harvest practices and more.

Consumer behavioural and retail data for fresh produce (MT17015)

Key research provider: Nielsen

This multi-industry investment is tasked with providing regular consumer behavioural data and insight reporting to a range of industries, through the Harvest to Home platform (www.harvesttohome.net.au).

The platform has a dedicated dashboard for citrus, making data and reporting easily accessible for industry participants. The 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 Citrus Fund marketing plans.

Building a genetic foundation for Australia's citrus future (CT15017)

Key research provider: The Queensland Department of Agriculture and Fisheries

This project supports a diverse and comprehensive breeding program to develop improved, quality varieties for the Australian citrus industry. A range of breeding technologies and germplasm work are employed in this integrated program, with updates available from www.bit.ly/ct15017.

Evaluation of new citrus varieties 2017-2022 (CT17006)

Key research provider: NSW Department of Primary Industries

This investment is tasked with rapidly and independently assessing new citrus varieties under local conditions – providing industry with objective performance data. It is a continuation of earlier levy investments, including the project *Evaluating new citrus varieties 2013-17* (CT12026).

Knowledge from the evaluation work is brought to growers through field walks, fruit variety displays and other industry events, while information sheets describing the horticultural performance of all varieties evaluated are also produced.

Evaluation of new rootstocks for the Australian citrus industry 2017-2022 (CT17002)

Key research provider: NSW Department of Primary Industries

This investment is evaluating the performance of new rootstocks for the Australian citrus industry, with a focus on improving the yield and quality of both fresh and processing fruit, boosting tree health by improving tolerance to stresses, and looking at the modification of tree architecture.

The goal is to deliver superior and locally-adapted rootstocks to Australian growers, suited to both mainstay and new citrus varieties. The work will ultimately allow growers to intensify plantings, modernise orchards and obtain higher yields with minimal extra inputs, while meeting requirements for existing and emerging markets.

Its work includes:

- » Continuing the evaluation of six new, high-performance Chinese rootstocks that were released to industry 2017 as a result of an earlier levy-funded project
- » Evaluating new rootstocks imported from Italy
- » Continuing dwarfing citrus rootstock trials
- » Progressing the evaluation rootstocks for salt tolerance
- » Continuing trials involving processing oranges
- » Working to identify Huanglongbing-tolerant rootstocks for importation and subsequent field trials.

Improving citrus quality with regulated deficit irrigation (CT17000)

Key research provider: NSW Department of Primary Industries

International research indicates that a regulated deficit irrigation approach can be applied during citrus maturation and ripening stages to enhance fruit sugar content, while saving irrigation water – however there are currently no practical recommendations for its implementation in improving fruit quality on-farm.

This project is using irrigation trials to develop a practical irrigation deficit method. It will ultimately produce guidelines allowing Australian growers to adopt smart, innovative agronomic practices that can deliver improved fruit quality – with a particular focus on enhancing sugar content for fruit to be exported to Asian markets, where there is a preference for sweeter citrus.

Australian Citrus Postharvest Science Program (CT15010)

Key research provider: NSW Department of Primary Industries

The development of rots and decay (such as green mould) after harvest can be a serious problem for growers and packers, particularly in fruit for export markets where produce is stored and transported over many weeks.

The Australian Citrus Postharvest Science Program is working to develop best practices to manage current fungicides and sanitisers to control decay, and to ensure Australian citrus remains clean and green with ultra-low residues. The project is continuing to review and extend the best ways to control postharvest decay and improve the quality of Australian citrus.

Improving biosecurity preparedness of the Australian citrus industry (CT17001)

Key research provider: Plant Health Australia

This project acknowledges that the industry faces a number of significant exotic pest threats that have the potential to affect production as well as market access. These include Huanglongbing and its psyllid vectors, *Xanthomonas* (which causes citrus canker) and *Xylella* (related to citrus variegated chlorosis). Its work is bolstering biosecurity capacity and technical capability for the Australian citrus industry, and includes a range of preparedness, response and awareness activities.

Importantly, the project involves the nationally coordination of citrus biosecurity activities and surveillance for the early detection of high-priority pests, involving growers, researchers, industry bodies and national and state government agencies. This incorporates the re-establishment and expansion of the First Detector Network – a network created through earlier levy-funded work and involving a range of personnel working in commercial orchards, packing sheds and the research community who regularly undertake inspection and monitoring of trees and fruit during seasonal production, harvesting and packing.



First Detector Network: USA Huanglongbing and citrus canker (CT18003)

NEW IN 2018/19

Key research provider: Citrus Australia

The First Detector Network is coordinated under project CT17001, described on the left. Investment CT18003 provided funding for network representatives to undertake a field visit to the United States, where currently the citrus industry in Florida is mounting a campaign to find and destroy Huanglongbing and Asian citrus psyllid (a vector of the disease) as they threaten to enter the main production region in the San Joaquin valley. Areas of the region have also been significantly affected by citrus canker. The visit was an opportunity for the Australian industry to gain insights and improve surveillance techniques to better prepare for incursions of such exotic pests, and to see firsthand the impacts and symptoms of both Huanglongbing and canker.

Maximising the biosecurity of the Australian Citrus Industry Budwood Facility (CT17003)

Key research provider: Auscitrus

Beginning in 2018, this investment is tasked with increasing the preparedness of the Australian citrus industry for any future incursion of the Asian citrus psyllid and Huanglongbing. It has provided funding to build a structure to house Auscitrus-grown citrus budwood plants under insect-proof conditions as part of the National Citrus Repository program described on p12 – ensuring a source of Huanglongbing-free budwood for Australian citrus nurseries.

While supply trees have been traditionally maintained in open-orchard conditions, with routine testing, an increased prevalence of Huanglongbing in neighbouring countries and greater pressure on Australia's quarantine borders mean the risk of an outbreak has grown. The availability of Huanglongbing-free budwood is seen as a critical factor in mitigating the spread of any future incursion of the disease, and in redeveloping orchards potentially affected as a result of this.

Citrus industry minor use program (CT16000)

Key research provider: Hort Innovation

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

For more on minor use permits, including a list of permits, see p17.

All current minor use permits for the industry are searchable at portal.apvma.gov.au/permits. Permit updates are also circulated in Hort Innovation's *Growing Innovation* e-newsletter, which you can sign up for at www.horticulture.com.au/sign-up.

Data generation investments (ST16006 and ST18001)

NEW IN 2018/19 (ST18001)

Key research providers: Eurofins, Peracto

The generation of pesticide residue, efficacy and crop safety data is required to support label registration and minor use permit applications and renewals made to the APVMA which, when approved, provide access to safe and effective chemicals for the management of pests, weeds and diseases.

In 2019, Hort Innovation secured more than \$900,000 in assistance grants under the Australian Government's Access to Industry Uses of Agricultural and Veterinary (AgVet) Chemicals program. Under *Generation of data for pesticide applications in horticulture crops (ST18001)*, this funding is being used, along with levy contributions, to generate the data required for a range of product registrations across a variety of horticulture crops. For the citrus industry, it's producing the data required to support a Bayer spiromesifen (Oberon 240 SC) label registration for the control of mites in oranges, mandarins, lemons and limes. Specific mites targeted by the product include broad mite, brown citrus rust mite, citrus bud mite, citrus flat (bunch) mite, citrus red mite, citrus rust (Maori) mite, Oriental spider mite and two-spotted mite.

Meanwhile, *Generation of residue, efficacy and crop safety data for pesticide applications in horticulture crops 2017 (ST16006)* involves grant funding from an earlier round of the AgVet program and is also working to support registrations and permits for a host of industries, including citrus.

Developing a national systems approach for meeting biosecurity requirements to access key Asian markets (AM17001)

HORT FRONTIERS

Key research provider: Queensland Eco-sciences Precinct

Most horticultural trade relies on demonstrating that the commodity either comes from an area that is free of pests and diseases (area freedom), or involves the application of an agreed, stringent end-point treatment. This project is a collaboration between industry, researchers and regulators to help Australian horticulture enterprises realise market opportunities in Australia and Asia by developing a quantitative 'systems approach' that will be acceptable to regulators. It will also be providing the supporting information necessary to help industries evaluate and adopt systems approaches.

Systems approaches integrate those pre- and post-harvest practices used in production, harvest, packing and distribution of a commodity which cumulatively meet requirements for quarantine security. The systems approach used in each region will set safeguards and mitigation measures which individually and cumulatively provide a reduction in plant pest risk.

SITplus: Port Augusta Qfly SIT factory pilot operation (FF18003)

NEW IN 2018/19

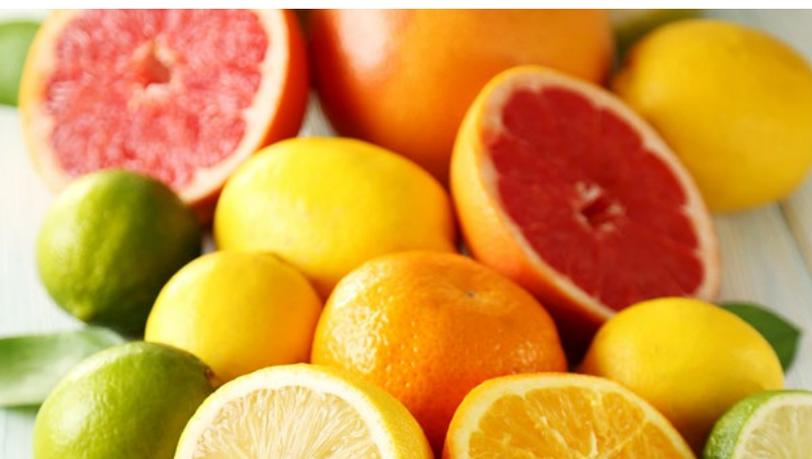
HORT FRONTIERS

Key research provider: University of Western Sydney, with Primary Industries and Regions South Australia (PIRSA)

A purpose-built sterile Queensland fruit fly facility was established in Port Augusta, South Australia under earlier work in the Hort Frontiers Fruit Fly Fund and broader SITplus initiative. With sterile insect technology (SIT) a promising control method for Queensland fruit fly, the facility is a state-of-the-art factory for the mass-rearing of sterile flies.

This investment is continuing support for the pilot operation of the facility, allowing delivery of sterile flies to an associated pilot release project. It is also delivering further research to optimise the SIT approach and improve the production of healthy and high-performing sterile fruit flies. The work is being funded through co-investment from a range of partners, funding from the Australian Government, and some contributions from levy industries, including through the Hort Innovation Citrus Fund.

For more on the facility, SITplus program and Hort Frontiers Fruit Fly Fund, visit www.horticulture.com.au/hort-frontiers.



SITplus: Developing and optimising production of a male-only, temperature-sensitive-lethal, strain of Qfly, *B. tryoni* (MT13059)

HORT FRONTIERS

Key research provider: South Australian Research and Development Institute (SARDI)

This project is developing a ‘temperature-sensitive lethal, male-selecting’ strain of Queensland fruit fly. To put simply, the research will allow for male-only, sterile fruit flies to be bred in large numbers. It is one of the key projects in the broader strategic co-investment SITplus initiative that’s tackling the issue of fruit fly. The male flies are to ultimately be released in growing regions of south-eastern Australian that are affected by the pest. They will come to outnumber the wild male population in these areas and by mating with wild females – and limiting the opportunity for wild males to do so – they are intended to lead to the collapse of wild Queensland fruit fly populations.

Levies from several horticulture industries are involved in the project which, as a SITplus initiative, is part of the Hort Frontiers Fruit Fly Fund.

***Xylella coordinator* (MT17006)**

NEW IN 2018/19

Key research provider: Wine Australia

Xylella fastidiosa is an exotic and potentially devastating bacteria that impedes the movement of rising sap in plants. While it hasn’t yet appeared in Australia it has proven catastrophic overseas and, were it to enter the country, it could threaten more than 350 commercial, ornamental and native plant species.

This multi-industry and multi-sector investment supports the role and activities of a national coordinator as part of a three-year program to improve Australia’s readiness for any potential incursion of the disease. This is a joint initiative between Hort Innovation and Wine Australia, through the Plant Biosecurity Research Initiative (PBRI). The PBRI is a collaboration between Australia’s seven plant-focused Rural RDCs, Plant Health Australia, the Department of Agriculture and other contributors, to coordinate plant biosecurity RD&E funding and efforts. You can learn more at www.pbri.com.au.

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

NEW IN 2018/19

Key research provider: The Victorian Department of Jobs, Precincts and Regions

Adding to the PBRI’s *Xylella* work outlined in the previous project description, this multi-industry investment will review and allow Australia to adopt world’s best practice methods for detecting and identifying strains of the *Xylella fastidiosa* bacteria, should it come to our shores. As well as developing state-of-the-art diagnostic tools, technologies and protocols to screen plant material entering the country and to support active surveillance programs, it will provide associated training to technical staff in diagnostic laboratories.

The project’s work will ultimately allow for quick and effective detection of what is considered to be the number one plant biosecurity threat to Australia and New Zealand, to facilitate a swift and sure response.

Improving the biosecurity preparedness of Australian horticulture for the exotic spotted wing drosophila (*Drosophila suzukii*) (MT17005)

Key research provider: Plant Health Australia

This multi-industry investment is tasked with improving industry awareness of the risks posed by spotted wing drosophila, which attacks a range of soft-skinned fruit, and also with increasing the capacity to detect and respond to any incursions of the pest.

Activities include building knowledge and capacity around appropriate surveillance and management tools and strategies within the growing industries, government and among other relevant stakeholders. Looking at options for meeting domestic and international quarantine requirements are also among the project’s activities.



To keep up to date with the latest information on new, ongoing and recently completed R&D investments throughout the year – and to search and find resources and reports from these investments – visit www.horticulture.com.au/citrus.

Minor use permits

The Hort Innovation Citrus Fund supports the submission of applications for new and renewed minor use permits for the industry, as well as data generation activities to support chemical permits and registrations, and strategic agrichemical reviews.

Together these efforts provide industry access to safe, relevant and effective chemicals for the management of pests, weeds and diseases.

For full details on these activities and links to relevant information, visit www.bit.ly/minor-use-citrus.

Permits in 2018/19

During the 2018/19 financial year, a successful renewal for PER13158 (issued as PER87164) was prepared by Hort Innovation and submitted to the APVMA, facilitated through the *Citrus industry minor use program* (CT16000).

Details for this and all other permits can be found in the following table.



Current permits

Below is a list of minor use permits for the citrus industry, current as of 19 September 2019.

PERMIT ID	DESCRIPTION	DATE ISSUED	EXPIRY DATE	PERMIT HOLDER
PER10706	Garlon (triclopyr) / Citrus plants and other host plants of citrus canker/ Citrus canker	01-Jul-08	31-Mar-20	Biosecurity Queensland
PER13059 Version 2	Abamectin + Clofentezine + Amitraz / Citrus trees / Citrus red mites	01-Oct-11	30-Sep-20	NSW Department of Primary Industries (NSW DPI)
PER87164 Version 2	Dimethoate / Specified citrus and tropical and sub-tropical inedible peel fruit commodities – post-harvest dip or flood spray / Various fruit fly species	01-Mar-19	31-Mar-24	Hort Innovation
PER14772 Version 3	Iprodione (Rovral) / Mandarins (susceptible varieties) and Tangelos / Emperor brown spot	01-Oct-15	30-Jun-23	Citrus Australia
PER13859	Dimethoate / Orchard clean-up – fruit fly host crops following harvest / Fruit fly	09-Feb-15	31-Jul-24	Growcom
PER14932 Version 2	Abamectin / Citrus / Queensland fruit fly	17-Feb-15	31-Jan-23	Citrus Australia
PER82043	Captan / Mandarins / Emperor brown spot	05-Oct-16	31-Jul-22	Citrus Australia
PER86822	Chlorine / Citrus – whole fruit of the family Rutaceae / Citrus canker	16-Jul-18	31-Jul-20	Department of Agriculture
PER86730	Sodium ortho-phenylphenate tetrahydrate (Preventol ON fungicide) / Citrus fruit / Citrus canker	03-Jul-18	31-Jul-23	Western Australia Department of Primary Industries and Regional Development
PER86582	Copper present as tribasic copper sulphate / Citrus / Citrus canker	01-Jun-18	31-May-20	Department of Agriculture and Food, Western Australia (DAFWA)
PER86477	Copper present as tribasic copper sulphate / Treatment of citrus trees / Citrus canker	18-May-18	31-May-20	DAFWA
PER13915	Benzalkonium chloride / Equipment and vehicles / Citrus canker and guava rust complex	01-Apr-13	31-May-20	NSW DPI
PER82367	Thiamethoxam (Actara) / Citrus and cotton / Brown marmorated stink bug and yellow spotted stink bug	22-Mar-18	31-Mar-23	Department of Agriculture

All efforts have been made to provide the most current, complete and accurate information on these permits, however you should always confirm all details on the APVMA website at portal.apvma.gov.au/permits. Details of the conditions of use associated with these permits can also be found on the APVMA site.

Minor use permit updates are circulated in Hort Innovation's e-newsletter, *Growing Innovation*. Don't yet receive it? Sign up for free at www.horticulture.com.au/sign-up.

Marketing report

Hort Innovation is responsible for investing the citrus marketing levy into a range of activities to drive awareness and consumption of the fruit, under the Hort Innovation Citrus Fund. Read on for a snapshot of activities and results from 2018/19 which is focused on export markets.

Under the Taste Australia banner, 2018/19 saw a successful Australian citrus marketing campaign to help drive growth for the category in four key export markets: Japan, China, Vietnam and the Philippines. Taste Australia is the whole-of-horticulture brand used to increase the profile, sales and consumption of premium Australian horticulture products in export markets. The citrus campaign focused on in-store activity to drive timely awareness and consumption and was supported by social media.

Taste Australia retail marketing

» **In Japan**, in-store activities included 76 sampling days at several popular outlets as well as point-of-sale materials to promote Australian fruit to consumers. Participating importers (Wismettac, Royal, Kobe Yoko and Hiro) indicated they imported 8825 tonnes of Australian oranges throughout the season from July to October 2018. Other activities

included a social media campaign across Instagram and Facebook to further encourage purchase of Australian citrus.

- » **In China**, in-store activities included 198 sampling days at key outlets City Super, Ole and Hema, as well as point-of-sale materials. Taste Australia branding was featured on the Hema Fresh homepage and product page as part of an e-commerce program, as well as a product post on their WeChat channel 'Moment' and group chat. Taste Australia and Australian oranges were also featured on the Benlai homepage banner, campaign page and product page, as well as a mobile push notification with a link.
- » **In Vietnam**, in-store activities included 96 sampling days at Mega Market, Aeon Mall and Big C as well as point-of-sale materials during August and September 2018. A Facebook campaign was run concurrently to further engage with





potential customers. The outlet Big C indicated that they experienced a 422 per cent increase in the volume of sales over the season compared to the previous year.

- » **In the Philippines**, 90 days of in-store activities were undertaken at the outlets Rustan and Shopwise, as well as the distribution of point-of-sale materials. A social media campaign was run in conjunction, including media seeding (the targeted distribution of content in social media networks via

influencers or other online media), on Facebook and Instagram. More than three million opportunities for people to see the content were generated by Facebook paid advertisements. Of note was celebrity Ilya Villania's Instagram story featuring Australian citrus which contributed another three million opportunities for people to see the content. The outlet Rustan indicated that they recorded an increase in the volume of sales of 21.4 per cent during the campaign.

Seasonal forecasting for Japan

Given that Japan is a sophisticated market, it was deemed appropriate to deliver seasonal forecast information via an online trade seminar in May 2019. A video capturing the key seasonal forecast information via citrus growers in Victoria was distributed to key export players. This was combined with statistics and industry commentary from Citrus Australia and Hort Innovation on the Taste Australia retail marketing program.

Financial statement

Financial operating statement 2018/19

	R&D (\$)	MARKETING (\$)	TOTAL (\$)
	2018/19 July – June	2018/19 July – June	2018/19 July – June
OPENING BALANCE	1,080,005	1,116,062	2,196,067
Levies from growers (net of collection costs)	2,300,165	372,293	2,672,458
Australian Government money	2,328,076	–	2,328,076
Other income*	35,387	33,404	68,791
TOTAL INCOME	4,663,628	405,697	5,069,324
Project funding	4,022,268	406,720	4,428,987
Consultation with and advice from growers	36,918	11,814	48,732
Service delivery – base	162,965	18,687	181,652
Service delivery – shared	270,057	30,966	301,023
Service delivery – fund specific	163,944	65,718	229,661
TOTAL EXPENDITURE	4,656,151	533,905	5,190,056
Levy contribution to across-industry activity	106,647	–	106,647
CLOSING BALANCE	980,835	987,854	1,968,689
Levy collection costs	97,601	18,910	116,511

* Interest, royalties



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