Hort Innovation

Final Report

Australian apple and pear industry innovation and adoption program

Project leader:

Rosalie Daniel

Delivery partner:

Apple and Pear Australia Limited

Project code:

AP15004

Project:

Australian apple and pear industry innovation and adoption program AP15004

Disclaimer:

Funding statement:

This project has been funded by Hort Innovation, using the apple and pear research and development levy and contributions from the Australian Government. Hort Innovation is the grower-owned, not-for-profit research and development corporation for Australian horticulture.

Publishing details:

ISBN 978-0-7341-4731-8

Published and distributed by: Hort Innovation

Level 7
141 Walker Street
North Sydney NSW 2060

Telephone: (02) 8295 2300

www.horticulture.com.au

Content

Summary

To remain globally competitive, Australian orchards need to be able to consistently produce higher yields of premium quality fruit, more efficiently. AP15004 commenced in 2016 with the primary objective of supporting apple and pear growers to implement change in their orchard businesses and to advance the production practices and global competitiveness of the Australian apple and pear industry.

The project, in collaboration with AP15005, facilitated the delivery of the Future Orchards® extension, engagement and technology transfer component utilising expert guests, in-orchard walks and on-farm demonstration trials to convey world's best practice and R&D outcomes to growers in each of the eight major apple and/or pear growing regions across Australia (Western Australia, South Australia, Northern Victoria, Southern Victoria, Tasmania, Stanthorpe, Queensland and Batlow and Orange in NSW). Front Line Advisors (FLAs) and Community Orchard Groups (COG) provided a conduit to growers in each of the regions to ensure local relevance and delivery of outcomes for growers.

Orchard walks were held two or three times each year (alternating years) across the eight growing regions. Attendance ranged between 175 and 376 participants for each 'loop' of orchard walks across the eight regions, depending on seasonality and competing orchard activities. Participant numbers were generally lower at orchard walks held during harvest. Demonstration trials conducted by FLAs and COGs in each of the regions addressed issues identified to be of interest locally. Trial results were presented at orchard walks and shared more broadly via APAL's media platforms. International guests continued to attract growers and the link with AgFirst via AP15005 has ensured content provided is locally and globally relevant and current.

The project facilitated transfer of other relevant R&D outcomes, knowledge, innovations and technologies via extension events including annual Speed Updating/Technical Day symposia, Pear Masterclasses and Postharvest seminars. All project events continued to attract new participants each year. Evaluations conducted after project events and activities indicate that the majority of participants (frequently 90-100%) left an event having learnt something that they were likely to try on their own orchard. There is an ongoing shift from traditional to modern, high density orchard systems that will be more able to accommodate automation and AI technologies in the future. The adoption of technologies to improve labour efficiencies and fruit quality in the orchard, and the large investments in packhouses and fruit sorting technologies are also apparent.

Via the appointment of a Technical Manager, AP15004 also provided comprehensive technical support around biosecurity preparedness and response, crop protection stewardship, targeted post-harvest improvements, export preparedness, grower services, R&D transfer and general technical assistance. Collectively the activities contribute to an ever more productive, profitable and globally competitive apple and pear industry.

Benchmarking data collected and modelled for the Orchard Business Analysis (OBA) (AP15005) indicates average Class 1 yield for apples and pears increased from 33.0 t/ha (70 % of total yield) to 35.2 t/ha (71% of total yield) in 2019, demonstrating improvements not only in yield, but more importantly, quality (refer to AP15005 for more information about the OBA). While the forecast Class 1 packout for apples and pears in 2020 was lower at 30.5 t/ha, attributed to seasonal variation in cropping, the percentage of total yield was still high at 71% of the total yield.

This Final Report demonstrates that through leadership of Future Orchards® the *Apple and Pear Industry Innovation and Adoption Program* has continued to engage apple and pear growers, advancing knowledge, attitudes, skills and aspirations through grower-focused activities as well as providing high level technical support to stimulate practice change in orchards and advance global competitiveness of the Australian apple and pear industry. Future R&D investments need to remain relevant to current and future needs of growers and the wider apple and pear industry, something that is best progressed by conversing with the apple and pear industry members.

Keywords

Apple, pear, pomefruit, orchard, extension, knowledge transfer, technology transfer, adoption, biosecurity, tree crop, grower engagement

Introduction

The *Apple and Pear Industry Innovation and Adoption Program* facilitated the adoption of new technologies and transfer of knowledge to enhance skills and aspirations of apple and pear growers and advance orchard production practices and improve the global competitiveness of the Australian pomefruit industry. The program stemmed from strategic initiatives taken by the apple and pear industry almost 20 years ago. At that time, productivity in the Australian apple and pear industry was lagging behind what was being realised overseas. Average apple production in Australia in 2002-2003 was 20 t/ha (ABS 2003-2004) compared with 55 t/ha in Italy and 42 t/ha in USA and NZ. This was largely attributed to the more intensive, modern production systems used in these countries. Average apple and pear production in Australia in 2020 was modelled to be 30.5 t/ha, 71% of Class 1 packout (refer to OBA for 2019/2020 AP15005; the OBA was part of AP15005 and collects and uses apple and pear financial and production data to create a 'model orchard of 40 ha). National apple production was 301,792 tonnes valued at $588 million and 118,545 tonnes of pears were produced valued at $130 million (Hort Statistics Handbook 2019-20).

AP15004 was designed to achieve strategic and specific outcomes across seven areas of fundamental importance to orchard businesses:

1. Orchard productivity improvement
    a. Leadership of Future Orchards®
    b. Grower upskilling and capacity building
    c. Improving grower crop and business risk mitigation strategies
2. Facilitation of adoption of R&D and innovation
3. Grower services and technical support to apple and pear industry and wider industry
4. Crop protection stewardship, chemical regulation and access
5. Biosecurity preparedness and plans implemented
6. Post-Harvest productivity improvement
7. Industry preparedness for export.

The goals of AP15004 were directly linked with the delivery of AP15005 *Delivery of Apple and Pear Future Orchards Extension Program* (Final report submitted September 2020).

Future Orchards® is an extension, engagement and technology transfer project utilising expert guest presentations, in-orchard walks, on-farm demonstration trials and technical support to convey world's best practice and R&D outcomes to apple and pear growers across eight major Australian growing regions (Table 1). Regional Front Line Advisors (FLAs) and Community Orchard Groups (COG) provided a conduit between APAL and growers in each of the regions and ensured the project remained locally relevant. Future Orchards played a pivotal role in supporting growers to implement change in their orchards and advance production practices and global competitiveness of the Australian apple and pear industry.

Two or three (alternating years) orchard walks are held across the eight apple/pear growing regions annually. Attendance remained consistently high, with between 175 and 376 participants attending orchard walks across all regions (combined number of attendees across the 8 regions). Participant numbers varied according to seasonality and competing orcharding tasks. Attendance was lower at orchard walks held in March (harvest) compared with other times. The orchard walks continued to attract new participants each year (15-20% of attendees), indicating that the content and format were still relevant and considered valuable by growers. Evaluations frequently showed that 90-100 % of respondents found the events of some value or use. In-orchard trials conducted by FLAs and COGs in each of the regions addressed issues that were of interest locally, and results were shared at orchard walks by the FLA and more broadly via articles or short videos on APAL's media platforms. International guests were a key attraction for growers at orchard walk events and the link with AgFirst via AP15005 ensured content provided was locally and globally relevant and current.

Table 1. Proportion of apple and pear production in 2019/20 across the main growing regions in Australia. Eight major growing regions were identified for the purposes of Orchard Walks and are listed in brackets in the table. Northern Victoria refers to the area around the Goulburn Valley, Shepparton and Ardmona; Southern Victoria includes the Yarra Valley, Harcourt, Mornington Peninsula, Inner Gippsland and outer Melbourne.

Region (Major growing locations and locations for Orchard Walks in brackets)	National production (%)	
	Apples	Pears
Queensland (Stanthorpe)	10	<1
NSW (Batlow, Bilpin, Orange)	14	<1
Victoria (Southern Vic and Northern Vic)	46	88
Western Australia (Manjimup, Pemberton, Perth Hills)	10	4
South Australia (Adelaide Hills)	10	5
Tasmania (Huon Valley, Northern Tasmania)	10	1

Source: Australian Horticulture Statistics Handbook 2019-2020;

Transfer of R&D outcomes, knowledge, innovations and technologies were also facilitated through additional grower-focused extension events including Speed Updating/Technical Days, the Pear Masterclass and Postharvest seminars. The Technical Manager role provided comprehensive technical assistance to support best practice and profitable apple and pear production, including in biosecurity preparedness and response, crop protection stewardship, targeted post-harvest improvements, support for export preparedness, grower services, R&D transfer and general technical support to the industry and wider community. Collectively these activities continue to support productive, profitable and globally competitive apple and pear industry into the future.

Future Orchards activities contributed to changes in grower knowledge, attitudes, skills and aspirations best demonstrated by the adoption of new practices and technologies, engagement in project activities, and improvements in yield and quality of apple and pears produced. The majority of participants (>90%) reported leaving events having learnt something that they were likely to try on their own orchard. No data was collected to determine the rate of adoption of new information or technologies, but observations suggest a shift from traditional to modern, high density orchard systems that will be more able to accommodate technologies, improve efficiencies and produce better quality fruit in the future. Also apparent are the adoption of technologies such as platforms, leaf blowers and hedgers to improve efficiencies, fruit quality and returns in the orchard, as well as large investments in packhouses and fruit sorting technologies. As concern about labour shortages rose, many growers invested in platforms to enable more diverse labour sources for harvest and other orchard activities.

Benchmarking data collected and modelled for the Orchard Business Analysis (OBA) (AP15005) show average Class 1 yield increased from 33.0 t/ha (69 % of total yield) in 2016 to 35.2 t/ha (70 % of total yield) in 2019. The 2020 season forecast was lower (Class 1 packout of 30.5 t/ha; 71 % of total yield) and attributed to seasonal cropping variability. The figures indicate continuing improvements in productivity and quality in apple and pear production.

AP15004 aimed to address Objectives 2 and 3 of the [then] Apple and Pear Industry Plan:

Objective 2. Produce high quality apples and pears at internationally competitive prices (costs and risks)

2.1 Enhance orchard productivity and management

Objective 3. Provide a supportive operating environment (skills and communication)

3.2 Adapt industry services to meet changing needs of growers

3.3 Improve quality and flows of information for decision-making across the supply chain

3.5 Invest in intra-industry and inter-industry relationships

AP15004, is the third iteration of the apple and pear industry Innovation and Adoption program funded by Hort Innovation. The longevity of the program is testament to its success and value to growers and the wider industry. This Final Report demonstrates that this extension program has continued to engage and provide value to apple and pear growers, transferring technology and knowledge through grower-focus activities in addition to providing high level technical support to areas such as orchard production, biosecurity, crop protection to deliver positive change within the industry.

Methodology

1.0 Orchard productivity improvement

Future Orchards® was the primary vehicle for the transfer of technology, innovation and knowledge to growers and was based around guest presentations and in-orchard demonstrations and discussions within an orchardist's own growing region.

1.1 Leadership of Future Orchards®

Apple and Pear Australia Limited (APAL) provided strategic and operational leadership to the Future Orchards® program and coordinated the activities of specialist agronomy services provided by New Zealand based consultancy company, AgFirst (under AP15005). SPW Solutions provided administrative support to both projects including collation of trial reports, liaison with FLAs and collation of information required for Milestone Reports. Annual planning meetings were held to develop an Annual Operating Plan (AOP). Annual themes for extension activities were confirmed by AgFirst, SPW Solutions and APAL to synchronise orchard walk topics, guest presenters, articles and other aspects of the Future Orchards orchard improvement component of the program.

The Program Logic and a Monitoring and Evaluation Plan (M&E) developed at the beginning of the project were embedded in the project to ensure improvements were made continuously throughout the project.

The **Project Reference Group**, established at the commencement of the project, provided guidance to APAL for the duration of the project.

An **independent mid-term project review** conducted by Inovact Consulting in 2019 found that both AP15004 and AP15005 were delivering the agreed outputs but that while growers were well aware of, and valued the extension component, awareness and appreciation of the wider Innovation and Adoption program was lower. This may be because many of the other activities, such as biosecurity and regulatory mechanisms occur away from the orchard and were not immediately obvious to growers. Efforts were made to increase awareness of the wider program activities among growers through relevant articles and presentations, such as the inclusion of a series of biosecurity articles in the *Australian Fruit Grower* magazine. Tailored and targeted approaches taken to improve engagement and promote practice change amongst different 'groups' within the industry were shown to be successful. One example of this was the introduction of the Pear Masterclass to address production challenges in pear production. The Pear Masterclass continues to receive positive feedback and engage with pear growers. While no data was collected on the impact of the Masterclass on grower practice change, a move toward modern planting systems and an interest in newer varieties can be observed among pear growers. These types of strategic responses can be applied in the future to increase awareness of other components of the Innovation and Adoption program such as biosecurity and crop protection stewardship, export readiness and quality and appreciation of how these add value to orchard businesses. The Review also found that increases in yield have been realised through the Future Orchards program. Future efforts need to focus on improving assurance of consistent eating quality for consumers and activities that support market developments, particularly for export.

The review suggested key recommendations for change which were acted upon following a meeting with the PRG:

- Future Orchards and the Communications team work more closely to improve and align communication of activities and outcomes across all regions; as an example, Communications team members participated in several orchard walks in March 2021 with information gathered providing direct content, or ideas for future articles and other APAL media.
- Detailed budget allocations were provided to the PRG to demonstrate how the budget is allocated between the AP15004 and AP15004 activities.
- While the recommendation that the contract for AP15005 be extended to align with AP15004 was not approved, a variation of AP15004 was approved by Hort Innovation in October 2020. This meant that there was continuity of activities (Orchard Walks, Webinars and articles) historically provided by AP15005 until the end of the AP15004 contract in April 2021.
- A single Hort Innovation Project Manager was allocated (rather than two project managers) to review milestone reports from both projects AP15004 and AP15005.
- Project Reference Group meetings were held more frequently than they had been previously.

Some of the project activities highlighted in the review included: Pear Masterclasses, overseas tour to Washington in 2017, Speed updating events, postharvest seminars, participation in a working group to produce the categorisation information package for Brown Marmorated Stink Bug (BMSB) and activation of the Emergency Plant Pest Response Levy in 2017.

In interviews conducted as part of the review, the projects were often cited as being "the best use of levy funds by the industry to date" supporting the value of the projects as perceived by growers.

All project activities were managed by APAL's **Technical Manager** (TM). This included overseeing the coordination and logistics of orchard walks in each of the eight apple/pear growing regions, managing Front Line Advisors (FLAs), and liaising with New Zealand based agronomic service provider AgFirst (AP15005). A new Technical Manager was appointed in October 2019 following the resignation of the existing Technical Manager in May 2019. In the time between May and October other APAL staff stepped in the backfill the role and ensure that activities continued to the highest standard.

APAL's **Industry Services and Export Manager** contributed to maintaining and developing grower relationships, the delivery of orchard walks and export activities. APAL's **Head of Quality** assisted with technical design, planning and delivery of the Pear Masterclass and food safety activities. The **Head of Government Relations** at APAL provided industry support in biosecurity and market access activities. Logistics and project support for orchard walks were provided by the **Program Manager**. Additional biosecurity support was provided by Kevin Clayton Greene. Administrative support was provided to the project by SPW Solutions and APAL staff. SPW Solutions was the key contact for FLAs to submit trial reports and assisted in collating information for Milestone reports for both AP15004 and AP15005.

Front Line Advisors (FLA) appointed in each of the eight growing regions were a conduit between local growers and the Technical Manager and AgFirst (Table 2). The FLAs were responsible for managing the local aspects of (a) Orchard walks (local event facilitation and promotion, provision of speaker notes, presentation of trial updates and Community Orchard Group considerations; (b) liaising with their Community Orchard Group; (c) establishing and reporting on applied in-orchard trials.

Community Orchard Groups, comprising of 3-5 leading local growers, the FLA (chair), an AgFirst representative and the TM, were established in each growing region to provide regional direction and guidance to the FLA about regional Future Orchards activities and to identify two trial topics each year. Community Orchard Groups met during the June round of orchard walks each year to discuss demonstration trial topics and their progress and the Focus Orchard. COG members were rotated if growers expressed an interest in leaving or joining the group.

Orchard Walks

A total of 13 'loops' of Future Orchards orchard walks (each 'loop' comprised a visit to each of the eight growing regions) were scheduled for the project. Two or three 'loops' were held across the 8 regions each year. Each orchard walk included a presentation by an invited guest speaker, an AgFirst representative and an update by the regional FLA, followed by an in-orchard discussion of the theme for that walk with the guests (Table 3). Presentations were made available to growers either on paper or USB stick at the orchard walk or online via the APAL website. From March 2020 walks were held virtually or in a hybrid format because of travel restrictions resulting from the COVID-19 pandemic.

Regional trials

Two demonstration trials were delivered by each FLA in each year of the project with the exception of some trials that were abandoned due to staff changes or other unavoidable issues. Trials were designed to address an issue of interest or concern to growers locally. Front Line Advisers consulted with their COG to decide on the new trial topics for the coming year. Trials typically commenced in September and were completed by May/June the following year. Some trials were designed to continue over multiple seasons. Trials were run by the FLAs and relied on growers volunteering their orchards to host the trial. AgFirst (AP15005) provided advice to FLAs during set up, running and reporting of trials. Reports were collated by SPW Solutions. Outcomes were reported by the FLA at orchard walks and a report that was made available to all of industry via APAL communications platforms.

Evaluation surveys

Surveys were conducted at each event using Survey Monkey on digital tablets that were passed among participants at events. The surveys were designed to gain feedback about the events, guest presenters, venue and participant experiences. There was some variability in the survey questions associated with staff changes around 2018/2019. Surveys did not include any evaluation of adoption of information presented at events or aspects of trials. In 2020, an SMS was sent to participants to request participation in an evaluation survey. Response rates

varied depending on the format of the survey. Those conducted online or by SMS had lower response rates than those where growers were actively asked to complete a survey during an event.

As per the M&E plan, an additional question about a separate aspect of the Future Orchards program (eg. articles, website use, OrchardNet, business analysis newsletters etc.) was included in surveys. Feedback cycled back into the program and make changes where appropriate.

Table 2. Front Line Advisors and Community Orchard Group members for the eight apple/pear growing regions.

Region	FLA	COG Members
Stanthorpe, Qld	Stephen Tancred, Simon Organ, Orchard Services	Steven Tomasel, Trent Vedelargo, Daniel Nicoletti, Arames, Volpato, Johnny & Rosie Savio, Ross Wilson, TM
Orange, NSW	Jess Fearnley, NSW DPI	Peter West, Bernard Hall, Ian Pearce, Glenn Fahey, Jonathan Brookes, TM
Batlow, NSW	Kevin Dodds, NSW DPI	Matt McMahon, Andrew Desprez, Ian Robson, Ralph Wilson, James Oag, Darryl Watkins, Jonathan Brookes, Jeremy Smart, Caroline Pisciuneri, TM
Northern Vic	Michael Crisera, Fruit Growers Victoria	Matt Lenne, Jason Shields, Brent Reeve, Maurice and Bo Silverstein, Alex Turbull, Ross Wilson, TM
Southern Vic	Nic Finger, Fruit Help; Camilla Humphries, EE Muirs until Nov 2020.	Thom Phillips Armours Apples, Brad Fankhauser, Mark Trzaskoma, Rod Taylor, Shaun Witchell, Krys Lockhart, Craig Hornblow, TM
Tasmania	Sophie Folder, Pear Consulting	Brad Ashlin, Ryan Hankin, Nigel Bartels, Brett Squib, Jackie Goeldner, Craig Hornblow, TM
SA	Paul James, Lenswood Coop	Susie Green, Steve Spark, Robert Green, Mathew Flavell, Joel Brockoff , James Fillsell, Noel Mason, TM
WA	Susie Murphy-White, Pomewest	Terry Martella, Mark Scott, Dave Stewart, Joe Fontanini, Matt Fox, Steve Spark, TM

Communication of project activities and outcomes

AP15004 worked closely with the APAL Communications Team, AP15007, to communicate program activities and outcomes to the broader industry via the industry newsletter *Industry Juice*, the magazine *Australian Fruit Grower*, You Tube and the APAL website.

Orchard business analysis

The OBA was prepared entirely by AgFirst as detailed in the reports submitted for AP15005. Following the variation approved in September 2020, a final OBA was again completed by AgFirst under AP15005 in March 2021. The OBA is shared with levy papers upon request.

1.2 Grower upskilling and capacity building

Regional and international study tours

Grower tours were held to familiarise growers with practices in other regions that they may choose to adopt themselves. Tours were organised by the Technical Manager.

Regional study tours were run as one- or two-day events to the Adelaide Hills in January 2017 and to Southern Victoria in 2019. Reports and learnings were shared via APAL's media platforms.

The international study tours took growers to Washington State, USA (2017) and Poland, Italy and Germany (2018). No tours took place in 2019-2021 due to the COVID 19 pandemic. Information gathered during the tours was shared with the broader industry through APAL's media platforms.

Pear Masterclass

The Pear Masterclass was introduced to provide information that was specifically relevant to pear growers and was run using a similar format to orchard walks. The Pear Masterclass ran annually in the Goulburn Valley, Victoria, as a one-day event and featured guest presenters, technical sessions and hands on field demonstrations. In 2020, due to the Covid-19 pandemic, a series of three webinars were held virtually with presentations given by Dirk van Hees from Fruit Consult in the Netherlands on three topics: Planting systems and rootstocks, Experiences with new varieties and Fertilisation and nutrition.

Technical Manager upskilling

To ensure the TM remained up to date with emerging technologies and best practice that could be shared with growers and the wider industry through Future Orchards, the project supported the attendance of the TM at relevant conferences, workshops and activities to facilitate development of skills/capacity and liaison with the R&D community, RDC community and other agricultural and agrifood industries. This assisted in the identification of skills gaps and training needs for industry and helped to identify guest presenters for Future Orchards activities.

1.3 Improving grower crop and business risk mitigation strategies

This component addressed existing and emerging risks faced by apple and pear growers, and their relative importance to industry, by enabling attendance of the TM at seminars, conducting of literature reviews, via stakeholder engagement and provision of support to other organisations working on risk mitigation strategies. Identified risks and management strategies were communicated to growers and the broader industry.

2.0 Facilitation of adoption of research, development and extension

Content appropriate for the Australian industry was identified through annual participation by the TM in an international conference, or similar, keeping up-to-date with international scientific and relevant industry publications via desktop literature reviews, interaction with horticultural industry networks and other plant industry bodies, and establishing relationships with industry development officers, agronomists, chemical resellers etc. Additional practical specialist information was provided by AP15005. Relevant RD&E outcomes were incorporated into events for communication to growers and the broader industry.

Speed updating and Technical day

Full day 'Speed updating' events, at which researchers, growers and other guest presenters shared snapshots of their research outcomes and other experiences, were held at the Gold Coast in 2016, Launceston as part of the Hort Convention in 2017 and in Brisbane as part of Hort Connections in 2018. The format changed after this, and in 2019 a Technical Day was held as part of the APAL forum. In 2020, a series of webinars replaced the technical day because of Covid-19 related restrictions on travel and gatherings.

PIPS updates

Extension of outcomes from the PIPS2 program were generally coordinated and delivered by AgFirst through AP15005 and updates were provided at Orchard Walks and via APAL media platforms.

3.0 Grower services and technical support to apple and pear industry and wider community

The TM was responsible for providing high-level technical advice to growers, APAL, Hort Innovation, government organisations, private agronomists and other industry stakeholders. This included visits to growing regions to provide support to growers and obtain feedback, provide industry-related advice, expertise and support to researchers and other stakeholders to support relevant projects, support to editing of the *AFG* magazine and technical content to conferences including selection of topics, speakers and delivery of APAL's speaker sessions and working with Hort Innovation to provide feedback on opportunities for the apple and pear industry and technical advice on apple and pear projects. Information was sourced via desktop research, face to face and virtual meetings, workshops and conferences. Linkages with the communication project AP15007 included technical support and editorial responsibilities for *Industry Juice* and the *Australian Fruit Grower* magazine.

4.0 Crop protection stewardship, chemical regulation and access

Changes to chemical availability and regulation were sourced from the Hort Innovation funded project *Regulatory Support and Coordination* (MT17019) as well as direct communication with chemical suppliers, government departments and other relevant representatives and made available to industry through *Industry Juice* and the APAL website.

5.0 Biosecurity preparedness

To protect Australia's apple and pear producers from endemic and exotic pests and diseases, including upholding the apple and pear industry's commitments to the Emergency Plant Pest Response Deed (EPPRD) the project provided input into nationally and regionally coordinated biosecurity responsibilities and activities.

6.0 Postharvest productivity improvement

An annual postharvest event and site visit was held with the aim of focussing specifically on sharing with growers and packers emerging and existing postharvest best practice and technologies that can contribute to reducing costs and improving efficiencies in postharvest processes. Technical support for content was provided.

7.0 Technical preparedness for export

Assistance was provided to market access initiatives to ensure that the technical/scientific elements of documents underpinning market access or market improvement requests contained accurate information.

Outputs

1. **Project Logic** and **Monitoring and Evaluation Plan** accepted by Hort Innovation (Appendix I).
2. Six-monthly **Milestone Reports** accepted by Hort Innovation.
3. **Project Reference Group** meetings were held regularly to present and discuss the annual operating plan and other project activities. Details are presented in Milestone Reports submitted throughout the project.
4. **Midterm review** – this has been covered in the Final Report for 15005.
5. Annual themes identified for the Future Orchards program.

Year	Time period	Theme
1	Oct 2015 - Nov 2016	Future Labour – needs, skills, labour management, mechanisation
2	Dec 2016- Nov 2017	Future Trees – variety mix, root stocks, architecture, tools, new technologies
3	Dec 2017- March 2018	Future Production Quality – price (size, colour, storage, timing, consumer)
4	April 2018 – Aug 2019	Future Climate – risk and mitigation, irrigation management, netting, frost,
5	Sept 2019- Sept 2020	Future Orchards
5.5	Oct 2020 – April 2021	Future Labour – managing labour in a pandemic

6. **Front Line Advisors** (FLA) appointed in each of the eight growing regions.
7. **Community Orchard Groups** (COG) established in each of the eight growing regions and annual meetings held.
8. Future Orchards **Orchard Walks** held.

Two or three orchard walk loops were held in each of the eight growing regions over 5 years (Table 3; Links to presentations are in Appendix II). Each loop travelled to each of the eight growing regions to give presentations and in-orchard discussions and demonstrations.

From March 2020 until completion of the project, walks were held either entirely online, or in a hybrid format, depending on travel restrictions.

At each of the events the number of participants, and their relationship to the industry was recorded. Because of a number of staff changes at APAL during the term of the project, some information could not be recovered. A summary of the number of participants for each of the walks for which information was available is shown in Figure 1. The first loop of walks attracted the highest number of participants across all regions (376) with numbers at subsequent walks ranging between 175 and 282 participants.

Despite being held entirely (June) or partially (September) online, the June (229) and September (182) 2020 walks still attracted relatively similar numbers of participants to those walks held prior to the Covid-19 pandemic. The November 2020 walk was a virtual presentation from AgFirst and attracted 58 participants to the live streamed event. The January 2021 presentation was on demand and no data is available about attendance rates.

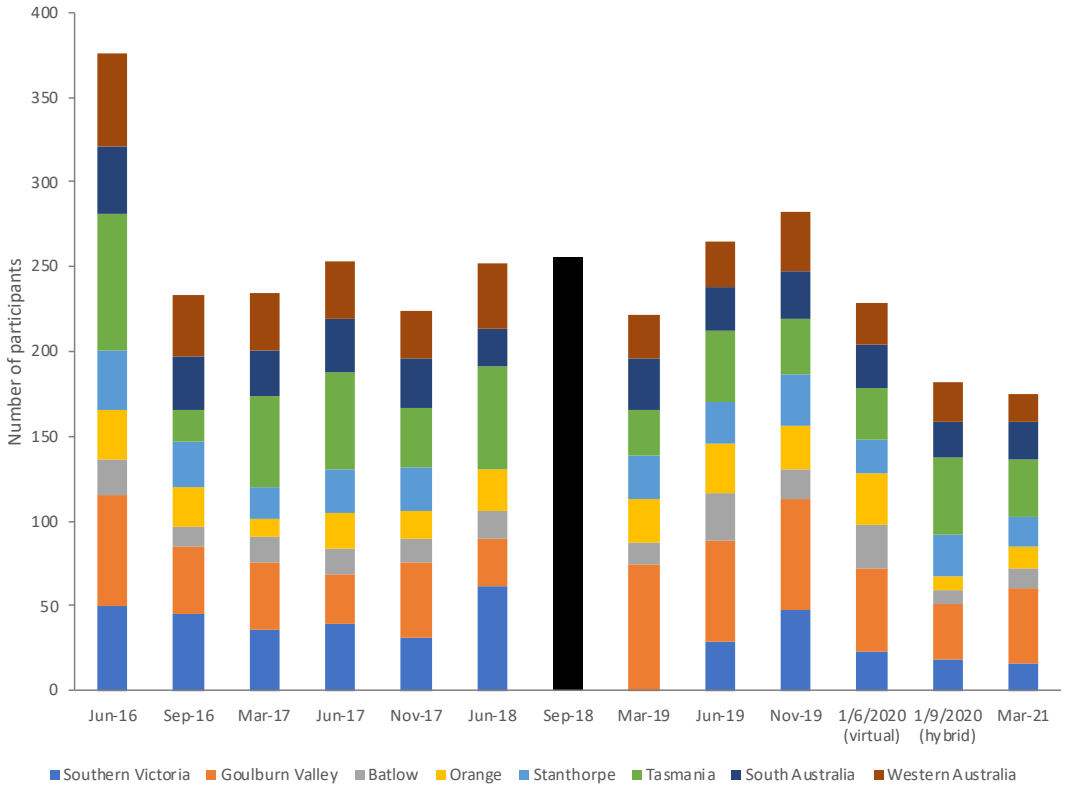

Figure 1. The number of participants at each of the orchard walks. Data presented is what was available at the time of preparing this report. Data for individual regions was not available for September 2018 so data is presented for all regions combined.

The number of participants at orchard walks fluctuated depending on the time of year (Figure 2). With a few exceptions, the majority of participants at orchard walks were growers (Figure 3). It was also considered valuable that government employees, researchers and other industry service providers attended orchard walks given that they also provide support or work with growers. The lowest number of participants was typically seen at the orchard walks held in March, which is in the middle of the harvest period. However, holding orchard walks at different times during the season meant that growers could see and discuss a range of activities and topics in the orchard, and this was generally accepted by growers. While this is a busy period, many growers did provide feedback saying that it was useful to see fruit ready to be picked on trees in March.

Evaluations were conducted at the end of each walk. Response feedback was used to improve the subsequent round of walks. Response rates varied but were generally highest when evaluation surveys were actively (asking growers to complete the survey) conducted during the orchard walk. Responses to online surveys following the presentations in 2020 and to SMS surveys sent following the walks were low. The questions included as part of the post-event evaluation changed during the project as staff members changed within APAL. From June 2016 until November 2017, individual components that made up each of the orchard walks were evaluated (Figure 4). Overall, the majority of participants considered the events to be valuable or of some value. The presentation of the PIPS project summary in 2016 stood out as being rated low by participants, perhaps because the presenter was not one of the PIPS researchers.

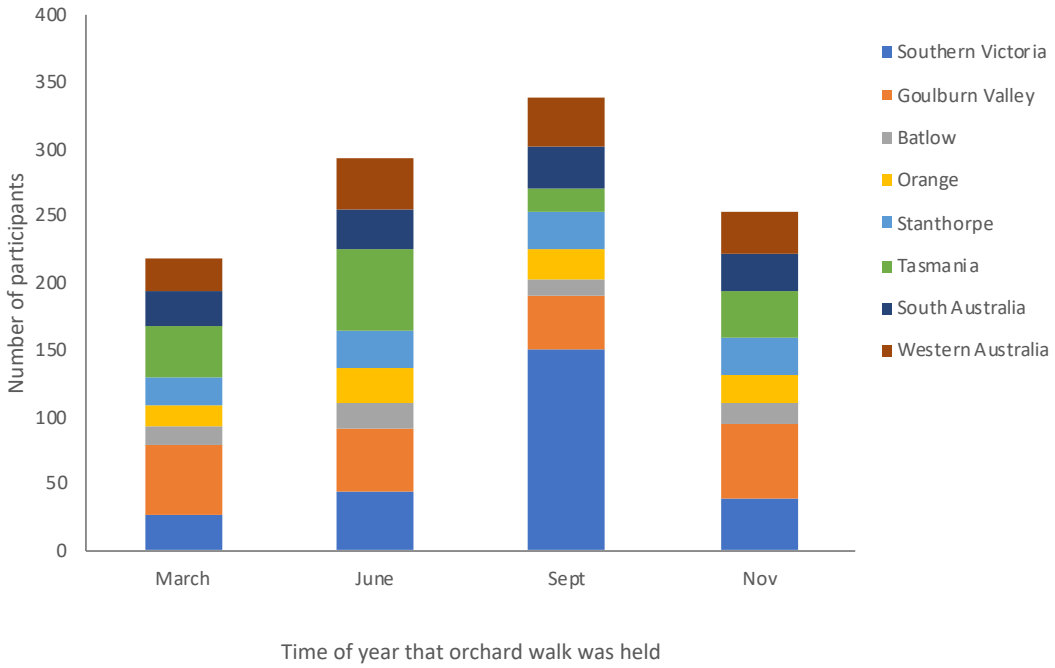

Figure 2. Time of year that the orchard walks were held affected attendance rates. March is in the middle of harvest and tended have the lowest number of participants.

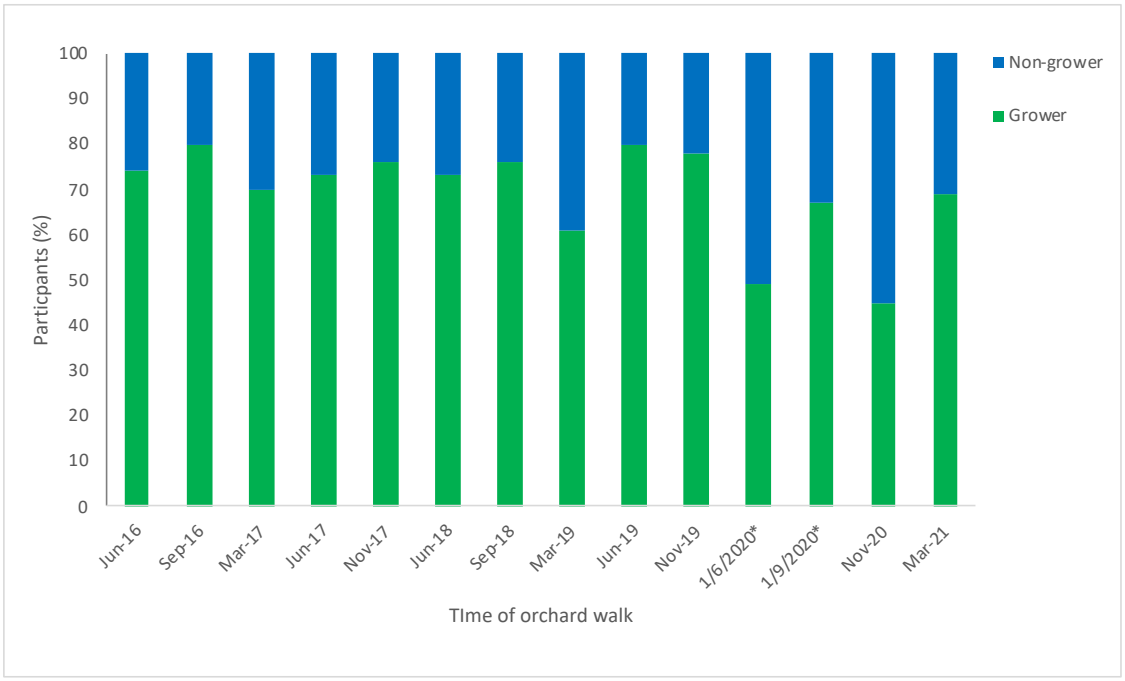

Figure 3. Orchard walk participants tended to be owners of orchard businesses or growers, their employees and packing shed owners or their employees with the remainder comprising private consultants, representatives of goods and service providers and government department staff.

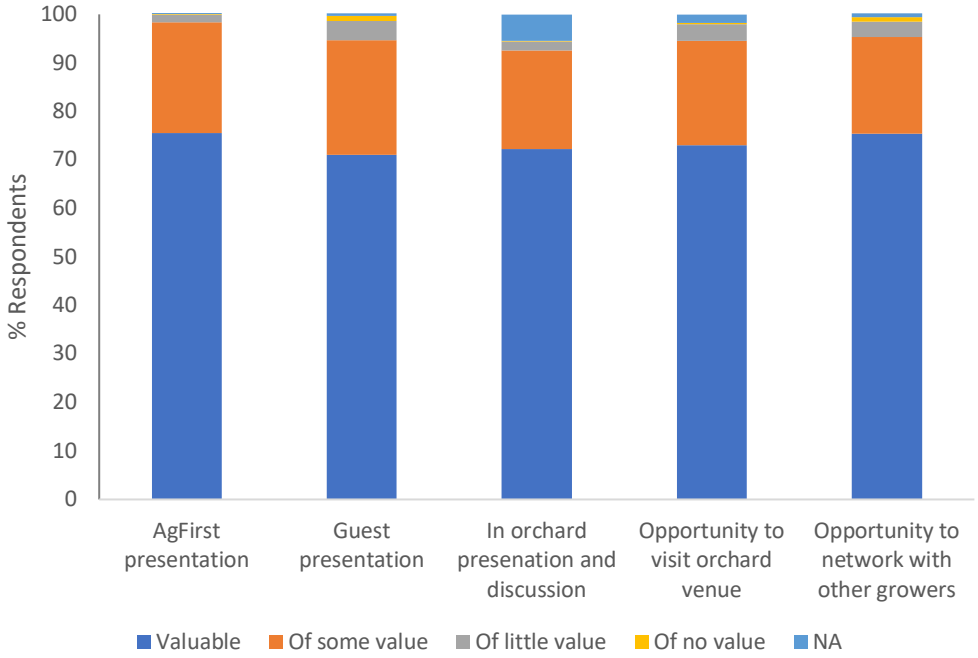

Figure 4. Evaluations conducted after the orchard walks from March 2016 until November 2017. Data presented is the average of all responses from all regions during this period.

After this time, the evaluation questions were condensed, and the entire orchard walk experience evaluated rather than individual components being separated. Evaluations conducted after orchard walk events in each of the regions in June and September 2018 found that 88 % and 90 %, respectively, rated the event 'valuable' or 'of some value'. From March 2019 until the end of the project, respondents were asked to rate out of 5 the overall event with event ratings ranging from 3.8 to 4.5. While these evaluation questions provide some information about the value of the content and format of the orchard walk, they do not provide any evidence of adoption of information or technologies.

Feedback received after online 'walks' held in June and September 2020 indicated that many growers appreciated not having to commute to the orchard walk venue, and several provided an opportunity for their staff to come together in a shed and watch the presentations on a screen. While this is not represented in the registration/attendance numbers, it does suggest there are benefits to online presentations. However, as 2020 came to a close, there was a clear desire amongst growers to get together again and back into the orchard for orchard walks.

Guest presenters included international and local researchers, extension staff and industry consultants as well as leading local and international growers (Table 3). From March 2020, orchard walk presentations by AgFirst, guests and the FLAs were streamed online as a result of travel restrictions. In June and September 2020 virtual 'walks' were recorded and presented online and the January virtual walk was released 'on demand' through *Industry Juice*. In March 2021, in-person orchard walks were held again following a streamed presentation and Q&A session by AgFirst as domestic travel restrictions eased. The in-orchard discussions were run by highly capable FLAs and growers. Presentations were made available to growers either at the orchard walk and online via the APAL website.

9. **Regional demonstration trials** were conducted by FLAs during the 5-year program (Table 4; Appendix III). Outcomes were shared with growers at COG meetings and orchard walks. Trial reports and presentations made at orchard walks were made available via Industry Juice and the APAL website. While no evaluation data was collected to determine the change in adoption/capacity of outcomes at the local level, the trials were considered valuable by the growers as they provide a local evaluation of a concept. Data about the perceived value of local trial presentations collected in September 2016 and March 2017 indicated that 84% and 100% of respondents across all regions considered the local trial presentations at Orchard Walk events as 'valuable' or 'of some value'.

Table 3. Time, themes and presenters at each of the Orchard walks held during the project period. Speakers present varied on the Northern (N) or Southern (S) loop. The northern loop included Stanthorpe, Orange, Batlow, Goulburn Valley/Northern Victoria. The southern loop included Western Australia, South Australia, Tasmania and Southern Victoria.

Date	Theme	AgFirst presenter and topic	Guest presenter(s) and topic
Jan 2016	Future Labour – needs, skills, labour management, mechanisation	Jonathan Brookes, AgFirst (North) Craig Hornblow, AgFirst (South) *Harvest labour management*.	Mauricio Frias (Chile) (N) *Mechanization of apple and pear orchards. Looking at a huge number of mechanical labour-saving options* Nigel Swarts, University of Tasmania (S) *PIPS nutrition research specifically nitrogen its role, movement in the soil and need in the plant*
June 2016		Ross Wilson (N) *Designing Labour Efficient Canopies* Steve Sparks (S) *Platforms for increased Labour Efficiency*	Tienie Dupreez (N) *Precision management of apple nutrition in poor and variable soils* Marcel Veens (S) *Designing Labour Efficient Canopies*
Sept 2016		Jonathan Brookes (N) *Future labour: Crop Load Optimisation* Steve Spark (S) *Crop Load Optimisation, Chemical Thinning and Biennial Bearing and Effects on Labour*	Brett Feehan (N&S) *PIPS 2 (Productivity, Irrigation, Pests & Soil) Research Update*
March 2017	Future Trees – variety mix, root stocks, architecture, tools, new technologies	Ross Wilson (N) Craig Hornblow (S) *Future Trees*	Dr David Williams, Agriculture Victoria (N) *Enhancing the robustness of IPM programs for apple and pear orchards* Dale Goldy, Stemilt Ag Services USA (S) *Young tree development, brand promise and profitability*

June 2017		Jonathan Brookes (N) Steve Spark (S) *What variety should I plant?*	Michael Weber, Germany (N) *Apple Brands – factors of success* Sally Bound, UTas (S) *PIPs 2 Research update particularly ASE*
November 2017		Ross Wilson (N) and Craig Hornblow (S) Orchard Business Analysis 2017 and Variety	Tom Auvil, North American Plants USA (N) *What's Next? Future Varieties, Practices and Cost of Establishment* Nicola Dellabatta, Foundation Edmund Mach (FEM) Technology Transfer Centre, Italy *Innovative Rootstocks for Apple Crops*
June 2018	Future Production Quality – price (size, colour, storage, timing, consumer)	Ross Wilson (N) *Improving fruit quality presentation* Steve Spark (S) *Passion for Quality*	Mark Ericksen (NZ) *Prune for quality* Stefano Musachi (USA) *Optimise Pruning and fruit quality in apple orchards*
Sept 2018		Jonathan Brooks (N) and Craig Hornblow (S) *Eating quality*	Ross Wilson (N) *PIPS 2 Sept 2018 Update* Brad Fankhauser (S) *Striving for Quality*
March 2019		Ross Wilson (N) and Steve Spark (S) *Climate Impacts on Quality*	Robert Weidner (Italy) (S) *Influences on Fruit Quality in the South Tyrol* Rick Derry (USA) (N) *Modern Variety Management for Quality*
June 2019	Future Climate – risk and mitigation, irrigation management, netting, frost,	Jonathan Brookes (N) and Dean Rainham (S) *Climate Mitigation Strategies*	Prof Stephanie Midgely, South Africa (N) *Adapting to climate change in a hot dry climate* Ross Wilson (S)

			PIPS 2 June 2019 Update
Nov 2019		Nic Finger (N) and Craig Hornblow (S) *Future Technology for the modern orchard*	Rob Blakey, Stemilt USA (N) *AgTech used in orchards in Washington State USA* Dirk van Hees, Fruit Consult *Agtech used in the Netherlands* Angus Hogan *Autonomous Agriculture*
June 2020	Future Orchard – what it will take to be an orchard of the future?	Jonathan Brookes (N) and Steve Spark (S) *What is orchard excellence now and into the future?* Virtual (filmed) orchard walks: Sunpeach orchard, NZ Hoddy's Fruit Co, NZ The Pines, NZ	Dr Nigel Swarts, Utas *Improved water and nutrient use efficiency for apple orcharding, PIPS update* Ross Wilson *PIPS2 extension update*
September 2020	Managing your orchard in a Covid-19 labour-restricted environment	Ross Wilson and Craig Hornblow (all regions) *Managing your orchard in a global pandemic*	Jessica Fearnley, FLA Orange Orange update – Stoneleigh Orchards Kevin Dodds, FLA Batlow Batlow Trial - Earwig monitoring Michael Crisera, FLA Northern Victoria Goulburn Valley update – Turnbull Orchards Susie Murphy-White, FLA WA WA trial update – Apples on apples Camilla Humphries, FLA Southern Victoria Soil health and replant disease

Nov 2020	Virtual	Nic Finger and Jonathan Brookes *Summer Orchard Management*	Videos : *Summer pruning in apples* *Hedging demonstration*
Jan 2021	On-demand	Jonathan Brooks and Steve Spark *Managing harvest in a global pandemic* *Platforms for orchard labour* *Managing vigour and crop load to increase profit*	
March 2021	Hybrid	Ross Wilson and Craig Hornblow *Labour, labour, labour* *Lessons Learnt from the Global Pandemic and a Vision of Improvement Going Forward*	Stanthorpe Stephen Tancred, Brevis trial update; Phytech irrigation presentation Northern Victoria Michael Crisera trial update Tasmania Sophie Folder, Trial update; Batlow Kevin Dodds, Trial update WA Dario Stephanelli, DPIRD

Table 4. Regional trials conducted by Front Line Advisors throughout the project.

Year	Region	Trial topics	Outcomes/notes
2016	Batlow and Orange, NSW	What leaf test levels of Nutrition can tell us about fruit quality attributes?	Demonstrated the variable nutrient levels across Pink Lady blocks and growing regions and reinforced the need for good nutrient monitoring to inform fertiliser programs.
	Batlow, NSW	Impact of Summer NAA on return bloom in Red Fuji	Helped to inform the application and use of Summer NAA in Fuji apples at Batlow including giving consideration to lower spray volumes and avoidance of hot weather and other contributors to crop stress. Need ongoing observations to confirm effects on fruit size.
	Northern Victoria	Effect of potassium on fruit colour in apple	Blush, colour intensity and background colour increased following potassium application compared to untreated control. Should be repeated on block of trees with more balanced nutrition.
		Inducing early cropping in pears *Physical (heading and scoring) and chemical methods were compared to reduce the development period in pears and get to full cropping more quickly without compromising maximum canopy establishment*.	Application of plant regulator MaxCel (6-benzyladenine) induced branching, a response that could improve labour efficiencies. Bud pinching resulted in a higher number of spurs and horizontal position of branches. Leader scoring resulted in more concentrated laterals in the middle of the leader. Heading alone gave the longest leader, low number of spurs and low number of laterals (ie. no effect). A longer trial would give more confidence in results and allow additional parameters to be measured.
	Orange, NSW	Root pruning demonstration	Root pruning resulted in earlier shoot termination leading to more fruiting wood and less vegetative wood, reduced average shoot length and a more open canopy resulting in greater fruit exposure and improved colour in the treated trees.
	Qld	Rate, wetter and number of applications of GA3 plant growth regulator on young apple trees	GA3 will be a useful tool to increase number and length of shoots in young apple trees, which will speed up the attainment of full tree canopies. It will shorten the time to reach full canopy and hence full production
		Rate, wetter and number and method of application of GA3 plant growth regulator on bearing apple trees	GA3 did not stimulate growth on bearing trees.
	SA	Young tree project (ongoing)	Long term trials are useful in observing differences over more seasons. Here what was considered the 'best' treatment in the first year did not give the preferred outcomes at the end of year 2. The treatments where the trees were whipped (but not headed at planting) and then whipped again at the end of the first growing season provided the greatest extension growth in the leaders. The grower's option gave the best tree height at this stage but not necessarily the best branch development or tree

			growth.
	Southern Vic	Bitter pit and calcium fertilisers	Calcium plays a major role in reducing the disorder but does not cure it on its own.
		Woolly aphid management with foliar and root drench insecticides	Foliar application of selected treatments alone gave 90 % control, soil drenching gave 70% control and both methods combined gave 100%.
	Tasmania	Achieving even growth in multi leader trees	Delayed heading of new apple plantings was not recommended as a practice to increase leader evenness in multi leader apple trees.
		Pedestrian Orchards: Single vs V-trellis case studies	Establishment costs for pedestrian orchard plantings are on par with conventional orchard plantings. Water management during establishment is important: Dry seasonal conditions resulted in reduced tree growth and therefore delayed performance against targets set for tree growth, fruiting and canopy fill in year 2.
2017	Batlow, NSW	Fuji Cincturing for Return Bloom	Could form part of a multi-pronged approach to vigour management.
	Batlow, Orange, NSW	How widespread is nematode infestation in developing orchards at Orange and Batlow. What are the population levels and the major genera present?	Aimed to raise awareness of the presence of pest nematodes in apple orchard soils. Root lesion nematode was the most common. Included in orchard walk discussions.
	Southern Vic	Establishing populations of European earwigs in a commercial apple orchard for the biological control of Woolly Apple Aphid	Most traps did not catch any earwigs; appeared the earwigs had not populated the orchard despite Woolly Apple Aphid presence; may take a second season to confirm this
		Modifying techniques to remove flowers in young trees	Comparison of different thinning techniques.
	WA	Leaf Defoliation in low chilling environments	ABA application to assist leaf defoliation did not occur at faster rate than when urea was used. If demonstrated again: use higher rate of ABA, test against Ethryl, apply ABA after urea, after the leaves have started to yellow.
		Evaluating the value of SNAP trees	Snap trees could offer up to 20% labour savings at harvest time once these canopies achieve the desired canopy width.
2018	Batlow and Orange, NSW	Demonstration of Real-time capacitance probe vs Neutron Probe soil moisture monitoring.	Demonstrated constant logging soil moisture monitoring system as a decision support tool. Fruit size monitoring was also useful to help confirm that fruit growth was being impacted by declining soil moisture. The opportunity to share the demo data with growers at two orchard walks was important in extending this technology to growers in the Batlow district.
	Batlow, NSW	Managing Burr Knots in young apple orchards	The real impact of burr knots in apple trees is not well understood. The effect of a single NAA

			treatment in winter suppressing burr knot activity was visually apparent and indicates that NAA may have a role in suppression or management of burr knots. This would require a research project to generate necessary data to have use registered for apple trees.
	Northern Vic	Use of Perlan/Cytolin to reduce russet on Packham pears	No definitive results as skin finish and shape were similar in both control and treatment blocks with favourable climate conditions in the GV this growing season.
	SA	Aztec Fuji - Timing of Pruning Trial	With the highly biennial bearing variety, waiting until later in the pruning period had an appreciable impact on yields whilst not impacting negatively on tree growth.
		Impact on leader growth of mature Pink Lady trees using 4 different pruning techniques.	Pruning strategies can be broken down into separate components to achieve different results. Traditionally growers prefer to prune the whole tree in winter. However, practice shows us that this approach in leader management leads to a continuous need to prune the tops to maintain tree height.
	Tasmania	Maximising Kanzi tree growth in young pedestrian apple orchards	Recommended that this trial be repeated as the season was not conducive to good tree growth.
		Over tree netting in Granny Smith apples in Tasmania's climate	Over tree netting • did not impact fruit set. • yielded fruit on average 8g lighter than unnetted trees • increased first grade fruit pack out percentage by 10% • increased the income by $ 7,728 / ha. The return on investment for nets was calculated as 5 years based on the trial results.
	Qld	Confirming interaction of Brevis thinner with wetters and oils	The warnings on the proposed Brevis label regards oil and wetter are warranted. Growers should show caution when using wetters or oils, with or in proximity to Brevis.
		Road testing Brevis thinner timings in Qld	The proposed label timings for Brevis use on apples provide desirable thing outcomes. Earlier and later use resulted in excessive or inadequate thinning.
	WA	Apples on apples	Additional time is required to determine how the soil amendments will affect tree growth and productivity.
2019	Orange	Comparison of two approaches to pruning young Kanzi trees to encourage canopy establishment	Practical demonstration of the differences in two pruning techniques. The opportunity to share the demo data with growers at the orchard walks was important in extending this method of pruning to growers in the Orange district.

	Qld	Shoot growth on young Smitten trees with different crop loads	Confirmed leader growth under different crop loads for Smitten trees.
	SA	High Density Orchard Leader Height Management	From the observations made to date the "non-winter" pruning treatments result in reduced leader regrowth and the amount of pruning required. Each of the winter pruning techniques has led to strong regrowth patterns and pruning requirements. (ongoing)
		Time of Pruning	Although trees were pruned to similar bud numbers in each season, the biennial bearing issue is very obvious, particularly in the 2017 treatments/2018 yields. (ongoing)
	Southern Vic	Dormancy breaking sprays and their effect on flowering and harvest timing and impacts on orchard management amidst climate variability.	Dormancy breakers can assist with thinning applications. The earlier Erger® spray application brought forward flowering.
	Tasmania	Investigating Envy apple eating quality	Crop load influences the eating quality and dry matter of Envy apples. The industry recommendation for a target yield 90-100 tonnes per hectare for Envy is relevant and supports the eating quality findings of this demonstration trial. The risk of internal browning was higher at low crop loads
	WA	Pollination under nets	Pollination under nets was very good. No differences were observed in the Kanzi and Rosy Glow blocks in the number of seeds per apple, regardless of netting whether the block was netted or not.
		Pruning under nets	Controlling tree height vigour is a major obstacle to maintaining future production under netted high-density orchards. The biggest difference in the average number fruit on the tree was seen in the Rosy Glow when the tops were pruned in Spring.
		Evaluating new rootstocks for apples in WA	Trial was discontinued because of unavailability of rootstocks.
	South Australia	Optimise the development, height and growth of young trees to suit netted orchards	Serious impacts of developing basal branches too early need to be carefully managed. Many of the branches tied down at the end of the first growing season may need to be removed as choke points that have weakened the leader growth developed. (Ongoing trial).
	All regions	Eating quality trials	This demonstration served as a reminder to growers, that optimal harvest maturity has an important impact of the likelihood of consumers purchasing again.
2020	Batlow, NSW	Late season nitrogen fertilisation and its impact on apple fruit quality and colour development at Batlow	Shared with growers the results of research from UTas that shows equivalent N utilisation and storage with reduced early season N applications

		Woolly apple aphid (WAA) review of current knowledge and management methods in apple orchards	Follow-up to this study will be to encourage growers to monitor earwig activity as a motivator for them to change chemical spray programs that may be impacting on this beneficial insect.
	Northern Victoria	Comparing Pink Lady primary thinning methods	Struggled to see much difference in size profile between the 5 plots, so not a good way to compare value after primary thinning. Yield was higher in the Darwin thinned blocks. Heavy blossoms can induce stress on trees causing excess fruit drop later on. The Darwin thinner may reduce crop load early and increase fruit set at a later stage.
	Orange, NSW	The effect of fruit thinning on the growth rate and quality of Pink Lady	Although this trial was compromised due to drought, there was some good indication of the effect of different crop loads on fruit quality. Interesting results with the heavy crop load could warrant further investigation to see the interaction between crop load and quality.
		The effect of mulch on the growth rate of young Bravos	Moisture retention appeared to be better under the mulch. When mulch is applied under the tree, it is important to supplement the tree with N to ensure there is still N for the tree to use.
	Qld	Crop loads in drought for yield and quality - Gala	The target “Normal crop load’ was reduced based on the grower’s assessment of water resources and developing drought, so was already a reduced crop load compared to what would be left on the trees in a non-drought year. The proportion of marketable fruit varied from 20.3 % in trees with a ‘normal’ crop load to 33.7 % in trees with just 20 % of the normal crop load.
		Crop loads in drought for yield and quality – Pink Lady	There was no clear trend for lighter cropped trees to have less stem end russet or more marketable fruit. Keeping in mind that the target “Normal crop load’ was reduced based on the grower’s assessment of water resources and developing drought.
	SA	Aztec Fuji Time of pruning trial	The time at which a particular variety is pruned can affect the performance of that variety. By pruning Aztec Fuji’s at different times we were able to achieve a yield difference of approximately 37% over the life of the trial simply by when it was pruned.
		Young Tree Growth under different pruning strategies	This long running trial showed that young tree management practices, such as tree style, initial pruning and crop load management strategies have a very significant impact on final orchard performance.
	Southern Victoria	Additional drench treatments to treat storage disorders in Granny Smith apples	Overall scald percentage was significantly reduced for the Naturcover CE treated fruit. No significant difference was observed for lenticel breakdown, nor was any CO_2 injury detected. Fruit quality improved with higher firmness measured for the Naturcover CE and the fungicide treatment compared to the grower standard.
		Minimising heat stress and	Some of the products evaluated reduced heat stress

		sunburn damage on Brookfield Gala apples to improve the marketable quality of fruit in high heat stress seasons	and sunburn damage and improve background colour and average fruit weight.
	WA	Water Use, growth rate and taste	Overall, this trial showed that there is more work to be done in WA orchards around irrigation management and fruit quality. Fruit quality was not affected by netting or different watering systems. These preliminary results have provided an opportunity to redefine the trial and find some more conclusive answers in the future.
		SNAP vs Click Pruning	There was little difference in the time taken to prune using the different methods. On average, it was 0.05 min faster using the SNAP method than the Click method. But the SNAP pruned trees had a better yield than the Click pruned trees. The average number of apples per tree was 220 on the SNAP trees and 168 apples per tree on the click pruned trees.
		Predicting lenticel damage and pit problems in Kanzi/Fuji	Each method tested (hot water, Ethephon, passive) successfully predicted/forced lenticel damage in Kanzi apples.
2021	Batlow, NSW	Assessing Bud fruitfulness following bushfire	Bud dissection was a good predictor of potential flowering. Trees that were severely affected by bushfire (i.e. overall leaf scorch) and regrow their canopy following the fire, are likely to have fewer fruitful buds in the following Spring. Trees with low or no observable fire impact (i.e. slight scorching of leaves or less), are likely to have a normal level of bud fruitfulness following bushfire.
	Batlow, Orange & Sth Vic	Value adding for second grade fruit – a regional perspective	Currently the low returns on culinary juice grade apples are not viable for commercial apple growers due to the high cost of production. Many apple growers would be willing to value add their product and work with the cider industry if returns are consistent to determine where they send their fruit. They also would like to see improved returns on fruit for juice to make it viable due to high production costs.
	Orange, NSW	Bud dissection to determine fruitfulness	Growers can use bud dissection as a tool to correlate to bloom potential in spring. If blocks have a low proportion of floral buds, then pruning can be altered to increase the number of flowers on trees. If floral bud numbers are low, growers can keep more wood and buds on the tree to increase the number of floral buds for this season.
	Northern Vic	Maturity of Gala irrigated under overhead irrigation and Gala not irrigated via overhead irrigation.	Observed differences in fruit colour at harvest time.
	Qld	Brevis thinning of minor apple varieties	Brevis is rate responsive on Gala. Brevis can play a role in spray thinning programs for the minor

			varieties Kalie, Envy and Rocket. Substantial costs of hand thinning can be replaced by spray thinners.
		Determining bud fruitfulness by dissection	Based on one season's data, growers can expect bud fruitfulness (assessed by dissection in winter) to correlate to bloom potential in spring.
	SA	Orchard field day to observe results of several Future Orchard trials	Outcomes from long term trials presented to growers: Young tree growth trial - Aztec Fuji; Time of Pruning – Aztec Fuji; Mason's leader Management trial – Rosy Glow
		Fire Damage Response Trial	Preliminary observations showed that the first priority should be to get water back on trees ASAP, that lighter pruning was more beneficial than heavy pruning. The level of damage on the trunk (heat side) appears to be good indicator of potential growth response.
	Tasmania	Apple replant disease rootstock trial	Despite effects of weed pressure and small size of rootstock planting material, the trial showed the potentially promising results of CG202, CG41 and MM102 rootstocks but requires further work to confirm.
		Cost effectiveness of late hand thinning Smitten apples	Later hand thinning dates created labour efficiencies because fruit size increased making it easier to thin and reducing costs per hectare. There was greater difficulty in controlling crop load at earlier thinning dates when the fruit is smaller, as more fruit remained post thinning despite aiming to hand thin the trees to a similar crop load.
		Investigating Gala apple eating quality	Harvest date influenced maturity and eating quality of Gala apples post storage. Application of PGR (Harvista) delayed the commercial harvest date by 10 days allowing for greater red colour development.
	WA	Precision Pruning to Bud Numbers	Precision pruning allows pre-thinning of the tree so that chemical thinning is more successful, and less hand thinning required to reach the optimal number of fruit per tree.
		Bud Dissection to Determine Fruitfulness	Based on one season's data, growers can expect bud fruitfulness (assessed by dissection in winter) to correlate to bloom potential in spring. If blocks have a low proportion of floral buds, then pruning can be altered to increase the number of flowers on trees. Increased flower numbers should increase cropping potential.

10. **Communication** of activities and outcomes. Articles, presentations, trial reports, visual media and other Future Orchards activities reported via Industry Juice, *Australian Fruit Grower* and available in the Future Orchards library on the APAL website. A list of articles, with corresponding links or pdfs, is provided in Appendix IV. Evaluation surveys conducted at Orchard Walks in 2016, 2017 and 2018 also included a question of participants views of the Future Orchards™ articles in the Australian Fruit Grower Magazine and their use of the Future Orchards library on the APAL website.

    The surveys indicate that 66% of respondents who see *AFG* read articles about the Future Orchards project every issue (34%) or if they were relevant (32%) (Figure 5). Fifty one percent of respondents also indicated that they 'often' or 'occasionally' use the Future Orchards library (Figure 6). In 2016 14% of respondents indicated that they don't see the magazine. This number declined to 2% of respondents by 2018. It was assumed that people who did not see the magazine were employees of a company that does not receive the magazine or that it was not available to employees.

    Also, in accordance with the Monitoring and Evaluation Plan, surveys in the same period included questions about the Future Orchards™ on-line library available on the APAL website. While the use and awareness of the Future Orchards library fluctuated somewhat, more respondents indicated that they visited the site 'quite often' in 2018 than in 2016. This may be because the password protection was removed in an effort to raise the exposure of the library. The library does have a lot of information in it and may benefit from a review to ensure content is still relevant and current.

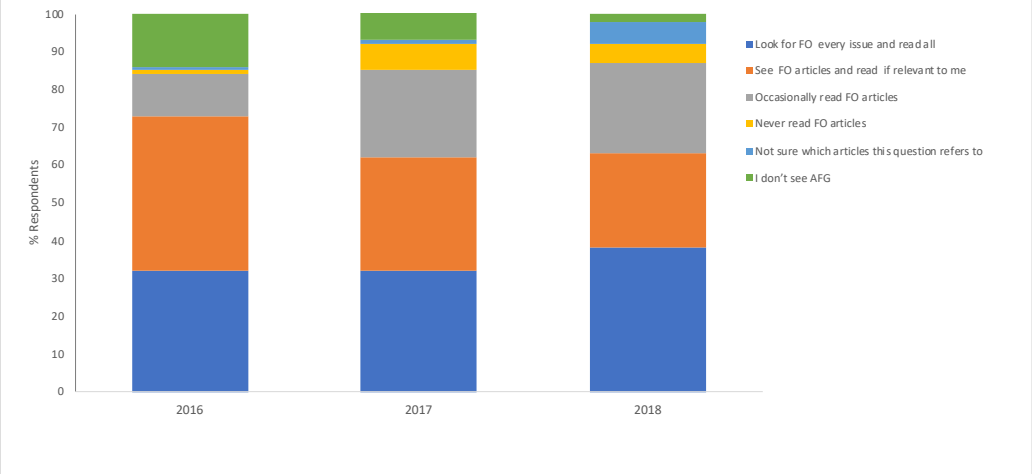

Figure 5. Participants at Orchard Walks in 2016, 2017 and 2018 were asked about their awareness of Future Orchards articles in the *Australian Fruit Grower* magazine. The question posed was "Future Orchards project articles are published in every issue of *Australian Fruit Grower* magazine. Please indicate the response which best describes your view of these articles." Data presented is the average of the three survey times.

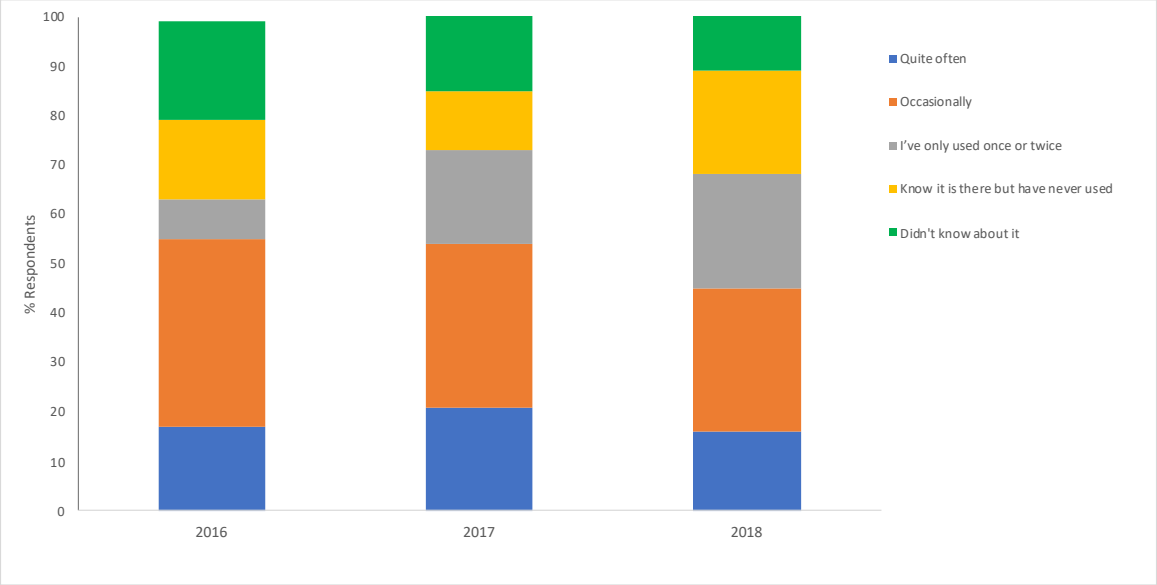

Figure 6. Participants at Orchard Walks in 2016, 2017 and 2018 were asked about their awareness of Future Orchards information made available in the Future Orchards library on the APAL website. The question posed was: "The Future Orchards website provides a comprehensive library of articles, webinars, tools and presentations provided through past Future Orchards activities. Do you use this resource?". Data presented is the average of the three survey times.

11. Two **regional study tours** for growers were run during the project. The first was held in the Adelaide Hills in January 2017 with 30 participants registered, but around 50 in attendance on the day.

    The regional tour of Southern Victoria was held in 2019 with 46 participants. Details are presented in the 'Outcomes' section and reports are provided in Appendix V. Reports of the events were shared via APAL media.

12. Two **international study tours** were held for growers.

    In 2017 a group of 28 Australian apple and pear growers travelled to Washington State, USA to meet with growers, researchers and other apple and pear industry members (Table 5).

    Following the tour, growers were asked to complete an evaluation survey. Ninety four percent of respondents found the tour 'valuable' or 'of some value' and were 'very satisfied' or 'satisfied' with the quality of the tour including the locations visited and topics covered. All respondents indicated that they had learned something that will change their current practice and that the visit provided relevant learning opportunities application to Australia.

    The second tour was held in August 2018. Fourteen growers visited apple and pear growing regions in Bolzano, Italy, Lake Constance, Germany and Poland (Table 6).

    Information learned during the tours was shared with the broader industry through APAL's media platforms. The tour also provided an opportunity to meet leading researchers and growers in the countries that were visited and several of the experts that the TM met during the tour participated in Orchard Walks or other project events. Full reports from the tours are provided in Appendix VI.

    No tours took place in 2019-2021 due to the COVID 19 pandemic.

Table 5. Summary of hosts of the grower tour to Washington State, USA in 2018.

Hosts	Topic(s)
Karen Lewis, Tom Auvil, Stefano Musacchi, Washington State University, Sunrise Research	Introduction to the local industry in Washington State; the context of why they do what they do
Tom Auvil, JJ Dagorrett, Lee Kalcsits, Tim Welsh, Scott McDougall, McDougall Legacy Ranch, East Wenatchee	Netting Trials, Rootstock trials, Automation
Del Feigal, Dan Plath, Mike Robinson, Vantage & Royal Slope	Auvil Fruit Company
Dale Goldy, Bryon McDougall, Quincy & Wenatchee	Tour of Red Lion including Nursery at Quincy, pear planting, cherries, apples. McDougall Apple Packing. Stemilt Cherry Line
Tom Auvil, Mark Gore, Jim Divis	Apples and cherry production, establishing new orchards, future technology
Rick Orozco, Denny Hayden, Travis Allan; Pasco & Matawa & Prosser	Orozco Stonefruit, apples, organic pears. Knowing your numbers and making money. Global fruit market. 2D orchards
Karen Lewis, Steve Nunley, Keith Valseka, Chris Peters; Yakima & Wapato	Spraying technology, Post harvest, Blueline Platforms
Bruce Allen, Jason Matson	Selah Orchard

Table 6. Summary of hosts of the grower tour to Europe in 2018.

Hosts	Topic(s)
Dr Nicola Dallabetta, Fondazione Edmund Mach Research Station	Training systems, Rootstock evaluations, tree density, pruning, orchard management, production and quality
Espen Giorgio and Josef E Walter, Trento, Romagnano, Forti Dario, Sulzer Gunther, Termeno, Bolzano	Organic and Biodynamic orchards
Francesco Pizzoli, Val di Non	Melinda Cooperative and the apple storage caves.
Dr Luca Lovatti and Dr Alberto Dorigoni, Innovation Fruit Consortium, Trentino	Variety evaluations; Guyot training systems for apples and pears
Nils Johnson, REVO	Machinery demonstration
Peter Matha, Bozen	Click pruning and the Peter Matha pruning method.
Christian Dallemulle, Beratungsring	Zucal and Munckhof Hermes harvesting platforms demonstration
Peter Triloff, Lake Constance	Spraying systems, crop protection, spray drift trials, European regulatory situation.
Michael Weber, Lake Constance	European apple production update, Club varieties: Opal, Junami, Evelina;
Peter van Arkely and Andrea Sozka, Poland	Polish apple and pear industry update, variety update, growing conditions
Peter van Arkely and Andrea Sozka, Wielun	Visit to Wielun district

13. The first **Pear Masterclass** was held in the Goulburn Valley, Victoria in July 2016 in a similar format to the traditional Future Orchards orchard walks with presentations in the morning and an orchard visit in the afternoon. Videos from the event were made available on the APAL website. The Masterclass featured international guest and consultant Anton Jongerius as well as Australian based consultant Marcel Veens. Anton Jongerius had a practical background, with detailed understanding and experience of more advanced pear orchard systems in the Netherlands. Angus Crawford (TM at the time) met Anton on the APAL European study tour in 2015 (part of the previous Future Orchards project) highlighting the value of such tours to identify guest presenters. Marcel Veens talked about pruning and rootstocks.

    The Pear Masterclass in 2017 aimed to provide a practical refresher on pruning of both old-style vase and semi intensive central leader trees. The most comprehensive evaluation data available, and presented here, is that for the 2017 Pear Masterclass. All aspects of the event were rated highly (Figure 7). All participants at all of the Pear Masterclass events felt that they had learnt something that they could apply to their business.

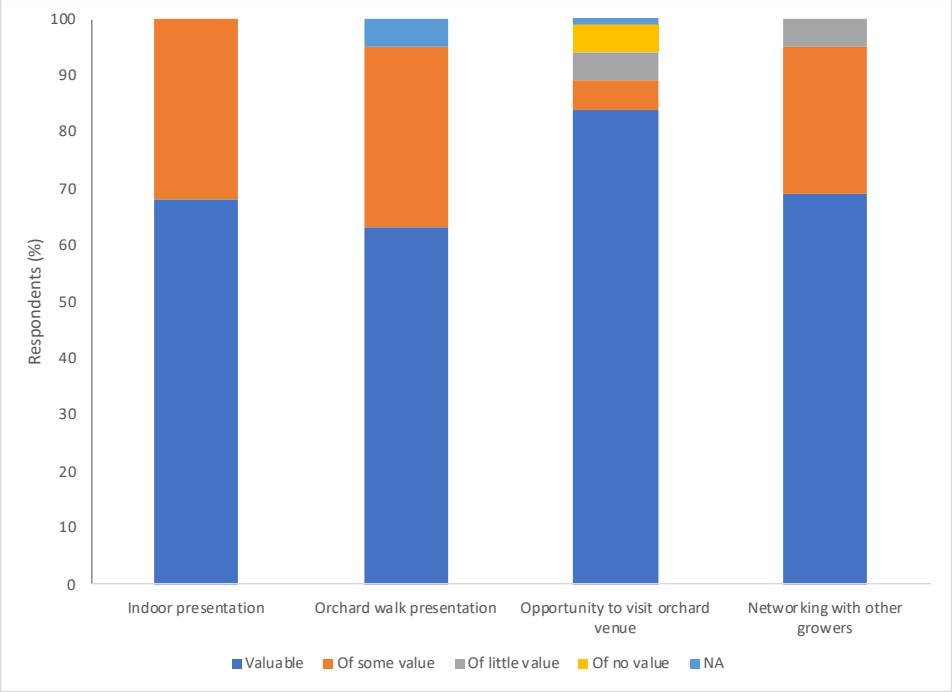

Figure 7. Results from the Pear Masterclass evaluation conducted after the 2017 event. Participants rated each of the components of the event as being 'valuable' or 'of some value' most of the time.

The Pear Masterclass 2018 focused on improving pear quality through orchard management practices, as part of the overall Future Orchards annual theme 'Future Quality' with guest speakers Professor Stefano Musacchi from Washington State University, Dr Ian Goodwin of Agriculture Victoria, and Horticultural advisor Marcel Veens. Presentations were again made available on the APAL website.

Fruit quality and profitability were the key topics fin 2019. Pear growers heard about the best performing pear planting systems, new cultivars, thinning and fertilising strategies and better ways of managing pests. Dr Ian Goodwin and Dr Lexie McClymont presented an update on the Profitable Pears project, Dr Sally Bound reviewed thinning programs for pears and the flexibility of non-chemical approaches, Russell Fox reviewed options for managing codling moth, Emily Crawford introduced the new IPDM project, and Marcel Veens continued to highlight best practice application of nutrients in the orchard.

The Pear Masterclasses attracted between 45 and 60 participants each year (Table 7). Around half of those were growers (owners or employees of orchard businesses or packing sheds) with the remainder being representatives of government departments, researchers, private consultants and other supporting service providers (Table 7).

Table 7. Participants at the Pear Masterclass events and their evaluation summary.

Year	Number of participants	Growers (% total participants)	Respondents (%) who rated the event valuable/useful*
2016	57	76	82
2017	60	69	100
2018	45	50	100
2019	47	10	NA

*'Of value' and 'of some value'; In 2019 a rating system using a score out of 5 was used in the evaluation and percentages of respondents who rated the question are not available. The overall score for survey participants was 4.5/5.

With the Covid-19 pandemic restricting travel and gatherings, the 2020 the Pear Masterclass was run online as a series of three 45-minute presentations given by Dirk van Hees from FruitConsult in the Netherlands followed by panel discussions with Dirk and Australian industry representatives and growers (Appendix VII). The three sessions were attended by growers and industry stakeholders including researchers and representatives from support services (Table 8). The online format was well received, consistently receiving ratings over 4/5. Participants were interested in the planting systems and rootstocks than other topics of varieties and fertilisation.

Table 8. Evaluations of Pear Masterclasses held online in 2020. Response rates were 20-24%.

Topic	Number of participants	% Growers	Content (/5)	Format (/5)	Avg Overall rating (/5)
Planting systems & rootstocks	41	54	4	4.7	4.4
New varieties	42	48	3.6	4.7	4.7
Fertilisation*	20	40	2.8	4.3	3.8

*This webinar received one particularly low rating response which brought down the average.

14. Three **Speed updating** and one **Technical Day** were held throughout the project attracting between 96 and 130 participants to each event (Table 9). The first three years, the events were held alongside other broader Horticultural industry events. In 2020, the Technical Day was held alongside the APAL Forum.

    The events were frequently rated highly for value of content, with around 90% of participants indicating that they found the event quite or extremely valuable or useful (Table 9).

    Examples of outputs, including programs of events, are provided in the Appendix VIII.

Table 9. Participant numbers at each of the Speed updating events.

Year	Event location	Number of participants	Growers (% total participants)	% Respondents found the event valuable/useful
2016	Gold Coast	100 (est.)*	NA	90
2017	Launceston	110	32	88
2018	Brisbane	130	48	90
2019	Melbourne	96	50	91

*Because Speed updating was held as part of the Hort Convention participants moved freely between rooms making it difficult to determine the exact number.

Webinars held in place of the technical day in 2020 were rated highly (Table 10). Webinars that had potential practical, in-orchard applications, for example the two webinars given by researchers from Washington State University, Tianna Du Pont and Dr Lee Kalcsits, tended to attract a higher number of growers. The nursery tree stock webinar by Dr John McDonald also had a relatively high number of growers participating, compared with other webinars. These webinars, along with the AI technology webinar presented by Dr Zygmunt Szpak also received the highest ratings for relevance/interest in content.

15. Outcomes from the **PIPS2 program** were coordinated and delivered by AgFirst (AP15005) with updates provided at Orchard Walks and via APAL media platforms. The extension of these activities is covered in the Final Report for AP15005. In person PIPs Extension events occurred September 2016 Northern loop, September 2016 southern loop, June 2017 Sothern Loop, June 2018 Northern Loop, June 2019 southern loop. A virtual PIPs extension presentation occurred June 2020. An update on the recently funded PIPS project AP19006 (Soil health), was given by Dr Sally Bound at the March 2021 Orchard Walk in Tasmania.
16. **Technical Manager upskilling** and support to growers and industry. To ensure the TM remained up to date with emerging technologies, innovation, R&D and global best practices that could be shared with growers and the wider industry through Future Orchards, the project supported the attendance of the TM at relevant workshops, conferences and activities to facilitate development of skills/capacity as well as support the development of relationships and linkages with the domestic and global R&D community, RDC community and other agricultural and agrifood industries. This assisted in the identification of skills gaps and training needs for industry. Reports from conferences and relevant workshops were shared with industry via APAL's media platforms. Details of participation in specific activities have been provided in Milestone Reports submitted throughout the project. The TM participated in the international conferences, workshops and other upskilling activities (Appendix IX).
17. **Grower services and technical support** were provided by the Technical Manager and other APAL staff including the Industry Services Manager, Quality Manager and Head of Government Relations, to the apple and pear industry and wider community. The TM and other APAL staff participated in meetings, and provided industry knowledge, to support the activities and organisations relevant to apple and pear production.

    Technical support was provided to levy payers, and resources that support levy payers, including state-based grower organisations (PomeWest, Apple and Pear Growers Association of South Australia, Fruit Growers Tasmania, Fruit Growers Victoria), government industry development officers, Hort Innovation, government departments and APAL's non-technical resources including the Communications Team. The science-based advice assisted in better decision making in delivering RD&E programs and services and in improving the general capability of the industry.

    The TM provided technical support to apple and pear R&D related meetings and supported technical aspects of the annual apple and pear industry conference planning such as content planning, selecting topics of technical interest and identification of suitable keynote speakers. The TM also represented APAL on the Project Reference Group (PRG) for a number of apple and pear levy funded projects funded by Hort Innovation. Additional details are provided in Appendix X.

Table 10. Webinars were held in 2020 in place of the technical/speed updating events and responses to evaluation surveys conducted. Response rates were low (10-15%) as surveys were conducted online after the presentation.

Date	Presenter	Topic	Number of participants	% Growers	Format (/5)	Overall score (/5)
14 May	Dr SP Singh, NSW DPI	Post-harvest treatment with supercharged air	40	25	4.2	4
27 May	Dr Brent Clothier, PFR, NZ Dr Anthony Kachenko, Hort Innovation	Eco-credentials and sustainability	61	33	4.5	4.3
17 June	Tianna Du Pont, WSU	Alternative controls for apple replant disease	40	50	4.8	4.8
30 June	Mark Skewes, SARDI	Managing through drought, lessons from other industries	23	17	4.7	4.3
9 July	Dr Zygmunt Szpak, University of Adelaide	Adoption of AI technologies in horticulture	50	16	4.3	4.0
23 July	Dr Lee Kalcsits, WSU	Outcomes from US Netting trials	33	45	5	4.9
6 August	John McDonald, Greenlife Industries	Growers managing nursery tree stock risk	23	39	4.5	4.3

18. **Crop protection stewardship, chemical regulation and access** activities updated growers and the wider industry about changes in Australian and international MRL standards and other regulatory amendments or decisions to chemical use that may affect apple and pear growers now and into the future. Information was made available to industry through Industry Juice and the APAL website. This included dissemination of relevant outcomes from the Hort Innovation funded project Regulatory support and coordination (pesticides) (MT17019) as well as direct communication with chemical suppliers, government departments and other relevant representatives. Examples of activities include:

    - Liaison with Hort Innovation and chemical company representatives about chemicals and Minor Use Permits, and priorities for the apple and pear industry
    - Participation in the Strategic AgriChemical Review Process (SARP)
    - Participation AgVet collaborative forums
    - Liaison with the APVMA to seek technical support for spray drift management tools (vertical sprayers), chemical review impacts, grower priorities for chemical access, resolution of label issues
    - Support to the National Residue Survey (NRS), Department of Agriculture and Water including articles to encourage use of the NRS and information about reducing patulin in juice
    - Participation in National Working Party for Pesticide Application (NWPPA) meetings and activities
    - Articles in the *AFG* magazine or *IJ* to update industry on changes to chemical use and access regulations
    - Technical advice supplied to registration or minor use permit applications and label changes

    Further information is presented in Appendix XI.

19. **Biosecurity preparedness** The TM and/or biosecurity consultant represented the apple and pear industry at Plant Health Australia (PHA) meetings, provided input into the nationally coordinated decision making and cost-sharing approaches to respond to incursions through eradication programs and transition to management via the Consultative Committee on Emergency Plant Pests (CCEPP) and other commitments to the EPPRD. In November 2019, Head of Government Relations also attended the Plant Health Australia Forum as the TM was participating in orchard walks. Specific activities are listed in Appendix XII.

20. **Postharvest productivity improvement**

    Postharvest events were held annually to demonstrate and showcase best practice initiatives and management. The event was held in Melbourne or northern Victoria and included presentations and a tour of postharvest related facilities, such as a modern packing shed. Technical support for content was provided by the TM. The **postharvest** seminars attracted an average of 110 participants to each annual event, with half of these usually participating in the tour.

    Adelaide, 2017 Postharvest forum

    - >80 participants
    - A total of 37 responses were received and of these 95 percent found the seminar of Excellent/High value and the organisational aspects were 100 percent excellent/good. All respondents indicated that they learnt something that they can apply.

    Melbourne, 2019 Postharvest forum

    - 113 participants.
    - The evaluation returned 64 responses and the results indicate that 98% of participants through the seminar was well, organised and of value.

    Virtual, 2020 Postharvest forum

    - The online postharvest forum was attended by 60 people on the day that it streamed live.
    - Ninety two % of respondents to the post-event evaluation indicated that the content was Very good or excellent and that they had learnt something they could use in their business.

21. **Technical preparedness for export**

Support provided included technical or scientific information about product characteristics, physiology (eg. factors affecting maturity), pests and diseases and their risks, and phytosanitary methods and production procedures. This has included confirming methods for controlling pests of concern such as codling moth and fruit fly. Technical support was also provided to growers around MRL requirements of export markets.

22. Orchard Business Analysis

The Orchard Business Analysis (OBA) was prepared by AgFirst. Because of delays in the September 2020 variation to the project, the report was submitted in March 2021 rather than January 2021. This is shared with levy payers on request.

Outcomes

Surveys of participants following project activities were identified as the means to measure engagement and potential for adoption as outlined in the M&E Plan. Additional feedback from participants was encouraged by asking about how the event could be improved, and which topics or activities participants would like to see covered in future events. This feedback was discussed at annual planning meetings and used to guide future activities.

Changes in grower knowledge, attitudes, skills and aspirations are reflected in the adoption of new practices and technologies by growers, engagement in project activities, and changes in yield and quality of apple and pears produced by growers. While quantitative data was not collected around the adoption of practices discussed or demonstrated, observations suggest a shift in orchard systems from traditional to modern, high density, planar/2D and pedestrian orchards, the increasing adoption of technologies such as platforms, leaf blowers and hedgers to improve labour efficiencies and fruit quality in the orchard, and the large investments in packhouses and fruit sorting technologies.

The OBA*, conducted as part of AP15005, modelled increases in the average Class 1 packout yields for apples and pears from 33.0 t/ha (69 % of total yield) to 35.2 t/ha (70 % of total yield) in 2019. The 2020 season forecast was predicted to be lower (Class 1 packout of 30.5 t/ha; 71 % of total yield) and was attributed to seasonal cropping variability. The average gross yield over this period increased from 47.2 t/ha in 2016 to 50.3 t/ha in 2019. This has achieved the 45 t/ha target identified for this project. The trending increase in the high proportions of Class 1 packout demonstrates improvements in fruit quality.

*The OBA collected financial and production data from apple and pear growing businesses that was used to develop a model Australian orchard. More information about the OBA is found in the Final Report for AP15005.

Orchard improvement and R&D Extension

Future Orchards orchard walks were consistently well attended across all 8 regions over the project period. Attendance varied depending on season and weather conditions which influence grower availability due to competing orchard activities. For example, participation in March which coincides with harvest time in most regions, was typically lower. However, harvest time also offers the opportunity to see fruit on trees. To accommodate this, walks were held in March in alternating years. Otherer walks were timed to align with specific orchard activities such as winter pruning, or flower thinning in spring. Surveys indicated that around 80-85% of participants tended to participate to orchard walks regularly, and that around 15-20% were new participants each year. Broadly, this suggests that the Future Orchards program maintains the interest of existing participants, while continuing to engage new growers. The greater proportion of attendees (>60%) were owners or employees of an orchard business with other participants including providers of goods and services to orchard businesses and government employees. Response to the question around learned experience fluctuated somewhat during the course of the project depending on the topic presented. Responses from participants and FLAs indicated that grower interest and engagement in presentations given by AgFirst, guest presenters and demonstration trial updates was generally high with most rating the content as ‘valuable’ (around 70% of participants) and the level of interest shown by participants as ‘high’ (80-100%). Reponses to surveys suggested that growers particularly valued being able to look around each other’s orchards and to network.

Feedback from growers include the following comments:

“*Future Orchards is one of the best things that has happened to the apple and pear industry. By facilitating orchard walks, and letting growers visit each other’s orchards, it has reduced competition between growers. We can see what other people are doing*.”

The objectives of the **Speed Updating** / **Technical Day** events were to provide research and knowledge updates the grower community. The events are well attended (between 90 – 110 participants including growers, researchers and industry service providers at each event) and more than 90% of survey respondents rated the presentations as valuable. Of respondents in 2019, 85% indicated they had learnt something that they could apply in your work or business and 87% indicated they had learnt something that they could share with other growers. Webinars replaced these technical events in 2020. Collection of feedback following webinars in 2020 were collected

differently, and the overall events rated an average of 4/5.

Feedback included:

"*As always, a good event, well organised and very relevant to the industry. Good topics, good presenters*"

A series of 6 webinars were held in 2020 because a technical day could not be held in person (Table 10; Appendix VIII)". The more 'practical' presentations tended to attract more growers. Feedback was positive with all webinars rating more than 4/5 overall.

The Pear Masterclass aimed to provide current information and updates specifically to pear producers. In 2018, the Pear Masterclass, 15% of survey respondents were new attendees, not having been to the Pear Masterclass the previous year. The first event was rated as 'valuable' by 68% of participants with the opportunity to visit the orchard rating somewhat higher than indoor presentations. Participant numbers ranged from 60 in the first year to 47 in 2019. A different evaluation survey was used in subsequent years and asked participants to rate the event on a scale of 1 to 5, and the event rated 4.3/5 overall. The event was held online in 2020 and attracted 103 participants over three 45-minute webinars. The sessions addressing planting systems and rootstocks (49) and new varieties (53) were most popular with the highest number of participants compared with the Fertilisation Webinar (26)

The **postharvest** seminars attracted an average of 110 participants, with half of these usually participating in the tour. In 2019 an average of 98% survey respondents indicated the seminar event was well organised and of value. The event received overall ratings of 4.2 – 4.5. Participants indicated that they found the seminar to be very informative and to provide valuable information they could take back to their business.

In January 2021 the postharvest event was held virtually and attended by 96 people (47% growers). It featured presentations from suppliers of modern packhouse technologies and discussions with packhouse operators in Australia using those technologies. The video can be found here: https://www.youtube.com/watch?v=duuIEdyh3yw. Like many of the virtual events held over 2020-2021, the presentation component received a high average rating of 4.5/5 and the tour 4.2/5 from participants.

The 2017 **International Tour** to the USA was highly valued by growers and 94% of participants rated the overall tour as 'extremely valuable' or 'valuable'. The same proportion of participants were 'very satisfied' or 'satisfied' with the tour. All participants indicated that they learnt something that will change their current practice, and 88% indicated that they learnt something that they would pass on to other growers. The second international tour to Europe in 2018 attracted 16 participants who travelled to Italy, Germany and Poland. Feedback received following this tour was also positive.

Comments received were also positive:

"*Good relevant content to challenge even the best growers to another level*"

"*This was my first opportunity to look at the apple industry outside Australia. To visit and experience other growing regions and countries is a fantastic opportunity to measure our practices against world leading operations*."

"*Got the opportunity to visit some very impressive operators who were very thought provoking and at the cutting edge. It's opened my eyes to what can be done back home and I am now comfortable with what I need to do to continue into the future*."

Key learnings from the tour included: trellis systems and orchard design, yield opportunities with higher planting densities, being ready to change varieties and having the correct variety mix, grafting, overhead cooling and organic production.

Key opportunities for Australian growers that were reported by participants included: improved systems for automation in the future, grafting provides faster turnaround for old blocks, overhead cooling, disease resistant rootstocks, uniformity in orchard systems.

The **regional tour** to the Adelaide Hills held in 2018 attracted more than 100 participants, half of these being local growers who came along on the tour. The **regional tour** to Southern Victoria held in 2019 attracted 46 participants with around 30% of these from interstate. All survey respondents rated the overall value of the tours as 'extremely valuable' or 'valuable' and 100% indicated that they had learnt something that will change their current practice. Eighty-seven percent stated that they had learnt something they would pass on to other growers. Feedback from participants suggested that they found the tour:

"*Constructive. Facilitated discussion amongst the group"*

"*Very well run, great interaction and discussion. It was busy and was little down time, but still there was no orchard that we should not have gone to. Use of the speaker system was perfect, especially for hearing the speakers clearly in the pack shed*."

"*Very educational. Would attend more trips. Great day*."

Engagement via **magazine articles** in *Australian Fruit Grower* was appraised in the evaluation activity undertaken in conjunction with the 2016, 2017 and 2018 orchard walks at which the post-event survey included a question about the value of the magazine articles. The results indicate 84.4% of responders read the Future Orchards™ articles at least some of the time and about a third of responders read all the articles. Of the remainder, nearly 14% don't see the magazine at all. This may be because they are not members of APAL or magazine subscribers. Less than 1% of responders indicated that they make an active decision not to read the articles while a little over 1% of responders are not sure to which articles the question referred. This evaluation indicates that the magazine articles are an important project resource valued by growers. This survey also included questions about the Future Orchards™ on-line library. More than 55% of respondents indicated that they go to the library often or occasionally. A further 9% indicated that they had been to the library once. Nearly 16% of responders indicated that they knew of the library but had never visited and 20% said they didn't know the library existed. Subsequently, efforts to raise the expose of the library and the decision was made to remove the password protection to library usage.

In summary, the grower engagement activities continue to attract new participants, and the overwhelming majority of participants left the events indicating that they had learnt something that they thought they could apply in their orchard or business.

No evaluation of activities that provided technical support to industry were included in the M&E Plan.

Monitoring and evaluation

The M&E Plan that was developed at the beginning of this project did not include any *Key Evaluation Questions* as determined in Hort Innovation's *Organisational Evaluation Framework* and detailed in the current M&E Plan template on the Hort Innovation website (2017 version). Monitoring and evaluation activities relied on surveys conducted at project activities that asked participants about their experience of the event and responses are provided based on these.

1 To what extent has the project achieved its expected outcomes?

In delivering the components of the Orchard Productivity Improvement Future Orchards component across the eight apple/pear growing regions, as well grower events (Speed updating/Technical day, Pear Masterclass, Postharvest seminar) that were consistently well attended and received positive feedback, this project has continued to facilitate the sharing of current and emerging innovations, adoption of new technologies and boosted capacity of apple and pear growers to advance Australian orchard production practices and improve global competitiveness of the Australian industry. In addition, the provision of technical support to growers, supporting services and organisations and researchers and the wider community in areas including crop protection stewardship, chemical regulation and access, business risk mitigation, postharvest improvements, pear production and biosecurity has provided support to the wider industry to ensure it continue to grow into the future.

The OBA*, conducted as part of AP15005, modelled increases in the average gross yield over this period increased from 47.2 t/ha in 2016 to 50.3 t/ha in 2019. This has achieved the 45 t/ha target identified at the beginning of this project. Class 1 packout yields for apples and pears from 33.0 t/ha (69 % of total yield) to 35.2 t/ha (70 % of total yield) in 2019. The 2020 season forecast was predicted to be lower (Class 1 packout of 30.5 t/ha; 71 % of total yield) and was attributed to seasonal cropping variability. The trend of high proportions of Class 1 packout demonstrates improvements in fruit quality.

2 How relevant was the project to the needs of intended beneficiaries?

Based on responses received to the evaluation surveys conducted at project events, the content delivered throughout the project has generally remained relevant to the needs of industry. Responses from participants were discussed at planning events, and where appropriate and relevant, feedback was used to guide future activities.

Changes in grower knowledge, attitudes, skills and aspirations are best demonstrated in the adoption of new practices and technologies by growers, engagement in project activities, and changes in yield and quality of apple and pears produced by growers. While no data was collected around the level of adoption of practices discussed or demonstrated, observations suggest a shift in orchard systems from traditional to modern, high density and planar/2D orchards, the increasing adoption of technologies such as platforms, leaf blowers and hedgers to improve labour efficiencies and fruit quality in the orchard, and the large investments in packhouses and fruit sorting technologies across the industry.

Satisfaction ratings for content and event format have been consistently high at greater than 4/5.

3 How well have intended beneficiaries been engaged in the project?

Surveys conducted at the end of project activities indicate that the intended beneficiaries, the apple and pear growers, have been highly engaged in the project and report their participation at events as being highly valuable. Attendance numbers at Future Orchards walks, speed updating, technical day, postharvest and the Pear Masterclass have been relatively consistent over the last 5 years and new participants attend each year. Grower participant in Community Orchard Groups has been active and recent feedback indicates that many growers would like the COG to be expanded to include more growers. Participation numbers and evaluation ratings have been discussed earlier in the report.

The project also engaged with apple and pear researchers including PIPS projects to extend relevant research outcomes to growers via Future Orchards events and APAL communications platforms.

4 To what extent were engagement processes appropriate to the target audience/s of the project?

Previous iterations of this project used paper evaluation forms that were handed out during grower engagement activities and relatively high response rates were achieved. This project moved to an online survey format using Survey Monkey, which was shared among participants on two iPads. The response rate was generally acceptable if the TM or FLA made sure the tablets were passed between growers. If this was not facilitated, responses were lower. At the March 2021 orchard walks, an SMS based survey was trialled, and this received no responses indicating that this was not an effective way in which to get feedback. Generally, the best feedback was received by speaking directly with growers following orchard walks or other activities or by calling them directly. In discussions with growers during and after the March orchard walks, many appreciated the additional time in the orchard to share experiences.

The evaluation conducted during the project focused largely on the experience of the respondent at an event, the information delivered by the presenters, and the perceived value of participating in the event. No data was collected to provide evidence of changes in practice or attitudes as a result of the information delivered. While it is useful to understand how an event/guest presenter was received so that future events can be improved upon, it is also useful to understand the rate/extent of adoption of the new information or technologies that are being shared. This could be improved upon in future iterations of the project.

5 What efforts did the project make to improve efficiency?

The movement of guests around the eight apple/pear growing regions to present and participate at orchard walks is expensive. However, being present in the growers' own region has been the most effective way in which to share information and knowledge with growers, and to focus on issues that are specific and relevant to their region. The COVID-19 pandemic year of 2020 meant that much of the activities had to be presented virtually. Several international guests were streamed in virtually to present a series of webinars. The cost savings from not being able to travel meant that AgFirst was subcontracted for the remainder of AP15005 to present virtually at orchard walks and to complete the 2020 OBA. While the disruptions to travel, and transition to virtual walks resulted in significant cost savings, growers have become 'zoom weary' and were keen to get together again. Moving forward, the experiences of 2020 mean that more people are familiar with virtual presentations and it is likely that a combination of face to face and virtual events, or hybrid activities, will be included in the future.

6 Other, if any, legacy: How and by whom would the legacy be managed?

The APAL website will continue to host the Future Orchards library and all content generated by the project which is freely available for anyone to access. The Future Orchards program will be continued with funding from APAL from July 2021.

Recommendations

- Future such projects could attempt to evaluate of the impact of the program on adoption, impact or change amongst growers, for example using Bennett's Hierarchy or similar methods, including such areas as the level of adoption of new technologies resulting from project activities. While more time consuming, more evaluation data was collected when participants were actively asked to complete surveys during orchard walks, rather than relying on a post-event SMS or online evaluation.
- Growers report interest in research and development investments in the following areas (amongst others):
    - Pollination under netting
    - Postharvest quality
    - New/modern rootstocks and varieties
    - Managing resistance to pesticides; and how widespread is this? This is important from the perspective of preserving pesticide longevity, and also biosecurity to ensure products are available and effective when they are required.
- Continue to share outcomes of relevant research projects through the Future Orchards program and APAL's communication platforms to ensure outcomes reach growers. Also engage with APAL and apple and pear growers to ensure that future R&D levy investments and projects are relevant to growers needs and provide practical outcomes to support orchard productivity.
- Activities need to target different audiences; for example, often it is the orchard owner who travels either abroad or interstate leaving the orchard manager to only see what they have on their own orchard and possibly their neighbour who may not be very advanced in modern orcharding anyway. However, often it is the orchard manager who has to implement any new orchard system or adopt the idea seen somewhere. Targeting activities to different workers will boost capacity throughout the entire production system.

Intellectual property, commercialisation and confidentiality

Project reports, including updates around MRLs, crop protection stewardship, biosecurity, that were presented to the APAL Board, as per the M&E Plan, are considered confidential and are not submitted with this report. Communications related to the EPPRD and CCEPP around biosecurity incursions are also considered confidential and not reported here. The OBA is also a document made available on request to levy payers and is not presented here.

No other project IP, project outputs, commercialisation or confidentiality issues to report.

References

All material produced for growers and industry through this project can be viewed on the APAL Future Orchard archive library on the APAL website; https://apal.org.au/programs/future-orchards/archive-library/

Acknowledgements

The success of this project can be credited to many people who have worked hard both during this current project, and since the program's inception almost 20 years ago. Thanks go to previous Technical Managers at APAL Jesse Reader and Angus Crawford and others, APAL staff, Alma Reynolds at SPW Solutions, the Front Line Advisors Stephen Tancred, Kevin Dodds, Jessica Fearnley, Michael Crisera, Camilla Humphries, Paul James, Susie Murphy-White, Nic Finger and Sophie Folder who play an important role in the success of the project over so many regions, AgFirst, the regional COG members, guest presenters who gave their time to commit to what was often a gruelling travel schedule, and most of all the growers who have opened their orchards and shared their experiences with others.

Appendices

Appendix I. Monitoring and Evaluation Plan

Monitoring and Evaluation Plan AP15004 & AP15005

1. Introduction

This plan is for two Horticulture Innovation Australia and Apple & Pear Industry funded projects. AP15005 Delivery of Apple & Pear Future Orchards Extension Program covers all technical aspects of the Future Orchards project delivered by AgFirst. This includes items such as orchard walks, focus orchards, use of OrchardNet to record orchard performance, annual orchard business analysis, pear masterclasses, extension of PIPS outcomes, some communications activities, and input into regional trials. Successful outcomes of many aspects of AP15005 are dependent upon the inputs included in AP15004. These inputs are appointment and management of Front Line Advisors, communications, monitoring and evaluation, stakeholder engagement and planning and reporting. AP15004 also includes apple and pear industry functions apart from the Future Orchards activity. The two projects are intertwined and interdependent and so several aspects of the reporting activities for them will be joint documents, such as this one.

Both AP15004 and AP15005 contain aspects of previously established projects funded by industry R&D levies and government funds administered through Horticulture Innovation Australian (HIA).

Monitoring and evaluation has been an ongoing feature of all aspects of the previous projects and the entities managing and delivering the projects expect that the established M&E procedures will continue into the new projects.

This M&E plan outlines the methodologies used to measure the impact, effectiveness, appropriateness, efficiency and legacy of program activities. This plan will be embedded and form part of the continuous improvement of the program and provide evidence of what the project has achieved over time.

2. Monitoring and Evaluating Activities

Project	Activity (What will be assessed?)	Who will be involved (who will be asked to judge the effectiveness / success of the activity)?	Method (How will it be assessed?)	When (At what time will the assessments be carried out?)	Responsibility (which member of the project team is responsible for the assessment)?
AP15005	Orchard Walks	Participants	Questionnaire	Immediately after	Alma R
AP15005	Orchard Walks	Front Line Advisors	Questionnaire	Immediately after	Alma R
AP15005	Orchard Walks	APAL Staff	Questionnaire	Immediately after	Alma R
AP15005	Orchard Walks	AgFirst personnel	Written report	Immediately after	AgFirst

AP15005	Focus Orchards	Focus orchardists	Questionnaire	At the end of appointment (i.e. mid way through project and at the end)	Alma R
AP15005	OrchardNet	Orchardists	Monitoring usage	On-going	AgFirst
AP15005	Pear Master Class	Participants	Questionnaire	Immediately after	Angus C
AP15005	R&D Extension	Participants	Questionnaire	Immediately after	Alma R
AP15005	Magazine articles	OW participants	Questionnaire	Annually	Alma R
AP15005	Website content	OW participants	Questionnaire	Annually	Alma R
AP15005	BDG Newsletters	OW participants	Questionnaire	Annually	Alma R
AP15005	Orchard trials	Members of the Community Orchard Group	Facilitated focus discussion with COG	Annually in September/October	Angus as facilitator Alma as collator
AP15004	Overseas Insights Missions	Participants	Questionnaire	Immediately after	Angus C
AP15004	Leadership of Future Orchards	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Alma & Angus

AP15004	Grower services and technical support	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Alma & Angus
AP15004	Crop Protection Stewardship, chemical regulation and access	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Alma & Angus
AP15004	Project reference group with PIPS	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Angus & Alma

3. Monitoring & Evaluation Outputs

Project	Output (What will be assessed?)	Who will be involved (who will be asked to judge the effectiveness / success of the activity)?	Method (How will it be assessed?)	When (At what time will the assessments be carried out?)	Responsibility (member of the project team responsible)
AP15005	Orchard Business Analysis	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board.	Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board.
AP15005	Trial reports	Community Orchard Group	Facilitated focus discussion with COG	Annually in June or as appropriate for the trials	Angus as facilitator Alma as collator
AP15005	Website content	Orchard walk participants	Data on number of visits to Future Orchards library	On-going reported with Milestones.	Alma collecting info from Sophie.
AP15005	Magazine articles	Orchard walk participants	Questionnaire	Annually	Alma R
AP15004	Adoption / engagement targets	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per	Angus C Angus C Angus C Angus & Alma

				year. (see Stakeholder Engagement Plan) Milestone reports as agreed	
AP15004	Report on skills and R&D gaps identified through grower upskilling & capacity building activities.	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Angus & Alma

4. Monitoring & Evaluation Outcomes

Project	Outcome (What will be assessed?)	Who or what will be involved (who will be asked to judge the effectiveness / success of the activity)?	Method (How will it be assessed?)	When (At what time will the assessments be carried out?)	Responsibility (which member of the project team is responsible for the assessment)?
AP15005 & AP15004	Harvest ≥ 45 t/ha	Orchard BDG	Data collection and analysis from OBA.	Annually	Data gathering: AgFirst Reporting: Alma
AP15005 & AP15004	Pack ≥ 73% class 1 fruit	Orchard BDG	Data collection and analysis from OBA	Annually	Data gathering: AgFirst Reporting: Alma

AP15005 & AP15004	Grow a commercially sound variety mix;	Focus orchardists OBA & Tree registry	Questionnaire Report on variety trends over time in Milestone report Case studies (RW)	At the end of appointment (i.e. mid way through project and at the end) Annually As appropriate through the project	Alma: Questionnaire AgFirst: Case studies
AP15005 & AP15004	Harvest at maturities appropriate for the ultimate market window	Focus orchardists	Case studies (RW)	As appropriate through the project	AgFirst
AP15005 & AP15004	Control pests and diseases effectively within MRL allowances	MRL reports from National Residue Survey	Independently collected from randomly selected points in the supply chain	Annually	Angus
AP15005	Be investigating and taking up export opportunities.	All growers through official export data	Analysis of export data from Fresh Intelligence Report	Annually	Report prepared by Wayne Prowse of HIA

AP15004	Grower upskilling & capacity building. 1. Overseas insight mission	Participants of the activities	Questionnaire	Immediately after each activity	Angus

	2. Australian insight missions				
AP15004	Improving grower crop and business risk mitigation strategies	APAL CEO as part of ongoing project input; Project Reference Group and HIA. Tree registry	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports Report on changes to netting cover over time included in Milestone.	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed 2. At the end of appointment (i.e. mid way through project Annually	Angus C Angus C Angus C Angus & Alma Alma: Questionnaire Angus C
AP15004	Facilitation of R&D and innovation outcomes	APAL CEO as part of ongoing project input; Project Reference Group and HIA. 2. Speed updating participants	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports Questionnaire on Speed updating	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed 2. Immediately after	Angus C Angus C Angus C Angus & Alma Angus C

AP15004	Biosecurity preparedness	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Angus & Alma
AP15004	Post harvest productivity improvement	APAL CEO as part of ongoing project input; Project Reference Group and HIA. 2. Post Harvest Seminar participants	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports 2. Questionnaire on Post Harvest Seminar	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed 2. Immediately after	Angus C Angus C Angus C Angus & Alma Angus C

AP15004	Technical preparedness for export	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan) Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Angus & Alma
AP15004	Target audience and stakeholder engagement	APAL CEO as part of ongoing project input; Project Reference Group and HIA.	Reports to APAL CEO and APAL Board. Reports to Project Reference Group. (see Stakeholder Engagement Plan). Milestone Reports	Informal reporting to APAL CEO. Formal reporting to APAL Board 4 to 6 times per year at scheduled meetings Formal reporting to Project Reference Group twice per year. (see Stakeholder Engagement Plan) Milestone reports as agreed	Angus C Angus C Angus C Angus & Alma

5. Project Reference Group (PRG)

A Project Reference Group (PRG) will be established at the commencement of the project to provide guidance to APAL for the duration of the project. The PRG will meet by teleconference twice per year and will provide a communication platform and align apple and pear programs AP15004, AP15005 & the PIPS (Productivity Irrigation Pests and Soils) program. The PRG will consist of;

· Two Horticulture Innovation Australia representatives;

· APAL representative (APAL CEO);

· Two levy payer representatives;

Other project team members will participate in the PRG meetings, as required. Opportunities to meet face to face at industry events will be taken where possible. The project will cover the cost of the teleconferences and may also cover costs of face to face meeting should the need arise. PRG meetings are a forum for the project team to outline progress, issues and challenges faced and canvass any additional guidance that may be required to deliver the project. They are also an opportunity for the PRG to provide feedback, ask questions about the status of project deliverables, provide input to operational plans and review other matters as required. Project management personnel will provide reports on the matters noted in the table above. Minutes will be taken for each meeting with recommendations incorporated into the program and reported back through milestones.

While PIPS has its own internal governance process, where researchers meet face to face, it does not have a forum where growers and other stakeholders can be engaged with the program. The PRG will be able to provide this engagement to PIPS and provide PIPS personnel an opportunity to update key stakeholders. The meeting agendas will be managed carefully to ensure that, should it be deemed inappropriate for certain members of the PRG to be involved in certain aspects of the discussion, those items will be listed at the end of the meeting so the participants can be monitored accordingly.

Please see Stakeholder Engagement Plan for further details.

6. Mid-term Review

At about the mid-point of the two projects (AP15004 and AP15005) an independent review will be commissioned by APAL. APAL will engage a suitably qualified and independent consultant to review all aspects of both projects and to comment upon those project aspects which are working well and those which could be improved. All recommendations from the review will be discussed by the Project Advisory Committee and the management personnel of both projects with a view to implementation.

This activity has been included in the project budget.

7. Questionnaires

From the commencement of AP15004, the project management team has decided to change questionnaires from paper based to on line responses using Survey Monkey. Like the paper based questionnaires used throughout the Future Orchards project history, the questions will mostly be multiple choice or requiring only very short, one or two word answers. Early experience in the project indicated very clearly that growers are most reluctant to answer open-ended questions.

To provide the ability to compare all questionnaire results, the format used for the orchard walk events will continue to follow the same general format as has been used previously. At each event there is the ability to include extra questions such as those scheduled for annual inclusion (see above) or any others that the project management team would like to put to participants, especially to assist in indicating the growers' needs and expectations.

Questionnaires for the June 2016 Orchard Walk can be viewed at https://www.surveymonkey.com/r/FKFV82Y (participants' survey); https://www.surveymonkey.com/r/F9MSCNV (FLAs' survey); and https://www.surveymonkey.com/r/FY53DGR APAL Technical Manager's survey.

Other participatory activities such as overseas insights missions, Australian insights missions, pear masterclasses, and post- harvest seminars will also be evaluated using on-line questionnaires which will adopt a similar format to those used for Future Orchards orchard walks.

8. Other Reporting

Project Milestones will include reference to all the other forms of evaluation and include attachments or links to show the original documentation on which reporting has been based.

9. M&E Timetable

Year 1

Month	M&E Activity
April 16	None
May 16	Regional trials evaluated by COG (or June)
June 16	Orchard walk questionnaires including questions about magazine articles and the website; Speed Updating evaluation.
July 16	None
August 16	None
September 16	Orchard walks questionnaire including questions about the success of the first year's theme and BDG newsletter. Milestone report.
October 16	None
November 16	None
December 16	None

January 17	None
February 17	None
March 17	Orchard walk questionnaires.

Year 2

Month	M&E Activity
April 17	Milestone report
May 17	Regional trials evaluated by COG (or June)
June 17	Orchard walk questionnaires including questions about magazine articles and the website; Speed Updating evaluation.
July 17	None
August 17	None
September 17	Milestone report.
October 17	None
November 17	Orchard walk questionnaires including questions about the success of the second year's theme and BDG newsletter.
December 17	None
January 18	None
February 18	None
March 18	None

Year 3

Month	M&E Activity
April 18	Milestone report
May 18	Regional trials evaluated by COG (or June). Mid- term review commenced.
June 18	Orchard walk questionnaires including questions about magazine articles and the website; Speed Updating evaluation.
July 18	Focus orchard questionnaires for first half focus orchardists including questions on the experience of being a focus orchardist and varietal mix
August 18	Mid-term review report completed.
September 18	Orchard walk questionnaires including questions about the success of the third year's theme and BDG newsletter. Milestone report.
October 18	None
November 18	None
December 18	None
January 19	None
February 19	None
March 19	Orchard walk questionnaires.

Year 4

Month	M&E Activity
April 19	Milestone report
May 19	Regional trials evaluated by COG (or June)
June 19	Orchard walk questionnaires including questions about magazine articles and the website; Speed Updating evaluation.
July 19	None
August 19	None
September 19	Milestone report.
October 19	None
November 19	Orchard walk questionnaires including questions about the success of the fourth year's theme and BDG newsletter.
December 19	None
January 20	None
February 20	None
March 20	None

Month	M&E Activity
April 20	Milestone report
May 20	Regional trials evaluated by COG (or June)
June 20	Orchard walk questionnaires including questions about magazine articles and the website; Speed Updating evaluation.
July 20	Focus orchard questionnaire for second half focus orchardists including questions on the experience of being a focus orchardist and varietal mix
August 20	None
September 20	Orchard walk questionnaires including questions about the success of the final year's theme and BDG newsletter. Milestone report.
October 20	None
November 20	None
December 20	None
January 21	None
February 21	None
March 21	None
April 21	Milestone report. Final Report.

Appendix II. Orchard walk topics, guests, details of evaluations and links to presentations

Year	Date	Presenter	Presentation title	Link to presentation
1	Jan 2016	Jonathan Brookes, AgFirst (North) Craig Hornblow, AgFirst (South)	Harvest labour management.	https://apal.org.au/wp-content/uploads/2019/09/LABOUR-HARVEST-JBv-Final-web.pdf https://apal.org.au/wp-content/uploads/2019/09/AgFirst-Notes-for-FO-Jan-2016-Orchard-Walk.pdf
		Mauricio Frias (Chile) (N)	Mechanization of apple and pear orchards" looking at a huge number of mechanical labour-saving options	https://apal.org.au/wp-content/uploads/2019/09/Mauricio-Frias-Future-Orchards-Mar2015-1.pdf https://apal.org.au/wp-content/uploads/2019/09/Mauricio-Frias-Future-Orchards-Mar2015-2a.pdf https://apal.org.au/wp-content/uploads/2019/09/Mauricio-Frias-Future-Orchards-Mar2015-2b.pdf https://apal.org.au/wp-content/uploads/2019/09/Mauricio-Frias-Future-Orchards-Mar2015-4.pdf
		Nigel Swarts, University of Tasmania (S)	PIPS nutrition research specifically nitrogen its role, movement in the soil and need in the plant	Not available.
	June 2016	Ross Wilson (N)	Designing Labour Efficient Canopies – presentation Designing Labour Efficient Canopies – notes	https://apal.org.au/wp-content/uploads/2019/09/Labour-efficient-canopies-AgFirst-June-2016-presentation-small.pdf https://apal.org.au/wp-content/uploads/2019/09/Labour-efficient-canopies-AgFirst-June-2016-notes.pdf
		Steve Sparks (S)	Platforms for increased Labour Efficiency – presentation Platforms for increased Labour Efficiency – notes	https://apal.org.au/wp-content/uploads/2019/09/Platforms-for-labour-efficiency-AgFirst-June-2016-presentation-small.pdf https://apal.org.au/wp-content/uploads/2019/09/Platforms-for-increased-labour-efficiency-June-2016-AgFirst-notes.pdf
		Tienie Dupreez (N)	Precision management of apple nutrition in poor and variable soils – presentation Precision management of apple nutrition in poor and variable soils – notes	https://apal.org.au/wp-content/uploads/2019/09/Precision-management-of-apple-nutrition-in-poor-and-variable-soil-notes-du-Preez.pdf https://apal.org.au/wp-content/uploads/2019/09/Precision-management-of-nutrition-in-poor-and-variable-soils-du-Preez-June-2016-presentation-part-1.pdf

			Orchard Nutrition Tips with Tienie du Preez – video	https://apal.org.au/wp-content/uploads/2019/09/Precision-management-of-nutrition-in-poor-and-variable-soils-du-Preez-June-2016-presentation-part-2.pdf https://www.youtube.com/watch?v=oVe0VeE6Ku0
		Marcel Veens (S)	Designing Labour Efficient Canopies – presentation	https://apal.org.au/wp-content/uploads/2019/09/Future-Orchards-Labour-Efficient-Canopies-M-Veens-June-2016-presentation-small.pdf
	Responses to the participants' survey continue to demonstrate the importance of the Future Orchards™ project and the orchard walk events. Highlights of the survey are: • • Over 95% of participants found the presentations and the opportunity to visit the venue either "valuable" or "of some value". • • Of those to who the question was relevant, 99% indicated they would attend future events • • Of those to who the question was relevant, 99% indicated they learnt something that will work in their orchard or business. • • Of those to who the question was relevant, 95% indicated they learnt something they would definitely implement in their orchard or business. • • More than 98% of attendees rated the organisational aspects of the event excellent or good. In accordance with the Monitoring and Evaluation Plan, questions were asked about the participants' views of the Future Orchards™ articles in the Australian Fruit Grower Magazine. More than 84% of responders indicated that they read the articles in the magazine either all the time, when they seem relevant or occasionally. Nearly 14% of responders indicated that they don't see the magazine. It is assumed this is because they are employees of a company that does not make the magazine available to them. Also, in accordance with the Monitoring and Evaluation Plan, this survey included questions about the Future Orchards™ on-line library. More than 55% of responders indicated that they go to the library often or occasionally. A further 9% indicated that they had been to the library once. Nearly 16% of responders indicated that they knew of the library but had never visited and 20% said they didn't know the library existed. I t is expected that further efforts to raise the expose of the library and the decision to remove the password protection will increase library usage. Library usage is higher than it was the last time this survey question was asked			
	Sept 2016	Jonathan Brookes (N) Steve Spark (S)	Future labour: Crop Load Optimisation Crop Load Optimisation, Chemical Thinning and Biennial Bearing and Effects on Labour	https://apal.org.au/wp-content/uploads/2019/09/Crop-load-Optimisation-Apal-16-Sept-2016.pdf https://apal.org.au/wp-content/uploads/2019/09/Future-labour-crop-load-optimisation-notes.pdf
		Brett Feehan (N&S)	PIPS 2 (Productivity, Irrigation, Pests & Soil) Research Update	https://apal.org.au/wp-content/uploads/2019/09/PIPS-2-update-Brett-Feehan.pdf
	81 surveys were completed from 220 attendees – a response rate of 37%. This return rate is lower than that experienced using "pen and paper" surveys and also lower than for the previous round of orchard walks. Responses to the participants' survey continue to demonstrate the importance of the Future Orchards project and the orchard walk events			

<table>
<tr><td></td><td colspan="4">Highlights of the survey:

• Over 95% of participants found the AgFirst presentations “valuable” or “of some value”.
• Over 80% of participants found the AgFirst guest presentation (PIPS) “valuable or “of some value”.
• More than 90% of responders found the in-orchard presentations, and the opportunities to visit the host property and network with other growers “valuable” or “of some value”.
• Of those to who the question was relevant, 100% indicated they would attend future events
• Of those to who the question was relevant, 95% indicated they learnt something that will work in their orchard or business.
• Of those to who the question was relevant, 96% indicated they learnt something they would definitely implement in their orchard or business.
• More than 92% of attendees rated the organisational aspects of the event excellent or good
In accordance with the Monitoring and Evaluation Plan, questions were asked about the participants’ views of the OrchardNet newsletters.
The responses regarding the Newsletter were somewhat confused. The Newsletter in question is sent directly to OrchardNet users. Other orchardists receive it either through the Future Orchards website or through the APAL e-zine “Industry Juice”. 46% of responders recall having seen the Newsletter. While only 39% of relevant responders are users of OrchardNet, 91% of responders found the Newsletter to be interesting and/or valuable. This result indicates that non-users of OrchardNet see and read the Newsletter and find it of value. This could easily be correct as many orchardists use alternative farm record keeping methods, but would still find the OrchardNet information of interest as a benchmark for their own performance.
To assist the project management team, participants were also asked about the annual Future Orchards theme. The responses regarding the theme for the first year of the project indicate that, of those who felt they were in a position to answer the question, 98% felt “Future Labour – needs, skills, management, mechanisation” was covered very well or adequately.</td></tr>
<tr><td rowspan="3">2</td><td rowspan="3">March 2017</td><td>Ross Wilson (N)
Craig Hornblow (S)</td><td>Future Trees</td><td>https://apal.org.au/wp-content/uploads/2019/08/Future-Trees.pdf</td></tr>
<tr><td>Dr David Williams, Agriculture Victoria (N)</td><td>Enhancing the robustness of IPM programs for apple and pear orchards</td><td>https://apal.org.au/wp-content/uploads/2019/09/Orchard_Pest_Management_Future_Orchards_Northern_Loop_farm_walks_March_20171.pdf</td></tr>
<tr><td>Dale Goldy, Stemilt Ag Services USA (S)</td><td>Young tree development, brand promise and profitability</td><td>https://apal.org.au/wp-content/uploads/2019/09/2017_APAL_Southern_Orchard_Walk_-_Dale1.pdf</td></tr>
<tr><td></td><td colspan="4">141 surveys were completed from 235 attendees – a response rate of 60%. This return rate compared with the previous 34% provides encouragement to continue with electronic survey methods.</td></tr>
</table>

<table>
<tr><td></td><td colspan="4">An attendance of 235 overall is a good number for this time of the year. Orchard walk events held during the harvest period are usually less well attended as many growers feel unable to spend time away from their business. Having a quality international guest like Dale Goldy was probably the major factor at play and in fact, this event attracted more participants than the September 2016 round.

Responses to the participants' survey continue to demonstrate the importance of the Future Orchards project and the orchard walk events. Highlights of the survey are:

• Over 99% of participants found the AgFirst presentations "valuable" or "of some value".
• Of those who thought the question applicable, over 99% found the in-orchard presentations
• Over 97% of participants found the guest presenter's presentation to be "valuable" or "of some value".
• More than 91% found the opportunities to visit the host property and network with other growers "valuable" or "of some value".
• Of those to who the question was relevant, 96% indicated they learnt something that will work in their orchard or business.
• Of those to who the question was relevant, 94% indicated they learnt something they would definitely implement in their orchard or business.
• More than 93% of attendees rated the organisational aspects of the event excellent or good
• Of those to who the question was relevant, 99% indicated they would attend future events

The Monitoring and Evaluation Plan for this project did not require any specific questions to be asked in this round of orchard walks, so the AgFirst team took the opportunity to request some questions about OrchardNet. The results were:

• 34% of the responders who thought the question relevant indicated they were users of OrchardNet
• 67% of the responders who thought the question relevant indicated they were not users of OrchardNet but would like to be
• 41% of the responders who thought the question relevant indicated they were aware of the new Focus Orchard Data section of OrchardNet
• 21% of the responders who thought the question relevant indicated they had logged in to the new Focus Orchard Data section of OrchardNet</td></tr>
<tr><td></td><td>June 2017</td><td>Jonathan Brookes (N)
Steve Spark (S)</td><td>What variety should I plant?</td><td>https://apal.org.au/wp-content/uploads/2019/08/AgFirst-What-Variety-Should-I-Plant-slides.pdf
https://apal.org.au/wp-content/uploads/2019/08/June-2017-Future-Orchard-Walk-Notes.pdf</td></tr>
<tr><td></td><td></td><td>Michael Weber, Germany (N)</td><td>Apple Brands – factors of success</td><td>https://apal.org.au/wp-content/uploads/2019/08/Apple-brands-factors-of-success-Michael-Weber.pdf</td></tr>
<tr><td></td><td></td><td>Sally Bound, Utas (S)</td><td>PIPs 2 Research update particularly ASE</td><td>https://apal.org.au/wp-content/uploads/2019/09/PIPS-2-June-2017-presentation.pdf</td></tr>
<tr><td></td><td>Nov 2017</td><td>Ross Wilson (N) and Craig Hornblow (S)</td><td>Orchard Business Analysis 2017 and Variety</td><td>https://apal.org.au/wp-content/uploads/2019/09/OBA-and-variety-performance-November-2017.pdf</td></tr>
</table>

				https://apal.org.au/wp-content/uploads/2019/09/Orchard-Business-Analysis-2017-Ross-Wilson-Notes-for-presentation-no-costs.pdf
		Tom Auvil, North American Plants USA (N)	What's Next? Future Varieties, Practices and Cost of Establishment	https://apal.org.au/wp-content/uploads/2019/08/Whats-next-Tom-Auvil-Future-Orchards-Nov-17.pdf
		Nicola Dellabatta, Foundation Edmund Mach (FEM) Technology Transfer Centre, Italy	Innovative Rootstocks for Apple Crops	https://apal.org.au/wp-content/uploads/2019/08/Innovative-Rootstocks-for-Apple-crop.pdf
	75 surveys were completed from 224 attendees – a response rate of 33%. This return rate is lower than that experienced using "pen and paper" surveys and also lower than for the previous rounds of orchard walks. Responses to the participants' survey continue to demonstrate the importance of the Future Orchards project and the orchard walk events. Highlights of the survey are; • Over 97% of participants found the AgFirst presentations "valuable" or "of some value". • Over 97% of participants found the guest presentations "valuable" or "of some value". • More than 98% of responders found the in-orchard presentations, and the opportunities to visit the host property and network with other growers "valuable" or "of some value". • Of those to who the question was relevant, 100% indicated they would attend future events • Of those to who the question was relevant, 95% indicated they learnt something that will work in their orchard or business. • Of those to who the question was relevant, 97% indicated they learnt something they thought would work in their orchard or business. • More than 99% of attendees rated the organisational aspects of the event excellent or good.			
3	June 2018	Ross Wilson (N) and Steve Spark (S)	Improving fruit quality presentation Prune for quality presentation Prune for quality notes	https://apal.org.au/wp-content/uploads/2019/09/FO-winter-2018-Fruit-quality-AgFirst.pdf
		Mark Ericksen (NZ)	Passion for Quality	Not available due to website update
		Stefano Musachi (USA)	Optimise Pruning and fruit quality in apple orchards part 1 Optimise Pruning and fruit quality in apple orchards part 2	https://apal.org.au/wp-content/uploads/2019/09//FO-winter-2018-Apple-Stefano-Musacchi-web-part1.pdf https://apal.org.au/wp-content/uploads/2019/09/FO-winter-2018-Apple-Stefano-Musacchi-web-part2.pdf

192 surveys were completed from 354 attendees – a response rate of 54%. This return rate is a significant improvement on the previous event.

The findings were that 85% of responders had previously attended and Orchard Walk event and 15% were new attenders. This demonstrates that, despite its longevity, the Future Orchards project is still attracting new participants.

99% of all responders indicated they would attend a Future Orchards event in the future.

When asked about the value of the event the responses were as follows;

- Excellent – I always learn something useful at these events – 47%
- Good – I usually learn something useful at these events – 41%
- OK – I sometimes learn something useful at these events – 7%
- Unsure as this is the first time I have attended – 4%
- No answer – 1%

Attenders represented a broad range of industry participants including:

- Owner or part owner of an orchard business – 36%
- Employee of an orchard business – 34%
- Provider of goods or services to the orchard industry – 9%
- Employees of a government department – 7%
- Consultants to the orchard industry – 5%
- Others – 6%

The questionnaire also asked about Future Orchards articles appearing in APAL publications and usage of the Future Orchards library. The responses to those questions have been reported in the relevant sections of this document.

FLAs were also asked to provide feedback on the event. They report that interest is still high among growers as attested by the high number of participants this time, with half the venues reporting attendance of 50 or more and five venues indicating that the attendees represented 50% or more of local production

Sept 2018	Jonathan Brooks (N) and Craig Hornblow (S)	Eating quality	https://apal.org.au/wp-content/uploads/2019/09/Eating-Experience-Trial-Sept-2018-.pdf
	Ross Wilson (N)	PIPS 2 Sept 2018 Update	https://apal.org.au/wp-content/uploads/2019/09/PIPS-2-June-2018.pdf
	Brad Fankhauser (S)	Striving for Quality	https://apal.org.au/wp-content/uploads/2019/09/Fankhauser-apples-presention-2-Future-Orchards.pdf

	117 responses were received from 256 attendees giving a response rate of 45%. The findings were that 82% of responders had previously attended and Orchard Walk event and 18% were new attenders. This demonstrates that, despite its longevity, the Future Orchards project is still attracting new participants. FLAs report that interest in the presentations was generally high to very high. Attendance was lower than in June but acceptable for the time of year – in many regions the event was held when the weather was ideal for crop spraying. Timing of orchard walk events is always a fine balance between important points in the production cycle and the demands on growers' time. All FLAs thought the event was well organised. The interactive session, which involved fruit tasting and assessing quality was well received and many FLAs suggested more interactive sessions be included in future events			
3	March 2019	Ross Wilson (N) and Steve Spark (S)	Climate Impacts on Quality	https://apal.org.au/wp-content/uploads/2019/08/Climate-Impacts-on-Quality-Steve-Spark-1.pdf
		Robert Weidner (Italy) (S)	Influences on Fruit Quality in the South Tyrol	Not available
		Rick Derry (USA) (N)	Modern Variety Management for Quality	https://apal.org.au/wp-content/uploads/2019/08/Modern-variety-management-for-quality-Rick-Derrey.pdf
	Of 221 attendees, 74 (33%) evaluation responses were received. The responses received indicate the extent to which growers value the Orchard Walk events. 93% rated the event they attended as excellent or good value and 3% were not sure as this was the first event they had attended. Of the attendees, 61% were owners or part owners of an orchard business or employees of an orchard business. 27% were providers of goods or services to orchards (including consultants). The remaining 15% were either government employees or "other". The orchard walks continue to attract new participants with 22% being first time attenders. FLAs all indicated that the interest level in every presentation was either "high" or "very High". They rated the success of the event in each in their respective regions as "excellent" or "good".			
	June 2019	Jonathan Brookes (N) and Dean Rainham (S)	Climate Mitigation Strategies	Not available
		Prof Stephanie Midgely, South Africa (N)	Adapting to climate change in a hot dry climate	Not available
		Ross Wilson (S)	PIPS 2 June 2019 Update	Not available
	Nov 2019	Nic Finger (N) and Craig Hornblow (S)	Future Technology for the modern orchard	https://apal.org.au/wp-content/uploads/2019/08/Future-Orchards-Future-Technology-for-the-Modern-Orchard-Nov-2019.pdf
		Rob Blakey, Stemilt USA (N)	AgTech used in orchards in Washington State USA	https://apal.org.au/wp-content/uploads/2019/08/APAL-Future-Orchards-Blakey-November-2019.pdf

		Dirk van Hees, Fruit Consult	Agtech used in the Netherlands	https://apal.org.au/wp-content/uploads/2020/04/Growing-technics-and-mechanisation-of-the-near-future.pdf
		Angus Hogan	Autonomous Agriculture	https://apal.org.au/wp-content/uploads/2019/08/FOW_November_SwarmFarm.pdf
4	June 2020; streamed individually to each region	Jonathan Brookes (N) and Steve Spark (S)	What is orchard excellence now and into the future? Example of online recording from Tasmania	https://apal.org.au/wp-content/uploads/2019/08/Jonathan-Brookes_Future-Orchards-June-2020.pdf https://apal.org.au/wp-content/uploads/2019/08/Future-Orchards-Future-Orchards-Southern-Loop-June-2020-Steve-Sparks.pdf https://www.youtube.com/watch?v=GddrbPkuoUk
		Dr Nigel Swarts, Utas	Improved water and nutrient use efficiency for apple orcharding, PIPS update	https://apal.org.au/wp-content/uploads/2019/08/Future-Orchards-pres_Swarts_2020_final.pdf
		Ross Wilson	PIPS2 extension update	https://apal.org.au/wp-content/uploads/2019/08/PIPs-2-update-Ross-Wilson-June-2020.pdf
		Virtual walks in New Zealand	Sunpeach orchard, NZ	https://youtu.be/2XzxtsAAHJk
			Hoddy's Fruit Co, NZ	https://youtu.be/37wMQ14Mfag
			The Pines, NZ	https://youtu.be/G06gmn5cHNU
	September 2020; streamed too 'north' and 'south' loops	Ross Wilson and Craig Hornblow (all regions)	Managing your orchard in a global pandemic Decision tree for Labour	https://apal.org.au/wp-content/uploads/2019/08/Future-Orchards-spring-walks-presentation-AgFirst-Managing-your-Orchard-in-a-Global-Pandemic-.pdf https://www.youtube.com/watch?v=B5R4icrVEF8 https://www.youtube.com/watch?v=18-SYMdlUdc https://apal.org.au/wp-content/uploads/2019/08/Decision-Tree-Labour-in-a-Global-Pandemic-HIA.pdf

		Jessica Fearnley, FLA Orange	Orange update – Stoneleigh Orchards	https://www.youtube.com/watch?v=m6TkGjKnF6A
		Kevin Dodds, FLA Batlow	Batlow Trial – Earwig monitoring demo	youtube.com/watch?v=ynrGADzSNqQ
		Michael Crisera, FLA Goulburn Valley	Goulburn Valley update – Turnbull Orchards	https://www.youtube.com/watch?v=tl7c2YnGRfg
		Susie Murphy-White, FLA WA	WA trial update – apples on apples	https://www.youtube.com/watch?v=lstmIgfohEo
		Soil health and replant disease	Camilla Humphries, FLA Southern Victoria	https://www.youtube.com/watch?v=SDZbtiesZFY
	Nov 2020	Nic Finger and Jonathan Brookes Videos : Summer pruning in apples Hedging demonstration	Summer orchard management	https://apal.org.au/wp-content/uploads/2019/08/Summer-Orchard-Management-Nov-2020-FINAL-updated.pdf https://www.youtube.com/watch?v=n8bo0zwmmf0 https://www.youtube.com/watch?v=H8Y9JG2Movk https://www.youtube.com/watch?v=K5ubiTedYp0
	For the November virtual orchard walk event, 80 people registered and 58 attended 45% of which were growers. For this event 14 evaluation surveys were completed; three from Southern Victoria, two from South Australia, one from Tasmania and one from Western Australia. All those who returned surveys had attended a Future Orchards event in the past and indicated they would attend future events. On a rating scale of 1 to 5, 11 responders rated the experience of attending 4 or 5 and all the responders rated the quality of the presentations 4 or 5. When asked the value of the experience all rated it as either “very good” (I learnt something I may be able to use in my business) or “excellent” (I learnt something I will use in my business). All responders rated the event as “successful’ (the topics were well presented) or “very successful” (the topics were clearly presented and delivered on their objectives). Five responders heard about the event from an item in *Industry Juice* and seven by direct email from the FLA, one from social media and one by message from the relevant state association.			

<table>
<tr><td></td><td colspan="4">Suggested topics for future presentations included

• Adapting the orchard to platform use
• Labour use
• System changes
• New research emanating from levy funded projects
Further comments were:

• Very succinctly summarized and well presented. Hopefully got a good number of growers viewing
• The videos worked well to break up the presentation. Good relevant content and interesting presenters.
• It is really important to think about your business and plan. Good to see these topics explored – relevant every year. Labour and other resource planning is a big part of our business.
• Maybe the program should not necessarily refer to walks – it is business planning, business opportunities on the orchard or elsewhere within the business.
• Sorry I missed half of the Orchard Walk, but I found the videos very laggy [sic.]. Nic and Jonathan did a great job presenting.</td></tr>
<tr><td rowspan="3">5</td><td>Jan 2021</td><td>Jonathan Brooks and Steve Spark, on-demand webinar</td><td>Managing harvest in a global pandemic
Platforms for orchard labour
Managing vigour and crop load to increase profit</td><td>https://apal.org.au/future-orchards-virtual-walk-january-2021/
https://www.youtube.com/watch?v=MGXxz-FNUro
https://www.youtube.com/watch?v=ouJ_tqaydy8</td></tr>
<tr><td colspan="4">This orchard walk was not a live event, instead it was an on-demand presentation released via APAL website and launched in Industry Juice, therefore there was no formal post-participation evaluation undertaken. The statistics for participation are:

• 384 views of which 294 unique views
• 10% of viewers watched the entire video.
This on-demand video presentation focussed strongly on the forthcoming harvest and included discussion of the following topics;

• Planning and prioritising tasks when labour availability is uncertain
• Determining the optimal harvest window for each variety and each block
• Prioritising labour allocation to the most profitable blocks
• Optimising labour efficiency by training, mentoring and capacity evaluation.</td></tr>
<tr><td>March 2021</td><td>Ross Wilson and Craig Hornblow</td><td>AgFirst presentation: Labour, labour, labour
Lessons Learnt from the Global Pandemic and a Vision of Improvement Going Forward</td><td>https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-Mar-2021-AgFirst-presentation-slides.pdf
https://www.youtube.com/watch?v=cdpYBE0Qovs

https://www.youtube.com/watch?v=mvUTw5InKAE</td></tr>
</table>

			Reviewing platforms at harvest	
		Stanthorpe	Stephen Tancred, Brevis trial update Phytech irrigation presentation	https://apal.org.au/wp-content/uploads/2019/08/Brevis-a-good-thinner-on-minor-varieties-Kalei-Envy-Rockit-21-March-2021-presentation-Stephen-Tancred-amended.pdf https://apal.org.au/wp-content/uploads/2019/08/Phytech-Stanthorpe-March-2021.pdf
		Northern Victoria	Michael Crisera trial update	https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-March-2021-GV-trial-update-Michael-Crisera.pdf
		Tasmania	Sophie Folder, Trial update;	https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-March-2021-Tasmania-Trials-update-Sophie-Folder.pdf
		Batlow	Kevin Dodds, Trial update	https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-March-2021-Batlow-trial-update-Kevin-Dodds.pdf
		WA	Dario Stephanelli, DPIRD	https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-WA-Dario-Stefanelli-March-2021.pdf

In coming years, we may reflect on 2020 as the year we saw a step-change in how our industry attracts and retains permanent and seasonal labour. So what could a more resilient and reliable labour supply look like, how will orchard design and operation need to change to achieve it, and how will this flow through to immediate and long term business investments and profitability?

For these hybrid events, Ross Wilson and Craig Hornblow from AgFirst joined growers online from New Zealand discussed actions that can be taken to reshape labour needs and orchards to:

- get the job done on time and well
- reduce the costs of labour per kg of fruit
- ensure orchards are workable by a broader demographic of staff and
- make orchards an employer of choice.

Ross and Craig were then available for a Q&A session at each event with the exception of Western Australia. In some locations connectivity issues made the Q&A session challenging. Future walks, if conducted via a hybrid format will require a roving microphone and speaker and better internet connectivity.

The March orchard walk event was evaluated in two ways. A questionnaire for participants was posted online and an informal discussion group of FLAs and AgFirst consultants was conducted via Zoom.

	Unfortunately, the online questionnaire elicited too few responses to be useful. The informal discussion included several points on which there was general consensus: • Holding an orchard walk event at harvest time usually results in lower numbers of attendees, however, all agreed that it is an important part of the project to provide growers with an opportunity to see mature fruit on the trees and the outcomes of the orchard management practices advocated in the project. A compromise is to hold walks in peak periods every second year. • The ability to use mixed methods of delivery means that, in future, it may be possible to have sufficient flexibility to allow FLAs to decide the date for the harvest event. This would allow the FLAs to select a time between the harvest of varieties. • The COVID restrictions imposed by State health departments added various levels of complexity to each event. • Events using online components require excellent internet connection and hardware of sufficient quality to ensure those present and those online are equally engaged in the event. • Any future on-line event needs to be preceded by a high level of communication between the FLA, AgFirst participants and APAL. • High levels of event promotion appear to work to attract more participants. Although this is labour intensive for FLAs, most thought it was a worthwhile investment. Given the timing of the events and the difficulties posed by the COVID situation, the participants in the discussion thought the orchard walks had gone well and provided valuable information for growers.

March 2021 Orchard Walk

Orchard Walk timetable and basic information as follows:

	Local theme(s)	Varieties, planting systems	Labour challenges	Planting systems	Varieties, platforms	Varieties	Varieties	Varieties, trial outcomes, irrigation tech	Platforms
Region		**Sth Vic**	**Orange**	**Batlow**	**GV**	**WA**	**SA**	**Stanthorpe**	**Tasmania**
Day		Friday	Thursday	Friday	Monday	Thursday	Thursday	Monday	Friday
Date		**5-Mar**	**11-Mar**	**12-Mar**	**15-Mar**	**18-Mar**	**18-Mar**	**22-Mar**	**26-Mar**
Times (local)	Arrival time	12:30pm	2:00 PM	2:00 PM	2.00 pm	2:00 PM	1:00 PM	8:30 AM	2:00 PM
	Program commence	1:00 PM	2.30pm	2:30 PM	2.30pm	2:00 PM	1:30 PM	9:00 AM	2:30 PM
	Program finish	3:30 AM	5:00 PM	4:30 PM	5:00 PM	4:30 PM	16:00	12:00 PM	5:00 PM
	Finish time	3:30 PM	5:00 PM	5:00 PM	5.00 pm	5:00 PM	4:00 PM	lunch follows	networking after walk
Venues	Presentation / meeting point	Woori Yallock Football Club,	Canobolas Dance Hall	Batlow RSL	Calimna Orchard	DPIRD Manjimup	Lenswood Bowling club	Pozeries Cold Stores	R&R Grove Orchard
	Walk	Old Oak Orchard	Apple Country Orchard	Mount View and Montague	same	same	Nicol's orchard	Nicoletti orchard	same

Following the AgFirst presentations, some FLAs chose to include local information as part of the session (details below) and all events included in-orchard visits to view and discuss practical implementation of the issues at hand and other orchard developments.

Local events

Tasmania – Scott Price

In Tasmania the guest presenter for the Orchard Walk was Scott Price. Scott has worked in the apple and pear industry for 34 years for Calvert Bros. Scott manages their Rookwood property in the Huon Valley and developed the apple orchard from a green-field site in 1984. He has been instrumental in planting new varieties and moving to high density plantings. Mr Price gained an Associate Diploma of Business in Agriculture in 1990. He was the Inaugural President of the Young Tasmanian Fruit Growers' Association (YTFGA) from 1993-94 and was awarded the Silver Apple in 2001. He was a Board Member of the Australian Pome Fruit Improvement Program® Ltd (APFIP) from 2001-06, Chairman of the Tasmanian Quality Fruit Group from 1997-99 and is a member of the Apple Research Advisory Committee. Scott became an APAL Director in December 2011.

As part of the presentation to growers APAL FLA, Sophie Folder, provided final reports on recent demonstration trials carried out as part of the Future Orchards project;

- apple replant decline rootstock trial,
- Smitten® hand thinning trial, and
- last season's Gala eating experience trial

The presentation can be seen at https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-March-2021-Tasmania-Trials-update-Sophie-Folder.pdf

The orchard walk was carried out at the property of APAL board director and Orchard Manager, Scott Price, at R&R Smith's Grove Orchard where the discussion centred on:

- their new harvest platforms and how they are adapting their workforce and orchard for platform use this harvest, and
- orchard floor management practices used in organic orchards.

Well known Tasmanian industry people, Andrew Smith, Nigel Bartels, and Ryan Hankin shared their experiences and practical tips for using platforms.

Southern Vic

In Southern Victoria the Orchard Walk was led by FLA Nic Finger. Nic brings extensive experience to his role as Horticultural Consultant with AgFirst. He specialises in both the research and development field and day-to-day orcharding operations. Hailing from Australia, where he grew up on his family's apple orchard and having previously worked in a project and trial management role for Australia's government research body (CSIRO), Nic's data analysis skills are highly-developed. He is experienced in basic summary statistics (comparative analysis) through to statistical modelling.

The orchard walk focussed on the skills required to produce consistently high-quality fruit destined for the most discerning independent fruit retailers.

Those attending the event discussed and saw the outcomes of aggressive chemical thinning, block specific nutrition plans, tree vigour management and summer pruning/leaf plucking are all used as needed to produce premium quality fruit at high yields. The event included inspections of young plantings of Kanzi (single and twin systems at the same age side-by-side), SweeTango™, Envy™ (M9 vs M111 side-by-side) and Miapple® as well as both mature and young plantings of Pink Lady, Granny Smith, Golden Delicious and Gala apples.

When the attendees viewed the vigour management trials taking place on the property, a lively discussion on various practices and techniques took place.

Batlow

Local Front Line Advisor, Kevin Dodds, hosted the Batlow orchard walk.

The orchard walk in Batlow showcased two of Australia's most advanced high density V-Trellis orchards. Discussions in the field focused on rapid tree establishment, early cropping and netting systems. These new orchard planting styles provide early yields of high-quality fruit and growers at the event were impressed with the statistics provided as well as the orchard management systems presented.

Prior to the event, local FLA, Kevin Dodds prepared a short preview video which can be seen at

https://www.youtube.com/watch?v=rQEzNMfdMwM

Kevin also presented outcomes from his bushfires recovery research.

Orange

The Orange Orchard Walk was arrange by FLA, Jessica Fearnley, and hosted by Joe Caltabiano at Apple Country Orchards. Unfortunately, a storm and heavy rain meant we were unable to visit the orchard. APAL staff visited the orchard the following morning when the rain had cleared.

"Joe has been on the premium-quality pathway for many years", said Jessica, "and he has proven his ability to adjust his operations in response to the many and varied seasonal challenges – from drought to labour – while remaining true to his commitment to produce quality fruit."

Apple Country Orchards provided apple growers with an opportunity to see and discuss what it takes to produce consistently high quality fruit in the Orange area.

With the COVID-19 pandemic slashing the number of available pickers, Joe tried a range of labour options in the race to harvest his crop. At the event he discussed the approaches he used and his outcome thus far.

Growers had the opportunity to view this 100% netted orchard and visit blocks of Pink Lady, Gala, Fuji, and high-colour Red Delicious. Joe was generous in sharing his approach to the current twin issues of managing

labour and maintaining quality.

Goulburn Valley

The in-orchard segment of the event was conducted at Calimna Orchard with owner Matthew Lenne (right), FLA Mick Crisera and Nic Finger from Fruit Help who led a discussion on the pros and cons of different varieties of pears and apples and shared their experiences in using leaf defoliators and hedging.

Jason Shields has been orchard manager at Plunkett Orchards for more than 20 years. He is a practical fruit grower who tracks data to prove the effectiveness of orchard practices. Always looking for new ideas and ways to improve productivity and quality, at this orchard walk event Jason discussed the use of picking platforms and the way in which orchards need to be prepared in order to accommodate them.

FLA in Northern Victoria, Michael Crisera, presented the findings of the demonstration trial evaluating overhead irrigation.

South Australia

During the South Australia event 4th generation apple grower, Duncan Nicol, FLA Paul James and Susie Green from South Australian Apple and Pear Growers Association led the orchard walk at the Nicol orchard. The discussion focused on the attributes of different managed club varieties at the orchard including Jazz™, Envy™, MiApple®, Bravo™ grown using a range of planting systems and the challenges in meeting high quality specifications.

Western Australia

The WA orchard walk was led by FLA Susie Murphy-White. During the Western Australia event, growers visited the DPIRD Apple Breeding Program. Growers were excited to attend this much-anticipated event where FLA, Susie Murphy-White and Steele Jacob, who is part of the project, presented on the new early varieties in the stage 2 block. Seeing the trees and the fruit as well as having the opportunity to taste new varieties led to lively discussion on the future of apple breeding and the possible preferences of future consumers.

The apple breeding program is a joint project of the Department of Primary Industries and Regional Development (DPIRD) and The University of Western Australia (UWA) to breed flavonoid-rich apples – healthier apples for consumers. The national project is focussing on aspects of the breeding process and the market knowledge required to deliver a healthier apple to the consumer. The three-year project is funded by Hort Innovation Australia, DPIRD and UWA. The project information was presented by Dr Dario Stephanelli of DPIRD and can be accessed at https://apal.org.au/wp-content/uploads/2019/08/FO-Autumn-Walk-WA-Dario-Stefanelli-March-2021.pdf

Stanthorpe

At the orchard walk event, FLA Stephen Tancred discussed the outcomes from the 2020-21 field trials of Brevis applied to managed varieties including Kalei® and Envy™ and Mark Heyward from Phytech talked about how their irrigation decision support tool can improve irrigation and fruit quality. Both discussions generated significant interest and discussion among growers. The presentations can be viewed at https://apal.org.au/wp-content/uploads/2019/08/Phytech-Stanthorpe-March-2021.pdf and https://apal.org.au/programs/future-orchards/future-orchards-library/

The in-orchard segment drew significant interest when third generation orchardist, Daniel Nicoletti together with Stephen and Tom Frankcomb, APAL Variety Manager, discussed the performance of the various apple varieties grown at the Nicoletti Orchard including Royal Gala, Pink Lady, Sundowner and Fuji.

Mark Heywood from Phytech presented information about irrigation management using sensor technology.

Appendix III. Articles and media in the Future Orchards library

With URL links.

Future Orchards Library

Section heading	Title (hyperlinked)
Climate modification/risk management	Frost monitoring and protection(notes)–AgFirst, September 2007
	Hail net investments (notes)–Ron Gordon, September 2007
	Risk management: control what you can, manage what you can't (Australian Fruitgrowerarticle)–John Wilton, AgFirst, July 2013
	Overcoming the effects of spring frost (Australian Fruitgrower article)–Steve Spark, AgFirstJuly 2014
	Focus Orchard and trial update (Tasmania): Seeing is believing–Craig Hornblow and Sophie Folder, April 2018
	Climate impacts on quality, Steve Spark, AgFirst, March 2019
	Dormancy-breaking sprays for low chill in apples, Camilla Humphries, E.E. Muir and Sons, April 2019
Varieties and rootstocks	Newplanting options 2007 and beyond (notes)–AgFirst, March 2007
	New planting options 2007 and beyond (slideshow)–AgFirst, March 2007
	Nursery tree specifications and tree types (notes)–APFIP, June 2007
	Varietal strategies for future success (notes)–Garry Langford, June 2007
	Varietal strategies for future success (slideshow)–Garry Langford, June 2007
	New planting options for 2009 and beyond (notes)–AgFirst, June 2009
	New planting options for 2009 and beyond (slideshow)–AgFirst, June 2009
	Future Orchards® Future Trees, notes, Ross Wilson andCraig Hornblow, AgFirst, March2017
	Future Orchards® Future Trees, presentation, Ross Wilson and Craig Hornblow, AgFirst,March 2017
	An exposé on pome frut rootstocks (Australian Fruitgrower article)–John Wilton, AgFirst,Apr/May 2017
	What variety do I plant?, notes, Jonathan Brookesand Steve Spark, AgFirst, June 2017
	What variety do I plant?, presentation, Jonathan Brookesand Steve Spark, AgFirst, June 2017
	Apple brands–factors of success, Michael Weber, Horticultural Consultant, Germany, June2017
	Innovative Rootstocks for apple crop, Southern Loop presentation, Nicola Dallabetta, FEM(Italy), November 2017
	What's Next??Future varieties, practices and cost of establishment, Tom Auvil, NorthAmerican Plants (US), November 2017

	Modern variety management for quality, Rick Derrey, T&G Global, March 2019
	Evaluating new rootstocks for apples in WA, Suzie Murphy White, August 2020
Orchard systems	The evolution towards more competitive apple orchard systems in the United States of America – Dr. Terence Robinson, February 2007
	Maximising light interception and productivity of Australian orchards (notes) – Dr. Simon Middleton, February 2007
	Economic performance of high density orchards (notes) – Paul James, June 2007
	A production and economic comparison of different intensive apple orchard systems under Australian conditions — Lenswood (slideshow) – Paul James, June 2000
	Thirty years of intensive orchard production in South Tyrol (notes) – Martin Thomann, November 2007
	Thirty years of intensive orchard production in South Tyrol (slideshow) – Martin Thomann, November 2007
	High density apple plantings, principles and pitfalls (notes) – Dr. John Palmer, November 2007
	High density apple plantings, principles and pitfalls (slideshow) – Dr. John Palmer, November 2007
	Pipfruit in Holland (slideshow) – Jan Peters, November 2009
	Modern apple growing in South Tyrol (notes) – Martin Thomann & Jurgen Christanell, November 2009
	Queensland high density planting system trials for new scab-resistant apples (notes) – Dr. Simon Middleton, March 2010
	More is not better! (notes) – AgFirst, March 2010
	More is not better! (slideshow) – AgFirst, March 2010
	Orchard systems Part 1: a few to compare (webinar) – AgFirst, August 2012
	Orchard systems Part 2: show me the money (webinar) – AgFirst, August 2012
	Fruiting wall presentation – Dr. Alberto Dorigoni, June 2013
	Fruiting walls with windows (magazine article) – Good Fruit Grower, June 2013
	Multi-leader trees and mechanical pruning in Europe (Australian Fruitgrower article) – Ulf Kerer, AgFirst, March 2015
	Orchard density and canopy design in 2015 and beyond – notes – Ross Wilson, AgFirst, July 2015
	Orchard density and canopy design in 2015 and beyond – presentation – Ross Wilson, AgFirst, July 2015
	Tatura SmartFarm – Introduction to the Sundial experimental orchard, Ian Goodwin, Agriculture Victoria, November 2019

Pre-plant preparation	Getting new orchard plantings to perform (notes) – AgFirst, November 2006
	Getting new orchard plantings to perform (slideshow) – AgFirst, November 2006
	Soil treatments against replant pests and diseases (notes) – Dr. Gordon Brown, March 2008
	Specific apple replant disease (slideshow) – Dr. Gordon Brown, March 2008
	Can fumigation improve young tree growth in replant soil? (report) – Orchard Services, June 2013
	Comparing fumigants and bio-inoculants in replant situations (report) – Victoria Fruit Growers, June 2013
	Pre-planting treatments for apples on old apple grounds – Susie Murphy White, July 2018
Postplant care	Getting new orchard plantings to perform (notes) – AgFirst, November 2006
	Getting new orchard plantings to perform (slideshow) – AgFirst, November 2006
	Rapid yield accumulation (slideshow) – AgFirst, March 2007
	Young tree development — filling the allotted space as quickly as possible (notes) – AgFirst, September 2007
	Alternative treatment to reach full canopy (report) – Victoria Fruit Growers, June 2013
	Can growth of Gala on M26 be kick-started? (report) – Orchard Services, June 2013
	Young Kanzi growth (report) – Lenswood Rural, June 2013
Grafting	Muralappi grafting (case study) – AgFirst, June 2013
	Grafting techniques (report) – AgFirst and DPI NSW, June 2013
	Pressing on when nature is against you: a grafting success (Australian Fruitgrower article) – Jesse Reader, AgFirst, May 2015
Pruning and training	Pruning demonstration (webinar) – AgFirst, June 2007
	Tree architecture and training (notes) – AgFirst, November 2006
	Tree architecture and training (slideshow) – AgFirst, November 2006
	Pruning and training to maximise marketable yields (notes) – AgFirst, June 2007
	Pruning and training to maximise marketable yields (slideshow) – AgFirst, June 2007
	Pruning (slideshow) – AgFirst, June 2009

	Growing for your market — pruning lays the foundation for next year's crop (Australian Fruitgrower article) AgFirst, April 2011
	Are all floral buds created equal? (notes) Dr. Stuart Tustin and Dr. Ben van Hooijdonk, June 2011
	Pruning — a critical factor in orchard performance (Australian Fruitgrower article) – AgFirst, May 2012
	Pruning — getting the job done well (Australian Fruitgrower article) – AgFirst, June 2012
	How to write your own pruning rules (notes) – AgFirst, June 2012
	How to write your own pruning rules (slideshow) – AgFirst, June 2012
	Jilba pruning (case study) – AgFirst June, 2013
	Cripps Pink on MM106 pruning trial in the Goulburn Valley (report) – Fruit Growers Victoria Ltd, June 2013
	Will simple pruning rules improve Royal Gala performance? (report) – AgFirst and DPI NSW, June 2013
	Rules for modern pruning systems (webinar) – AgFirst, June 2013
	Pruning – Setting up the tree canopy for future crops (Australian Fruitgrower article) – John Wilton, AgFirst, June 2014
	Future Orchards winter walks (Australian Fruitgrower article) – Angus Crawford, APAL, August 2014
	Q&A at Battunga Orchards: Harvest data & pruning by numbers (Australian Fruitgrower article)– Jesse Reader, AgFirst, July 2015
	Future Orchards wrap – winter 2016 (Australian Fruitgrower article) – Steve Spark, AgFirst, August/September 2016
	Optimize pruning and fruit quality in apple orchards, Stefano Musacchi (USA), June 2018 – Part 1
	Optimize pruning and fruit quality in apple orchards, Stefano Musacchi (USA), June 2018 – Part 2
	Passion for Quality, presentation, Mark Ericksen, Waima Fruit Co, June 2018
	Prune for Quality, presentation, Steve Spark, AgFirst, June 2018
	Prune for Quality, notes, Steve Spark, AgFirst, June 2018
Pollination	Pipfruit pollination (notes) – AgFirst, June 2009
	Australian apple pollination (presentation) – Dr. Mark Goodwin, June 2013
	Pollination Program 2013 (business case flyer) – HAL & RIRDC, June 2013
	Apple pollination (fact sheet) – HAL & RIRDC, June 2013
	Pear pollination (fact sheet) – HAL & RIRDC, June 2013
	Pollination under nets, Suzie Murphy-White, 2017
	Securing pollination through revegetation, Katja Hogendoorn, November 2019

	Pollination under netting – learnings from New Zealand, Lisa Evans, Plant & Food Research, November 2019
Growth regulators	Some uses of plant growth regulators in modern apple production systems (notes) – Dr. Steve McCartney, March 2012
	Some uses of plant growth regulators in modern apple production systems (presentation) – Dr. Steve McCartney, March 2012
	Presentation (Stanthorpe, QLD): Enhancing young tree growth with Gibberellic Acid (ProGibb) – Stephen Tancred, Orchards Services, June 2014
Vigour balance	Vigour management 2007 (notes) – AgFirst, September 2007
	Vigour management 2009 (notes) – AgFirst, September 2009
	Vigour management (slideshow) – AgFirst, September 2009
	Growing for your market — vigour management (Australian Fruitgrower article) – AgFirst, May 2011
	Mount View root pruning trial (case study) – AgFirst, June 2013
	How critical is timing of the first regalis? (report) – Orchard Services, June 2013
	Root pruning (report) – AgFirst and DPI NSW, June 2013
	Growing season vigour management (Australian Fruitgrower article) – John Wilton, AgFirst, October 2013
Biennial bearing	Oakleigh bienniel bearing (case study) – AgFirst, June 2013
	Do summer applications of NAA and root ripping assist in reducing biennial bearing in Fuji trees? (report) – Lenswood Rural, June 2013
	Solving Biennial Bearing (notes) – AgFirst, November 2013
	VIDEO: Ross Wilson discusses biennial bearing in Fuji apples (Batlow), July 2016
	VIDEO: Jens Wunsche and Dario Stefanelli Biennial Bearing PIPS project update – August 2018
	VIDEO: Biennial bearing videos from 2020
Chemical thinning	Chemical thinning and application technology (notes) – AgFirst, September 2007
	Chemical thinning and application technology (slideshow) – AgFirst, September 2007
	Chemical thinning planning (notes) – AgFirst, September 2009
	Chemical thinning planning (slideshow) – AgFirst, September 2009
	Chemical thinning — a tool for managing biennial bearing (Australian Fruitgrower article) – AgFirst, September 2012
	Improving ATS effectiveness (webinar) – AgFirst, November 2012
	Improving chemical thinning results (webinar) – Steve Spark, September 2013

	High orchard performance depends on good thinning (Australian Fruitgrower article) – John Wilton, AgFirst, November 2015
Crop loading and hand thinning	Crop load (notes) – AgFirst, November 2006
	Crop loading (notes) – AgFirst, November 2007
	Crop loading (slideshow) – AgFirst, November 2007
	Thin to optimise (article) – Dr. Sally Bound, September 2009
	Growing for your market (notes) – AgFirst, November 2010
	Growing for your market — setting the crop (Australian Fruitgrower article) – AgFirst, June 2011
	Variation in flowering (webinar) – AgFirst, November 2011
	Setting the Optimum Crop Load (Australian Fruitgrower article) – AgFirst, November 2011
	Crop loading — the key to an easy harvest (Australian Fruitgrower article) – AgFirst, November 2012
	High orchard performance depends on good thinning programmes (Australian Fruitgrower article) – John Wilton, AgFirst, November 2015
	Crop load optimisation; chemical thinning; and biennial bearing and effects on labour presentation, Steve Spark and Jonathan Brookes, September 2016
	Shoot growth on young Smitten trees with different crop loads Stephen Tancred, March 2019
	Investigating Envy apple eating quality, Sophie Folder (Tas FLA, Pear Consulting), Craig Hornblow (AgFirst), Dean Rainham (Agfirst) and Ryan Hankin (Hansen Orchards), 2019
	Business Development Group newsletter, July 2020, Jack Wilson, AgFirst
Fruit monitoring	Stanthorpe fruit size (presentation) – Stephen Tancred, November 2010
	Fruit growth monitoring (presentation) – Chris Peters, November 2010
	Precision fruit production (notes) – Chris Peters, November 2010
	Fruit size monitoring using OrchardNet® (webinar) – AgFirst, February 2012
	Fruit size monitoring in the field (webinar) – AgFirst, November 2012
	Managing orchards for fruit size (Australian Fruitgrower article) – John Wilton / Ross Wilson, AgFirst, May 2014
Water	Guide to best practice in water management (publication) – Ann-Maree Boland, September 2009
	Guidelines for irrigation management for apple and pear growers (notes) – APAL, September 2009
	Sanders water budget (case study) – AgFirst, June 2013
	Water use and fertigation (report) – DAFWA, May 2013

	Irrigation: A key component of high quality – Drouin (notes) – Dr. Ian Goodwin, November 2013
	Irrigation: Apple orchard water budget – Drouin (graph) – Dr. Ian Goodwin, November 2013
	Irrigation: A key component of high quality – Lenswood (notes) – Dr. Ian Goodwin, November 2013
	Irrigation: Apple orchard water budget – Lenswood (graph) – Dr. Ian Goodwin, November 2013
	Irrigation: A key component of high quality – Tasmania (notes) – Dr. Ian Goodwin, November 2013
	Irrigation: Apple orchard water budget – Spreyton (graph) – Dr. Ian Goodwin, November 2013
	Irrigation: A key component of high quality – Shepparton (notes) – Dr. Ian Goodwin, November 2013
	Irrigation: A key component of high quality – Western Australia (notes) – Dr. Ian Goodwin, November 2013
	Irrigation: Apple orchard water budget – Manjimup (graph) – Dr. Ian Goodwin, November 2013
	More water for increased tree growth (Australian Fruitgrower article) – Steve Spark, AgFirst, November 2013
	Understanding irrigation requirements (Australian Fruitgrower article) – Ross Wilson, AgFirst, June 2015
	Transforming your orchard irrigation with sensors and monitoring,– Mark O'Connell, Agriculture Victoria, November 2019
Nutrition	Orchard nutrition (notes) – AgFirst, June 2009
	Principles of orchard nutrition (slideshow) – AgFirst, June 2009
	Soils, households and Governments – they all have budgets, deficits and surpluses (notes) – Stephen Tancred, Orchard Services, November 2013
	Perfecting your orchard's nutrient balance (Australian Fruitgrower article) – Dean Rainham, AgFirst, October 2015
	Post-harvest nutrient management – Dean Rainham, AgFirst, April-May 2016
	Precision management of apple nutrition in poor and variable soil – notes, Tienie du Preez, June 2016
	Precision management of apple nutrition in poor and variable soils – presentation, Tienie du Preez, June 2016
	Part 1
	Part 2
	Understanding soils for improved water and nutrient efficiency, Nigel Swarts, November 2019

Pest and disease	Alternaria leaf blotch and fruit spot of apple in Australia (presentation) – Dalphy Harteveld, November 2011
	Achieving better black spot control (Australian Fruitgrower article) – Stephen Tancred, August 2012
	Research update on Alternaria leaf blotch and fruit spot of apples in Australia (fact sheet) – November 2012
	Pest and disease control – is it about reducing costs or increasing packouts? (notes) – Stephen Tancred, November 2012
	Pest and disease control – Alternaria (presentation) – Stephen Tancred, November 2012
	Pest and disease control – Codling Moth (presentation) – Stephen Tancred, November 2012
	Pest and disease control – Mealy Bug (presentation) – Stephen Tancred, November 2012
	Pest and disease control – Mites (presentation) – Stephen Tancred, November 2012
	Pest and disease control – Powdery Mildew (presentation) – Stephen Tancred, November 2012
	Pest and disease control – Woolly Apple Aphid (presentation) – Stephen Tancred, November 2012
	PIPS IPDM project update November 2012 – PIPS, November 2012
	Comparing black spot fungicide programs (report) – Orchard Services, June 2013
	Can fumigation improve young tree growth in replant soil? (report) – Orchard Services, June 2013
	Comparing fumigants and bio-inoculants in replant situations (report) – Victoria Fruit Growers, June 2013
	Orchard Pest Management, Northern Loop presentation, David Williams, Agriculture Victoria, March 2017
	Combating Codling Moth with Mastrus wasp, David Williams, Agriculture Victoria, November 2019
Spray technology	Spray application (notes) – Dr. Geoff Furness, September 2009
	Apple spraying (notes) – Dr. David Manktelow, freshLearn, November 2014
	Apple spraying (pdf of powerpoint presentation) – Dr. David Manktelow, freshLearn, November 2014
	Spray rate calculator – Dr. David Manktelow, freshLearn, November 2014
	Spraying lesson and orchard business analysis (Australian Fruitgrower article) – Angus Crawford, APAL, February 2015
	Autonomous Agriculture, Angus Hogan, SwarmFarm, November 2019
	Variable rate flower thinning, Angus Hogan, SwarmFarm, November 2019

Fruit quality	Maximising quality begins right from the start of the season (notes) – Colin Little, September 2007
	How to grow large Galas (notes) – Dr. Terence Robinson, February 2007
	Marketable yield and optimising quality(notes) – AgFirst, February 2007
	Fruit colour and size (notes) – Marcel Veens, January 2009
	Fruit colour and size (slideshow) – Marcel Veens, January 2009
	Growing for your market — getting the harvest right (Australian Fruitgrower article) – AgFirst, February 2011
	Some key components of producing high quality fruit (notes) – Stephen Tancred, November 2011
	Fruit quality and grower costs (presentation) – Paul James, November 2011
	Producing high quality fruit (notes) – AgFirst, November 2011
	Growing high quality fruit — mid-growing season management (Australian Fruitgrower article) – AgFirst, December 2011
	Tools for assessing internal fruit quality (notes) – P.P. Subedi and K.B Walsh, March 2012
	Tools for assessing internal fruit quality (slideshow) – P.P. Subedi and K.B Walsh, March 2012
	Growing high quality fruit at internationally competitive prices — creating value from harvest to sale (notes) – AgFirst, March 2012
	Growing high quality fruit at internationally competitive prices — creating value from harvest to sale (slideshow) – AgFirst, March 2012
	Optimize pruning and fruit quality in **apple** orchards, Stefano Musacchi (USA), June 2018 – Part 1 | Part 2
	Optimize pruning and fruit quality in **pear** orchards, Stefano Musacchi (USA), June 2018 – Part 1 | Part 2 | Part 3
	Improving fruit quality, presentation, Ross Wilson and Steve Spark, AgFirst, June 2018
	Improving fruit quality, notes, Ross Wilson and Steve Spark, AgFirst, June 2018
	Eating quality trial update, Ross Wilson, Craig Hornblow, and Jonathan Brookes, AgFirst, September 2018
	Comparison of two approaches to pruning young Kanzi trees to encourage canopy establishment Kevin Dodds & Jessica Fearnley NSW DPI, 2018/19
	Influences on fruit quality, Robert Wiedmer, Beratungsring, April 2019
	Pruning under nets, Suzie Murphy-White, June 2019
	Lenswood Young Tree Growth trial, Paul James, August 2019
	Cold Chain Disinfestation and Quality Management of Pomefruit for Market Access, Francis De Lima, AgHort Solutions, November 2019
	Lenswood Time of Pruning Final Trial Report Paul James, 2019
	High Density Orchard Leader Height Management, Paul James, 2019

General orchard husbandry	Growing for your market (Australian Fruitgrower article) – AgFirst, November/December 2010
	Growing for your market — maximising orchard performance next year and beyond (Australian Fruitgrower article) – AgFirst, March 2011
	Getting the basics right (Australian Fruitgrower article) – AgFirst, January 2012
	Mid-late season orchard husbandry management (Australian Fruitgrower article) – AgFirst March 2012
	Summer management reminders – Craig Hornblow, AgFirst, November 2014
	A critical time for orchard management (Australian Fruitgrower article) – Jesse Reader, AgFirst, December 2014/January 2015
	Spring crop management (Australian Fruitgrower article) – John Wilton, AgFirst, August 2015
	Key points that have 'caught on' – notes – Steven Spark, AgFirst, July 2015
	Key points that have 'caught on' – presentation – Steven Spark, AgFirst, July 2015
	Pre-harvest orchard performance appraisal (Australian Fruitgrower article) – John Wilton, AgFirst, February/March 2016
	Year round quality management begins after harvest (Australian Fruitgrower article) – John Wilton, AgFirst, April/May 2016
	Pushing orchard performance boundaries (Australian Fruitgrower article) – John Wilton, AgFirst, August/September 2016
Harvest management	Harvest management of early season varieties focusing on Royal Gala (notes) – AgFirst, February 2007
	Maturity and harvesting of late varieties (slideshow) AgFirst, March 2007
	Managaing Cripps Pink harvest and storage (notes) – AgFirst, March 2007
	Cripps Pink harvest management — optimising quality and profit (slideshow) – Marcel Veens, March 2008
	Maturity of Cripps Pink (slideshow) – Dr. Gordon Brown, March 2008
	Pome fruit maturation and storage (notes) – Dr. Gordon Brown, March 2008
	Harvest management considerations (notes) – AgFirst, January 2009
	Harvest management considerations (slideshow) – AgFirst, January 2009
	Harvest maturity (notes) – Stephen Tancred, January 2009
	Harvest maturity (slideshow) – Stephen Tancred, January 2009
	Optimising apple and pear outturn quality using industry best practices (slideshow) – Dr. Ian Wilkinson, March 2010
	Optimising harvest (webinar) – AgFirst, February 2012

	Picking techniques: fruit lineup (webinar) – AgFirst, January 2013
	Picking techniques: bag setup and bin filling (webinar) – AgFirst, January 2013
	Picking techniques: picking and fruit handling (webinar) – AgFirst, January 2013
	Picking techniques: ladder work (webinar) – AgFirst, January 2013
	Harvest management (Australian Fruitgrower article) – Stephen Tancred, Orchard Services, March 2014
	Harvest labour management – presentation – Craig Hornblow and Jonathan Brookes, AgFirst, January 2016
	Future Labour – harvest – notes – Craig Hornblow and Jonathan Brookes, AgFirst, January 2016
	Pre-harvest orchard performance appraisal (Australian Fruitgrower article) – John Wilton, AgFirst, Feb/Mar 2016
	Labour-saving harvest techniques (Australian Fruitgrower article) – Ulf Kerer, AgFirst, Apr/May 2017
	Dormancy breaking sprays and their effect on flowering and harvest timing and impacts on orchard management amidst climate variability, April 2019, David Finger
Postharvest management	Pink Lady internal browning (slideshow) – Stephen Tancred, November 2010
	Apple water core — a seasonal problem (presentation) – Stephen Tancred, June 2011
	Post-harvest management: Part 1 (Australian Fruitgrower article) – Stephen Tancred, Orchard Services, March 2013
	Post-harvest management: Part 2 (Australian Fruitgrower article) – Stephen Tancred, Orchard Services, August 2013
	Post-harvest orchard management (Australian Fruitgrower article) – John Wilton, AgFirst, February 2015
	Harvest info and post-harvest nutrition – Steve Sparks / Jonathan Brooks, AgFirst, March 2015
	Post-harvest nutrient management (Australian Fruitgrower article) – Dean Rainham, AgFirst, April 2016
	Year-round quality management begins after harvest (Australian Fruitgrower article) – John Wilton, AgFirst, April 2016
	Calcium to combat post-harvest disorders (Australian Fruitgrower article) – Dean Rainham, AgFirst, September 2016
Pears	Intensive pear production in Australia; why we need more rootstocks (notes) – Angie Grills, January 2009
	Pears — travel broadens the mind! (Australian Fruitgrower article) – AgFirst, December 2012
	Pear rootstocks – presentation – Marcel Veens, Horticultual Consultant,

	July 2016
	Pear pruning – presentation / video presentation – Marcel Veens, Horticultural Consultant, July 2016
	Click pruning demonstration in pears – video – Marcel Veens, Horticultural Consultant, July 2016
	Branch ripping demonstration in pears – video – Marcel Veens, Horticultural Consultant, July 2016
	Optimize pruning and fruit quality in **pear** orchards, Stefano Musacchi (USA), June 2018 – Part 1 | Part 2 | Part 3
	Pear production masterclass
	016 Presentations and videos
	Sharing the best in European pear production with Australian pear growers – presentation / video presentation – Anton Jongerius, Fruitconsult, July 2016
	Pear Masterclass – Profitable pears – Ian Goodwin, June 2018
	Pear Masterclass – Storage rots in pears – Marcel Veens, June 2018
	Pear Masterclass focuses on orchard management
Business planning	Short-term planning (notes) – AgFirst, June 2010
	Short-term planning (slideshow) – AgFirst, June 2010
	Long-term planning (notes) – AgFirst, June 2010
	Long-term planning (slideshow) – AgFirst, June 2010
	Business planning introduction (notes) – AgFirst, June 2012
	Business planning introduction (presentation) – AgFirst, June 2012
	Orchard business plan guidelines – AgFirst, June 2012
	Orchard business plan template – AgFirst, June 2012
	Strategic planning (Australian Fruitgrower article) – AgFirst, April 2013
	Strategic planning on orchards raises profitability (Australian Fruitgrower article) – Kevin Manning, AgFirst, April 2014
	How does your orchard stack up? Orchard Business Analysis – APAL, September 2016
	Orchard Business Analysis 2015-2016 (Australian Fruitgrower article) – Ross Wilson, AgFirst, January 2017
Labour efficiency	Labour efficiency (notes) – AgFirst, November 2010
	Labour management in modern orchards and opportunities for mechanisation (notes) – Karen Lewis, November 2012
	Labour efficiency and orchard systems (notes) – AgFirst, November 2012

	Labour efficiency and orchard systems (presentation) – AgFirst, November 2012
	Mechanisation: a strategy to stay competitive (Australian Fruitgrower article) – AgFirst, June 2013
	Labor management in modern orchards and opportunities for mechanization – Karen Lewis, Washington State University, March 2015
	Mechanisation of apple and pear orchards – Mauricio Frias, Chile, March 2015
	Part 1
	Part 2a
	Part 2b
	Part 3
	Part 4
	Improving harvest efficiencies with picking platforms (Australian Fruitgrower article) – Craig Hornblow, AgFirst, April 2015
	Improving labour productivity in orchards (Australian Fruitgrower article) – Angus Crawford, APAL, June 2015
	Designing labour efficient canopies – notes, Ross Wilson, AgFirst, June 2016
	Designing labour efficient canopies – presentation, Ross Wilson, AgFirst, June 2016
	Platforms for increased labour efficiency – notes, Steve Spark, AgFirst, June 2016
	Platforms for increased labour efficiency – presentation, Steve Spark, AgFirst, June 2016
	Labour efficient canopies – presentation, Marcel Veens, June 2016
	Future Labour – harvest – notes – Craig Hornblow and Jonathan Brookes, AgFirst, January 2016
	Harvest labour management – presentation – Craig Hornblow and Jonathan Brookes, AgFirst, January 2016
	VIDEO: Improving harvesting efficiency in your orchard with Craig Hornblow
	Future labour – crop load optimisation – notes, Craig Hornblow and Jonathan Brookes, September 2016
Orchard profitability	Block profitability (notes) – AgFirst, June 2007
	Block profitability (slideshow) – AgFirst, June 2007
	The key drivers of orchard profit in 2010 (notes) – AgFirst, June 2011
	Orchard profitability — strategies and management (Australian Fruitgrower article) – AgFirst, July 2012

	Orchard Business Analysis 2017 and variety performance, presentation, Ross Wilson and Craig Hornblow, AgFirst, November 2017
	Orchard Business Analysis 2017 and variety performance, notes, Ross Wilson and Craig Hornblow, AgFirst, November 2017
Measure, manage, improve	Future Orchards 2012 introduction (notes) – AgFirst, September 2006
	Future Orchards website profile (notes) – AgFirst, March 2007
	Future Orchards website (slideshow) – AgFirst, March 2007
	What variety do I plant?, notes, Jonathan Brookes and Steve Spark, AgFirst
	What variety do I plant?, presentation, Jonathan Brookes and Steve Spark, AgFirstvariety
	Future Orchards 2012 roadmap (notes) – AgFirst, May 2008
	What growers need to do to succeed in 2012 (slideshow) – Marcel Veens, June 2008
	International competitiveness (slideshow) – Dr. Desmond O'Rourke, June 2008
	A roadmap to an internationally competitive apple and pear industry (slideshow) – AgFirst, June 2008
	Indicators of success (notes) – AgFirst, March 2010
	Indicators of success (slideshow) – AgFirst, March 2010
	Growing high quality fruit at internationally competitive cost of production (notes) – AgFirst, November 2011
	Growing high quality fruit at internationally competitive cost of production (presentation) – AgFirst, November 2011
	Crop review (webinar) – AgFirst, May 2013
	Lightbulb moments make for orchard innovations (Australian Fruitgrower article) – Angus Crawford, APAL, September 2015
	The Australian orchard of the future (Australian Fruitgrower article) – Jesse Reader, AgFirst, September 2015
	Mapping Orchard Flowers and Fruit, Dr James Underwood, Green Atlas, April 2019
AgTech and orchard data	Shortening the time to market – Southern Loop presentation, Dale Goldy, Stemilt Ag Services, March 2017
	The growing techniques and mechanization of the near future – Dirk van Lees, Fruit Consult, November 2019
	Future Technology for the Modern Orchard – Nic Finger and Craig Hornblow, AgFirst, November 2019
	AgTech in Washington – Rob Blakey, Stemilt, November 2019
	Autonomous Agriculture – Angus Hogan, SwarmFarm, November 2019

	Yield-driven operations, Roei Yaakobi, Tie Up Farming, November 2019
	Transforming your orchard irrigation with sensors and monitoring,– Mark O'Connell, Agriculture Victoria, November 2019
Tools and calculators	TRV/TCA calculator (spreadsheet)
	Crop load calculator (spreadsheet) – AgFirst, November 2007
	Spray concentration calculator
	Field Trials — Simple Steps (webinar) – AgFirst, October 2013
	Irrigation calculator (excel spreadsheet) – Dr. Ian Goodwin, DEPI Victoria, November 2014
OrchardNet training and resources	Fruit size monitoring using OrchardNet® (webinar) – AgFirst, February 2012
	Maximising the use of OrchardNet Part 1 — Production – AgFirst, June 2012
	Maximising the use of OrchardNet Part 2 — Financials – AgFirst, June 2012
	OrchardNet tutorial (webinar) – AgFirst, June 2012
	Fruit size and leader extension monitoring – AgFirst, first published December 2012, updated November 2016
	TRV, TCA and Photopoint measurements – AgFirst, December 201
PIPS extension	PIPS2 update – September 2016
	PIPS2 update – June 2017
	Understanding Biennial Bearing in Apples project update, August 2018
	PIPS2 update – September 2018

Focus Orchard Updates

Section heading	Title (hyperlinked)
2018-2021	Focus Orchard and trial update (Northern Victoria and Queensland) – Ross Wilson, AgFirst, and Stephen Tancred, Orchard Services, June 2018
	Focus Orchard trial update (NSW) – Nic Finger, AgFirst, October 2018
	Focus Orchard trial update (Southern Victoria and Tasmania), Craig Hornblow and Dean Rainham, AgFirst, December 2018
	Focus Orchard trial update (Northern Victoria and Queensland), Nic Finger, AgFirst, February 2019
	Focus Orchard trial update (Southern Victoria), Camilla Humphries, E.E. Muir & Sons, April 2019
	Focus Orchard trial update (SA/WA), Steve Spark, AgFirst, April 2019
	Focus Orchard trial update (Batlow and Orange), Nic Finger, AgFirst, May 2019
	Focus Orchard trial update (Southern Victoria and Tasmania), Dean Rainham, AgFirst, July 2019
	Focus Orchard trial update (Northern Victoria and Queensland), Nic Finger, AgFirst, August 2019
	Focus Orchard trial update (WA – pollination under nets, chloropicrin, click pruning), Steve Spark and Karen McCallum, AgFirst, September 2019
	Focus Orchard trial update (Batlow and Orange), Nic Finger, AgFirst, November 2019
	Focus Orchard trial update (Southern Victoria and Tasmania), Craig Hornblow and Camilla Humphries, April 2020
	Focus Orchard trial update (South Australia and West Australia), Tom Scott and Steve Spark, AgFirst, with Suzie Murphy White FLA, April 2020
	Focus Orchard trial update (Goulburn Valley and Stanhope), Nic Finger and Ross Wilson, April 2020
	Focus Orchard trial update (New South Wales), Nic Finger, Fruithelp, July 2020
	Focus Orchard trial update (Victoria), Camilla Humphries, E.E Muir, Sept 2020
	Focus Orchard and Trial Update (Western Australia and South Australia), Steve Sparks, AgFirst, February 2021
2016-2018	Introducing the new focus orchards (Australian Fruitgrower article) – Jesse Reader, AgFirst, December 2015 / January 2016
	VIDEO: Future Orchards summer 2016 wrap
	Focus Orchards block data a few mouse clicks away (Australian Fruitgrower article) – Ross Wilson, AgFirst, December 2016 / January 2017
	Focus Orchard trial update January 2017 – Steve Spark and Yvette Jones, AgFirst, January 2017
	Focus Orchard trial update April 2017 – Jonathan Brookes, AgFirst, April

	2017
	Focus Orchard and trial update (Northern Victoria and Queensland) – Ross Wilson, AgFirst, September 2017
	Focus Orchard and trial update (South Australia) – Yvette Jones, AgFirst, November 2017
	Focus Orchard and trial update (New South Wales) – Jonathan Brookes, AgFirst, March 2018
	Focus Orchard and trial update (Tasmania): Seeing is believing – Craig Hornblow and Sophie Folder, April 2018
2012-2015	Focus Orchard: update No.1 (Australian Fruitgrower article) – AgFirst, October 2012
	Focus Orchard: update No.2 (Australian Fruitgrower article) – AgFirst, February 2013
	Focus Orchard: update No.3 (Australian Fruitgrower article) – AgFirst, May 2013
	Focus orchard shows how to improve orchard return by $18,000/ha (Australian Fruitgrower article) – Steven Spark and Craig Hornblow, AgFirst, September 2013
	Focus Orchard Update No 4: Reviewing successes and failures (Australian Fruitgrower article) – Ross Wilson, AgFirst December 2013/January 2014
	Focus Orchard learnings 2012-14 – Ross Wilson and Craig Hornblow, AgFirst, June 2014
	Key points that have 'caught on'– Steven Spark, AgFirst, July 2015

Trial Reports

Section heading	Title (hyperlinked)
2017-2018	Focus Orchard Trial Update 2018 (WA and SA) – Yvette Jones, AgFirst, August 2018
	NSW: Impact of summer NAA on return bloom in Red Fuji, Kevin Dodds
	NSW: Fuji cincturing for return bloom 2016/17, Kevin Dodds
	NSW: How widespread is nematode infestation in developing orchards at Orange and Batlow. What are the population levels and the major Genera present? Kevin Dodds and Adam Coleman
	Tasmania: Managing crop load on young Envy plantings, Sophie Folder (Pear consulting), Nigel Bartels (Serve-Ag) and Ryan Hankin (Hansen Orchards)
	Tasmania: Maximising growth in young pedestrian orchards, Sophie Folder (Pear Consulting and Justin Miller (Millers Orchard)
	Queensland: Possible nutrition influence on Pink Lady colour, Stephen Tancred
	Queensland: Mealy bug control options, Stephen Tancred
	SA: Lenswood young tree growth trial, Paul James
	SA: Observations of Erger™ use in South Australian 2016-17, Paul James
	Victoria: Establishing a population of European Earwigs (Forficula auricularia) in a commercial apple orchard for the biological control of Woolly aphid (Eriosoma lanigerum), Jabbar Khan (FGV) and Angus Crawford (APAL).
	Victoria: Use of wetting agent / surfactant to improve water penetration and distribution into dry soils or repellent soils, Julie Godwill, Elizabeth Mace, Bhupinder Kaur and Petar Bursac
	Victoria: Comparison of flower removal strategies in young trees for growth response, Jabbar Khan (FGV) and Angus Crawford (APAL)
	Victoria: Regulation of fruit set in pears with plant growth regulators (PGRs), Julie Godwill
	WA: Evaluating the value of SNAP trees, Susie Murphy White
	WA: Leaf defoliation demonstration, Susie Murphy White
	WA: Leaf defoliation in low chilling environments, Susie Murphy White
2015-2016	Pedestrian and Multi leader tree project – Sophie Folder, PEAR Consulting
	Control of woolly aphid (Eriosoma lanigerum) by using insecticide soil-root drenches and foliar application – Angus Crawford, APAL and Petar Bursac, Fruit Growers Victoria
	What leaf test levels of Nutrition can tell us about fruit quality attributes? – Kevin Dodds, NSW DPI
	Bitter Pit Treatment of Apples with Calcium Foliar Fertilisers – Angus Crawford, APAL and Petar Bursac, Fruit Growers Victoria
	Inducing Early Cropping in Pears – Petar Bursac, Fruit Growers Victoria
	Potassium impact on apple colour – Petar Bursac, Fruit Growers Victoria
	Testing rate, wetter and number of applications of GA3 plant growth regulator on young apple trees – Stephen Tancred, Orchard Services

	Testing rate, wetter and number of applications and method of application of GA3 plant growth regulator on bearing apple trees – Stephen Tancred, Orchard Services
	Young Tree Growth Project – Paul James, Lenswood Co-operative
	Impact of Summer NAA on return bloom in Red Fuji – Kevin Dodds, NSW DPI

Grower case studies

Title (hyperlinked)
How long can we keep doing the same thing? – Mark Trzaskoma, July 2015
Striving for quality, Brad Fankhauser, September 2018

Technical webinars 2020

Date	Topic	Presenter	No. participants	Link
14 May	Post-harvest treatment with supercharged air	Dr SP Singh, NSW DPI	40 (10)	https://apal.org.au/wp-content/uploads/2019/08/Webinar-Supercharged-Air-with-Dr-SP-Singh-14-May-2020.pdf
28 May	Eco-credentials and sustainability	Dr Brent Clothier, Plant & Food Research, NZ & Dr Anthony Kachenko, Hort Innovation	61 (20)	https://apal.org.au/wp-content/uploads/2019/08/Presentation-slides-webinar-eco-credentials-sustainability-27-May.pdf https://youtu.be/e2aajo-hWvs
17 Sept.	Alternative controls for apple replant disease	Tianna Du Pont, WSU	40 (20)	https://apal.org.au/wp-content/uploads/2019/08/Alternatives-Controls-for-Apple-Replant-Disease-for-APAL-presentation-slides-Tianna-DuPont.pdf
30 June	Managing through drought, lessons from other industries	Mark Skewes, SARDI	23 (4)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Drought-Webinar_June-2020v2.pdf https://youtu.be/4dc8PprjAlE
9 July	Adoption of AI technologies in horticulture	Dr Zygmunt Szpak, University of Adelaide	50 (8)	https://apal.org.au/wp-content/uploads/2019/08/APAL-webinar-Adoption-of-AI-in-Horticulture-Presentation-slides-Dr-Zygmunt-Szpak.pdf (slides) https://youtu.be/aLa0nPO-1Cw
23 July	Outcomes from US Netting trials	Dr Lee Kalcsits, WSU	33 (15)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Webinar-Outcomes-from-US-Netting-trials-Presentation-Slides-Dr-Lee-Kalcsits.pdf (slides)
6 Aug	Growers managing nursery tree stock risk	John McDonald, Greenlife Industries	23 (9)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Webinar-Growers-managing-nursery-tree-stock-risk-Presentation-Slides-John-McDonald.pdf https://youtu.be/g-UqqxFRpeQ

Business Development Group Newsletters

Title (hyperlinked)
Business Development Group newsletter, Mar, 2021, Jack Wilson, AgFirst
Business Development Group newsletter, Dec 2020, Jack Wilson, AgFirst
Business Development Group newsletter, Sep 2020, Jack Wilson, AgFirst
Business Development Group newsletter, July 2020, Jack Wilson, AgFirst
Business Development Group newsletter – Mar 2020, Nic Finger, AgFirst
Business Development Group newsletter – Feb 2020, Nic Finger, AgFirst
Business Development Group newsletter – Dec 2019, Nic Finger, AgFirst
Business Development Group newsletter – Nov 2019, Nic Finger, AgFirst
Business Development Group newsletter – Oct 2019, Nic Finger, AgFirst
Business Development Group newsletter – Jun 2019, Nic Finger, AgFirst
Business Development Group newsletter – Mar 2019, Nic Finger, AgFirst
Business Development Group newsletter – Jan 2019, Nic Finger, AgFirst
Business Development Group newsletter – Dec 2018, Nic Finger, AgFirst
Business Development Group newsletter – Nov 2018, Nic Finger, AgFirst
Business Development Group newsletter – Sep 2018, Nic Finger, AgFirst
Business Development Group newsletter – Jul 2018, Nic Finger, AgFirst
Business Development Group newsletter – Jun 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Sep 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Nov 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Dec 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Apr 2018, Nic Finger, AgFirst
Business Development Group newsletter – Apr 2018 (2), Nic Finger, AgFirst
Business Development Group newsletter – Aug 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Oct 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Nov 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Dec 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Feb 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Mar 2017, Adrian Stone, AgFirst
Business Development Group newsletter – Mar 2017, Ross Wilson, AgFirst
Business Development Group newsletter – Aug 2015, Ross Wilson, AgFirst
Business Development Group newsletter – Dec 2015, Ross Wilson, AgFirst
Business Development Group newsletter – Jan 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Feb 2016, Ross Wilson, AgFirst
Business Development Group newsletter – Apr 2016, Ross Wilson, AgFirst

Appendix IV. Regional trials

Demonstration trials were run by the FLAs in each region. *Reports are provided in a separate folder*.

Appendix IV. Regional study tours

Tour of the Adelaide Hills, January 2017

- 30 registered for tour, around 50 with additional locals at actual event
- Delivery by Susie Green and Marcel Veens

8:00am	Meet Adelaide city for departure (bus)
8:10am	Depart for Lenswood
9:00am	Lenswood Co-op tour; Pre-sizer, automation, managing quality, varieties
10:10am	Oakleigh Orchards; Improving pack-outs, measuring production
12:00pm	AG & HC Mason; Orchard mechanisation, orchard set-up
2:15pm	Joyson Orchards Pty Ltd; Cordon pedestrian systems, multi-row spraying
4:00pm	Flavell Fruit Sales Pty Ltd; Orchard improvement and transformation
5:30pm	Return to Adelaide
7:00pm	Meet for dinner

Tour of Gippsland/Southern Victoria, 2019

46 participants with 30% from interstate

Time	Description	Key Guide
8:00am	Meet at the MCG bus area	Marcel Veens and Angus Crawford
9:30am	9Mile Fresh, Tynong	Robert Thompson
10:50 am	Fankhauser Apples, Drouin	Brad Fankhauser
12:15 pm	Q&A Lunch	
1:00 pm	Battunga Orchards, Warragul West	Mark Trzaskoma
2:45 pm	Arrive Armours Apples, Nilma	Thom Phillips
6:00 pm	Arrive Melbourne Airport	

- Overall the itinerary was good however in the end four visits was too much and these days should only have three visits maximum which will allow time for proper debrief and refreshments at the end of the day.
- Constructive facilitated discussion amongst the group
- In general understanding all how different orchard systems operate was probably the best.
- 9-mile packing
- The farm visits
- It was good to see some well run and different planting systems to be able to see these with other members from our company and discuss with them where we are going and the challenges we will face.
- Good to see what is happening outside of own patch. Good to see innovation and “best practice” being put into practice

Appendix VI. International study tours

Appendix VII. Pear Masterclass guests, presentations, evaluation outcomes and links to presentations

Year	Presenter	Presentation title	Link to presentation
July 2016	Anton Jongerius	Pear Growing in Holland	https://apal.org.au/pear-masterclass-presentations/ https://apal.org.au/wp-content/uploads/2019/09/Pear-Masterclass-Anton-Jongerius-Lessons-from-European-pear-production.pdf
	Marcel Veens	Pear pruning Video	
	Marcel Veens and Anton Jongerius	Click pruning demonstration (video) Branch Ripping in Pears (video)	
	Marcel Veens	Pear Rootstocks for Intensive Production (and video)	
	17 surveys were completed from 57 attendees – a response rate of 29%. This is a low response rate attributed to the implementation of the new Survey Monkey based systems. It is likely that a paper based system is more appropriate to ensure a better response rate. Responses to the participants survey were mixed with some very positive and others not so. These negative responses were not unexpected as some participants felt somewhat confronted and challenged with how different their old style orchards compare with modern ones which were presented. • Over 82% of participants found the presentations and the opportunity to visit the venue either "valuable" or "of some value." • 88% of participants learnt something they could implement in their business. • Over 95% thought the organisation, location, facilities, catering was good to excellent. • Over 76% of participants were either owners or employees of an orchard business		
June 2018	Stefano Musacchi, WSU	Optimise Pruning and fruit quality in pear orchards part 1 Optimise Pruning and fruit quality in pear orchards part 2 Optimise Pruning and fruit quality in pear orchards part 3	https://apal.org.au/wp-content/uploads/2019/09/FO-winter-2018-Pear-Stefano-Musacchi-web-part1.pdf https://apal.org.au/wp-content/uploads/2019/09/FO-winter-2018-Pear-Stefano-Musacchi-web-part2.pdf https://apal.org.au/wp-content/uploads/2019/09/FO-winter-2018-Pear-Stefano-Musacchi-web-part3.pdf
	Ian Goodwin, Agriculture Victoria	Pear Masterclass – Profitable pears	
	Marcel Veens, Horticultural Consultant	Pear Masterclass – Storage rots in pears	
	Of about 40 to 45 attendees, 20 evaluation surveys were completed. The results indicated that 100% of responders thought the day was valuable or of some value • 100% of those who responded thought the in-orchard presentation was valuable or of some value		

	• 100% of respondents thought the event organisation was excellent or good • 15% of responders were new attendees, not having been to a pear masterclass event before • 95% of responders indicated would attend a future event (5% of responders indicated the question was not applicable to them) • 85% of responders indicated that they had learned something they could implement in their orchard or business (15% were n.a.) Responders indicated their relationship to the pear growing industry as • 30% (6) Employee of an orchard business • 25.00% (5) Independent consultant • 20.00% (4) Owner or part owner of an orchard business • 10.00% (2) Other • 10.00% (2) Employee of a provider of orchard goods or services. • 5.00% (1) Employee of a government department The results of the survey indicate that this activity is a successful part of the Industry Innovation and Adoption project and is considered valuable by industry participants.	
September, 2019	Dirk van Hees, FruitConsult, Netherlands	Pear Masterclass Session 1 – Planting systems and rootstocks(Slides), Pear Masterclass Session 1 – Planting systems and rootstocks(recording of online session) Pear Masterclass Session 2 – Experiences with new varieties (Slides) Pear Masterclass Session 2 – Experiences with new varieties (recording of online session) Pear Masterclass Session 3 – Fertilization (Slides) Pear Masterclass Session 3 – Fertilization (recording of online session)
	A different evaluation survey was used as the event was held online. The events rated 4.3/5 overall. The event was held online in 2020 and attracted 103 participants over three 45-minute webinars. The sessions addressing planting systems and rootstocks (49) and new varieties (53) were most popular with the highest number of participants compared with the Fertilisation Webinar (26).	

Appendix VIII. Speed updating/technical day/webinars

Programs for the speed update events are included here. Presentations were not made available.

Gold Coast, 2016

Presentation	Presenter
Introduction	Angus Crawford, APAL (Chair)
Dr APAL	Dr James Underwood, The University of Sydney
Future Orchards® and crop and data projects	Ross Wilson, AgFirst
PIPS2 overview	Dr Anne-Maree Boland, RM Consulting Group
New manual pruning techniques in intensive and super-intensive orchard systems	Nicola Dallabetta, FEM San Michele all' Adige, Italy
Winter chill: how much is enough for profitable yields?	Dr Heidi Parkes, Department of Agriculture and Fisheries
Investigating biological control of Mealy Bugs	Peter Nimmo, Department of Agriculture and Fisheries
Morning tea	Morning tea
Brevis – Year 2 of work on a new thinner for Australian apple orchards	Stephen Tancred, Orchard Services
Do chemical thinners give better results than Artificial Spur Extinction?	Dr Sally Bound, Tasmanian Institute of Agriculture
Are dessert seconds ripe for cider?	Dr Nigel Swarts, TIA, University of Tasmania
Internal storage disorders of apples	Dr Hannah James, AgroFresh
Prevar Limited update	Garry Langford, APAL
Sensory Tasting Session	Richard Cornish
Lunch	Variety Showcase
If you had $1.6 Trillion – how would you spend it?	Paul Levins, Invention Development Fund
Value adding opportunities for apples and pears	Jonathan Middis, Food Revolution Group
Hort Innovation update	Stuart Burgess & Graeme Yardy, Horticulture Innovation Australia Limited

At the conclusion of the Horticultural Convention the apple and pear delegates were asked to complete an online Survey Monkey. 44 Responses were received and some of the key finding were as follows.

- 82% of Industry Updating respondents rated the event as good/excellent
- 93% of Respondents rated the Sensory Tasting and Variety Showcase as good/excellent.

The addition of a high profile key note international researcher in amongst Australian researchers in the program was seen as a good fit and should continue in future iterations of this event. Incorporation of marketing presentation was not of high interest to the majority of participants in the room.

Launceston Tasmania 2017

Run as part of the FGT conference; 110 participants

Table 9. Program of presentations at the 2017 Speed updating event held in Launceston, Tasmania.

Activity/Speaker	Organisation	Title
Angus Crawford	APAL	Introduction/Welcome
Dr Ian Goodwin	DEDJRT	Profitable Pears
Dr Nigel Swarts	TIA	Nutrition decision support tools
Dr Sally Bound	TIA	Is precision crop load management without chemicals feasible?
Dr Heidi Parkes	Queensland DAF	How much chill have we had? Accessing winter chill data for your region
Q&A Panel		
Dallas Gibb	TechMAC Pty Ltd	Agritechnology needs of the apple and pear industry
Dan Steere	Abundant Robotics	Robotic Harvesting of apples
Dr Zhe Xu	Australian Centre of Field Robotics	Dr Apple - Information systems for apples
Dr Sigfredo Fuetes	The University of Melbourne	Apple Sunburn Risk and Harvest Fruit Size Estimation Using a Smartphone App

Q&A Panel		
Dr Paul Horne	IPM Technologies	IPM needs analysis of the apple and pear industry
David Williams	DEDJRT	Introducing *Mastrus ridens* for the biological control of codling moth into IPM programs
Dr Romina Radar	University of New England	Pollination research in Australian apple orchards
Elizabeth Frankish	The University of Tasmania	Food safety risk management for apple pack-houses
Dr Bob Farqueson	The University of Melbourne	Tactical horticultural water decisions in northern Victoria: fruit tree irrigation options and economic responses
Dr Virginia Williamson	The University of Melbourne	Endogenous Ethylene/Ethrel Breakdown in apples
Dr Dario Stefanelli	DEDJRT	Biennial Bearing Project
Ross Wilson	AgFirst	Future Orchards
Mark Spees	Hort Innovation	Apple and Pear Domestic Marketing Update

Brisbane, @ Hort Connections, 2018

The results as presented below showed 97% found Speed Updating as either good or excellent value.

Article: http://apal.org.au/speed-updating-gives-growers-fast-serve-current-rd/

Technical Webinars 2020 and links to presentations

Topic	**Presenter**	**Participants (brackets = growers)**	**Link**
Post-harvest treatment with supercharged air	Dr SP Singh, NSW DPI	40 (10)	https://apal.org.au/wp-content/uploads/2019/08/Webinar-Supercharged-Air-with-Dr-SP-Singh-14-May-2020.pdf
Eco-credentials and sustainability	Dr Brent Clothier, PFR, NZ Dr Anthony Kachenko, Hort Innovation	61 (20)	https://apal.org.au/wp-content/uploads/2019/08/Presentation-slides-webinar-eco-credentials-sustainability-27-May.pdf https://youtu.be/e2aajo-hWvs

Alternative controls for apple replant disease	Tianna Du Pont, WSU	40 (20)	https://apal.org.au/wp-content/uploads/2019/08/Alternatives-Controls-for-Apple-Replant-Disease-for-APAL-presentation-slides-Tianna-DuPont.pdf
Managing through drought, lessons from other industries	Mark Skewes, SARDI	23 (4)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Drought-Webinar_June-2020v2.pdf https://youtu.be/4dc8PprjAlE
Adoption of AI technologies in horticulture	Dr Zygmunt Szpak, University of Adelaide	50 (8)	https://apal.org.au/wp-content/uploads/2019/08/APAL-webinar-Adoption-of-AI-in-Horticulture-Presentation-slides-Dr-Zygmunt-Szpak.pdf (slides) https://youtu.be/aLa0nPO-1Cw
Outcomes from US Netting trials	Dr Lee Kalcsits, WSU	33 (15)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Webinar-Outcomes-from-US-Netting-trials-Presentation-Slides-Dr-Lee-Kalcsits.pdf (slides)
Growers managing nursery tree stock risk	John McDonald, Greenlife Industries	23 (9)	https://apal.org.au/wp-content/uploads/2019/08/APAL-Webinar-Growers-managing-nursery-tree-stock-risk-Presentation-Slides-John-McDonald.pdf https://youtu.be/g-UqqxFRpeQ

Appendix IX. Technical Manager upskilling

- Orchard Systems Symposium, Bologna, Italy In August 2016

Notes from this trip were provided through the 2016 Future Orchards visits via USB memory stick.

- International Fruit Tree Association (IFTA), Wenatchee, United States of America , February 2017
- International Fruit Tree Association (IFTA), Napier, New Zealand
- International Fruit Tree Association, Rochester, New York
- Outcomes were communicated through discussions in the field at Future Orchards orchard walks.

Attending such conferences provided an opportunity to hear from researchers around the world on their results and help identify future speakers to invite to Australia.

- FruitCrisp Summer School

In July/August 2018 APAL's Technical Manager was accepted as a participant for the International Society for Horticultural Science FruitCrisp Summer School as a professional development opportunity. Over the two weeks the course provided interaction with experts on topics on pre/post harvest physiology of temperate fruit crops.

https://www.ishs.org/news/first-ishs-summer-school-pre-and-postharvest-physiology-temperate-fruit-crops

- Participated in local Gippsland Fruitgrowers Association meeting
- Participated in regular HIN meetings
- Attended a Bayer Crop Science Pome and Stone Fruit Pest and Disease Workshop
- Attended Fruit Growers Victoria and Fruit Growers Tasmania Conferences
- Food Incident Forum Workshop

Grower Crop and Business Risk Mitigation Strategies

Food safety

Industry support was offered to the University of Sydney ARC Centre for Food Safety Training Centre proposal

- APAL provided funding to support the proposal in 2016
- Providing to the researcher grower contacts and pack-sheds visit
- Presentations and articles at APAL events by student Elizabeth Frankish
- The scope of the NRS was expanded to include microbial contamination detection and heavy metals
- A number of apples were recently affected by the 2018 needle tampering crisis where the project provided updates to growers through updates to Future Orchards®. This provided assurances on three main points which was that the apple and pear industry is committed to food safety, APAL is supporting the industry and that these incidents are part of a broader issue affecting Australia's fresh produce sector.

Netting

- Technical assistance and basis toward a netting program proposal https://apal.org.au/national-netting-program/

Bushfires

- Technical assistance toward bushfire rebuild support following the 2019-2020 fires
- Participation in a reference group providing assistance and materials to a Victoria Government Climate Change Adaptation in Agriculture Goulburn project. In this forum we communicated the work the apple and pear industry has done to understand climate change, impact it will have and what can be down to mitigate this.

Climate

- Participated in a "Providing Farmers with Regional Weather and Climate Guides" initiative run by the Bureau of Meteorology seeking to understand the various needs of agricultural industries for forecasting, type of modelling and how to communicate climate information.
- South Australian Apple and Pear Growers Association Hailstorm meeting; Discussions around the business decisions behind keeping the crop versus destroying the crop as well as the practicalities

Appendix X. Grower services and technical support

Honeybee and pollination industry

- The Technical Manager participated in the Honeybee and Pollination Industry Advisory Committee meetings and provided feedback on reports.
- APAL's Technical Manager participated and presented to the Honeybee Congress in June 2018. Copies of slides were submitted with MS106

Grower support for selecting varieties

- A variety and rootstock register was generated to give an overview of what is available to plant. This was published in the AFG in 2017 (no longer available online as it is being updated)
- Collaborating with the Australian Pomefruit Improvement Program (APFIP)

HortCon technical planning

- Selection of topics, speakers and delivery of APAL's speaker sessions
- Preparation and facilitation of APAL panel session "Disrupt your orchard – Key component of a successful orchard in 2030"

Webinar 2020 planning

- Selection of topics, speakers and delivery of webinar sessions
- Preparation and facilitation of webinars and uploading onto the website

The program is also active in the following areas.

- Technical editor of the Australian Fruit Grower magazine and Industry Juice
- Met with University of Queensland to discuss a potential apple breeding collaboration with Washington Tree Fruit Research Commission RosBreed
- Provided input into the "IPM needs of the apple and pear industry" project led by Dr Paul Horne and RMCG
- Participated in panel at a PICC (Primary Industries Climate Challenges Centre) roundtable at the University of Melbourne
- Took part in Future Orchard's team member media training held in Gold Coast (APAL Communications)
- Advice - Alternative pollination for the apple and pear industry, University of New England
- Climate change adaptation survey for the apple and pear industry, University of Melbourne
- Indian government delegation to Australia presentation, Hort Innovation
- Canadian and USA grower delegation to Australia presentation, Rotary International
- Review of potential future services of the National Residue Survey
- Response to the IPM needs of the apple and pear industry, Hort Innovation
- Technical editing of all communications content, website/magazine, APAL
- Dr Apple project planning workshop, University of Sydney
- Apple and Pear Industry strategic investment plan, Hort Innovation
- Australian Pomefruit Improvement Program project input, Hort Innovation
- Primary Industries Climate Change forum presentation, University of Melbourne
- Regulatory affairs officer support to registration of Brevis
- Packhouse optimisation project, Victoria Government/APAL
- Glenelg Hopkins Catchment Land Capability Assessment – Horticulture, Deakin University
- The program also disseminated the results of the Apple and pear crop estimate as Australia's input into the World Apple and Pear Association. The WAPA update includes all apple and pear countries specific crop updates including, marketable crop, processing, juicing, export, consumption and import data.
- Hort Innovation Strategic Investment Advisory Panel (SIAP) and evaluation panels for a range of projects.
- Developed successful proposal for Export Readiness and Market Access program
- Participated in Yarra Valley Queensland Fruit Fly SIT program

The following article was also prepared to communicate Hort Innovation's new AgTech project.

http://apal.org.au/swarmfarm-new-apple-agritech-project/

- Orchard Business Analysis communication to growers via Industry Juice
- National Residue Survey liaison
- Diphenylamine (DPA) Project Reference Group, project by Hort Innovation
- Climate Change Adaptation in Agriculture – Goulburn Project
- DA Meter Project, Agriculture Victoria
- National Temperate Fruit Biosecurity Surveillance Steering Committee and sub-projects
- Providing Farmers with Regional Weather and Climate Guides, Bureau of Meteorology
- Apple and Pear Orchard Maturity Program

Appendix XI. Crop protection stewardship

The apple and pear industry operate in a highly regulated environment and is subject to ongoing reviews and changes.

Activities in this area have been:

2016

- Member of the National Working Party for Pesticide Application Technical Working Group.
- Updated Hort Innovation on AgVet collaborative forum priorities
- Provided advice addressing inquiries to chemical use in the apple and pear industry
- Met with Department of Agriculture Water Resources National Residue Survey representatives to discuss results and proposed changes to the services
- Update of the apple and pear industry strategic agrichemical review process (SARP). During the period the project has initiated an update of the apple and pear industry strategic agrichemical review process (SARP).
- National Residue Survey expanded to include microbial and heavy metal detection in addition to the standard residue testing. This change was in development for some time and based on now commonplace requirements of retailer Quality Assurance schemes to include microbiological and heavy metals
- The program provided technical input on APVMA's Spray Drift Consultation which invited responses on their methods to determine spray drift risk. The response required expertise on spraying from the program which likely otherwise would not have been understood by industry and useful to have the background for industry once implemented.
- Brevis for Australia is a new chemical product near registration which will be a new important chemical thinning product for apples and pears. The program participated in a grower field demonstration of the product based in Tatura. The product was used at various rates and program to demonstrate efficacy and will useful familiarisation for the project when advising best practice.
- Advised on usage pattern trends for the following active constituents.
    - Chlorpyrifos
    - Dithiocarbamate
    - Dicofol
    - Paraquat
    - Pirimicarb
    - Iprodione
    - Azinophos methyl
    - Imazalil

Appendix XII. Biosecurity preparedness

This component enables the apple and pear industry to uphold its commitments to the Emergency Plant Pest Response Deed (EPPRD).

- Participation in CCEPP (Consultative Committee for Plant Pests), National Management Group meetings as required
- Provided input into notifications and decisions on CCEPP proposed recommendations following incursion/detection of potential novel or high-priority plant pests
- Responding to incursions (eg. *Varroa jacobsoni* in Townsville, Queensland. Apple and pears were an affected industry party and now are subject to a major share of the response plan.)
- Reviewing and approving response plans, minutes, and situation reports etc.
- Participation in Plant Biosecurity CRC Research Update "Smart biosecurity science for horticulture symposium"
- National Plant Biosecurity RD&E Priorities Forum
- Attended a *Xylella fastidiosa* preparedness workshop
- Attended Plant Health Australia member meetings, discussing changes to the Deed which now addresses known vectors as an Emergency Plant Pest
- Managing cost claims for industry regarding Torres Strait Fruit Fly and *Varroa jacobsoni* responses
- Western Australia Tomato Potato Psyllid incursion affecting interstate trade of apple growers
- Response to 'Pest Risk Analysis Cut Flower and Foliage Review' submitted to Department of Agriculture
- Development of the APAL Biosecurity Incident Standard Operating Plan (BISOP) and EPPRD training for APAL staff with PHA completed in May 2020
- Participation in PHA's Owner Reimbursement Costs (ORC) workshops
- Preparation and publication of articles in AFG to improve awareness of the biosecurity system in Australia.

Activities that were not completed:

- Assistance provided to PHA and other stakeholders to increase grower awareness of on-farm biosecurity best-practice
- The proposed categorisation and information package for Apple Leaf Curling Midge was not developed.

Plant Health Australia completed the Apple and Pear Biosecurity plan which includes a significant number of activities for the industry to implement.

The program took steps to activate the apple and pear Emergency Plant Pest Response levy which took effect 01 October 2017 where now the industry pay 0.05 cents per kilogram for fresh domestic/export apples and pears. This significant step now ensures the apple and pear industry is raising funds in order to repay its share of biosecurity response plans for exotic pest incursions.

The Apple and Pear Innovation and Adoption program was part of a categorisation of Brown Marmorated Stink Bug industry working group which produced a categorisation information package for the pest. This initiative lead to a request for categorisation where industry and government liabilities for a response under the EPPRD can be more correctly determined. The program's input was in relation to various impact on affected cropping sectors where all information from affected industries was collated.

Under a Plant Health Australia project the Apple and Pear Innovation and Adoption program participated in a Temperate Fruit Surveillance Strategy. This is to determine the need for across industry surveillance to meet the needs of the multiple industries in the strategy.