Final Report

# Independent program coordination for the apple and pear Productivity, Irrigation, Pests and Soils program (PIPS3)

**Project leader:**

Marguerite White

**Delivery partner:**

ICD Project Services

**Project code:**

AP19007

**Project:**

Independent program coordination for the apple and pear Productivity, Irrigation, Pests and Soils program (PIPS3) (AP19007)

**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:**

Published and distributed by: Hort Innovation

Level 7
141 Walker Street
North Sydney NSW 2060

Telephone: (02) 8295 2300

www.horticulture.com.au

# Contents

## Public summary

The *AP19007- Independent program coordination for apple and pear productivity, irrigation, pests, and soils program* (PIPS3 Program) project aimed to develop and implement a collaborative approach to research, demonstration, communication, and extension activities across the four projects of AP19002, AP19003, AP19004 and AP19005. By providing overarching coordination of activities, apple and pear growers were delivered a highly integrated, effective, and efficient program of R&D between 2020-2023, conducted on experimental and demonstration sites, both research facility and commercially based, including multiple locations in the Goulburn Valley (Victoria), and the Huon Valley (Tasmania), Orange (NSW), Lenswood (South Australia) and Manjimup (Western Australia).

The role of coordinator was integral in ensuring R&D engagement activities were relatable to current and emerging profitability and sustainability challenges for industry, such as climate and weather variability, increasing cost of production, and access pressures associated with labour, energy, water, and fuel.

Over half of the PIPS3 Program was conducted during Covid-19 restrictions.

**Governance- consultation and collaboration**

The role of the PIPS3 Program Independent Coordinator was executed by Marguerite White of ICD Project Services over the three year timeframe of the PIPS3 Program, guided by the Program Reference Group (PRG) comprised of the project leaders, apple and pear growers, industry advisors, an APAL representative and the Hort Innovation Program Manager. The coordinator acted as executive officer to the PRG, preparing the agenda/minutes and delivering upon the actions of eight (8) meetings conducted.

The project leaders and coordinator formally met twelve (12) times to update and coordinate program-wide initiatives and cross-project cooperative activities. In March 2022, the entire program team of twenty-four was able to come together for the first time over two days at Agriculture Victoria's Tatura SmartFarm to exchange and plan.

**Project planning and management**

The coordinator was responsible for the stakeholder consultation processes and preparation, implementation (in collaboration with projects), and monitoring of the PIPS3 Program planning and project management instruments:

- PIPS3 Program Communications and Extension Plan, 2020 (C&E Plan) (Appendix 1)
- PIPS3 Program Monitoring and Evaluation Plan, 2020 (M&E Plan) (Appendix 2)
- PIPS3 Program Risk Register template, 2020 (Automated system)
- PIPS3 Program M&E Portal (drop box based system)
- PIPS3 Program Mid-term Evaluation Report, 2022 (Appendix 3)

**Communication**

The role consulted and coordinated to implement the ambitious C&E Plan, raising the bar on number of outputs and impact of effective communication materials previously achieved by the PIPS Program. In order to do so, the role proactively consulted with the APAL communications team and developed a standard approach to PIPS branding for all partners (slide, fact sheet, event promotion and acknowledgement templates). Progressive research activities and findings were regularly prepared for industry stakeholders through printed (e.g., Australian Fruit Grower (AFG), WA Grower), and digital mediums (video, e-newsletters, social media). Importantly, the role worked closely with the research teams to translate their work into key messages for growers and advisors, especially on the likely implications to management and business decisions of R&D outcomes. The focus of the communication effort was on benefit to industry environmental sustainability and resilience, product quality, business profitability and strategies to meet growing consumer demands. At the program level, the coordinator, in collaboration with the collective efforts of the research teams, was responsible for:

- Development, original content writing, and content maintenance of the PIPS3 Program Website that currently hosts ninety-three (93) resource outputs (more in preparation at this time), with current views totalling 11,200 (www.apal.org.au/programs/more-industry-programs/pips3program)
- Publication of thirty-four (34) AFG articles with a reach of 33,200.
- Filming and production of thirty-seven (37) videos hosted by the APAL YouTube channel resulting in 13,700 views.
- Seventy-eight (78) Industry Juice publications resulting in almost 4,000 click throughs.
- One hundred and fifteen (115) social media posts with a reach of 26,000, resulting in 5,000 engagements.

**Engagement and extension**

Key program-wide initiatives were initiated and coordinated by the coordinator, in collaboration with the collective efforts of the research teams and associated partnering industry organisations:

- September 2021 APAL R&D Forum- presentations delivered by the four projects via video recording due to the late cancellation of this event face to face.
- November 2021 Future Orchards Walks (Manjimup (WA), Orange (NSW), Huon Valley (Tas), Tatura (Victoria) - PIPS3 R&D core program content across all regions
- June 2022 Fruit Growers Tasmania Conference (Hobart)- three presentations delivered (AP1006 x 2 & AP19002)
- August 2022 APAL R&D Forum (Melbourne)- five presentations delivered (AP19006 x 2, AP19002, AP19003 x 2, AP19005)
- PIPS3 Program Researcher Roadshow 2023 encompassing a series of events across all delivery regions:
    - Goulburn Valley Horticulture Field Day, March 23rd (Exhibitor display and integration of AP19002/AP19003 research into a climate change presentation made by Ian Goodwin (AP19003 & AP19005 leader)
    - Orange, NSW, April 26th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
    - Huon Valley, Tasmania, May 24th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
    - Lenswood, Adelaide Hills, May 30th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
    - Manjimup, Western Australia, 1st June (PIPS3 Orchard Walk with research leaders)
    - Fruit Growers Tasmania conference 15th-16th June (Exhibitor Display and AP19002, AP19002/AP19006, AP19003/AP19005 & AP19005 presentations)

**Monitoring and evaluation**

AP19007 was responsible for conducting comprehensive evaluation of the PIPS3 Program at both the mid-term and final points of the program against the M&E Plan. Extensive interview surveys and desktop assessments were undertaken.

As a result of the recommendation of the mid-term evaluation, the coordinator and project leader conducted a workshop to identify the next phase of industry R&D needs and prepare a proposal. The group then met with the Strategic Investment Advisors Panel (SIAP) in August 2022 to discuss the content. This proactive initiative resulted in a more seamless tender process for PIPS 4 Profit (2023-2028) to provide greater continuity and efficiency for industry.

The final evaluation process concluded the following successful performance outcomes of the PIPS3 Program.

| Evaluation domain | Determined performance rating | Stakeholder rating | Summary |
|---|---|---|---|
| **Effectiveness** | Strong | 4.2/5 | Steady rating compared to the mid-term. The program delivered and exceeded, in certain components, upon the intended outcomes. |
| **Relevance** | Strong | 4.4/5 | + 0.1 compared to the mid-term. The program delivered research outcomes and outputs relevant to the needs of apple and pear growers, service providers and other industry stakeholders by project end. |
| **Appropriateness** | Strong | 4.6/5 | + 0.2 compared to the mid-term. The program operated above expectation and delivered appropriate communication and extension to support dissemination of research activity, progress and outcome information. |
| **Efficiency** | Strong | 4.1/5 | + 0.1 compared to the mid-term. Partners are worked collaboratively to deliver an efficient and integrated program approach to research, extension and communication activities. Some areas for continuous improvement have been identified. |
| **Legacy** | Strong | 3.8/5 | Steady rating compared to mid-term. Respondents believe that researchers, growers and service providers have increased their knowledge and understanding (4.0/5- Strong (-0.1 compared to mid-term)) but are less confident of the likelihood of this translating into changed practices within the next 12 years (3.6/5- Moderate (+0.2 compared to mid-term)). Increased confidence at the end point of the project compared to the mid-point is a positive trajectory. Lack of industry programs dedicated to longer-term extension and support of R&D outcomes (beyond the life of PIPS projects) is an identified barrier to adoption. |

## Keywords

Apples; Pears; research; development; decision support tools; remote sensing; orchard management; orchard systems; climate challenges; resilience; weather extremes; sustainability; fruit quality; irrigation; soil health; nutrients; water efficiency, integrated pest and disease management; biological control; cultural control; cover cropping; orchard floor management; rootstocks; chemical thinning; mechanical thinning; crop load; floral initialization; labour efficiency; nutrient efficiency; water efficiency.

## Introduction

The *AP19007- Independent program coordination for apple and pear productivity, irrigation, pests, and soils program* (PIPS3 Program) project was conducted to enhance collaboration and information exchange between program partners, and their teams, and to foster a more integrated and whole-of-system approach to R&D activities, outputs, and outcomes. Furthermore, the role was engaged to facilitate agreement upon processes to increase efficiencies in implementation of activities (e.g., colocation of experimental sites and shared resources), ensure effective communications across regions/ projects and accelerate transferal of the progressive R&D updates, outputs (tools & resources) and outcomes to the industry end-users to augment early improvement in knowledge and understanding of the concepts, and heighten the likelihood of adoption in the medium to longer-term (<10 years).

Previous iterations of the PIPS Program (1 and 2) highlighted the need for individual projects to adopt a more collegiate approach to R&D activities in order to deliver greater efficiency and provide improved integration of the outcomes to better reflect the integrated environment of an orchard system. For R&D to be effective, it was acknowledged as critical that a system approach needed to be supported. Any management practice or technology to be adopted from the PIPS3 Program R&D outcomes had potential to have an impact on other factors within the orchard system.

The AP19007 project implemented four core pillars to address effectiveness, relevance, appropriateness, efficiency, and legacy of the PIPS3 Program R&D, communications, and engagement activities.

**1. PIPS3 Structure & Planning**

The project established a governance structure that facilitated grower and industry input through the Program Reference Group (PRG), accelerated timely planning, exchange, and collaboration between projects through formal Project Leadership meetings, and prepared whole team and partner opportunities to increase cohesiveness and integration of activities and outcomes through team forums (face to face, online & email). The coordinator provided a whole-of-program oversite to project based consultative groups such as the AP19005 Project Reference Group, AP19002 Community of Practice and AP19006 cross-regional team meetings.

The project consulted with industry and program stakeholders to prepare high quality planning instruments: Risk Register, Communications and Extension Plan (2020) and Monitoring and Evaluation Plan (2020) that were expertly delivered above expectation.

**2. PIPS3 Program Communications**

The project delivered PIPS3 Program communications to amplify the importance of the R&D objectives in the context of current and future operating environments for apple and pears, the relevance of the R&D activities, outputs and outcomes to orchard management decisions and potential for increased effectiveness, efficiency and sustainability whilst striving for improved product quality and business profitability.

A focus of increasing the profile of the PIPS3 Program brand was taken so that growers could better identify and trust the quality of R&D, undertaken for their industry by suitably qualified scientists, and encourage them to engage more in the R&D activities. The aim was also to raise awareness of how their levy investment was being used to support robust experiments, demonstration and trial that reflected their feedback on previous PIPS Programs and provided avenues for active participation in the research. Consequently, a series of standard formats for presentations, resource materials, event promotion and acknowledgments (logos and text) were developed and used by program partners locally, nationally, and internationally to both science and industry audiences.

The project built the right partnerships with industry organisations across growing regions (APAL, Pomewest, Fruit Producers SA, FGT, FGV) and aligned commercial and government organisations, to prepare and/or coordinate an unprecedented volume of communication materials, disseminated via existing printed, electronic, and digital channels (Refer Outputs Section). These relationships required ongoing management as personnel changed, and annual planning to ensure the delivery of seasonally responsive articles and resources.

**3. PIPS3 Program engagement and extension**

The project endeavored to work collaboratively with existing industry extension models to ensure timely updates and accelerated transfer of new knowledge, understanding and key messaging. This resulted in PIPS3 Program team members presenting at industry conferences, R&D forums, and orchard walks across all major growing regions except south-eastern Queensland. To further enhance the effectiveness of R&D release in the second half of the program, the role developed a program of events called the “PIPS3 Program Researchers Roadshow” to reflect feedback that growers were keen to see researchers apply outcomes of the PIPS3 Program to their region and growing conditions. From April to June 2023, the research team committed to preparing for, and travelling for these events. As a platform for discussion and

demonstration, the regional demonstration sites of AP19006, and the *Mastrus ridens* release sites of AP19002 were used.

4. **PIPS3 Program continuous improvement**

The project conducted two extensive processes to evaluate the progress (mid-term) and overall (final) performance of the PIPS3 Program. Through a total of 106 telephone interviews (20 minutes duration), researchers, growers and service providers were empowered to provide their input and feedback into the program. The mid-term evaluation process resulted in the comprehensive *PIPS3 Program Mid-term Evaluation Report (2022)* (Appendix 3) that helped to inform 'tweaks' in research direction and new initiatives in the second half of the program and provided insight for the SIAP in development of the objectives of PIPS 4 Profit (2023-2028).

**Clear industry linkages**

As a result of developing and coordinating a more integrated and interactive, quality driven research, communication and engaging PIPS3 Program model, the objectives of the program were expertly addressed. Outcomes of monitoring and evaluation processes (mid-term and final) have found that whilst the PIPS3 Program has made a substantial step-change in knowledge and understanding for industry, the three year duration limited potential, some of which will now be progressed in PIPS 4 Profit.

The PIPS3 Program has provided the apple and pear industry with tools and knowledge to develop sustainable orchard systems of the future that:

- Are more resilient to climate variability and weather extremes;
- Use resources more efficiently and sustainably;
- Apply biological and cultural solutions in the management of pests, disease, nutrients and irrigation;
- Drive product quality and business profitability through the use of accessible decision support tools and advanced sensing and data collection/ management technologies in the orchard; and
- Have greater potential to produce a lower environmental footprint and sustainable product that meets consumer preference and expectations.

Whilst the *Apple and Pear Industry Strategic Investment Plan (2022-2026)* was developed and released during delivery of the PIPS3 Program, the outcomes and strategies closely align with the aims and activities of the program, and further justify the approach to R&D being undertaken by the industry through the PIPS Program. The PIPS3 Program remained highly relevant, or potentially had an influence upon industry sentiment and aspiration, captured in the plan. The PIPS Program has, and will continue, to address the following goals of the industry, whilst also contributing to relevant strategies associated with Outcomes 1 and 4:

| | |
|---|---|
| **Outcome 2** | **Industry supply, productivity, and sustainability- The Australian apple and pear industry has increased profitability, efficiency, and sustainability through innovative R&D and sustainable best management practices (BMPs).** |
| Strategy 1 | Develop management strategies to optimise productivity and profitability in apple and pear orchards, including soil and plant health, inputs such as water and labour, and crop protection and environmental factors. *(All projects)* |
| Strategy 3 | Enhance sustainable orchard system design and management to optimise orchard profitability through improvements in input efficiencies and quality improvements. *(All projects)* |
| Strategy 4 | Support pollination security through robust honeybee health, and pest and disease mitigation. *(AP19002 & AP19006)* |
| **Outcome 3** | **Extension & capability- Improved capability and an innovative culture in the apple and pear industry maximises investments in productivity and demand.** |
| Strategy 1 | Deliver industry-specific communication, capacity, and capability to create positive changes in the areas of sustainable production, value-adding opportunities along the supply chain, labour efficiency, crop protection, biosecurity, soil, plant health and export capability. *(All projects)* |
| Strategy 2 | Provide opportunity for engagement within industry, across industry members and with relevant stakeholders throughout the supply chain to innovate by utilising trusted relationships. *(All projects)* |
| Strategy 3 | Strengthen industry leadership through initiatives and training. *(All projects)* |

# Methodology

**Beneficial partnerships**

Establishing and fostering beneficial partnerships in order to magnify the quality, effectiveness, and efficiency of the PIPS3 Program was the most essential method used in coordination of program activities and execution of the associated consultation processes. Creating opportunities for open dialogue through formal (meetings) and informal (email, phone calls, messaging) mechanisms delivered increased collaboration between projects and with industry programs/projects (esp. AP18000/AP2100) and delivered a more integrated approach to the timely dissemination of information to the end-user via multiple established, trusted channels.

**Central Contact**

The coordination role provided a formal touchpoint for industry partners, valued as a quality and efficient conduit for cooperative activities. Collaborators could be confident their needs or ideas would receive a prompt, collated response from the perspective of the PIPS3 Program collective, wherever relevant. Conversely, collaborators were buoyed when they could reply upon the coordinator role to facilitate cooperative project input and preparation of materials and engagement initiatives across the program, alleviating the need to contact individual research members. In essence, the AP19007 project allowed the PIPS3 Program to better control the integrity and accuracy of information that was released to the end-user, at a time most appropriate to ensure confidence in the science findings, and as considered translation of the research for each of the grower (e.g., considering seasonality and current operating conditions) and industry service provider (e.g., more data driven) target audiences.

**PIPS3 Governance and Collaboration Opportunities**

The PIPS Program was guided by the knowledgeable input and feedback of the PIPS3 PRG. comprised of the project leaders, apple and pear growers, an APAL representative and the Hort Innovation Program Manager. The PRG, its meetings and executive support (provided by the coordinator) was conducted under formally agreed Terms of Reference, prepared by the coordinator in accordance with Hort Innovation policy. The first meeting was held in September 2020, with a further seven meetings conducted, the last where final project outcomes were presented in June 2023. Meetings were held online for 1.5- 2 hours using an open discussion format where project leaders presented key updates (presentation or verbal) and posed a number of questions needing input from the group. All meetings were minuted and recorded. For each meeting, a Drop-box was provided afterwards with all presentations, agenda, minutes, and copies of relevant materials sourced during the meeting.

Similarly, the project leaders and coordinator met formally, at least quarterly, over the two years, ten online and two face to face. These meetings were called by the coordinator when there was a need to update one another and coordinate program-wide initiatives and cross-project cooperative activities. The Hort Innovation Program Manager also attended a number of these meetings. There was substantial informal collaboration between this group using both email and texting. Overall, the relationships were extremely supported by all members and a strong collegiate approach was taken to support one another and substantially contribute where a collective effort was needed.

In March 2022, the entire program team of twenty-four was able to come together for the first time over two days at Agriculture Victoria's Tatura SmartFarm to exchange and plan. This forum also included APAL's communication team and Hort Innovation representatives. Beyond simply updating and exchanging on project progress, the team also collaborated on "challenges and solutions" highlighted by the mid-term evaluation process and conducted communications and extension planning for the second half of the project. The team (with additional personnel) will meet to commence PIPS 4 Profit in September 2024, and ongoing annually during the five year duration. All team members also had access to an up to date team contacts list for informal exchange.

**PIPS3 Program Communications**

PIPS3 Program *Communications and Extension Plan, 2020* (C&E Plan) (Appendix 1) set-out the commitment of the program partners to deliver best practice internal and external communication activities across the program over the three year duration. The C&E Plan was written by the AP19007 project, commencing with project input using a template approach, and meeting with the APAL communications team (at the time) to align with their planning and timeframes, and to build a beneficial relationship so that the projects (AP19007 and AP18000/AP2100) supported one another's initiatives. The core conduit for communications to the end-user was to be the established APAL mechanisms (and the organisation holding the industry contacts list) of the quarterly magazine, *Australian Fruit Grover Magazine (AFG)*, and the e-newsletter, *Industry Juice (IJ)*, as well as associated social platforms (Facebook, LinkedIn, Instagram, Twitter). Those partners with organisational social media platforms (Agriculture Victoria, University of Tasmania, NSW DPI, Pomewest) were encouraged to actively engage and share in posts by APAL on the PIPS3 Program.

The PIPS3 Program **website** was a considerable foundation activity undertaken by the coordinator, delayed due to AP18000 staff changes at this time, impacting timing of development, trial, and release of the site by their contractors. The coordinator developed all content, including project information sheets for download on each project, and provided design and layout boards to help facilitate a streamlined delivery timeframe, though little could be done to circumnavigate the bottleneck associated with AP18000 at the time. Eventually, the website went live eight months after the commencement of PIPS3. The coordinator then continued to supply AP18000/AP2100 with new materials (videos, articles or fact sheets) and updates throughout the following two years.

The development of **templates** for articles, presentations, event promotions, event evaluations and fact sheets were delivered by AP19007 to build awareness of the PIPS3 Program brand as a trusted R&D program for the industry, that delivers efficient and effective projects for their levy investment, in partnership with leading organisations. Another benefit was the demonstration of a more collaborative approach to R&D across organisations and regions, to give growers confidence that research was working together, not working in silos, for a more impactful outcome for industry. The templates also ensured that all partners were duly acknowledged using a consistent, high quality format. A Drop-box folder was used to ensure all team members had access to up to date templates throughout the three years.

**Articles for AFG** were coordinated by the coordinator every quarter. APAL were notified a month from the deadline of the contributions the team would be providing. She then worked with the team members to prepare articles, and associated figures, to best target the end-user and reviewed and supplied edits, where needed. The role also authored and co-authored a number of articles. **Web articles** were also prepared where it was more appropriate to use *IJ* to ensure timely release of the information rather than wait for the next release of the printed magazine. Additionally, most AFG articles were also released in a web version via *IJ* after publication, providing a secondary opportunity for end-users to engage with the articles. The *IPDM in Focus* articles that became a quarterly staple of the AFG magazine was an initiative instigated by the coordinator, bringing AP19002 on board to work collaboratively on articles. The reason for doing so was to ensure the newly released *Apple and Pear IPDM Manual (2021)* was promoted to growers in a practical way, and continuously sign-posted to increase awareness of the freely available resource.

**Journal articles** were prepared as contracted by AP19003 and AP19005 projects. The coordinator was responsible for reviewing draft articles and providing feedback to the researchers and ensuring all acknowledgment obligations were met. The review and approvals process was then facilitated with Hort Innovation.

**Videos** were a major communications tool used by the coordinator to engage with growers and service providers in an interactive and “quick and easy” approach to updates and release of timely information. The coordinator would identify opportunities for stories, or later in the project the team members became very proactive in making suggestions, to be captured, mostly in the orchard or within the researcher environment. Dependent on the topic, an interview style was used at times where a researcher interviewed a grower, or team members interviewed one another, to take a more relaxed “conversational” style to the video. During site visits for filming, the coordinator also used these opportunities to identify other needs of the research team such as assisting them with written communications, planning next project stages, or assisting liaising on upcoming reporting requirements. Of the thirty-seven (37) videos released on the PIPS3 Program, thirty-four (33) were filmed, produced, and edited by the program coordinator. APAL was notified of expected timelines for video release and were provided with “thumbnails” (photos with titles in JPEG format) to be used in *IJ*, and written introductory web articles, to introduce the topic and purpose of the videos to the end used, were also authored, and provided by the coordinator. Again, the coordinator facilitated the review and approvals process with all organisations associated with the video, often requiring multiple intra-organisational approvals. Amendments were made when required prior to final release.

**Fact Sheets** that were outputs of individual projects of AP19003, AP19005 and AP19006 had substantial input, editing and review by the coordinator. The role was then responsible for promoting the availability of the resources through IJ and assisting relevant team members to prepare related articles in upcoming publications to provide context and draw attention to the new information for growers and service providers. **Hand-outs** were also developed for extension events using the fact sheet templates and reviewed and edited by the coordinator.

Hort Innovation **approvals and acknowledgement guidelines** were always adhered to by the program due to the diligence of the coordinator. Copies of all materials were reviewed and approved by the two relevant Hort Innovation Program Managers and the Hort Innovation communications team. An agreement was established with APAL early in execution of the on the use of the PIPS3 Logo, partner/investor logos and text acknowledgments to increase awareness of the brand across all platforms.

**Monitoring** of the performance of PIPS3 Program communication materials (digital & hard copy) released was tracked in accordance with Section 9.1 of the C&E Plan. The coordinator worked with the APAL team to establish a template for collecting and reporting analytics on Industry Juice, Web page, YouTube and social media engagement, and reader reach on the hard-copy publication of AFG. The final reporting of these is avaialble in Appendix 4.

**PIPS3 Program engagement and extension**

The *PIPS3 Program Communications and Extension Plan, 2020* (C&E Plan) (Appendix 1) also outlined the key activities that would be undertaken to engage growers in the R&D of the PIPS3 Program. Central to the plan was for the coordinator and program partners to collaborate closely with APAL's Future Orchards® Walks model and APAL R&D Forum, to streamline the number of events growers and service providers were required to attend. It also outlined the importance of using the regional demonstration sites in Victoria, NSW, Tasmania, South Australia, and Western Australia to deliver a more Participatory Action Research (PAR) extension model, where growers have input into the research regularly to reflect local seasonal conditions, systems, soil types and climatic conditions.

In the first eighteen months of the program, Covid-19 restrictions had a marked impact upon face to face events that could be conducted. This saw the program use video medium to keep industry updated on the research. The coordinator organised for the researchers to film their research that they then provided to her to produce, edit and release. The role also negotiated to have a special PIPS3 Program session and panel as part of the program of APAL R&D Forum in 2021. Unfortunately, due to Covid-19 restrictions, the forum was cancelled, and the coordinator organised for the PIPS3 Program researchers to deliver their presentations in a video format and subsequently released via IJ.

Through building a good working relationship with APAL's Extension Manager, Rose Daniels, the AP19007 project worked with APAL to have the Spring (September) 2021 Future Orchards® Walks focus upon the PIPS3 Program. The research teams across the regions delivered presentations and in-orchard walks with local growers, including conducting the very successful Soil Your Undies campaign in Tasmania and Western Australia. Across all regions, approximately 150 growers and service providers attended.

As an outcome of the mid-term evaluation process conducted in early 2022, and a growing reluctance by a changed APAL extension program/ funding model to integrate PIPS3 into FO® Walks, a decision was made to conduct stand-a-lone PIPS3 Program extension activities by the coordinator with the support of the PRG. As such, industry conferences such as Fruit Growers Tasmania (AP19006 & AP19002) and Fruit Growers Victoria (AP19003 & AP19005) became an important conduit for extension in 2022, and the coordinator drew-upon her good working relationship with the APAL communications team to have a substantial PIPS3 Program presence at the August 2022 APAL R&D Forum held in Melbourne where six presentations were delivered (AP19006 (Nigel Swarts on SINATA), AP19006 (Sally Bound on Soil Health & Orchard Floor Managements), AP19002 (Greg Lefoe, Mastrus ridens and Conservation-biocontrol) , AP19003 (Tim Plozza, Effect of crop load on biennial bearing and fruit quality), AP19005 (Lexie McClymont, Pear rootstock/scion combinations) and AP19003 in the orchard on day two (Green Atlas® Cartographer validation and practical use)).

The team worked collaboratively with the coordinator to prepare and schedule a "PIPS3 Program Researcher Roadshow" from March to June 2023. This initiative saw members of the research team travel to all growing regions, partnering with local organisations (Agriculture Victoria, Tasmanian Institute of Agriculture, Pomewest, Fruit Producers South Australia, Fruit Growers Tasmania, Fruit Growers Victoria, and NSW DPI) to deliver outcomes of the PIPS3 Program research direct to growers and service providers in the orchard. The coordinator was integral in scheduling all events locally, working with local organisations and researchers to formulate a regional specific program that reflected the needs of the local growers, and on logistics and local promotion, and conducting a national promotion campaign. The AP19002 project also used these events, where relevant, to involve local growers in release of the new population of *Mastrus ridens*. These events were:

- Goulburn Valley Horticulture Field Day, March 23rd (Exhibitor display and integration of AP19002/AP19003 research into a climate change presentation made by Ian Goodwin (AP19003 & AP19005 leader)
- Orange, NSW, April 26th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
- Huon Valley, Tasmania, May 24th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
- Lenswood, Adelaide Hills, May 30th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)
- Manjimup, Western Australia, 1st June (PIPS3 Orchard Walk with research leaders)
- Fruit Growers Tasmania conference 15th-16th June (Exhibitor Display and AP19002, AP19002/AP19006, AP19003/AP19005 & AP19005 presentations)

Whilst there were also individual project/ regional extension activities conducted during the three years, these events were undertaken through the program by the AP19007 project.

**PIPS3 Program Monitoring and Reporting Systems**

During the program start-up phase, the AP19007 developed a standard template for all projects to prepare risk registers. The template provided a more automated process, delivering greater efficiency, and these were shared between projects

to help identify shared risks that could be cooperatively addressed and managed through the project leadership and PRG platforms.

The *PIPS3 Program Monitoring and Evaluation Plan, 2020* (M&E Plan) (Appendix 2) was prepared by the AP19007 in close consultation with the projects, commencing with project input using a template approach. The collated information enabled the coordinator to build the whole-of-program logic and program and projects level key evaluation questions (KEQ). The plan underwent a review and approval process with Hort Innovation, the PRG and all project organisations. In order to execute the plan, tools were also developed by the coordinator to assist projects keep track of their communications and extension activities, used to prepare their six-monthly Hort Innovation milestone reports, and seek ongoing participant input. These were the *PIPS3 Program M&E Portal* (Drop-box based system) that required projects to use a drop-down system to register their activities and associated monitoring data, as they were delivered, and an event evaluation in both a paper and online survey format. Projects adopted these tools to a certain extent, however, improvement in use is needed in PIPS 4 Profit.

The AP19007 project assisted each of the research projects to achieve their milestone obligations, providing information on communications and extension analytics and materials/links where relevant to each project. As requested, the role also provided review and feedback assistance for project leaders.

**PIPS3 Program Evaluation**

The *PIPS3 Program Monitoring and Evaluation Plan, 2020* (M&E Plan) (Appendix 2) outlined the way in which the program and projects were to be evaluated against the KEQ, to assess progress (mid-term) and final (end) performance against the program logic. Evaluation of progress towards/ achievement of the short-term outcomes (project duration), delivery of the agreed (and contracted) outputs, and the effectiveness/ appropriateness of the activities implemented to realise the outcomes and outputs was assessed.

The AP19007 project conducted the mid-term evaluation during February and March of 2022, resulting in the *PIPS3 Program Mid-term Evaluation Report, 2022* (Appendix 3), and the final evaluation during June and July 2023, the results of which are presented in sections below.

Contributions to the collation of reports demonstrating achievement criteria status, evidence of activities undertaken, and the impact of activities was provided by project team members, the Hort Innovation Program and the APAL Communications team.

The evaluation process used the PIPS3 Program Logic (Section 2 of the M&E Plan) to determine the approach and focus of the evaluation at the mid and end points. Both desk-top and interview survey methods were used.

Whilst intermediate (<5 year post-project) and long-term (legacy, <10 years post-project) outcomes are less of a focus at the mid and end points of a short three year project, it was important to consider these in the context of how the stakeholders understood the PIPS3 Program was/had improved knowledge and understanding, and whether there are indications that certain outcomes/ outputs will be adopted post-project or what more can be done to increase the likelihood of adoption in PIPS 4 Profit.

**Methodology of the PIPS3 Program Final Evaluation**

Background information and documentation was reviewed for each project against the KPI (Section 4, M&E Plan) and to gather evidence of output and activity achievement/ progress towards achievement (including Hort Innovation contracted Achievement Criteria) of the program logic. This information was drawn from:

- One set of milestone reports submitted since the mid-term. No final reports were used as these were not available due to the timing of the evaluation (final reporting date July 31st, 2023).
- PRG and Project Leadership Meeting minutes
- *PIPS3 M&E Database portal* entries of each project
- Peer-reviewed publications and conference abstracts
- Interrogation of communication analytics provided by APAL or partner organisation communication avenues, in accordance with section 9.1 of the C&E Plan

Each of the desk-top sources reviewed were interrogated for both qualitative and quantitative analysis purposes using the minimum data requirements table in Section 5 (Evaluation) of the M&E Plan.

The desk-top review was primarily used to evaluate the **effectiveness, process appropriateness** and **efficiency** (the latter two mostly in relation to implementation of the C&E Plan) KEQ of the PIPS3 Program (Table 1). **Relevance** was evaluated using PRG minutes only, especially in relation to the final PRG meeting where the final outcomes were presented by the project leaders.

Overall, forty-three (43) telephone interviews were undertaken by the PIPS3 Program Coordinator, each interview averaging a 20 minute in duration. Eleven questions were asked (refer Table 1), seven of these structured with a rating response required between 1 (most negative) and 5 (highly positive), with an opportunity to provide an extended comment to support the rating response. Most often, the respondents were highly motivated to expand upon the ratings provided. Four questions were open-ended to gain feedback and insight in a less formal and structured approach. These responses were particularly important in identifying areas for continuous improvement.

The stakeholder groups represented in the interviews were:

- Research team (n = 8)
- Growers (n = 20)
- Service Providers (n = 15)

The service provider stakeholder group included agency extension, commercial advisors, private advisors, and technical collaborators.

Some interviewees provided a response based upon their involvement across multiple projects of the program. This resulted in fifty-four (54) possible responses when quantifiably analysing results on a project basis. The following is a break-down of possible responses per project:

- Whole-of-program relationship (n = 6)
- AP19002 (n = 10)
- AP19003 (n = 6)
- AP19005 (n = 8)
- AP19006 (n = 24)

Although the spread of project respondents appears to be disproportionate, with AP19006 having 24 respondents, this reflects the large geographic spread of this project. The interviews conducted for this project ensured good representation across the regional areas in which both trial and demonstration activities were being conducted.

The interview process of both quantifiable and qualitative questions was used to evaluate **effectiveness**, **relevance**, **process appropriateness**, **efficiency** and **legacy** KEQ of the PIPS3 Program, and the specific program/project questions underpinning these. The design of the questions enabled analysis of responses at both a program and project level.

**Table 1. Interview questions used to address the PIPS3 Program KEQ**

| | Key evaluation question | Interview questions |
|---|---|---|
| **Effectiveness** | To what extent did the activities of the program address the objectives, research agreement achievement criteria and identified outcomes/ outputs? | 1. How satisfied are you with the execution of the research activities of the project/s? (1- Extremely dissatisfied, 5- Extremely Satisfied)<br>2. How satisfied are you with the way in which the overall project/program was delivered? (Includes non-research activities) (1- Extremely dissatisfied, 5- Extremely satisfied) |
| **Relevance** | At this time, are there indications that the research outcomes/ outputs will be relevant to the needs of apple and pear growers, advisors and industry stakeholders? | 3. How satisfied are you that the outcomes/outputs of the research are relevant to growers/ service providers? (1- Extremely dissatisfied, 5- Extremely satisfied)<br>4. Are there any changes you have made/ advice you have provided from what you have seen/ heard about/experienced from the PIPS3 Program research so far? *Prompt examples provided |
| **Appropriateness** | How well were the intended audiences engaged in the PIPS3 Program ?<br>Was the PIPS3 Program Communications and Extension Plan appropriate and did it have an impact upon the target audience? | 5. What extension/ collaboration/ communication activities have you engaged with over the past 12 months *Prompt examples provided<br>6. What activities/information or communication do you feel has been particularly effective or resonated for you and why?<br>7. How do you rate the value of the PIPS3 Program events you have attended or communications you have read/watched at providing relevant information and engaging industry growers / service providers? (1- No value, 5- Extremely valuable)<br>8. What could we do better in PIPS 4 Profit to communicate and extend the program research information and its relevance to orchard operations/ businesses? |
| **Efficiency** | What were the valuable activities undertaken by the PIPS3 Program partners to improve efficiency and did a "program" approach make a difference? | 9. How would you rate the success of the PIPS3 Program (being delivered as a collaboration between projects and teams) in delivering increased research efficiencies, knowledge exchange between researchers and grower impact through extension & communications? (1- Not successful, 5- Extremely successful) |
| **Legacy** | Are there signs that the PIPS3 Program has influenced apple and pear growers now and into the future? | 10. Based on your level of involvement, how much do you think grower/ service provider knowledge and understanding on (project specific outcomes) has improved as a result of PIPS3 Program? (1- No improvement 5- High level of improvement)<br>11. Based on your level of involvement, how likely is it that growers will adopt/ service providers will adjust their advice on (project specific outcomes) as a result of PIPS3 Program in the next ten years? (1- Extremely Unlikely 5- Extremely likely) |

It is important to note that AP19007 was not directly included in the interview question process due to the potential for a perceived conflict of interest by the interviewees. As the role is responsible for planning and executing cross-project efficiency, collaboration, communication and extension opportunities, the outcome of the evaluation with regards to these activities are an assumed assessment of the progress performance of this project.

*Appendix 5 (Confidential) is a database containing all responses received to both quantitative and qualitative questions of the interview process, with the identity of the respondents removed for confidentiality.*

Using the KPI (Section 4, M&E Plan) to evaluate performance against the short-term outcomes, outputs and activities of the program logic, and milestone achievement criteria of the projects, a three-level traffic light system was used.

The evaluation result of the document review was determined as shown in Table 2.

**Table 2. Desk-top review evaluation criteria to determine performance.**

| Evaluation result against KPI | Evaluation Criteria |
|---|---|
| **Strong** | Delivery of planned outputs and achievement criteria in full or with minor omissions or gaps |
| **Moderate** | Partial delivery of planned outputs and achievement criteria, with moderate omissions or gaps |
| **Weak** | Limited delivery of planned outputs and achievement criteria, with significant omissions or gaps |

For the interview quantitative ratings (analysis at overall, stakeholder and project levels), the evaluation status was determined as shown in Table 3.

**Table 3. Stakeholder interview quantitative response ratings to determine performance.**

| Stakeholder Interview result | Evaluation criteria |
|---|---|
| **Strong** | Rating of between 3.8 to 5 |
| **Moderate** | Rating of between 2.4 to 3.7 |
| **Weak** | Rating of between 1 to 2.3 |

Where relevant, both the desk-top review and stakeholder interviews were combined to provide an overall evaluation finding. The desk-top review criteria (Table 2) and stakeholder interview quantitative response criteria (Table 3) were combined as shown in Table 4.

**Table 4. Combined evaluation criteria to determine performance.**

| | | Stakeholder Interview Result | | |
|---|---|---|---|---|
| | | **Strong** | **Moderate** | **Weak** |
| **Desk-top Review Result** | **Strong** | Strong | Strong | Moderate |
| | **Moderate** | Strong | Moderate | Weak |
| | **Weak** | Moderate | Weak | Weak |

Both quantitative and qualitative information was used to provide a performance rating of strong, moderate, or weak. Additionally, interpretation of the stakeholder responses and document review was used to highlight likely reasons for the performance progress rating.

The results and discussion on the whole-of-program are outlined in the next section of the report. Individual project reports on the KEQ, project performance results with discussion, example respondent quotes (researcher, grower & service provider) and recommendations for continuous improvement were prepared for each project by the AP19007 project (Program Coordinator), presented in the final project reports of AP19002, AP19003, AP19005, and AP19006.

## Results and discussion

Whole-of-program evaluation findings are presented using the following format:

- Overall program performance rating &/ or the associated overall program interview rating
- Break-down of performance per project &/or the associated project interview rating
- Break-down of performance per stakeholder group with representative quotes
- Analysis and discussion on the findings of each KEQ performance rating with a focus on the whole-of-program findings.

**Effectiveness**

| Overall performance rating | Overall program stakeholder rating |
|---|---|
| Strong | 4.2 |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on the extent to which it addressed the objectives of the program and delivered upon the contracted outcomes and outputs. Overall, respondents are very confident (4.2/5) that the research, communication, extension, and collaboration activities were effectively implemented by the project partners and delivered results to the industry. However, it was raised certain components of the research needed more time to comprehensively investigate the impact of certain treatments and practical solutions/ strategies for growers, and more needed to be delivered on the economic impacts of potentially adopting certain practices. A significant number of respondents raised concerns about the impact of Covid-19 upon activities, including the establishment of trial plots and year one data collection, and face to face extension of the research to engage growers more fully. There was praise, however, for the way in which the teams continued to find ways to adapt the research activities/timelines to continue (relatively) and trialed ways to update industry by using innovative strategies such as videos and social media grabs of activity at research sites.

**Table 5. Project effectiveness evaluation finding**

| Project | KPI Review | Q1.Research Delivery | Q.2 Overall Program Delivery | Average Effectiveness Rating | Combined Effectiveness Evaluation |
|---|---|---|---|---|---|
| **Program** | Strong | 4.2 (n=6) | 4.2 (n=6) | 4.2 | **Strong** |
| **AP19002** | Strong | 4.1 (n=10) | 4.3 (n=10) | 4.2 | **Strong** |
| **AP19003** | Strong | 4.6 (n=6) | 4.7 (n=6) | 4.6 | **Strong** |
| **AP19005** | Strong | 4.5 (n=8) | 4.3 (n=8) | 4.4 | **Strong** |
| **AP19006** | Moderate | 4.0 (n=24) | 4.2 (n=24) | 4.1 | **Strong** |
| **Respondent Av. (n=54)** | | **4.2** | **4.3** | **4.25** | |

Breaking the evaluation down at the project level, the projects rated **strongly** overall. AP19006 and AP19002 rated a little lower, with this assessment primarily reflective of respondent views on the success of the orchard floor management trials, especially native treatments. There was also some frustration conveyed in the lack of data shared with growers to date on the effects of the treatments on soil health parameters, and a lack of confidence that the AP19006 should be collecting certain metrics around fruit quality and yield. It only received a “moderate” on the desk-top review as, to date, no guidelines have been produced or evidence to determine soil health indicators- both outputs of the project. The PRG was considered much more effective in the second phase of the program, however, continuity of attendees needs to be addressed for PIPS 4 Profit. Amongst the project teams, there were examples of where inter-project agreements had not been followed through, for example, samples being supplied by one project and no results forthcoming from the other.

**Table 6. Stakeholder effectiveness evaluation finding**

| Stakeholder group | Combined Performance Rating | Representative Quotes |
|---|---|---|
| **Research (n=8)** | 4.5 | *All activities were implemented but it's going take us longer to identify and realise the soil health impacts. The practicalities of soil health management are really not realised yet and it's what we need to work through. Also, economics needs to be fully evaluated.*<br>*Accurate (and precise) pre-harvest spatial measures of pear orchard productivity are now available to fruit growers and scientists [Cartographer].* |
| **Grower (n=20)** | 4.3 | *The final PRG demonstrated that all projects have really achieved what we asked. The outcomes have not necessarily been as far as we had anticipated (i.e., soil health) but we have learnt more about what it takes and what growers are thinking (PRG Member).*<br>*Different across projects. What Ian Goodwin has done in Apple & Pear in Cartographer is invaluable. SINATA valuable, but soil health stuff is really available somewhere else. Soil health is really quite subjective- we need to know minimum level & economic return of soil health for good fruit. It might be best for soil health is not good for production- we haven't seen this yet. (PRG Member).*<br>*From my experience with projects, it is right up there.*<br>*Technology transfer is the key. Having trials and then having the grower talk about it to their peers is important- putting it in front of them and getting them interested.*<br>*The final year of data you'd think is more appropriate for soil health e.g., nutrient status, leaf testing but haven't seen data yet. Fruit colour/ size/ weight not so relevant in my view.*<br>*SWAN- I used to predict my irrigation for the whole year- actually used it and compared it to tensiometers I had in the ground. Lots of confidence in it and will continue to use it.* |
| **Service Provider (n=15)** | 4.0 | *Overall, things were really well managed from a PRG perspective. It was really good the way AP19003, AP19005 and AP19006 partnered with AgTech companies (PRG Member).*<br>*The work is getting done, no doubt about that.*<br>*Validation of technology [Cartographer] was good and the examples used in commercial orchards.* |

**Relevance**

| Overall performance rating | Overall program stakeholder rating |
|---|---|
| Strong | 4.4 |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on delivering research outcomes and outputs relevant to the needs of apple and pear growers, service providers and other industry stakeholders. Overall, respondents are very confident (4.4/5) that their engagement with activities demonstrated project outputs and outcomes will inform future orchard design and management decisions to combat seasonal and climatic conditions, assist in labour resources, and reduce unnecessary input costs and pesticide use.

**Table 7. Project relevance evaluation finding**

| Project | KPI Review | Q3.Relevance of outcomes/outputs | Combined Relevance Evaluation |
|---|---|---|---|
| **Program** | Strong | 4.3 (n=6) | **Strong** |
| **AP19002** | Strong | 4.3 (n=10) | **Strong** |
| **AP19003** | Strong | 4.6 (n=6) | **Strong** |
| **AP19005** | Strong | 4.4 (n=8) | **Strong** |
| **AP19006** | Strong | 4.4 (n=24) | **Strong** |
| **Respondent Av. (n=54)** | | **4.4** | |

The PIPS3 Program projects are considered **strongly** relevant. There were indications that certain components of research demonstrated relevance immediately with growers and service providers involved in AP19003 and AP19005, particularly in relation to the validation of the Green Atlas Cartographer®, shade netting technologies and temperature effects on fruit colour development and fruit quality.

Whilst respondents were very satisfied (4.4/5) that AP19006 research was relevant, there was significant commentary on the practicalities of implementing orchard floor practices and lack of data yet presented to growers on the impact of using certain interrow and tree-line treatments. It was acknowledged that the general information extended on the likely benefits of improved soil health was relevant and well received. Again, the need to demonstrate the economics across all projects was suggested as imperative, such as providing more scenario case studies. While there are indications that some of the orchard floor and IPDM strategies demonstrated at the regional sites are being adopted, respondents recommended the need to demonstrate the benefits longer-term as the concepts are a “slow burn”.

Growers and service provider respondents were satisfied that the research was relevant to their stakeholder groups (Table 8.). There was aligned belief that they are likely to “pick what’s relevant” of the research outcomes dependent upon their interest and what they believe may make a difference to their/ their client systems and business profitability. There were also suggestions that local advisors should be more involved in the design of experiments/ demonstrations conducted on the regional sites to ensure they are more appropriate to local systems, conditions and practices.

**Table 8. Stakeholder relevance evaluation finding**

| Stakeholder Group | Performance Rating | Representative Quotes |
|---|---|---|
| **Research (n=8)** | 4.4 | *PRG demonstrated they could see the importance of each component of the work at the final meeting.*<br>*I am comfortable…I really do think this is really critical and we are on-track to deliver this understanding long-term- what the growers need to do and how to do it into PIPS4.*<br>*Some could have been more practical in nature and advanced things further—some planned into the next project. More practical plan for the heat & temperature type work—things they can do rather than the physiology side of things.*<br>*It has been important I think to work on commercial farms.* |
| **Grower (n=11)** | 4.3 | *What they are trying to address is certainly relevant- all of it. It may not be obvious now, but that is what research is all about. (PRG Member)*<br>*User friendly to my region and the data is relevant to our region. We have different growing environments, so the work needs to be done here to have influence.*<br>*It is definitely by projects. Cartographer is new technology that we need. SINATA brings the research together for day-to-day activities.* |

| | | |
|---|---|---|
| | | *Soil health- it's an expensive way of saying what we are doing is good or not good- just not sure that we would get more from looking at other industries who have already done this work. (PRG Member)*<br>*This is really about the cartographer and SINATA. What they say is right about the soil health stuff- not long enough. If the Mastrus works- then it will be great- it's one of the biggest issues in the GV, and if we fix this then we fix other issues (i.e., over spraying). (PRG Member)*<br>*Definitely. SINATA is for everyone. It's what you do with the knowledge you get from the walks and resources. For single operators maybe SINATA not needed but for those with staff excellent for communication.*<br>*Once I knew what it was all about, I really started to follow you guys. I am one to give something a go.* |
| **Service Provider (n=15)** | 4.5 | *There is always an issue between research and then research to extension. Researchers can go off and so it's important that the program looks to see the whole-of-system. (PRG Member)*<br>*The Mastrus work is so relevant to all regions. Getting growers to think about soils has been good, but we need to work through the 'how' more for orchard floor management. SINATA- more promotion definitely.*<br>*Needs much more engagement with the local agronomists [in treatments imposed].* |

**Appropriateness**

| Overall performance rating | Overall program stakeholder rating |
|---|---|
| Strong | 4.6 |

Across both the desk-top review and interviews, the PIPS3 Program has been given a **strong** rating on its performance relating to delivery of appropriate communication and extension of the research. This increased rating compared to the mid-term evaluation reflects the efforts made to adopt recommendations with regards to increasing grower membership of the PRG, conducting the PIPS3 Program Researcher Roadshow, and responding to feedback on methods to communicate more effectively from the respondents. The desk-top review included collation of communication analytics, with the assistance of the APAL communications team on program level initiatives. These are summarised in the Outputs section of this report and detailed in Appendix 4. APAL has also provided a separate testimonial to support the statistical analysis of the program (Appendix 6). AP19002, AP19003 and AP19005 final reports attend to extensionAUS and HIN website analytics, and AP19006 the University of Tasmania website analytics.

**Table 9. Project appropriateness evaluation finding**

| Project | KPI Review | Q7. Value of PIPS3 as communicated & extended via the C&E Plan | Combined Appropriateness Evaluation |
|---|---|---|---|
| **Program** | Strong | 4.5 (n=6) | **Strong** |
| **AP19002** | Strong | 4.5 (n=10) | **Strong** |
| **AP19003** | Strong | 4.8 (n=6) | **Strong** |
| **AP19005** | Strong | 4.6 (n=8) | **Strong** |
| **AP19006** | Strong | 4.5 (n=24) | **Strong** |
| **Respondent Av. (n=54)** | | **4.6** | |

Across all projects, agreement achievement criteria associated with engaging the apple and pear industry, as well as the science community, were exceeded. The contributions made to both project and program level activities by the PIPS3 Program team members has resulted in a **strong** rating for all projects. Project respondents certainly supported the desk-top review with project ratings between 4.5-4.8.

When asked about the most effective communication or extension activity conducted by the PIPS3Program, from their perspective, PIPS3 Program Researcher Roadshow had the most mentions (19). Respondents were enthusiastic to see the researchers come to their regions to openly present and discuss their findings. There was feedback about improvements next time to make sure local data is used wherever possible in the development of hand-outs.

All projects have had success with the reach of videos prepared in collaboration with the Program Coordinator and were highlighted by many growers as a valuable way to "quickly" stay updated. It was a recommendation by a number of respondents that videos on the "how to" use the research outputs and outcomes would be beneficial as a next step.

**Table 10. Stakeholder appropriateness evaluation finding**

| Stakeholder Group | Performance Rating | Representative Quotes |
|---|---|---|
| **Research (n=8)** | 4.8 | *It's pretty obvious that we need so much work in extension [IPDM] as people are interested but they do not know how to access the information. People don't even know about the manual- it's there but we need to get it out. Maybe a pocket guide rather than a large manual?*<br><br>*Orchard walks definitely worked. In April-June there were peaks on the extensionAUS website after each roadshow field day. The CoP targeted advisors and consultants- so we are targeting a number of levels. Our focus of the CoP has been quality rather than quantity of numbers- emphasis on key influencers who can discuss the tricky issues in a safe forum.*<br><br>*Talking live to the audience is always such good feedback for me. It's hard to know how well they are absorbing when it comes to articles and videos, but the advantage is that these [materials] are there for many years.* |
| **Grower (n=20)** | 4.6 | *The PRG is excellent as it allows researchers to learn more about what will be most valuable and relevant and allows tailoring of the projects.*<br><br>*These videos you have knocked out are dynamite! 3-4 minutes gets people involved.*<br><br>*I can't think of a reason why they have not been exposed to the R&D. They have had the opportunity. If you haven't attended, read, watched, or not contacted researchers, then that's on them.*<br><br>*The guys you had talk at the event were really fascinating. I pulled out what was relevant to me. Also, when we were in the orchard, those specialists were so knowledgeable, and I really paid attention to what they had to say. To have specialists in the orchard who are experts in certain aspects is so good- nitrogen input, IPDM- a group in the orchard and available to ask questions. It was awesome to have that opportunity.* |
| **Service Provider (n=15)** | 4.5 | *I liked the fact that there was a coordinator to oversee everything and get the extension stuff happening. Especially considering half delivered during covid. Videos reached people when we couldn't.*<br><br>*Excellent content & volume. We [service provider organisation] need to better coordinate what we pick up and disseminate locally through our socials.*<br><br>*The roadshow was certainly very important. Got to get the researchers* |

| | | |
|---|---|---|
| | | *out. Crucial. The research benefits, and that's what needs to happen.*<br><br>*The publications have been important as we can point to these, but also the fact that articles are written for publications like AFG where growers can see the practical side. There is a lot of AgTech, and this helps to demystify.*<br><br>*FGT conference, PIPS Roadshow, FO with Nigel involved. IJ & AFG articles are good and keep me informed.*<br><br>*I certainly saw things across all platforms. Personally, I am a short & sharp person- so videos are good. IJ if good will click on it. Like the AFG articles that get to the point.* |

The PIPS3 Program Researcher Roadshow enabled all stakeholder groups to have the right conversations in a safe and jovial environment for growers, with greater traction using local established networks to promote the event and prepare the program. Having an active program coordinator driving communication and extension activities was viewed integral across all stakeholder groups and there was seen to be more research team participation in delivering communication and extension activities, considered a valued outcome in facilitating greater exchange between researchers and growers/advisors.

**Efficiency**

| Overall performance rating | Overall program stakeholder rating |
|---|---|
| Strong | 4.1 |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on project partners working collaboratively to deliver an efficient program approach to research, extension, and communication activities.

The PIPS3 Program successfully delivered a more cooperative research effort for the industry, with evidence that both formal and informal exchange between project team members, and especially the research leaders, resulted in reduced duplication of effort (i.e., shared soil testing and IPDM monitoring protocols) and a willingness to share knowledge (i.e., PRG, Leadership meetings and team forum). The benefit of having shared researchers across projects has resulted in expediting opportunity for cross-project updates and information on findings within project teams. However, there was some discussion on certain inter-project partnerships being a little one-sided, with samples provided for testing but results not having been received. There were also intra-project issues raised relating to direction from leadership on foundational activities (i.e., establishment of clear protocols and procedures) and lack of ongoing communication and support at the regional level.

**Table 11. Project efficiency evaluation finding**

| Project | KPI Review | Q9. Success of Program approach in delivering efficiencies | Combined Efficiency Evaluation |
|---|---|---|---|
| **Program** | Strong | 4.3 (n=6) | **Strong** |
| **AP19002** | Strong | 4.0 (n=10) | **Strong** |
| **AP19003** | Strong | 4.3 (n=4) | **Strong** |
| **AP19005** | Strong | 4.2 (n=7) | **Strong** |
| **AP19006** | Strong | 4.1 (n=22) | **Strong** |
| **Respondent Av. (n=49)** | | **4.1** | |

**Table 12. Stakeholder efficiency evaluation finding**

| Stakeholder Group | Performance Rating | Representative Quotes |
|---|---|---|
| **Research (n=8)** | 3.9 | *…we can do some more connectivity across PIPS4- i.e., share data across the projects and have opportunities to prepare papers on these integrated outcomes in orchards.*<br>*It's more beneficial to industry as growers have a range of issues to contend with, so looking at the whole system improves integration.*<br>*More room for improvement- cross-project communications and protocols that are actually followed.* |
| **Grower (n=17)** | 4.4 | *It continues on the conversation and keeps people talking. Been extremely good thing, significant to have a committed coordinator. Absolutely. Having an engaging person in the role and someone who challenges everyone involved. [PRG Member]*<br>*PRG has opened my eyes on the value of the projects working together. The only issue is that some projects are not as good as others. [PRG Member]*<br>*I'm a real fan. When they all come together, they are really powerful. It has got better- some are not good communicators though [example provided]. Someone like Nigel is great. It is good that there is an exchange of researchers between projects too.*<br>*It's good to talk about all system issues together- The roadshow day showed that the researchers are working together to consider the impacts across the whole system.*<br>*Whole of system is what needs to be considered, so anything that addresses that is good.*<br>*My experiences with the program showed that everyone seemed to be in sync and knew where the integration points are.* |
| **Service Provider (n=14)** | 4.0 | *Benefits for the researchers which gives an indirect benefit to me. On the whole it has worked pretty well. Better than the past. Past knowledge is good so continuity is important (i.e., Ian Goodwin knowing what we have already done and not repeating).*<br>*With both my hats on [Grower & Fertiliser reseller], the program allows you to see across different projects and data and allows you to extract this for your property. The Roadshow definitely stimulated a lot of discussion, it was very interesting.*<br>*With you [coordinator] coming onboard it was a godsend. This project has forced researchers to be more aligned and work together. Cross fertilisation of ideas is a must and has worked.*<br>*Really successful. It has got so many growers into the conversation, looking at the whole system.* |

Growers provided the strongest rating for efficiency. They identified the value for them in having the researchers consider the whole-of-system rather than conduct components of research in isolation, and also appreciated the opportunity for findings to be communicated collectively, such as through the PIPS3 Program Researcher Roadshow. Researchers know there are improvements to be made in PIPS 4 Profit, especially regarding improved standardised protocols and procedures across regional sites and increasing the value of combining data to co-author journal papers. The role of the coordinator (AP19007) is considered valuable in bringing the stakeholders together and value-adding to the individual projects through program-wide initiatives.

**Legacy**

| Overall performance rating | Overall program stakeholder rating |
|---|---|
| Strong | 3.8 |

The intermediate (>5 years post-project) and longer-term (>10 years post-project) outcomes of most agricultural R&D project are difficult to predict, however, the evaluation endeavoured to gauge how confident respondents believed project activities had increased knowledge and understanding, and the extent to which adoption of the outcomes are likely in the next ten years. Whilst the overall response resulted in a low Strong rating of 3.8/5, breaking the responses into the two separate components of "improved knowledge" and "likelihood of adoption", it is clear that respondents are more confident in growers and service providers taking onboard latest learnings (4.0/5- Strong), but less confident about the likelihood of this new knowledge and understanding resulting in changed practices (3.6/5- Moderate). However, it is interesting to note that "likelihood of adoption" has lifted +0.2 since the mid-term evaluation, indicating that confidence has increased as more of the research has been implemented, communicated, and extended.

**Table 13. Project legacy evaluation finding**

| Project | Q.10 Improved knowledge & understanding | Q.11 Adoption <10 years | Average Legacy Rating |
|---|---|---|---|
| **Program** | 4.0 (n=5) | 3.7 (n=6) | 3.8 |
| **AP19002** | 3.9 (n=10) | 3.8 (n=10) | 3.9 |
| **AP19003** | 4.3 (n=6) | 4.7 (n=6) | 4.5 |
| **AP19005** | 4.4 (n=8) | 4.1 (n=8) | 4.3 |
| **AP19006** | 3.9 (n=24) | 3.7 (n=23) | 3.8 |
| **Respondent Av. (n=52) & (n=52)** | **4.0** | **3.6** | **3.8** |

Respondents of AP19003 and AP19005 indicated that they understood more fully the concepts being researched and had seen results already that gave them the confidence to provide a strong rating. The two projects that rated the lowest on likelihood of adoption from respondent experience were AP19002 (3.8/5) and AP19006 (3.7/5). Both projects are tackling relatively new and longer-term concepts for industry. It is important to note that AP19002 has risen 0.5 since the mid-term, and AP19006 by 0.3, perhaps reflecting that as the research has continued and been extended, confidence is building. There was also a sense of "slow-burn" in-terms of adoption, with an acknowledgement this may take some time, and more data on IPDM, soil health, tree health and production parameters, to back-up the sustainability benefit "theory", was going to play an important role in broader adoption across the industry, along with needing more on the economic impacts- both short-term input costs and long-term profitability benefits.

IPDM extension was raised as a significant industry gap by a number of respondents and has also been identified by PRG members in meetings of the past year. Although it was acknowledged that this was not the role of a research program, they believe that there is significant IPDM information and resources that growers and service providers were not aware of, and more signposting was needed. Suggestions that IPDM research on *Mastrus ridens* could be used in PIPS 4 Profit as a vehicle for extending more on the general concepts of IPDM, and information on getting started, were provided.

It is important to note that the timeframe for practice change within an agricultural R&D context can take years (or decades). It is rare for industry adoption of R&D to occur rapidly during or immediately following the completion of the underlying research, but rather, adoption occurs in stages depending on the overlapping of a range of other factors including the strength of extension pathways and stakeholders' appetite for risk and change (social aspects) and underlying climatic and market conditions. Respondents suggested that there were likely going to be aspects of the research outcomes that resonate differently for growers depending on their situation outlook. The idea of "grabbing different components" was seen be a valued way to transition towards new practices and a whole-of-system approach.

**Table 14. Stakeholder legacy evaluation finding**

| Stakeholder Group | Combined Rating | Representative Quotes |
|---|---|---|
| **Research (n=8)** | 4.0 | *The economics of different management options will be very important in PIPS4- for all growers. e.g., thinning sprays v other options.*<br>*I think now that we have done this roadshow, understanding has increased significantly. The final report will have region-by-region specific approach for soil health orchard management, and SINATA, and deliver out to growers, so that will hopefully put some of the engagement into more initial steps other than just awareness. Clearly articulating application to their businesses is important.*<br>*Short duration project but we have learned we need to do more. The extension needs to be more- the appetite is there. There is a big gap and PIPS often fills that as there is a need, but it's not what we are contracted to do. [IPDM]* |
| **Grower (n=20)** | 4.0 | *Think different aspects of the program get grab with different sections of the industry. There is conversation about things like biological control that didn't happen before. Packaging in small parts is important.*<br>*There will be but will be in 5-10 years as always. 10% in 5yrs, 30% in year 10. Slow burn, only have one opportunity a year to make changes.*<br>*People will take notice when the information is relevant to them. We are likely to have hotter summers again soon, then the relevance of temperature and sun-damage and netting will be something they look at.*<br>*Have increased and expanded my knowledge. Everything combined gives me the picture and I use what's relevant.*<br>*The knowledge is gold. It's a lot of time and money, and sometimes there is only a couple of sentences in advice that come out of this, but it's worth it and can give you the confidence to act. There is no one solution, but if you give the full arsenal on what is available a go, which is what the program is providing, then we can give what is relevant a go. Growers want to be shown and won't look at many things until it is proven consistently over many years.*<br>*Implementation will be slow because of the economic environment. The cover cropping will not be highly implemented due to cost and effort. The benefits have to be significant. But the questions are asked and answered by the research. We can't get things wrong- so research that says not to do something, then that's just as good.* |
| **Service Provider (n=15)** | 3.8 | *Service providers have picked-up a lot, and then the growers pick-up from this.*<br>*The [demonstration] site has helped but there was already a definite swing towards soil health and sustainable practices generally. The site helps us have the discussion amongst each other. A focus provides an opportunity to talk about our approaches to managing soil health.*<br>*Really successful. It has got so many growers into the conversation, looking at the whole system.*<br>*I have enjoyed it right the way through. It is nice to have practice related trials going on, something growers can take away.* |

## Outputs

The communication outputs provided are those the AP19007 project has either prepared directly, contributed to the preparation, or coordinated release and dissemination through APAL channels. The extension outputs provided are those of the AP19007 directly coordinated as program (multiple project) initiatives. Individual project activities are reported in the relevant project final reports. AP19002, AP19003 and AP19005 final reports attend to extensionAUS and HIN website analytics, and AP19006 the University of Tasmania website analytics.

Communication analytics have been collected in accordance with section 9.1 of the C&E Plan, with the assistance of the APAL communications team. These are further detailed (e.g., titles, links to the outputs, further comprehensive analysis data) in Appendix 4. All outputs provided have undergone a coordinated review and dissemination process by the AP19007 project.

**Table 15. Output summary**

| Output* | Description | Detail |
|---|---|---|
| PIPS3 Program Project **Information Sheets** | **4** information sheets prepared to communicate the research activities and benefits of the outcomes for industry in the early stages of the program.<br><br>These are hosted on the web pages of each project. | https://apal.org.au/wp-content/uploads/2021/09/AP19002-IPDM-Info-Sheet_Final.pdf<br><br>https://apal.org.au/wp-content/uploads/2021/09/AP19003-Apple-Systems-Info-Sheet_Final.pdf<br><br>https://apal.org.au/wp-content/uploads/2021/09/AP19005-Pear-Systems-Info-Sheet_Final.pdf<br><br>https://apal.org.au/wp-content/uploads/2021/09/AP19006-Soil-Health-Plant-Nutrition-Info-Sheet_Final.pdf |
| PIPS3 Program **Website**/ APAL Web article pages | Dedicated website for the program with individual project pages and a resource page hosting 93 outputs.<br><br>Content development, layout design, liaison with developer/APAL, and ongoing maintenance via the APAL Digital Officer. | https://apal.org.au/programs/more-industry-programs/pips3program/<br><br>April 2021- June 30, 2023:<br><br>3168 page view of PIPS3 Program pages (2:37 av. time spent)<br><br>52 web articles with a total page view of 8,803 (2.58 av.time spent)<br><br>Web page address provided on all communication outputs to refer reader to relevant developed resources of the program. |
| **Australian Fruit Grower** magazine articles<br><br>Quarterly hard-copy magazine mailed directly to APAL members. | **34** articles (2-4 pages in length) were prepared and published across the program to communicate the concepts and topics being addressed through the R&D, update on the research activities and progressive outcomes of the projects, promote engagement activities, and demonstrate the integrated approach of the research being undertaken. | https://apal.org.au/news-and-resources/apal-publications/<br><br>These articles were published in 33,200 hard copies of the AFG magazine. The mailing list for AFG is comprised of industry stakeholders throughout the supply chain. Copies are also avaialble via the APAL website.<br><br>Growers and advisors value the in-depth information provided in this format, including the presentation of data through figures.<br><br>The C&E Plan aimed for 19 contributions to the AFG Magazine. |

| | | |
|---|---|---|
| **Industry Juice**<br><br>Weekly e-newsletter emailed to the APAL apple and pear industry subscription database. | **78** communication outputs were released through the apple and pear industry's weekly e-newsletter. | Web articles and videos were extended to the apple and pear industry through this channel, resulting in 3,994 "click throughs". The IPDM related materials were those with the greatest engagement.<br><br>The C&E Plan aimed for 36 contributions to IJ. The program more than doubled this target. |
| **Videos** | **37** Videos were filmed, produced, edited, and promoted through social platforms, IJ and AFG. | As of June 30th, 2023, the videos have a total of 13,721 views with an average view duration of 1 minute 30 seconds. On average, 46.39% of the videos are viewed.<br><br>Growers and advisors support the efficiency and types of information provided in this format.<br><br>The C&E Plan aimed for 30 videos. |
| **Social Media**<br><br>APAL Facebook Page<br><br>APAL Linked-In Page<br><br>APAL Instagram Page<br><br>APAL Twitter Page | **115** posts on the PIPS3 Program were made on social media platforms. | The posts had a reach of 25,964, with 70,977 impressions achieved. There were 5,144 engagements recorded. |
| **APAL R&D Forum, July 2021** | Dedicated PIPS3 Program session & panel<br><br>**163** views | AP19007 negotiated to have a dedicated PIPS3 Program session and panel as part of the program of this annual industry event. Unfortunately, due to Covid-19 restrictions, the forum was cancelled, and the coordinator organised for the PIPS3 Program researchers to deliver their presentations in a video format and subsequently released via IJ (refer to Appendix 5). 163 views of these videos have been recorded. |
| **Future Orchards ® Walks, Spring 2021**<br><br>(November 2021) | FO® walks conducted at the research and demonstration sites of the PIPS3 Program in Victoria, Tasmania, NSW, and Western Australia, with the R&D presented and discussed in the orchard by team members.<br><br>**150** attendees | AP19007 project worked with APAL to have the FO® walks focus upon the PIPS3 Program. The research teams across the regions delivered presentations and in-orchard walks with local growers, including conducting the very successful Soil Your Undies campaign in Tasmania and Western Australia. Across all regions, approximately 150 growers and service providers attended. No evaluation was conducted by APAL.<br><br>The AP19006 project also presented at a further two FO® Walks in Tasmania, and Nigel Swarts of part of the southern loop in Spring 2022, including WA, SA, Southern Victoria and Tasmania. |
| **Fruit Growers Tasmania, May 2022** | **220** delegates | Presentations made by Greg Lefoe (AP19002- Mastrus ridens for Codling Moth control & Sally Bound and Steve Quarrell (AP19006/AP19002- *Managing the orchard floor for sustainable apple production*)<br><br>https://www.fruitgrowerstas.org.au/assets/Program_-_FGT_Conference_2022_V3.pdf |
| **Hort Connections, June 2022** | **>1500** delegates | The PIPS Program featured as part of the Hort Innovation exhibition display, with photography and information from the Soil Your Undies campaign used to create the back-drop panels. This initiative was a collaboration between the coordinator and the Hort Innovation communications team. |

| | | |
|---|---|---|
| **Fruit Growers Victoria, August 2022** | **250** delegates | In-orchard presentation at Plunkett's Orchard (commercial research site) made by Alessio Scalisi on the ongoing work to calibrate and validate the Green Atlas® Cartographer for rapid apple and pear yield and fruit quality assessment. |
| **APAL R&D Forum, August 2022** | Major PIPS3 Program presence with six presentations made across the two-day event.<br><br>**200** delegates | The coordinator draw-upon her good working relationship with the APAL communications team to have a substantial PIPS3 Program presence at this major industry annual event in Melbourne where six presentations were delivered:<br>• AP19006, Nigel Swarts, SINATA<br>• AP19006, Sally Bound, Soil Health & Orchard Floor Managements<br>• AP19002, Greg Lefoe, Mastrus ridens and Conservation-biocontrol<br>• AP19003, Tim Plozza, Effect of crop load on biennial bearing and fruit quality<br>• AP19005, Lexie McClymont, Pear rootstock/scion combinations<br>• AP19003 in the orchard on day two, Alessio Scalisi & Ian Goodwin, Green Atlas® Cartographer validation and practical use<br>• There were approximately 200 attendees at this event according to APAL. |
| **PIPS3 Program Researcher Roadshow**<br><br>March to June 2023 | **464** attendees across all events.<br><br>The team worked collaboratively with the coordinator to prepare and schedule. Members of the research team travelled to all growing regions, partnering with local organisations (Agriculture Victoria, Tasmanian Institute of Agriculture, Pomewest, Fruit Producers South Australia, Fruit Growers Tasmania, Fruit Growers Victoria and NSW DPI) to deliver outcomes of the PIPS3 Program research direct to growers and service providers in the orchard. | • Goulburn Valley Horticulture Field Day, March 23rd (Exhibitor display and integration of AP19002/AP19003 research into a climate change presentation made by Ian Goodwin (AP19003 & AP19005 leader)<br>• Orange, NSW, April 26th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)<br>• Huon Valley, Tasmania, May 24th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)<br>• Lenswood, Adelaide Hills, May 30th (PIPS3 Orchard Walk with research leaders & *Mastrus ridens* release)<br>• Manjimup, Western Australia, 1st June (PIPS3 Orchard Walk with research leaders)<br>• Fruit Growers Tasmania conference 15th-16th June (Exhibitor Display and AP19002, AP19002/AP19006, AP19003/AP19005 & AP19005 presentations)<br>https://www.fruitgrowerstas.org.au/assets/Program_-_FGT_Conference_2023_-_print_program.pdf<br>https://www.fruitgrowerstas.org.au/sponsors-exhibitors-2023/<br>The coordinator was integral in scheduling all events locally, working with local organisations and researchers to formulate a regional specific program that reflected the needs of the local growers, and on logistics and local promotion, and conducting a national promotion campaign. The AP19002 project also used these events, where relevant, to involve local growers in release of the new population of *Mastrus ridens*. |

## Outcomes

### Table 16. Outcome summary

| **Outcome**<br>As per the PIPS3 Program logic- intermediate & short-term Outcomes of the program | **Alignment to fund outcome, strategy and KPI** | **Description** | **Evidence** |
|---|---|---|---|
| Short-term: The PIPS Program has been delivered as a high impact, collaborative and integrated research program | **Apple & Pear Industry SIP (2022-2026)**<br>Outcome 2, Strategies 1, 3 & 4<br>Outcome 3, Strategies 1-3 | AP19007 has established and facilitated a highly collaborative program of R, D & E that has resulted in projects AP19002, AP19003, AP19005 & AP19006 achieving outcomes that have demonstratable profitability, efficiency, and sustainability benefits, through the development of more sustainable best management practices. Additionally, it has directly contributed to industry capacity and capability building by taking PIPS3 Program communication collateral and extension opportunities to the next level, in cooperation with industry, government agencies and the private sector, to improve knowledge and understanding on the R&D concepts and commence a strong pathway to adoption likelihood. | Final evaluation results have been determined to be **strong** across all domains of the M&E Plan- effectiveness, relevance, appropriateness, efficiency, and legacy. |
| Short-term: Stakeholders were effectively informed on research activities and progressive outcomes, as well as the potential benefits of these for businesses profitability, industry sustainability, efficient resource management practices & local operating environments. | **Apple & Pear Industry SIP (2022-2026)**<br>Outcome 2, Strategies 1, 3 & 4<br>Outcome 3, Strategies 1-3 | AP19007 was responsible for delivering a high volume package of materials, in varying formats, released via multiple platforms, to increase industry exposure to progress and demonstrate relevance of the R&D activities. The role worked closely with team members to prepare videos, articles and fact sheet communicators, and programs and presentations for | Website containing **91** resources.<br>**51** Web articles published.<br>**37** Videos released.<br>**34** *AFG* articles published.<br>**77** *Industry Juice* publications released.<br>**115** social media posts released.<br>**TOTAL: 88,098** viewer/ reader connections<br>Program-wide extension initiatives resulted in **1447** attendees. This does not include Hort Connections.<br>Growers rated the PIPS3 |

| | | | |
|---|---|---|---|
| | | extension events, that assisted to the target audiences to connect the R&D to their business, growing and local environment systems. | communications and extension they had engaged with as **highly valuable** (4.6/5), as did service providers (4.5/5). |
| Intermediate: Advisors & consultants are more confident to provide sustainable management practice advice to apple and pear growers developed from PIPS3. | **Apple & Pear Industry SIP (2022-2026)**<br>Outcome 2, Strategies 1, 3 & 4<br>Outcome 3, Strategies 1-3 | As a direct conduit for new R&D information to be extended one-on-one to growers, private, industry and government service providers play an integral role in communication and practical implementation of new/adapted sustainable managements. The PIPS3 Program developed materials and extension events that equally targeted growers and those who supported them in the orchard. | Fifteen service providers were interviewed as part of the final evaluation process. They rated the PIPS3 Program as strong across all relevant domains:<br>**Effectiveness:** 4.2/5<br>**Relevance:** 4.5/5 (topic rating)<br>**Appropriateness:** 4.5/5<br>**Legacy:** 3.8/5<br>They provided examples of how their advice has been influenced by the program, and what impact they were seeing amongst their grower networks. (Appendix 5). As an intermediate outcome of the project logic (<5 years post-project), this is a very good foundation on which to build. |
| Intermediate: Growers have adopted recommendations and tools of the PIPS3 Program and are able to demonstrate benefits. | | | Twenty growers were interviewed as part of the final evaluation process. They rated the PIPS3 Program as **strong** in the **legacy** domain, with an overall rating of 4/5, broken down as:<br>**Improved knowledge and understanding:** 4/5<br>**Likelihood of adoption (<10 years):** 3.9/5<br>They provided examples of how they had been influenced and what impact they were seeing amongst their peers. (Appendix 5). As an intermediate outcome of the project logic (<5 years post-project), this is again a very good foundation on which to build. |

## Monitoring and evaluation

Due to the nature of the AP19007 project, monitoring and evaluation was a major activity of the project, and as such this section has been addressed under results and discussion.

## Recommendations

1 **Leverage from the momentum gained in PIPS3 Program:** There are components of research that have not been fully realised. Soil health, IPDM and climate variability research requires a longer-term focus, preferably over varying annual seasonal conditions/ weather events, to ensure the outputs are understood, meaningful and adoptable by the end user. Similarly, extension and communication beyond research timelines is needed to support improved knowledge, understanding and practical adoption of the tools and recommendations. PIPS 4 Profit is a five-year program of R&D that will more adequately allow for data collection over the longer-term to provide more evidence-based communication and extension activities to target audiences.

2 **Continue with a multi-pronged approach to communication and collaboration activities:** The use of multiple channels and medium for communicating the research was considered highly effective. In order to take this to the next level in PIPS 4 Profit, there are a number of additional approaches that will be used:

- Work with each project to prepare economic case studies that demonstrate the profitability impacts of adopting certain strategies, and where possible, present the evidence the whole-of-system economic and sustainability benefits;
- Work more closely with each of the regional organisations engaging with apple and pear growers (NSW DPI, FFT, FGV, Fruit Producers SA and Pomewest) to extend information more directly, better responding to how growers have shared they are more likely to receive their information.
- Work more closely with local commercial service providers to extend information where possible, for example in South Australia and NSW it has been suggested that local agronomy providers have local newsletter or are willing to host fact sheets on front counters.
- Articles and videos should also be developed more specifically for each region where the messages and outcomes need to be tailored for local growing conditions (soil, climate, varieties, pest/disease considerations), and extended through local newsletters and social media.
- Continue to have local demonstration sites, but further leverage from these by providing opportunities for a higher level of grower/service provider input and ongoing engagement. Use the site as a central discussion/conversation site but visit other orchards in the region to keep growers/service providers interested and demonstrate examples of where/ how/ when local growers are finding solutions to local issues. It is important that local organisations engaged in research/ demonstration activities are adequately resourced and have the skills to provide these opportunities.

3 **Engage service providers using their typical avenues for accessing new information:** Service providers are viewed as a vital link in providing information to growers and should be elevated in their importance through more dedicated extension efforts. Often, they are seeking more data-driven, in-depth information. They are also an extremely important audience for local input into experiments (start to finish) and have a strong sense of how growers are likely to respond to suggested changed/ new practice managements. Extension activities for service providers (and

perhaps their leading growers) that has the time to comprehensively communicate the underpinning science and economic imperatives is integral to longer-term adoption outcomes.

Using regional service provider networks is important- i.e., Agriculture Victoria conduct advisor focused breakfasts with a guest speaker each meeting, and linking with existing company events, such as Muirs and Nutrien agronomy bi-annual national or state forums are two ideas that should be investigated.

4 **Facilitate the development of core messages for greater impact**: PIPS 4 Profit has an opportunity to establish some new and innovative messages (or catch-phrases) that are simple in their approach but have a real connection with growers. Each project needs to identify the narrative/s they need to prepare and promote early in the project. For example, on soil health, reduce focus upon more complicated orchard floor management changes, and amplify the narrative around simple but effective practices such as mow and throw, and using legume mixes, to reduce fertiliser inputs, decrease weed incursion, and attract beneficials as a good starting point for IPDM. Be clear on the practicalities and financial realities of doing so. Later in project execution, these narratives can be adjusted to include more evidence-based statements.

5 **Develop or sign-post more to orchard management implementation guides:** It has been identified through the final evaluation that extension of certain information (especially IPDM) has become an increasing gap for the apple and pear industry. Although PIPS 4 Profit is an R&D program, it has outputs linked to communication and extension of the R&D, including practical execution of the outcomes. The PIPS 4 Profit C&E Plan could potentially include:

- A set of clear and user-friendly key messages for each project with an overt value proposition – i.e., clearly aligning recommended practices with economic considerations. In the initial stages these may be "likely benefits", to more evidenced-based benefits nearer project end.
- Preparation of short guidelines/ pocket guides that outline more of the "How to" and "Why" for growers, or integration into existing manuals such as the annual *Plant protection guide for deciduous fruits in NSW.*, supported by videos. Use the R&D activities of PIPS 4 Profit as core examples to justify relevance to the program i.e., how to best implement IPDM to enhance *Mastrus ridens* populations- potential to cover "soft chemical" approach, increasing habitat and food sources, tackling seasonal incursions of pests or disease to reduce impacts on biological and cultural control methods. These can also be provided to service providers.
- Written narratives or short case studies showing the benefits experienced from orchard trials, from the host farmer's perspective on how they have done things and how they overcame challenges. Use these as an opportunity to sign-post growers to existing resources that have been simply forgotten over-time as extension has been reduced (i.e., *Apple and Pear IPDM Manual (2021)*;
- Tools developed within the PIPS3 Program that need increased promotion with clear instructions for use and benefits of long-term use (not just a once-off trial). Case studies can be embedded into industry and agency training.

6 **Integrated soil, nutrient and irrigation master class materials:** The "Master Class" model is familiar to apple and pear service providers and growers. The PIPS3 Program highlighted the need for a clear and trusted connection between research outcomes and practical action on the ground to improve adoption in this integrated topic area. The PIPS3 Program has an opportunity to commence dialogue with established extension avenues (APAL, NSW DPI, TIA, AgVic, Fruit Growers, Hort Innovation) on how to best prepare final project materials (new or updated information/ BMPs) that can be seamlessly embedded into existing extension and training. Conversely, these organisations could consider ways in which they can integrate researchers into the delivery model and provide compensation for their services.

7 **Continue the PIPS Program Researcher Roadshow:** Growers and service providers valued the opportunity to interact with researchers and hear directly on how research conducted elsewhere (farm, region or national variation), or on local demonstration sites, can apply to their orchard system. An improvement to be made for the three PIPS 4 Profit events is greater alignment with local growing conditions, and regional specific hand-outs. The pilot roadshow in PIPS3 was a great foundation on which to build.

It would also be beneficial for the greater good of the industry to try all avenues to use existing APAL initiatives to update growers on progressive R&D activities and outcomes, to dovetail with the roadshow approach, and demonstrate collaborative endeavours to extend R&D in the context of the focus that FO® walks. The coordinator can continue to collaborate with the APAL grower services team wherever possible.

8 **Improved project management processes:** The quality of experimental design and data collection, collation, analysis and reporting should be improved by better planning at the commencement of projects, especially those working across sites being managed by third parties. Written protocols and procedures, along with clear schedules need to be prepared and agreed very early in the commencement of PIPS 4 Profit. Throughout the project, team meetings need to be regularly scheduled to increase communication within teams and provide for further information to be shared between projects through the PRG, project leadership group, or annually through whole-of-team forums.

The development of the *PIPS 4 Profit Communications and Extension Plan* will include improved consultation with APAL communications and grower services teams, as well as regional organisations, to ensure a more coordinated approach to activities resulting in more aligned messaging and scheduling of events to reflect annual and seasonal considerations of the industry.

## Appendices

**Appendix 1-** PIPS3 Program Communications and Extension Plan, 2020 (C&E Plan)

**Appendix 2-** PIPS3 Program Monitoring and Evaluation Plan, 2020 (M&E Plan)

**Appendix 3-** PIPS3 Program Mid-term Evaluation Report, 2022 (Mid-term evaluation)

# APPLE AND PEAR

## *PRODUCTIVITY, IRRIGATION, PESTS AND SOILS PROGRAM (PIPS3)*

pips Apples & Pears

PRODUCTIVITY IRRIGATION PESTS AND SOILS

# Communications and Extension Plan 2020-2023

AGRICULTURE VICTORIA

tia TASMANIAN INSTITUTE OF AGRICULTURE

UNIVERSITY of TASMANIA | Tasmanian Government

TIA is a joint venture of the University of Tasmania and the Tasmanian Government

iCd project services

Initiated Coordinated Delivered

Hort Innovation Strategic levy investment | APPLE AND PEAR FUND

This project has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

CONTENTS

# 1 PLAN PURPOSE

The Communications and Extension Plan (C&E Plan) has been prepared to guide activities of the third Productivity, Irrigations, Pests and Soils Program (PIPS3 Program) for the apple and pear industry over a three-year period.

Funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government, the PIPS3 Program is a collaboration between Hort Innovation, stakeholders of the five contributing projects, and industry groups involved in existing communication and extension efforts, importantly Apple and Pear Australia Limited (APAL) and regional grower groups.

The C&E Plan outlines the PIPS3 Program stakeholders, key target audiences, methodology for internal and external communication and extension activities of the individual projects, the tools that will be used, and the schedule for implementation of the identified strategies.

As the PIPS3 Program has multiple agencies involved in leading research and development, the CEP has been prepared to emphasise the importance of integration of both internal and external communication and extension activities to deliver a program approach that is consistent and unified in communication of core messages, and contextualises research outcomes in relation to individual business and industry benefit.

# 2 BACKGROUND

The PIPS3 Program is being conducted over three years to build upon preceding research activities, outputs and outcomes of PIPS1 (2009-2014) and PIPS2 (2015-2020). These precursor programs contained three projects of Integrated Pest Management, Tree Structure, and Soil and Water, and were designed to provide integrated research, development and extension (R,D &E) to support gains in efficiency within the apple and pear orchard while providing orchardists with tools to implement practices more conducive to long-term sustainability of their orchards.

In June 2019, the Apple and Pear Strategic Investment Advisory Panel (SIAP) considered future research and development priorities for the PIPS3 Program. In consultation with the PIPS researchers, they determined the key research topics, and how these should be approached using lessons learnt from the preceding PIPS R,D&E effort and the experience of SIAP members.

## 2.1 PIPS3 PROGRAM OBJECTIVES

The objective of the PIPS3 program is to provide the Apple and Pear industry with tools and knowledge to develop sustainable orchard systems of the future that:

- use resources efficiently and sustainably;
- focus on cultural and biological management solutions (reducing pesticide dependence); and
- drive quality through access to better information along the supply chain (through use of new technology such as IoT and blockchain).

Orchards of the future will ensure industry meets consumer preference and expectations through the sustainable production of apple and pears and will continue to meet consumer demands and inspire public confidence.

The PIPS3 Program will address key gaps and advance understanding of potential sustainable orchard systems of the future through superior research cooperation. It will deliver an elevated level of collaboration on research methodology to proliferate understanding and knowledge amongst stakeholders and increase investment value via shared resourcing and reduced duplication efficiencies. Greater opportunity for information exchange will be facilitated so that the progressive and final research outcomes are appropriately packaged into key messages for growers and advisors in response to their ongoing input.

## 2.2 PIPS3 PROGRAM PROJECTS

The PIP3 Program has been designed as a portfolio of four research projects that work cooperatively to deliver upon the objectives of the overall program. The four research projects all have *at least two* formal relationships with *at least one other project* through collocated research activities, cross-project resourcing (researchers/ laboratory technicians/ subcontractors) or analysis of the relationship of treatments upon other factors being assessed in the orchard system (e.g. orchard floor cover crop treatments upon the establishment and persistence of biological pests controls).

The fifth project is the role of Independent Program Coordinator (AP19007), engaged to oversee the governance, management and reporting of the program as well as accelerate the timeliness and effectiveness of communications and extension through greater collaboration between program research teams and externally in cooperation with key industry and regional stakeholders, and research organisation communication networks. The four research projects are summarised:

### 2.2.1 **AP19002**: STRENGTHENING CULTURAL AND BIOLOGICAL MANAGEMENT OF PESTS AND DISEASES IN APPLE AND PEAR ORCHARDS

**Lead agency:** Agriculture Victoria

**Project Leader:** Greg Lefoe, Senior Research Scientist- Invertebrate and Weed Sciences

**How it will be undertaken:**

- Demonstration of biocontrol efficacy of codling moth (CM) and light brown apple moth (LBAM)
    - Develop and deploy lures to:
        - assess establishment of *Mastrus ridens (Mastrus)*;
        - determine the optimal conditions for *Mastrus*; and
        - the potential for long-term suppression of CM.
- Assess the genetic diversity of *Mastrus* in Australia.
- Measure the impact of *Trichogramma* spp. on CM eggs and their impact on CM and LBAM in orchards.
- Address gaps in cultural practices, orchard biodiversity practices and Integrated Pest and Disease Management (IPDM) by establishing conservation biocontrol plots in Tasmania (Huon Valley- commercial orchard (AP 19006)) and Victoria (Goulburn Valley- SmartFarm pear orchard (AP 19003).
- Measure orchard cultural management practices on plant health, yield and quality.
- Measure and analyse data on apple scab and root rot.

**Outcomes:**

- Commercialisation/implementation plan developed for *Mastrus*.
- High level understanding of the interactions between cultural (including soil health in collaboration with AP 19006), biological and chemical practices in IPDM.
- Advisors and consultants more confident in providing IPDM advice to apple and pear growers.
- Adoption of effective, sustainable, low-input pest management.

### 2.2.2 **AP19003:** ADVANCING SUSTAINABLE AND TECHNOLOGY DRIVEN APPLE ORCHARD PRODUCTION SYSTEMS

**Lead agency:** Agriculture Victoria

**Project Leader (acting):** Dr Ian Goodwin, Research Leader Crop Physiology

**How it will be undertaken:**

Physiological studies and the development of sensing tools undertaken in the Sundial apple orchard at the Tatura SmartFarm and on a commercial orchard in Tatura North (Goulburn Valley) to:

- Determine relationships between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation.
- Identify chemical signals that determine the impact of high crop load on floral initiation and differentiation, and fruit size in the subsequent season.
- Develop a rapid orchard assessment tool using a ground-based mobile sensing platform equipped with LiDAR and optical cameras (Green Atlas Cartographer™) capable of objectively measuring fruit size, fruit colour and tree size, and advising crop load distribution in an orchard.

**Outcomes:**

- Orchard design – less sunburn damage and improved quality product.
- Management options to stabilise floral initiation.

- Sensing tools to measure in situ fruit number, size and colour.
- Improved crop load management to deliver premium fruit.
- Reduction in spatial and temporal variation.

### 2.2.3 AP19005: DEVELOPING SMARTER AND SUSTAINABLE PEAR ORCHARDS TO MAXIMISE FRUIT QUALITY, YIELD AND LABOUR EFFICIENCY

**Lead agency:** Agriculture Victoria

**Project Leader:** Dr Ian Goodwin, Research Leader Crop Physiology

**How it will be undertaken:**

This project will be undertaken in the experimental pear orchard at the Tatura SmartFarm and in commercial orchards in the Goulburn Valley to:

- Determine training system, planting density and rootstock effects on yield, fruit quality and irrigation requirements.
- Determine crop load relationships and investigate thinning to minimise biennial bearing and maximises fruit quality and yield (involves Tasmanian Institute of Agriculture collaboration).
- Investigate the determinants of colour expression.
- Explore effects of alternate-side coloured hail netting to maximise fruit colour and minimise sun damage.
- Calibrate and validate a mobile sensing platform equipped with LiDAR and optical cameras (Green Atlas Cartographer™) to spatially measure tree size and fruit number, size and colour.
- Test sensing equipment (SwarmFarm Robotics) for spatially measuring cluster number, flower number and flower phenology.

**Outcomes:**

- The development of climate-smart pear orchard systems that go beyond the use of conventional orchard management practices
- Increase in pear orchard profitability through increased yield and greater consistency of pack-out fruit quality (size, colour coverage and colour intensity), made possible by determining new or improved practices relating to:
    - Tree density.
    - Rootstock.
    - Training systems (+ suitability for mechanisation).
    - Efficient irrigation.
    - Increased knowledge of colour determinants.
    - Better understanding of crop load management in pears.
    - Innovative netting design.
    - Sensing tools to measure in situ fruit number, size and colour.

### 2.2.4 AP19006: IMPROVED AUSTRALIAN APPLE AND PEAR ORCHARDS SOIL HEALTH AND PLANT NUTRITION

**Lead agency:** Tasmanian Institute of Agriculture / University of Tasmania (TIA/UTAS)

**Project Leader:** Dr Nigel Swarts, Senior Research Fellow

**How it will be undertaken:**

This project is adopting a systems approach with consideration given to how outputs will be integrated with other aspects of orchard management. It will undertake research trials, using a range of tree-line (cover crops (legume/grass mix), compost mulch, grower practices) and inter-row (native herbaceous mix, flowering meadow mix, grass/legume mix) sustainable management treatments, on orchards in five growing regions (Tasmania, Victoria, South Australia, Western Australia & New South Wales). This approach will reflect regional priorities and soil, climatic and management system differences to:

- Identify the biological, structural and chemical indicators for soil health, including relationship to regional and soil type differences, and assessment methods.
- Improve understanding of the interaction between management practices, soil health, nutrient availability, water availability, pest and disease control and fruit productivity/quality.
- Measure the impact of sustainable orchard floor management on the presence and function of mycorrhizal fungi and the organic carbon content of the soil.
- Conduct studies to understand relationships between soil health, tree health, growth and fruit yield, productivity and quality.
- Understand and address grower perceived impediments to adoption including water requirements, herbicide and fungicide use, tractor movements and fire risk.
- Use regional front line advisors to coordinate local studies in response to local input; and
- Develop an irrigation (soil water balance) and nutrient management decision support web App.

**Outcomes:**

- Increased understanding of how orchard floor management practices impact on soil health, tree water-availability, nutrition and health, and pest and disease incursions.
- Greater knowledge on how to implement these approaches in relation to regional variation.
- Demonstrated links between healthy soils and orchard sustainability.
- Reduced environmental footprint of apple and pear production systems through application of sustainable (regenerative) approaches to orchard floor management.

## 2.3 PIPS3 PROGRAM PRINCIPLES

The following principles were determined by the SIAP and are considered critical in effective implementation of the PIPS3 Program:

***Industry Engagement*** to ensure true practice change within the industry and facilitate greater industry involvement by:

- Ongoing presentation of project messages and outputs through existing APAL led extension activities;
- Ongoing communication of messages, outputs and business outcomes through the APAL communication program (i.e. Industry Juice and AFG magazine).
- Establishment of processes to engage directly with front line advisors and regional agronomists/consultants, to facilitate greater regional connections and ensure two-way communication regarding priorities, delivery of messages and outputs; and
- Establishment of the PIPS3 Program Reference Group comprised of growers, research leaders, Hort Innovation Program Manager, APAL extension representation and the PIPS3 Program Coordinator.

***Connectivity with the regions*** to recognise variability in soil type, climate, weather events, pest and diseases, and local practices/ systems.

***Collaboration and partnerships*** between the projects delivering research activities and within industry service providers; encourage exchange of information and focus on broader industry solutions incorporating the latest R&D.

***Market driven*** consumer and public sentiment with the consideration of industry social licence to operate, environmental performance, and export and trade requirements.

***Sustainable systems approach*** that considers how the outcomes of R&D (recommended practices/ adaption, recommended technology adoption) have a flow-on effect to other orchard management practices or factors influencing productivity, quality and profitability outcomes. It enables stakeholders of the PIPS3 Program to better understand the combined effects or benefit.

***Cooperative learning*** opportunities are critical where growers, consultants, industry/ agency service providers and commercial suppliers can have input and provide feedback into local trials so that the R&D is relevant and understanding is developed along-side research providers.

***Climate and weather variability*** context is fundamental given increasing evidence of the impacts of extreme weather and climatic changes across the growing regions.

## 3 INTERNAL AND EXTERNAL PROGRAM STAKEHOLDERS

The C&E Plan has been prepared as the guiding document on communication and extension activities for the apple and pear industry and research partners of the PIPS3 Program. These stakeholders will be involved in development, implementation and participation of both internal and external whole-of-program activities as well as individual or collaborative delivery with other program research partners at a project/ regional level. Research partners will be responsible for the way in which they involve and create opportunities for their project collaborators, as well as monitor the messages and materials which are developed by these organisations.

Table One outlines the key stakeholders who may be involved in communication and extension activities over the three year duration, though it is acknowledged that organisations, roles and whether the stakeholder is a key player in external or internal program communication and extension activities may evolve over time.

The details of the key contacts are provided in Appendix 1.

*TABLE ONE ROLE OF STAKEHOLDERS IN PIPS3 PROGRAM COMMUNCATIONS AND EXTENSION ACTIVITIES*

| Organisation | PIPS3 Program relationship | Key contact | Internal | External | Communication | Extension |
|---|---|---|---|---|---|---|
| *GROUP ONE* | | | | | | |
| **Hort Innovation** | Investment management and monitoring of apple and pear R&D levies and Australian Government funds. | Adrian Hunt | ✓ | ✓ | ✓ | |
| | Communications support using industry engagements | Lauren Jones | | ✓ | ✓ | |
| | Communications support using general media | Maria Stathis | | ✓ | ✓ | |
| **APAL** | Extension support via *Future Orchards ®Program* (AP15005) field walks. | Rose Daniel | | ✓ | ✓ | ✓ |
| | Extension support via *Australian apple and pear industry innovation and adoption program* (AP15004) | Rose Daniel | | ✓ | | ✓ |
| | Communication support via *National apple and pear industry communication program* (AP18000) including online, print & e-publications, and social media. | Lindy Nieuwenhuizen (Website)<br>Alison Barber (Publications) | | ✓ | ✓ | |
| **Agriculture Victoria Research (AgVic)** | Project lead agency for AP19002<br>AP19003 & AP19005. | Greg Lefoe<br>Ian Goodwin | ✓ | ✓ | ✓ | ✓ |
| | Project communications support and organisational approvals. | Jen Bladon-Clark | | ✓ | ✓ | |
| | Project communications and extension support | Emily Crawford (AP19002- IPDM CoP)<br>Lexie McClymont (AP19003 & AP19005) | | ✓ | ✓ | ✓ |
| **TIA/UTAS** | Project lead agency for AP19006 | Nigel Swarts | ✓ | ✓ | ✓ | ✓ |
| | Project communications support and organisational approvals. | Phoebe Bobbi | | ✓ | ✓ | |
| | Project communications and extension support.<br>Regional front-line advisor liaison. | Michele Buntain<br>Sally Buntain | ✓ | ✓ | ✓ | ✓ |

| | | | | | | |
|---|---|---|---|---|---|---|
| **ICD Project Services** | PIPS3 Coordination: internal & external communications, coordinating integration opportunities between program stakeholders and other levy-funded programs. | Marguerite White | ✓ | ✓ | ✓ | ✓ |
| **PIPS3 Program Reference Group** | Industry strategic input and feedback on integrated and collaborative PIPS3 Program research, communication and extension. | Marguerite White | ✓ | ✓ | ✓ | ✓ |
| *GROUP TWO* | | | | | | |
| **Project Reference Groups** | Technical input and feedback on project research activities and local communications and extension. | Project Leaders | ✓ | ✓ | ✓ | ✓ |
| **Green Atlas** | AP19003 & AP19005 projects collaborator | Ian Goodwin | ✓ | | | |
| **SwarmFarm Robotics** | AP19003 & AP19005 projects collaborator | Ian Goodwin | ✓ | | | |
| **Plant & Food Research NZ** | AP19006 project contractor (App development) | Nigel Swarts | ✓ | | | |
| **Frontline advisors- NSW DPI** | AP 19006 project collaborator & Future Orchards Program (APAL)- Orange | Jessica Fearnley | ✓ | ✓ | ✓ | ✓ |
| **Frontline advisors- PomeWest** | AP 19006 project collaborator & Future Orchards Program (APAL)- WA | Susie Murphy White | ✓ | ✓ | ✓ | ✓ |
| **Frontline advisors- Lenswood Cooperative** | AP 19006 project collaborator & Future Orchards Program (APAL)- SA | Paul James | ✓ | ✓ | ✓ | ✓ |
| **Frontline advisors- Apple & Pear Growers Association of SA** | AP 19006 project collaborator | Susie Green | ✓ | ✓ | ✓ | ✓ |
| **Frontline advisors- Fruit Growers Victoria** | Future Orchards Program (APAL)- Goulburn Valley | Michael Crisera | | ✓ | ✓ | ✓ |
| *TARGET AUDIENCES* | | | | | | |
| **Apple & Pear Growers** | Industry input & feedback via action learning opportunities & adopters | APAL C&E Programs, PIPS3 PRG & project PRGs | | ✓ | ✓ | ✓ |
| **Service Providers & Advisors** | Industry extension, input & feedback via action learning opportunities & adopters | APAL C&E Programs, Project PRGs & IPDM CoP | | ✓ | ✓ | ✓ |
| **Markets & Consumers** | Communication of industry sustainability efforts- general media and industry supply chains. | Maria Stathis & Lindy Nieuwenhuizen | | ✓ | ✓ | |
| **Research Community** | Communications via conferences and publications. | Project Leaders | | ✓ | ✓ | |

# 4 COMMUNICATION & EXTENSION OBJECTIVES

## 4.1 INTERNAL

1. To proactively plan and coordinate communication activities of the PIPS3 Program with adherence to obligations specified within Hort Innovation project agreements and the *Hort Innovation Branding Guide* (2017).
2. To provide platforms for research partners and collaborators to exchange information on workplans, methodology, findings and cross-project learnings resulting in greater integration and added value to project outcomes for the industry.
3. To proactively plan and coordinate a collegiate, program approach to communications and extension by identifying project level synergies and fostering cross-project collaboration and contribution to key collective messages, resource/ publication outputs and events.
4. To monitor research partner communication and extension activities against obligations of the relevant Hort Innovation agreement.
5. To collaboratively work with the nominated communications contact of each partner organisation to prepare communication and extension activities for external purposes, both planned and responsive to industry need, seasons and opportunity.
6. To assist project partners to facilitate stakeholder input and feedback (active engagement) into research, communications and extension activities.

## 4.2 EXTERNAL

1. To ensure identified stakeholders are well informed and engaged during implementation of the PIPS3 Program research activities.
2. To promote the beneficial efficiencies and value-add arising from cross-project collaboration on integrated co-factors/ flow-on impacts in the orchard system and opportunities for collective thought on innovative practice and technology solutions.
3. To appropriately articulate the orchard system operations, farm business and industry benefits of the PIPS3 Program research activities, findings and outcomes to identified science, industry and market stakeholders.
4. To prepare and extend well targeted, high impact communication messages through industry platforms, networks and commercial/agency advisors, supported by research activities and outputs, on improved practices that deliver resource efficiency, sustainability and yield/ quality improvements for growers, together with profitability outcomes.
5. To develop materials and resources that support growers, and their advisors, to make more informed decisions and provide practical guidance in adoption of practices and technologies trialled by the portfolio of PIPS3 Program projects.
6. To schedule and promote well-targeted and tailored events as a vehicle for motivating stakeholders to engage in research and trial activities of the PIPS3 Program and determine what it means to them.
7. To prepare material for broader market distribution which promotes the benefits of improved management practices upon the environmental footprint of the apple and pear industry.

# 5 PIPS3 PROGRAM COMMON UNDERSTANDING APPROACH

To ensure an integrated approach to communicated and extended messages, the delivery stakeholders of the PIPS3 Program are being encouraged to collaboratively formulate key messages under a common quarterly theme across the lifespan of the program. This approach will deliver more consistent, unified and reinforced messages on identified issues, possible solutions and the way in which the research is progressing towards outcomes for industry.

The key messages of the PIPS3 Program will evolve over the lifespan, as it progresses through the themes, and collaboration efforts spawn further ideas and potential activities. Certain messages may be very specific to a theme or season, others may be carried throughout the delivery timeframe.

The following are the priority messages identified at the commencement of the program. The PIPS3 PRG, along with representatives from the identified communication supports, will identify new messages and make amendments to the C&E Plan accordingly.

## 5.1 INTERNAL KEY MESSAGES

During PIPS3 Program delivery there will be both formal and informal collaboration and cooperation opportunities for the organisations identified in Group One, Table 1 and Group Two, Table 1 where deemed appropriate by the relevant project leader. There are internal key messages, focused upon research delivery and methodology, to be used across the program to communicate the collegiate approach that has been adopted by all leading parties. These initially include:

- Project Leaders, in conjunction with their team members and subcontracting collaborators have identified, and will continue to communicate on, opportunities to integrate research activities to enhance whole-of-system outcomes for the PIPS3 Program.
- Extension and communication activities of the PIPS3 Program draw-upon the collective knowledge and understanding of the research teams and their collaborators to deliver unified and scientifically supported messaging for the industry.
- The PIPS3 PRG has been established to provide ongoing industry input into the strategic research scope, delivery and communication to industry of the program.
- The PIPS3 Program Coordinator is an important conduit for cross-program communication and information exchange opportunities and their advice will be sought on:
    - The types of information to be shared amongst stakeholders;
    - The target stakeholders for that information; and
    - The appropriate method, dissemination avenue and release schedule of the communication for optimal stakeholder response and / or engagement.
- The Program Coordinator communicates via phone and email with the identified contact in Group One (Table One) and it will be the responsibility of project leaders to establish clear communication structures with the relevant stakeholders of Group Two (Table One).

## 5.2 EXTERNAL KEY MESSAGES

Well targeted and timely communications and extension activities are critical to long-term adoption of the outcomes of the PIPS3 Program. While the research is important, the *why it is needed (what problem will it resolve), what it means to my business (production/ quality/profit/people outcomes)* and *how I can adopt with* confidence *(understand the science/practical know-how/ known cost impacts/benefit)* is what growers

and advisors will want to know. The initial external key messages to build awareness on the research effort, and why it is needed, are:

- The PIPS3 Program has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government.
- The PIPS3 Program is delivering integrated research and development, together with effective extension to industry, to promote a sustainable systems approach to apple and pear production.
- The activities of the PIPS3 Program are being undertaken in commercial orchards across five growing regions of Tasmania, Victoria's Goulburn Valley, South Australia, Western Australia and NSW, and on Agriculture Victoria's Tatura SmartFarm Sundial apple orchard and experimental pear orchard.
- The PIPS3 Program is building knowledge and understanding on the significance of interactions between orchard system management, irrigation, soil health and nutrition, and pest and disease management and determining how changed practices or technological solutions applied to one factor may provide benefit to others.
- The PIPS3 Program is building knowledge on how climate variability and extreme weather is impacting/ will impact management of the orchard system and is conducting trials using advanced technologies, cultivars and biological management strategies to improve preparedness and increase resilience to manage risk and optimise opportunities of changes to the operating environment.
- The whole-of-system approach will help research teams collaborate on needs identified by the apple and pear industry such as: managing orchards in variable climates; meeting customer expectations; using resource inputs more efficiently; and fostering greater sustainability through biological solutions.
- The apple and pear systems projects, managed by Agriculture Victoria, focus on new sensing technology and advanced management systems that maximise fruit quality, yield and labour efficiency. These projects are preparing industry for scalable mechanisation and automation. They aim to improve orchard management by using these systems to monitor fruit development and quality parameters. They focus on training methods, planting densities, rootstock, sun protection and irrigation strategies to adapt to changes in climate.
- The soil health, irrigation and nutrient project, managed by the Tasmanian Institute of Agriculture, together with the biocontrol integrated pest and disease management project, managed by Agriculture Victoria, work across both apples and pears to measure outcomes of applying a range of environmentally sustainable cultural management strategies in orchards. They aim to provide a step-change to operating more sustainable production systems that provide greater biological diversity on the orchard floor and inter-rows, and monitor subsequent effects on the establishment and survival of *Matrus ridens*, pest and disease suppression, soil health, tree health, productivity and quality.

## 5.3 PIPS3 PROGRAM SCHEDULED THEMES

The following themes have been collaboratively prepared and agreed by project leaders together with Hort Innovation and APAL communication supports. The themes will provide a headline topic for each quarter under which unified messaging will be prepared and extended across communications and extension methods (Section 8). Importantly, these themes will be used in the context of the seasonal management practices (Section 6) and conditions of the period:

- **Whole system approach** – December 2020, June 2022, June 2023
- **Integrated management solutions** – March 2021, September 2022
- **The role of advanced technologies in future orchard systems**- June 2021, September 2022
- **Resource use efficiency** – September 2021, December 2022
- **Biological and cultural management solutions**- March 2022, March 2023
- **Performance indicators**- March 2022, March 2023
- **Adaption and resilience in a more variable climate**- December 2021, December 2022

## 5.4 REGIONAL SEASONAL CALENDAR

The projects of the PIPS3 Program have collectively contributed to the development of a regional level seasonal calendar to better understand when a grower, perhaps with a trusted advisor, are planning and making decisions on management practices in the orchard. Knowing when a grower is seeking the latest information and data to inform their decisions, or conversely, when they have limited time to read communications or participate in an event, assists the PIPS3 Program to program effective activities, using dissemination/ delivery methods that are conducive to grower capacity, scheduled at the right time.

PIPS3 Program information that is relevant to the seasonal orchard management practices outlined in Table Two require communication and extension approximately two months prior to the core months in which they are managed by a grower.

***TABLE TWO IDENTIFIED SEASONAL MANAGEMENT PRACTICES OF PIPS3 PROGRAM REGIONS***

| *SEASONAL ORCHARD MANAGEMENT PRACTICE* | *CORE MONTHS OF MANAGEMENT PRACTICE* | | | | |
|---|---|---|---|---|---|
| | **TAS** | **VIC** | **NSW** | **SA** | **WA** |
| Dormant season pruning | May-Aug | May-Sep | May-Aug | May-Sep | May-Aug |
| Dormant oil applications | May-Aug | | June-Aug | Minimal use | Sep |
| ASE crop load management | Jul-Aug | TBC | | Not used | Jul-Aug |
| Chemical thinning | Oct-Nov | Sep-Oct | Sep-Oct | Oct | Oct |
| Hand thinning | Nov-Jan | Nov-Jan | Jan | Nov-Jan | Nov-Dec |
| Tree-row herbicide application | Spring-Summer | Spring-Summer | | Spring-Summer | Aug-Sept |
| Irrigation System maintenance | Aug-Sep | Aug-Sep | Aug-Sep | Oct-Nov | Aug-Sep |
| Irrigation undertaken | Oct-May | Sep-May | Sep-May | Nov-May | Oct-Apr |
| Fertigation undertaken | Oct-May | Sep-May | Sep-May | Nov-May | Oct-Apr |
| Fertiliser application | | Aug /post-harvest | | Aug /post-harvest | October onwards |
| Pest Monitoring | Aug-May | Aug-May | All year | Oct-May | Sep-May |
| Biocontrol predators | Sep-Mar | Aug-May | | If necessary | |
| Monitoring Codling Moth | Sep-May | Sept-May | | Oct-May | DPIRD |
| Monitoring LBAM | Aug-May | Aug-May | | | Aug-May |
| Monitoring Other | | All year-Qfly | Sep-May- Qfly | | Sep-May- Med fly |
| Fungicide application | Aug-May | Aug-May | | Sep-Dec | Aug-May |
| HARVEST | Feb-May | Jan-May | Feb-May | Sep-Jan | Feb-May |
| Mowing/Slashing/ Mulching | All year | All year | Mar-May | All year | Sep-Mar |
| Post-harvest nitrogen | Mar-May | TBC | Mar-May | Mar-May | Mar-May |

## 5.5 ACKNOWLEDGEMENT AND LOGOS

Stakeholders of the PIPS3 Program are required to comply with acknowledgement and logo requirements of the *Hort Innovation Branding Guide* (2017). As the PIPS3 Program is a collaboration between the lead research organisations, these organisations are also to be acknowledged for their contributions. Collectively, the Hort Innovation Pear and Apple Fund logo, together with the two logos of the delivery organisations are to be displayed in the footer of all PIPS3 Program collateral.

Where the content of the communication material does not include the following statement, "*The PIPS3 Program has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government*", the Fund Block must be used to display both the logo and acknowledgment.

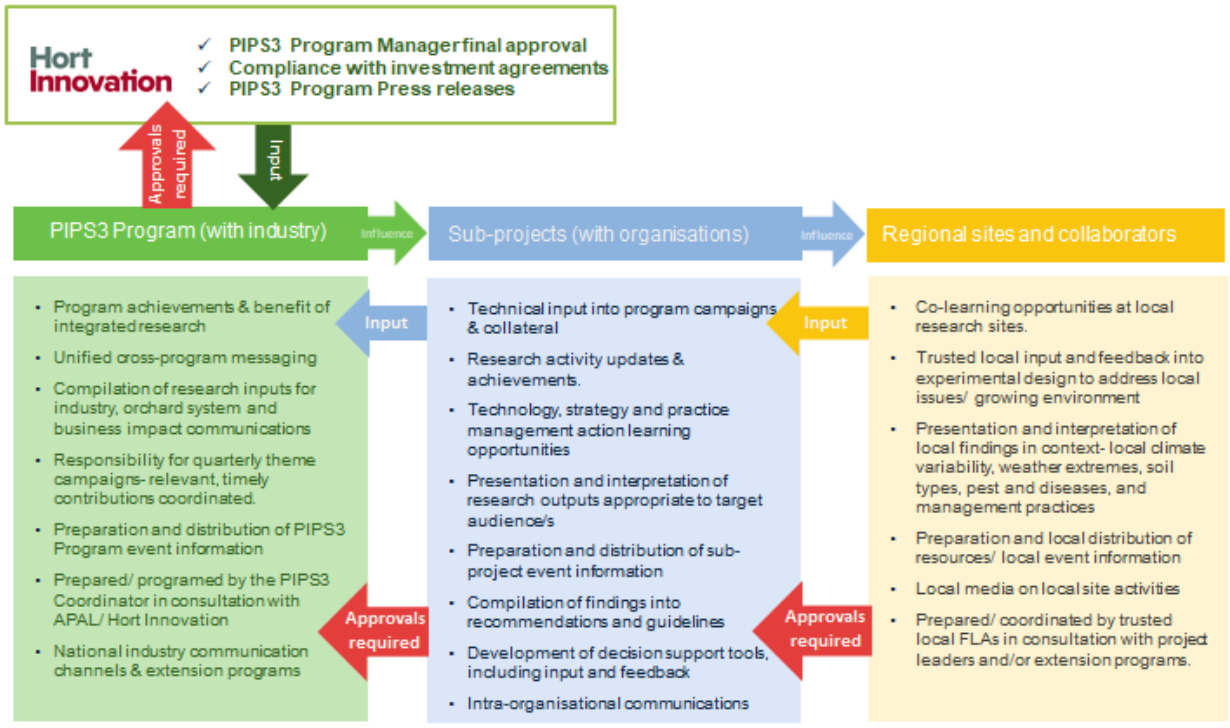
The PIPS logo has also become a recognised brand of the program and importantly it is used to market the PIPS3 Program. The PIPS logo is to be used in the header or within the page content of all PIPS3 communication materials.

Examples of the PIPS3 Program templates are can be found in Appendix 2 and can be accessed HERE.

# 6 PIPS3 PROGRAM CONTENT RELATIONSHIPS AND APPROVALS PROCESS

In the preparation of communication collateral and planning for extension activities of the PIPS Program, stakeholders have roles in providing both written and presentation content that contribute to collective awareness, knowledge and understanding across target audiences. An approvals process is integral in ensuring that consistently relevant, quality and technically robust content is prepared that integrates the PIPS3 Program core themes and messages. Figure 1 outlines the roles in preparation of high impact communications and extension activities for the PIPS3 Program and the approvals which must be undertaken.

***Figure 1 PIPS3 Program Communications and Extension content relationships***



# 7 COMMUNICATION AND EXTENSION METHODS

The C&E Plan is prepared to emphasise the importance of both internal and external program communication and extension. The benefits to be gained from continual and open information exchange between the partners are immense - from sharing project planning documentation to discussion on methodology and scheduling of implementation activities - all of which deliver efficiencies and accelerate increased knowledge and understanding of team members, likely to result in additional and valued outputs and outcomes. The quality and impact of communication and extension to external stakeholders will be amplified by collaboration efforts amongst the contributing researchers, technical personnel and extension specialists.

Section 7.1 outlines the mechanisms which will be used to achieve a high level of communication exchange to deliver integrated research outcomes, increased science knowledge and understanding, and skill development of emerging scientists. This will be achieved within the PIPS3 Program team, including the PRGs at the program and project levels.

Section 7.2 outlines the mechanism to be used to successfully deliver upon the PIPS3 Program outcomes by involving growers, service providers, advisors and consultants in the research and by extending emerging management/ technology options, including seeking their input and feedback in the context of local experience and operating conditions. End-users who embrace opportunity to become active participants in research become part of the progressive knowledge and understanding journey and, therefore, are more likely to grasp the benefits of adoption and appreciate the orchard system and business impacts.

Broader community and industry markets will be informed of the ways in which the PIPS3 Program is using robust science to increase product quality and ensure industry sustainability with the lowest possible environmental footprint.

## 7.1 PLANNED INTERNAL COMMUNICATIONS AND EXTENSION METHODS

| METHOD | STAKEHOLDERS | PURPOSE |
|---|---|---|
| **INDEPENDENT PROGRAM COORDINATOR** | All involved in delivery of PIPS3 Program.<br>INFORMAL EXCHANGE: Email & phone calls with Hort Innovation Program Manager, Project Leaders, industry program representatives & communications and extensional specialists. | Establish an appreciation and understanding between stakeholders of the benefits of cross-program sharing and learning with an aim to increase integration of the research effort, identify efficiencies to reduce duplication, facilitate ongoing collaboration and deliver higher impact external communications and extension activities through coordination of stakeholder contributions into quality products for use/ implementation. |
| **CO-LOCATED RESEARCH ACTIVTIES & SHARED RESOURCES** | Tatura SmartFarm hosting research of all four projects. AP19002/ AP19006 co-location commercial orchards & shared soil sampling analysis. All team members.<br>INFORMAL EXCHANGE: Email between Project Leaders & relevant team members. | Integrated research to accelerate shared learnings and knowledge on whole-of-system impact and overall business outcomes. Provide a platform for communicating and demonstrating system benefit and efficiencies. Research data, resources and costs shared. |
| **PLANNING DOCUMENTS**<br>(PRE-SHCEDULES/ WORK PLANS/ GANTT CHARTS) | Hort Innovation Program Manager, PIPS3 Program Coordinator & Project Leaders | Collaboration on methods and scheduling of activities. Efficient use of resources. Shared knowledge. |
| **PIPS3 PROGRAM TEAM CONTACTS LIST**<br>(SPREADSHEET STORED CENTRALLY) | All involved in delivery of PIPS3 Program. | Opportunity for program team members to identify personnel in similar roles and exchange information/ seek advice informally via email or phone. |
| **PROGRAM REFERENCE GROUP (PIPS3 PRG)**<br>(2 ANNUAL MEETNGS- ZOOM & FACE TO FACE) | PRG members (Hort Innovation Program Manager, PIPS3 Program Coordinator, Project Leaders, 4 selected growers and APAL Technical Manager (extension))<br>INFORMAL EXCHANGE: Email used between meetings. Drop-box established for sharing of documents. | Oversee implementation and monitoring of the C&E Plan. Information exchange on strategic and integrated communication and extension methods and implementation of Hort Innovation requirements. |
| **PROJECT REFERENCE GROUPS (PROJECT PRG)**<br>(2 ANNUALLY, ZOOM & FACE TO FACE) | PRG members (Project Leaders, team representatives, collaborators, grower group representatives, selected growers)<br>INFORMAL EXCHANGE: Email & phone calls. | Provide guidance, input and feedback to specific research projects, including communication and extension activities. Identification of local opportunities for collaboration on extension activities and local communication. Promotion of project contribution and role in the PIPS3 Program. |
| **PROJECT LEADERSHIP MEETINGS**<br>(4 ANNUALLY, ZOOM & FACE TO FACE) | Hort Innovation Program Manager, PIPS3 Program Coordinator & Project Leaders<br>INFORMAL EXCHANGE: Email, phone calls & document sharing. | Program/ project management, activity scheduling and alignment, and risk monitoring/ management. |
| **PROJECT TEAM MEETINGS** | Project Leaders, project researchers, technical staff & communications/extension specialists. | Project management and scheduling of research technical activities, sampling, testing and analysis. Allocation of labour and resources. |

| | | |
|---|---|---|
| (>MONTHLY, ZOOM & FACE TO FACE) | INFORMAL EXCHANGE: Organisation platforms (i.e. Microsoft teams), emails, phone calls & texting. | Collaboration on interpretation of results and preparation of reports, communication material and extension content. |
| **PROJECT COLLABORATOR MEETINGS** | Project Leaders, relevant team members, contractors and (as relevant) in-kind collaborators.<br>INFORMAL EXCHANGE: Emails, phone calls & texting. | Scheduling of subcontractor or in-kind support activities- agreement on methodology, sampling, testing and analysis. Allocation of labour and resources. Collaboration on interpretation of results and coordination of contributions for reporting or preparation of communication material and extension content. |
| **PIPS3 PROGRAM PARTNER FORUMS** | Hort Innovation Program Manager, PIPS3 Program Coordinator, Project Leaders, PRG members, project team members, subcontractor collaborators, frontline advisors/ service providers, industry extension and communication program representatives, grower group representatives and engaged growers. | Updating on progress and delivery and opportunity for stakeholders to raise strategic issues for the PRG to consider and Program Manager / Coordinator to action.<br>Provide a platform for robust cross-program exchange of information. The opportunity to discuss, share and debate allows research partners to identify synergies between activities, resulting in reduced duplication and improved outcomes, including communications and extension that is highly tailored to the needs and wants of the audiences. |
| **ORGANISATION NEWSLETTERS** | Project Leaders, project team members & organisational communications personnel. | Provides opportunity for research teams to communicate progress and outcomes of research as it is undertaken and seek input and feedback. Potential to identify new collaboration opportunities from within organisations. |
| **ORGANISATIONAL CONFERENCES/ FORUMS** | Project Leaders, project team members and organisational personnel. | Provides opportunity for research teams to communicate progress and outcomes of research as it is undertaken and seek input and feedback. Potential to identify new collaboration opportunities from within organisations. |
| **FIELD BASED INTERACTION** | Project Leaders, project team members, subcontracted collaborators, frontline advisors/ service providers and growers. | Informal discussion, debate and solution consideration. Verbal, face to face communication results in ultimate common understanding and agreement on following actions. |
| **HORT INNOVATION REPORTING** | PRG members, Project Leaders, Coordinators, Hort innovation | Provision of formal progress against agreed milestones presented in an update report by the Coordinator at PRG meetings and via all five projects six monthly using Hort Innovation templates. |

## 7.2 PLANNED EXTERNAL COMMUNCIATIONS AND EXTENSION METHODS

| METHOD | STAKEHOLDERS | PURPOSE |
|---|---|---|
| **INDEPENDENT PROGRAM COORDINATOR** | All involved in delivery of PIPS3 Program. | Responsibility for cohesive communications and extension of the technical research and production/profit/ environmental advancements being investigated and achieved for industry through the collaborative approach of the PIPS3 Program.<br>Responsibility for consulting and collaborating with existing industry invested communication and extension programs to implement the C&E Plan as well as integrate the PIPS3 Program principles, themes and messages into broader industry activities. |
| **WHOLE SYSTEM DEMONSTRATION- TATURA SMARTFARM** | Project Leaders, project teams, industry extension programs, industry communications, service providers and growers. | The Tatura SmartFarm provides a platform for demonstration of the collaborative implementation of the PIPS3 Program and resultant increased integrated, orchard system understanding and knowledge of the outcomes of trial and experimental findings. Provides a focal point for video and social media communications and demonstration of system benefit and efficiencies using field days and field walks. |
| **COMMERCIAL RESEARCH SITES** | Local frontline advisors, grower groups (e.g. regional FGA), growers, research teams. | Local focal point for cooperative learning and demonstration of the research activities and outcomes. Used in local field days/ field walks. |
| **ONLINE PLATFORMS** | • APAL Website- PIPS3 Program Webpage<br>• Hort Innovation Website<br>• Horticulture Industry Network (HIN) Website<br>• ExtensionAus Website (AP19002)- Apple and Pear IPMD Webpage, including interactive “Ask the Expert” functions.<br>Program Coordinator, Webpage developers, content managers and content contributors. | The PIPS3 Program Webpage will provide a central portal for promoting activities and host material prepared and extended (see videos, fact sheets, case studies & guidelines). The Coordinator will liaise with content writers (projects) and site managers to develop an engaging interface, supported by quality content. The Coordinator will also prepare specific material for this site.<br>The PIPS3 page will also sign-post to the identified external websites/ web pages that will be upgraded with collateral developed through the program. The PIPS3 webpage will provide a summary of resources hosted by these sites and then provide a direct link. |
| **INDUSTRY EXTENSION PROGRAMS** | Program Coordinator, Project Leaders, project teams & technology collaborators<br>• APAL and AgFirst Future Orchards® extension programs<br>• APAL Future Business Program<br>• Regional agency and private service providers<br>• IPDM Community of Practice (AgVic) | Integration of PIPS3 Program sites and activities into the scheduled Future Orchards Walks (3 per year) and liaison with APAL Extension FLAs and regional service providers to conduct site specific field walks or provide content/ presenters for aligned local events. Link PIPS3 Program key messages for business profitability with Future Business where possible. Continue to build membership of the IPDM Community of Practice. |
| **MEDIA RELEASES** | • Hort Innovation<br>• Agriculture Victoria | Community and consumers informed about the efforts of the industry to improve its sustainability and environmental credentials |

| | | |
|---|---|---|
| | • Tasmanian Institute of Agriculture | through the PIPS3 Program research, communication and extension scope of works. |
| **INDUSTRY COMMUNICATION CHANNELS** | • Australian Fruit Grower Magazine (quarterly)<br>• Industry Juice e-Newsletter (weekly)<br>• Regional grower group publications (Table One, Group Two) | Collaborate with APAL and publishers to supply regular content that provides the industry with transparent, timely and outcome focused articles under a quarterly 'headline' theme (Section 5.3). These themes provide the audience with broader context and then enable them to drill to the project and data output level as relevant and timely (refer Section 5.4 on seasonal management practice calendar). Regional e-newsletters/ newsletters used to provide locally specific updates and promote upcoming local PIPS3 activities/ involvement in Future Orchards activities. |
| **VIDEOS** | Program Coordinator, industry communication programs, Project leaders, project teams, research organisation communications personnel, subcontractors (i.e. Green Atlas, SwarmFarm, PFRNZ), FLAs and commercial research site growers. | • Informational- awareness of PIPS Program/ project why, what, how and benefits/ outcomes for business and industry sustainability.<br>• Peer Exchange- grower & advisor experiences, trialling new approaches & the results through their eyes (benefits of adoption).<br>• Instructional- Use of new tools and technology, data generation and benefits of this information to make more informed decisions with ease. |
| **FIELD DAYS/ WALKS** | • APAL and AgFirst Future Orchards extension programs<br>• Regional grower groups<br>• Regional extension networks<br>• Project leaders, project research teams & subcontractors | Use existing extension programs to provide active interaction on research sites through cooperative and action learning where PIPS3 Program activity is being conducted. Provide content to scheduled Future Orchard Walks by using research teams as presenters and facilitators of discussion between attendees to seek input and feedback.<br>Create new PIPS3 Program specific field days/ walks in regional areas tailored more specifically to systems, soil health, nutrients, irrigation and IPM topics. Integrate cross-program content and presenters.<br>Trade delegations, government ministers, students and international scientists frequently visit the Tatura SmartFarm and presentations will be made on collaborative PIPS3 Program research, primarily by AP19003 & AP19005 team members. Dates of these are not specific and therefore are not planned in Section 8.1. |
| **WORKSHOPS OR WEBINARS** | Program Coordinator, Project Leaders, Industry Master Class organisers (APAL), FLAs, service providers, commercial consultants, growers and project research teams & subcontractors. | Delivery of technical content to increase skills or use in new tools and technology specific to projects.<br>PIPS3 Program personnel invited by APAL to present as guest speakers and/or provide resource materials to inform and upskill using existing industry conduits.<br>Whole-of-program online webinars to inform on research progress across broader audiences. |

| | | |
|---|---|---|
| **SOCIAL MEDIA** | • Hort Innovation- Facebook, Twitter, LinkedIn<br>• Research organisations- Facebook, Twitter, LinkedIn, YouTube<br>• AgriBio (AgVic) IPMD Community of Practice (CoP) Facebook<br>• APAL- Facebook, LinkedIn, Instagram, YouTube<br>• Grower groups (Table One, Group Two) | Release of posts containing short, sharp key messages, links to new release articles/ resources on webpages and videos via Hort Innovation, APAL, AgVic (SmartFarm, AgriBio, IPMD CoP) and TIA with feeds into other identified stakeholder channels. Dates of use will relate to the development of materials and therefore are not specifically planned in Section 8.1. |
| **FACT SHEETS** | • Program Coordinator<br>• AgVic (AP19002, AP19003, AP19005)<br>• TIA (AP19006)<br>• APAL and AgFirst Future Orchards® extension programs | Provide specific practice/ technology information and guidance to growers/ service providers. Prepared by projects and hosted by PIPS3 Program Webpage.<br>**AP 19003 identified topics:**<br>• Sensing the spatial distribution of fruit number, fruit size and fruit colour in apple orchards<br>• Crop load optimisation |
| **CASE STUDIES** | • Program Coordinator<br>• AgVic (AP19002, AP19003, AP19005)<br>• TIA (AP19006)<br>• APAL and AgFirst Future Orchards® extension programs | Communicate the outcomes of research and/ or adoption through a "story telling" approach and use of data to support the practice/ technology adoption. Growers sharing with other growers. Prepared by Program Coordinator with input from projects and hosted by PIPS3 Program Webpage. |
| **GUIDELINES** | • Projects AP19003, AP19005 & AP19006<br>• Collaborators of AP19005- Green Atlas & SwarmFarm Robotics | Projects have outputs requiring preparation of practical guidelines for growers to increase knowledge and understand the benefits and "how to" of transitioning and long-term adoption of technology or whole system, soil health practices. AP19005- *User guidelines on new technology and advanced management systems*, AP19003- *Recommended Sensors and platforms for apple production* and AP19006- *Research results incorporated into a practical guide.* Prepared by projects and hosted by PIPS3 Program Webpage, HIN Website & IPMD Webpage |
| **TECHNICAL TOOLS** | • Projects AP19005 & AP 19006 | Projects have outputs requiring development of decision support tools: AP19005- *Irrigation planning and scheduling tool* (Excel based) & AP19006- *SINATA for irrigation scheduling and nutrient management* (Web App). Prepared by projects and hosted by PIPS3 Program Webpage. |
| **INDUSTRY CONFERENCES/ FORUMS** | Hort Innovation Program Manager, Program Coordinator, Project Leaders & project team members. | Coordinate a collaborative approach to presentation of PIPS Program research progress and final outcomes at major industry events, potentially as special sessions. Primary events are: Hort Connections Conference (& associated aligned conferences e.g. APAL Tech Transfer Conference), APAL Industry Forum, Australian Fruit Grower conference (Victoria), Pome Fruit conference (Tasmania). Dates of conferences are not all known at this time and are therefore not all presented in Section 8.1. |

| | | |
|---|---|---|
| **TECHNICAL REPORTS** | Project Leaders and teams of AP19003 & AP19005. | AP19005- Technical Report- *Current pear industry orchard design and management practice, and the constraints and incentives needed to adopt new orchard design and advanced management systems,* AP19003- Technical Report- *Describing new technology and advanced management systems for apple.* Prepared by projects and hosted by PIPS3 Program Webpage. |
| **SCIENCE CONFERENCES** | Project Leaders and teams of AP19003 & AP19005, other projects may identify opportunities in future. | Extend research findings to an internal audience at identified conferences: International Society for Horticultural Science (ISHS)- Orchard systems conference & ISHS Pear conference (AP19005). International Horticultural Congress (AP19003). Other national opportunities, examples are Soil Science Australia Conference, Irrigation Australia Conference. Dates of conferences are not all known at this time and are therefore not all presented in Section 8.1. |
| **SCIENCE JOURNAL PAPERS** | AP19003 (5) AP19005 (3) | Prepare manuscripts and undertake review and submission processes for submission to reputable science journals. Publication underpins the integrity of research undertaken by projects of the PIPS3 Program.<br>**AP19005 identified topics:**<br>• Crop load relationships<br>• Sensing spatial distribution of fruit<br>• Effect of light and temperature on colour<br>**AP 19003 identified topics:**<br>• Crop load effects on productivity<br>• Sensing spatial distribution of fruit<br>• Organic metabolites related to biennial bearing<br>• Effects of light and fruit position on yield, quality and sun damage<br>• Effects of light and temperature on colour expression and colour bleaching |
| **PhD MANUSCRIPTS** | AP19006 | • Communicate research undertaken and outcomes of that research. |
| **REPORTING** | PRG members, Project Leaders, Coordinators, Hort innovation | Provision of formal progress against agreed milestones presented in an update report by the Coordinator at PRG meetings and via all five projects six monthly using Hort Innovation templates. |

# 8 PIPS3 PROGRAM COMMUNICATIONS AND EXTENSION IMPLEMENTATION

The C&E Plan will be overseen and monitored by the PIPS3 Program Coordinator, in consultation with the Hort Innovation Program Manager and the four Project Leaders.

The comprehensive planner of Section 8.1 has been prepared in consultation with project leaders, especially with consideration for outputs/outcomes of contracted Hort Innovation Mandatory Response Tables (MRTs), Hort Innovation Industry Communications and APAL communications and extension program leaders. The schedule of activities reflects alignment between existing industry communication and extension channels, seasonal relevance (Section 5.4), consolidation of the PIPS3 Program themes (Section 5.3) and contracted milestones of the projects. Where possible, project activities have been integrated to deliver a PIPS3 Program presence/ interface at major industry events or via the major industry communication outlets.

Both communication and extension are planned to keep the industry well informed of progress, provide a strong platform for ongoing industry input and feedback, and release new knowledge and tools through an easily accessible online platform, as they are developed.

Partner activities contributing to the overall outcomes of the Program, will be monitored and assisted by the PIPS3 Program Manager. Implementation of project level activities will be undertaken by research partners themselves in partnership with local and technology collaborators.

Each of the research partners has prepared an initial communication and extension plan table, presented in Appendix 3. It is acknowledged that as research projects progress, there may be a need to adjust planned activities and schedules. Accordingly, the PIPS3 Program Communications and Extension Implementation Planner has been prepared in a Microsoft Excel format for ongoing management adaption. Adjustments may also be required to reflect industry feedback, especially through evaluation of extension events and input from grower members of the PIPS3 Program PRG and the PRGs of the projects.

## 8.1 PIPS3 PROGRAM COMMUNCIATIONS & EXTENSION PLANNER

### PLANNER LEGEND

Program Coordinator consultation/ preparation period with stakeholders

Delivery/ Output date

**PIPS3 Program Themes**

| | |
|---|---|
| **WSA** | Whole system approach |
| **IMS** | Integrated management solutions |
| **TECH** | The role of advanced technologies in future orchard systems |
| **RUE** | Resource use efficiency |
| **B&C** | Biological and cultural management solutions |
| **PI** | Performance Indicators |
| **ADAPT** | Adaptation and resilience in a more variable climate |

| Planned formal activities of the PIPS3 Program | 2020/2021 | | | | | | | | | 2021/2022 | | | | | | | | | | | | | 2022/2023 | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sep | Oct | Nov | De | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apri | May | Jun | Jul |
| **INTERNAL COMMUNICATIONS, EXCHANGE & COLLABORATION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Tatura SmartFarm cooperative research activities commenced. | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Commercial/ regional site research activities commenced. | | | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Project planning documents completed and exchanged between sub-projects. | ■ | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| PIPS3 Program Teams Contacts List/ Updates | ■ | | | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | | | ■ | | | | | |
| Program Reference Group Meetings | | | ■ | | | ■ | | | ■ | | | | | | ■ | | | | | | ■ | | | | | ■ | | | | | ■ | | ■ | |
| Project Reference Group Meetings | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | ■ | | | | | ■ | | | ■ | |
| Project Leadership Meetings | | ■ | | | ■ | | | ■ | | | ■ | | | | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | |
| Project team meetings | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| PIPS3 Program Partner Forums | | | | | | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | | | ■ | | | |
| Hort Innovation Reporting *AP19007* | | | ■ | | | ■ | | | | ■ | | | ■ | | ■ | | | ■ | | | | ■ | | | ■ | | ■ | | | ■ | | | ■ |
| *AP19002* | | | ■ | | | | | ■ | | | | | | | ■ | | | | | ■ | | | | | | | ■ | | | | | | | ■ |
| *AP19003* | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | ■ |
| *AP19005* | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | | | | ■ |
| *AP19006* | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | | ■ |
| **EXTERNAL COMMUNICATIONS & EXTENTION** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | July | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apri | May | Jun | Jul |
| **PIPS 3 Program Quarterly Themes** | **WSA** | | | **IMS** | | | **TECH** | | | **RUE** | | | **ADAPT** | | | **B&C/ PI** | | | **WSA** | | | **IMS/ TECH** | | | **RUE/ ADAPT** | | | **B&C/ PI** | | | **WSA** | | |
| PIPS3 Program Webpage Live & *updates incl. case studies & all program collateral (links: Hort Innovation, ExtensionAus, HIN)* | | | ■ | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | | ■ | | | | | | ■ | |
| Press Releases (9) | | ■ | | | | | | ■ | | | ■ | | | ■ | | | | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | |
| PIPS3 Program Booklet Prepared/ annual updates (printable as project pages from webpage) | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | ■ | | | | | | | | ■ | |
| Future Orchards Walks (5 PIPS3 regions)- integration of PIPS3 research & sites in collaboration with APAL | | | | | | ■ | | | ■ | | | ■ | | | | | | ■ | | | ■ | | | ■ | | | | | | ■ | | ■ | |
| PIPS3 Program Regional Field Days- potential for incorporation with some Future Orchards activities. | All PIPS3 Program Sub-projects will work collaboratively through the Program Coordinator to co-jointly prepare and deliver upon the PIPS3 Program led field activities | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *AP19006 (5 regions)* | | | | | | | | | | | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | |
| *AP19003 (Future Orchards & PIPS3)* | | | | | | ■ | | | | | | | | | | | | | | ■ | | | | | | | | | | ■ | | | | |
| *AP19005 (Future Orchards & PIPS3- 2/yr)* | | | | | | ■ | | | | | | | | | | | | | | ■ | | | | | | | | | | ■ | | | | |
| PIPS3 Program *(AP19007)* themed *AFG Magazine* contributions submitted (grey) & published (black). | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | | | ■ | |
| *Planned project AFG submissions* *AP19003* | | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | | | | | | | | | ■ | |
| *AP19005* | | | ■ | | | ■ | | | | | | | | | ■ | | | ■ | | | | | | | | | | | | ■ | | | | |
| *AP19006* | | | | | | ■ | | | | | | ■ | | | | | | | | | ■ | | | | | | ■ | | | ■ | | | | |
| *AP19002* | | | | | | ■ | | | | | | | | | | | | ■ | | | | | | ■ | | | | | | ■ | | | | |
| *Industry Juice* materials (with APAL): Average 1/mth | x2 | x2 | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ |
| Regional e-News/ Newsletters/ media materials | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Videos (via IJ & hosted @ PIPS3 Program APAL Webpage) | All PIPS3 Program Sub-projects will work collaboratively through the Program Coordinator to co-jointly prepare and deliver key messages through high impact videos. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| *Informational (research updates/ outcomes)* | x2 | x2 | | | | 002 | | | | | 007 | | | | | | | 007 | | | | | | | 007 | | | | | | 007 | | | |
| *Peer Exchange (adopters exepertience)* | | | | | | | | 007 | | | 007 | | | | | | | | | | | | | | | | 007 | | | | | 007 | 007 | | 007 |
| *Instructional (technology/ practice)* | | | | | | | 005 | | | | | | | 005 | | | | 002 | | | 003 | | | 005 | | | | | 006 | | 002 | | 003 | 006 | |
| Workshops/ Webinars *Technology/ DSS tool skills* | | | | | | | | | | | | | | | 005 | | | | | | | | | | 006 | 006 | | | | | | | | |
| *PIPS3 Program Research Updates* | | | | | | | | | ■ | | | | | | | | | | | | ■ | | | | | | | | | | | | ■ | |
| Technical Reports | | | | | | | | | | | | | | | | | | | | | | | | | 005 | | | | | | | 003 | | |
| Fact Sheets & Guidelines | | | | | | | | | | | | | | | | | | 002 | 003 | | | | | | | 003 | | | | 002 | 005 | | 006 | |
| Industry Conference/ Forums | | | | | | 006 | | | ALL | | | | | | | | | | | | | ALL | | | | | | | | | | | ALL | |
| Science Conferences | | | | | | | | | ■ | ■ | | | | | | | | | | | | | | | 003 | | | | | | | | | |
| Science Journal Papers | | | | | | | | | | | | | 005 | 003 | | | | | | | | | | | 005 | | | | | | 005 | 003 | | |

# 9 COMMUNICATIONS AND EXTENSION MONITORING AND REPORTING

Internal and external communication and extension activities will be monitored as part of the PIPS3 Program Monitoring & Evaluation Plan (M&E Plan).

Project Leadership Meetings will be used to coordinate planned and opportunistic communications and extension activities for the three-month period forward. Wherever possible, coordination of cooperative project contributions will be conducted to ensure integration of research extension for greater, whole-of-system, impact.

Project Leaders are required to undertake the following steps for unplanned activities between meetings:

- ☐ Notify the PIPS3 Program Coordinator of the opportunity
- ☐ Develop draft communications using PIPS3 Program templates (i.e. flier, presentation, hand-out)
- ☐ Submit to PIPS3 Program Coordinator for review/ approval process to be undertaken
- ☐ Notification of final approved versions will be provided

The PIPS3 Program Coordinator will maintain a data-base of all planned and notified activities that will be cross-referenced with reporting on communications and extension activities as a part of six-monthly Hort Innovation milestone reporting.

PIPS3 Program extension events need to include the following for reporting purposes:

- ☐ Undertake a registration process and manage the process so that all attendees sign upon entry to the event or have pre-registered through a booking/ registration process used by the organisation.
- ☐ Undertake a participant evaluation of the event using the *PIPS3 Program Event Evaluation* (PIPS3 M&E Plan (Appendix 2) template/ Survey Monkey link) and manage the process so that all attendees complete the survey.
- ☐ For an event where the PIPS3 Program/ project is not the direct organiser but is part of an event led by an industry organisation/ collaborator, a registration sheet and evaluation of a third party may be used. The PIPS3 Program must be supplied with:
    - Evidence that permissions for photographs/ recordings has been obtained by all in attendance.
    - Attendee numbers with a break-down of growers and service providers.
    - A collated summary of the outcomes of the evaluation

Upon delivery of the event, an entry in the *AP1900X PIPS3 Program M&E Data-base* needs to be completed and following should be uploaded to a newly created folder for the event in the *PIPS3 Program M&E Portal*:

- ☐ Copy of all promotions
- ☐ Copy of all presentations & hand-outs
- ☐ Copy of the Event Registration
- ☐ Collated summary of the Event Evaluation
- ☐ Copies of photographs/ recordings

All collaborations, communications and project materials will be reported and filed in a similar manner in accordance with Section 5.1 of the PIPS3 Program M&E Plan. A communications and extension report will be provided at each PRG Meeting, including outputs and evaluation results for discussion. Adaption to the C&E Plan may be undertaken from time to time based upon PRG response.

## 9.1 C&E PLAN MONITORING AND EVALUATION TABLE

Table Three outlines the indicators to be used in evaluating successful performance of the C&E Plan. It provides qualitative and quantitative monitoring and evaluation criteria to be assessed six monthly (quantitative) and at mid-term and final stages (qualitative survey) of the three-year program.

***TABLE THREE C&E PLAN PERFORMANCE INDICATORS AND M&E METHODS***

| PERFORMANCE INDICATOR | QUANTITATIVE M&E (SIX-MONTHLY) | QUALITATIVE M&E (MID-TERM & FINAL PROCESS) |
|---|---|---|
| **Meetings result in sound project management and research integration** | ☐ Conducted & well attended<br>☐ Record of meetings<br>☐ Actions undertaken<br>☐ Program & projects continuously meet milestone achievement criteria. | ☐ Evidence of exchange & resource efficiency outcomes<br>☐ Valued as vehicle for input/feedback on research |
| **Forums result in greater collaboration between stakeholders, adding value to research outcomes** | ☐ Conducted & well attended<br>☐ Outcomes & actions collated & documented<br>☐ Actions undertaken<br>☐ Internal program event evaluation. | ☐ Research team members can identify increased knowledge and understanding benefits of networking and exchange opportunity. |
| **Location of research provides greater capability to integrate research and address regional differences within the research** | ☐ Sites are well-managed and activities are undertaken in accordance with milestone achievement criteria.<br>☐ Formal interaction encounters on site between researchers<br>☐ Local grower/ service provider engagement opportunities.<br>☐ Attendance numbers and external event evaluation results. | ☐ Trial site activities are understood, supported and valued by local growers/ service providers.<br>☐ Adoption/ intention to adopt trialled practices and/ or technologies.<br>☐ Confidence in research as undertaken in local region.<br>☐ Local growers/ service providers believe research has responded to input/feedback. |
| **Extent and impact of engagement through online platforms.** | ☐ PIPS3 webpage content is updated ongoing (no. of resources)<br>**Website/ webpage analytics:**<br>☐ Number to landing page<br>☐ Visited/ duration of accessed resources<br>☐ Movement to associated websites/pages | ☐ PIPS3 webpage is valued as a reputable source of information by stakeholders.<br>☐ Engagement with resources of the webpage have resulted in Adoption/ intention to adopt trialled practices and/ or technologies. |
| **Reach and impact of press releases, published articles and visual media methods.** | ☐ Resulting mainstream media publications and reach emanating from press releases.<br>☐ Number & audience reach of published articles in industry magazine/ newsletters. | ☐ Stakeholders believe that articles/videos are relevant and dissemination timing is appropriate to season/ region. |

| | | |
|---|---|---|
| | **Google/ social media analytics:**<br>☐ Click-throughs to promoted articles/resources from social media/ e-newsletters.<br>☐ Engagement in posts (likes/ comments)<br>☐ Landings on online platforms from electronic publications. | ☐ Stakeholders have increased their awareness on activities of the PIPS3 Program from publications/ videos.<br>☐ Stakeholders can identify the publication/ video that increased their knowledge and understanding on a certain practice.<br>☐ Publications/ videos have resulted in adoption/ intention to adopt trialled practices and/ or technologies. |
| **Field walks/ field days result in increased awareness, knowledge, understanding and intent to adopt.** | ☐ Number of PIPS3 Program collaborations with FO events.<br>☐ Attendance numbers and FO event evaluation results, especially influence of PIPS3 Program speakers.<br>☐ Number of PIPS3 Program specific extension events.<br>☐ Attendance numbers and external event evaluation<br>☐ Stakeholders have increased their awareness on activities of the PIPS3 Program from participation.<br>☐ Stakeholders can identify the speaker/ event that increased their knowledge and understanding on certain practices. | ☐ Trial site activities are understood, supported and valued by stakeholders.<br>☐ Gowers/ service providers believe research is relevant to industry priorities.<br>☐ PIPS3 Program interactions have resulted in adoption/ intention to adopt trialled practices and/ or technologies. |
| **Workshops/ webinars result in increased knowledge, skills and confidence to adopt.** | ☐ Number of PIPS3 Program collaborations with FO events.<br>☐ Attendance numbers and FO event evaluation results, especially influence of PIPS3 Program speakers.<br>☐ Number of PIPS3 Program specific extension events.<br>☐ Attendance numbers and external event evaluation<br>☐ Stakeholders have increased their awareness on the progress of PIPS3 Program activities from participation.<br>☐ Stakeholder have increased their skills and confidence to adopt certain practices/ technology/ tools through training events. | ☐ PIPS3 Program interactions have resulted in adoption/ intention to adopt trialled practices/ technologies or tools.<br>☐ Stakeholders value the research outputs that underpin the capabilities of new technologies/ tools. |

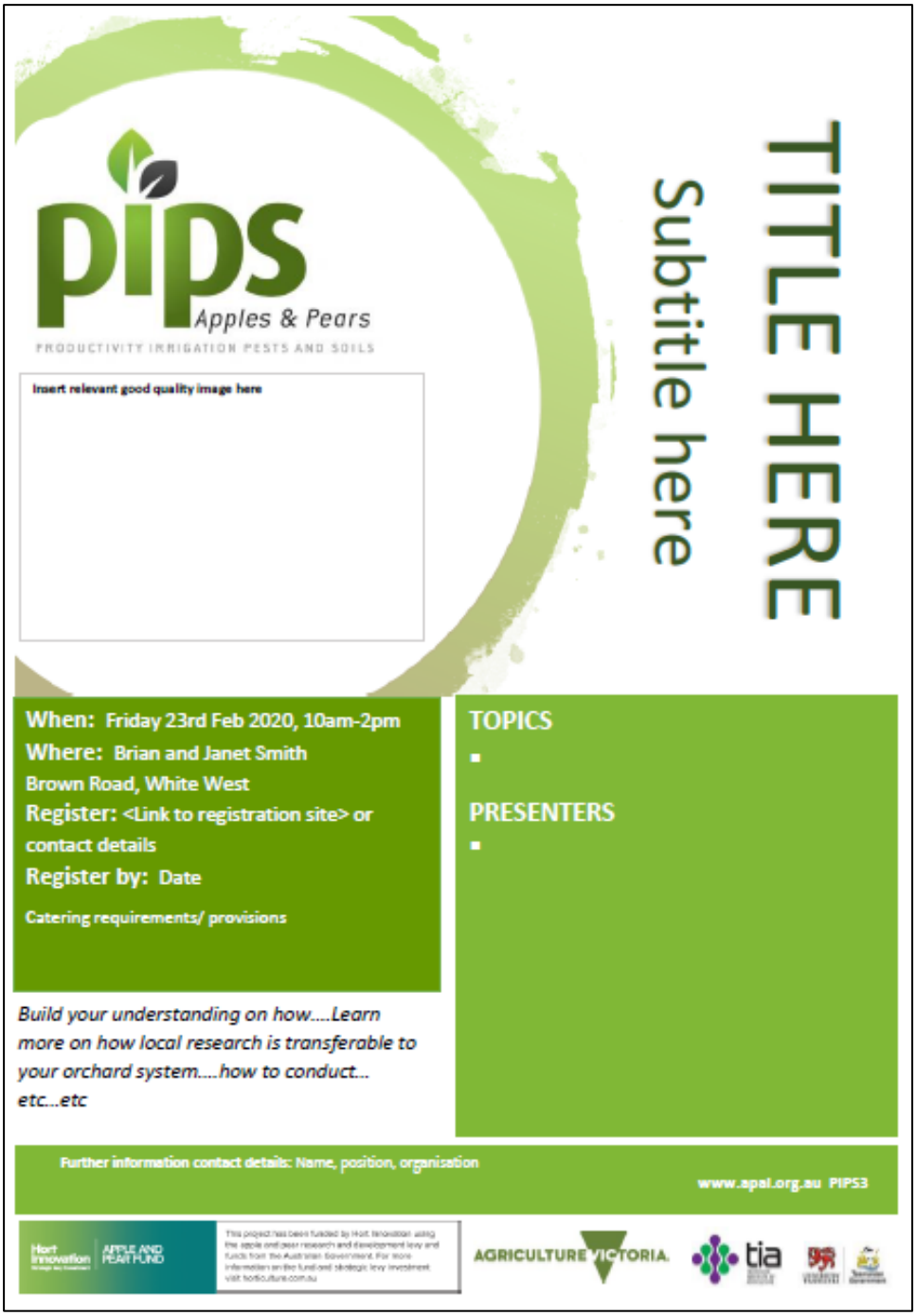
| | | |
|---|---|---|
| **Online/printable resources (Fact Sheets, Case Studies, Guidelines) deliver increased appreciation for research outputs and practical skills and confidence to adopt outcomes.** | ☐ Number of resource outputs of the PIPS3 Program<br>Analytics:<br>☐ Access and downloads of each resource.<br>☐ Access and downloads of developed tools.<br>☐ YouTube videos views, likes & comments. | ☐ PIPS3 Program resources and tools have resulted in increased knowledge and understanding of the trialled practices/ technologies or tools.<br>☐ Stakeholders have confidence in the science underpinning the resource material/ tools. |
| **PIPS3 Program participation in industry conferences/ forums and science conferences increases industry and science community understanding and knowledge of the research and its impact.** | ☐ PIPS3 Special sessions programmed<br>☐ Abstracts accepted<br>☐ Presentations delivered<br>☐ Attendance and reach of conference | ☐ Stakeholders have increased their awareness on activities of the PIPS3 Program.<br>☐ Stakeholders can identify the industry conference presentation that increased their knowledge and understanding on a certain practice.<br>☐ Science community has responded to research outcomes of the PIPS3 Program through participating in "next step" research collaborations. |
| **Publication of research findings delivers confidence from industry and science stakeholders in the integrity and quality of the research.** | ☐ Journal manuscripts are prepared and undergo peer and journal review processes.<br>☐ Number of publications in accordance with milestone achievement criteria. | ☐ Publications result in post program industry impact and interest from science community. |
| **PIPS3 Program linkages to PhD research adds value and increases research capability for industry.** | ☐ PhD manuscripts are submitted and accepted in accordance with milestone achievement criteria. | ☐ PhD work has added value to the project findings and outcome for industry.<br>☐ PhD candidates aspire to continue research within the industry. |
| **Extent to which reporting systems assist help to monitor and report upon implementation of the C&E Plan.** | ☐ Five projects submit and receive approval of Milestone Reports by Hort Innovation at least six-monthly. | ☐ PIPS3 Program stakeholders identify the benefits in a program approach to research.<br>☐ PIPS3 Program approach is believed to have delivered greater impact than previous PIPS research activities. |

## APPENDIX 1 PIPS3 PROGRAM KEY COMMUNICATIONS AND EXTENSION CONTACTS

| Name | Organisation | | Email | Phone Number |
|---|---|---|---|---|
| Marguerite White | ICD Project Services | PIPS3 Program Coordinator | mwhite@icdprojectservices.com.au | 0477 500 415 |
| Maria Stathis | Hort Innovation | Media and Public Affairs Manager | Maria.Stathis@horticulture.com.au | 0477 304 255 |
| Lauren Jones | Hort Innovation | Industry Communications Manager | Lauren.Jones@horticulture.com.au | 0427 140 765 |
| Lindy Nieuwenhuizen | APAL | Head of Communications | Lindy@APAL.org.au | 0409 849 982 |
| Alison Barber | APAL | Manager Communications & Media | ABarber@APAL.org.au | 0424 004 070 |
| Rose Daniel | APAL | Technical Manager | RDaniel@APAL.org.au | 0432 842 794 |
| Jennifer Bladon-Clark | Agriculture Victoria Research | Governance & Communication Manager | jen.bladon-clark@agriculture.vic.gov.au | 0472 877 979 |
| Phoebe Bobbi | Tasmanian Institute of Agriculture | TIA Corporate Communications Manager | TIA.comms@utas.edu.au | 03 6226 6385 |
| Dr Lexie McClymont | Agriculture Victoria- Tatura | Research Scientist- AP19005 | lexie.mcclymont@agriculture.vic.gov.au | 0447 376 813 |
| Dr Ian Goodwin | Agriculture Victoria- Tatura | Project Leader- AP19003 | ian.goodwin@agriculture.vic.gov.au | 0409 351 962 |
| Emily Crawford | Agriculture Victoria- AgriBio | Project Officer, Extension Support- AP19002 | Emily.crawford@agriculture.vic.gov.au | 0408 105 812 |
| Michele Buntain | UTAS-TIA | Horticulturalist, Extension and Development- AP19006 | Michele.buntain@utas.edu.au | 0429 957 975 |

## APPENDIX 2 PIPS3 PROGRAM COMMUNCIATION TEMPLATES

### PIPS3 PROGRAM POWER POINT TEMPLATE


pips
Apples & Pears
PRODUCTIVITY IRRIGATION PESTS AND SOILS
Insert relevant good quality image here
TITLE HERE
Subtitle here
When: Friday 23rd Feb 2020, 10am-2pm
Where: Brian and Janet Smith
Brown Road, White West
Register: <Link to registration site> or contact details
Register by: Date
Catering requirements/ provisions
TOPICS
PRESENTERS
Build your understanding on how....Learn more on how local research is transferable to your orchard system....how to conduct... etc...etc
Further information contact details: Name, position, organisation
www.apal.org.au PIPS3
AGRICULTURE VICTORIA
tia


CLICK TO ADD TITLE
Click to add Subtitle
CALL-OUT BOX HEADING
Key messages highlighted
Succinct sentences that summarise
TITLE HERE 12 pt bold
Subtitle
Build your understanding on how....Learn more on how local research is transferable to your orchard system....how to conduct... etc...etc
TITLE HERE 12 pt bold
Subtitle
Build your understanding on how....Learn more on how local research is transferable to your orchard system....how to conduct... etc...etc
Insert relevant good quality image here
Shape Fill> Picture
Insert relevant good quality image here
TITLE HERE 12 pt bold
Subtitle
Build your understanding on how....Learn more on how local research is transferable to your orchard system....how to conduct... etc...etc
Insert relevant good quality image here
TITLE HERE 12 pt bold
Subtitle
Build your understanding on how....Learn more on how local research is transferable to your orchard system....how to conduct... etc...etc
References
asdasdasd
Further information contact details: Name, position, organisation
www.apal.org.au PIPS3
This project has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

## APPENDIX 3 PIPS3 PROGRAM PROJECT C&E PLAN TABLES

### AP19002 COMMUNICATIONS & EXTENSION TABLE

#### Project/ Program duration internal communications & collaboration

| Strategy/ Activity | Implementation steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|
| *What should be undertaken & why?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| extensionAus contributor training | • On-line platforms | Project Team | Emily Crawford/Greg Lefoe | # contributed articles<br># expert responses | 10 Sept 2020 |
| Project meetings to coordinate activities | • On-line platforms | Project team members | Greg Lefoe | | As required |
| AgriBio/AVR newsletter to promote the project internally | • Internally circulated newsletter | Project team members | Greg Lefoe | | Twice; at commencement and completion of project |
| AgriBio Science conference to promote Hort IPDM within Agriculture Victoria | • On-site or on-site conference | Agriculture Victoria | Greg Lefoe | # abstracts accepted and attendance | Once |
| Project updates with all four PIPS3 projects | • Microsoft teams | All project team members in all 4 projects | Project leaders<br>Marguerite to co-ordinate | | Biannually |

## External Communications & Engagement

| THEME * | Strategy/ Activity | Target Audience | Implementation Steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *Who do you want to be engaged?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| Biological and cultural management solutions | ExtensionAus Apple and Pear IPDM webpage | Growers and advisors | • Written articles, photos, videos on webpage<br>• Ask the Expert function | Project team And CoP | Greg Lefoe and Emily Crawford | Google analytics | Fortnightly Sept 2020 – June 2023 |
| Biological and cultural management solutions | Facebook IPDM group | Growers and advisor | • Posts, photos, videos on facebook group page, with signposting to webpage | Project team And CoP | Greg Lefoe and Emily Crawford | Facebook analytics | Fortnightly Sept 2020 – June 2023 |
| Biological and cultural management solutions | IPDM Community of Practice (CoP) | Advisors | • CoP meetings (videoconferences) | Project team And CoP | Greg Lefoe and Emily Crawford | • Feedback from members<br>• Contributions and engagement from members in project | Bimonthly / quarterly Sept 2020 – June 2023 |
| Biological and cultural management solutions | APAL Industry Juice | Growers and advisors | • Written articles | Project team | Greg Lefoe and Emily Crawford | | As appropriate Sept 2020 – June 2023 |

## Project/ Program duration internal communications & collaboration

| THEME* | Strategy/ Activity | Implementation steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| | Tatura SmartFarm is the common site for experiments in AP19002, AP19003, AP19005 and AP19006. | • Share costings between projects | Ag Vic and TIA | Project leaders | Experiments well implemented and managed | Project duration |
| | Sharing and discussion of methods document (i.e. research pre-schedule) | • Document, share and discuss | Ag Vic | Project leaders and principal investigators | Sharing of methods to standardise measurements, avoid duplication of data collection and identify value-add uses. | Oct 2020 |
| | Sharing of Gantt charts with project activities and timelines documented | • Document, share and discuss | Ag Vic | Project leaders and staff | Joint activities planned for in advance. Equipment, space and labour resources managed without conflict. | Oct 2020 |
| | Opportunity for project 19002 to use the Cartographer and fruit grader (calibration, testing, sync data). | • Share costings between projects<br>• Train staff in the use of the grader | Ag Vic | Project leaders and principal investigators | Increase in the accuracy of the response to treatments due to volume of data collected (not a sub sample). Increase in the efficiency of data collection. | Commence in Jan – Feb 2021. |
| | Joint field walks, video making | • Discussion between project leaders to establish feasibility and strategy | Ag Vic | Project leaders | | |
| | Better pest management | • Face-to-face discussion with AP19002 scientists | Ag Vic | Principal investigators | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Increased knowledge on orchard management and potential interactions | • Day-to-day education of project staff on orchard management | Ag Vic | Principal investigators | | |

## External Communications & Engagement

| THEME * | Strategy/ Activity | Target Audience | Implementation Steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *Who do you want to be engaged?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| TECH | Technical report and user guidelines on new technology and advanced management systems | Growers and FLA via HIN or APAL websites | Technical report describing recommended sensors, platforms and how to use for apple production. | Ag Vic and collaborators (TIA, Green Atlas and SwarmFarm Robotics) | Lexie McClymont | | May 23 |
| TECH | Technical videos on new technology | Growers and FLA via APAL website | U-tube video of Green Atlas demonstrating the platform and sensors, the crop load management tool and near real-time (next day) visualisation of data | Ag Vic, AP19007 and collaborators (TIA, Green Atlas and SwarmFarm Robotics) | Alessio Scalisi | | May 22 |
| TECH | Factsheets | Growers and FLA via APAL website | Topics<br>- sensing the spatial distribution of fruit number, fruit size and fruit colour in apple orchards<br>- crop load optimisation | Ag Vic | Alessio Scalisi<br>Ian Goodwin | | May 22, Nov 23 |
| | Grower and service provider field walks at SmartFarm and commercial site(s) | Growers and FLA | Incorporated with 'Future Orchard' walks (and other PIPS3 projects) | Ag Vic | Alessio Scalisi<br>Ian Goodwin | | On-going |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Field days, open days and SmartFarm visiting groups | Growers and FLA, trade delegations, government ministers, students, international scientists | Ad hoc (groups listed under 'Target Audience' frequently visit Tatura SmartFarm) | Ag Vic | Alessio Scalisi<br>Ian Goodwin | | On-going, reported in May milestones |
| WSA TECH ADAPT | Science journal papers (5) | Science community | Topics<br>- Crop load effects on productivity<br>- Sensing spatial distribution of fruit<br>- Organic metabolites related to biennial bearing<br>- Effects of light and fruit position on yield, quality and sun damage<br>- Effects of light and temperature on colour expression and colour bleaching | Ag Vic and collaborator (Green Atlas) | Alessio Scalisi,<br>Tim Plozza,<br>Priyanka Reddy,<br>Ian Goodwin | | Nov 22, Nov 22, May 23, May 23, May 23 |
| WSA TECH ADAPT | Industry articles (4) | Growers and FLA | Topics:<br>- Project overview<br>- 'ANABP 01' responses to rootstock<br>- Fruit sun damage<br>- Crop load and fruit quality | Ag Vic, collaborators (Green Atlas) | Ian Goodwin<br>Tim Plozza<br>Alessio Scalisi | | Nov 20, Nov 21, Nov 22, May 23 |
| WSA TECH ADAPY | Science conference presentations | Science community | - XXXI International Horticultural Congress<br>- Hort Connections | Ag Vic | Alessio Scalisi<br>Ian Goodwin | | Nov 22 (IHC) |
| | Present at PIPS3 meetings | PIPS3 project staff | Project results and implications continuously updated | Ag Vic | Ian Goodwin | | At least one per year |
| | Project updates to industry at various forums | Growers and FLA | Project results and implications continuously updated | Ag Vic and collaborator (Green Atlas) | Ian Goodwin | | At least one presentation per year |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | 6 monthly milestone reports and Final Report | Hort Innovation, APAL, growers and FLA | Document project progress and key outcomes and messages | Ag Vic and collaborator (Green Atlas) | Ian Goodwin | | Six monthly (Nov and May) |

## AP19005 COMMUNICATIONS & EXTENSION TABLE

### Project/ Program duration internal communications & collaboration

| THEME* | Strategy/ Activity | Implementation steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| | Common experimental site in the pear orchard at Tatura SmartFarm. | • Meeting with statistician and project teams<br>• Share costings between projects | Ag Vic and TIA | Project leaders | Scientifically robust design resulting in scientific publications of the results | Aug 2020 |
| | Joint Project Reference Group or shared annual meeting/s (AP19005 and AP19002) | • Discussion between project leaders to establish feasibility and strategy | Ag Vic | Project leaders | | |
| | Sharing and discussion of methods document (i.e. research pre-schedule) | • Document, share and discuss | Ag Vic and TIA | Project leaders and principal investigators | Sharing of methods to standardise measurements, avoid duplication of data collection and identify value-add uses. | Oct 2020 |
| | Sharing of Gantt charts with project activities and timelines documented | • Document, share | Ag Vic and TIA | Project leaders and staff | Joint activities planned for in advance. Equipment, space | Oct 2020 |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | and discuss | | | and labour resources managed without conflict. | |
| | Opportunity for project 19002 to use the Cartographer and fruit grader (calibration, testing, sync data). | • Share costings between projects<br>• Train staff in the use of the grader | Ag Vic | Project leaders and principal investigators | Increase in the accuracy of the response to treatments due to volume of data collected (not a sub sample). Increase in the efficiency of data collection. | Commence in Jan – Feb 2021. |
| | Joint field walks, video making | • Discussion between project leaders to establish feasibility and strategy | Ag Vic | Project leaders | | |
| | Better pest management | • Face-to-face discussion with AP19002 scientists | Ag Vic | Principal investigators | | |
| | Increased knowledge on orchard management and potential interactions | • Day-to-day education of project staff on orchard management | Ag Vic and TIA | Principal investigators | | |

## External Communications & Engagement

| THEME * | Strategy/ Activity | Target Audience | Implementation Steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *Who do you want to be engaged?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| | Project reference group meetings (3) | Key growers, FGV, APAL | Invitation to potential members, annual meetings, minutes documented | Ag Vic, key growers, FGV, APAL, collaborators (Sally Bound, Green | Ian Goodwin | | Annual meeting; informal interim contact between Ian/Lexie and PRG for advice and feedback |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | Atlas, SwarmFarm Robotics) | | | |
| RUE ADAPT | Irrigation planning and scheduling tool – instruction text and video | Growers and FLA via APAL website | Excel spreadsheet updated to include dropdown options relevant for GV Pear growers; documented instructions, short technical video to demonstrate use of each worksheet | Ag Vic, AP19007 | Ian Goodwin | | Deliverable for Milestone 104 (Oct 2021) |
| TECH ADAPT | User guidelines on new technology and advanced management systems | Growers and FLA via APAL website | Short documents (AgNote style) | Ag Vic and collaborators (TIA, Green Atlas and SwarmFarm Robotics) | Lexie McClymont | | Ongoing thru'out; documented for Milestone 107 (Apr 2023) |
| TECH ADAPT | Technical videos on new technology | Growers and FLA via r APAL website | Short videos (~ 5 min) demonstrating in-field use of equipment or explaining data outputs | Ag Vic, AP19007 and collaborators (TIA, Green Atlas and SwarmFarm Robotics) | Alessio Scalisi | | Ongoing thru'out; documented for Milestone 107 (Apr 2023) |
| | Report on current pear industry orchard design and management practice, and the constraints and incentives needed to adopt new orchard design and advanced management systems. | APAL, FLA, Hort Innovation | Technical report | Ag Vic | Lexie McClymont | | Milestone 106 (Oct 2022) |
| | Grower and service provider field walks (6) | Growers and FLA | As part of PRG meetings, and when possible incorporated with 'Future Orchard' walks, APALs Pear Master Class or other PIPS3 projects | Ag Vic; TIA, AP19007 | Ag Vic project staff (Ian, Lexie and Alessio) | | 2/year, reported in Milestone 103, 105 and 107 (Apr 2021/22/23) |
| | Present to SmartFarm visiting groups | Trade delegations, government ministers, | Ad hoc (groups listed under 'Target Audience' frequently visit Tatura SmartFarm) | Ag Vic | Ag Vic project staff (Ian, Lexie and Alessio) | | On-going, reported in Milestone 103, 105 and 107 (Apr 2021/22/23) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | students, international scientists | | | | | |
| WSA ADAPT TECH | Science journal papers (3) | Science community | Topics<br>- Crop load relationships<br>- Sensing spatial distribution of fruit<br>-Effect of light and temperature on colour | Ag Vic and collaborators (TIA and Green Atlas) | Lexie and Alessio | | Report in Milestone 104 (Oct 2021), 106 (Oct 2022), 107 (Apr 2023) |
| WSA ADAPT TECH | Industry articles (6) | Growers and FLA | Topics:<br>- Project overview<br>- Crop load relationships<br>- Pear planting systems<br>- Sensing fruit in orchards<br>- Fruit thinning<br>Alternate-side netting | Ag Vic, AP19007 and collaborators (TIA and Green Atlas) | Lexie McClymont | | One/six months, reported in each Milestone 102 – 107 (Oct, Apr 2020-23) |
| WSA | Science conference presentations | Science community | - ISHS Orchard systems conference<br>- ISHS Pear conference | Ag Vic | Lexie and Alessio | | Report in Milestone 104 (Oct 2021), 107 (Apr 2023) |
| | Present at PIPS3 meetings | PIPS3 project staff | | Ag Vic | Ian Goodwin | | |
| | Project updates to industry at various forums | Growers and FLA | Project summary, videos and updates in e-newsletters and APAL website | Ag Vic and collaborators (TIA and Green Atlas) | Ian Goodwin | | |
| | 6 monthly milestone reports and Final Report | Hort Innovation, APAL, growers and FLA | Document project progress and key outcomes and messages | Ag Vic and collaborators (TIA, Green Atlas and SwarmFarm Robotics) | Ian Goodwin | | |

## Project/ Program duration internal communications & collaboration

| Strategy/ Activity | Implementation steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|
| *What should be undertaken & why?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| Consultation with FLA and projects to inform trial design | • Zoom meeting<br>• Email | Project team members<br>AP19006 team leads | Nigel Swarts<br>Sally Bound | Trial design has regional input and consistency of methodology and relevance across PIPS3 projects | September 2020 |
| Communication between team members to ensure project on track and activities completed | • Email<br>• Zoom meetings or face to face at UTAS | Project team members | Sally Bound | Record of meetings; Actions from meetings undertaken; | Monthly or more frequently as required |
| Communication between program coordinator and projects to ensure consistent and coordinated messaging to external stakeholders | • Email<br>• Zoom meetings | Project team lead | Marguerite White | Record of meetings; Actions from meetings undertaken; | Monthly |
| Communication with relevant projects to promote collaboration and ensure efficient use of resources; sharing of knowledge; | • Email<br>• Zoom meetings | Project team leads | Nigel Swarts | Record of meetings; Actions from meetings undertaken; Evidence of resource sharing; File share between projects | At critical times including Site selection<br>• Trial implementation<br>• Field days<br>• Trial assessment & harvest |
| Communicate progress to UTAS, TIA & DPIPWE to demonstrate value of investment and allow promotion to wider Tas horticulture community | • Email (Key activity report) | UTAS communications group, TIA (TIA board, TIA communications group) and DPIPWE | Nigel Swarts | Evidence of project promotion via TIA and local media | 6 monthly |
| Program reference group meeting | • Zoom | Selected growers and project leads | Marguerite White | Program modifications implemented as needed. | 6 monthly |

| | | | | | |
|---|---|---|---|---|---|
| Liaison with trial site owners to ensure trial site suitability and management will be implemented as needed | • Phone Email<br>• Face to face on site (regional travel required) | Owners of trial sites | Sally Bound<br>FLA's | Trial sites are well managed, direct grower feedback | Monthly from August to April. |
| Inform HI of trial progress | • Reports (milestone) | Project team | Nigel Swarts | Milestone accepted | 6 monthly (Mar & Sep) |

## External Communications & Engagement

| THEME * | Strategy/ Activity | Target Audience | Implementation Steps/ resources | Stakeholders | Responsibility | Monitoring/Evaluation | Timing/ frequency |
|---|---|---|---|---|---|---|---|
| | *What will be undertaken & why?* | *Who do you want to be engaged?* | *How will it be executed?* | *Identify organisations/ personnel needed.* | *Who will manage the process start to end?* | *How will extent of impact be determined?* | *When will it happen?* |
| WSA | Media release to inform industry of new program | Australian Pome Fruit Industry; | Input from project leads<br>Email to media | Project leads; | PIPS3 Coordinator Marguerite White | Media outputs recorded | August 2020 |
| WSA | Communication with project leads local growers & advisors to inform trial design and promote ownership/participation in demonstration and trial sites | Project team members (other PIPS3 projects), growers & advisors/agronomists in trial regions, WA, SA, NSW, Tas, Vic | Regional FLA's & Project team communicate with growers & advisors – Project lead communicates with other project leads phone, email, meetings; | FLA's, project team leads, project team members | Nigel Swarts | Region specific trial designs developed demonstrate integration with other PIPS 3 projects | September 2020 |
| IMS<br>RUE<br>ADAPT | PIPS 3 promo video to promote the PIPS 3 program: why is it being done; what is going to be done and why important to growers | Australian Pome Fruit Industry; | Create a 3-minute video in orchard | Nigel Swarts<br>Michele Buntain<br>APAL | Marguerite White | Web analytics on views | October 2020 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| IMS<br>RUE<br>ADAPT | AFG article 1 – to increase awareness of project why, what, how | Australian Pome Fruit Industry; | Preparation of article with input from FLA's, project team | Nigel Swarts, FLA's | Marguerite White | | March 2021 |
| | Conference presentation to promote awareness of project to Pome fruit industry in Tasmania | Tasmanian Pome fruit industry | Conference presentation | • Nigel Swarts,<br>• Project team<br>• FLA's | FGT | Conference feedback | March 2021 |
| IMS | AFG article 2 to raise awareness of soil health indicators relevant to orchards | Australian Pome Fruit Industry; | Preparation of article with input from FLA's, project team | • Nigel Swarts,<br>• Project team<br>• FLA's | Marguerite White | | September 2021 |
| WSA | Field days in 5 regional locations – Tas, Vic, NSW, SA and WA to increase grower's/advisor's awareness of sustainable orchard management practices impacting on soil health relevant to their region and get feedback on trial progress | Pome fruit growers, industry advisors | • Demonstration plots in commercial orchards<br>• Coordinate content and timing with FO, Project leads, Project team and site owner<br>• Promotion (media, APAL, Email, Social, Local Industry Organisations) | • FLA's<br>• Project team<br>• Project Leads<br>• Future Orchards<br>• Site owner | Nigel Swarts | Observations<br>Attendance<br>Survey | October 2021 |
| WSA | APAL tech transfer conference, associated with Hort connections to raise awareness of project progress and outcomes | Australian Pome Fruit Industry; | Technical presentation | • Project leads<br>• Team members<br>• Project leads | Nigel Swarts | | Annual |
| IMS | AFG article 3 to increase industry awareness of project progress | Australian Pome Fruit Industry; | Preparation of article with input from FLA's, project team | • Nigel Swarts,<br>• Project team<br>• FLA's | Marguerite White | | June 2022 |
| RUE<br>ADAP | Workshops/ webinar to demonstrate WEB app to increase grower's awareness and skill in use of online app | Australian apple growers | Webinar presentation<br>Workshop at conference and/or regional industry events | • Nigel Swarts<br>• Steve Green | Nigel Swarts | Attendance<br>Web analytics | Oct – Nov 2022 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| RUE | AFG article 4 – increase industry awareness of project progress | Australian Pome Fruit Industry | Preparation of article with input from FLA's, project team | • Nigel Swarts,<br>• Project team<br>• FLA's | Marguerite White | | December 2022 |
| IMS<br>RUE<br>B&C<br>ADAPT | Field days in 5 regional locations – Tas, Vic, NSW, SA and WA to increase grower's/advisor's knowledge of soil health indicators; impact on soil health; to increase grower's/advisor's knowledge of management practices that impact on soil health | Pome fruit growers, industry advisors, | • Demonstration plots in commercial orchards<br>• Coordinate content and timing with FO, Project leads, Project team and site owner<br>• Promotion (media, APAL, Email, Social, Local Industry Organisations)<br>• Setup & run | • Project team<br>• FLA's<br>• Project leads<br>• Future Orchards<br>• Site owner | Nigel Swarts | Observations<br>Attendance<br>Survey | October 2022 |
| ADAPT | AFG article 5 | Australian Pome Fruit Industry | Preparation of article with input from FLA's, project team | • Nigel Swarts,<br>• Project team<br>• FLA's | Marguerite White | | March 2023 |
| WSA | AFG Article 6 | Australian Pome Fruit Industry | Preparation of article with input from FLA's, project team | • Nigel Swarts,<br>• Project team<br>• FLA's | Marguerite White | | June 2023 |
| IMS | Grower Guide to increase knowledge of management practices that reduce the environmental footprint of apple and pear production | Australian Pome Fruit Industry: growers, advisors, researchers | Research results incorporated into a practical guide for growers and published online | • Nigel Swarts,<br>• Project team<br>• FLA's | Sally Bound | Guide accepted for publication; | June 2023 |

# APPLE AND PEAR

## *PRODUCTIVITY, IRRIGATION, PESTS AND SOILS PROGRAM (PIPS3)*

pips Apples & Pears
PRODUCTIVITY IRRIGATION PESTS AND SOILS

# Monitoring & Evaluation Plan

2020-2023

AGRICULTURE VICTORIA

tia TASMANIAN INSTITUTE OF AGRICULTURE

UNIVERSITY of TASMANIA | Tasmanian Government

TIA is a joint venture of the University of Tasmania and the Tasmanian Government

iCd project services
Initiated Coordinated Delivered

Hort Innovation Strategic levy investment | APPLE AND PEAR FUND

This project has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

CONTENTS

# 1 INTRODUCTION

The purpose of the Monitoring and Evaluation Plan (M&E Plan) is to outline the framework and work plan that will be implemented to appropriately evaluate the performance and effectiveness of the Apple and Pear industry's third *Productivity, Irrigation, Pests and Soils Program (PIPS3)*, funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government.

The PIPS3 Program is a three-year (2020-2023) research and development effort encompassing five integrated projects, led by four organisations. These are:

- AP19002- *Strengthening cultural and biological management of pests and diseases in apple and pear orchards*, Project Lead: Agriculture Victoria, Dr Greg Lefoe
- AP19003- *Advancing sustainable and technology driven apple orchard production systems*, Project Lead: Agriculture Victoria, Dr Ian Goodwin
- AP19005- *Developing smarter and sustainable pear orchards to maximise fruit quality, yield and labour efficiency*, Project Lead: Agriculture Victoria, Dr Ian Goodwin
- Ap19006- *Improved Australian apple and pear orchards soil health and plant nutrition*, Project Lead: Tasmanian Institute of Agriculture (TIA), Dr Nigel Swarts & Dr Sally Bound
- AP19007- Independent Program Coordination for PIPS3 Program, Project Lead: ICD Project Services, Marguerite White

The M&E Plan will assist the individual projects to each deliver upon the milestones and achievement criteria of their relevant research agreements, in consultation with their partners and Project Reference Groups (PRG), whilst also contributing to overall program and industry objectives through the established avenues of the Independent Coordinator, PIPS3 Program Reference Group (PIPS3 PRG) and the *PIPS3 Program Communications and Extension Plan* (C&E Plan).

Projects of the PIPS3 Program have contributed to the preparation of this program level M&E Plan. It has been developed to provide a cascading roadmap, to ensure appropriate and timely monitoring, evaluation, reporting and continuous improvement processes at both the program and project levels to demonstrate immediate and intermediate performance and effectiveness, together with the valuable contribution the program will make towards the *Apple and Pear Strategic Invest Plan 2017-2021 (SIP)* and longer-term industry goals.

## 1.1 RELATIONSHIP WITH SIP STRATEGIES

| | |
|---|---|
| **Outcome 1** | **Industry and global competitiveness is improved by reducing the average cost per carton** |
| Strategy 1.1 | Drive orchard reworking with emphasis on preparedness for increased mechanisation/ automation/scale. Primary research projects: AP19003 & AP19005 |
| Strategy 1.2 | Continue to build the body of knowledge around pest & disease management & prevention, considering both biosecurity risk mitigation & cost reduction. Primary research project: AP19002 |
| Strategy 1.3 | Improve soil health & increase knowledge of beneficial microbes in orchard management. Primary research project: AP19006 |
| Strategy 1.4 | Improve labour productivity through greater adoption of technology and leadership training Primary research project: AP19003 & AP19005 |
| Strategy 1.5 | Research IT and data systems that enable better collection and connectivity of orchard and business data at every level of the supply chain. Primary research projects: AP19003 & AP19005 |
| **Outcome 3** | **The value of the average bin has risen, resulting in improved industry profitability** |
| Strategy 3.1 | Improve quality consistency and percentage of Class 1 fruit per hectare |

## Long-term Outcomes >10yrs

**The apple and pear industry has adopted tools and management practices required to operate orchards that:**

- Are resilient to climate variability and weather extremes;
- Use resources efficiently and sustainably;
- Apply biological and cultural solutions in the management of pests, disease and nutrients;
- Drive product quality and business profitability through use of automated/ mechanised advanced technologies along the supply chain; and
- Produce a low environmental footprint and sustainable product that meets consumer preference and expectations.

## Intermediate Outcomes >5yrs

- Informed understanding of interactions between cultural/biological/chemical IPDM & soil health practices leading to implementation of recommended sustainable orchard practices.
- Apple orchard design & management practices adopted that improve crop loading, maximise fruit yield & quality, minimise impacts of extreme heat events & foster greater orchard system diversity.
- Rework recommendations of pear orchard design adopted, underpinned by research findings of the yield & fruit quality potential of new cultivars & benefits of a sustainable whole system approach.
- Decision support tools adopted by industry: Pear irrigation scheduling, SINATA for apples irrigation scheduling & nutrient budgeting & Apple crop-load tool.
- Accessible, high-quality information on IPDM practices, economic benefits & costs leading to increased adoption of biological controls.
- Improved pear crop load management recommendations adopted to avoid biennial bearing and maximise fruit quality.
- Sensing technologies adopted that improve informed decision-making, leading to efficient production of premium quality product.
- Industry platforms for greater collaboration on productivity, irrigation, pests and soils are valued by industry growers/advisors as trusted sources of scientifically robust information & recommendations.
- Advisors & consultants are confident in providing sustainable management practice advice to apple and pear growers developed from PIPS3.
- Growers have adopted recommendations and tools of the PIPS3 Program and are able to demonstrate benefit through yield/quality, profitability and resilience gains.

## Short-term Outcomes (project duration)

- Developed recommendations for cultural practices that support orchard biodiversity for low input pest & disease management.
- Effects of orchard design on yield & fruit quality of new pear cultivars measured and subsequent management practice options devised.
- Commercial sensing technologies calibrated/ validated for industry to measure in situ fruit & tree parameters and establish orchard-specific crop load relationships.
- Chemical signals identified for apples that determine impact of high crop load on floral initiation & differentiation, and fruit size in the subsequent season.
- Improved efficacy of biological control of codling moth, LBAM, apple scab & root rot.
- Increased knowledge on the drivers of pear fruit colour development and degradation, and effectiveness of novel netting protection strategies.
- Relationship understood for apples between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation.
- Increased knowledge on sustainable orchard management practices & soil health, resilience, productivity/quality impact, incl. soil health indicators.
- Decision support tools developed, trialled & training of advisors/ grower conducted for improved decision-making & monitoring of orchard precision and sustainable management practice recommendation implementation.
- The PIPS Program has delivered as a high impact, collaborative and integrated research program.
- Stakeholders are effectively informed on research outcomes and the potential benefit of these for businesses profitability, industry sustainability, efficient resource management practices & local operating environments.

## Outputs

- Decision criteria for selecting native species mixes for biological control & soil health.
- Determination of physical, biological & chemical soil health indicators.
- Developed knowledge on soil health, pest & disease, & productivity (tree size & fruit number, size & colour) relationships.
- *Matrus ridens* genetic diversity, establishment & impact assessment monitoring tools.
- *Mastrus ridens* commercialisation plan
- Developed & trialled decision support tools – Pear irrigation scheduling, SINATA for apples irrigation scheduling & nutrient budgeting & Apple crop-load tool.

**Outputs of the PIPS3 Communication & Extension Plan**

- Peer reviewed science journal articles, conference papers and technical reports.
- Guides & technical fact sheets- skills training to support these in sensing technology, sustainable orchard practices & IPMD.
- Presentations at industry conferences/ events on research progress and findings.
- Case studies & videos: informational, peer exchange & on technology/decision support tool use.

**Program-wide**

- Websites established/ updated (APAL, ExtensionAus) & content maintained
- Broad media press releases
- *AFG* magazine & *Industry Juice* publications.
- Social media campaigns (APAL, AgVic, TIA)
- PIPS3 Future Orchards® event collaboration/ contributions
- PIPS3 specific field events and industry forums

## Activities

**AP19002 Project**

- Conduct conservation biocontrol field, glasshouse & laboratory experiments (*Mastrus ridens* & *Trichogramma spp.*).
- Cover crop suitability assessment.
- Conduct *Mastrus ridens* release, detection, efficacy & impact studies. Includes development & testing of pheromone detection methods.
- Conduct soil health, pest/disease, & productivity relationship field sampling & analysis.

**AP19003 Project**

Collect, analyse & report field experiment data:

- Rootstock, row orientation, fruit position & light exposure effects on fruit quality and floral initiation (Sundial orchard Tatura).
- Crop load effects on fruit quality & floral initiation (commercial orchard).
- Metabolic analysis of bud samples to identify chemical signals that influence floral initiation.
- Field testing of sensors technologies
- Orchard specific crop load algorithm determination for crop load decision support tool.

**AP19005 Project**

Collect, analyse & report field experiment data:

- Continuation of planting system and rootstock experiments
- Crop regulation
- Functional yield relationships
- Sensing technology 'proof-of-concept' and calibration
- Decoupling heat and light
- Novel netting
- Undertake development of pear orchard irrigation scheduling tool (excel based)

**AP19006 Project**

Collect, analyse & report on sustainable floor management field experiment data across five growing regions:

- Inter-row treatments- native & general meadow cover-crops
- Tree-line treatments- legume mixes & mulches
- Physical, chemical & biological (microbial, carbon) indicators and parameters investigated.
- Develop data package and grower guide on recommended sustainable orchard managements.
- Undertake development of SINATA web app

**Program Level**

- Implement governance/ consultation process
- Six-monthly reporting on research/ activity progress
- Implement and monitor the PIPS3 Program Communications and Extension Plan, in collaboration with projects, PRG and industry stakeholders.
- Implement the PIPS3 Program M&E Plan to monitor, evaluate & undertake adaptive management processes, to continually improve, in collaboration with projects and PRG
- Coordinate mid-term and final evaluation processes & reporting.

## Start-up Outputs

- Project Work plans/ preschedules, methodology & protocols developed &
- Literature reviews completed/ baseline data determined.
- Field and glasshouse experiments established
- Established communication platform with industry communications & extension (Website)
- Prepared mechanisms for collaboration & integrated planning - project leadership group, PRGs & program plans.

## Start-up Activities

- ADMINISTRATION/ GOVERNANCE PROCESSES
- LITERATURE REVIEWS/ BASELINE DATA COLLECTION
- PARTNERSHIP DEVELOPMENT
- PROJECT/ PROGRAM PLANNING CONSULTATIONS
- INVESTMENT/ SUPPORT SECURED
- CONTRACTING CONDUCTED

# 3 M&E PLAN SCOPE

The M&E Plan has been prepared to address both internal and external monitoring, evaluation, reporting and improvement requirements. Primary stakeholder groups are those who will use the results of the M&E Plan to manage and make decisions about the PIPS3 Program. The secondary stakeholder groups are those that may be interested to know certain results of the PIPS3 Program's M&E processes, but do not have a management or decision-making role in relation to the program.

## 3.1 STAKEHOLDER AUDIENCE GROUPS

| STAKEHOLDER GROUPS | ROLE IN ACHIEVING OUTCOMES | WHAT THEY NEED TO KNOW |
|---|---|---|
| PRIMARY AUDIENCE | | |
| **HORT INNOVATION** | Program manager to ensure compliance with contract agreements and alignment with industry investment strategies and Hort Innovation processes. | • Consultative program/ project planning conducted and review/ approval processes undertaken (project workplans/ preschedules, risk management registers, Communications & Extension Plan, M&E Plan).<br>• Program/ project reference groups established and ongoing input/feedback & actions from these industry consultations.<br>• Reviewed project communications from Program Coordinator for approval.<br>• Timely and quality six-monthly reports received on research progress.<br>• Performance/ impact of integrated research, communication and extension activities.<br>• Performance/ impact of project level levy payer communications and extension activities.<br>• Early detection of project risks and identification of adaptive management solutions to be applied. |
| **INDEPENDENT PROGRAM COORDINATOR** | Coordination and implementation of program plans and facilitation of research integration and stakeholder collaboration opportunities. | • Schedule of key project research, communications and extension activities.<br>• Target audiences and avenues for communications and extension.<br>• Project progress and findings for appropriate, timely and accurate communications through C&E Plan identified methods.<br>• Draft project communications for review & seek approvals from Hort Innovation.<br>• Analytics and evaluation results from levy payer/ stakeholder communications and extension activities to report to Hort Innovation on extent of engagement and impact and identify/ implement opportunities for improvement. |

| | | |
|---|---|---|
| | | • Early detection of project risks and identification of adaptive management solutions to be applied. |
| **AGRICULTURE VICTORIA RESEARCH LEADERS & TEAMS** | Design, implementation and review of research activities in accordance with the Hort Innovation Research Agreement and project preschedule. Have farm use agreement in place with grower partners. Conduct planned activities to implement the risk management register, PIPS3 C&E Plan and PIPS3 M&E Plan. Timely project progress reporting to Hort Innovation and other supporters. | • Analysis of experimental site data collection activities.<br>• Project progress in accordance with preschedules/ workplans and reportable milestone and final outputs/ outcomes.<br>• Data findings from PIPS3 and sub-contractor collaborators<br>• Early detection of project risks and identification of adaptive management solutions to be applied.<br>• Evaluation outcomes of extension activities to assess performance, extent of impact and seek feedback on ways to improve.<br>• Analytics on communication activities to evaluate level of engagement with target audiences and potential impact.<br>• Preparation of peer reviewed manuscripts for publication in scientific journals. |
| **TASMANIAN INSTITUTE OF AGRICULTURE RESEARCH LEADERS & TEAM** | Design, implementation and review of research activities in accordance with the Hort Innovation Research Agreement and project workplan. Conduct planned activities to implement the risk management register, PIPS3 C&E PLAN and PIPS3 M&E Plan. Timely project progress reporting to Hort Innovation and other supporters. | • Analysis of experimental site data collection activities.<br>• Project progress in accordance with preschedules/ workplans and reportable milestone and final outputs/ outcomes.<br>• Data findings from PIPS3 and sub-contractor collaborators<br>• Early detection of project risks and identification of adaptive management solutions to be applied.<br>• Evaluation outcomes of extension activities to assess performance, extent of impact and seek feedback on ways to improve.<br>• Analytics on communication activities to evaluate level of engagement with target audiences and potential impact. |
| **PROGRAM REFERENCE GROUP** | Strategic program level planning, input, feedback and advice pertaining to Hort Innovation investment in PIPS3 Program integrated research, communication, engagement and reporting activities. The PRG ensures industry need and sentiment is reflected, activities are well targeted and will result in high level industry impact. | • Progress of the research to provide timely grower/ extension advisor input into activities.<br>• Evaluation outcomes of extension and communication activities to assess performance, extent of impact and provide input on ways to improve.<br>• Forward plans for research, communications and extension activities to identify potential risks and provide grower/ extension advisor insight into potential adaptive management solutions. |
| SECONDARY AUDIENCE | | |
| **RESEARCH TEAM SUB-CONTRACTORS** | Assist core project team in specific research component or locality relevant project research, communication and extension activities in accordance with the Hort Innovation Research Agreement and project workplan. | • Project preschedules/ workplans for appropriate resourcing and scheduling.<br>• Collaboration opportunities with broader research activities as relevant to sub-contracted components.<br>• Data findings of research activities as relevant sub-contracted components. |

| | | |
|---|---|---|
| | | • Evaluation outcomes of extension activities to assess performance, extent of impact and seek feedback on ways to improve. |
| **PROJECT REFERENCE GROUPS** | Project level grower/advisor perspective input feedback and advice pertaining to experimental design and treatments, extension and communications. The PRG ensures regional industry need and sentiment is reflected, activities are well targeted and will result in high level industry impact. | • Progress of the research to provide timely grower/ advisor input into activities.<br>• Evaluation outcomes of extension and communication activities to assess performance, extent of impact and provide input on ways to improve.<br>• Forward plans for research, communications and extension activities to identify potential risks and provide grower/ advisor insight into potential adaptive management solutions. |
| **HOST GROWERS OF FIELD EXPERIMENTS** | Provide access and maintain the integrity of research sites. Provide grower perspective on usual practice versus treatment experiments as well as insight into how research needs to be communicated and extended to peers. | • Research project workplans and schedules.<br>• Risks and management requirements to maintain integrity of the research sites.<br>• Progressive research finding to provide timely grower, formal and informal, input and feedback |
| **APPLE & PEAR ADVISORS AND GROWERS** | Input, feedback and practical advice pertaining to experimental design and treatments, extension and communications via extension events. Openness to consider and build knowledge in new orchard management and technology adoption options. | • Timely updates on the findings of the research and how these may address their needs and impact upon orchard management practices/ advice provided.<br>• Develop new knowledge and skills to understand orchard/ business benefit and implement recommendations/ guidelines.<br>• Develop confidence in new management options/ technologies using industry standard data metrics to demonstrate sustainability, yield, production and profitability outcomes. |
| **COMMUNICATION COLLABORATORS**<br>**(Further details outlined in the PIPS3 Program C&E Plan)** | Assistance in engaging key audiences in the research activities and extending prepared program materials, resources, tools and videos to update and inform through industry or organisational avenues. Provider of analytics on extent of reach and engagement via these avenues. | • Planned PIPS3 Program communication activities via the PIPS3 C&E Plan.<br>• Number of communication materials, reach and engagement (publication, social media and web-based platform analytics)<br>• Influence of these activities on increased knowledge, understanding and skill development.<br>• Influence of these activities on intent to adopt or newly adopted practices. |
| **EXTENSION COLLABORATORS**<br>**(Further details outlined in the PIPS3 Program C&E Plan)** | Assistance in engaging key audiences in the research activities and extending prepared program materials, resources, tools and videos to update and inform through industry or organisational avenues, especially training and field walk events. Provider of analytics on extent of participation, reach and engagement associated with PIPS3 Program collaborations, and evaluation of metrics associated with increased knowledge, understanding and intent to adopt. | • Planned PIPS3 Program extension activities or intent to collaborate with industry events (e.g. FO) via the PIPS3 C&E PLAN.<br>• Number of activities conducted, participation, reach and engagement.<br>• Influence of these activities on increased knowledge, understanding and skill development.<br>• Influence of these activities on intent to adopt or newly adopted practices. |

## 3.2 KEY EVALUATION QUESTIONS

The key evaluation questions of the PIPS3 Program have been prepared in consultation with each of the partner projects. Where KEQ are relevant across the program, or have a whole of industry focus, these are presented as whole of program questions. It is anticipated that as the project progresses towards the mid-term point, the KEQ may be further defined in consultation with the PRG and the evaluation consultant.

| KEY EVALUATION QUESTIONS | SPECIFIC PROGRAM/ PROJECT QUESTIONS |
|---|---|
| | **EFFECTIVENESS** |
| **To what extent has the PIPS3 Program addressed the objectives, research agreement achievement criteria and identified outcomes/ outputs?** | WHOLE OF PROGRAM<br>• To what extent has the PIPS3 Program advanced the apple and pear industry's capabilities to achieve the overall objectives?<br>• To what extent did the five projects of the PIPS3 Program meet research agreement achievement criteria and milestones according to the expectations and timeframes of Hort Innovation?<br>AP19007<br>• To what extent has the independent program coordinator role delivered improved integration of R&D through greater collaboration across the projects of the PIPS3 Program?<br>• To what extent has the independent program coordinator role delivered improved communication of R&D outcomes and outputs to growers by ensuring collaboration across the four projects, industry extension and communication providers, leading industry growers, service providers and regions?<br>AP19002<br>• To what extent has the project improved knowledge and understanding of the role of *Mastrus ridens* for sustainable management of codling moth in Australia?<br>• To what extent has the project demonstrated benefits to orchard pest management, soil health and tree health through new approaches to cultural and biological practices?<br>AP19003<br>• To what extent has the project improved orchard design and crop load management in a variable climate by providing knowledge and tools to consistently deliver premium fruit that meets consumer expectations in domestic and export markets?<br>• To what extent has the project developed, calibrated, validated and evaluated sensor technology to measure in flower number, tree size, fruit number, fruit size and fruit colour?<br>AP19005<br>• To what extent has the project improved knowledge and understanding of orchard design and management to grow new pear cultivars to market specifications within the context of a changing and variable climate?<br>• To what extent has the sub-project advanced sensor technology to enable/improve measurement of orchard parameters? |

| | |
|---|---|
| | AP19006<br>• To what extent did the project increase grower and front-line advisor knowledge and understanding of sustainable orchard management practices?<br>• Did the project produce sustainable orchard management guidelines and the SINATA Irrigation & Nutrition web app? |
| **RELEVANCE** | |
| **How relevant were the research outcomes/ outputs to the needs of apple and pear growers, advisors and industry stakeholders?** | WHOLE OF PROGRAM<br>• What outcomes/ outputs of the PIPS3 Program are most valued by growers and front-line advisors?<br>• How, and to what extent, will these influence future business and management decisions?<br>AP19002<br>• To what extent has the project met the needs of growers and front-line advisors in providing step-change information on the multiple benefits of inter-row conservation biocontrol plantings?<br>AP19003<br>• Do identified stakeholders believe the project investment was worthwhile and would they invest in the project team and/or subject matter in the future?<br>AP19005<br>• To what extent has the project met the needs of growers and front-line advisors to provide information on design and management of pear orchards and use of sensor technology?<br>AP19006<br>• Is there evidence that outcomes/ outputs of the project have inspired growers to implement sustainable orchard management practices?<br>• To what extent has the project met the needs of growers and front-line advisors to provide information and guidance on soil health management strategies and the impact of these upon soil health, production and profitability? |
| **PROCESS APPROPRIATENESS** | |
| **How well have intended audiences been engaged in the project?***<br><br>***The PIPS3 C&E Plan, Section 9.1 outlines the Performance Indicators for assessment of this KEQ.** | WHOLE OF PROGRAM<br>• To what extent did the PIPS3 Communications and Extension Plan succeed in engaging growers, advisors and service providers in the research?<br>• What were the most successful mechanisms for engaging target audiences in the activities of the PIPS3 Program?<br>• To what extent did partners of the PIPS3 Program engage in collaborative activities with relevant extension providers?<br>• To what extent did the Program/Project Reference Groups provide opportunity for growers and front-line advisor input and feedback into activities?<br>AP19002 |

| | |
|---|---|
| | • To what extent did the project engage growers and front-line advisors through the IPDM Community of Practice and ExtensionAus apple and pear website? |
| **To what extent was the PIPS3 Program Communications and Extension Plan appropriate and had an impact upon the target audience? ***<br><br>***The PIPS3 C&E Plan, Section 9.1 outlines the Performance Indicators for assessment of this KEQ.** | WHOLE OF PROGRAM<br>• To what extent has implementation of the Communications and Extension Plan resulted in increased knowledge, understanding and capability of growers and front-line advisors?<br>• To what extent is there evidence that growers and front-line advisors have adopted or intend to adopt management practice outcomes of the PIPS3 Program?<br>• To what extent did extension activities meet the expectations of the intended audience/ audiences and is there evidence that PIPS3 Program applied appropriate adaptive management in response to event evaluation results?<br>AP19007<br>• To what extent has the independent program coordinator successfully coordinated/ delivered upon the PIPS3 Program Communications and Extension Plan?<br>AP19002<br>• To what extent has the project resulted in greater confidence, intention to adopt, or adoption of IPDM cultural and biological practices for sustainable pest management?<br>AP19003<br>• To what extent has the project resulted in greater confidence, intention to adopt, or adoption of new orchard design and the uptake of sensor technologies?<br>AP19005<br>• To what extent has the project resulted in greater confidence, intention to adopt, or adoption of new orchard design and management, and improve utilisation of sensor technologies?<br>AP19006<br>• To what extent has the project resulted in greater confidence, intention to adopt, or adoption of practices in sustainable orchard management practices? |
| **EFFICIENCY** | |
| **What efforts did the PIPS3 Program partners make to improve efficiency?** | WHOLE OF PROGRAM<br>• Did projects of the PIPS3 Program address STOP/GO review recommendations to avoid project creep and budgetary overspend?<br>AP19007<br>• To what extent did the governance, planning and collaboration activities implemented by the independent program coordinator improve efficiency across the program? If so, is there evidence that increased efficiency achieved additional value and impact?<br>AP19002/ AP19006 |

| | |
|---|---|
| | • To what extent did collaboration across the PIPS3 Program improve efficiency of pest, natural enemy and soil/tree health measurements?<br>AP19003/ AP19005<br>• Did the project/s efficiently manage shared resources and utilise skills and knowledge within other PIPS3 Program projects? |
| **LEGACY** | |
| **Are there signs that the PIPS3 Program will influence apple and pear growers in the future?** | • Is there evidence that outcomes and outputs of the PIPS3 Program will continue to be adopted by growers and front-line advisors?<br>• To what extent do stakeholders believe that outcomes/ outputs of the PIPS3 Program are likely to become "usual grower practice" within the next ten years? |

## 4 PERFORMANCE EXPECTATIONS- PROGRAM MONITORING PLAN

The PIPS3 Program Monitoring Plan is a collated program level guide to what needs to be monitored, the Key Performance Indictors (KPI), and the data collection methods are to be used across all projects. It is supported by the detailed Monitoring Plans of each individual projects in Appendix 1. It is important to highlight that with regards to communications and extension, the Communications and Monitoring Plan of the PIPS3 Program C&E Plan, Section 9.1 is the primary source for KPI of both a qualitative and quantitative nature. The two plans complement one another and must be jointly considered in all monitoring, evaluation and reporting.

| LOGIC LEVEL | WHAT WILL BE MONITORED | KEY PERFORMANCE INDICATORS | DATA COLLECTION | TIMING |
|---|---|---|---|---|
| **Start-up Activities & Outputs**<br><br>*What foundational structures, plans and processes will be established to guide and support the PIPS3 Program activities and outputs over three years?* | **Execution** of research agreements & collaborator contracting. | Contracting process completed by all parties. | • Milestone 102 reporting demonstrates all collaborators have been contracted in accordance with Research Agreements. | Milestone 102 |
| | **Establishment** of governance, consultation & collaboration.<br><br>(Program & Project Reference Groups, Project Leadership Group, Project Team Meetings) | Terms of Reference (ToR) **prepared** and six-monthly meetings **conducted**<br><br>**Effectiveness** of PRGs as primary consultative platform for stakeholder input and feedback.<br><br>**Effectiveness** of the Project Leadership Group and Project Team Meetings in increasing collaboration and monitoring research progress to achieve research agreement milestones. | • Membership & ToR reviewed & approved by the Hort Innovation Program Manager.<br>• Meeting attendance<br>• Meeting agendas & minutes<br>• Actions implemented (documented in following meeting minutes).<br>• Mid-term and final evaluation key stakeholder questions. | PRGs 6-monthly (AP19002 & AP19006)<br><br>PRG Annually (AP19005)<br><br>AP19003 to form relationship with AP19006 PRG.<br><br>PLGs 4 annually<br><br>Team Meetings approx. monthly |
| | **Prepared and approved** risk registers | **Risk registered submitted** and approved in Milestone 102.<br><br>**Evidence** that risk registers are reviewed and continuous improvement actions are undertaken. | • Risk registers submitted Milestone 102.<br>• Six-monthly within research team meeting minutes.<br>• Annually within PLG & PRG meeting minutes. | At least 6-monthly |
| | **Adoption and execution** of the PIPS3 Communications & Extension Plan (PIPS C&E Plan). | **PIPS3 C&E Plan prepared** in consultation with project, communication and extension stakeholders in Milestone 102.<br><br>**Effectiveness** of the PIPS3 C&E Plan as the primary tool for executing program communications and extension activities | • PIPS3 C&E Plan prepared by Program Coordinator & review/ approval processes undertaken in Milestone 102 period.<br>• PIPS3 M&E Table (Section 9.1) outlines specific quantitative and qualitative data collection to be undertaken. | 6-monthly (milestone reports), mid-term & final project evaluation metrics. |

| | | | | |
|---|---|---|---|---|
| | | in accordance with Hort Innovation requirements and Research Agreements of all partners. | • Mid-term and final evaluation key stakeholder questions to evaluate impact. | |
| | **Adoption and execution** of the PIPS3 M&E Plan. | **Effectiveness** of the PIPS3 M&E Plan in assisting Hort Innovation and program partners to monitor Research Agreement obligations.<br>**Effectiveness** of the PIPS3 M&E Plan as a tool to assess progress towards final program outputs and outcomes throughout implementation. | • M&E Plan prepared by Program Coordinator & review/ approval processes undertaken in Milestone 102 period.<br>• Six-monthly reporting against the M&E Plan by the Program Coordinator.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | 6-monthly (milestone reports), mid-term & final project evaluation metrics. |
| | **Prepared** project preschedules/ workplans/ Gantt charts finalised and exchanged. | **Project plans prepared** & exchanged.<br>**Extent** to which exchange of planning documents, together with providing progress updates as a part of governance/ consultation meeting structures, leads to **effective** collaboration and implementation. | • Documentation prepared and exchanged within Milestone 102.<br>• Updates and discussion on these documented in PLG & Team meeting minutes.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | PLGs 4 annually |
| | **Prepared and agreed** experiment protocols | **Evidence** that experiment protocols have been determined and agreed where collaboration between projects is required or regional demonstration sites are established. | • Documentation prepared, agreed and exchanged within Milestone 102.<br>• Regional demonstration sites have been established with standardised trial design and protocols implemented (AP19006). | Milestone 102- 31st December 2020 |
| | **Established** experimental sites | **Evidence** that experimental sites have been established in accordance with Research Agreements on both research and commercial properties. | • Research site locations specified- address, GPS Coordinates & collaborating farmer.<br>• Experiment and treatment designs determined and documented.<br>• AP19002- Tatura SmartFarm/ Tas (AP19006) Bio Control Plots & *Mastrus ridens* release sites<br>• AP19003- Tatura Sundial Orchard & 1 commercial orchard.<br>• AP19005- 1 Tatura experimental pear site & 1 commercial property | Milestone 102- 31st December 2020<br><br>Milestone 104- 31st October 2021 |

| | | | | |
|---|---|---|---|---|
| | | | • AP19006- In-depth Tasmanian trial sites (2) & regional demonstration sites (4) | |
| **Project Activities & Outputs**<br><br>*What will the PIPS3 Program deliver and produce?* | Literature review | Literature review completed by AP19006. | • Internal peer review undertaken to finalise report.<br>• "Healthy Soils" parameters determined. | Milestone 106- 15th December 2021. |
| | Field & glasshouse experiments/ technology validation & calibration. | **Extent to** which experiments are implemented in accordance with Research Agreement milestones.<br>**Evidence** that the data collection is scientifically robust and can be used for baseline and comparison analysis purposes.<br>**Extent** to which the research activities are valued and relevant to industry stakeholders and are generating increased knowledge and understanding. | • Site based data recording systems/ data capture software implemented.<br>• Experiment data outputs & subsequent analysis outcomes progressively reported in 6-monthly Milestone Reports.<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | 6-monthly (milestone reports), mid-term & final project evaluation metrics. |
| | Laboratory based research, testing & analysis | **Extent to** which experiments are implemented in accordance with Research Agreement milestones.<br>**Extent to** which testing and analysis activities inform field-based activities and support determination of decision support tool algorithms and soil health, IPDM, production, productivity and quality parameters/ scoring.<br>**Evidence** that data sampling, testing and analysis results are scientifically robust and can be used for accurate baseline and comparison analysis purposes. | • Data recording systems/ data capture software implemented.<br>• Experiment data outputs & subsequent analysis outcomes progressively reported in 6-monthly Milestone Reports.<br>• Pheromone traps developed (AP19002)<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published. | 6-monthly (milestone reports), mid-term & final project evaluation metrics. |
| | Technical Reports | **Extent** to which the research has contributed to "adoption ready" new knowledge in orchard design and sustainable management practices. | • Technical reports delivered.<br>• Refer to Section 9.1 of the PIPS3 C&E Plan. | Relevant milestone & final project reporting on technical reports. |
| | Grower Fact Sheets & Guidelines | **Extent** to which resources deliver increased appreciation for research outputs, grower confidence to adopt and knowledge/skills to implement outcomes. | • Case studies documenting grower experiences in using developed resources and production/ quality outcomes (AP19007). | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) |

| | | | | |
|---|---|---|---|---|
| | | | • Refer to Section 9.1 of the PIPS3 C&E Plan.<br>• Final evaluation key stakeholder questions to evaluate impact. | Relevant milestone & final reporting on resource development.<br>Mid-term & final project evaluation. |
| | Decision Support Tools | **Extent** to which growers have confidence to use and implement recommendations of developed decision support tools.<br>(AP19006 SINATA Web App, AP19003 Crop-load tool, AP19005 Irrigation planning & scheduling tool) | • Workshops conducted and evaluated to introduce and develop grower/ advisor confidence/ skills in use.<br>• Case studies documenting use of the tools and subsequent decisions made/ advice provided by growers/ advisors.<br>• Final evaluation key stakeholder questions to evaluate impact. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1)<br>Relevant milestone & final reporting on workshops.<br>Final project evaluation. |
| | Science Journal Papers | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1)<br>Final project reporting on manuscripts & publications. |
| | Workshops/webinars/ field days/ field walks | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1)<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | Website content (including videos)/ published articles/ social media presence | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1)<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | Industry conferences, forums and collaboration opportunities | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) |

| | | | | |
|---|---|---|---|---|
| | | | | 6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | Science conferences | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1)<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| **Short-term outcomes (project duration)**<br><br>*What will result within three years from PIPS3 Program research, communication and engagement activities?* | **Effective** coordination, collaboration, communications and extension. | **Extent** to which activities of the Program Coordinator role (AP19007) has increased collaboration between research teams, project collaborators and industry stakeholders.<br>PIPS3 Program has **effectively communicated and extended** research outputs/ outcomes in sustainable orchard management practices, biocontrol IPDM practices, orchard design and sensing technologies within the context of business resilience, productivity and profitability outcomes.<br>**Extent** to which implementation of the PIPS3 C&E Plan has resulted in greater knowledge/ understanding of the impact of certain treatments/ managements upon orchard sustainability, production and fruit quality.<br>**Extent** to which implementation of the PIPS3 C&E Plan has resulted in greater confidence to adopt research recommendations/ guidelines/ tools. | • Refer to Section 9.1 of the PIPS3 C&E Plan.<br>• Results of publication analytics across electronic and print platforms (number, reach, engagement).<br>• Attendance numbers at events<br>• Event evaluation results (Appendix 2),<br>• Effectiveness of PIPS3 Program speakers at third party events (i.e. Future Orchards)<br>• Final evaluation key stakeholder questions to evaluate impact. | Milestone reports of AP19007<br>Mid-term & final project evaluation. |
| | **Improved** efficacy of biological control of major pests and diseases. | **Extent** to which growers are aware of the benefits of IPDM practices. | • Research outcomes reported in Milestone Reports. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per |

| | | | | |
|---|---|---|---|---|
| | | **Extent** to which researchers/growers/ advisors understand the requirements for viable long-term *Mastrus ridens* and *Trichogramma sp.* populations. | • *Mastrus ridens* commercialisation plan developed.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate awareness and understanding. | event conducted where AP19002 is involved in delivery.<br>Final project evaluation. |
| | **Increased** knowledge and understanding of the critical factors within conservation biocontrol treatments, and the sustainable orchard management practices, that result in improved soil health, plant health, resilience, orchard productivity and fruit quality. | **Extent** to which researchers/growers/advisors have increased their awareness and understanding on how inter-row plantings and tree-line ameliorants (the sustainable practices) impact soil health, pest control, orchard sustainability and production outcomes.<br>**Extent** to which growers aspire/ intend to adopt sustainable management practices. | • Combined research outcomes reported in Milestone Reports where multiple projects are contributing to this understanding.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate increased knowledge and understanding, and intent to adopt demonstrated practices. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19002/ AP19006 are involved in delivery.<br>Final project evaluation. |
| | **Evidence** of the determination of relationship between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation. | **Extent** to which the apple orchard systems research experiments are completed and report upon the determination of relationship factors.<br>**Extent** to which researchers/growers/advisors have increased their knowledge and understanding on the relationship between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation in apple orchards. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19003 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that chemical signals have been identified that determine the impact of high crop load on floral initiation and differentiation, and fruit size in the subsequent season. | **Extent** to which the apple orchard systems research experiments are completed and report upon chemical signals that impact upon key apple orchard production parameters.<br>**Extent** to which researchers/growers/advisors have increased their knowledge and understanding on chemical signals that determine the impact of high crop load | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19003 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |

| | | | | |
|---|---|---|---|---|
| | | on floral initiation and differentiation, and fruit size in the subsequent season. | | |
| | **Evidence** that commercial mobile sensing technology is available to industry to measure in situ fruit and tree parameters and establish orchard-specific crop load relationships. | **Extent** to which apple orchard systems remote sensing technology calibration and validation work has been completed and reported.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the benefits of using remote sensing technology and have built greater confidence to adopt tools. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19003 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that the effects of orchard design on yield and fruit quality of new pear cultivars have been measured and management implications communicated to growers. | **Extent** to which the pear orchard systems research experiments are completed and report upon the effects of orchard design upon key pear orchard production parameters.<br>**Extent** to which growers/advisors have increased their knowledge and understanding of the impact of orchard design on yield and fruit quality of new pear cultivars and the associated management implications. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt associated practice managements. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19005 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that proof-of-concept and/or calibration of sensing technology research has potential to provide data to support management decisions in pear orchards. | **Extent** to which the pear orchard systems remote sensing proof of concept / validation work has been completed and reported.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the potential benefits of using remote sensing technology and have built greater confidence to adopt tools. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed sensor guidelines and videos completed.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19005 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that pear orchard systems research has increased knowledge on the drivers of fruit | **Extent** to which the pear orchard systems experiments are completed and report upon the key drivers of fruit colour | • Milestone & final reporting<br>• Peer reviewed science papers published. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per |

| | | | | |
|---|---|---|---|---|
| | colour development and degradation, and the effectiveness of novel netting protection strategies have been determined. | development/degradation and the assessment of novel netting protection strategies.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the drivers of fruit colour development and protection mechanisms. | • Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | event conducted where AP19005 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that soil health indicators for apple and pear orchards have been established and extended with consideration for regional differences. | **Extent** to which in-depth and regional experiments are completed and report upon the determination of soil health indicators.<br>**Extent** to which growers and advisors are aware of the determined physical, biological and chemical soil health indicators for apple and pear orchards of their region. | • Milestone & final reporting<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19006 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| | **Evidence** that decision support tools (web app or excel based) have been extended and skills have been developed to aid adoption. | **Extent** to which growers and advisors have increased their knowledge and skills in using the developed decision support tools to manage irrigation, nutrients and crop-loads in the orchard. | • Combined research outcomes reported in Milestone Reports where multiple projects are contributing to this understanding.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to increased knowledge and capability to adopt decisions support tools. | Progressive updating of project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted where AP19003/AP19005/AP19006 is involved in delivery.<br>6-monthly (milestone reports).<br>Mid-term & final project evaluation |
| **Intermediate Outcomes**<br>**(post project to ten years)** | Understanding of interactions between cultural, biological and chemical IPDM practices has led to practice change. | **Extent** of adoption of conservation biocontrol practices.<br>**Measured** industry improvements in the suppression of codling moth and LBAM in orchards can be attributed to adopted conservation biocontrol practices. | • *Mastrus ridens* commercially available.<br>• Industry annual survey includes IPDM practices.<br>• CM, LBAM, *Mastrus* and *Trichogramma* surveys. | Annual Industry Survey<br>Annual website analytics on access to relevant resources. |
| | Orchard design to maximise fruit yield and quality and minimise | **Extent** of adoption by growers of PIPS3 Program recommendations/ guidelines | • Industry annual survey includes how growers are using orchard design, technologies and practices to manage the | Annual Industry Survey<br>Annual website analytics on access to relevant resources. |

| | | | | |
|---|---|---|---|---|
| | the impact of extreme heat events. | on training and pruning systems to better manage light environment.<br>**Extent** to which technology to measure light environment demonstrated/ developed by the PIPS3 Program is commercially available from industry service providers | light environment and the accessibility of advice/ technology from local service providers. | |
| | Improved crop load management by providing knowledge and tools to deliver premium fruit that meets consumer expectations. | **Extent** to which growers are using sensors to determine thinning requirements.<br>**Evidence** that further research is investigating how to apply metabolites to stimulate floral initiation. | • Industry annual survey includes how growers are determining thinning requirements.<br>• Review of further investment in apple orchard thinning technology projects. | Annual Industry Survey<br>Annual website analytics on access to relevant resources. |
| | Sensing technology used in apple orchards to assist growers to produce fruit to market specifications. | **Extent** to which growers are using sensors to determine management intervention to increase fruit colour and manipulate fruit size. | • Industry annual survey includes technology adoption by growers. | Annual Industry Survey<br>Annual website analytics on access to relevant resources. |
| | Decisions to rework pear orchards are informed by knowledge of yield and fruit quality potential of new cultivars and whole systems implications. | **Extent** to which **g**rowers are using different rootstocks, new blush cultivars, higher tree density and modern training systems.<br>**Extent** to which growers demonstrate intent to adopt next generation rootstocks and cultivars. | • Industry annual survey includes components of the orchard system that have been reworked/ intend to be reworked associated with recommendations/ guidelines of the PIPS3 Program. | Annual Industry Survey<br>Annual website analytics on access to relevant resources. |
| | Use of sensing technology in pear orchards to assist growers to grow fruit to market specifications. | **Evidence** that further research is/ has furthered capability (e.g. sensing fruit quality) for full adoption readiness.<br>**Extent** to which growers are using sensors to provide flower and fruit load data to assist decision making.<br>**Extent** to which growers that have adopted sensor technology have improved the percentage of fruit grown to market specification. | • Industry annual survey includes technology adoption by growers and impact upon percentage of fruit grown to market specification.<br>• Review of further investment in pear orchard sensing technologies. | Annual Industry Survey |
| | Better crop load management in pears to avoid biennial bearing and maximise fruit quality. | **Extent** to which growers have adopted recommended fruit thinning techniques | • Industry annual survey includes thinning techniques used by pear growers and | Annual Industry Survey |

| | | | | |
|---|---|---|---|---|
| | | of the PIPS3 Program that consistently maximise fruit quality and yield. | impact upon yield and percentage of fruit grown to market specification. | |
| | Orchardists implementing sustainable orchard management practices | **Extent** of industry adoption of sustainable management practices recommended by the PIPS3 Program.<br><br>**Measured** industry-wide soil health improvements evident through use of industry soil health indicators in industry surveys.<br><br>**Extent** to which growers that have adopted sustainable management practices can demonstrate improved soil health, plant health, orchard productivity, fruit quality and increased resilience to climate variables. | • Industry annual survey includes what sustainable management practices have been adopted and measured improvements in productivity and fruit quality.<br>• Industry soil health check campaign conducted using the determined soil health indicators. | Annual Industry Survey<br><br>Industry Soil Health Check Campaign 5- & 10-years post PIPS3 Program completion. |

# 5 EVALUATION

A summary of the minimum data requirements for both the mid-term and final evaluation demonstrates that both the KEQ and KPI can be assessed through a limited number of information sources.
Mid-term evaluation completed: December 31st, 2021 & Final evaluation completed: 30th May 2023.

| DATA COLLACTION CATEGORY | QUANTITATIVE (MONTHLY REPORTING + ANALYSIS WITHIN MID-TERM & FINAL EVALUATIONS) | QUALITATIVE (MID-TERM & FINAL SURVEY) |
|---|---|---|
| **Communications** | ☐ Number of materials/ publications produced<br>☐ Dissemination/ publication avenues.<br>☐ Reach & engagement analytics<br>☐ Metrics collected in the project *PIPS3 Program M&E Portal* (refer Section 5.1) per communication activity undertaken. | ☐ Materials/ publications/ platforms are valued as a reputable source of information by stakeholders.<br>☐ Materials/ publications/ platforms have improved knowledge, understanding and skills.<br>☐ Materials/ publications/ platforms have resulted in adoption/ intention to adopt recommended practices and/ or technologies. |
| **Extension** | ☐ Industry/grower/ service provider extension opportunities.<br>☐ Registered participation numbers<br>☐ PIPS3 Program event evaluation results or collaborating organisation evaluation results.<br>☐ Metrics collected in the project *PIPS3 Program M&E Portal* (refer Section 5.1) per extension event conducted/ co-operatively delivered. | ☐ Improved knowledge & understanding on outputs & outcomes of the research and acquired skills to aid in implementation.<br>☐ Growers/ service providers believe research has responded to input/feedback leading to confidence in outputs/outcomes.<br>☐ Adoption/ intention to adopt recommended practices and/ or technologies. |
| **Collaboration/ Consultation** | ☐ Collaborations conducted through governance and industry/ program forums.<br>☐ Agendas/programs and resultant meeting minutes/ forum proceedings prepared.<br>☐ Team meeting agendas/actions/ adaptive management documented.<br>☐ Metrics collected in the project *PIPS3 Program M&E Portal* (refer Section 5.1) per event conducted. | ☐ Evidence of exchange, input & resource efficiency outcomes.<br>☐ Valued as vehicle for input/feedback on research by industry/ collaborator members.<br>☐ Research team members can identify increased knowledge and understanding benefits of networking and exchange opportunities. |
| **Research** | ☐ Six-monthly reporting upon milestone achievement criteria.<br>☐ Final Reports<br>☐ Peer reviewed science journal publications, fact sheets & technical reports.<br>☐ Tested (validated & trilled) decision support tools available for use. | ☐ Trial site activities are understood, supported and valued by industry/growers/ service providers. |

## 5.1 PIPS3 PROGRAM M&E DATA-BASE AND PORTAL

The *PIPS3 Program M&E Portal* is designed to be centrally located, cloud-based file platform for the management and collection of data relating to communication, extension and collaboration activities, as well the publication of project materials. It will assist the Program Coordinator to generate six-monthly project and program level reports for all partners. These reports will contain quantitative graphs and tables for Project Leaders to provide as supporting appendices of Milestone Reports and for reporting to their own organisations and project collaborators.

Each PIPS3 Program project has access to their project folder only. The folder is comprised of a motherhood excel database named "AP1900*X* PIPS3 Program M&E Data-base" and individual folders for each activity delivered.

There are two-steps in fulfilling the requirements of the *PIPS3 Program M&E Drop Portal* for each activity delivered by the project:

(1) Input the activity into the *PIPS3 Program M&E Database* by completing each column of the spreadsheet.
(2) Create a new folder for each activity to upload evidence of the activity using the following naming protocol: Year_Month_Date_Event (2020_Nov_11_NSW Field Day).

In accordance with Section 9 of the PIPS3 Program C&E Plan, the following should be uploaded:

Ex**tension activities**:

- ☐ Copy of all promotions
- ☐ Copy of all presentations & hand-outs
- ☐ Collated summary of the *PIPS3 Program Event Evaluation* (Appendix 2) results
- ☐ Copies of photographs/ recordings

**Communication activities:**

- ☐ Copy of the article/ post
- ☐ Analytics evidence (web/ social media platform generated) relating to reach and engagement

**Collaborations:**

- ☐ Agenda/ Program
- ☐ Minutes/ Notes demonstrating completed & planned actions
- ☐ For larger forums: Summary of the *PIPS3 Program Event Evaluation* (Appendix 2) results

It is expected that project materials (fact sheets, technical reports, published science journal articles) will be submitted with the relevant Milestone Report and therefore is not required to be uploaded to the *PIPS3 Program M&E Portal* but an entry must be made into the data-base to record this activity.

**Click the link to view the standard template for the** AP1900*X* PIPS3 Program M&E Data-base template, including examples of the data collation potential of this reporting mechanism.

PIPS3 Program M&E Data-base Template

# 6 REPORTING AND CONTINUOUS IMPROVEMENT

The following reporting mechanism are being used to report upon the progressive and final research, collaboration, communications and extension activities, outputs and outcomes.

The PIPS3 Program C&E Plan provides extensive detail on how reporting will be undertaken to the broader industry through planned communications and extension activities. The details below concentrate on formal Hort Innovation requirements and governance/consultation/collaboration structures.

| REPORT TYPE | TO WHOM & CONTINUOUS IMPROVEMENT ACTIVITIES | TIMING |
|---|---|---|
| **Milestone Reports** | **Hort Innovation/ Research Partner Organisation**<br>☐ Performance against milestone achievement criteria determined.<br>☐ Monitoring of project creep<br>☐ Project risk assessment | 6- monthly |
| **Final Reports** | **Hort Innovation/ Research Partner Organisation**<br>☐ Performance against project milestones determined.<br>☐ Key outputs and outcomes for industry identified for final communication to levy investors.<br>☐ Communication to industry in relation to delivery against industry strategic investment plan. | End of project |
| **Written, presentations and verbal updates** | **Project Leadership Group**<br>☐ Update on project activity progress to Hort Innovation R&D Program Manager.<br>☐ Collaborate on project/program activities, scheduling and resource sharing across the five projects.<br>☐ Seek technical input/ feedback from peers.<br>☐ Review of risk registers across the program<br>**Program/ Project Reference Groups**<br>☐ Present key results<br>☐ Discuss implications and communications of key results (could include anecdotal grower observations), gaps (e.g. knowledge, costs risks) for effective adoption of key results.<br>☐ Report upon the communications, communications, collaborations and project materials achieved for the six-month period (generated from the *PIPS3 Program M&E Drop-box*)<br>☐ Platform for collective research and industry input, feedback and design of adaptive management strategies (where identified as required).<br>☐ Collaborate on communication and extension methods to best extend progressive findings.<br>☐ Seek input into the composing of key messages for industry emanating from progressive research findings. | Quarterly<br><br>6-monthly<br>Annually- AP19005 |

| | | |
|---|---|---|
| | ☐ Review of the project risk register<br>**Industry & PIPS3 Program team forums**<br>☐ Communicate project/program activity progress and the outcomes of collaborative research.<br>☐ Seek technical advice/ input<br>☐ Exchange information and ideas to assist in research delivery or the assessment/understanding of research data.<br>☐ Consult on communication and extension methods to best extend key outcomes/ messages emanating from progressive research findings.<br>**Project Team Meetings**<br>☐ Update on project activity progress<br>☐ Review progress against the project preschedule/ workplan/ Gannt chart<br>☐ Allocate resources and schedule experimental work.<br>☐ Risk register review and design of adaptive management strategies quarterly (where identified as required). | At least annually<br><br>Monthly |

## APPENDIX 1 PROJECT LEVEL PROJECT MONITORING PLANS

### AP19002 PROJECT MONITORING PLAN

| Sub-project Logic Level | What will be monitored | Key Performance Indicators (KPI) | Data Collection Methods/ Source | Timing/ frequency/ responsibility |
|---|---|---|---|---|
| ***Sub-project start-up*** | | | | |
| **Planning & management**<br>The underpinning structure and processes to guide and support project duration activities and outputs<br><br>*What needs to be planned for and managed?* | Mastrus establishment and spread | # release sites monitored | Record keeping (lab book, form template, spreadsheet or field data capture software) | Seasonal (Sub-project Leader and inter-state collaborators) |
| | Standardized IPDM protocols | # orchards implementing IPDM protocols<br># timely data submissions | Record keeping (lab book, form template, spreadsheet or field data capture software) | Seasonal (Sub-project Leader and inter-state collaborators) |
| | Project reference group (PRG) | # grower representatives/States on PRG<br># PRG meetings | PRG minutes | Six-monthly (Program Coordinator; Sub-project Leaders) |
| | PIPS3 Program meetings | # meetings<br>Increase in sub-project collaboration | PIPS3 meeting minutes | Quarterly (Program Coordinator; Sub-project Leaders) |
| ***Activities and Outputs*** | | | | |
| **Research, communication, and engagement**<br><br>*What will the sub-project deliver and produce?* | Conservation biocontrol plots | % efficacy of Tricho against codling moth eggs<br>Suitability score for cover crop species for (1) orchard suitability, (2) Tricho & Mastrus abundance, (3) soil health, and (4) tree health. | Record keeping (lab book, form template, spreadsheet or field data capture software) | Seasonal (Sub-project leader, conservation biocontrol lab and field staff) |

| | | | | |
|---|---|---|---|---|
| | Mastrus establishment and impact | Mastrus pheromone trap produced<br># Mastrus traps deployed and retrieved | Record keeping (lab book, form template, spreadsheet or field data capture software) | Year 1 (Sub-project leader, Mastrus lab and field staff) |
| | Mastrus efficacy | # Specimens analyzed for genetic diversity<br># supplementary Mastrus releases | Record keeping (lab book, form template, spreadsheet or field data capture software, import permits) | Year 1 (Sub-project leader, international collaborator, Mastrus lab and field staff) |
| | Communication and adoption | # Soil Biodiversity and IPDM Training courses conducted<br># New IPDM experts contributing to Community of Practice<br># IPDM enquiries addressed through Community of Practice<br># Articles submitted as detailed in the Commun. and Engagement plan.<br># peer-reviewed papers submitted | Evaluation questionnaires, analytics | Ongoing/intermittent (Sub-project leader, Extension officer, Program Co-ordinator) |
| ***Short-term outcomes (project duration)*** | | | | |
| **Achievable within the life of the project**<br><br>*What will result by project end from the sub- project research, communication, and engagement activities?* | Improved efficacy of biological control of major pests and diseases | % growers aware of IPDM practices<br>% growers and advisors who understand requirements for viable long-term Mastrus and Tricho populations | Interviews, questionnaires | Ongoing/intermittent (Sub-project leader, Extension officer) |
| | Important factors for improved soil biodiversity, soil health and plant resilience | % growers and advisors aware of contribution of inter-row plantings to soil health | Interviews, questionnaires | Ongoing/intermittent (Sub-project leader, Extension officer) |

| | | | | |
|---|---|---|---|---|
| | Communications to growers and wider industry | % growers and advisors aware of research findings | Evaluation questionnaires, analytics | Ongoing/intermittent (Sub-project leader, Extension officer, Program Co-ordinator) |
| ***Intermediate Outcomes (Post project 5-10 yrs)*** | | | | |
| **Legacy**<br><br>*What longer-term influence will outcomes of the sub-project have on industry?* | Informed understanding of interactions between cultural (incl. soil health), biological and chemical IPDM practices | % growers adopting conservation biocontrol practices<br>% growers aware of biocontrol agent establishment and impact in their orchard | Interviews, questionnaires, industry reports | |
| | Increased grower confidence in integrated pest and disease management decision making | % growers routinely practicing IPDM<br>% reduction in use of pesticides incompatible with biocontrol | Interviews, questionnaires, industry reports | |
| | More accessible high-quality information on IPDM practices, and economic benefits and costs | % growers regularly interacting with an IPDM Community of Practice | Interviews, questionnaires, industry reports | |

AP19003 PROJECT MONITORING PLAN

| Sub-project Logic Level | What will be monitored | Key Performance Indicators (KPI) | Data Collection Methods/ Source | Timing/ frequency/ responsibility |
|---|---|---|---|---|
| ***Sub-project start-up*** | | | | |
| **Planning & management**<br>The underpinning structure and processes to guide and support project duration activities and outputs<br><br>*What needs to be planned for and managed?* | • Gantt chart and research preschedule | | | |
| | • Completion of Gantt chart and research preschedule, sharing with project team and PIPS3 projects. | Gantt chart and research preschedule approved by project team, statistician and collaborators and viewed by other PIPS3 projects. Synergies with other PIPS3 projects identified. | Direct communication at meetings led by AP19007. | Nov 2020, once, Project leader (Ian Goodwin) |
| ***Activities and Outputs*** | | | | |
| **Research, communication, and engagement**<br><br>*What will the sub-project deliver and produce?* | • Field experiments implemented, data collected and statistically analysed. | Peer reviewed science papers. | Submitted to journal. | One draft paper by Nov 2022 and 3 draft papers by May 2023, Project team |
| | • Industry articles. | Publication in AFG or other industry magazine. | Editor feedback. | Four articles (Nov 2020, Nov 2021, Nov 2022 and May 2023, Project team |
| | • Technical report, user guidelines, video and factsheet on new technology | Published on APAL web site. | Web statistics (APAL). PRG feedback. | Video May 2022, Factsheet Nov 2022, Technical report and user guidelines May 2023, Principal investigator |

| | | | | |
|---|---|---|---|---|
| | and advanced management systems. | | | |
| | • Field walks and SmartFarm visitations. | Grower and industry service provider participation.<br>> 300 visitors to SmartFarm. | Evaluation survey and feedback.<br>Email thanks. | As required. Documented in milestone reports, Project team |
| | • PIPS3 Program reference group. | PRG provides advice to project leaders and industry context for communicating results | Meeting minutes | Once per year, documented in milestone reports, Project leader |
| ***Short-term outcomes (project duration)*** | | | | |
| **Achievable within the life of the project**<br><br>*What will result by project end from the sub- project research, communication, and engagement activities?* | Relationships established between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation. | Completion of experiments, results reported to industry and peer reviewed. | Documented in milestone reports and final report. | Six monthly milestone reports (Nov 2020 – May 2023) and final report (July 2023), Project leader |
| | Chemical signals identified that determine the impact of high crop load on floral initiation and differentiation, and fruit size in the subsequent season. | Completion of experiments, results reported to industry and peer reviewed. | Documented in milestone reports and final report. | Six monthly milestone reports (Nov 2020 – May 2023) and final report (July 2023), Project leader |
| | Commercial mobile sensing technology available to industry to measure in situ fruit and tree parameters and establish orchard-specific crop load relationships. | Completion of experiments, results reported to industry and peer reviewed. Completion of sensor | Documented in milestone reports and final report | Six monthly milestone reports (Nov 2020 – May 2023) and final report (July 2023), Project leader |

| | | | | |
|---|---|---|---|---|
| | | guidelines, factsheets and videos. | | |
| ***Intermediate Outcomes (Post project 5-10 yrs)*** | | | | |
| **Legacy**<br><br>*What longer-term influence will outcomes of the sub-project have on industry?* | Orchard design to maximise fruit yield and quality and minimise the impact of extreme heat events. | Growers are adopting training and pruning systems to better manage light environment. Technology to measure light environment offered by commercial service providers and other researchers looking at management systems. | Industry survey or industry database. | |
| | Improved crop load management by providing knowledge and tools to deliver premium fruit that meets consumer expectations. | Growers are using sensors to determine thinning requirements. Researchers investigating how to apply metabolites to stimulate floral initiation. | Service/equipment providers.<br>New projects to develop products to increase floral initiation. | |
| | Sensing technology used in apple orchards to assist growers to produce fruit to market specifications. | Growers are using sensors to determine management intervention to increase fruit colour and manipulate fruit size. | Service/equipment providers. | |

AP19005 PROJECT MONITORING PLAN

| Sub-project Logic Level | What will be monitored | Key Performance Indicators (KPI) | Data Collection Methods/ Source | Timing/ frequency/ responsibility |
|---|---|---|---|---|
| ***Sub-project start-up*** | | | | |
| **Planning & management**<br>The underpinning structure and processes to guide and support project duration activities and outputs<br><br>*What needs to be planned for and managed?* | • Pre-schedule | | | |
| | • Completion of preschedule, sharing with project team and PIPS3 projects | Preschedule approved by project team, statistician and collaborators and viewed by other PIPS3 projects. Synergies with other PIPS3 projects identified. | Direct communication at meetings led by AP19007. | Oct 2020, once, Project leader (Ian Goodwin) |
| ***Activities and Outputs*** | | | | |
| **Research, communication, and engagement**<br><br>*What will the sub-project deliver and produce?* | • Field experiments implemented, data collected and analysed | Peer reviewed science papers | Submitted | Milestone 104 (Oct 2021), 106 (Oct 2022), 107 (Apr 2023), Project team |
| | • Industry articles | Publication in AFG or other industry magazine | Publication reference<br>PRG feedback | Two per year, documented in milestone reports, Lead investigator (Lexie McClymont) |
| | • Irrigation guidelines and videos | Grower interest | Web statistics (APAL)<br>PRG feedback | Once, end-of-project, Project leader |
| | • Sensor guidelines and videos | Grower interest | Web statistics (APAL)<br>PRG feedback | Once, end-of-project, Lead investigator |

| | | | | |
|---|---|---|---|---|
| | • Field walks | Grower participation | Attendance – sign in sheets<br>Evaluation survey and feedback | Two per year, documented in milestone reports, Project leader |
| | • Project reference group | PRG provides advice to project team and industry context for experiment planning and interpretation of results. | Meeting minutes | Once per year, documented in milestone reports, Project leader/Lead investigator |
| ***Short-term outcomes (project duration)*** | | | | |
| **Achievable within the life of the project**<br><br>*What will result by project end from the sub- project research, communication, and engagement activities?* | Effects of orchard design on yield and fruit quality of new pear cultivars measured and management implications communicated to growers. | Completion of experiments, results reported to industry as outlined above,<br>10% of growers attend a field walk<br>20 % of growers access web resources | Documented in milestone reports and final report. | Six monthly milestone reports (Oct 2020 – April 2023) and final report (July 2023), Project leader |
| | 'Proof-of-concept' and/or calibration of sensing technology to provide data to support management decisions in pear orchards. | Completion of experiments, results reported to industry as outlined above.<br>Completion of sensor guidelines and videos.<br>10% of growers attend a field walk<br>20 % of growers access web resources | Documented in milestone reports and final report. | Six monthly milestone reports (Oct 2020 – April 2023) and final report (July 2023), Project leader |
| | Increased knowledge of drivers of fruit colour development and | Completion of experiments, results | Documented in milestone reports and final report | Six monthly milestone reports (Oct 2020 – April 2023) and final report (July 2023), Project leader |

| | | | | |
|---|---|---|---|---|
| | degradation and effectiveness of novel protection strategies. | reported to industry as outlined above, | | |
| ***Intermediate Outcomes (Post project 5-10 yrs)*** | | | | |
| **Legacy**<br><br>*What longer-term influence will outcomes of the sub-project have on industry?* | Decisions to rework orchards informed by knowledge of yield and fruit quality potential of new cultivars and whole systems implications. | Growers are using different rootstocks, new blush cultivars, higher tree density and modern training systems. Growers are interested in investigating next generation rootstocks and cultivars. | Industry survey or industry database. | |
| | Use of sensing technology in pear orchards to assist growers to grow fruit to market specifications. | Growers are using sensors to provide flower and fruit load data to assist decision making. Development of additional capabilities (e.g. sensing fruit quality) are further informing management decisions or integrating data with management systems. | Service/equipment providers | |
| | • Better crop load management in pears to avoid biennial bearing and maximise fruit quality. | Fruit thinning techniques developed to consistently maximise fruit quality and yield. | | |

AP19006 PROJECT MONITORING PLAN

| Sub-project Logic Level | What will be monitored | Key Performance Indicators (KPI) | Data Collection Methods/ Source | Timing/ frequency/ responsibility |
|---|---|---|---|---|
| ***Sub-project start-up*** | | | | |
| **Planning & management**<br>The underpinning structure and processes to guide and support project duration activities and outputs<br><br>*What needs to be planned for and managed?* | • Formation of sub-project team | Subcontracts in place | Sub-project records | **N Swarts** (30-9-2020) |
| | • Collaboration with growers providing trial sites | Trial sites confirmed | Sub-project records | **N Swarts** (30-9-2020)<br>FLA's |
| | • Coordination with sub-project leads | Coordinated trial site plans | Sub-project records | **N Swarts** (30-9-2020)<br>FLA's |
| | • Collaboration with contractor to provide web app | Subcontract in place | Sub-project records | **N Swarts** (30-9-2020) |
| ***Activities and Outputs*** | | | | |
| **Research, communication, and engagement**<br><br>*What will the sub-project deliver and produce?* | • Literature review | Review completed | Sub-project records | **S Bound** (15-12-2021) |
| | • Project (PIPS 3) update meetings | Meetings conducted;<br>Action plans produced; | Sub-project records | **M White**<br>6 monthly |

| | | | | |
|---|---|---|---|---|
| | • Sub-project trial planning meetings | Meetings conducted; Action plans produced; | Sub-project records | **N Swarts**<br>Monthly |
| | • Detailed field trial plans | Field trial plans reviewed and produced | Sub-project records | N Swarts (30-9-2020)<br>FLA's |
| | • Regional Field trials (NSW, SA, WA, Vic) | Demonstration sites established at minimum 4 sites | Sub-project records | **N Swarts** (annual)<br>FLA's |
| | • In depth research trial (Tas sites) | Trial sites established at minimum 2 sites | Sub-project records | **S Bound** (annual) |
| | • Regional grower field days; Industry technical conferences | Field days conducted at field trial sites | Sub-project records | **N Swarts** (2022, 2023)<br>FLA's |
| | • Industry communications | 6 Industry journal articles; Web page produced updated bi-annually or as needed; Social media updates; | Sub-project records | **N Swarts** (ongoing)<br>M White |
| | • Nutrient / irrigation management decision support tool - web app | Web app developed | Sub-project records | **N Swarts** (Update at 30-6-2022 and 30-6-23)<br>S Green |
| | • Grower Guide | Grower guide reviewed and published | Sub-project records | **N Swarts (**30-6-23)<br>S Bound, FLA's |
| | • Data Package | Data package published | Sub-project records | **N Swarts** (Updates 30-6-21; 30-6-2022; 30-6-23)<br>S Bound |

| | | | | |
|---|---|---|---|---|
| | • | | | |
| ***Short-term outcomes (project duration)*** | | | | |
| **Achievable within the life of the project**<br><br>*What will result by project end from the sub- project research, communication, and engagement activities?* | • Key soil health indicators for apple and pear orchards established | An increase in orchardists aware of key soil health indicators for apple and pear orchards | Sub-project records | N Swarts<br>Project team |
| | • Orchardists & advisors with increased awareness & knowledge of sustainable orchard management practices and their impact on soil health, resilience, orchard productivity and fruit quality | An increase in orchardists/advisors in major apple & pear growing regions of Australia are aware of key sustainable orchard management practices | Event surveys and feedback.<br>End of project survey | N Swarts<br>Project team |
| | • Orchardists & advisors with increased awareness and skill in using web-based tools to manage water and nutrients in the orchard | An increase in orchardists in major apple & pear growing regions of Australia are aware of SINATA web-based tool for managing water and nutrients in the orchard; 10 % of orchardists/advisors have tested the web-based tool; | Web-data analytics; Start and end of project surveys. | N Swarts<br>Project team |
| | • Orchardists aspire to implement sustainable orchard management practices | An increase in orchardists aspiring to implement sustainable orchard management practices | Start and end of project surveys; | N Swarts<br>Project team |

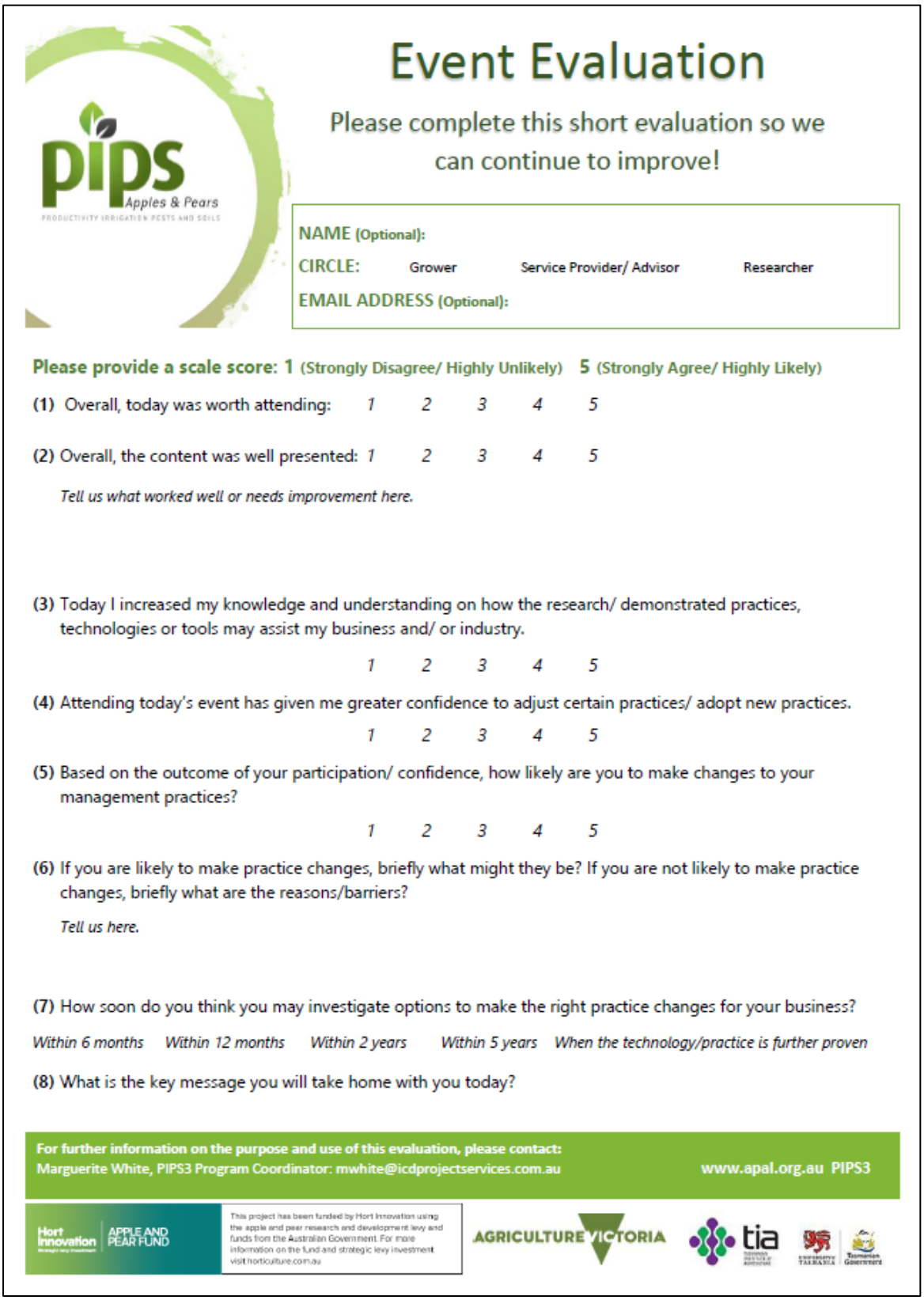
| *Intermediate Outcomes (Post project 5-10 yrs)* | | | | |
|---|---|---|---|---|
| **Legacy**<br><br>*What longer-term influence will outcomes of the sub-project have on industry?* | • Orchardists implementing sustainable orchard management practices | | | |
| | • Orchardists confidently using web-based tools to help manage orchard irrigation and nutrition | | | |

## APPENDIX 2 PIPS3 PROGRAM EVENT EVALUATION TEMPLATE

The PIPS3 Program Event Evaluation package is available in the PIPS3 Program Template Drop-box: HERE

Link to online version for smartphones: https://www.surveymonkey.com/r/PIPS3 .

Also available via a QR code for scanning by event participants. Printable version example provided below.



# Event Evaluation

Please complete this short evaluation so we can continue to improve!

NAME (Optional):

CIRCLE: Grower Service Provider/ Advisor Researcher

EMAIL ADDRESS (Optional):

**Please provide a scale score: 1** (Strongly Disagree/ Highly Unlikely) **5** (Strongly Agree/ Highly Likely)

**(1)** Overall, today was worth attending: *1 2 3 4 5*

**(2)** Overall, the content was well presented: *1 2 3 4 5*

*Tell us what worked well or needs improvement here.*

**(3)** Today I increased my knowledge and understanding on how the research/ demonstrated practices, technologies or tools may assist my business and/ or industry.

*1 2 3 4 5*

**(4)** Attending today's event has given me greater confidence to adjust certain practices/ adopt new practices.

*1 2 3 4 5*

**(5)** Based on the outcome of your participation/ confidence, how likely are you to make changes to your management practices?

*1 2 3 4 5*

**(6)** If you are likely to make practice changes, briefly what might they be? If you are not likely to make practice changes, briefly what are the reasons/barriers?

*Tell us here.*

**(7)** How soon do you think you may investigate options to make the right practice changes for your business?

*Within 6 months Within 12 months Within 2 years Within 5 years When the technology/practice is further proven*

**(8)** What is the key message you will take home with you today?

**For further information on the purpose and use of this evaluation, please contact:**
Marguerite White, PIPS3 Program Coordinator: mwhite@icdprojectservices.com.au www.apal.org.au PIPS3

This project has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

**Privacy Policy on reverse side of the PIPS3 Program Event Evaluation printed version and stated at the commencement of the on online version.**

The PIPS3 Program collects, stores, uses, discloses and otherwise handles your personal information in accordance with the *Privacy Act 1988 (Cth)* and as otherwise set out in the privacy policy available at Hort Innovation Privacy Policy. For project evaluation purposes, your response to rated questions is reported in an aggregated per event, per project or overall program format only, without disclosure of individual names, personal contact details or location. Long answers may be used for communication materials or project/program reporting to Hort Innovation as anonymous responses unless written consent is otherwise obtained from you. Provision of names, phone numbers and email addresses are entirely optional and are collected for post event PIP3 Program recommended practice follow-up information or grower/ advisor support by the relevant project team only. You may request that data provided by you is removed at any time.

# APPLE AND PEAR

## *PRODUCTIVITY, IRRIGATION, PESTS AND SOILS PROGRAM (PIPS3)*

pips Apples & Pears
PRODUCTIVITY IRRIGATION PESTS AND SOILS

# Mid-term Evaluation Report

April 2022

AGRICULTURE VICTORIA

UNIVERSITY of TASMANIA
TIA
Tasmanian Institute of Agriculture

iCd project services
Initiated Coordinated Delivered

Hort Innovation
Strategic levy investment
APPLE AND PEAR FUND

This project has been funded by Hort Innovation using the apple and pear research and development levy and funds from the Australian Government. For more information on the fund and strategic levy investment visit horticulture.com.au

## CONTENTS

## EXECUTIVE SUMMARY

This evaluation report outlines the findings of a desk-top document review and 36 stakeholder telephone interviews for the *Productivity, Irrigation, Pests and Soils Program (PIPS3 Program)* mid-term review.

Overall, the Apple and Pear industry's third PIPS3 Program has been evaluated as **Strong** against all Key Evaluation Questions at the middle point of research, extension and communication activity. This report also breaks the findings into both project and stakeholder ratings, with supporting evidence, discussion points and recommendations. A summary of the overall findings is outlined in the table below.

| *EVALUATION DOMAIN* | *DETERMINED PROGRESS PERFORMANCE RATING* | *OVERALL PROGRAM STAKEHOLDER RATING* | *SUMMARY* |
|---|---|---|---|
| **Effectiveness** | Strong | 4.2 | The program is on-track to deliver and exceed upon the intended outcomes. |
| **Relevance** | Strong | 4.3 | The program is delivering research outcomes and outputs relevant to the needs of apple and pear growers, service providers and other industry stakeholders by project end. |
| **Appropriateness** | Strong | 4.4 | The program is operating above expectation at the mid-point and is delivering appropriate communication and extension to support dissemination of research activity and progress information. |
| **Efficiency** | Strong | 4 | Partners are working collaboratively to deliver an efficient and integrated program approach to research, extension and communication activities. |
| **Legacy** | Strong | 3.8 | At the mid-point there is greater confidence that growers and service providers will increase their knowledge and understanding by project-end (4.1/5- Strong), but less confidence in the likelihood of this translating into immediate changed practices (3.4/5- Moderate). There are stronger indicators of longer-term adoption. |

Although the first half of PIPS3 Program activities have been conducted under Covid-19 restrictions and border closures, there is a high level of certainty that all achievement criteria will be delivered by June 30, 2023, with some adaptive management already identified and applied.

There are indications that the short duration of the PIPS3 Program (three years) will impact upon the true potential of the research activities, outcomes and outputs. Therefore, consideration of an extended PIPS3 Program (budget and timelines), or roll-over into an immediate PIPS4 start on July 1st , 2023, is needed to leverage from current research momentum.

The PIPS3 Program is augmenting unprecedented cooperation between all research teams, assisted by an active and trusted Program Coordinator. The results for industry include evidenced efficiencies, accelerated understanding and knowledge exchange between researchers and between researchers and end users (service provider and growers), and an amplification of PIPS3 Program activity and initial outcomes to intended audiences through multiple industry and organisational communication and extension channels.

The evaluation process has reinforced that the economic imperative needs to be determined and simply extended along-side the sustainability narrative, to maximise uptake by growers of the PIPS3 Program outputs and outcomes, to which the program partners will positively respond.

Progress performance certainly indicates that the PIPS3 Program is currently positioned to deliver:

- new understanding and knowledge on the biological management of pests and diseases to reduce pesticide inputs;
- advance sustainable and technology driven apple orchard systems;
- smarter and sustainable pear orchards to maximise quality, yield and labour efficiencies; and
- develop confident strategies to biologically and practically manage floor orchards that will result in improved soil health, optimise plant nutrition whilst reducing synthetic inputs, and maximise water efficiency.

# 1 INTRODUCTION & PURPOSE

The purpose of undertaking a mid-term evaluation of the Apple and Pear industry's third *Productivity, Irrigation, Pests and Soils Program (PIPS3 Program)* was to assess the progress performance of program/project activities and outcomes against the Monitoring and Evaluation Plan (M&E Plan), primarily the Key Evaluation Questions (KEQ), and effectiveness/ appropriateness of methods used to undertake research, collaborate, extend and communicate in the first half of execution. The focus of the evaluation was the timeframe of July 1st, 2020 to December 31st, 2021.

This report has been prepared to inform the Program Reference Group (PRG), project leaders, and the Hort Innovation Program Managers on how the program/project is performing and to provide recommendations on what/how adaptive management measures may be deployed to elevate overall outcomes and effectiveness by project completion on the 30th of June 2023.

The five projects subject to the evaluation were:

- AP19002- *Strengthening cultural and biological management of pests and diseases in apple and pear orchards*, Project Lead: Agriculture Victoria, Dr Greg Lefoe
- AP19003- *Advancing sustainable and technology driven apple orchard production systems*, Project Lead: Agriculture Victoria, Dr Ian Goodwin
- AP19005- *Developing smarter and sustainable pear orchards to maximise fruit quality, yield and labour efficiency*, Project Lead: Agriculture Victoria, Dr Ian Goodwin
- AP19006- *Improved Australian apple and pear orchards soil health and plant nutrition*, Project Lead: Tasmanian Institute of Agriculture (TIA), Dr Nigel Swarts & Dr Sally Bound
- AP19007- Independent Program Coordination for PIPS3 Program, Project Lead: ICD Project Services, Marguerite White.

The mid-term evaluation will assist the individual projects to each deliver upon the milestones and achievement criteria of their relevant research agreements, in consultation with their partners and Project Reference Groups (as relevant), whilst also contributing to overall program and industry objectives through the established avenues of the Independent Coordinator, PIPS3 PRG and the *PIPS3 Program Communications and Extension Plan* (C&E Plan).

Projects of the PIPS3 Program have contributed to the preparation of this report by participating in the mid-term interview process, participating in the 2022 PIPS3 Program Team Forum (March 8th & 9th 2022), maintaining their project *PIPS3 Program M&E Database portal* and providing timely, quality Milestone Reports to Hort Innovation.

This report should be considered in conjunction with the PIPS3 Program M&E Plan.

## 1.1 PIPS3 PROGRAM OBJECTIVES

The objective of the PIPS3 Program is to provide the Apple and Pear industry with tools and knowledge to develop sustainable orchard systems of the future that:

- Are resilient to climate variability and weather extremes;
- Use resources efficiently and sustainably;
- Apply biological and cultural solutions in the management of pests, disease and nutrients;
- Drive product quality and business profitability through use of automated/ mechanised advanced technologies along the supply chain; and

- Produce a low environmental footprint and sustainable product that meets consumer preference and expectations.

Orchards of the future will ensure industry meets consumer preference and expectations through the sustainable production of apple and pears and will continue to meet consumer demands and inspire public confidence.

The PIPS3 Program is currently addressing key gaps in knowledge and is advancing understanding of potential sustainable orchard systems of the future through a collaborative research model. The aim of the program approach is to deliver a high level of cooperation on research methodology and progressive findings, to proliferate understanding and knowledge amongst stakeholders and increase investment value via shared resourcing and reduced duplication efficiencies. Greater opportunity for information exchange and coordinated activities, especially in the area of communications, is providing ongoing insight into the research for the targeted stakeholders, and appropriately packaged key messages for growers and service provider in response to their ongoing input through governance structures and extension activities.

## 1.2 RELEVANCE TO THE APPLE AND STRATEGIC INVESTMENT PLAN

The PIPS3 Program M&E Plan was approved for implementation in December 2020. At that time, the following outcomes and strategies of the *Apple and Pear Strategic Plan (SIP) 2017-2021* were identified as being significantly addressed by the projects of the PIPS3 Program:

| | |
|---|---|
| **Outcome 1** | **Industry and global competitiveness is improved by reducing the average cost per carton** |
| Strategy 1.1 | Drive orchard reworking with emphasis on preparedness for increased mechanisation/ automation/scale. Primary research projects: AP19003 & AP19005 |
| Strategy 1.2 | Continue to build the body of knowledge around pest & disease management & prevention, considering both biosecurity risk mitigation & cost reduction. Primary research project: AP19002 |
| Strategy 1.3 | Improve soil health & increase knowledge of beneficial microbes in orchard management. Primary research projects: Ap19002 & AP19006 |
| Strategy 1.4 | Improve labour productivity through greater adoption of technology and leadership training Primary research project: AP19003 & AP19005 |
| Strategy 1.5 | Research IT and data systems that enable better collection and connectivity of orchard and business data at every level of the supply chain. Primary research projects: AP19003 & AP19005 |
| **Outcome 3** | **The value of the average bin has risen, resulting in improved industry profitability** |
| Strategy 3.1 | Improve quality consistency and percentage of Class 1 fruit per hectare: All projects |

The outcomes and strategies of the latest *Apple and Pear Industry SIP (2022-2026)* demonstrate that the PIPS3 Program remains highly relevant, or potentially has had an influence upon industry sentiment and aspiration captured in the plan. The PIPS3 Program is already, and will continue, to contribute to the following goals of the industry:

| | |
|---|---|
| **Outcome 1** | **Demand Creation- contribute to demand generation to drive growth across domestic and international markets.** |
| Strategy 1 | Drive quality and customer experience from farm to home (including in-store strategy): All projects |
| Strategy 5 | Monitor and record an apple and pear pests and diseases profile for the purpose of supporting market access and to continue to seek new market access and improvements to existing markets as outlined in the export strategy: AP19002 |

| | |
|---|---|
| **Outcome 2** | **Industry supply, productivity and sustainability- The Australian apple and pear industry has increased profitability, efficiency and sustainability through innovative R&D and sustainable best management practices (BMPs).** |
| Strategy 1 | Develop management strategies to optimise productivity and profitability in apple and pear orchards, including soil and plant health, inputs such as water and labour, and crop protection and environmental factors: All projects |
| Strategy 3 | Enhance sustainable orchard system design and management to optimise orchard profitability through improvements in input efficiencies and quality improvements: All projects |
| Strategy 4 | Support pollination security through robust honeybee health, and pest and disease mitigation: AP19002 & AP19006. |
| **Outcome 3** | **Extension & capability- Improved capability and an innovative culture in the apple and pear industry maximises investments in productivity and demand.** |
| Strategy 1 | Deliver industry-specific communication, capacity, and capability to create positive changes in the areas of sustainable production, value-adding opportunities along the supply chain, labour efficiency, crop protection, biosecurity, soil, plant health and export capability: All projects |
| Strategy 2 | Provide opportunity for engagement within industry, across industry members and with relevant stakeholders throughout the supply chain to innovate by utilising trusted relationships: All projects |
| Strategy 3 | Strengthen industry leadership through initiatives and training: All projects |
| **Outcome 4** | **Business insights- The Australian apple and pear industry is more profitable through informed decision-making using consumer knowledge and tracking, trade data, production statistics and independent reviews.** |
| Strategy 2 | Use Industry production benchmarking activity to measure and track industry productivity and profitability: All project data contributes |

# 2 EVALUATION METHODS

ICD Project Services (Marguerite White), as *the Independent Program Coordinator (AP19007)*, conducted the mid-term evaluation during February and March of 2022. Contributions to the collation of reports demonstrating achievement criteria status, evidence of activities undertaken, and the impact of activities was provided by project team members, the Hort Innovation Program Manager (Adrian Hunt) and the APAL Communications team.

The evaluation used the PIPS3 Program Logic (Appendix 1, or Section 2 of the M&E Plan) to determine the approach and focus of the evaluation at the mid-point. Desk-top and interview methodology was used to determine "progress performance" of the program/projects through assessment against the Key Performance Indicators (KPI) of the M&E Plan (Section 4), and therefore, evaluation of progress towards achieving the short-term outcomes (project duration), delivering upon the agreed (and contracted) outputs, and the effectiveness/ appropriateness of the activities being implemented to realise these outcomes and outputs by project end. Whilst intermediate and long-term (legacy) outcomes are less of a focus at the mid-point, it is important to consider these in the context of how the stakeholders believe the PIPS3 Program is improving knowledge and understanding, and whether there are indications that certain outcomes/ outputs will be adopted post-project or what more can be done to increase the likelihood of adoption.

## 2.1 DESK-TOP DOCUMENT REVIEW

Background information and documentation was reviewed for each project against the KPI (Section 4, M&E Plan) and to gather evidence of output and activity achievement/ progress towards achievement (including Hort Innovation contracted Achievement Criteria) of the program logic. This information was drawn from:

- Milestone reports
- PRG and Project Leadership Meeting minutes
- *PIPS3 M&E Database portal* entries of each project
- Peer-reviewed publications and conference abstracts
- Interrogation of communication analytics published through APAL or partner organisation communication avenues, in accordance with section 9.1 of the C&E Plan

Each of the desk-top sources reviewed were interrogated for both qualitative and quantitative analysis purposes using the minimum data requirements table in Section 5 (Evaluation) of the M&E Plan.

Unfortunately, the results of Future Orchards® walk evaluations that benefited from the contribution of significant PIPS3 Program input in the Huon Valley (Tasmania, 2 events), Goulburn Valley (Victoria), Orange (NSW) and Manjimup (WA) were unable to be used in the evaluation as the requested information was unable to be provided.

The desk-top review was primarily used to evaluate the **effectiveness, process appropriateness** and **efficiency** (the latter two mostly in relation to implementation of the C&E Plan) KEQ of the PIPS3 Program (refer to Table 1, Section 2.2). **Relevance** was evaluated using PRG minutes only. The detailed analysis results, with commentary, of the desk-top review can be found in Appendix 2.

## 2.2 STAKEHOLDER INTERVIEWS

The project leaders of the PIPS3 Program were requested to provide a list of potential interviewees across three stakeholder groups: research, grower and service provider. The response from each project varied, dependent upon the breadth of contributors/ active participants at the mid-point of the project.

An email was sent to 55 people by the PIPS3 Program Coordinator informing them about the evaluation purpose and process, and their nomination as a potential contributor to the process. Interviews were conducted based upon availability of each individual during mid-February to mid-March, resulting in a random process.

Thirty-six (36) telephone interviews were conducted, each interview averaging a 20 minute in duration. Eleven questions were asked, seven of these structured with a rating response required between 1 (most negative) and 5 (highly positive), with an opportunity to provide an extended comment to support the rating response. Most often, the respondents were highly motivated to expand upon the ratings provided. Four questions were open-ended to gain feedback and insight in a less formal and structured approach. These responses were particularly important in enhancing the opportunity to identify areas for improvement.

The stakeholder groups represented in the interviews were:

- Research team- 10
- Growers- 11
- Service Providers - 15

The service provider stakeholder group included agency extension, commercial advisors and private advisors.

Some interviewees provided a response based upon their involvement across multiple projects of the program. This resulted in forty-two (42) possible responses when quantifiably analysing results on a project basis. The following is a break-down of possible responses per project:

- Whole-of-program relationship- 4
- AP19002- 8
- AP19003- 7
- AP19005- 6
- AP19006- 17

Although the spread of project respondents appears to be disproportionate, with AP19006 having 17 respondents, this reflects the large geographic spread of this project. The interviews conducted for this project ensured a good representation across the regional areas in which both trial and demonstration activities were being conducted.

The interview process of both quantifiable and qualitative questions was used to evaluate **effectiveness**, **relevance**, **process appropriateness**, **efficiency** and **legacy** KEQ of the PIPS3 Program, and the specific program/project questions underpinning these (refer to Section 3.2 of the M&E Plan). The design of the questions enables analysis of responses at both a program and project level so that all users of the evaluation report can apply findings to both program and individual project level questions. Table 1 outlines the interview questions that were used to assess progress performance of the program/ projects against the KEQ.

**Table 1. Interview questions used to address the PIPS3 Program KEQ at mid-term**

| | KEY EVALUATION QUESTIONS (MID-TERM CONTEXT) | INTERVIEW QUESTIONS |
|---|---|---|
| **Effectiveness** | To what extent are the activities of the program to date addressing the objectives, research agreement achievement criteria and identified outcomes/ outputs? | 1. Given this stage of the PIPS3 Program, how satisfied are you with implementation of the research activities? (1- Extremely dissatisfied, 5- Extremely Satisfied)<br>2. Given this stage of the PIPS3 Program, how satisfied are you with overall project/program progress to date? (1- Extremely dissatisfied, 5- Extremely satisfied) |
| **Relevance** | At this time, are there indications that the research outcomes/ outputs will be relevant to the needs of apple and pear growers, advisors and industry stakeholders? | 3. How satisfied are you that the outcomes/outputs of the research will be relevant to growers/ service providers? (1- Extremely dissatisfied, 5- Extremely satisfied)<br>4. Are there any changes you have made/ advice you have provided from what you have seen/ heard about/experienced from the PIPS3 Program research so far? *Prompt examples provided |
| **Appropriateness** | How well have intended audiences been engaged in the PIPS3 Program to date?<br>Are there indicators at this time that the PIPS3 Program Communications and Extension Plan is appropriate and is having an impact upon the target audience? | 5. What extension/ collaboration/ communication activities have you engaged with to date? *Prompt examples provided<br>6. What activities/information or communication do you feel has been particularly effective or resonated for you and why?<br>7. How do you rate the value of the PIPS3 Program events you have attended or communications you have read/watched at providing relevant information and engaging industry growers / service providers? (1- No value, 5- Extremely valuable)<br>8. What could the PIP3 Program do better to communicate & extend the program research information and it's relevance to orchard businesses? |
| **Efficiency** | What efforts have been made to date by the PIPS3 Program partners to improve efficiency and is a "program" approach making a difference? | 9. How would you rate the success of the PIPS3 Program to date (being delivered as a collaboration between projects and teams) in delivering increased research efficiencies, knowledge exchange between researchers and grower impact through extension & communications? (1- Not successful, 5- Extremely successful) |
| **Legacy** | Are there signs that the PIPS3 Program will influence apple and pear growers in the future? | 10. Based on your level of involvement to date, how much do you think that grower/ service provider knowledge and understanding on (project specific outcomes) will improve as a result of PIPS3 Program? (1- No improvement 5- High level of improvement)<br>11. Based on your level of involvement to date, how likely is it that growers will adopt/ service providers will adjust their advice on (project specific outcomes) as a result of PIPS3 Program? (1- Extremely Unlikely 5- Extremely likely) |

It is important to note that AP19007 was not directly included in the interview question process due to potential perceived conflict of interest by the interviewees. As the role is responsible for planning and executing cross-project efficiency, collaboration, communication and extension opportunities, the outcome of the evaluation with regards to these activities are an assumed assessment of the progress performance of this project.

Appendix 3 provides the questions and responses of the interview process, with the identity of the respondents removed for privacy reasons.

## 2.3 2022 PIPS3 PROGRAM TEAM FORUM: MID-TERM EVALUATION SESSION

In March 2022, a session of the PIPS3 Program Team Forum was dedicated to the mid-term evaluation process. The Program Coordinator presented upon the interview responses at that time (approximately 2/3 completed). For each KEQ, the average rating overall was provided together with quotes from respondents divided into "Challenges to be addressed" and "Positive Indicators". Using a facilitated process, the 21 attendees of the session collaborated to form recommendations on "What can we do better to address the challenges through learnings of the positive indicators". These contributions have been integrated into the recommendations of this report.

## 2.4 EVALUATION CRITERIA

Using the KPI (Section 4, M&E Plan) to evaluate "progress performance" towards the short-term outcomes, outputs and activities of the program logic, and milestone achievement criteria of the projects, a three-level traffic light system was used.

The evaluation result of the document review was determined as shown in Table 2.

**Table 2. Desk-top review evaluation criteria to determine progress performance**

| *EVALUATION RESULT AGAINST KPI* | *EVALUATION CRITERIA* |
|---|---|
| **Strong** | Delivery of planned outputs and achievement criteria in full or with minor omissions or gaps |
| **Moderate** | Partial delivery of planned outputs and achievement criteria, with moderate omissions or gaps |
| **Weak** | Limited delivery of planned outputs and achievement criteria, with significant omissions or gaps |

For the interview quantitative ratings (analysis at overall, stakeholder and project levels), the evaluation status was determined as shown in 3.

**Table 3. Stakeholder interview quantitative response ratings to determine progress performance**

| *STAKEHOLDER INTERVIEW RESULT* | *EVALUATION CRITERIA* |
|---|---|
| **Strong** | Rating of between 3.8 to 5 |
| **Moderate** | Rating of between 2.4 to 3.7 |
| **Weak** | Rating of between 1 to 2.3 |

Where relevant, both the desk-top review and stakeholder interviews were combined to provide an overall evaluation finding. The desk-top review criteria (Table 2) and stakeholder interview quantitative response criteria (Table 3) were combined as shown in Table 4.

**Table 4. Combined evaluation criteria to determine progress performance**

| | | *STAKEHOLDER INTERVIEW RESULT* | | |
|---|---|---|---|---|
| | | Strong | Moderate | Weak |
| *DESK-TOP REVIEW RESULT* | Strong | Strong | Strong | Moderate |
| | Moderate | Strong | Moderate | Weak |
| | Weak | Moderate | Weak | Weak |

Both quantitative and qualitative information was used to provide a progress performance rating of strong, moderate or weak. Additionally, interpretation of the stakeholder responses and document review was used to highlight likely reasons for the performance progress rating.

# 3 EVALUATION OF PROGRESS PERFORMANCE AGAINST THE PIPS3 PROGRAM MID-TERM KEQ

The results of the evaluation process against each KEQ are outlined in this section. Although an overall rating has been applied, at the mid-term stage of the PIPS3 Program, it is important for the PRG and leadership team to consider the open responses provided by each of the stakeholder groups. These provide strong insight into how best to apply adaptive management measures where needed or, mostly, support on going activities that are strongly supported and considered highly effective by respondents.

Evaluation findings are presented using the following format:

- Overall program progress performance rating &/ or the associated overall program interview rating
- Break-down of progress performance per project &/or the associated project interview rating
- Break-down of progress performance per stakeholder group with representative quotes
- Analysis and discussion on the findings of each KEQ progress performance rating

## 3.1 EFFECTIVENESS

| *OVERALL PROGRESS PERFORMANCE RATING* | *OVERALL PROGRAM STAKEHOLDER RATING* |
|---|---|
| **Strong** | **4.2** |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on the extent to which it is making progress towards addressing the objectives of the program and delivering upon the contracted outcomes and outputs. Overall, respondents are very confident (4.2/5) that the research, communication, extension and collaboration activities to date are effectively being implemented by the project partners and will deliver results to the industry by project end, though there are concerns that certain components of the research need more time to comprehensively investigate the impact of certain treatments and practical solutions/ strategies for growers. Furthermore, a significant number of respondents (65%) raised concerns about the impact of Covid-19 upon start-up activities, including the establishment of trial plots and year one data collection.

**Table 5. Project effectiveness evaluation finding**

| *PROJECT* | *PROGRESS AGAINST KPI REVIEW* | *Q1.RESEARCH PROGRESS* | *Q.2 OVERALL PROGRAM PROGRESS* | *AVERAGE EFFECTIVENESS RATING* | *COMBINED EFFECTIVENESS EVALUATION* |
|---|---|---|---|---|---|
| **Program** | Strong | 4 (n=4) | 4.3 (n=4) | **4.1** | **Strong** |
| **AP19002** | Moderate | 4 (n=7) | 4.4 (n=7) | **4.2** | **Strong** |
| **AP19003** | Strong | 4.6 (n=7) | 4.6 (n=7) | **4.6** | **Strong** |
| **AP19005** | Strong | 4.4 (n=6) | 4.7 (n=6) | **4.5** | **Strong** |
| **AP19006** | Moderate | 3.9 (n=17) | 4.2 (n=16) | **4.1** | **Strong** |
| **Respondent Av. (n=35)** | | **4.1** | **4.3** | **4.2** | |

Breaking the evaluation down at the project level, the projects are each tracking **strongly** overall. AP19002 and AP19006 have been rated as **moderate** in the desk-top review, however, this assessment is primarily based upon

delays in achievement criteria relating to specific components of the research and adaptive measures have already been implemented in consultation and agreement with the relevant Hort Innovation Program Managers.

AP19002 has experienced set-backs in sourcing and importing a *Mastrus ridens* culture from Chile, onwards impacting upon the timeframes of the biosecurity laboratory culture rearing and subsequent release and monitoring activities in the field.

AP19006's SINATA web app development has been slow to engage with a suitable IT developer to build an independent tool, however, more recent discussions with existing commercial irrigation and nutrient platform collaborators are seeing this component of work back on track to deliver a milestone later than contracted, but potentially a much-improved outcome for the industry long-term.

Both these projects also received the lowest ratings for research activity progress by respondents, primarily in relation to the delayed establishment of the floor orchard tree-line and interrow treatments across the 3 research trials and 3 demonstration sites. These delays can be partially attributed to Covid-19 restrictions, but also in relation to a misalignment between project commencement and ideal seasonality for the preparation, sourcing and planting of certain species being trialled in the conservations bio-control plots. Whilst this has impacted on the project, it has also become a key learning of the research to date that is to be considered in what it will take for growers to actually implement and manage these sustainable orchard floor practices.

There is *extremely* **strong** confidence in the overall effectiveness of both the AP19003 and AP19005 projects being led by Dr Ian Goodwin. Desk-top review determined that AP19003 is meeting all requirements and the project is strongly contributing to communication, extension and collaboration activities, whilst AP19005 is progressing ahead of schedule.

The desk-top review has highlighted that further grower attendance at the PRG meetings would be beneficial. Only two growers are regular attendees and the project coordination and leadership is already implementing actions to recruit further growers in the second half of the PIPS3 Program.

**Table 6. Stakeholder effectiveness evaluation finding**

| *STAKEHOLDER GROUP* | *COMBINED RATING* | *REPRESENTATIVE QUOTES* |
|---|---|---|
| **Research (n=10)** | 4.5 | *You are going to hear lots of 5s in that respect from me, being done extremely well. [Commercial research contributor]*<br>*There have been quite a few Covid related impediments- so considering this I am more than happy.*<br>*The treatments took longer [to establish] than we had hoped, that's the big one missing.*<br>*We are tracking very well. Just a little behind due to Covid.*<br>*We've delivered everything on-time. Some outlier issues but put in appropriate variations so no concerns.*<br>*I think it's an absolutely fabulous program and great to be part of it.*<br>*Great progress, especially in the comms space. Not a 5 because of the barriers- slow response and time lag on some aspects of the research.*<br>*It's been pretty good really. Coming from a new industry I think it's great that there are all those communications and extension elements which is new for me. I like the fact we have CoP, videos, website, overall coordination and collaboration.* |

| | | |
|---|---|---|
| | | *.. from the group forum, I can see that things are very much on track. I think that this project, the way we are running the project meetings and social media- it's a very well-connected program and enjoying very much.* |
| **Grower (n=11)** | 4.2 | *Because the researchers have done previous work, they are understanding the brief well and are very close to what has been asked with them. So yes, very happy with their focus.*<br>*Going well. 5 is because there is a calling for us growers to get a more accurate crop loading on our trees to get the right size and colour- I believe this technology can help us.*<br>*There are a few condition difficulties & issues with accessing seeds. But I think they are going well.*<br>*Not a 5 as some of the species are not relevant to commercial production. But great as the project is a good level for growers who have little exposure to soil health- good first step. The science (or baseline data) on what biology is active in our soils [is important as] we don't have this and need it- especially species & mix for the orchard floor.*<br>*Pretty happy as it's a great crew that's involved and excellent operators. I rarely give 5s. [rating of 4 provided]*<br>*PIPS3 has been much better as we are actually seeing some results and we have something being done here in our growing conditions e.g., difference in chill and soils & September/ October our soils are warm so we had active biology. We haven't seen SINATA results yet though.* |
| **Service Provider (n=14)** | 4.1 | *Keep it up! Keep going- don't stop! We do need this as an industry. We need the connection between the research and the service providers.*<br>*Need to go out to more people and the CoP needs to be more regularly updated. CoP is only one avenue though.*<br>*The project was always ambitious in terms of timeframes and timing- so we are a full season behind really.*<br>*It is extremely relevant but the 3 years will be a limitation as we won't have sufficient data as we are working on longer-term issues. Monitoring protocols- there have been lots of learnings and has taken time- working out what is feasible and learning techniques and baseline.*<br>*I think the researchers have put in a big effort to establish and measure, but not a 5 as more to do with little things. Initial consultation was rushed about species choice- needed more grower input but time didn't allow.*<br>*Plantings were late to establish and the grower mowed one of them prior to establishment which put things back.*<br>*It is still a way to go on it. Happy of direction.*<br>*I think they are doing a great job.*<br>*Relative to the last round, things seem to be much better.*<br>*For what we've actually got at this stage, [the project] has a great profile. Not lots of outcomes but good awareness of the activity.*<br>*If wasn't for Covid it would be higher [rating of 4 provided].* |

Overall, the stakeholder groups have a high level of confidence that the PIPS3 Program progress performance is **strong** across all elements. The research group have the greatest confidence, likely reflective of their detailed insight into how their projects/ components of research are progressing.

The feedback from service providers assisting in delivery of AP19006 demonstration sites indicates that there are improvements to be made in supporting the team to apply consistent protocols across sites to ensure quality data outcomes:

- *Year one was a little struggle because it was difficult to source native seeds, and determine what TIA wanted. Was also waiting sometime on the insect monitoring and implementation was not explained. So really only getting everything up and running now- but going well.*
- *The trial site is all up and going but sometimes feel like the protocols etc not coming through quickly enough e.g., fruit quality, soil tests, parameters to be monitored……it's always us asking for the next step. Standard protocols need to be used across the sites.*

There are concerns that the concepts being investigated in the soil health space, and also the IPDM linkages, are complex and longer-term than the 3-year duration of the PIPS3 Program. This was also highlighted at the PIPS3 Program Team Forum held in March:

- *The project was always ambitious in terms of timeframes and timing- so we are a full season behind really.*
- *From a research perspective, have should have had the revegetation specialists involved in the project proposal as they would have highlighted that some of the milestones were not achievable and would have been more realistic. We could have done better at tailoring the project to what was realistic within the timeframe and progressed accordingly.*
- *It is extremely relevant but the 3 years will be a limitation as we won't have sufficient data as we are working on longer-term issues. Monitoring protocols- there have been lots of learnings and has taken time- working out what is feasible and learning techniques and baseline.*
- *Insufficient time to prepare the prior to sowing. Ideally native species plots need spray-out and preparation at least 18 months in advance- we have learnt this.*
- *Some uncertainty about the establishing of the native plots within the 3 years and measuring treatment impacts.*
- *Follow-up will be import and some is longer -term implementation of 5-20 years.*
- *It's going to depend upon the outcomes we learn as it requires a mind shift from deep fertilisers to more sustainable practices. We need to demonstrate the outcomes and this takes time and budget.*
- *Because this is the first of its kind in Orange it will need more iterations to demonstrate and convince about the benefits.*
- *It's a pity this is three years, it needs to be more like five. I think we need to think about PIPS4.*

Keeping the PIPS3 Program team informed of progress across the projects has been highly valued:

- *I think I was surprised about the expansive research and effort that was going on across all the projects. Really impressed with pushing ahead and getting good results.*
- *There is good open discussion & collaboration across the program.*

Local grower groups and commercial farmers value the regional and commercial presence of the PIPS3 Program, as well as the opportunity to link with the research at the Tatura SmartFarm:

- *We have a trial in WA which is important- local conditions.*
- *They have applied it across a number of different scenarios and sites.*
- *Put simply we don't seem to have as many opportunities to get out in front of growers- but local sites are important to keep coming back to.*
- *Because we have the advantage of using the best person in the field who has the relationship with the growers and the state association. The relationships are there and we have the trust.*
- *I think it's just good that they are doing it- they came to me and I think it works well. It's great that they work on the research farm and commercial farm.*

Linkages made with existing avenues for communications and extension is highly valued:

- *Mainly because I think using the fun aspect of using the SYU, we had so much interest from growers and links with FO and we got good communications through our WA magazine also. Association gives that pull-through.*
- *They are out there & learning all the time, I chat to Lexie to learn more about what's going on.*
- *In terms of linking in with the FO walks and I got a good sense of the activities and monitoring to date. Has been great to link- in for me as an FO e.g., link to the experts and the SYU campaign.*

## 3.2 RELEVANCE

| *OVERALL PROGRESS PERFORMANCE RATING* | *OVERALL PROGRAM STAKEHOLDER RATING* |
|---|---|
| **Strong** | **4.3** |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on delivering research outcomes and outputs relevant to the needs of apple and pear growers, service providers and other industry stakeholders by project end. Overall, respondents are very confident (4.3/5) that their experience with activities to date demonstrate the project deliverables will inform future orchard design and management decisions to combat seasonal and climatic conditions, assist in labour resources, and reduce unnecessary input costs and pesticide use.

**Table 7. Project relevance evaluation finding**

| *PROJECT* | *PROGRESS AGAINST KPI REVIEW* | *Q3.RELEVANCE OF OUTCOMES/OUTPUTS* | *COMBINED RELEVANCE EVALUATION* |
|---|---|---|---|
| **Program** | Strong | 4.3 (n=4) | **Strong** |
| **AP19002** | Strong | 4.2 (n=8) | **Strong** |
| **AP19003** | Strong | 4.1 (n=7) | **Strong** |
| **AP19005** | Strong | 4.3 (n=6) | **Strong** |
| **AP19006** | Strong | 4.4 (n=17) | **Strong** |
| **Respondent Av. (n=36)** | | **4.3** | |

Breaking the evaluation down at the project level, the projects are considered **strongly** relevant. In the desk-top review, PRG (program & project as relevant) were reviewed for member feedback and input, and how the program/ project responded to this through noted actions.

There were indications that certain components of research have demonstrated relevance immediately with growers and service providers involved in the research of AP19003 and AP19005, particularly in relation to the validation of the Green Atlas Cartographer® , shade netting technologies and learning more about temperature effects on fruit colour development and fruit quality. There was little commentary on research components that are a continuation of PIPS1 and PIPS2, such as planting systems and rootstock experiments, and there were no responses in relation to chemical signalling influence on floral initialisation, likely a reflection of less promotion of this research activity to date.

Whilst respondents were very satisfied (4.4/5) that AP19006 research focussing on ways to improve soil health in orchards and gather industry data for the first time on the benefits of improved soil management was relevant, a number of respondents cautioned against ignoring the practicalities of implementation and highlighted the need to demonstrate the economics of implementation and potential to reduce input costs. Again, while there are indications that some of the strategies being demonstrated at the regional sites are already adopted to a degree by some orchardists, respondents recommended the need to demonstrate the benefits long-term as the concept with be a "hard sell" to other growers.

**Table 8. Stakeholder relevance evaluation finding**

| *STAKEHOLDER GROUP* | *PROGRESS PERFORMANCE RATING* | *REPRESENTATIVE QUOTES* |
|---|---|---|
| **Research (n=10)** | 4.0 | *There is quite a bit of interest being driven by input costs- herbicide & pesticides. It is really relevant at the moment given rising prices. We need to give them the info and they need to act.*<br>*When you set-out you are pretty optimistic that they going to be practical outcomes but there are always some bumps to ensure relevant to growers.*<br>*Lots of engagement with growers so far, we think the technology is there, and it's becoming trusted but may take some time to introduce to the business model.*<br>*We are not developing new technologies but we are adjusting to make this useful and easily interpreted by the growers. A key objective has been the validation- it does what it says it does- the validation of yield results in an independent way is extremely valuable for the industry- they can have trust in our technology [commercial contributor].*<br>*It is extremely relevant but the 3 years will be a limitation as we won't have sufficient data as we are working on longer-term issues. Monitoring protocols- there have been lots of learnings and has taken time- working out what is feasible and learning techniques and baseline.* |
| **Grower (n=11)** | 4.4 | *Despite some growers not being so sure, I think a lot of growers are going in the right direction through the PIPS3 Program.*<br>*Good to see funding behind this Green Atlas stuff. If they can get the algorithms then there are real opportunities.*<br>*This has got lots of potential but need to be assured of the growers scenario- may need adaption.*<br>*It will be relevant but there will be so many more factors that affect what they do and will have impact.*<br>*It's always great when they take our input and respond and change direction through what they see.*<br>*Really important and where it could lead to. There are practicality issues for the cover crops- such as seed access. Flowers that blossom may also take bees away and harbour pests, so the monitoring will be important. Variety in the inter-row is important and perhaps the natives will be hardier and tree-line treatments get the soils active (e.g., microbial activity) which is critical. Water retention could be better and extremely relevant and important for the future.* |

| | | |
|---|---|---|
| **Service Provider (n=15)** | 4.4 | *All very relevant and takes some time to get everything through.*<br>*The soil health information and species within the inter-rows and tree-lines is integral, as well as the IPDM controls.*<br>*I certainly believe in this- some growers may not see it but I do.*<br>*Extremely relevant but will be a longer & harder sell. They are used to spraying or mowing and not thinking too much about below the ground other than compaction and moving over the surface. Putting the whole package together around nutrients will take longer.*<br>*Sometimes the implementation that these research projects come-up with are not practical and it's not until the research gets into our hands as advisors we see if they are practical. What's good is the management of risks are being looked at. There is a guideline to inter-row species in wine (NSWDPI)- we need something very similar for apples & pears. I use this and adjust it for my clients.*<br>*In the fact that growers are really getting mindful of farming the land and what they need to put into the soil to get out of it. Carbon farming, climate issues are important and growers know this. Consumers are looking for this- growers being more mindful of the environment.* |

Growers and service provider respondents were equally very satisfied (4.4/5) that the research is relevant to their stakeholder groups. There was a common thought expressed that their groups are likely to take an interest in certain components of the research as it unfolds, dependent upon their interest and what they believe may make a different to their systems and profitability, therefore extension of the research needs to consider this in the future:

- *Different components suit different growers as the research is so extensive and broad. Some of it depends upon how the long-term outcomes might look. Inter-row and side strips- waiting for the outcomes on this as we are already implementing.*
- *it's a gradual process. There are very few things that are picked-up immediately. Constant reinforcement is needed. Growers are visual and so the extension can be ready.*
- *Some overtime will be more relevant and uptake will be specific. Timeframe also will come account. If you look back at PIPS1 & PIPS2- what has been up-taken? Where there has been direct interaction with growers, uptake has been better.*
- *Nothing like "wow" I will do that. The smallest things I pick-up and run with into general practice. Always pick-up something.*
- *The way the message is being delivered through APAL newsletter and magazine is much better than it used to be. I integrate research into all my advice as soon as I think it is relevant.*

There was also a certain level of confidence that “sustainable orchard” concepts are not necessarily a new and that the PIPS3 Program research will assist to provide the data and discussion platform needed to bring others in the stakeholder groups onboard with realising the relevance:

- *It is so strong- growers are integrating [sustainable practices] into their thinking.*
- *IPDM is being pushed now by us- keeping things like parasitoids safe and not broad-spectrum sprays- but we need more confidence in things like the Mastrus and then we can use softer chemicals. Exporters are strict on ERLs so anything we can do in that space helps.*
- *I've picked-up that the species being trialled are likely not more beneficial than the practices I am implementing- mow and throw. This is not a negative, just reinforces I am doing a good job. The practicalities are an issue and can be expensive but where I am at- somewhere in between- is a good balance. The trial is allowing all growers to consider pros and cons- Food safety, worker safety. Principles around this are important and having the discussion.*

The “openness” of the PIPS3 Program research is appreciated by all stakeholder groups. It is viewed as an opportunity to learn and be involved in the research journey:

- *At this stage we haven't [made changes] and not saying we won't just sitting back and waiting- comes to the practical side- how we can utilise the strategies without destroying it or getting the establishment. Considerations around irrigation. Being organic we are interested to see what other insects are being draw-in and this is where I am really happy with Steve Quarrell- lots of respect. Some may have been there but we are monitoring now and will have everything documented and we have confidence in the person.*
- *Has changed the conversation as we are discussing what the project is doing- has changed my personal focus and observe what growers are doing. Was grass before, now I see it as something else in the inter-row and tree-line. Also very interested in looking at other projects and seeing why that works over other technologies e.g., the cartographers V another technology in Tasmania that seems to be the same. Arms [me] with the right questions.*
- *We intend to take the learnings as we see them, we don't want to keep spraying weeds. We want different options. The other benefits other than weed control will be important. We may be able to reduce nutrients that could [result in] cost input reductions*

## 3.3 APPROPRIATENESS

| *OVERALL PROGRESS PERFORMANCE RATING* | *OVERALL PROGRAM STAKEHOLDER RATING* |
|---|---|
| **Strong** | **4.4** |

Across both the desk-top review and interviews, the PIPS3 Program has been given a **strong** rating on its progress performance relating to delivery of appropriate communication and extension of the research in the first half of the project. The desk-top review included collation of communication analytics by the APAL communications team, as well as higher level analytics from Agriculture Victoria (HIN and extensionAus sites) and the Tasmanian Institute of Agriculture. Unfortunately, participation and evaluation of the 2020 and 2021 FO® walks that the PIPS3 Program projects played a major role in hosting (at trial sites), and providing substantial content into, were not made avaialble to this evaluation process. Appendices 2 and 4 provide detailed information on the outputs to date.

As an indication of the depth of the PIPS3 Program penetration, the combined efforts of all projects to date has resulted in 32 PIPS3 Program publications in *Industry Juice* (1430 click throughs) 17 You Tube videos produced and released through IJ (3182 views, average view time 1.40 minutes), 16 articles published in AFG across 7 editions (990 readers per edition) and 52 social media posts across Twitter, Facebook (3507 engagements), 3 mainstream media articles and 2 television primetime news articles. Although the PIPS3 Program webpage, hosted by APAL, was hampered by resourcing issues resulting in the page not launching until mid-2020, PIPS3 Program content has had 4249 page views with an average view time of 2.45 minutes. The PIPS3 Program “resources” page has an average view time of 3.41 minutes. These outputs exceed the planned activities of the PIPS3 Program C&E Plan by 45%.

Overall, respondents rate the value and appropriateness of the PIPS3 Program communications and extension as highly valuable (4.4/5) in engaging the intended audience in the research to date. The key message from respondents that was that the use of multiple engagement avenues was highly effective and important to continue for the PIPS3 Program. Respondents generally believed that growers and service providers of the industry learn in different ways. Videos are deemed successful for time poor and visual growers, whereas service providers prefer longer, science backed articles. There were also a number of growers who embraced the

opportunity the PIPS3 Program offered in exposing them to detailed science underpinning recommended technologies and practices, with articles often read over a longer timeframe. Face to face orchard walks, with researcher interaction, is the preferred method of extension but it was understood that this had been difficult to execute in the first half of the project due to Covid restrictions. Feedback from respondents who had attended FO® walks where PIPS3 Program researchers had hosted, presented and conducted discussion in the orchard believed that the content and opportunity to ask questions was invaluable to their increased knowledge and understanding.

**Table 9. Project appropriateness evaluation finding**

| *PROJECT* | *PROGRESS AGAINST KPI REVIEW* | *Q7. VALUE OF PIPS3 AS COMMUNICATED & EXTENDED VIA THE C&E PLAN* | *COMBINED APPROPRIATENESS EVALUATION* |
|---|---|---|---|
| **Program** | Strong | 4.5 (n=4) | **Strong** |
| **AP19002** | Strong | 4.3 (n=7) | **Strong** |
| **AP19003** | Strong | 4.6 (n=8) | **Strong** |
| **AP19005** | Strong | 4.3 (n=6) | **Strong** |
| **AP19006** | Strong | 4.6 (n=17) | **Strong** |
| **Respondent Av. (n=35)** | | **4.4** | |

Across all projects, agreement achievement criteria associated with engaging the apple and pear industry, as well as the science community, have been achieved and exceeded. The contributions made to both project and program level activities by the PIPS3 Program team members has resulted in a **strong** rating for all projects. Project respondents certainly supported the desk-top review with project ratings between 4.3-4.6.

When asked about the most effective communication or extension activity conducted by the PIPS3Program, from their perspective, the "Soil Your Undies" campaign, conducted by AP19006 in Tasmania and Western Australia, had the most mentions (11). Respondents believed that the campaign provided a "fun" platform on which to start the conversation at FO® walks, and on social media, about soil health and commence a journey to learn more about biological activity in the soil and the potential impacts of management practices. AP19006 respondents also valued regional newsletter articles in South Australia and Western Australia, with NSW respondents noting that the PIPS3 Program trial is often included in the AFG regional report by FLA, Jess Fearnley. There was feedback from South Australia that to date there has been no field events and this needed to be a focus of the second half of the project, especially when first year results are avaialble.

The Pear and Apple IPDM Community of Practice (CoP), an activity of AP19002 conducted by Agriculture Victoria, is considered a unique and valued platform for service providers to share and exchange on research, experiences and current issues regarding pest and disease challenges. However, respondents also believed there was opportunity for more new and innovative information, sometimes exchange being constrained by "company line" communication. Some ideas shared were to meet once or twice per year in-person, provide a short update on the PIPS3 Program each month (possibly with a particular component of the multi-pronged AP19002 project in-focus each time) and linking more with existing young farmer groups. Generally, there is a sense that the newer generation of orchardists have not had the same opportunities to build their knowledge and develop skills in IPDM practices. The CoP may be well positioned to not only "discuss" but to increase communications and skill training in IPDM, using its member base. The associated Facebook Group totals 145 members, with 78 active in

the first-half of the project: 40 posts with 187 reactions, the top two posts were group members posting questions with other members commenting to problem solve. While the Facebook Group is valued, respondents suggested a campaign to have more growers join would be beneficial.

The most successful social media communication activities to date relate to the SYU campaign, with two-thirds of the PIPS3 Program engagements derived from SYU posts and an average web page view time 4.06 minutes (TIA). The APAL communications team recommended at the 2022 PIPS3 Program Team Forum that linking communications to innovative events/ campaigns of the PIPS3 Program going forward is highly recommended as the analytics clearly demonstrate this approach gains traction.

All projects have had success with the reach of videos prepared in collaboration with the Program Coordinator. *Advancing sustainable & technology driven apple orchard production systems* (415), *Native Species in the Orchard* - AP19002 (319) and *AP19003 December 2021 update: Irrigation scheduling at Tatura SmartFarm* (316) were the top performers by early 2022.

**Table 10. Stakeholder appropriateness evaluation finding**

| *STAKEHOLDER GROUP* | *PROGRESS PERFORMANCE RATING* | *REPRESENTATIVE QUOTES* |
|---|---|---|
| **Research (n=10)** | 4.5 | *There has been a combination of different types of outputs- articles, videos, walks- lots of variety and mechanisms which is great. Videos are really accessible, through to scientific journal.*<br>*The SYU as it has led a conversation about soil health and soil biology. Gets people talking about orchard floor management- key for the project.*<br>*The CoP is really coming into its own now. It started slowly but in the last six months it has really stepped-up- they are engaging now and wanting to participate.*<br>*The FO walk with apple growers in November was a great group who were really engaged- that was about the time the perception of the technology changed- to trusting but still needing to understand the cost effectiveness and other benefits. Was excellent feedback- they believe the accuracy of the data is good [in relation to the Green Atlas® Cartographer], it's just that the focus on the cost.* |
| **Grower (n=10)** | 4.6 | *SYU undies has built understanding and at FO gave things a real lift.*<br>*I read the magazines [AFG] as everything ends-up in there and I pick-up bits and pieces I can use. I look at IJ but printed is what I prefer. I think a mix of everything is good- we have learnt more about all of that through Covid.*<br>*Videos are relevant as you learn more through seeing. I am time poor so a quick video you will make time.*<br>*Those videos are bloody good. I think they are a good outcome. I think a video is better than an article.*<br>*The new program coordinator is much more active/ interactive across the group and the communication is much improved from the grower perspective and is highly visual. It's a different approach and that's so much better.* |

| | | |
|---|---|---|
| | | *It's invaluable to have the research group [TIA] work for our industry. The industry is getting harder so anything we can find to make our businesses profitable is beneficial.*<br><br>*To stand in the field with a hardcopy in-hand and the researchers to talk to- this is the most effective and important.*<br><br>*A written account is important and triggers memory of what I have seen at the FO Walks.* |
| **Service Provider (n=15)** | 4.3 | *I think we have done a great job- using various mediums- magazines, eNewsletters, YouTube- something appeals to everyone. Videos are well watched and we can track this.*<br><br>*In terms of linking in with the FO walks the extension has been excellent. I got a good sense of the activities and monitoring to date [on the trial sites]. Has been great to link- in for me as an FO e.g., having access to the experts and SYU.*<br><br>*The CoP meetings are interesting to learn more about the major issues and what growers are going through. Gives me good connections as a researcher to the advisors. The different presenters are great.*<br><br>*The contents, speakers of high quality, and relevance to timing has been great at the CoP- such as Codling Moth.*<br><br>*I think its running well. I am seeing so much going out across the board.*<br><br>*Been keeping-up through AFG and I view this type of info paramount to my job.*<br><br>*PIPS3 is far better than 1 & 2- the communications & extension is much improved.*<br><br>*It's going really well, great coordination, strict [PIPS3 Branding branding], which is good, see all the publication coming out in different mediums and across platforms.*<br><br>*Case study approach to articles is quite good e.g., the recent summer AFG article by Alessio Scalisi on Green Atlas® validation findings to date which was 2 pages in length. The videos and articles will be really important longer-term given field days come and go. The program is operating in a hard environment so having some tools for later when growers are in the right frame of mind will be important.*<br><br>*We like all the materials- videos & articles can be shared through our own channels and that's really important as PIPS3 is shared even further.*<br><br>*One of my portfolios with VFG is an Emerging Leaders program (young growers) and this is an opportunity for the PIPS3 IPDM project to deliver great information as they are hungry for information- captured audience. Target a key group that are looking for new information and want to run with things- then they are more likely to attend field days.* |

A flagship campaign is an opportunity to have the right conversations in a safe and jovial environment for growers, with greater traction using local established networks:

- *SYU was certainly a spotlight to get soil health out there. Gave others a chance to participate in the project and share the information back to other growers.*
- *Mainly because I think using the fun aspect of using the SYU, we had so much interest from growers and links with FO and we got good communications through our WA magazine also. Association gives that pull-through locally.*

Having an active program coordinator driving communication and extension activities is viewed integral across all stakeholder groups and is drawing increased participation from the research team in delivering communication and extension activities:

- *History in a department had extension specialists, so now we are in an environment where we are doing the extension and having to work in a general orcharding environment. Program approach is a good way to develop this so it's working.*
- *This PIPS3 Program has had so much more content. IJ has been a great one and can click if you want to. Bit of both is good for me- certainly been watching the videos as articles are a bit long. It's great that we can click through from our phone. Researchers coming to us is important- networking and growers seeing and believing.*
- *The coordinator is doing a good job. You are keeping us all progressing along and have lots of good ideas.*

All stakeholders groups value meeting face to face to discuss findings and have the opportunity to ask questions of one another, resulting in longer-term impact. Whilst the FO model, in partnership with APAL, was welcomed, there is a general belief that more "airtime" is needed and PIPS3 Program separate events may be beneficial, with enthusiasm for a researcher "roadshow" throughout the regions:

- *Presentations at FO are key- face to face. Growers talk afterwards about these.*
- *PIPS3 specific events so the message is not diluted through FO model.*
- *A simple one- a roadshow where the researchers get out and about to the progressive orchards and physically talk and show. Or at least be at all the fruit conferences across the regions.*
- *We also need to have more of a conversation within all regions as we have in Tas- more PIPS3 Program specific events.*
- *PIPS3 researchers to go to all regions and have that engagement would be really good. What is lacking that personal contact.*
- *PISP3 Roadshow would be great- from Tassie to our regions- soil specific.*

Local commercial trials/ demonstration delivers greater confidence that the research is relevant, no matter the outcome, to growers of a particular region and provides a platform for local engagement:

- *You are the right track about demonstrating across the regions. Next step is to show it can keep going and not just for the project. Needs to show longer term and tangible and practical ways to implement. A lot of growers want "what's this worth to me"- demonstrate a block over a long-term has better pack-out and reduced input costs. Idea like "Paired Sites".*
- *Really important that the same thing is being trialled in other regions so that there are multiple sites and locally relevant.*
- *Grower talking to a grower is really valuable- the practical implications and solutions can be shared.*
- *I think what works well is how we have the regional sites so they are engaging for the local growers…… While the outcomes are probably relevant, the growers glaze over it because it's not here.*
- *I look for presentations locally. We need walks and talks in-field & most growers do- they turn-up!*
- *Most growers are willing to adapt if they can see it locally.*
- *Straight research is very sterile. Growers like to get out and see- both failures & successes. As long as at the end of the program we can say it worked but may need some amendments.*

The respondents shared opportunities for the PIPS3 Program to increase its impact through communication and extension in the second half. There is a strong demand for the economic narrative to be shared along-side the sustainability narrative, as well as case studies from the grower perspective, in the second half of the project:

- *Putting out some more case studies, including the AFG, with economics- costs to implement.*
- *Need some cost benefit analysis. Quantifying the establishments costs at the moment.*
- *Growers want to know the economic benefits or even just the costs in establishing- will it make life easier? Cost out alternatives as well.*
- *Fact sheets with tips and recommendations- more confident statements. Maybe this for advisors and then agronomists do local/ seasonal interpretation of this.*
- *Bring a grower inside the project structurally that would dedicate one of his blocks so we have the business insights and we can deliver the scientific strategies- then bring these together- case study approach with an economics.*
- *We need to be able to talk to the consumer to let them know we are cleaner & safer- get message out. Economics around the research for growers- economic benefits will see adoption.*
- *Need to avoid going into the files and be communicated in a way growers are interested e.g., case studies and trusted researchers .*
- *We need more economic analysis. We may have this wonderful data but it may not be feasible. Labour for maintenance, input costs/ reductions- finding the right balance for a business.*
- *Putting out some more case studies, including the AFG, with economics- costs to implement.*
- *Ultimately down the track we need to demonstrate tangible benefits in sustainability and profitability- economic case studies and also being able to physically look and see what has worked as well as what has not worked. I don't think we can underestimate what has not worked. If there are benefits from the treatments- how do you adopt this at a commercial level- the practicalities. Having growers relate their stories on practical solutions to implement.*

Taking the opportunity now to refocus the narrative on cover crops in the inter-row may result in simplifying the messages and demonstrate consideration for challenges in establishing native species:

- *There have been so many key learnings and bringing together different technical knowledge/ systems- production focused and revegetation. We need to look at a staged approach- i.e., weed control, then grasses, then manage these, then input planting of tubestock of flowering plants- spreads effort and costs- then finally get the orchard floor of the open canopy that we need.*
- *The grassy mixes seem to be doing better and are less of a shock to growers.*

Continuing to ensure PIPS3 Program researchers extend and communicate within the broader tree-crop research community benefits the industry longer-term:

- *Science publications are extremely important. The findings/ data gets lost or redone in ten years' time if we are not publishing.*
- *Benefit for me has been exchanging with other researchers and also sharing at the international level. Growers actually like that validation of our work and also like us bringing back ideas from other regions/ countries.*

## 3.4 EFFICIENCY

| OVERALL PROGRESS PERFORMANCE RATING | OVERALL PROGRAM STAKEHOLDER RATING |
|---|---|
| **Strong** | **4** |

Across both the desk-top review and interviews, the PIPS3 Program has been rated as **strong** on its progress performance on project partners work collaboratively to deliver an efficient *program* approach to research, extension and communication activities. The PIPS3 Program is seen to be successfully delivering a cooperative research effort for the industry, with evidence that both formal and informal exchange between project team members, and especially the research leaders, is resulting in reduced duplication of effort (i.e., shared soil testing and IPDM monitoring protocols) and a willingness to share knowledge (i.e., PRG, Leadership meetings and team forum). The benefits of shared research trials in both Tasmania (AP19002 & AP19006) and the Tatura SmartFarm (AP19002, AP19005 & AP19006) include co-operative problem solving, and increased understanding and generated data on the influence of treatments upon multiple factors within the orchard system. Similarly, the benefit of having shared researchers across projects has resulted in expediting opportunity for cross-project updates and information on findings within project teams.

Overall, respondents rate a program approach as highly successful (4/5) in delivering increased research efficiencies, knowledge exchange between researchers and grower impact through extension & communications.

*"Instead of having silos, there are project outcomes that work interactively as that's how a farm works! It's highly import they talk to each other and know what the outcomes collectively will be. There may need to be modifications based upon talking to one another- it's collaboration." [PRG Member & Grower]*

**Table 11. Project efficiency evaluation finding**

| PROJECT | PROGRESS AGAINST KPI REVIEW | Q9. SUCCESS OF PROGRAM APPROACH IN DELIVERING EFFICIENCIES | COMBINED EFFICIENCY EVALUATION |
|---|---|---|---|
| **Program** | Strong | 4.3 (n=4) | **Strong** |
| **AP19002** | Strong | 4.1 (n=7) | **Strong** |
| **AP19003** | Strong | 4.4 (n=6) | **Strong** |
| **AP19005** | Strong | 3.7 (n=6) | **Strong** |
| **AP19006** | Strong | 3.9 (n=13) | **Strong** |
| **Respondent Av. (n=30)** | | **4.0** | |

Across all projects, there was a **strong** rating determined for efforts being made by teams to improve the efficiency and value of research, extension and communication activities, especially through exchange of information when requested, and a willingness to exchange on methodology and season one findings.

The only project to rate **moderate** in the interview results was AP19005. Some research respondents were sceptical that a program approach was delivering any improved benefits above those that would have occurred operating as an individual project because three of the four research projects are led by Agriculture Victoria,

therefore, collaboration may have occurred through organisational structures regardless. This is in contrast to AP19002 research respondents from Agriculture Victoria who believed the PIPS3 Program had provided exposure to trusted researchers within their organisation who they had not had the opportunity to collaborate with in the past.

**Table 12. Stakeholder efficiency evaluation finding**

| *STAKEHOLDER GROUP* | *PROGRESS PERFORMANCE RATING* | *REPRESENTATIVE QUOTES* |
|---|---|---|
| **Research (n=10)** | 4.1 | *Initially sharing project plans and methods was good. Having the AP19002 site on-site has been great for keeping up to date with that.*<br>*Program is way better than individual isolated projects- because you have more critical mass to draw upon. The bigger overall team provides advantages to pick-up the phone or have small meetings. Have done lots of past work in isolation and that's really hard.*<br>*Not a 5 because these links are still being built- Soil Health & IPDM is still a little siloed but we are getting there. Links with TIA means there has been a culture shift. Getting to know Ian [Goodwin] and working out the relationship between projects has developed.*<br>*Linked us with Steve Quarrell to bounce ideas around, sourcing and get good advice. Together we have found common issues and explore solutions. Looking forward to more contributions to the soils project- has taken some time to get the soil monitoring protocol which meant we missed the boat a little and also had to repeat sampling.*<br>*Sometimes people just concentrate on one aspect, but the program allows us to investigate and communicate the relevance and connection between all aspects of the program.* |
| **Grower (n=9)** | 4.2 | *Anytime they [researchers] are collaborating is adding value.*<br>*It's vital that all the elements are considered across the system- we are talking about a tree that relies upon so many aspects- soil, sun, temperature, crop load- the understanding needs to all come together.*<br>*It gets more growers together- more growers involved across the program operations provides more insight on issues to be considered i.e., cost savings with irrigation, rootstock etc.*<br>*Really important that the same thing is being trialled in other regions so that there are multiple sites and locally relevant.* |
| **Service Provider (n=11)** | 3.7 | *It gives the growers the message that it fits into a broader plan. The PIPS Program is brilliant as it's varying researchers but also being replicated across regions. Better to show how it all fits together.*<br>*Shared knowledge is important to consider all the parts.*<br>*The program approach really brings the researchers together.*<br>*Doesn't make sense to me as some of these projects need to be longer-term (i.e., soil health) to get the long trends. May be needed to deliver in themes.*<br>*Only because I think it's just starting [rating 3.5]. Covid had a big impact. It will get better. As an overall program demonstrated to growers- the integration is coming across well.*<br>*Gives a common format for researchers and gives more of an extension focus which is critical.* |

| | | |
|---|---|---|
| | | *Forum was great in comparison to the past PIPS.*<br>*The Program Manager is doing a good job- keeping us all progressing along and have lots of good ideas.* |

Researcher respondents largely believed that the PIPS3 Program model was delivering greater collaboration between the project teams, resulting in knowledge exchange that would ultimately deliver increased, quality-driven outcomes for the industry by project end (4.1/5). Respondents were motivated by opportunities to come together, such as the 2022 PIPS Program Team Forum, but were also wanting to be careful about adding more work to the current project. There were multiple respondents who highlighted the role of a coordinator in "gluing" the program together, including bringing the right people together across research, extension and communication to deliver a more seamless thread between "theory" and "practical application".

Grower respondents provided the highest rating (4.2/5) on industry research being delivered as a program. A number of respondents highlighted that their orchards operated as a system, so it was important to them that parts of this system were not compartmentalised. By having researchers share information across the system, they believed there was greater consideration for how treatments, and subsequent findings, may interact and impact upon other parts of the system, and therefore solutions and recommendations that have multiple benefits within the orchard system will result by project end.

Whilst service provider response resulted in a **moderate** rating (3.7/5), the comments provided clearly indicate that this stakeholder group are only beginning to experience the benefits of the program approach and believe there will be more opportunities in the second half of the project to engage more fully across the program:

- *Only say that at the moment because I haven't heard heaps yet, but there is great collaboration within our project team. Next week's forum will be great. I think the program itself is really well run and the integrated research outcomes across the program to growers will be really great.*
- *Not heaps of exposure but need more of it. Would be good to have cross-program webinars.*
- *Only say that at the moment because I haven't heard heaps yet, but there is great collaboration within our project team. Next week's forum*
- *The program forum was extremely well done. In the future it would be great to have the growers there.*

At the conclusion of the 2022 PIPS3 Program Forum, attendees were asked to express their take-home thoughts and possible adjustments/ tweaking they believe may be appropriate for their component of work after collaborating face to face over two days:

- *A key thing I have taken away is the different components of research I didn't know were going on and I have already had conversations with others in the room on other potential collaborations.*
- *Everyone is working together and linking-in. It's good to see the team working together on challenges that need a broad knowledge such as climate change issues.*
- *We are not alone on some of the challenges we are having, they are happening everyone {native plantings]*
- *We have achieved so much integration across the program, for example I have met and am now working with three researchers who also sit at AgriBio that I haven't had the opportunity to work with them again.*
- *As an extension person, coming together to hear the breadth of research has been motivating and given me ideas on how I may extend this to growers.*
- *It has raised some ideas on how we may be able to link together with*
- *What an impressive amount of work a small group of people can achieve.*
- *Seeing the Cartographer, IPDM and cover-cropping work is being conducted and how it all comes together.*

- *I have learnt more about each of the projects and it has got me thinking about other opportunities to collaborate with other projects we have going-on within AgVic*
- *I have never met the Tasmanian team before and now we have so many opportunities to work together and generate ideas on what can be done.*
- *We have a project and budget that has been designed and set in concrete, so we need to work enthusiastically together on how we can prepare for PIPS4 otherwise we will become too stretched in this project.*
- *As a researcher, hearing more on the extension strategies we need to consider and seeing how we can trace communication analytics has been really interesting and made me think about the way I can potentially communicate the research for the audience.*
- *I am reminded of the breadth and wealth of information, experience and knowledge here, and how lucky the industry is to have these people helping it prosper and go forward. But as a communicator it has reminded me of how time consuming it can be, that we don't always have a quick outcome that we can say "do this on your farm now, this has 100% been proven" . Often there is no definitive answer so we need to be comfortable sometimes that we just need to keep the industry aware of what is happening, where it is making small steps, where these might be leading, but not making any big headline statements.*
- *Much better awareness of the "mini" experiments going on that I wasn't aware of and also useful knowledges on what I can communicate, even being more aware of the limitations and challenges.*
- *Visiting Maurice's place this morning made me refocus on how much a grower has to contend with and provided a reality check on whether growers really have the time to implement some of the strategies we are exploring.*
- *It's the conversations we have had over the last couple of days has been incredibly valuable in not only tweaking the current work but thinking about the next generation of work- we need to be starting now to think about these things.*

## 3.5 LEGACY

| OVERALL PROGRESS PERFORMANCE RATING | OVERALL PROGRAM STAKEHOLDER RATING |
|---|---|
| **Strong** | **3.8** |

The intermediate (>5 years post-project) ) and longer-term (>10 years post-project) outcomes of most agricultural R&D project are difficult to predict, however, the mid-term evaluation endeavoured to gauge how confident respondents were feeling, at this time, that project activities would increase knowledge and understanding, and the extent to which adoption of the outcomes are likely. Whilst the overall response resulted in a low **Strong** rating of 3.8/5, breaking the responses into the two separate components of "improved knowledge" and "likelihood of adoption", it is clear that at this time respondents are more confident in growers and service providers taking onboard latest learnings (4.1/5- Strong), but less confident about the likelihood of this new knowledge and understanding resulting in changed practices (3.4/5- Moderate).

**Table 13. Project legacy evaluation finding**

| PROJECT | Q.10 LIKELIHOOD OF IMPROVED KNOWLEDGE & UNDERSTANDING | Q.11 LIKELIHOOD OF ADOPTION | AVERAGE LEGACY RATING |
|---|---|---|---|
| **Program** | 3.8 (n=4) | 3.5 (n=4) | **3.6** |
| **AP19002** | 4.1 (n=8) | 3.3 (n=8) | **3.7** |
| **AP19003** | 4.4 (n=7) | 3.6 (n=7) | **4.0** |
| **AP19005** | 4.8 (n=5) | 3.7 (n=6) | **4.2** |
| **AP19006** | 3.9 (n=17) | 3.4 (n=16) | **3.7** |
| **Respondent Av. (n=35) & (n=36)** | **4.1** | **3.4** | **3.8** |

Breaking down the responses into stakeholder groups, all rate strongly on the contribution to knowledge and understanding that will result from the PIPS3 Program, based upon their experiences at the mid-term of the project/ program activities. The greatest confidence at this point is for AP19005, a project which is continuing a number of components of research from PIPS and PIPS2 (planting system & rootstock experiments, irrigation scheduling tool) and is undertaking new, highly practical in the eyes of growers and service providers, research into netting effects and temperature effects on fruit quality (especially skin damage/colour). Respondents of AP19003 and AP19005 indicated that they understood more fully the concepts being researched and had seen results already (previous PIPS or Green Atlas® Cartographer) that gave them the confidence to provide a strong rating.

The two projects that rated the lowest on likelihood of adoption from respondent experience at this time were AP19002 (3.3/5) and AP19006 (3.4/5). Both projects are tackling relatively new and longer-term concepts for industry, with no results yet released through extension and communications. Whilst there was strong confidence that knowledge and understanding would be improved, respondents conveyed that their current knowledge was relatively poor and any new information, extended simply, would result in increased knowledge and understanding. There was also a sense of "watch and see" in-terms of adoption, with an acknowledgement this may take some time, beyond project duration. Having these projects collect and analyse data on IPDM, soil health, tree health and production parameters, to back-up the sustainability benefit theories, was going to play

an important role in broader adoption across the industry according to a number of respondents. Also, being upfront on the economic impacts- both short-term input costs and long-term benefits, including market access, was deemed an important factor in cover cropping, tree-line treatment and IPDM practice adoption.

While stakeholders rated the likelihood of project outcomes being adopted, from their experiences at the mid-point, as moderate across the board, it is important to note that the timeframe for practice change within an agricultural R&D context can take years (or decades). It is rare for industry adoption of R&D to occur rapidly during or immediately following the completion of the underlying research, but rather, adoption occurs in stages depending on the overlapping of a range of other factors including the strength of extension pathways and stakeholders' appetite for risk and change (social aspects), and underlying market conditions. A wide range of social and economic barriers were identified by stakeholders, with the primary impediments being the perceived risk of missing out on lost productivity.

**Table 14. Stakeholder legacy evaluation finding**

| *STAKEHOLDER GROUP* | *COMBINED RATING* | *REPRESENTATIVE QUOTES* |
|---|---|---|
| **Research (n=10)** | 3.9 | *It will definitely improve AgTech knowledge and issues like colour development in pears…. Growers are always the first to be sceptical but I think we are already seeing it now, growers taking onboard- e.g., rootstocks, training systems & AgTech.*<br>*Step-change in knowledge from the project on how to structure projects and experimental orchards.*<br>*Uncertain because of the business case more than anything else [on Green Atlas® technology uptake.*<br>*They definitely learn more but whether they will take it up is another thing. Just the fact we are talking about it is really important and a big step. Growers responded that they don't think about floor management- this is changing that.*<br>*I think we will have to rely upon the communications rather than the findings. We need to do more communications- mechanism is there but question is whether we can get enough convincing information out of the project.*<br>*It's going to depend upon the outcomes we learn as it requires a mind shift from deep fertilisers to more sustainable practices. We need to demonstrate the outcomes.*<br>*My concern with service providers is that most of them are selling something. It [may seem] in their best interest to not advise. There is potential for private consulting in this longer-term once we have the feasibility and outcomes to demonstrate advantages for businesses.*<br>*I've been told there are growers we will really have to work with as they stick to what they have always done- measure of success will with these who come onboard.*<br>*Based on the aspect of putting in natives [rating of 3 on adoption] but based upon monitoring for pests & these techniques much more likely. We need to demonstrate the benefits outweigh the effort and I am not sure we are going to be able to do this in a short project.* |
| **Grower (n=11)** | 3.9 | *We need to know more and then make that fit…Same old story. At first 5-10% will look at it, then the next 25% by which time next evolution has come along.* |

| | | |
|---|---|---|
| | | *Can't guarantee everyone, but pretty much supplying all the information that's needed.*<br><br>*Those that want to learn will do from this research, others will continue to do what they have always done. People need to see it happening- so demonstration and learning from those who have done it is important. When we had extreme temperatures, people noticed what we did. We like to see how others do it.*<br><br>*They tend to respond to their advisor or chemical advisor.*<br><br>*I've certainly learnt a lot about the technology, not so much on crop load. I know more on how technology can predict crop load.*<br><br>*Depends how well it is communicated. This [rating of 4 on K&U] is going off the level of comms I have seen so far from the PIPS3 Program. Otherwise, 3 in the past- without doubt.*<br><br>*The reason [for 3 rating] is that there is a huge range. There are those that are doing nothing to those who are really advanced. For the advanced, it will just reinforce, for those at the bottom, they should see a difference.*<br><br>*It is a bit dependent on people but you are putting the stuff out there.*<br><br>*Most growers are willing to adapt if they can see it locally.*<br><br>*Keep chipping away at it. Won't be immediate but build over time.*<br><br>*Purely because growers historically are very difficult to change [rating 3 on adoption]. Will depend on if it is proven to give them an economic advantage. Otherwise, they will stay the same.*<br><br>*Soil health is a big one. Someone summed it up well, we as growers will call the cover crops weed- I don't want to water and apply nutrients to the cover crop. Conventional farmers need to change our perceptions- if the project demonstrates a benefit (production, less inputs) then it is something that can be taken-on in a conventional space.*<br><br>*I think having the local site and the growers that are left around here are very willing and want to try. As soon as one person says it's worth it- we all give it a go.*<br><br>*Comes down to cost and return on investment. Low prices will be a barrier- they are long-term. IPDM can take a back step to commercial decision.*<br><br>*Going to depend on growers seeing the tangible benefit in relation to economics, tree returns and soil health. The low returns effect the changes people can make- it's been a challenging time. Like I said, over the last 18 months we have really seen a change in the improved communications and relevance of the program- we think a number of growers feel this way, not just us.* |
| **Service Provider (n=14)** | 3.6 | *Across the multiple projects- Green Atlas [validation work] will be really good, rootstocks many of them are already doing. Some is really cutting edge, others are more simple learnings.*<br><br>*Demonstration is really relevant and provides the evidence and place for discussion.*<br><br>*Regional site is a big influence.*<br><br>*I think a regional demonstration is a good start but there will need to be a long-term regional extension project following the project. We need the evidence then we can communicate the benefits.* |

| | | |
|---|---|---|
| | | *Confidence that the growers are really engaged and want to know more. If we didn't have interested growers, then I say we need to pull our finger out. They are already at a stage of looking for information.*<br><br>*I think that data and knowledge is really valuable.*<br><br>*Depends on each grower and the way they engage.*<br><br>*They will grab bits but not others. Some would be 5, others 1.*<br><br>*Implementing during another activity is important- evidence of impacts upon soil and planting responses. The evidence I point to at the moment is the RISK of not having a diverse inter-row and the benefits if you do- I encourage a trial first until they feel comfortable & point to the plants and benefits as we walk in the orchard.*<br><br>*It will depend upon the outcomes- those that have the more benefits and commercially viable, and have profitability links, will be the ones to be looked at by growers. I think the compost is the most likely and has the most interest of the grower. Simple and practical.*<br><br>*They need to see the need to change and often need the support to implement the change. They'll see something, but then look to their advisors & peers for advice- the research may simply stimulate the ideas.*<br><br>*It will be my intention to make it a 5 with the growers I work with, but there are agronomists who will focus on the pay-packet rather than the outcomes for growers.*<br><br>*the outcomes will be a lot longer term and therefore the adoption.*<br><br>*It will depend upon the outcomes but projects are working with the growers (on farms) then this is a way of increasing adoption.* |

Importantly, grower respondents expressed that there is a tendency for producers to take components of research outcomes and integrate them into an existing orchard system overtime. They expressed that while research outcomes are often communicated as “findings” with a “one size fits all” approach, they were seeking information on how to make changes to improve sustainability and profitability that were most appropriate for their system and most economical to deploy. Accordingly, respondents overwhelmingly believed the best way of learning how to adapt research learnings and outcomes, in a commercial scenario, is through visiting and talking to those who have already ‘led the charge’ and through local demonstration. A number of respondents highlighted that there are producers who are simply not interested in making changes, and others who they believe are already ahead of the research.

A number of grower respondents, primarily research host farmers who have been exposed to the ongoing research, conveyed that they had made some initial changes based upon their direct PIPS Program engagement:

- *I've changed my priorities of picking and thinning- in terms of which blocks I am starting at e.g., less fruit, larger fruit first. Has changed my way of thinking about pollinators- where they were and what they are doing. Implementing more pollinators as a result.*
- *We've stopped using herbicides and weedicides and provide for beneficials.*
- *Yes definitely. Rather than just mowing the inter-row, I’m thinking about management and the conversation is changing.*

There were also concerns raised about the associated practical application and upfront investment costs by this stakeholder group which need to be considered by researchers in order to overcome adoption barriers:

- *There are practicality issues for the cover crop- such as seed access. Flowers that blossom may also take bees away and harbour pests so the monitoring will be important.*
- *I think they are missing one of the key parts- how are we going to manage the practicalities of managing the cover crop. How to mow and manage? We are very keen and priced a single-side mowing head and it's 35k and we don't know if that's the best option.*
- *Sometimes the implementation that these research projects come-up with are not practical and it's not until they get into our hands as advisors if they are practical*

Understanding and addressing barriers to change where possible and reinforcing the key research messages through industry specific resources and extension is critical to achieving incremental practice change and industry impact. While this process can be supported with communication and extension throughout the R&D process, as the PIPS3 program is doing through the delivery of 145% of planned communication and extension activities and outputs to date, it's success is ultimately dependent on extension of the final research results in the longer term, following the completion of the research phase, with this responsibility falling to government agency, industry and private service providers (current rating of 3.6/5- Moderate). Importantly, the significance of this ongoing process was clearly recognised by all stakeholder groups and adoption is more likely to occur over time as final recommendations are integrated into industry resources and extension programs. This relies upon post-project use and uptake by those responsible for extension and communication outside the control of the PIPS3 Program research partners. It is, therefore, integral that the PIPS3 Program work to ensure the service provider stakeholder group is armed with the right information, packaged in the right way, throughout the research process to ensure their confidence to tailor outcomes for their grower audience and orchard systems longer-term.

# 4 CONCLUSIONS

The desk-top review and interview processes of the PIPS3 Program mid-term evaluation have found that each of the projects, and collectively as a program, the PIPS Program is progressing extremely well and is on a pathway to deliver quality outputs and short-term outcomes (project duration) for the apple and pear industry by June 30, 2023. Although impacted by Covid-19 restrictions and border closures, the leadership, in consultation with Hort Innovation, has navigated project creep risks well, ensuring that each project is well placed to deliver upon the agreed achievement criteria. Whilst certain delays have been highlighted in particular components of the research, sound adaptive management procedures have been put in place to guarantee not only the required output, but potentially better-quality outcomes for the industry longer-term (e.g., SINATA and *Mastrus ridens* culture importation).

The design of the PIPS3 Program is supported strongly by all stakeholder groups. A mix of research and commercial farm trials is delivering confidence that the final outcomes will be more practical and user friendly than past PIPS research. The second half of the program will provide increased opportunity for face-to-face engagement activities to be conducted on-site with growers and service providers, facilitating greater input and discussion.

It is strongly evident that certain components of the research effort were overly ambitious from the proposal stage and require increased research time (e.g., orchard floor treatment impacts on soil health, pest and beneficial insects and productivity) and/or opportunity to trial under a variation of seasonal conditions (innovative netting and heat/cooling effects on fruit quality). It is integral that the PIPS3 Program partners and PRG commence discussions immediately on extending the program or planning for PIPS4 in the next six months.

There is strong confidence that communications and extension activities being executed by both program and project level mechanisms is effective and highly relevant to growers and service providers. The evaluation has highlighted some areas that require further refinement, and ideas for greater impact in certain growing regions, though no wholesale changes are required. There has been limited opportunity for team members to present at industry or science conferences, with pre-recording presentations having to take place. There is evidence that the second half of PIP3 Program will see greater delivery on this front.

Overall, the PIPS3 Program C&E Plan is tracking-well and is significantly ahead of schedule. The partnership between the program, partner organisations and APAL communications and extension is working very effectively through the coordination of the independent program coordinator. Whilst opportunities to integrate PIPS3 Program activities into Future Orchard® walks has been welcomed and well-received by industry participants, PIPS3 Program specific events and resources may be needed in the latter stages to engage industry more effectively in the practical and economic outcomes of the research they are seek.

Collaboration is highly valued across all stakeholder groups and there is evidence that this is delivering resource and infrastructure efficiencies, and improved knowledge exchange between the research teams. Given Covid-19 restrictions have constrained face to face collaboration, this is a very positive outcome and promises to be stronger going forward.

## 5 MID-TERM EVALUATION RECOMMENDATIONS

The mid-term evaluation has highlighted some key areas on which the leadership, management and governance structures should collaborate to further advance the outcomes and impact of the PIPS3 Program for the apple and pear industry. These recommendations not only consider the final eighteen months of the program, but should be used to facilitate further investment planning agreement on research needing longer-term investigation, communication and extension:

1 **Undertake planning and discussions now to leverage further from current PIPS3 Program research trials:** There are components of research that will result in poorly defined outcomes or confidence levels from data collected over only two-seasons. Soil health, IPDM and climate variability research requires a longer-term focus, preferably over varying annual seasonal conditions/ weather events, to ensure the outputs are understood, meaningful and adoptable by the end user. Similarly, extension and communication beyond research timelines is needed to support improved knowledge, understanding and practical adoption of the tools and recommendations.

2 **Continue with a multi-pronged approach to communication and collaboration activities:** The use of multiple channels and medium for communicating the research is considered highly effective. In order to take this to the next level, the PIPS3 Program should execute the Soil Your Undies campaign across all regions and/ or consider other opportunities to link project activities to high profile events, deliver key messages and findings using a case study approach, and consider duration of videos and articles to better fit social media formats. Articles and videos should also be developed more specifically for each region where the messages and outcomes need to be tailored for local growing conditions (soil, climate, varieties, pest/disease considerations), and extended through local newsletters and social media.

3 **Engage with service providers and growers outside the usual Future Orchards® model of extension:** Service providers are viewed as a vital link in providing information to producers and should (continue to) be included with PIPS3 Program activities. Extension activities for service providers and leading growers that has the time to comprehensively communicate the underpinning science and economic imperatives is integral to longer-term adoption outcomes.

On-ground support for the program outputs will, to some extent, hinge on the level to which service providers feel they have beneficial new information and are equipped to communicate relevant messages. In IPDM, the apple and pear CoP has an opportunity to arm members with not only information, but skills in extending and training growers in IPDM practices, potentially through a business model.

Consideration could be given to increasingly engaging service providers in the research findings as projects continue to mature and the development of an end of project training module/workshop covering the benefits of the research findings and the tools. They could also play a role working with researchers in developing and delivering findings and practical approaches through program communications.

4 **Facilitate the development of relevant and effective messaging:** As the research begins to produce results, it is recommended that the PIPS3 Program (continues to) engage with relevant industry service providers to facilitate the development of clear messaging of project findings and the strategic delivery of resources to next and end users through existing agency and industry programs.

Each project needs to identify the narrative/s they need to prepare and promote in the second half of the project, based upon research experiences and findings to date. For example, AP19002 and AP19006 may need to reduce focus upon native plantings and amplify the narrative on generally diversifying the species (and therefore contribution of services) of the orchard floor, and the practicalities and financial realities of doing so.

5 **Develop PIPS3 Program case studies:** As the program heads towards completion, consideration should be given to the development of specific project component economic and orchard manager case studies. These could potentially include:

- A set of clear and user-friendly key messages for each project with an overt value proposition – i.e., clearly aligning recommended practices with economic considerations. If benefit proposition cannot be fully determined on the trial orchard/site by project-end, transparency on initial adoption costs with potential benefits analysed through a scenario approach could be considered;
- Written narratives or short case studies showing the benefits experienced from orchard trials, from the host farmer's perspective on how they have done things and how they overcame challenges;
- Tools developed within the PIPS3 Program that need increased promotion with clear instructions for use and benefits of long-term use (not just a once-off trial). Whilst

videos have been developed in certain circumstances (i.e., Irrigation scheduling tool), case studies can be embedded into industry and agency training.

- A series of videos (YouTube) including short case studies, how-to guides etc. These could potentially involve service and extension providers as presenters.

6 **Integrated soil, nutrient and irrigation master class materials:** The "Master Class" model is familiar to apple and pear service providers and growers. The PIPS3 Program highlights the need for a clear and trusted connection between latest research outcomes and practical action on the ground to improve adoption in this integrated topic area. The PIPS3 Program has an opportunity to commence dialogue with established extension avenues (APAL, NSW DPI, TIA, AgVic, Fruit Growers, Hort Innovation) on how to best prepare final project materials (new or updated information/ BMPs) that can be seamlessly embedded into existing extension and training. Conversely, these organisations could consider ways in which they can integrate researchers into the delivery model and provide compensation for their services.

7 **PIPS3 Program researcher roadshow:** Growers and service providers highly value an opportunity to interact with researchers and hear from 'the horse's mouth' on how research conducted elsewhere (farm, region or national variation) can apply to their particular region or orchard system. The PIPS3 Program should investigate ways for investment and resources to be made avaialble to personally extend final outputs and outcomes directly to all growing regions of Australia, through a series of field and workshop-based events, post June 30, 2023.

## Long-term Outcomes >10yrs

**The apple and pear industry has adopted tools and management practices required to operate orchards that:**

- Are resilient to climate variability and weather extremes;
- Use resources efficiently and sustainably;
- Apply biological and cultural solutions in the management of pests, disease and nutrients;
- Drive product quality and business profitability through use of automated/ mechanised advanced technologies along the supply chain; and
- Produce a low environmental footprint and sustainable product that meets consumer preference and expectations.

## Intermediate Outcomes >5yrs

- Informed understanding of interactions between cultural/biological/chemical IPDM & soil health practices leading to implementation of recommended sustainable orchard practices.
- Apple orchard design & management practices adopted that improve crop loading, maximise fruit yield & quality, minimise impacts of extreme heat events & foster greater orchard system diversity.
- Rework recommendations of pear orchard design adopted, underpinned by research findings of the yield & fruit quality potential of new cultivars & benefits of a sustainable whole system approach.
- Decision support tools adopted by industry: Pear irrigation scheduling, SINATA for apples irrigation scheduling & nutrient budgeting & Apple crop-load tool.
- Accessible, high-quality information on IPDM practices, economic benefits & costs leading to increased adoption of biological controls.
- Improved pear crop load management recommendations adopted to avoid biennial bearing and maximise fruit quality.
- Sensing technologies adopted that improve informed decision-making, leading to efficient production of premium quality product.
- Industry platforms for greater collaboration on productivity, irrigation, pests and soils are valued by industry growers/advisors as trusted sources of scientifically robust information & recommendations.
- Advisors & consultants are confident in providing sustainable management practice advice to apple and pear growers developed from PIPS3.
- Growers have adopted recommendations and tools of the PIPS3 Program and are able to demonstrate benefit through yield/quality, profitability and resilience gains.

## Short-term Outcomes (project duration)

- Developed recommendations for cultural practices that support orchard biodiversity for low input pest & disease management.
- Effects of orchard design on yield & fruit quality of new pear cultivars measured and subsequent management practice options devised.
- Commercial sensing technologies calibrated/ validated for industry to measure in situ fruit & tree parameters and establish orchard-specific crop load relationships.
- Chemical signals identified for apples that determine impact of high crop load on floral initiation & differentiation, and fruit size in the subsequent season.
- Improved efficacy of biological control of codling moth, LBAM, apple scab & root rot.
- Increased knowledge on the drivers of pear fruit colour development and degradation, and effectiveness of novel netting protection strategies.
- Relationship understood for apples between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation.
- Increased knowledge on sustainable orchard management practices & soil health, resilience, productivity/quality impact, incl. soil health indicators.
- Decision support tools developed, trialled & training of advisors/ grower conducted for improved decision-making & monitoring of orchard precision and sustainable management practice recommendation implementation.
- The PIPS Program has delivered as a high impact, collaborative and integrated research program.
- Stakeholders are effectively informed on research outcomes and the potential benefit of these for businesses profitability, industry sustainability, efficient resource management practices & local operating environments.

## Outputs

- Decision criteria for selecting native species mixes for biological control & soil health.
- Determination of physical, biological & chemical soil health indicators.
- Developed knowledge on soil health, pest & disease, & productivity (tree size & fruit number, size & colour) relationships.
- *Matrus ridens* genetic diversity, establishment & impact assessment monitoring tools.
- *Mastrus ridens* commercialisation plan
- Developed & trialled decision support tools – Pear irrigation scheduling, SINATA for apples irrigation scheduling & nutrient budgeting & Apple crop-load tool.

**Outputs of the PIPS3 Communication & Extension Plan**

- Peer reviewed science journal articles, conference papers and technical reports.
- Guides & technical fact sheets- skills training to support these in sensing technology, sustainable orchard practices & IPMD.
- Presentations at industry conferences/ events on research progress and findings.
- Case studies & videos: informational, peer exchange & on technology/decision support tool use.

**Program-wide**

- Websites established/ updated (APAL, ExtensionAus) & content maintained
- Broad media press releases
- *AFG* magazine & *Industry Juice* publications.
- Social media campaigns (APAL, AgVic, TIA)
- PIPS3 Future Orchards® event collaboration/ contributions
- PIPS3 specific field events and industry forums

## Activities

**AP19002 Project**

- Conduct conservation biocontrol field, glasshouse & laboratory experiments (*Mastrus ridens* & *Trichogramma spp*.).
- Cover crop suitability assessment.
- Conduct *Mastrus ridens* release, detection, efficacy & impact studies. Includes development & testing of pheromone detection methods.
- Conduct soil health, pest/disease, & productivity relationship field sampling & analysis.

**AP19003 Project**

Collect, analyse & report field experiment data:

- Rootstock, row orientation, fruit position & light exposure effects on fruit quality and floral initiation (Sundial orchard Tatura).
- Crop load effects on fruit quality & floral initiation (commercial orchard).
- Metabolic analysis of bud samples to identify chemical signals that influence floral initiation.
- Field testing of sensors technologies
- Orchard specific crop load algorithm determination for crop load decision support tool.

**AP19005 Project**

Collect, analyse & report field experiment data:

- Continuation of planting system and rootstock experiments
- Crop regulation
- Functional yield relationships
- Sensing technology 'proof-of-concept' and calibration
- Decoupling heat and light
- Novel netting
- Undertake development of pear orchard irrigation scheduling tool (excel based)

**AP19006 Project**

Collect, analyse & report on sustainable floor management field experiment data across five growing regions:

- Inter-row treatments- native & general meadow cover-crops
- Tree-line treatments- legume mixes & mulches
- Physical, chemical & biological (microbial, carbon) indicators and parameters investigated.
- Develop data package and grower guide on recommended sustainable orchard managements.
- Undertake development of SINATA web app

**Program Level**

- Implement governance/ consultation process
- Six-monthly reporting on research/ activity progress
- Implement and monitor the PIPS3 Program Communications and Extension Plan, in collaboration with projects, PRG and industry stakeholders.
- Implement the PIPS3 Program M&E Plan to monitor, evaluate & undertake adaptive management processes, to continually improve, in collaboration with projects and PRG
- Coordinate mid-term and final evaluation processes & reporting.

## Start-up Outputs

- Project Work plans/ preschedules, methodology & protocols developed &
- Literature reviews completed/ baseline data determined.
- Field and glasshouse experiments established
- Established communication platform with industry communications & extension (Website)
- Prepared mechanisms for collaboration & integrated planning - project leadership group, PRGs & program plans.

## Start-up Activities

- ADMINISTRATION/ GOVERNANCE PROCESSES
- LITERATURE REVIEWS/ BASELINE DATA COLLECTION
- PARTNERSHIP DEVELOPMENT
- PROJECT/ PROGRAM PLANNING CONSULTATIONS
- INVESTMENT/ SUPPORT SECURED
- CONTRACTING CONDUCTED

## APPENDIX 2 DESK-TOP REVIEW OF MID-TERM PERFORMANCE AGAINST THE MONITORING PLAN

| LOGIC LEVEL | WHAT WILL BE MONITORED | KEY PERFORMANCE INDICATORS | DATA COLLECTION | EVALUATION RESULT |
|---|---|---|---|---|
| **Start-up Activities & Outputs**<br><br>*What foundational structures, plans and processes will be established to guide and support the PIPS3 Program activities and outputs over three years?* | **Execution** of research agreements & collaborator contracting. | Contracting process completed by all parties. | • Milestone 101 reporting demonstrates all collaborators have been contracted in accordance with Research Agreements. | Start-up activity achieved. |
| | **Establishment** of governance, consultation & collaboration.<br><br>(Program & Project Reference Groups, Project Leadership Group, Project Team Meetings) | Terms of Reference (ToR) **prepared** and six-monthly meetings **conducted**<br><br>**Effectiveness** of PRGs as primary consultative platform for stakeholder input and feedback.<br><br>**Effectiveness** of the Project Leadership Group and Project Team Meetings in increasing collaboration and monitoring research progress to achieve research agreement milestones. | • Membership & ToR reviewed & approved by the Hort Innovation Program Manager.<br>• Meeting attendance<br>• Meeting agendas & minutes<br>• Actions implemented (documented in following meeting minutes).<br>• Mid-term and final evaluation key stakeholder questions. | • Covid restrictions impacted whole-of-team collaborations until early 2022.<br>• 5 PRG Meetings conducted with agenda contributions from members & minutes taken / distributed.<br>Improvements to be made in grower attendance at PRGs.<br>• 3 AP19003 PRG Meetings conducted.<br>• 8 Project Leadership Meetings conducted with agenda contributions from members & actions noted/ distributed. Projects leaders always attending and significantly contributing.<br>• 1 PIPS3 Program Forum conducted face to face. Reported in Milestone 107 of AP19007. |

| | | | | |
|---|---|---|---|---|
| | | | | • Evidence of project team meetings conducted and actions undertaken. |
| | **Prepared and approved** risk registers | **Risk registered submitted** and approved in Milestone 102.<br><br>**Evidence** that risk registers are reviewed and continuous improvement actions are undertaken. | • Risk registers submitted Milestone 102.<br>• Six-monthly within research team meeting minutes.<br>• Annually within PLG & PRG meeting minutes. | Template prepared by AP19007 and all risk registers submitted. Used for Stop/Go processes as relevant at PRG meetings. |
| | **Adoption and execution** of the PIPS3 Communications & Extension Plan (PIPS C&E Plan). | **PIPS3 C&E Plan prepared** in consultation with project, communication and extension stakeholders in Milestone 102.<br><br>**Effectiveness** of the PIPS3 C&E Plan as the primary tool for executing program communications and extension activities in accordance with Hort Innovation requirements and Research Agreements of all partners. | • PIPS3 C&E Plan prepared by Program Coordinator & review/ approval processes undertaken in Milestone 102 period.<br>• PIPS3 M&E Table (Section 9.1) outlines specific quantitative and qualitative data collection to be undertaken.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | C&E Plan submitted Milestone 102 (AP19007) and fully executed. Currently strongly exceeding scheduled outputs. |
| | **Adoption and execution** of the PIPS3 M&E Plan. | **Effectiveness** of the PIPS3 M&E Plan in assisting Hort Innovation and program partners to monitor Research Agreement obligations.<br><br>**Effectiveness** of the PIPS3 M&E Plan as a tool to assess progress towards final program outputs and outcomes throughout implementation. | • M&E Plan prepared by Program Coordinator & review/ approval processes undertaken in Milestone 102 period.<br>• Six-monthly reporting against the M&E Plan by the Program Coordinator.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | M&E Plan submitted in Milestone 102 (AP19007) and activities fully executed |
| | **Prepared** project preschedules/ workplans/ Gantt charts finalised and exchanged. | **Project plans prepared** & exchanged.<br><br>**Extent** to which exchange of planning documents, together with providing progress updates as a part of governance/ consultation meeting structures, leads to **effective** collaboration and implementation. | • Documentation prepared and exchanged within Milestone 102.<br>• Updates and discussion on these documented in PLG & Team meeting minutes.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | Exchange of project plans undertaken at commencement.<br><br>Updates on project plans/ protocols conducted verbally at Project Leaders Meetings but not formally. Improvements in ongoing exchange.<br><br>Strong evidence of project leaders preparation & presentation of research, |

| | | | | |
|---|---|---|---|---|
| | | | | communications & extension updates at PRG and leadership meetings.<br>Strong evidence of exchange of information detailed information at the 2022 PIPS3 Program Forum. |
| | **Prepared and agreed** experiment protocols | **Evidence** that experiments protocols have been determined and agreed where collaboration between projects is required or regional demonstration sites are established. | • Documentation prepared, agreed and exchanged within Milestone 102.<br>• Regional demonstration sites have been established with standardised trial design and protocols implemented (AP19006). | Evidence of project protocols established within Milestone reports.<br>There are improvements to be made for project AP19006 in regard to proving more timely protocols to regional sites and assistance in implementation of these. |
| | **Established** experimental sites | **Evidence** that experimental sites have been established in accordance with Research Agreements on both research and commercial properties. | • Research site locations specified- address, GPS Coordinates & collaborating farmer.<br>• Experiment and treatment designs determined and documented.<br>• AP19002- Tatura SmartFarm/ Tas (AP19006) Bio Control Plots & *Mastrus ridens* release sites<br>• AP19003- Tatura Sundial Orchard & 1 commercial orchard.<br>• AP19005- 1 Tatura experimental pear site & 1 commercial property<br>• AP19006- In-depth Tasmanian trial sites (2) & regional demonstration sites (4) | Strong performance by all projects to establish sites with Covid restrictions requiring adaptive management.<br>Delays in AP19006 project in establishing regional sites and native species plots across all sites. All on track at mid-term, though likely this project will have only 2 seasons of data by project end. |
| **Project Activities & Outputs**<br><br>*What will the PIPS3 Program deliver and produce?* | Literature review | Literature review completed by AP19006. | • Internal peer review undertaken to finalise report.<br>• "Healthy Soils" parameters determined. | Literature review completed and submitted Milestone 104 and publication on literature review outcomes in Autumn 2022 AFG achieved. |
| | Field & glasshouse experiments/ technology validation & calibration. | **Extent to** which experiments are implemented in accordance with Research Agreement milestones. | • Site based data recording systems/ data capture software implemented. | Strong progress in AP19003 & AP19005 in using electronic data collection methods and in validating the Green Atlas |

| | | | | |
|---|---|---|---|---|
| | | **Evidence** that the data collection is scientifically robust and can be used for baseline and comparison analysis purposes.<br><br>**Extent** to which the research activities are valued and relevant to industry stakeholders and are generating increased knowledge and understanding. | • Experiment data outputs & subsequent analysis outcomes progressively reported in 6-monthly Milestone Reports.<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Mid-term and final evaluation key stakeholder questions to evaluate impact. | Cartographer on tree and fruit yield and quality parameters.<br><br>AP19003- 1 published & 1 in prep. journal articles & 2 accepted abstracts.<br><br>AP19005- 2 published & 1 submitted journal articles, 2 abstracts accepted & presented at conferences.<br><br>To date, limited data results and analysis available from AP19002 & AP19006 conservations bio-control trials/ demonstration sites due to delays in establishment. |
| | Laboratory based research, testing & analysis | **Extent to** which experiments are implemented in accordance with Research Agreement milestones.<br><br>**Extent to** which testing and analysis activities inform field-based activities and support determination of decision support tool algorithms and soil health, IPDM, production, productivity and quality parameters/ scoring.<br><br>**Evidence** that data sampling, testing and analysis results are scientifically robust and can be used for accurate baseline and comparison analysis purposes. | • Data recording systems/ data capture software implemented.<br>• Experiment data outputs & subsequent analysis outcomes progressively reported in 6-monthly Milestone Reports.<br>• Pheromone traps developed (AP19002)<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published. | Strong evidence for AP19003 & AP19005.<br><br>Moderate evidence for AP19002 & AP19006. Some data collection was impacted by delays and Covid-restrictions and poor establishment at some sites, particularly native plots. |
| | Technical Reports | **Extent** to which the research has contributed to “adoption ready” new knowledge in orchard design and sustainable management practices. | • Technical reports delivered.<br>• Refer to Section 9.1 of the PIPS3 C&E Plan. | Not applicable at this time. This is an end of project KPI. |
| | Grower Fact Sheets & Guidelines | **Extent** to which resources deliver increased appreciation for research outputs, grower confidence to adopt and knowledge/skills to implement outcomes. | • Case studies documenting grower experiences in using developed resources and production/ quality outcomes (AP19007). | In accordance with Achievement Criteria at this time. |

| | | | | |
|---|---|---|---|---|
| | | | • Refer to Section 9.1 of the PIPS3 C&E Plan.<br>• Final evaluation key stakeholder questions to evaluate impact. | Irrigation scheduling tool delivered with video instructions. Published on HIN & ExtensionAus Pear & Apple Irrigation site.<br>IPDM Manual delivered and promoted through PIPS3 Program activities. Published on ExtensionAus Pear & Apple IPDM site. |
| | Decision Support Tools | **Extent** to which growers have confidence to use and implement recommendations of developed decision support tools.<br>(AP19006 SINATA Web App, AP19003 Crop-load tool, AP19005 Irrigation planning & scheduling tool) | • Workshops conducted and evaluated to introduce and develop grower/ advisor confidence/ skills in use.<br>• Case studies documenting use of the tools and subsequent decisions made/ advice provided by growers/ advisors.<br>• Final evaluation key stakeholder questions to evaluate impact. | Assessment in use of DST not applicable at this time, however:<br>AP19005 Irrigation planning & scheduling tool achieved with instructional video released.<br>AP19006- Delays in achievement of Milestone 103 (appoint SINATA web app subcontractor & publication of industry article). Noted that Hort Innovation Program Manager informed evaluation process that this has moved forward and is on-track for strong performance by project end. Variation to be executed to postpone App delivery from Milestone 105 to Milestone 106. |
| | Science Journal Papers | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | AP19003- 1 published & 1 in prep. journal articles & 2 accepted abstracts.<br>AP19005- 2 published & 1 submitted journal articles, 2 abstracts accepted & presented at conferences. |

| | | | | |
|---|---|---|---|---|
| | | | | To date, this meets Milestone obligations. |
| | Workshops/webinars/ field days/ field walks | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | 5 Future Orchard Walks hosted/ contributions by the PIPS3 Program projects. |
| | Website content (including videos)/ published articles/ social media presence | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | Refer to detailed section of the evaluation report on communications. Exceeding C&E Plan extensively at this stage.<br>• PIPS3 Program has had videos/ articles in 32 editions of IJ – 1430 Click throughs with strong contributions from all projects.<br>• 17 You Tube Videos produced – 3182 Views, with strong representation across all projects.<br>• Web content prepared for APAL by Dec. 2020, though delayed "live" date of June 2021 due to APAL resourcing – 4249 Views<br>• 39 Facebook, Twitter, Instagram, LinkedIn – 3407 Engagements<br>• AFG- 7 editions = 16 articles – 990 each edition, further 5 articles in prep. for Winter 2022. Strong contributions from all projects. |

| | | | | |
|---|---|---|---|---|
| | | | | • 3 general media articles (Hobart & Goulburn Valley)<br>• 2 TV News articles (Hobart (*SYU Campaign*- Prime News) & Goulburn Valley (*Using Cartographer in apples*- Win News)<br>• 1 Radio Interview (ABC Country Hour Hobart)<br>• 11 pear & apple CoP meeting conducted.<br>• 13 "Ask the expert" interactions on the CoP Facebook Group Page.<br>• ExtensionAus, HIN & TIA analytics reviewed. Some issues with isolating PIPS3 specific pages/ tools. |
| | Industry conferences, forums and collaboration opportunities | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | • 2021 APAL Forum- PIPS3 Program dedicated Session programmed- subsequently 5 PIPS3 Presentations recorded & released through IJ as the forum was cancelled due to Covid.<br>• Tasmanian Fruit Growers Conference presentation (AP19006) |
| | Science conferences | **Extent** to which activities are implemented in accordance with Section 8.1 of the PIPS3 C&E Plan. | Refer to Section 9.1 of the PIPS3 C&E Plan. | • 2 abstracts for IHC, August 2022, France accepted (AP19003)<br>• McClymont, L. *Yield and canopy radiation interception of two blush pear selections in* |

| | | | | |
|---|---|---|---|---|
| | | | | *Australia*. Oral paper. XII International Symposium on Integrating Canopy, Rootstock and Environmental Physiology in Orchard Systems, Wenatchee, USA. 26 – 30 July 2021. (AP19005)<br>• Goodwin, I. *Profitable pears*. IFTA 65th Annual Conference, Pennsylvania, 12 – 15 February 2022. (AP19005) |
| **Short-term outcomes (project duration)**<br><br>*What will result within three years from PIPS3 Program research, communication and engagement activities?* | **Effective** coordination, collaboration, communications and extension. | **Extent** to which activities of the Program Coordinator role (AP19007) has increased collaboration between research teams, project collaborators and industry stakeholders.<br><br>PIPS3 Program has **effectively communicated and extended** research outputs/ outcomes in sustainable orchard management practices, biocontrol IPDM practices, orchard design and sensing technologies within the context of business resilience, productivity and profitability outcomes.<br><br>**Extent** to which implementation of the PIPS3 C&E Plan has resulted in greater knowledge/ understanding of the impact of certain treatments/ managements upon orchard sustainability, production and fruit quality.<br><br>**Extent** to which implementation of the PIPS3 C&E Plan has resulted in greater confidence to adopt research recommendations/ guidelines/ tools. | • Refer to Section 9.1 of the PIPS3 C&E Plan.<br>• Results of publication analytics across electronic and print platforms (number, reach, engagement).<br>• Attendance numbers at events<br>• Event evaluation results (Appendix 2),<br>• Effectiveness of PIPS3 Program speakers at third party events (i.e.,Future Orchards)<br>• Final evaluation key stakeholder questions to evaluate impact. | Strong execution of the C&E Plan evident.<br><br>For example:<br><br>AFG article planned: 13<br><br>AFG articles delivered: 16<br><br>Videos planned: 11<br><br>Videos delivered: 17<br><br>IJ presence planned: monthly<br><br>IJ presence delivered: 2/month<br><br>Refer to Appendix 4 for APAL derived analytics from primary communication platforms.<br><br>Attendance at the FO Walks & evaluation results have not been provided by APAL upon request. |

| | | | | |
|---|---|---|---|---|
| | **Improved** efficacy of biological control of major pests and diseases. | **Extent** to which growers are aware of the benefits of IPDM practices.<br>**Extent** to which researchers/growers/ advisors understand the requirements for viable long-term *Mastrus ridens* and *Trichogramma sp.* populations. | • Research outcomes reported in Milestone Reports.<br>• *Mastrus ridens* commercialisation plan developed.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate awareness and understanding. | All Achievement Criteria of Milestones (including MS104) have been achieved.<br>Draft Commercialisation Plan submitted. |
| | **Increased** knowledge and understanding of the critical factors within conservation biocontrol treatments, and the sustainable orchard management practices, that result in improved soil health, plant health, resilience, orchard productivity and fruit quality. | **Extent** to which researchers/growers/advisors have increased their awareness and understanding on how inter-row plantings and tree-line ameliorants (the sustainable practices) impact soil health, pest control, orchard sustainability and production outcomes.<br>**Extent** to which growers aspire/ intend to adopt sustainable management practices. | • Combined research outcomes reported in Milestone Reports where multiple projects are contributing to this understanding.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate increased knowledge and understanding, and intent to adopt demonstrated practices. | Progress performance primarily assessed through interview processes.<br>Attendance at the FO Walks & evaluation results have not been provided by APAL upon request. |
| | **Evidence** of the determination of relationship between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation. | **Extent** to which the apple orchard systems research experiments are completed and report upon the determination of relationship factors.<br>**Extent** to which researchers/growers/advisors have increased their knowledge and understanding on the relationship between fruit position and light exposure on colour development, sunburn damage, fruit quality and floral initiation in apple orchards. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |
| | **Evidence** that chemical signals have been identified that determine the impact of high crop load on floral initiation and differentiation, and fruit size in the subsequent season. | **Extent** to which the apple orchard systems research experiments are completed and report upon chemical signals that impact upon key apple orchard production parameters.<br>**Extent** to which researchers/growers/advisors have increased their knowledge and understanding on chemical signals that | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2) | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |

| | | | | |
|---|---|---|---|---|
| | | determine the impact of high crop load on floral initiation and differentiation, and fruit size in the subsequent season. | • Final evaluation key stakeholder questions to evaluate knowledge and understanding. | |
| | **Evidence** that commercial mobile sensing technology is available to industry to measure in situ fruit and tree parameters and establish orchard-specific crop load relationships. | **Extent** to which apple orchard systems remote sensing technology calibration and validation work has been completed and reported.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the benefits of using remote sensing technology and have built greater confidence to adopt tools. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |
| | **Evidence** that the effects of orchard design on yield and fruit quality of new pear cultivars have been measured and management implications communicated to growers. | **Extent** to which the pear orchard systems research experiments are completed and report upon the effects of orchard design upon key pear orchard production parameters.<br>**Extent** to which growers/advisors have increased their knowledge and understanding of the impact of orchard design on yield and fruit quality of new pear cultivars and the associated management implications. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed technical fact sheets and reports published.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt associated practice managements. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |
| | **Evidence** that proof-of-concept and/or calibration of sensing technology research has potential to provide data to support management decisions in pear orchards. | **Extent** to which the pear orchard systems remote sensing proof of concept / validation work has been completed and reported.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the potential benefits of using remote sensing technology and have built greater confidence to adopt tools. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Peer reviewed sensor guidelines and videos completed.<br>• Website analytics on access to relevant resources.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge, understanding and confidence/intent to adopt. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |

| | | | | |
|---|---|---|---|---|
| | **Evidence** that pear orchard systems research has increased knowledge on the drivers of fruit colour development and degradation, and the effectiveness of novel netting protection strategies have been determined. | **Extent** to which the pear orchard systems experiments are completed and report upon the key drivers of fruit colour development/degradation and the assessment of novel netting protection strategies.<br>**Extent** to which growers/advisors have increased their knowledge and understanding on the drivers of fruit colour development and protection mechanisms. | • Milestone & final reporting<br>• Peer reviewed science papers published.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |
| | **Evidence** that soil health indicators for apple and pear orchards have been established and extended with consideration for regional differences. | **Extent** to which in-depth and regional experiments are completed and report upon the determination of soil health indicators.<br>**Extent** to which growers and advisors are aware of the determined physical, biological and chemical soil health indicators for apple and pear orchards of their region. | • Milestone & final reporting<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to evaluate knowledge and understanding. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |
| | **Evidence** that decision support tools (web app or excel based) have been extended and skills have been developed to aid adoption. | **Extent** to which growers and advisors have increased their knowledge and skills in using the developed decision support tools to manage irrigation, nutrients and crop-loads in the orchard. | • Combined research outcomes reported in Milestone Reports where multiple projects are contributing to this understanding.<br>• Event evaluation results (Appendix 2)<br>• Final evaluation key stakeholder questions to increased knowledge and capability to adopt decisions support tools. | Updates on progress have been provided in Milestone Reports as required, through PRG Meeting Updates and the 2022 PIPS3 Program Team Forum.<br>Not applicable until final evaluation. |

# APPENDIX 3 PIPS3 PROGRAM INTERVIEW RESPONSES WITH IDENTITY REMOVED

## APPENDIX 4 APAL COMMUNICATIONS TEAM SUPPLIED COMMUNICATIONS ANALYTICS