

Final Report

Australian Almond Industry Innovation and Adoption Program

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Almond Board of Australia

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Project:

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Summary

The Australian almond industry innovation and adoption project contributes towards the implementation of the industry's strategic plan that relies on the outputs from the Hort Innovation's almond research program and other sources to address gaps in knowledge and develop new technologies to support the sustainability and competitiveness of the industry. This project, ran from February 2017 to March 2020, and facilitated the provision of information generated within the Australian and international research communities as well as drawing on the expertise within the industry to establish best practice and enable better business decisions. The target audience was almond levy payers; industry stakeholders and value chain members.

Project delivery occurred during a period of expansion from 37,839 hectares in 2016 to 51,541 hectares in 2019 as a result of strong demand for Australian almonds in both domestic and export markets. Almond orchards predominantly exist in south eastern Australia with approximately half (53%) of the total plantings in Victoria. Recent orchard expansion in NSW, now represents 24% of the total number of hectares planted, with South Australia representing 21% and Western Australian 2% (ABA 2019).

Adoption of research outcomes was a major focus of extension activities addressing priority areas identified in the industry's strategic plan and responding to industry needs including: orchard hygiene to control pests and disease; maintaining healthy hives and pollination efficiency; developing nursery tree standards and maintaining disease free planting material; evaluating new varieties and rootstocks; improving on-farm water use efficiency and soil health; food safety and quality; biosecurity; and maintaining industry capacity.

Information relevant to Australian growers was sourced by industry development (ID) staff via participation in industry committees and events, government and employer forums and monitoring overseas communicate recognizing emerging issues, research findings, breeding programs, new technology, best on-farm practices, trade requirements, biosecurity, climate change and environmental issues, chemical regulation, labour issues and government policy changes.

The ABA has maintained strong cohesive relationships with industry leaders, researchers and provider organisations, both in Australia and overseas, and has documented the community of practice illustrating the extensive and diverse networks allowing trusted communication and information sharing to ensure Australian almond growers have the information they need to adapt to the increasingly dynamic physical and economic environments and make smart business decisions.

The ID staff, in consultation with the project reference group (PRG), delivered a program of over 380 extension activities engaging industry stakeholders and supporting the adoption of research and development and new technologies to address strategic priorities. Key achievements include:

- 13 field days - 487 participants
- Two R&D forums - 446 participants, and one Australian conference - 480 participants
- Four regional meetings in each of the growing regions – 301 participants
- Eight workshops with international guest speakers attended by 168 stakeholders
- Eleven ABA hosted domestic tours showcasing local growing regions and processing facilities
- Three economic analyses of orchard hygiene; new varieties and irrigation scheduling tools
- A decision support tool for internal benchmarking of new technology and best practice
- Three best practice management tools
- 29 "In a Nutshell" magazine articles
- 11 fact sheets "All About Almonds"
- 12 best practice videos.

It is recommended that future extension activities continue to build-on collaborative networks and linkages between industry leaders, partner organisations, researchers, product and service providers tailoring extension activities to address industry needs utilizing a mix of traditional and modern mediums to deliver key messages.

The efficiency, effectiveness and relevance of extension activities will be more closely monitored through target and regular feedback mechanisms so that products create an information legacy supporting the expanding industry.

Keywords

Industry development; Best practice; On-farm adoption; Extension.

Introduction

In recent years the strong demand for Australian almonds, observed in both domestic and export markets, has seen a 36% expansion in almond orchards (from 37,839 hectares in 2016 to 51,541 hectares in 2019). Almonds are mainly grown in south eastern Australia with approximately half (53%) of the total plantings occurring in Victoria. Recent orchard expansion in NSW, now represents 24% of the total number of hectares planted in Australia, with South Australia representing 21% and Western Australia 2% (ABA 2019).

In 2019/20 production reached a record 104,000 tonnes and was one of Australia's most valuable horticultural crops valued at \$830 million. Future production forecasts predict an increase to 160,000 tonnes by 2025 as new orchards mature. In 2018/2019 Australia was the world's second largest almond producer producing 7% of the global crop. The USA produced 80% of world production in 2018/2019 with 1,100,000 tonnes.

The industry experienced a strong growth phase over the last three years making its ability to consistently produce high yields and reduce input costs even more critical to the future competitiveness of the Australian almond industry given our higher production, processing and marketing costs.

The ABA has established a wide network of contacts within research organisations in Australia, USA and Spain.

As the peak industry body representing the interests of 99% of growers, the Almond Board of Australia's (ABA) key objective is to maximise the industry's profitability across the supply chain ensuring its sustainability into the future. Five key focus areas are identified in the Hort Innovation Strategic Investment Plan (SIP) 2017-2021. These are all relevant to this project:

- Pest and Disease Management
- Pollination Efficiency
- Crop Production and Product Integrity
- Industry Development and Intelligence
- Market Development.

Over the past decade, ABA has driven innovation and adoption through previous industry liaison and extension projects funded through Hort Innovation levy fund (AL07008, AL09021 and AL12000). These projects employed industry development (ID) staff that applied the outputs from the Hort Innovation's almond research program to address gaps in knowledge and technologies to support the sustainability and competitiveness of the industry.

The ID staff utilized various communication channels within industry and other Hort Innovation projects delivered by ABA (figure 1).

This report describes the grower extension program delivered to extend new knowledge and technologies to almond levy payers; industry stakeholders and value chain members that have been integral to implementing the Australian almond industry strategic plan that has addressed the risks and opportunities facing the industry.



Figure 1: Almond industry extension and adoption project linkages with ABA projects

Methodology

The project was delivered from February 2017 to March 2020 by a team of ABA staff including chief executive officer (CEO), industry development manager (IDM) and two industry development officers (IDO) supported by marketing, farm manager, communication, finance and administration personnel. ABA ID staff were responsible for delivering innovation and adoption strategies to address key industry priorities outlined in the Hort Innovation Almond industry strategic investment plan (SIP) 2017-2021 addressing the following:

- Pest and disease management
- Pollination efficiency
- Crop production and product integrity
- Industry development and intelligence
- Water

1. Establish and seek guidance from a project reference group

The ABA Production Committee, representing corporate and family-owned producers from four regions, as well as processors and suppliers, and served as the Project Reference Group (PRG) providing guidance for project delivery. Each year a work plan was developed and endorsed by the PRG and Hort Innovation and reported back to the PRG.

2. Identify innovation suitable for adoption by the Australian almond industry

ABA ID staff actively engaged with growers, researchers, government officers, investors and agronomic stakeholders to identify new and emerging issues as well as advances in research, policy and technology. Developments of most relevance and value to almond growers were elicited through:

- ABA sub-committee meetings (Market Development, Processing, Production, Pollination and Plant Improvement, and Water) and ABA Board of Directors meetings.
- ABA regional forums held in Riverland, Sunraysia and the Riverina annually.
- Hort Innovation management meetings and informal discussions and research managers visit to the Riverland and Sunraysia.
- Research and innovation forums in Australia and overseas.
- Almond research project reference group meetings.
- Field days for Hort Innovation projects.
- Australian Almond conference and research forums.
- Almond Board California (ABC) conferences, pre-conference meetings, R & D liaison and ongoing liaison.
- Innovation conferences such as AgEvoke and Advanced Ag.
- Researchers.
- HIA staff.
- Other industries.

Informal enquires and discussions with stakeholders such as growers, processors, marketers, manufacturers, suppliers, beekeepers, international and national consultants, pest and disease scouts etc.

Government and partner organization forums and communicate on cross-industry issues e.g. biosecurity, pollination, water, chemical registrations and maximum residue levels (MRLs) etc.

Consultative committees e.g. industry drought response, hail recovery, future climate change impacts.

3. Develop and implement extension strategies to grow knowledge and drive adoption of the almond R&D program outputs and other appropriate technology

To assist with planning extension activities to meet industry requirements the following management tools were produced in consultation with the Project Reference Group (PRG) and endorsed by Hort Innovation:

- Annual workplans.
- A program logic with monitoring and evaluation plan linking project activities with available resources and industry objectives (Appendix A).
- A stakeholder engagement and communication plan described each of the target audiences, proposed extension activities, desired messages and media to maximise on-farm adoption. When appropriate, multiple extension activities and products were deployed to reinforce messaging and support different learning styles (Appendix B)
- A project risk register was used to analyse and implement strategies to mitigate project delivery risks (Appendix C)

A portfolio of extension activities was used by the ABA to extend information including:

- Grower field days and workshops - presenting technical aspects of research projects. Multiple sessions were offered on different commercial properties encouraging interactive discussions.
- Industry tools e.g. spreadsheets and calculators, applying research theory with commercial considerations. Tools were designed and tested in consultation with researchers and growers.
- Reconfiguring the ABA website for improved industry focus and access to audio and visual products.
- Technical articles were published to convey seasonal considerations as well as complement field days, workshops and technical forum presentations in the industry magazine “In a Nutshell”.
- Best practice fact sheets providing reference documents on best practice. All factsheets were distributed to growers via email and posted on the ABA website.
- Videos produced to convey best practice focused on information that growers find useful and valuable. The PRG was consulted in determining the topics suitable for video production.
- Research and development forums, alternating with the almond industry conference enabled ID staff to identify relevant topics and suitable guest speakers. ID staff assisted with chairing sessions and provided logistical support.
- Regional grower forums provided updates on research and extension activities in the four main production areas.
- Invited technical experts, domestic and international, to provide their experience and advice on issues of major significance.
- Domestic study trips to view technical advances in operations.
- Establishment of the Almond Centre of Excellence (ACE) to showcase best practice and research outputs in collaboration with researchers conducting experimental trials. ID staff provided pest scout monitoring and nutritional testing and advice.
- Undertake economic analysis of emerging practices and technologies on new varieties, orchard hygiene, irrigation scheduling.
- Accepted best practice will be incorporated into the Certificate courses conducted by Sunraysia TAFE for Victorian and NSW growers and into GrowSmart courses for SA growers.
- One to one with growers and investors.
- Meetings of the ABA Supply Chain Committees and Board of Directors.

Crucial information pertaining to the almond industry is also communicated as requested on statistics, food safety and contaminants, chemical permits, chemical registrations and minor use permits, biosecurity alerts, water market, pollination service challenges and international advances in production technologies.

Industry responses, both almond and the broader horticulture, to land and water management plans, climate change, and natural disasters including, fires, droughts, and pandemics.

4. Identify the capacity building requirements of the Australian almond industry and develop initiatives to address these, including an Almond industry community of practice

The ABA staff continued to build capacity and strong collaborative linkages with researchers, government departments, educational bodies, service providers and suppliers to the industry. The Stakeholder engagement and communications plan (Appendix B) identified target audiences and described the information needs to maintain the knowledge, skills-base and support future capacity needs across the industry.

A community of practice was documented (Appendix D) highlighting inter-connectivity between a broad range of organisations that partner, or work, with the ABA board of directors, committee members and employees to keep the grower community informed.

The ABA's comprehensive contacts database has facilitated practice change by maintaining well recognized and trusted communication channels within the industry.

5. Provide input to the almond industry R&D program including membership on project reference groups

ABA ID staff worked with Hort Innovation and the Almond Strategic Investment Advisory Panel (SIAP) to develop new project ideas to address important knowledge gaps and technology needs in the research portfolio and participated in the following project reference committees:

AL12003	Advanced processing of almonds
AL12015	Australian almond variety evaluation and commercialisation program
AL13009	Better tree performance and water use efficiency through root system resilience
AL14004	Pollination as a controlling factor in almond yield
AL14005	Identifying factors that influence spur productivity in almond
AL14006	Managing almond production in a variable and changing climate
AL14007	Tree architecture and development of new growing systems
AL15004	Management of Carpophilus Beetle in almonds
ST16000	Advanced production systems for temperate nuts
AL16005	An integrated disease management program for the Australian almond industry
AL16009	An integrated pest management program for the Australian almond industry
AL17005	National almond breeding and evaluation program

6. Provide feedback to Hort Innovation on opportunities and issues identified for the Australian almond industry through project activities

The ABA CEO maintained a high level of communication about new and emerging project needs that addressed industry risks and embrace opportunities. The ABA also provided insight into the challenges for adoption of project outputs that may influence investment decisions.

7. Provide technical advice to the almond industry on key production issues

ID staff managed daily enquires and provided technical advice to industry stakeholders on a broad range of issues. A strong level of trust has been established over the past decade and stakeholders are comfortable in approaching ABA staff to address matters in confidence.

Outputs

A register of innovation and extension activities is provided in Appendix E and is summarized below.

Formative activities to identify innovation:

- Industry consultation through ABA's value-chain committees and ID staff presentations and discussions: ABA Board Meetings (13 meetings); Production Committee (12); Almond Centre of Excellence (10); Plant Improvement (10); Pollination Committee (4); Water Committee (2); Australian Nut Industry Council (11).
- Attendance at 19 industry run events (e.g. field days).
- Two international study tours were undertaken by two ID staff in California coinciding with attendance at the annual ABC conference and pre-conference meeting in 2017 and 2018. Adaption of US research outputs to suit Australian growing conditions by visiting:
 - BASF field trip 'hitting new heights in almonds' and Field Day, Butte County (27 November – 4 December 2017)
 - Chemical pipeline tour in North Carolina (4 - 10th December 2019).
- Twelve cross-industry horticulture industry network (HIN) meetings convened by Agriculture Victoria and attended by ID staff providing exposure to various topics with relevance to almond production.
- Monitor overseas research and commercial breeding programs via ABC publications and communicate from other countries e.g. Spain.
- Crucial information and feedback was provided to partner organisations on issues including food safety and contaminants, chemical permits, chemical registrations and minor use permits, spray drift policies, biosecurity alerts and response plans, the Murray Darling Basin Plan, pollination and bee hive health, international advances in production technologies, land and water management plans, climate change, natural disasters e.g. fires and droughts, and virus pandemics (COVID19).

Extension activities

- Stakeholder engagement/ communication plan (1).
- Thirteen field days were hosted by ABA on commercial farms (Griffith, Lindsay Point, Robinvale, Carina, Lake Powell, Loxton and Renmark) with over 12 guest presenters talking about: integrated pest management; orchard hygiene trials to manage Carpophilus Beetle and Carob Moth; Navel Orange Worm; the rootstock trials and new varietal breeding program; results from the almond industry irrigation system audit; and soil amelioration machinery demonstration. Attended by 488 participants.
- Three tools were produced to assist growers in budgeting and tracking seasonal inputs as well as monitoring flowering seasons and comparing varieties.
- Reconfiguration of the ABA website in 2018 to aid navigation of extension products and publications.
- The ID staff contributed to the production of the quarterly ABA magazine "In a Nutshell" with twenty-nine articles featuring seasonal observations, research findings, highlights from overseas study tours and extension activities.
- Eleven best practice fact sheets "All About Almonds" were distributed via email grower members and stakeholders and saved on the website.
- Twelve videos were produced by ID staff promoting current research, seasonal updates and industry capacity development.
- ID staff assisted in two R&D forums (Loxton) were held in October 2017 and 2019 with a variety of research and industry presenters together with field displays attended by 446 industry stakeholders.
- ID staff assisted in one Australian Almond conference (Melbourne) was held in October 2018 with 35 presenters and trade displays attended by 480 industry stakeholders.
- Four regional meetings were conducted each year in the growing regions Adelaide Plains, Riverland, Sunraysia and Riverina with 301 attendees.
- Eight workshops (Riverland, Sunraysia, Adelaide Plains and Riverina) were convened with eight guest speakers from California talking about: plant pathology and lower limb dieback; deficit irrigation for hull rot management; orchard sanitation; and varieties in California with 168 attendees.
- Eleven ABA hosted tours showcasing local growing regions and processing facilities with visitors from Spain, Nepal, California and Australian capital cities.

- Assistance with establishing demonstration plantings at the Almond Centre of Excellence suitable for field days to promote best practice.
- Economic analyses for orchard hygiene (Appendix F); new varieties (Appendix G); irrigation scheduling (Appendix H).
- Meetings with investment groups and corporate growers such as Olam, Select Harvests, Hancocks, Bright Lights, Century Orchards, Southern Cross Farms, Sumich Group, Auston Corp, and Superior Wilmot Farms (10).

Capacity building and collaborative linkages

- An almond industry community of practice was documented (Appendix D) identifying the complex and collaborative communication pathways between the ABA Board of directors, value chain members, staff, growers, researchers, suppliers and other industries.

Input into R&D program

- CEO and ID staff maintained regular and close communications with researchers regarding project work and extension opportunities. Forty-eight project reference group meetings were attended by ID staff for key Hort Innovation projects and other issue-based forums including:
 - AL16009 Integrated pest management and AL16005 Integrated disease management (8)
 - Securing pollination for more productive agriculture (4)
 - AL16700 Australian almond industry conference and field day (5)
 - AL16003 Industry statistics and data collection (4)
 - Industry hailstorm recovery reference group (4)
 - Biosecurity Round Table discussions (2)
 - Almond Breeding and Rootstock Evaluation projects (AL12005 / AL17005 / AL16006).
- ID staff participated in the R&D Strategic planning day convened by Hort Innovation, Loxton 9 May 2018.
- Forty-one project management and industry consultation meetings were held with Hort Innovation staff where opportunities and issues were discussed.
- CEO travelled with David Moore and Alok Kumar of HIA to meet with Almond Board of California to discuss R & D opportunities.

Technical advice on key production issues

- On site visits and enquiries were managed by ID staff for over 195 growers and industry stakeholders.
- Over 29 liaison meetings with fertiliser, chemical, ag tech and machinery companies to understand and improve available products.

Project Reference Group

- Twelve extension reports were presented to the ABA production committee and ABA Board who provided feedback and guidance on project delivery (Appendix I).

Project work and assistance

- Oversight of budwood program delivering over 2 million high health and true-to-type buds to almond nurseries to facilitate the expansion of the industry with best available plant material.
- Assistance with the establishment of field trials on the ACE experimental and demonstration orchard, Loxton.

Evaluation

- A survey was emailed to 460 growers and industry stakeholders on the 28th February 2019 to determine the effectiveness of the program. Of the 19 responses received 10 identified as growers. The responses are presented in Appendix K and discussed in the monitoring and evaluation section.
- Producer benchmarking decision support model to stimulate practice change.

Outcomes

The program aimed to deliver extension activities that:

1. Were efficient, effective and appropriate for the Australian almond industry.
2. Improved the rate of on-farm adoption of R&D outputs, new technologies, and best practices to improve yield and quality and optimize inputs.
3. Increased engagement of the industry in project activities.

Achievements of the project are described in terms of their contribution to the relevant almond industry R & D Plan priorities (Almond SIP 2017-21) including improved nut quality, product value and competitiveness.

SIP outcome 1: Pest and disease management

By 2022 serious almond defects caused by pests and diseases will have been reduced to less than two percent at weighbridge

A primary focus of the program was to minimize insect pest damage that caused defects in almond kernels costing the industry over \$25 million in 2017-18. The ABA worked closely with local technical experts through a dedicated PRG for Hort Innovation funded integrated pest management (AL16009) and integrated disease management (AL16005) projects. With guidance from the PRG and other value-chain committees the ID staff played a key role in identifying orchard hygiene, best practice and extending this to growers as a best bet management strategy until the research projects produced results. ABA technical expertise was enhanced with Dr Greg Buchanan, an experienced entomologist being appointed in June 2018.

Thirteen orchard hygiene field days and workshops were attended by 342 industry participants. Considerable effort went into designing events that promoted local observations and successes as well as featuring guest researchers from California sharing their experience with similar pests. Field days were located on commercial orchards in each growing region and presentations were tailored to address unique regional challenges. The ABA disseminated factsheets (2), videos (4) and magazine articles (5) about orchard hygiene, pest and disease identification and control. It was also a major topic at ABA Production Committee meetings where two thirds of industry production are represented.

A survey of growers indicated that the ABA extension activities improved grower awareness about key pest and disease issues and best bet management strategies for over 50% of respondents with orchard hygiene now seen as an accepted practice across the industry. With pest issues a lesser concern outside of Sunraysia, most of the affected growers did implement sanitation practices that covered the majority of production.

Strategies implemented by industry successfully reduced insect damage in the 2019 season between 0-2% thereby reducing the estimated cost of damage to less than \$5 million and importantly going a long way to restoring the export trade's confidence in Australian almonds, particularly for in-shell market.

An economic analysis framework was developed for orchard hygiene (Appendix F) and provides a basis for future quantitative assessment considering the costs and benefits for pest and disease management strategies.

Awareness of less disease susceptible new varieties.

SIP outcome 2: Pollination efficiency

A major productivity gain in almond pollination by 2022 through a 25 percent reduction in bee stocking rates with no loss in pollination efficiency (nut set)

Recent industry expansion increases pressure on honeybee pollination services with future demand anticipated to be in the order of 300,000 hives by 2025. The Almond industry demonstrated its commitment toward maintaining a robust honeybee industry by eliciting grower support for a levy to raise \$317,400 and refund its share of the \$2.5million Australian government's biosecurity response to *Varroa destructor* incursion in June 2017. A dedicated ABA value chain committee was established to oversee industry consultation process and deal more broadly with pollination security, and issues impacting on the quantum, quality and cost of pollination services. This committee was supported by ID staff and has actively promoted honeybee and pollination R&D through presentations to the

honey bee congress and regional apiarist associations (3); regional grower forums (12); targeted specialist guest presentations at the ABA conference and R&D forum; and magazine articles (3). This has seen an increase in grower awareness about strategies to maintain healthy hives on-farm. Two tools were developed to assist growers in tracking flowering seasons and identifying the difference in flowering times for different varieties.

ABA staff have attended industry workshops to improve their knowledge and capacity to support the honeybee industry in implementing best practice by promoting the Bee Biosecurity Code of Practice as well as advocating for the development of new honeybee pest and disease monitoring technology.

In 2019 the ABA joined the Australia Honeybee Industry Council (AHBIC) and continue their support by provided advice to state and federal governments on issues affecting the honeybee industry in particular harmonising cross-border access, and expanding native floral resource access on public land and parks (a particular concern after the 2019 bush fires which destroyed hives and hive health across Australia).

SIP outcome 3: Crop production and product integrity

An almond industry crop production system that supports further efficiencies in Horizon 1 orchards and the development of Horizon 3 orchards and has lifted average industry yield from 3 to 4 tonnes per hectare. This will include new almond varieties featuring self-fertility and sealed shells, a new nursery accreditation scheme, 4 megalitres of irrigation water per tonne of almond kernel yield and proven 'shake and catch' harvesting and postharvest systems

Industry expansion since 2016 resulted in a high demand for budwood material with ABA providing approximately 2.2 million virus-tested, high health, true-to-type buds to nurseries. ID staff in consultation with the plant improvement committee developed 'Nursery tree standards' documenting best practice for the nursery industry.

Australian almond growers have embraced new varieties as alternatives to Nonpareil. During the project 13,702 hectares were planted taking the total industry to 51,541 hectares. New varieties accounting for 1,709 hectares or 12.5% of the areas planted (Appendix G). This uptake has been aided by the commercialization of six new varieties through the Australian almond breeding program and two new imports. Improved qualities such as high yielding, self-fertility etc. were introduced to growers through three field walks (flowering and hull split) supported by factsheets (4); 'In a nutshell' article; and four videos providing comparison of new varietal performance against nonpareil in a commercial setting.

An economic analysis framework was developed for comparing new varieties against Nonpareil (Appendix G). The analysis provides the basis for future quantitative assessment considering the costs and benefits for each variety once agronomic practices and markets are established.

The dry conditions experienced in recent years and seasonal allocations enacted in 2019 highlighted the priority for best practice of limited water resource especially in the Murray-Darling system. The ABA developed a drought management factsheet which collated publications from previous droughts for growers to incorporate into their drought strategies. Given most orchards are equipped with state-of-the art irrigation systems the ability to improve water use efficiency requires sophisticated technologies and expertise that have been adopted by some of the larger orchards.

An irrigation performance benchmark tool developed through the Hort Innovation funded Irrigation systems audit project (AL17004) was promoted through ABA field day (2); magazine article (1) and two videos. An almond production spreadsheet tool was developed to assist growers with irrigation and fertigation management.

An economic analysis framework was developed for irrigation scheduling equipment (Appendix H) and provides a basis for future analysis for determining the cost and benefits when these technologies are more widely adopted within industry.

The industry is exploring ways to build up resilience against extreme heat and dry conditions by improving soil moisture holding capacity by incorporation of organic matter in the form of processed almond hulls and / or bio-ash. Working with Select Harvests and almond researchers through a combination of pilot commercial trials validated by experimental trials has assisted in focusing trial work and avoid exacerbating pest and disease issues with increased orchard nutrient and moisture.

SIP outcome 4: Industry development and data

An informed industry that adopts Research & Development outcomes and has the capacity to support current and future needs

The ABA community of practice (Appendix D) illustrates the complexity and diversity of networks used to inform and deliver extension activities. Almond growers are at the center of the community of practice with extensive linkages between industry leaders, partner organisations, researchers, product and service providers. A key feature of the successful development of the almond industry is the collaborative approach and willingness to share information between growers.

During the project, sixty-four value chain advisory committee meetings were convened by ABA staff providing an opportunity for interaction with the industry's most influential members, who are generally early adopters of innovation and research findings. These meetings provided valuable insights into industry information needs and ensure activities were effective and appropriate for the Australian almond industry.

Engagement with researchers internationally was actively pursued. Two international conferences were attended, and eight workshops were organized bringing experienced Californian researcher / extension staff to the Riverland, Sunraysia and Riverina production regions. These networks are valuable in collaboratively addressing production issues similar in Australia to those faced in California.

During the project the ABA successfully delivered over 380 extension activities and products (Appendix E) addressing a range of topics. Key features of the extension program delivered are described below.

Industry forum and field days

Regional grower meetings (12 events; 301 attendees), Almond conference and R&D forum (three events; 926 attendees) and field days (13 events; 487 attendees) were well attended by growers and industry stakeholders. These events proved effective and appropriate in raising awareness as they: allowed for peer interaction; covered multiple topics enticing a broader range of interest; provided valuable feedback on regional concerns; provided opportunity for face-to-face interaction to better influence practice change. Field days and regional grower meetings were convened in multiple locations to maximise participation across regions.

Factsheets

Factsheets were the second most preferred method for receiving information as indicated by 61% of growers and stakeholders surveyed (Appendix L). Factsheets (13) were regularly developed to complement field days and research project findings and enabled more detailed information to be available for future reference on the ABA website extending information beyond the event – spatially and temporally. Website and mail chimp analytics showed that factsheets distributed to 4188 were actively downloaded by 551 (13%) people.

Website

The ABA website provides a key platform for reference products such as factsheets, videos, magazines and tools. Website analytics (Appendix K) show the number of views for each page. The top-10 most visited sites are shown below indicating the interest for each topic. The Australian Almonds website underwent refurbishment in August 2018 for easier navigation. This has required reporting of analytics pre and post refurbishment.

Videos

ABA staff have built up file footage of field days, forums, projects and events, resulting in the production of 12 videos. Some delays in production meant analytics were not available to demonstrate their effectiveness. This medium will be prioritized in the future as it enables the provision of short, concise and useful information, available for growers and their staff to access when convenient and eliminating travel constraints to stay up to date. Embedding video links within the "In a nutshell" magazine has been an effective form of dissemination e.g. Tenias harvester demonstration. Once approved all videos are placed on the ABA website for access.

Monitoring and evaluation

Success of the program was illustrated by:

- Successful completion of activities within the project timeframe (Appendix E – project deliverables and extension register).
- Maintenance of a network of early adopters for innovation and R&D by establishing new and supporting existing value-chain committees.
- Maintained or increased level of industry uptake of innovation as shown through webpage and mail-chimp analytics (Appendix J).
- Feedback and attendance levels of activities and events was maintained or increased (Appendix E).
- Maintained or increased level of adoption of research and development techniques by industry (Appendix K – grower and stakeholder survey).
- Industry engagement in extension activities is maintained or increased (Appendix E).
- High health true to type materials have been made available to industry with the project timeframe.

Key Evaluation Question 1: Were the initiatives and information produced relevant to industry?

1.1 To what extent were the initiatives read/utilized?

Website analytics (Appendix K) from February 2017 to February 2020 show the top-10 products viewed. The industry magazine and the conference and R&D forums are clearly effective communication channels to the industry. The popularity of the Carpophilus Beetle and Carob Moth factsheets indicates the importance of this information to assist growers.

Topic	Page Views
In-A-Nutshell (12 issues published)	3,824
Conference archived presentations	2,012
R&D Forum archived presentations	1,329
Carpophilus Beetle factsheet	1,161
Carob Moth factsheet	871
Vela factsheet	687
Pollination 101 factsheet	652
Interactive flowering graph tool	617
Almond bud initiation factsheet	518

The most frequently sourced information, based on topic, included:

Topic	Page Views
Orchard management	2,862
Pest and disease	2,275
Publications	2,110
Economics of almond production	1,901
Irrigation and soil	1,704
Conferences/ forums	1,269
Processing	1,201
Growing principals	1,149
ACE farm	843
Almond production	823
Water and irrigation	752
Pollination	628
Variety selections	560
Almond physiology	415
Biosecurity	256
Food safety	239
Sustainability	196
Renewable energy	185
Quality and food safety	129

1.2 What percentage of industry are aware of the management strategies conveyed?

Grower and stakeholder survey results are presented in Appendix K and summarized below. The sample size of 19 represented 8.9% of the 213 who viewed the survey. Respondents comprised: 10 growers; 2 agrochemical representatives; 1 consultant; 2 researchers; 1 fertiliser representative; 2 others. The relatively small sample size makes it difficult to measure the effectiveness of extension activities, however some observations are highlighted.

Greatest awareness was achieved for extension activities on:

- Confirmation of hive health and frame numbers (78%) and hive biosecurity (78%)
- Early harvest to limit pest breeding cycles (78%)
- Assessing level of mummy nuts (72%)
- Windrow mummy nuts for removal/ destruction (72%)
- Spray calibration (67%)
- Timing of spray (67%)
- Australian varieties (67%)

1.3 What initiatives have you adopted because of this information?

Because only growers and researchers were able to apply the new knowledge on-farm the percent adoption is higher than that illustrated in the survey results contained in Appendix K. Fifty percent of growers and researchers had adopted information on N P K and micronutrients and 42% of growers and researchers had utilized knowledge gained from: routine flushing; maintaining drip line uniformity; water holding capacity; pest identification; registered chemical use and time of nutrient application.

1.4 Were the initiatives valuable to commercial almond business?

When asked what practices have been the most beneficial in improving farm efficiency and profitability the following information was provided:

“New varieties.”

“Hygiene within orchard, improving Insect damage in the crop to low threshold levels from 7.6% down to 1.15%.”

“Water / Nutrient management.”

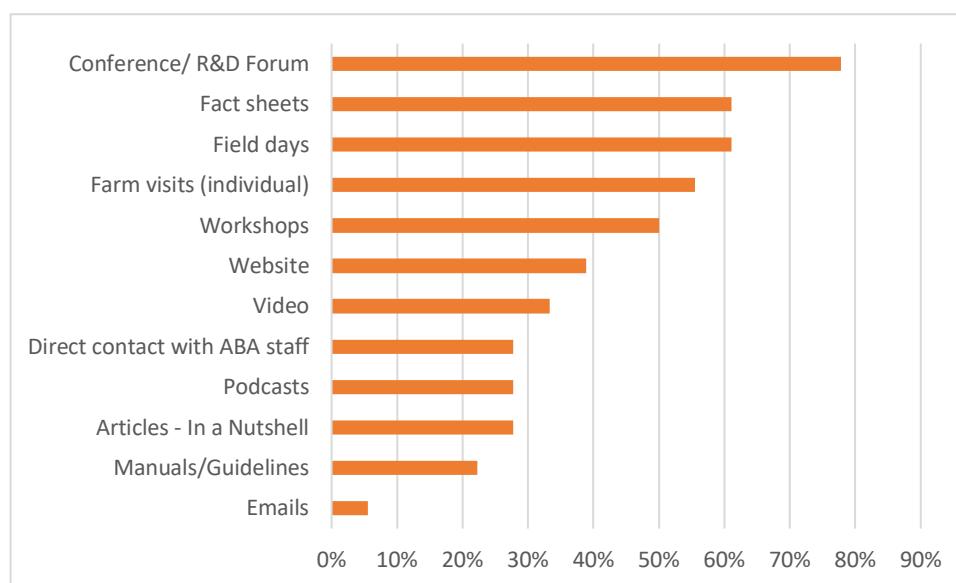
“Nutrition management, Spraying when bees are in, Orchard hygiene.”

“Trellis system on young trees. Medium density plantings.”

“Sub soil compost application.”

1.5 Which information sources do you find most valuable to your business?

Survey respondents indicated their preferred method for receiving information was through the annual conference and R&D forum (78%), followed by factsheets (61%), field days (61%), farm visits (56%) and workshops (50%).



1.6 How effective did you find the extension strategies used?

When asked “how can the delivery of extension information to growers be improved” the following responses were provided:

“It is very thorough with what we are receiving now.”

“It’s pretty good at the moment just keep abreast of trends I guess.”

“Perhaps more research and information on off ground harvesting. It would be good to be in front of the US as a point of difference in the marketplace.”

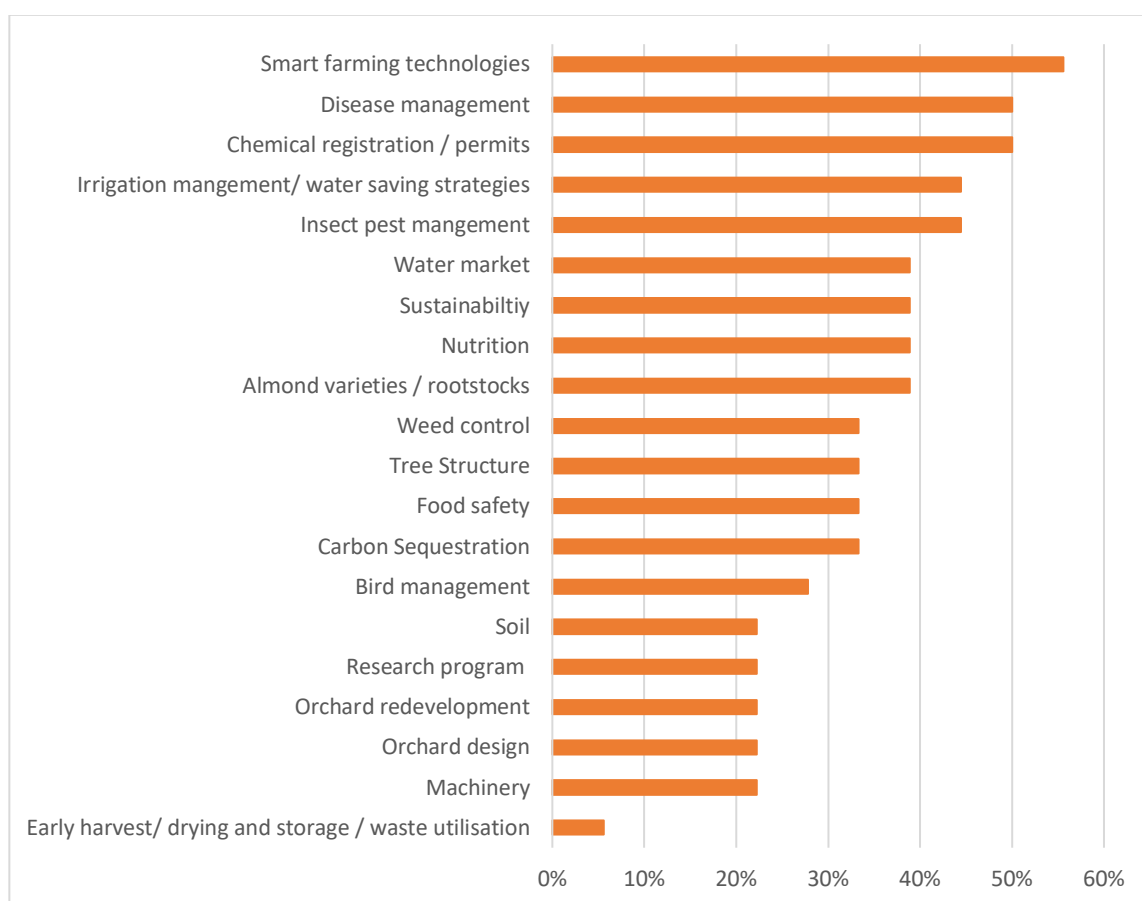
“Tailored to the individual growers’ requirements.”

“There are a number of new entrants in the industry, ensure basic information provided, assume low level of knowledge.”

“More emphasis on speaking techniques. Working with researchers to ensure messages are clear and concise.”

“Do not be “faceless” people.”

The top-five topics that survey respondents were looking for more information on included: smart farming technologies (56%); disease management (50%); chemical registrations and permits (50%); insect management (44%) and irrigation management (44%).



Key Evaluation Question 2: How effective was the project in delivering high health, true to type material to industry?

How many high health, true to type trees delivered to nurseries?

From January 2017 to December 2019 2.5 million buds were delivered to almond nurseries for propagation into almond trees.

What percentage of high health, true to type trees delivered to nurseries were planted?

In 2017-18 and 2018-19 a total of approximately 2.2 million buds were delivered to nurseries equating to approximately 7,731 hectares planted using ABA sourced material (assuming 10% failure and 317 trees per hectare). This equates to 80% of total area planted using ABA budwood.

Was the industry aware of new material being made available?

New varieties were promoted over a series of three field days and 122 participants able to see how the varieties performed in a commercial setting. These field days were supplemented with presentations at Conference and regional meetings, 'In a Nutshell' articles, factsheets, videos and one to one advice. The grower and stakeholder survey indicated that 67% of respondents increased their awareness of Australian varieties through these extension activities.

Is high health, true to type material becoming growers first choice of material?

Despite the high demand in budwood material in 2017 and 2018 high health material has been used by approximately 80% of the industry. Industry leaders have assisted in promoting the benefits of using high health material and the risks associated with commercial orchard material being used in propagation.

Key Evaluation Question 3: Was the evaluated budwood material suitable to industry?

Are yields higher than current traditional material?

During the project Agriculture Victoria through Agri-bio produced a fact sheet describing the importance of using high health material to generate a superior growth habitat and in effect yield and revenue. This fact sheet can be found [here](#).

Is demand for new material increasing?

The area planted to new varieties has increased from 714 hectares in 2016 to 1,759 hectares in 2019 which represents an increase from 8.6% to 10% of new plantings each year and from 2% to 3.4% of the total industry. The uptake of new varieties has been more rapid amongst smaller to medium growers. Most large investor-based developments have been years in development and have based planting plans around traditional varieties and have not had the flexibility to change the prospectus.

Does analysis indicate positive variances from traditional varieties or systems?

As presented in the economic analysis for new varieties (Appendix G) there has been an increase in non-traditional varieties since 2016.

Is there market acceptance of the product?

A major aim of the breeding program was to produce Nonpareil types to achieve similar returns but have significant production benefits. Crop volumes for the new varieties have not yet achieved levels where the product can be marketed and sold separately but the trade who have received samples are very accepting of the qualities of the new varieties. It has been observed that the price difference between Nonpareil and the pollinating varieties is decreasing. This is due to the increase in demand for almonds for use in the manufacturing of breakfast cereals, snack foods, confectionary, milks etc. where the nut is processed, and visual characteristics are less important. This has opened the opportunity for new varieties to be considered for specific products.

How suitable was the evaluated material for industry?

Material supplied to industry through the ABA was annually tested for viruses and disease and protocols implemented to ensure material supplied was to specification and virus free. Less than 1% of material required replacement over the three-year period.

Project learnings and improvement processes

Distributing the end of project grower survey in the harvest period is the likely reason for the low response. It has been difficult through this process to confidently attribute ABA influence on industry practice change apart from the industry wide adoption of orchard hygiene as the response required to reduce insect pest damage.

All information circulated directly to growers via email was sent from a central source i.e. mail chimp, enabling: reliable delivery using up-to-date and relevant contact group, delivered from a recognized ABA mailing address, time-stamped delivered, provided analytics on the number of people who view and download the extension product.

Website upgrades mid-project created difficulties in analyzing the utilization of the ABA website over that time. This is a once-off and website improvements in 2018 will assist with future analyses.

The video presentation skills within the team has continued to develop with experience and provides a strong option to deliver this service for research projects in the future. This will be encouraged within the research community to build on the visual resources available for video production.

Many topics and research results are relevant to both new and established growers and it is important that a mix of traditional and modern mediums are utilized to meet different learning styles providing information on world's best practice and production system fundamentals. Tailored advice was generally provided to established growers seeking specific and sophisticated information. New entrants required additional support and guidance to understand basic knowledge as well as establishing industry networks.

The Almond Centre of Excellence experimental orchard will provide a valuable resource for to demonstrate R&D activities and findings as well as exploring and testing new technologies and commercial products.

Two staff resignations were managed over three years with minimal disruption due to the skill set and experience of remaining ABA staff and the development of junior ID staff. New staff were recruited to the vacant positions, made easier by the progressive nature of the industry and the organisation.

The addition of Dr Greg Buchanan to assist with addressing the insect pest issue demonstrated the value of being flexible in adding resources to meet critical needs.

Recommendations

- The close alignment between the knowledge and technology needed to implement the ABA's Almond Industry Strategic Plan and the outputs of Hort Innovations R&D program is crucial to ensuring the work of researchers is taken up by industry stakeholders and needs to continue at the current high level through co-operation between the ABA and Hort Innovation.
- Future extension projects continue building the linkages and collaborative networks between industry leaders, partner organisations, researchers, product and service providers to identify and optimize on-farm adoption of new information and technology.
- Videos will continue to be a major focus for the extension program to improve the conveyance of best practice by focusing on information that growers find useful and valuable and extend the reach beyond the event – spatially and temporally. Virtual reality is a natural extension of this technology.
- Feedback from the grower/ surveyor survey will provide insight for future extension activities utilizing a mix of traditional and modern mediums to deliver key messages.
- More targeted feedback for product/event specific activities will better inform the efficiency, effectiveness and relevance of extension activities.
- The ongoing expansion of the Riverina as an almond production area will require a greater focus on servicing this region that now represents 24% of plantings of an industry that will grow to a farmgate value of \$1.2 billion during the period of the next project.

Refereed scientific publications

No refereed scientific publications to report.

References

ABA 2019 Almond Insights <https://industry.australianalmonds.com.au/almond-board/almond-insights/>

Intellectual property, commercialisation and confidentiality

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

Acknowledgements

The ABA wishes to acknowledge the contribution from the members of the ABA value-chain committees who contribute their time and share their knowledge for the prosperity of the Australian Almond industry.

Appendices

Appendix A – Program logic and monitoring and evaluation plan

Appendix B – Stakeholder engagement and communications plan

Appendix C – Risk register (provided to Hort Innovation)

Appendix D – Almond industry community of practice

Appendix E – Project deliverables - extension activities and analytics

Appendix F – Economic analysis framework for orchard hygiene

Appendix G – Economic analysis framework for new varieties

Appendix H – Economic analysis framework for irrigation scheduling

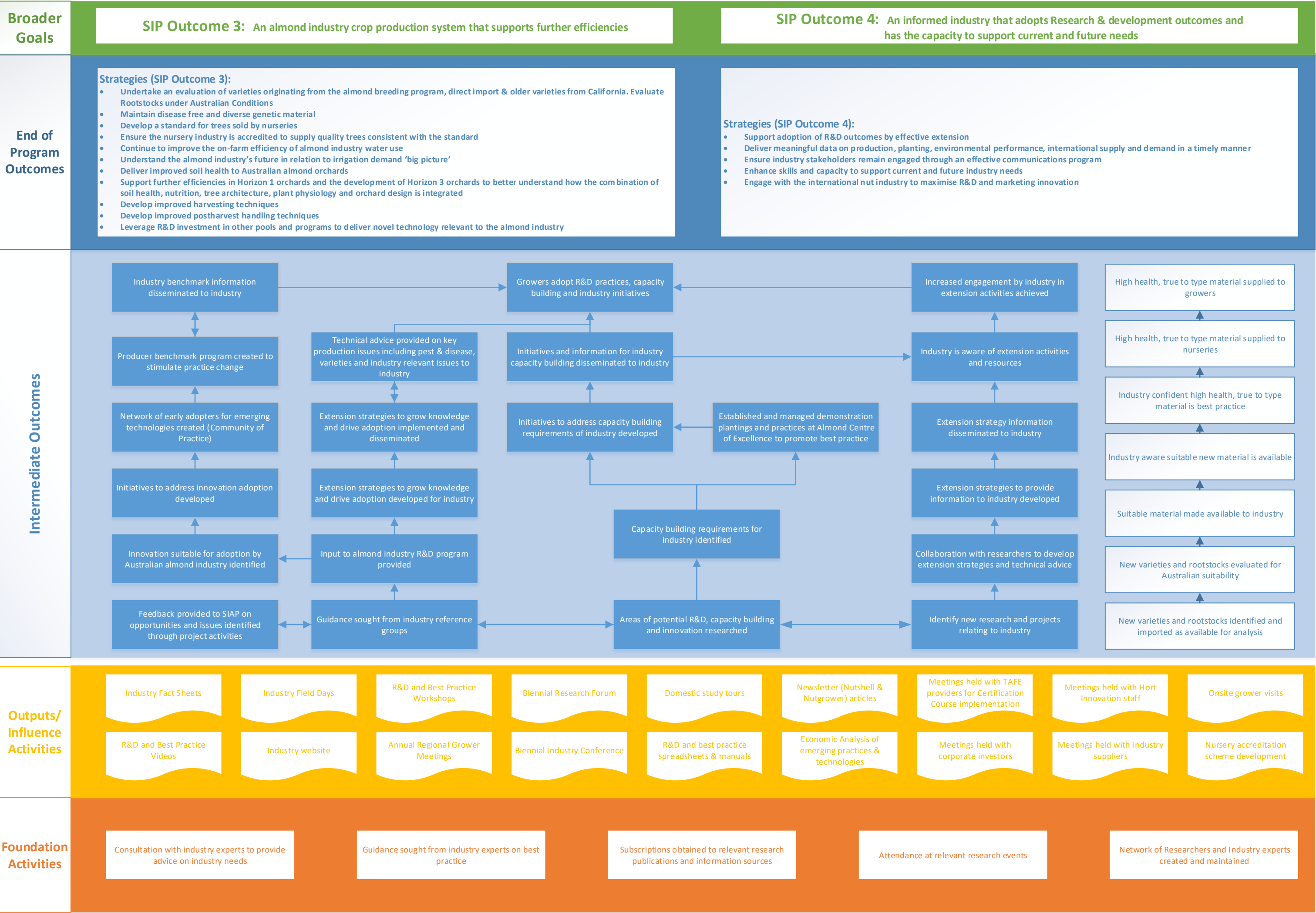
Appendix I – Extension project reports to the project reference group

Appendix J - Web site and mail chimp analytics

Appendix K – Grower and stakeholder survey results

Appendix L – Benchmarking decision support model

Program Logic





australian
almonds

ALMOND BOARD OF AUSTRALIA

COMMUNICATIONS & STAKEHOLDER ENGAGEMENT PLAN

Project AL16001

Australian Almond Industry Innovation and Adoption Program

OUR MISSION:

As the Australian almond industry's peak body, the ABA facilitates further growth of the industry, seeks to maximise its profitability and ensure its sustainability, by providing a platform for industry members to collectively respond to industry wide issues, invest in research and marketing, share knowledge, and interact with government and other stakeholders.



AUSTRALIAN ALMONDS

www.australianalmonds.com.au



Summary

The Almond Board of Australia (ABA) is the lead organisation providing industry communications to the Australian almond industry. It is the peak industry body and as such, represents the interests of all almond grower / levy-payers across all growing regions in Australia. The ABA has extensive experience in exploiting a range of communication tools dedicated to empowering and informing growers / levy-payers and participants within the supply chain so that they can make better business decisions.

This report provides details of the Review and Strategy as it relates to activities that are funded by Hort Innovation under Project AL16001 'Australian Almond Industry Innovation and Adoption Program'. The Innovation and Adoption project is an integral part of the broader industry communications program aimed at implementing the almond industry's strategic plan.

The industry's innovation and adoption program plays a critical role in ensuring world's best production systems and management strategies are put in place to maximise the competitiveness of the Australian almond industry. The industry must also compete against the Californian almond industry, which in 2015 was worth more than the entire Australian horticultural industry. The Almond Board of Australia is charged with representing 99% of Australian production and is responsible for implementing the industry strategic plan covering many facets of production, processing and market development. Communicating the actions required to implement the industry's strategic plan is crucial if the industry is to continue to work in the cohesive manner that has been the hallmark of its successful development to date. Hort Innovation's research program aims to deliver in part the knowledge and technologies required for the ABA to implement the industry strategic plan, but information is also being sourced from researchers, suppliers and industry participants around the world to ensure Australian industry members are well placed to make strong business decisions.

Almond Board extension activities align closely to the CEO and Industry Development staff roles, who undertake liaison with multinational corporates to small producers in providing business case information through to orchard demonstrations. This close team co-operation combined with the knowledge sharing of industry participants and researchers lies at the heart of the almond industry's high-level performance in this area.

The ABA is well positioned to drive industry innovation and adoption as it has developed a skilled, dedicated staff base, allowing all extension to be conducted in-house. A thorough understanding of the almond industry R&D strategic plan that the ABA is responsible for implementing gives ABA staff a holistic approach to this program. The quality of publications and extension activities has been widely recognised and commended for many years and the experience of the Industry Development Team is extremely significant in seeking continuous improvement and ensuring activities that have been found wanting in the past are not repeated.

The rapid growth of the Australian almond industry and high level of corporate investment has significantly increased the participation of professional managers who have high-level communication needs and technical support. The ABA strives to provide a range of extension activities and communication mediums to enable access to knowledge in the most timely and suitable way. As a leader in communicating almond industry research, new technologies and methodologies, the ABA ensures that information is available to all members of industry and that information is uniformly shared.

Communication which leads to innovation and adoption within the almond industry is critical if growers are to adjust and adapt to the increasingly dynamic physical and economic environments that they face now and into the future. Growers and supply chain participants need a range of communication inputs to remain well informed as to outcomes of research and development, new technology, best on-farm practices, trade requirements, biosecurity, climate change and environmental issues, chemical regulation, labour issues and government policy changes.

Purpose

The innovation and adoption project is an initiative to enhance the transfer of research and technological information to industry. It is designed to facilitate the communication links between participant groups and to develop the knowledge brokerage skills of individual participants. As part of this process the ABA has looked at other national and international models of successful extension programs so we can evaluate ours and make changes as required improving our own extension strategy.

Industry communication is ranked as a high priority in the Hort Innovation Strategic Plan and within the Australian Almond Industry Strategic R&D Plan 2011 – 2016 including achieving the following outputs:

- Maintenance of a comprehensive, up to date database of contact details for industry participants for distribution of communication material including biosecurity incursion actions, planting information and other industry correspondence.
- A quarterly industry E-Zine that includes updates on Hort Innovation funded research projects.
- An up to date industry website encompassing articles on chemical permits, biosecurity updates and copies of Hort Innovation report summaries.
- Distribution of Hort Innovation Final Report summaries to Australian almond levy-payers.
- Publication and distribution of the almond industry's Strategic Plan and R&D Investment Plans.
- Media releases promoting key research findings and events.
- Website and blog including industry best practice supported with video clips of research outcomes and field day presentations.

The messages for Australian almond industry communications can be classified into five areas:

1. Where industry levy dollars are spent: New projects that are starting, expected benefits for industry in relation to levy investment, milestones and project outcomes/results.
2. Adopting Change: Key results from industry projects in Australia and overseas, related impact on industry participants and how they should manage adoption of any new or key technology in their day to day business.
3. Industry data & initiatives: Outcomes of industry data collection activities including plantings, production and sizing, imports and exports, consumption and world trends in almonds.
4. Topical Industry Issues: Key issues that impact on industry and their consequences, or actions required by industry participants.
5. General industry information: Issues such as industry events, environmental and natural resource management, biosecurity, market opportunities, food policy, almond industry and ABA activities and achievements and international industry issues.

Background & Objectives

The project follows on from Hort Innovation projects AL07008, AL9021 & AL12000, focusing on providing a broad range of timely information to all Australian almond industry stakeholders and interested parties. Industry extension remains a high priority as per Outcome 4 "An informed industry that adopts R&D outcomes and has the capacity to support current and future industry needs" detailed in the Almond Strategic Investment Plan 2017-21.

The objective of this project is to provide an effective extension programme to enable industry participants to improve their knowledge, leading to enhanced business enterprises better able to compete in a sustainable manner. While the project's communication objectives have a primary focus on producers, the project aims to communicate across the entire supply chain.

The Australian almond industry is a very dynamic one; wherein the communication and extension programme continues to play a vital role in industry adopting world's best technology, positively supporting industry levy-payers and Hort Innovation, research organisations, and enabling participants of industry to make better business decisions in the following areas:

- Orchard design
- Water management
- Plant nutrition
- Production cost management through input efficiency
- Pest and disease control
- Soil health
- New varieties
- Pollination
- Extreme weather events
- Product quality and food safety issues
- Biosecurity

The scope of this document is to prepare an Extension Strategy and Action Plan for the ABA for the life of project AL16001. This includes:

- Communications plan for key audiences
- The content/messages/activities for each audience
- The channels/tools required
- Inclusion of electronic and social media as appropriate
- Priorities across audiences, content and channels
- Nominations of resources required including staffing and infrastructure – in-house resource and external
- An action plan and timeline for implementation

Key Audiences & Communications Channels

Audiences

A fundamental consideration in undertaking the development of the Extension Strategy is an assessment of the needs of the target audiences of almond industry communications. These audiences were assessed to include:

- | | |
|--|---|
| <p>1 Internal Audience</p> <ul style="list-style-type: none"> ○ ABA Staff, Board Members & Committees <p>2 Primary audiences</p> <ul style="list-style-type: none"> ○ All almond growers (levy-payers) ○ Supply chain participants ○ Industry Investors <p>3 Secondary audiences:</p> <ul style="list-style-type: none"> ○ Agronomists ○ Researchers ○ Input suppliers ○ Consumers / community ○ Media | <p>4 Statutory & Government:</p> <ul style="list-style-type: none"> ○ Horticulture Innovation Australia ○ Minister for Agriculture, Fisheries and Forestry ○ Parliamentary Secretary to the Minister for Agriculture, Fisheries and Forestry ○ Ministers such as Trade, Regional Development, Water, Natural Resources ○ Australian Government Department of Agriculture, Fisheries and Forestry; ○ State departments of primary industries ○ Australian Quarantine and Inspection Service ○ National Residue Survey |
|--|---|

The almond industry's 'Primary audiences' can be further delineated into three tiers; each has different needs. These can anecdotally be defined as:

- **Tier 1** – Progressive organisations who run their orchards on a business model – generally larger corporate operations that employ many people. They have invested on farm and run sophisticated operations, seeking best practice and extension information from around the world.
- **Tier 2** – Growers who are good horticulturalists and have technical know-how, and are fair to good business managers. This group has generally held back from major investment on farm in recent years. They have the potential to become Tier 1 growers given the right extension information and encouragement to invest.
- **Tier 3** – Traditional growers who supply almonds to almond processing and marketing companies; they are generally lacking connections to the supply chain. This group is disconnected and disinterested. They have the least chance of survival in a 'new world environment'. Many are older generation growers who have no succession plans in place or are planning to potentially leave the industry within the next ten to fifteen years.

There are regular messages which are critical to the success of the almond industry, these messages will be woven into the communications activities defined by this plan and consist of the following:

- Where are levy dollars spent? - Industry Levy - new projects that are starting, expected benefits for industry in relation to levy investment, project outcomes
- Changes that producers should be adopting in your business because of project outcomes – communicate key results from industry projects and related impacts on industry participants
- Benefits of industry data and industry initiative to collect relevant industry data - outline benefits to industry and mechanism that will be used to collect data
- Topical Industry Issues – communicate major issues that are impacting on industry and consequences / actions required by industry participants
- Communicate general industry information - communicate issues such as industry events, industry statistics and information sources, environmental and natural resource management, biosecurity, consumer trends, market opportunities, food policy, almond industry and ABA activities / achievements and international industry issues
- Promote the Australian almond industry and the credential of the industry with broader community / consumers and government

During the life of the Almond Innovation and Adoption Programme the background and value of the Australian Almond Industry needs to be understood by a wide range of stakeholders. These stakeholders play a vital role in maintaining a commercially sustainable almond industry.

The table below identifies the information that the defined list of ABA target audiences needs to receive through the ABA communications program.

Target Audience	Media/Delivery Channels
Internal	All ABA communications activities
Primary	In a Nutshell newsletter, emails, website, meetings with ABA staff, regional grower meetings, workshops, field days, media releases, social media, best practice fact sheets
Secondary	In a Nutshell newsletter, emails, website, meetings with ABA staff, relevant workshops and field days, media releases, social media
Statutory & Government	In a Nutshell newsletter, emails, website, relevant meetings with key staff, media releases, social media

There is the need for a holistic approach to be taken for communications and extension within the Australian almond Industry and its stakeholders both internally and externally. The almond industry takes a proactive approach to meet the needs of its growers and stakeholders, both in Australia and overseas.

Key factors for this to occur are:

- ABA website to be regularly updated for public usage and grower usage and will contain key documents from the ABA and Hort Innovation;
- Encourage more growers utilise the website; look to have 80% usage by growers by 2018
- Ensure that all material is available in several formats such as electronic, printed and in plain speak
- Set up feedback systems to ensure all stakeholders can provide information and ideas for new publications and ideas for the benefit of the industry into the future
- Continue to provide traditional extension services such as field days and workshops but also ensure these can be accessed through new technologies available and through the NBN (i.e. live feed video, recorded clips uploaded to website)
- Meetings of the Committees and Regional Forums provide the opportunity for the ABA Chair, Directors and staff to present to growers and other value chain participants and receive feedback on issues.

Industry Forums and Field Days

The ABA has continuous contact with growers on a day to day basis on specific issues. The CEO, Industry Development Manager and IDO's undertake most of this communication with growers whilst the Market Development Manager liaises closely with the industry marketers.

The ABA's value chain Committees meet quarterly to address the industry's major risks and opportunities. There are over twenty meetings scheduled during 2017 and they each provide an opportunity for interaction with many of the industry's most influential members.

The Regional Grower Meetings are held annually in each of the four major producing districts. These events attract strong attendance and presentations are made by the Chairman, CEO and Industry Development Manager covering all aspects of the implementation of the industry strategic plan from plant improvement to promotion. The forums allow for group interaction and provides valuable feedback on regional concerns.

The Almond Conference is held every second year and provides a forum at which all of industry is invited. On alternate years, an R&D Forum and Field Day will be conducted. This is to be resourced under a separate project.

All these events provide the ABA with ample opportunity for direct communication with the industry's producers and stakeholders and are the most valuable extension channel for influencing better orchard practices and addressing key issues.

Recommendations:

- Ensure there is a relevant theme to field days that will 'hook' growers to attend
- Promote field day dates well in advance
- Consider filming a section of one Grower Meeting for those who can't attend to be shared digitally
- Capture and table those issues in a final session of the program, to ensure growers agree on what they want the ABA to focus on
- Facilitate interactive feedback where participants are asked: What stood out? What did you learn? What can you put into practice?

Fact sheets

The almond industry has a clearly defined accessible area of fact sheets within its website grower pages. Presently fact sheets, like all technical documents tend to be comprehensive and detailed in nature. There is an argument for a more succinct version to capture the essence of the fact sheets to capture a grower's interest before they study more reasoned advice.

There are many topics that fact sheets could cover including; biosecurity; climate change, environmental issues; financial analysis from a grower perspective; and chemical regulation and these will continue to be a focus of extension staff.

Recommendations:

- Content plan developed in January each year to determine fact sheet topics and seasonal information updates.
- Drive distribution and engagement with growers by utilising comment ability on blog replication of fact sheets
- Create series of short and concise factsheets on key topics
- Broaden the scope of information

In A Nutshell E-Zine

In A Nutshell is the preferred channel of communication for growers and stakeholders within the Australian almond industry. Growers like the publication and it is often the only communication they read and take notice of. It is important for *In A Nutshell* to remain a key source of information for growers and participants within the value chain so that they can make better business decisions. Specifically, *In A Nutshell* should remain as a key channel for the dissemination of:

- Technical know-how to reinforce the messages and learning points arising from the Industry Development program
- Outputs from Research and Development such as articles from domestic and international R&D
- Information about the business, regulatory and physical environment in which growers / levy-payers and the supply chain operate including trends in domestic and international markets, trade requirements, biosecurity, climate change and environmental issues, chemical regulation, labour issues and government policy changes.

Recommendations:

- Articles relating to new technology to be sourced and included as they become available
- Inclusion of quarterly statistical information in each edition
- Inclusion of regional reports on season status and outlook in each edition
- More updates relating to current Hort Innovation projects
- As an agenda item at the end of Board and Committee meetings identify if any messaging would be worthwhile to convey to growers
- Nurturing young farmers to provide content, widening their development as future leaders for the ABA

ABA grower website

Grower specific pages of the ABA website have the benefit of being immediate and current. The latest information can quickly be uploaded and it is possible to provide an opportunity for feedback, giving visitors to the site the ability to ask questions, make comment and to receive a response via email – thereby encouraging two-way communication.

The ABA website should be the single most important channel for growers and industry to gather practical, technical information to help them farm better; gain access to experts who advise on on-farm topics; gain insights of best practice both nationally and internationally; to read what the ABA and Hort Innovation is doing; and to network with other growers to share ideas.

Recommendations:

- Modify the grower section of the website so that it becomes the 'go to' web destination for growers and the supply chain
- More immediate information sharing from industry activities
- More stories about industry participants
- Better information about Hort Innovation
- Addition of an updated News Centre / Media section
- Podcasts of orchard walks / farm practice videos on specific topics
- Discussion groups which anyone can drop into and make a comment, including the experts and specialists such as agronomists and agriculture consultants

It is important to encourage better utilisation of the website by growers as an ongoing strategy.

Social Media

The ABA has Facebook, YouTube and Twitter accounts that are underutilised. These should be a tool to reach the wider almond community, plus media and other interested people. Younger growers prefer this medium so they may receive bite size updates as opposed to the longer eNews and other communication tools. In general, it's a low cost and low involvement activity that will help inform growers of R&D outcomes while also being a useful advocacy tool. The key to success of social media communications is regular and targeted Tweeting, and regular Facebook updates.

Recommendations:

- **Social media**
 - Tweeting and Facebook posts 'as it happens' at grower events and field days
 - Multiple communicators – Industry Development staff and Communications staff to update the channels
 - Liaise with communication staff in AL16000 regarding the best content to upload onto Facebook
 - Utilising the Facebook Live feature at events to reach a wider audience that are unable to attend events
- **YouTube Videos**
 - Actively seek new topics and explore innovative techniques to create multimedia for uploading to YouTube.

Review of communications infrastructure / processes and future requirements

Grower database & Email Database

The ABA maintains a comprehensive database of industry participants facilitated by communication with processor/marketer members and supply chain advisory committees who provide feedback on communications and industry information needs. The ABA database is key to an effective communications program and is also critical should implementation of the Biosecurity Management Plan be required.

The grower and email databases are an important tool to ensure effective engagement with growers and stakeholders, including the full industry supply chain, agronomists, government and other service providers. They contain relevant contact information gleaned from industry field days and events, conferences, personal communication, grower surveys and website sign up areas. The ABA's Communications Manager maintains both databases.

These databases are used to distribute all ABA communications and invitations to various events. However, these databases are underutilised. One problematic issue is that currently each ABA staff member has their own email groups that are not accessible by other staff members, rather than using the ABA Communications Manager to manage and distribute communications using master email groups for (for example) growers, government contacts, service providers, agronomists etc. This makes it difficult to ensure targeted communications consistently reach the right person every single time, and updates to contact information may not be passed on.

Generally, details are added to the database when a person subscribes to communications through the ABA website, attends an ABA event, or contacts the ABA personally. At this point in time there are more than 1,000 people in the database, approximately 150 of whom are R&D Levy-payers, making up approximately 98% of known industry growers. The ABA database is updated at least biennially from major communications activities which are conducted. The grower database and email database are regularly cross checked and updated and master email distribution groups created and maintained.

It should be a priority to ensure that all ABA communications are sent from a central source, to organised and segmented lists. The ABA Communications Manager should be the administrator and conduit for communications relayed to target audiences and stakeholders, therefore eliminating issues concerning relevance of lists and misdirection of communication.

Planned/recommended enhancements: This database is continually updated by ABA Staff from contact with industry participants and database members via conferences, forums, field days and membership updates. Review of the database is conducted three times per year by phone, email and following industry events to ensure contact and subscription details for each person listed are accurate.

Photo library

The ABA has a comprehensive photo library that is available via Dropbox to anyone requesting images. This image library enhances the ABA's ability to pitch stories and ensure prominent placement in newspapers and media stories. It also helps TV news tell their story too.

Recommendations:

- Existing images need to be re-collated into the ABA website and consideration needs to be given as to whether the ABA should commission a photo shoot of people within the industry for use within stories to give a personal and human touch
- The revised website page of images should enable people to view a thumbnail image, but must request permission and access to a high-resolution image from the Communications Manager directly via email

DVD's / videos

Video is a powerful way to impart information and provide short, useful detail to assist farmers on a range of best practices and research outcomes.

Recommendations:

- Placing and embedding video clips on the website allowing growers to access them in their own time
- Topics should be targeted for each grower segment and aligned with Fact Sheets and *In A Nutshell* articles where possible
- Specific videos and industry DVD's should be created on seasonal or relevant industry topics as necessary from industry field days and events, conferences and forums and other issues of importance
- All industry videos should be distributed by eBlast, hosted on YouTube and embedded in ABA webpage articles

Situation Analysis

The current Strategic Investment Plan for the Australian almond industry highlights that: Australia has a worldwide reputation as a supplier of quality almonds. Few countries can efficiently produce the high-quality almonds that Australia provides. This gives Australia a powerful competitive position as an international supplier.

As the Peak Industry Body (PIB) for the almond industry, ABA's roles are to:

- Provide recommendations on behalf of industry to Hort Innovation regarding the expenditure of almond levies
- Communicate back to growers the outcomes from Hort Innovation and industry investment
- Provide services to almond growers / levy-payers and the supply chain to improve their business decision making and enhance their day to day operations. This includes:
 - A provision of extension and industry development services
 - Dissemination of regulatory and policy changes e.g. chemical, environmental and labour
 - Dissemination of key messages and learning points from levy funded research and extension.
- Represent the interests of almond growers to policy-makers and regulators across Government

As the almond industry moves forward, there is a need for strong coordination at farm level, through the supply chain, with other aligned horticulture industries in Australia, with Federal Government and state government research organisations and potentially with overseas industries where there are tangible benefits to be gained.

The ABA has demonstrated its commitment to playing a lead role in facilitating change within the industry. Effective communication, engagement and coordination of efforts is important to maintain strong collaboration in Australia's almond industry.

The ABA is best placed to aggregate and communicate relevant information, to provide necessary services to growers and the value chain to empower them to make the sound business decisions.

Communications Objectives

All ABA extension activities are designed to support the organisation's key outcomes in the Strategic Investment Plan:

- An informed industry that adopts Research & Development outcomes and has the capacity to support current and future needs
- Lift industry average yield from 3T per hectare to 4T per hectare
- Improved product value
- Improved competitiveness
- Improved nut quality

More specifically extension activities align directly with:

Outcome 3: An almond industry crop production system that supports further efficiencies in Horizon 1 orchards and the development of Horizon 3 orchards and has lifted average industry yield from 3 to 4 tonnes per hectare. This will include new almond varieties featuring self-fertility and sealed shells, a new nursery accreditation scheme, 4 megalitres of irrigation water per tonne of almond kernel yield and proven 'shake and catch' harvesting and post-harvest systems

Strategies	Deliverables
Undertake an evaluation of varieties originating from the Australian Almond Breeding program, direct import and older varieties from California. Evaluate rootstocks under Australian conditions	• Provide support to the Australian Almond Breeding program (AL12015) in promoting promising selections and newly commercialised varieties through fact sheets, videos and field days
Maintain disease free and diverse genetic material	• High health status mother plantings which decrease contamination risk and ensure varieties are true to type • Support a secure variety and rootstock germplasm repository for almonds through the new Almond Centre Experimental orchard
Ensure the nursery industry is accredited to supply quality trees consistent with the standard	• Nursery industry educated and encouraged to adopt an accreditation scheme that delivers the quality standard for almond nursery trees • The accreditation scheme delivers better planting material and provides recourse for growers when nursery trees don't meet accreditation standards

Outcome 4: An informed industry that adopts R&D outcomes and has the capacity to support current and future industry needs

Strategies	Deliverables
Support adoption of R&D outcomes by effective extension	• Extension program that includes fact sheets, field days, field trials, workshops, training, project updates in newsletters, online copies of final reports and regular surveys of stakeholders to gauge uptake • Additional Industry Development Officer capacity, two or three in total, to support extension and small/new grower training
Ensure industry stakeholders remain engaged through an effective communications program	• A communications plan and program supported with either an annual industry conference or marketing forum
Enhance skills and capacity to support current and future industry needs	• Capacity building investment – including students, irrigation staff, 2ICs, technical officers, middle managers and farm managers who can lead large and complex businesses, young leaders and researchers. Focus directed to the transition from irrigation to farm manager
Engage with the international nut industry to maximise R&D and marketing innovation	• International study trips and support for the international networking initiative – with priority for international study trip funding to be given to small growers who do not have the capacity to self-fund

Methodology

The strategy by which communications to the Australian almond industry and its stakeholders will be delivered will be multi-dimensional in that delivery methods will be linked, and target audiences will be able to access information from a range of sources. This communications and stakeholder engagement plan aims to improve on the service that the ABA provided in previous projects and that there is no degradation of services only enhancements.

The ABA has been working on industry extension activities since the association's inception, providing knowledge and experience essential for effective communication. The team is led by the ABA CEO and employs an Industry Development Manager, Andrew Downs, who leads the industry development team of a Senior Industry Development Officer, Brett Rosenzweig, and a Junior Industry Development Officer, Joshua Fielke.

Different extension activities are suited to different people, and this project utilises a range of communication methods including print, digital and written media as outlined below. Communication methods are integrated so each contains links with others and encourages feedback and information sharing. It is essential that these communications are readily available to all participants and service providers in a variety of formats to suit the diverse nature of each audience.

With these objectives in mind, the innovation and adoption project aims to achieve key outcomes including:

- Stakeholder engagement which includes grower forums
- Accurate databases of industry participants.
- *In A Nutshell* E-Zine distributed to industry contacts spanning the almond industry supply chain, including growers, processors, marketers, nurseries, beekeepers, chemical providers, research providers, investors, etc. This will also be accessible electronically via the Australian Almonds website.
- An effective and up-to-date website that provides a comprehensive information source for anyone seeking information relevant to the Australian almond industry enabling access to Hort Innovation project reports and other information tools that have been developed from the almond R&D program.
- eNews and updates providing almond crop and industry information circulated to contacts.
- Circulation of Hort Innovation Final Reports to almond levy-payers and links to the Hort Innovation website.
- Publication of Industry Fact Sheets detailing best practice.
- Best practice/research program outcome YouTube videos created, uploaded and disseminated.
- Forums for industry participants on industry and research and development activities.

The ABA will conduct a mid-term review of extension activities to assess the program and the effectiveness of communication. This evaluation will be distributed via individually preferred method of either email or hardcopy post. Survey questions will be designed to determine the quality, timeliness, frequency, format, distribution method and relevance of information provided to stakeholders. This process will also be supplemented by informal evaluation procedures. Findings from these assessments will be considered when planning each year's extension program. Surveys and input from ABA committees will continue to guide a program of continuous improvement in the associated communication outputs.

The Australian Almond Innovation and Adoption project builds on key areas identified in previous projects and results of industry surveys including the use of new information sources and those currently available to those involved in the industry, and barriers to the uptake of research and development outcomes. Industry participants rely on one or two sources for their information. The ABA continues to address issues of efficiency and effectiveness of information transfer to different stakeholders and how to make the most of the opportunities available using information technology.

Principles for engagement

The ABA uses five key principles to guide stakeholder engagement activities. The principles set the standards to which we aspire in building consistent, open and respectful relationships. The principles have been tested against and are consistent with current stakeholder engagement standards and practices across the public and private sectors, locally and internationally.

Purposeful	We begin every engagement with a clear understanding of what we want to achieve • While our engagement will be driven by strategic priorities, we must be aware of our stakeholders' objectives, environment, expertise and level of influence. • When we know why we need to engage and we agree on what success looks like, it is easier to conduct focused and meaningful engagement. • By planning our communication and managing expectations, we aim to build lasting goodwill with stakeholders participating in the process and develop an understanding about their capacity to engage.
Inclusive	We identify relevant stakeholders and make it easy for them to engage • We identify and enable the participation of those people and organisations who contribute to, influence, or are affected by our work. This includes those that may be harder to reach for reasons such as language, culture, age or mobility. • We provide our stakeholders with the information they need to participate in a meaningful way
Timely	We involve stakeholders from the start and agree on when and how to engage • We will clearly identify and explain the engagement process, and negotiate with stakeholders, where possible, as to timelines. • This includes meeting schedules, and response times for information requests or feedback.
Transparent	We are open and honest in our engagement and set clear expectations • We will provide information so stakeholders can participate in a meaningful way and will foster a culture of sharing ideas. • We will clearly identify and explain the engagement process, the role of stakeholders in the engagement process, and communicate how their input will inform the project.
Respectful	We acknowledge and respect the expertise, perspective, and needs of stakeholders • We understand that engagement is a two-way process. We take care to be open to alternative views and to listen as well as speak. • We respect our stakeholders' expertise and appreciate the benefits of mutual learning. • We recognise the different communication needs and preferences of stakeholders and endeavour to meet these wherever possible.

Process for engagement

The ABA's model for stakeholder engagement has been adapted from the international standard developed by the Institute of Social and Ethical Accountability (2005).

This five-step process is structure to support thorough planning, preparation, action and evaluation of every engagement activity. The process is a dynamic and ongoing cycle, which supports a comprehensive approach to engagement and will, over time, build an evidence based platform for continuous improvement.



Think	Develop an overall consideration of strategic objectives, how these relate to stakeholders and specific issues, and conduct an initial prioritisation of stakeholders and issues for further analysis.
Plan	Introduce different levels of engagement, and guide the analysis of existing relationships, available resources and organisational constraints. Learn more about specific stakeholder's representatives, and to decide on what kind of relationship to develop with these stakeholders.
Prepare	Address questions of internal and external competencies and capacities to engage, and ensure that all parties to an engagement can join and take part effectively.
Engage	Address and outline different engagement techniques, and – building on the previous steps – design an approach that suits the needs of the specific situation to reach your objectives.
Evaluate	Follow-up on the outputs of engagement, and ensure that stakeholders feel assured regarding the quality of efforts.

How this process is applied will be driven by the purpose, level and type of engagement undertaken. It is also important to note that the process will operate at the strategic and operational ends of stakeholder engagement activities and more than one step in the process at any time, with different stakeholders, depending on the nature of the engagement.

Monitoring & Evaluation Matrix

Monitoring, feedback and evaluation a key to measure the ongoing effectiveness of communications and extension activities. By monitoring and responding to feedback regularly, communications can continue to address the needs and concerns of key stakeholders.

Monitoring and evaluation mechanisms:

- a. **Non-participant evaluation** – judgements on the level of engagement of the people involved
- b. **Reference groups** – Formal communication will be conducted with selected reference groups conducted via email, online and telephone.
- c. **Industry Development Needs Assessment** –
- d. **Participant Surveys & Evaluation** – Quantitative data collection of feedback from those participating in events including questions on logistics, satisfaction and relevance of information presented. Face to face communications will provide an opportunity for the audience to give feedback directly on communications activities identified in the communication matrix
- e. **Collaborative Outcomes Reporting** – will be based around the performance story presenting evidence of how the program has contributed to outcomes and impacts, and will be reviewed by both technical experts and program stakeholders, and may also include industry members.
- f. **Web, Social & Email Analytics** – Monitoring of accumulated data and data on individual emails including list subscribers, unsubscribes, open rates, forward rates, bounce rate, click and conversion rates. Quantitative website data such as number of visits, page views, unique views, return rate, time spent and bounce rate. All social media channels – Third party and inbuilt monitoring including mentions, likes, reach, engagements, views, click-through rate, comments, shares, re-tweets, impressions and reactions
- g. **Photo elicitation** –
- h. **Statistical collection & evaluation** –
- i. **Informal/Unsolicited feedback** – Informal feedback will be obtained via word of mouth through ABA Staff and Committee members.

The ABA will establish benchmarks and subsequently measure progress by building into annual workplans quantitative and qualitative questions about the following:

- Frequency of visits to website and purpose
- Industry Field Days, Regional Grower meetings and Forums
- Publications e.g. *In A Nutshell* E-Zine, fact sheets, social media posts
- Access, quality and delivery of R&D, extension and general information
- Visibility of information disseminated via traditional media

Frequency of monitoring:

1. Quarterly
2. Seasonally
3. Annually
4. Bi-annually
5. Ad-Hoc

ID	Monitoring Question:	
1	Where the initiatives and information produced relevant to industry?	
ID	Evaluation Questions:	Method & Frequency
1.1	To what extent were the initiatives read/utilised?	f1, d3
1.2	What percentage of industry are aware of the initiative?	d3, c3
1.3	How did you find these initiatives valuable to your business?	i5, b4
1.4	What initiatives have you adopted because of this information?	d4, b3
1.5	What percentage of industry has adopted initiatives and Research and Development because of this project?	d4
1.6	Which information sources do you find most valuable to your business?	i5, b5, f1
1.7	How effective did you find the extension strategies used?	i5, b4, c3, f5

ID	Monitoring Question:	
2	How effective was the project in delivering high health, true to type material to industry?	
ID	Evaluation Questions:	Method & Frequency
2.1	How many high health, true to type trees delivered to nurseries?	h3
2.2	What percentage of high health, true to type trees delivered to nurseries were planted?	h3
2.3	Was the industry aware of new material being made available?	d3, i5
2.4	Is high health, true to type material becoming growers first choice of material	h3, d3, i5

ID	Monitoring Question:	
3	Was the evaluated material suitable to industry?	
ID	Evaluation Questions:	Method & Frequency
3.1	Are yields higher than current traditional material?	h3, b3
3.2	Is demand for new material increasing?	h3, b4
3.3	Does analysis indicate positive variances from traditional varieties or systems?	g3, g2, i5
3.4	Is there market acceptance of the product?	b3, h3, i5
3.5	How suitable was the evaluated material for industry?	e3, h3

Communications Responsibilities

Key:

A = *Accountable* for communication event, takes part in meetings

C = Provides information and *content* for communications material/event

E = *Evaluates* and approves communications material

P = *Publishes* information/communications material

M = *Monitors* communications process and provides feedback

Event ID	CEO	IDM	IDO's	Comms Manager
1	A/E/M	A/C/E/M	A/C/E/M	P/M
2	A/E/M	A/C/E/M	A/C/E/M	P/M
3	A/E/M	A/C/E/M	A/C/E/M	P/M

Measures of Success & Industry Adoption

The resources funded by the project will assist Australian almond growers / levy-payers, processors and marketers and other industry stakeholders - to be better informed and consequently, to be able to make better business decisions based on adoption of innovation and research and development. The industry development project supports the capacity building initiatives within Strategic Investment plan and the Industry Development initiatives of the R&D Strategic plan. Industry adoption is critical to the program.

Program activities will be measured by monitoring and evaluation initiatives to provide insight into the uptake and adoption. Success for the program will be measured on:

- Successful completion of influence activities within the project timeframe.
- Development and maintenance of a network of early adopters for innovation and research and development.
- Maintained or increased level of industry uptake of innovation
- Feedback and attendance levels of activities and events is maintained or increased
- Maintained or increased level of adoption of research and development techniques by industry
- Industry engagement in extension activities is maintained or increased
- High health true to type materials have been made available to industry with the project timeframe.

These measurements will be assessed against the following objectives, with the following outcomes:

Assist Australian almond growers produce high quality almonds at competitive prices through superior information to growers and supply chain on technology transfer, economic and physical environment, product quality and innovation, export market information, government regulation.

- Improve dissemination of information on R&D outcomes back to growers and the supply chain.
- Drive a program of activity that ensures growers remain well informed about market data, industry and regulatory matters, which help improve their business decision making ability
- Properly segment growers and stakeholder database; develop useful interactive database
- Improve on feedback provided by growers and the supply chain to help inform future R&D projects
- Establish peer-to-peer communications
- Become a one-stop shop resource for growers
- Develop and implement a strong media strategy to support information to growers and the supply chain
- All communication to be timely, relevant, short, sharp, crisp and newsy with clear value to audience

Build a strong reputation for the quality and innovation of Australian almonds.

- Increase awareness of how the Research & Development levy is spent so growers feel supported

Create Government and community support for the almond industry; represent the interests of growers and supply chain members to Government to reduce or minimise negative impacts, seek positive benefits and create a sustainable and profitable operating environment for almonds.

- Implement a stakeholder engagement program
- Ensure the Australian almond industry is recognised as a valuable component of the economy and a contributor to rural Australia
- Keep growers informed of what the ABA does on its behalf; internal advocacy
- Develop feedback channels so growers can guide the ABA on advocacy priorities

Build organisational capability and communications infrastructure to deliver on the first three objectives

- Develop core stories and key messages for the ABA's communications, to arch across all objectives
- Ensure consistency of brand image application
- Develop internal processes for dealing with issues
- Build communications resources within organisation and outsource as necessary

Overarching adoption targets for the communications program are as follows:

- The majority (>75%) of almond levy-payers should rate all industry development activities highly and positively when their feedback is sought or reviewed
- Prompted and unprompted awareness of the *In A Nutshell* E-Zine to remain at or improve upon the mark as it was in the previous grower survey
- 40% of almond levy-payer's rate at least one of these publications as a valuable tool for assisting with decision making in their business

- The ABA becomes the mainstay of almond industry information and statistics

Next Steps

This review and strategy will provide the basis upon which a plan can be developed to deliver effective and timely information and know-how to meet grower needs into the future (next three to five years). Effectively, this engagement plan is to ensure that priorities and content as well as tools, activities and infrastructure provide the best possible industry outcomes for the money invested in extension.

The ABA remains committed to providing new and enhanced extension tools and resources to the almond industry. This Engagement Plan will provide the ABA with a direction so that it can develop a way forward. The ABA has a small team to progress the new communications program focused on meeting the diverse communication needs of growers and industry stakeholders.

The new program is targeted for commencement from January 2017.

Appendix D – Almond industry community of practice

A community of practice can be defined as a group of professionals informally bound to one another through the exposure to a common set of problems and a common pursuit of solutions. The community of practice is often portrayed in a holistic view of an industry and its networking partners.

The Almond Board of Australia (ABA) has an extensive and diverse community of practice which is highly interactive and continually monitors internal and external pressures and opportunities in a bid to maximise almond production systems while maintaining input efficiency. Each connection featured in figure 1 illustrates a two-way flow of information and feedback. The four tiers described below represent the consolidation of information along these channels through various forums/platforms that prioritise and refine key industry messages.

Tier 1 is the highest level of community interaction amongst almond growers (green oval). The ABA was formed to represent grower interests and direct the investment of grower levied funds into research and development projects with the greatest benefit. It is appropriate that the ABA Board is centric to the community of practice as they are at the heart of ABA operations and the primary hub for all communications. The role of the Board is to ensure the ABA organisation has clear strategic direction and provides strong oversight to manage risks and embrace opportunities in the journey to achieve the industry's objectives.

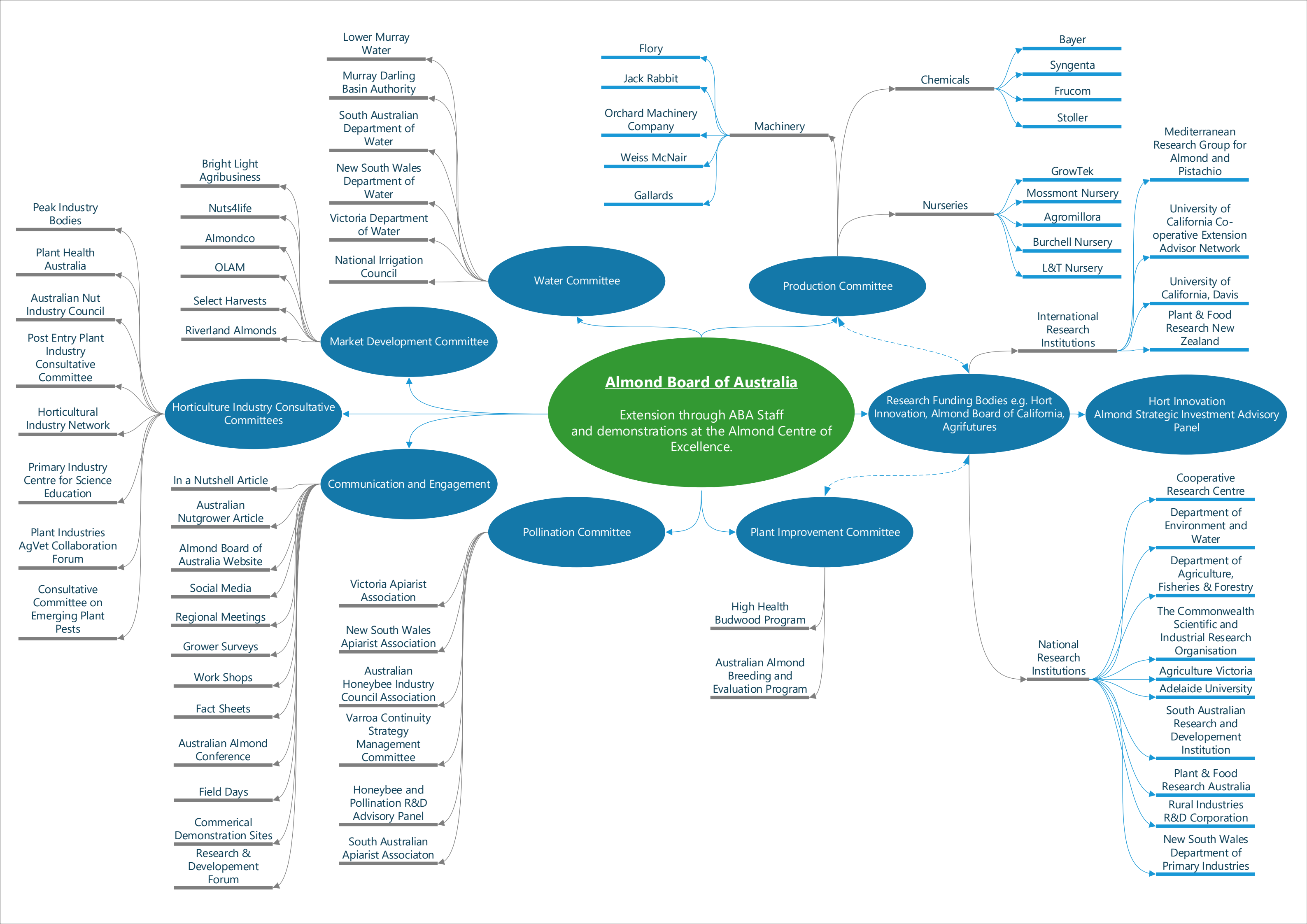
ABA staff are included in the primary hub of communications as they are responsible for developing and implementing plans that best achieve the boards objectives by utilising the network community. The Almond Centre of Excellence (ACE) is also included in the primary hub as it has been purpose-built to trial new technologies and showcase best practice in a commercial setting while buffering the risk of production losses sometimes associated with innovation.

Tier 2 illustrates the connectivity between the ABA and the wider industry (blue oval). Five sub committees include representation from growers, technical specialists, researchers, service providers etc. have been tasked by the ABA to bring into the community their knowledge, experience, data and networks to investigate and resolve specific issues associated with: pollination, production, marketing, water and plant improvement. Also included on the second tier are research funding bodies and horticultural industry consultative committees e.g. Hort Innovation depicting their role in developing suitable research programs relevant to industry needs providing practical and timely solutions. The Hort Innovation Strategic Investment Advisory Panel (SIAP) holds a unique position in the community of practice. This committee is responsible for guiding the industries strategic investment plan and assigning funds to addresses industry priorities.

The Communication and Engagement program is included in Tier 2 as it delivers extension activities to improve innovation and on-farm adoption. It's inclusion in Tier 2 it illustrates the importance of direct connectivity with the value-chain committees to contextualize important information.

Tier 3 (underlined in grey) recognises the further sub-divisions within each of the specified areas addressed by ABA sub-committees and operating environment for wider horticultural networks. Each sub-division provides networking partners for the sub-committees and ABA staff to obtain the most relevant and up-to-date information from the highest source of intelligence.

Tier 4 (underlined in blue) expands on relevant sub-divisions, recognising particular partner organisations that aid in providing specialised services, products and information that assists with almond research, development and production efficiencies.



Appendix J. Project deliverables – extension register summary

Field Days	Event	Invites opened	No. of attendees
1	Rootstock field day	389	46
2	ABA Rootstock Trial - Lacton	325	52
3	New Australian Varieties Flowering Field Day - Lacton	451	29
4	Pest management strategies - OLAM orchards	379	30
5	New Australian Varieties pre-harvest field day - Lacton	1542	42
6	Orchard Hygiene field days - Riverland	275	39
7	Orchard Hygiene field days - Sunraysia	275	42
8	Orchard Hygiene field days - Riverina	275	27
9	SARDI Soil amelioration demonstration – ACE farm	758	25
10	Pre-harvest orchard field walk - Select Harvest 6 & 7th Feb 2019	1027	49
11	Flowering field walk and workshop - Paringa	875	51
12	IPM & Irrigation Best Practice - Select Harvest Lake Powell	717	30
13	IPM & Irrigation Best Practice - Century Orchards Loxton	717	25

Workshops	Event	Invites opened	No. of attendees
1	Californian presenters	664	45
2	What's new from the USA - David Doll workshop	664	24
3	Plant Pathology & Lower Limb Dieback Workshop - Adelaide	664	6
4	Plant Pathology & Lower Limb Dieback Workshop - Riverland	664	15
5	Australian Almond Post Conference workshops - Adelaide Plains	218	4
6	Australian Almond Post Conference workshops - Riverland	218	32
7	Australian Almond Post Conference workshops - Sunraysia	218	22
8	Australian Almond Post Conference workshops - Riverina	218	20

Factsheets	Title	Reach	Downloads (New website)
1	All about almonds - Carpophilus beetle monitoring guidelines	575	121
2	All about almonds - Managing Mice in Australian Almonds	713	25
3	All about almonds - Managing food safety risks in Almonds	778	42
4	All about almonds - Best Practice for Orchard Hygiene	409	55
5	All about almonds - Australian almond variety - Vela	828	61
6	All about almonds - Glyphosate*	0	
7	All about almonds - Australian almond variety - Maxima	300	56
8	All about almonds - Australian breeding varieties update	88	78
9	Reducing the risk of Spray Drift - Haloxypop	10	28
10	All about almonds - Viruses in Australian Almonds	12	52
11	All about almonds - Drought strategies	475	33

*Written; not published

Research Forums	Event	No. of attendees
1	ABA Almond R&D Forum and Field Day - 24-25th October 2017	220
2	18th Australian Almond Conference - 30th October to 1st November 2018	480
3	ABA Almond R&D Forum and Field Day - 30-31st October 2019	226

Presentations	Forum	No. of events
	Industry updates - various corporate investor board of directors (by invitation)	11
	Industry expansion and hive forward estimate to Australian beekeeper forums	3
	Australia's Vision for the Future – ABC conference, California	2
	Overview of the almond industry and future forecasts - various stakeholder groups	6

Videos	Title	Reach
1	Carob moth life cycle and control methods	616
2	AL16005 Almond Integrated Disease Management ^	428
3	Almond Centre of Excellence - Orchard update 2017	133
4	AL16009 Almond Integrated Pest Management ^	122
5	Almond Centre of Excellence Update July 2018	121
6	Tenias harvester - demonstration CMV farms	201
7	Orchard hygiene	168
8	Almond industry - Career pathways	-
9	Irrigation systems audit - what the study told us	-
10	Australian Almond breeding program & evaluation	-
11	Australian Almond breeding program - Maxima	-
12	Australian Almond breeding program - Carina	-
13	Australian Almond breeding program - Mira	-
14	Irrigation systems monitoring and maintenance	-

- Videos produced at the end of the project have no reach data available at the time of reporting

^ Produced by Agriculture Victoria and promoted by ABA

Regional Forums	Event	No. of attendees
1	2017 Regional Meeting - Adelaide Plains	16
2	2017 Regional Meeting - Riverland	40
3	2017 Regional Meeting - Sunraysia	34
4	2017 Regional Meeting - Riverina	22
5	2018 Regional Meeting - Adelaide Plains	15
6	2018 Regional Meeting - Riverland	19
7	2018 Regional Meeting - Sunraysia	26
8	2018 Regional Meeting - Riverina	15
9	2019 Regional Meeting - Adelaide Plains	22
10	2019 Regional Meeting - Riverland	37
11	2019 Regional Meeting - Sunraysia	34
12	2019 Regional Meeting - Riverina	21

"In a Nutshell"	Title	Reach**
1	SNAP! Wet Spring creates potential mouse plague	1871
2	Varroa Eradication - Emergency Pest Plant Response Deed (EPPRD)	1871
3	Managing Carpophilus Beetle in almonds	1871
4	In the Orchard - Post Harvest Fertigation	1871
5	Managing Food Safety in Almonds	1628
6	Almond Centre of Excellence - Where to from here?	1628
7	In the Orchard	1628
8	Producing Results for industry - rootstock project	1688
9	In the Orchard - density and scion selection	1688
10	The bees and the blossoms	1688
11	In the Orchard - Preparing for harvest	1415
12	Australian Almond R&D Forum Review	1415
13	Growing Almonds in Kern Country, California	1415
14	In the Orchard - Orchard hygiene	1597
15	R&D roundup - ACE trials	1597
16	In the Orchard - Replanting considerations	1574
17	R & D Roundup - Rootstock and variety trial update	1574
18	Review: Lake Powell Orchard Walk	1506
19	In the Orchard - 2019 harvest update	1506
20	In the Orchard - what mite this be?	1471
21	Almond project expands into three states	1471
22	New irrigation project for industry	1555
23	In the Orchard - Spraying considerations	1555
24	Thoughts for 2019 pollination season	1555
25	In the Orchard - Rootstock trial: evaluating the yield findings	1447
26	2019 R&D forum: some quick notes	1383
27	Introducing the new irrigation assessment resource!	1457
28	Breaking down AgChem formulations and the future of AgChem	1457
29	Tenias harvester - demonstration CMV farms	1457

***Reach is determined by the number of openings for the relevant issue of "In-a-Nutshell" magazine*

Domestic Study Tours	Event	No. of attendees
1	Spanish visitors	2
2	Almond Board of California board member Holly King visit to Riverland	2
3	Manan Cooperative directors tour of Australian Almonds - 13 to 16th March 18	16
4	Ed Kuykendall and Californian Visitors In Australia	3
5	Dietitians tour - 11th and 12th March 2029	6
6	Byron de Kock - Head of R&D Hort Innovation	2
7	Hort Innovation Communications team	3
8	PIRSA Executive team	5
9	Ambassador to Nepal	
10	Almond Board of California Chair	
11	60 Minutes film crew	

Value chain meetings	Forums	No. of events	No. of attendees
	ABA Board meeting	13	147
	ABA Production Committee Meeting [#]	12	124
	ABA Centre of Excellence Committee Meeting	10	80
	ABA Plant Improvement Committee Meeting	10	74
	ABA Pollination Committee Meeting	4	29
	ABA Processing Committee Meeting	1	12
	ABA Water Committee Meeting	2	10
	ABA Market Development Committee Meeting	12	89
	ANIC Australian Nut Industry Council - Board Meeting	11	68

#ABA Production Committee also served as the AL16001 Project Reference Group

Meetings with Hort Innovation	Forum	No. of events
	Strategic Investment Advisory Panel meetings	5
	Almond Industry Strategic Planning Day	1
	Hort Innovation R&D update meetings – various staff	35

Project reference group meetings	Forum	No. of events
	AL16003 Industry Statistics and Data collection Reference Group Meeting	4
	AL16009 IPM & AL16005 IDM Stakeholder Reference Group meeting	8
	AL16700 Australian Almond Industry Conference & Field Day Committee	5
	Rural R&D for profit - Securing Pollination for More Productive Agriculture	4
	Almond Breeding and Rootstock Evaluation projects (AL12005/AL17005/AL16006)	1
	Biosecurity Round table meetings	2
	Industry recovery reference group hailstorm meetings	3
	Robinvale regional area management group - April 2017	1
	Salinity review DEWNR - April 2017	1
	Young people in Agriculture	1
	Murray-Darling Association: Moira to Mildura - Constraints Workshop	1
	Informal research collaboration meetings with various project staff	17

Tools	Title	Reach
	Almond Production Spreadsheet	823
	ABA's Australian Almonds Flowering Observation Tool	196
	Flowering synchronisation tool	617

Innovation and training	Event	No. of events
	Industry events/conferences	19
	Horticulture Industry Network forums	12
	International industry liaison including ABC board of directors R&D discussions	6
	University of Melbourne – Young horticultural advisors’ network	3
	Society of Precision Agriculture Australia (SPAA) Workshop	1
	GroChem - Bee attractant and nutrition seminar	1
	Ceres Imaging workshop	1
	GrowSmart: Almond Production Optimisation Course	1
	Xylella fastidiosa symposium	1
	Collaborative Farming Workshop	1

Activity	Title	No. of events
	Stakeholder engagement/communication plan	1
	Producer benchmarking decision support model to stimulate practice change	1
	Economic analyses of emerging practices and technologies	3
	Australian Almond industry community of practice	1
	Grower enquires and farm visits	195
	Liaison meetings with industry suppliers: fertiliser, chemical, machinery and Agtech companies	29

Evaluation	Title	Reach	Participants
	ABA Roostock Field Day: Attendee Survey	75	
	Grower survey on the Murray Darling Water Market	108	33
	2020 Extension Survey - a review to gain focus	213	19

Appendix F - Economic analysis framework for orchard hygiene

The following report is based on information compiled from project outputs, feedback from the project reference group, ABA value chain committees and investigation done by ID staff.

Introduction

Historically the Australian almond industry was well known as a producer of high-quality almonds. Keeping this reputation was imperative for the industry to maintain strong prices and market access.

Australian growing conditions have been conducive to producing a clean product experiencing minimal pest and disease issues with orchards established predominantly in arid areas; rainfall supplemented by controlled irrigation; and properties isolated from other horticultural production.

However, the emergence of a new insect pest in 2016 called for a rapid and industry-wide response in order to minimise crop damage and potential threat to existing markets.

The industry up to 2017

The biggest threat to the production of high-quality almonds in recent years was the discovery of a 'new' Carpophilus species, *Carpophilus near dimidiatus*. In comparison to the stone fruit pest *C. hemipterus*, *C. nr dimidiatus* is a much more aggressive species which has been discovered to be the only carpophilus species that damages the almond kernel. This is most problematic for the in-shell product as the defect technology used during processing cannot see the damaged kernel to remove it. India and China are key markets for in-shell nuts.

The attract and kill trap initially used consisted of an attractant (protein) and co-attractant (pheromone) that had been developed for stone fruit. However, it was soon evident that the trap failed to attract *C. nr dimidiatus* and proved ineffective providing inaccurate and false information.

Populations of the *C. nr dimidiatus* were building and in 2017 reached significant levels in isolated areas. The 2017-18 season experienced conditions conducive for carpophilus beetle reproduction and caused in-excess of \$25 million in damage. This created industry-wide concern and a call for action to invest in research and development to address the issue. Hence, the integrated pest and disease management projects were contracted to Agriculture Victoria via Hort Innovation using Almond levies in 2018:

- 1) AL16005 An integrated disease management program for the Australian almond industry
- 2) AL16009 An integrated pest management program for the Australian almond industry

While these projects were a positive step forward to better understanding Almond pests and diseases, the industry needed to take immediate action. Managers and companies began to allocate resources and implement control strategies on-farm. However, the options were limited: the attract and kill system didn't work and chemical control was not feasible across large areas as the active ingredient couldn't penetrate to where the pest harboured beneath the almond hull. Up until this time there was only a small element of orchard hygiene employed within the industry, however this was not considered general practice and was not a budgeted item. If orchard hygiene had been conducted it consisted of a re-shake to maximising yield rather than minimising pest damage. A poor shake, or failure to re-shake, left a significant number of nuts (mummies) to overwintering. In some cases, over 100 nuts (1.2 kg) were observed remaining on the tree. These mummy nuts, if infested, could carry pest populations from one season to the next.

During the project timeframe of AL16001

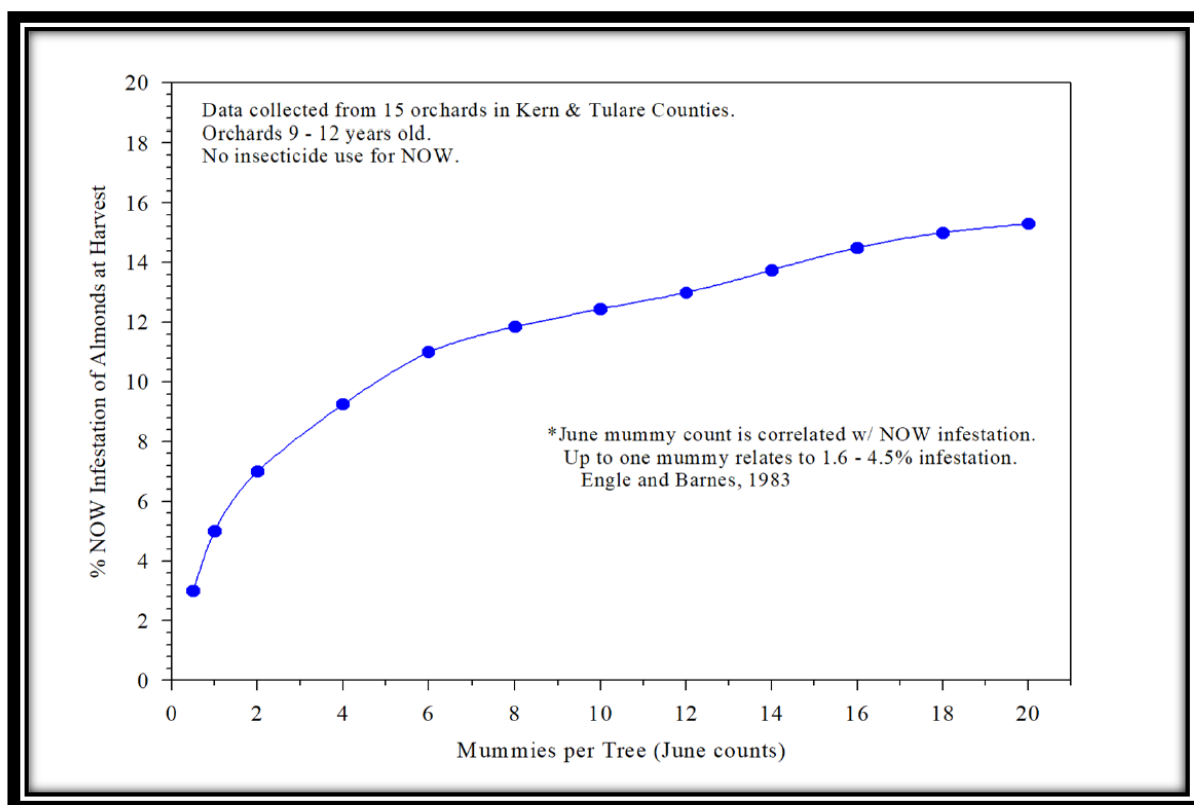
A primary focus of the ABA extension focused on orchard hygiene elements that were largely being neglected.

Industry experts nationally and internationally recommended the best response to reducing *C. nr dimidiatus* populations was through orchard hygiene. Chemical control options were considered, and permits granted. However, chemical control was limited to reducing populations in hotspots rather than broad sprays, while residues and the effect on beneficial's within the orchard could be assessed.

Technical expertise was enhanced within the ABA with the appointment of Dr Greg Buchanan as an experienced entomologist in June 2018. The ABA played a key role in developing best practice advice conveyed to the wider grower community by facilitating information exchange between industry and researchers. Multiple extension activities were deployed with considerable effort in delivering engaging and informative workshops with guest researchers from California including David Haviland and Charles Burk sharing their experience in controlling orchard pests and field days promoting results from local research projects. Thirteen field days/ workshops were facilitated by the ABA and attended by approximately 342 industry participants. Events were held on commercial orchards in each growing region and presentations were tailored to address the challenges for each region. Working closely with local technical experts the ABA produced supporting factsheets, videos and magazine article that reinforced key messages from the field days and extend the reach.

Success of the strategies implemented by industry manifested in the 2019 season with reduced insect damage from 0-2% approximating \$5 million. This went a long way to restoring the export trade's confidence in Australian almonds particularly for the in-shell market.

The key to achieving low pest pressure was the change in the mindset of growers, in seeing the results of their efforts and accepting orchard hygiene as a necessary operational cost that needed to be budgeted for. One graph that was distributed and addressed by the University of California's, David Haviland is shown below.



This graph represents the economics of investing in orchard hygiene in response to Navel Orange Worm (NOW). While the threshold may change for *Carpophilus* the message is the same. That is, if you only invest a little into orchard hygiene, you might as well not invest anything at all as reducing mummy counts from 20 to 12 per tree will not achieve a significant difference in pest damage. However, if you invest heavily and get below 2 mummies per tree significant results will occur.

Economic analysis of orchard practices

As described above there is a heavy reliance on population management for successful control of *Carpophilus* Beetle and this has been further described in the following table. It is important to note there is a high correlation between techniques that reduce the number of overwintering nuts and techniques that reduce pest populations. This is because the mummy nuts provide a place of shelter and the kernel provides a food source for the pest to complete their lifecycle and build up rapidly. Each technique plays an important role. If conducted properly and with precision they can achieve a high level of population reduction.

A rating of economic benefit has been applied to show those practices that have the greatest influence on pest and disease (P&D) costs. While reducing the pest population is likely to incur a cost, this needs to be considered in terms of the potential losses associated with downgraded nuts or loss of market associated with 'doing nothing'. This may change with new information becomes available and results of the R&D projects.

Practice	Effect	Economic Benefit	Rating	Notes
Harvest efficiency/ adequate shaking time	Fewer overwintering nuts on the tree and on the orchard floor	P&D costs	High	An efficient harvest will achieve low populations into the following seasons which is easier to maintain.
Level orchard floor	Improved nut pickup during harvest and reduced overwintering nuts	P&D costs	High	Carpophilus may overwinter in nuts on the ground. The better the pickup the less population carried forward.
Regulated deficit irrigation (RDI)	Drier microclimates reduce P&D. Also helps gain a more even hull split and harvest	P&D costs	Low - Moderate	May be difficult in variable soils but an effective RDI can reduce Hull Rot and better harvest shake.
Re-shaking	Reduced overwintering nuts on trees	P&D costs	Moderate - High	Most effective done post rain/ morning dew.
Sweeping/ blowing nuts away from dripline	Reduced overwintering nuts on the orchard floor in moist conditions	P&D costs	Low - Moderate	This process moves the fruit from a moist to a drier environment in the mid-row where they are removed from the orchard.
Flail mow windrowed mummy nuts	Flail mower can break nuts into smaller chunks and reduces overwintering nuts	P&D costs	Low - Moderate	Depending on how effectively the flail mower can break down nuts.
Pick up and burry mummy nuts	Reduced overwintering nuts	P&D costs	Low - Moderate	Depending on the burial depth. Carpophilus can survive and resurface. Recommendations is that a depth of >2m is required.
Pick up and remove	Overwintering nuts removed	P&D costs	High	Removes food source and habitat to support overwintering population.
Pick up and destroy mummy nuts to <1cm	Reduced overwintering nuts	P&D costs	High	Removes habitat and food source.
Chemical Control	Carpophilus killed on contact	P&D costs	Low - Moderate	Depending on spray coverage a spray at the point of hull split can be beneficial as the pests are yet to fully penetrate the kernel and are more likely to be exposed to the chemical. There is a risk to killing beneficial species within the orchard.
Pest monitoring, September - December	Potential risk areas identified - hotspots	Monitoring	Moderate	Used to determine if a spray at hull split is required. Check irrigation management in low-lying areas to avoid wet patches.
Disease monitoring, September - December	Potential risk areas identified - hotspots	Monitoring	Moderate	Control methods can be implemented in targeted areas when thresholds are met.
Pest monitoring, January - March	Potential risk areas identified - hotspots	Monitoring	Low	Monitoring during this time can give you an idea of potential pest damage controlling the population at this time is difficult. RDI may be an option.
Disease monitoring, January - March	Disease levels identified	Monitoring	Moderate	Control methods can be implemented in targeted areas when thresholds are met.
Pest monitoring, April - August	Potential risk areas identified - hotspots	Monitoring	Moderate	Used to determine where extra resources are needed to optimise orchard hygiene practices.

Disease monitoring, April - August	Disease levels identified	Monitoring	Moderate	Control methods can be implemented in targeted areas when thresholds are met.
Utilising new varieties with sealed shell	Protection of kernel from insect damage	Improved quality	Moderate	The shell provides an effective physical barrier making it more difficult for carpophilus beetle to burrow into the kernel.
Entomopathogenic fungi bioinsecticide	Reduced pest population	P&D costs	High	Currently unavailable but may be a potential control method.
Attract and kill trapping method	Monitoring and reducing pest population under mass trapping strategy	P&D costs	High	Currently unavailable but in development and may be a potential control method.

The future of pest management

Agriculture Victoria is advancing the integrated pest management front and making headway into attracting beetles to a specific location where they can be trapped and destroyed. Other bioinsecticides are also being investigated with some promise for entomopathogenic fungi.

As for many integrated pest management strategies keeping the population levels as low as possible from one season to the next is key. This means orchard hygiene will remain a priority technique that needs to be undertaken annually even when an effective trap and kill method is designed.

Continued investigation on the best method for removing/destroying the overwintering nuts from the orchard are being investigated and, together with other hygiene, trapping and chemical control techniques, form the basis of a guideline for integrated pest management in Almond orchards. Until the best practice guidelines are available industry is using the best information available to substantially reduce pest and disease levels to restore confidence in export markets.

Appendix G - Economic analysis framework for new varieties

The following report is based on information compiled from the Almond industry planting surveys during 2018 and 2019, feedback from the project reference group, ABA value chain committees and investigation done by ID staff.

Background

Since 2015 the almond industry has gone through a significant expansion phase. During this time new varieties became available and some growers invested in planting large areas with these varieties. This report discusses these new varieties and the characteristics that growers believe will provide an economically viable option. The report classifies 'new varieties' as ones that have been made publicly available since 2014 through plant breeders rights. These varieties are listed in table 1.

Table 1: Commercialisation of New varieties for the Australian Almond Industry

Variety	Breeder/ licence holder	Date the Plant Breeders Rights (PBR) were Accepted	Self-fertile
Independence (alm-21/ Zeepareil)	Zaiger Inc. Genetics	11 December 2014	Yes
Carina	The University of Adelaide	4 January 2016	Yes
Capella	The University of Adelaide	4 January 2016	Yes
Maxima	The University of Adelaide	4 January 2016	No
Mira	The University of Adelaide	4 January 2016	Yes
Rhea	The University of Adelaide	4 January 2016	Yes
Vela	The University of Adelaide	21 February 2017	Yes
Shasta	The Burchell Nursery Inc.	18 April 2017	Yes
Supareil	The Burchell Nursery Inc.	11 March 2016	No

The varieties bred by the University of Adelaide through the Australian Almond Breeding project, were done through two projects:

- 1) AL17005 - National almond breeding and evaluation program (Completion due 2023); and
- 2) AL12005 - Australian almond variety evaluation and commercialisation program (2013-2019).

The main driver for a grower to invest in a new variety would be if it had superior production characteristics that provided economic gain through a higher return to growers or reduced operational costs. Some of the desired characteristics selected for in the breeding program for new varieties were:

- Self-fertility - Potential to reduce dependence on pollination and enables single variety plantings that would reduce labour and logistical costs.
- A replacement to Carmel (most susceptible to non-infectious bud failure). As the climate warms, this disease is expecting to become difficult to control, hence the desired replacement of the variety.
- Superior physical characteristics such as shell seal, tree size and other traits that ease agronomic operations.

The economic benefit/cost for these characteristics will be discussed in this report. It is important to note that while the varieties have been commercialised for some time, industry is now only just producing the quantities that are saleable as a stand-alone product, and they are yet to prove themselves in the market.

The industry up to 2017

Initial planting of new varieties started in 2013 however these plantings were for trial assessments inline with the plant breeders right (PBR) conditions.

The first self-fertile variety Independence became commercially available in late 2014, with 165 hectares of the

variety being planted in the first planting season of 2015. The size of the initial planting demonstrates how the Australian industry was eager to access a self-fertile variety. Independence was the only option available in 2014-15 which boosted the planting of this variety. The same was observed in California therefore a significant commercial quantity of nuts were predicted creating the need to find a potential market.

More varietal options became available in 2016 in the same year as a significant industry-wide expansion of 6,514 hectares (Table 2). Newly commercialised varieties made up 8.56 % of the plantings undertaken in that year (Table 2).

Most of the area planted in 2016 was to either Independence (177ha) or Supareil (174ha; Table 3). Of the 206 hectares planted to the University of Adelaide varieties the most popular were Carina (93ha), Maxima (70ha) and Rhea (30.5ha).

In 2017 (at the commencement of the project AL16001) there was approximately 714 hectares of new varieties planted. Independence represented 46% of the total new varieties planted at that time (Table 3).

Table 2: Planting of new and traditional plantings (hectares)

	2016	2017	2018	2019
New Varieties				
Area planted that year	557.38	420.52	355.01	376.66
Area removed that year	15.22	0.00	12.76	94.73
Cumulative total	713.83	1,134.35	1,476.60	1,758.52
% of total area planted that year	8.56	6.72	8.87	10.10
% of total industry	1.89	2.58	3.08	3.41
Traditional Varieties				
Area planted that year	5,956.47	5,836.72	3,648.17	3,351.44
Area removed that year	500.17	72.45	80.79	26.04
Cumulative total	37,125.49	42,889.75	46,457.13	49,782.53
% of total area planted that year	91.44	93.28	91.13	89.90
% of total industry	98.11	97.42	96.92	96.59
Total Industry (cumulative)	37,839.32	44,024.10	47,933.73	51,541.05

Table 3: Plantings of new varieties (hectares)

	2016	2017	2018	2019
Independence				
Area planted that year	177.19	132.47	60.01	24.04
Area removed that year	15.22	0.00	0.00	0.00
Cumulative total	327.13	459.60	519.61	543.65
% of new varieties planted that year	31.79	31.50	16.91	6.38
% of total area of new varieties planted	45.83	40.52	35.19	30.92
Adelaide University Varieties				
Area planted that year	205.85	126.79	256.48	8.78
Area removed that year	0.00	0.00	12.76	94.73
Cumulative total	212.35	339.14	582.86	496.91
% of new varieties planted that year	36.93	30.15	72.25	2.33
% of total area of new varieties planted	29.75	29.90	39.47	28.26
Shasta				
Area planted that year	0.00	160.05	29.97	218.89
Area removed that year	0.00	0.00	0.00	0.00

<i>Cumulative total</i>	0.00	160.05	190.02	408.91
<i>% of new varieties planted that year</i>	0.00	38.06	8.44	58.11
<i>% of total area of new varieties planted</i>	0.00	14.11	12.87	23.25
Supareil				
<i>Area planted that year</i>	174.35	1.21	8.54	124.95
<i>Area removed that year</i>	0.00	0.00	0.00	0.00
<i>Cumulative total</i>	174.35	175.56	184.11	309.05
<i>% of new varieties planted that year</i>	31.28	0.29	2.41	33.17
<i>% of total area of new varieties planted</i>	24.42	15.48	12.47	17.57
Total new varieties (cumulative)	713.83	1,134.35	1,476.6	1,758.52

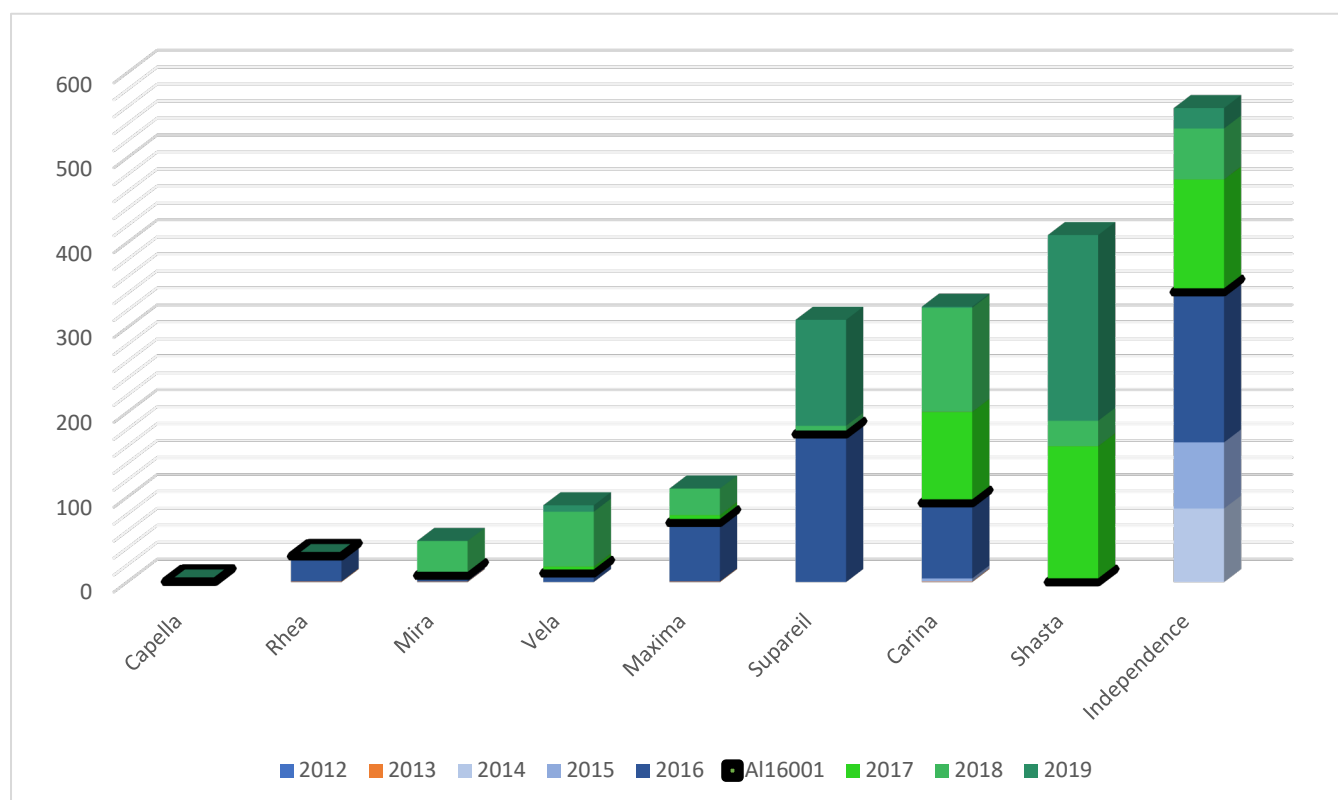
During the project timeframe of AL16001

Building on the previous extension project (AL12000) awareness and knowledge about the new varieties was extended to industry through field days, workshops, fact sheets and one-on-one phone calls. Further information was also provided by Michelle Wirthensohn through conferences and forums.

Over the course of the project there has been a significant increase in industry plantings. New orchards were established across 13,702ha taking the industry total to 51,541ha by 2019. New varieties accounted for 1,709ha (or 12.5%) of this expansion. Figure 1 illustrates the areas planted for each variety from 2012 to 2019. The black line represents the beginning of AL16001 and the relative uptake depicted in green.

Trends have shown a gradual increase in the percentage of new varieties planted each year in comparison to traditional varieties. In 2016 the industry was 98.24% traditional varieties; this has decreased to 96.74% in 2019. New varieties made up 10% of all new plantings in 2019.

Figure 1: Planted area of new varieties (hectares)



Economic potential of new varieties

The notion behind planting new varieties is to improve the economic efficiencies of almond growing while maintaining or increasing economic earnings. New varieties are bred to have various growing and marketing characteristics that are more profitable for the grower and positive for the consumer. Some of these traits and their benefits include:

- The ability to reduce disease and pest damage is a major benefit of new varieties that follows on from several varietal characteristics. Beginning at disease resistance and harvestability; if disease level remains low, it increases the harvestability of the crop, and reduces the potential for pest population carry over the following year. The sealed shell also plays a role in deterring pests from damaging the nut providing similar efficiencies and benefits as described for disease resistance.
- The acceptance and marketability of the product can take a significant amount of time, however if the product can generate desirable traits the value of the product has potential to manifest as returns to the grower.
- Self-fertility is a benefit, however how much of a benefit is in increasing the efficiency of pollination. However, this is not scientifically proven at this stage. A single bee may achieve greater efficiency in flying down a single row (as opposed to flying across rows to cross-pollinate) which leads to a reduced number of bees needed. Also, in a situation where a grower is unable to gain access to hives, the probability of generating some type of crop is possible.
- Moisture management is becoming a large component of almond growing, as it optimises the quality and returns for the grower and manufacture. The sealed semi-hard shell provides a physical barrier preventing moisture from a rain event penetrating the shell. On the flip-side it may increase the time period that it takes to dry the kernel compared to a paper shell

Table 4 describes each of these characteristics and rates them according to how beneficial they could be from an economic perspective. Note: A numerical figure of economic benefit cannot be determined yet as the yields throughout the industry have not yet reached a level where a marketable product has been achieved enabling quantitative evaluation.

Until a variety is proven in the field and the market, Nonpareil will no doubt remain the dominant variety. Therefore, in the short term the place for new varieties will be in the pollinator category which will be determined by productivity gains and price compared with traditional pollinating varieties.

Table 4: Characteristic of new varieties evaluated

Characteristic	Effects	Economic Benefit	Rating	Notes
Sealed Shell	Reduced ability for pests and disease to damage nut/ kernel	Improved quality	High	Sealed shell protects kernel, reducing damage and increasing returns.
Sealed Shell	Moisture staining	Improved quality	Moderate	Depends on harvest conditions - resistance to staining has greater benefit during wet harvests.
Sealed Shell	Harder to break shell in field – during harvest	Improved quality	Moderate	Reduced mechanical damage will increase yield slightly.
Sealed Shell	Processing capabilities/ hand crack for in-shell	Increase processing capability	Low	Processing capability will need to be improved to extract kernel.
Flowering	Optimised flowering time	Increased yield	Moderate	Season dependant. Greatest benefit achieved when replacing an early flowering variety to avoid frost and better align with Nonpareil (NP) flowering.
Flowering timing	Pollination efficiency for NP	Increased nut set and yield	Moderate	Replacement dependant, compatibility with timing of flowering compared with Nonpareil.

Self-fertility	Less bees needed to achieve pollination	Pollination costs	Moderate - High	Potential to reduce hive density in field - yet to be scientifically proven.
Self-fertility	Single variety plantings	Production costs	Moderate - High	Ability to plant single variety blocks and reduce logistical cost.
Flowering strength	bloom strength – number of flowers that open	Yield	Moderate	Higher crop set leads to yield increase in all varieties.
Flowering duration	Bloom duration – length of time flowers open	Yield	Low - Moderate	Higher crop set leads to yield increase in all varieties.
Flower duration	Reduced/ longer period of flowering	Production costs	Low - Moderate	Improved flower synchronisation aids management strategies such as bloom spray.
Tree size	Smaller canopy with low density spacings	Production costs	Moderate - High	Improved canopy spray coverage with a smaller canopy.
Tree size	Quick canopy growth for early yielding	Early yield	Moderate	Quicker return on investment for planting/ replanting.
Productive spurs	More spurs bearing fruit in consecutive years	Consistent yield	Moderate - High	A more spur bearing variety leads to increased yield. Dependant on grower's ability to promote this growth.
Disease resistance	Reduced ability for disease to damage nut/ kernel	Improved quality	Moderate - High	Disease reduction is also beneficial to growers in terms of reduced costs.
Non-infectious Bud-Failure resistance	More fertile buds in canopy each season	Yield	High	When replacing Carmel, the benefit can be high if Non-infectious bud failure is likely to have occurred in the first 7 years of growing.
Harvest efficiency	Higher percentage of nuts removed at first shake.	Yield	Moderate - High	The more nuts that are harvested from the tree increases yield.
Harvestability	Higher percentage of nuts removed at first shake.	Improved quality	Moderate – High	Reduced potential for mummy nuts to carry pest population into following year.
Physical Traits	Harvest timing	Less defects	Moderate	Ability to finish harvest earlier before rain occurs more frequently.
Kernel size	More or less desired size to suit the market.	Saleability	Low - High	Improves potential to establish and maintain a market to sell product.
Kernel shape	More or less desired shape to suit the market	Saleability	Low - High	Improves potential to establish and maintain a market to sell product.
Kernel taste	More or less desired taste to suit the market	Saleability	Low - High	Improves potential to establish and maintain a market to sell product.
Kernel damage	Kernel less prone to processing damage	Saleability/ quality	Low - High	Improves potential to establish and maintain a market to sell product.
Licensed purchase	Royalty payments for access to material	Planting cost	Low	Increased once-off cost at planting may be offset by greater returns.
Tree size	Higher tree density if smaller tree	Planting cost	Low	Increased cost at planting.
Tree size	Hedging requirements and frequency	Production costs	Low - High	Increased operational cost. Varies depending on growth habit of variety.

The future of planting new varieties

New varieties will continue to be planted as growers look to optimise production through the variety's superior characteristics described above. By investing in new varieties, the grower may be better able to achieve production targets, such as reduced pest damage. The ratings provided above will help to identify the characteristic most likely to provide the greatest economic gain when selecting which variety to plant. With time, and establishment of markets, quantitative amounts could be applied to the assessment for each varietal characteristic.

However, uptake will largely be driven by market demand and grower return. The market continues to be strong for the traditional Nonpareil variety and still provides the highest value per kilogram. Some corporate investors may prefer to plant proven varieties with known performance and forecast budgets.

If market demand does establish for a new pollinator, coupled with production and logistical benefits, then a significant uptake is likely to occur. For market demand to develop a large quantity of product will be needed which can only be generated through investment made by innovative growers both in Australia and California.

Appendix H - Economic analysis of irrigation technology

The following report is based on feedback from the project reference group, various ABA value-chain committees and investigations done by ID staff.

Background

The Australian almond industry is well known through-out the international almond industry as an industry that optimises water use. Most orchards are situated within 15km of the Murray River and therefore rely on the Murray-Darling Basin and river system to provide the water required. During years of low inflows and storages restrictions on allocations mean water must be managed carefully. The Australian almond industry is proud to say that 94% of orchards utilise drip irrigation which optimises water use by applying water in the rootzone directly where it is needed and reducing evaporation.

With the low inflows to the Murray-Darling system for the last three years pressures continue to rise for irrigation managers to improve efficiencies and public pressure on growers to ensure optimal water use. It is up to the industry to demonstrate responsible use of this limited resource by highlighting the various actions that have been taken. With the current situation of low allocations and high price, becoming more water efficient has a significant cost benefit for all irrigators. However, with state-of-the-art irrigation systems in place, irrigation management calls for a heightened degree of sophistication to be able to achieve additional efficiency gains.

The industry up to 2017

Much of the industry's knowledge about Almond irrigation management came about through a project undertaken from 2003 to 2010 titled 'Developing optimal nutritional and irrigation requirements for Almonds' (commonly known as the 'CT Trial'). This project produced results that growers could use to better guide irrigation and nutritional inputs. This is where the almond industry established an optimal water use for mature trees between 12-14ML/Ha per year. Knowing this and utilising crop factors with weather data, a water budgeting program was developed. As a result of this program irrigation efficiency increased and growers became educated about when and how much water was being used by the tree during each growth phase of the season.

The challenge however is the natural soil variation and the ability of irrigation systems designed servicing large areas to accommodate the variability. Managing this variability is where the largest improvements are likely made.

During the project timeframe AL16001

Agricultural technology continues to develop to meet the unique requirements of Australian farming systems. Individual Agtech companies are utilising all the technologies available such as high resolution aerial imaging, multispectral and thermal imaging, sap flow meters, dendrometers, lysimeter, psychrometer/ hygrometer, micro tensiometer and stem water potential sensors to develop simple tools and integrated computer platforms that growers can utilise to make better irrigation decisions.

Since 2017 there has been many companies approach the ABA and almond growing businesses. Companies are now developing the ability to assess the water health status of the tree at any point in time and forecast water health using irrigation algorithms with weather prediction software. Over the past three years this software is now being used by more growers where the savings are significant.

The ABA production committee has received multiple presentations from Agtech companies and have provided valuable feedback to these companies and technology is continuing to develop and become more affordable. Large investments from outside the agricultural industry into Agtech companies has begun with companies such as Microsoft investing into the irrigation management company FluroSatⁱ for example. External funds injection will continue to speed up the development and usability of these programs.

The other part of irrigation efficiency is making sure that the irrigation system is functioning within specifications and the grower knows the 'true' volumes of water used in each application. This ensures any new technology implemented can operate with precision. To determine the irrigation efficiency across the industry Hort Innovation

commissioned a project with Almond levy funds AL17004 - Almond irrigation best practice management, to conduct an irrigation audit providing a benchmark for irrigation system efficiency. This project has provided an online tool where growers can measure their own efficiency against the benchmark and uptake of this tool will be encouraged by the ABA.

Another element of water management of importance is soil health. Australia has quite poor sandy soils which is low in organic matter compared to California and trials are being conducted through various organisations to better increase the soils ability to hold water and reduce nutritional inputs.

Economic considerations for irrigation technologies

Table 1 describes the elements that are currently being utilised by Australian almond growers with a corresponding benefit rating. As almond orchards are established over large areas and are mechanically driven, it is important that the irrigation technology that is implemented to assist with water scheduling and analysis can be connected and interact wirelessly, otherwise this investment becomes worthless.

In the case of water management many different practices work together to produce a recommended outcome or irrigation decision which has the highest of the economic benefits. Therefore, the elements that feed into this decision play a smaller yet vital role in irrigation efficiency.

Table 1: Cost Analysis of irrigation technology

Practice / Technique	Effect	Economic benefit	Rating	Notes
Tree water stress monitoring - aerial/satellite	Data indicates tree stress and variability across orchard	Reduced water cost	Moderate	Water applied to maintain acceptable tree stress and reduce excess water use. Reduced need to purchase additional water.
Tree water stress monitoring – tree probe	Data indicates water use by tree - limited to trees with probes	Reduced water cost	Moderate	Best used in conjunction with orchard imagery to calibrate tree stress.
Soil water stress monitoring	Data indicates how much water is in the soil available for plant use	Reduced water cost	Moderate	Inexpensive but unable to show plant use.
Data analysis	Collation of data and analytics to enable an informed management decision	Irrigation efficiency	High	May be provided through the monitoring technology; could be outsourced; or investment in developing in-house expertise and knowledge.
System checks	Identifying under-performing irrigation systems and fixing areas of concern	Irrigation efficiency	Moderate	Greater frequency provides better results but also incurs cost each time they are undertaken.
Soil amelioration with organic matter	Increasing soil health and water holding capacity ensuring water available for plant use for longer	Irrigation efficiency	Moderate	Provides a buffer against extreme heat and may extend days between irrigation application.
Irrigation system maintenance	Systems are running to specifications so that they are delivering the right amount of water	Irrigation efficiency	Moderate	Having constant maintenance maintains irrigation functionality so that when applying irrigation there is confidence in the volumes being applied.

The future of irrigation technology

Implementation of irrigation technology is done through a business arrangement between the grower and the software company. The role of the ABA has been to understand the range of technologies available and to assist the grower in understanding what technology best suits their needs. As technology develops further it will optimise the irrigation data collected to better inform decision making.

The information accuracy of the data collected is now able to identify the extent of variation in soil/plant stress for different soil types and new varieties. Optimal plant performance has many different variables that require different levels of irrigation. With better understanding of these variables, irrigation efficiencies may be improved.

Irrigation technology may also assist in achieving better uniformity of trees. An example of this is regulated deficit irrigation (RDI) used as a strategy to achieve disease suppression and uniform hull split. Currently this is not possible with the topographical variability of Australian soils challenging distribution uniformity. Irrigation system technology is being developed with Netafim currently trialling a variable drip system in California.

Better irrigation technology may enable fully automated systems to be implemented. This may mean an overarching program would schedule irrigations based on analytical data collected through the various monitoring tools to achieve pre-programmed irrigation management targets. A manager could overwrite this program if needed but the system would be designed to run without intervention.

Finally, In California they have shown that by utilising whole orchard recycling (tree mulching) they can greatly improve the water holding capacity of their soils. Initial trials have been undertaken in Australia by Select Harvest using biofuel biproducts. Further research is required in this area to understand and quantify the benefits for Australian soils and future irrigation management.

ⁱ Microsoft invests in FluroSat - <https://flurosat.com/news/flurosense-now-available-to-agronomists-globally-with-new-investment-backed-by-microsofts-m12>

Extension Activities

Prepared by: Brett Rosenzweig

A meeting was held between Jo, Andrew, Josh and myself to plan the next twelve months of extension activities to satisfy the milestone requirements for AL16000 (communications) and the yet to be finalised AL16001 (extension). The list of activities is below:

Videos

- New Australian varieties
- RDI trial
- Carpophilus Beetle
- Carob Moth

In A Nutshell articles

- Food safety
- Almond Centre of Excellence
- Emergency Plant Pest Response Deed (EPPRD)
- Budwood report
- Spring leaf sampling for nutrient analysis
- Preparing for pollination
- Best on-farm practices before replanting
- Delta T
- R&D Forum

Field days

- Machinery (in association with the R&D Forum)
- Food safety
- Pollination (featuring Gordon Wardell)
- New Australian varieties

Fact sheets

- Farm finances
- Food safety
- Delta T
- Spring leaf sampling for nutrient analysis
- Mouse control

The above activities are in addition to the quarterly committee meetings, the regional meetings in July and the R&D Forum in October.

Extension Activities

Prepared by: Andrew Downs

Over the last couple of months, the following activities from the extension workplan have been either completed or progressed.

Videos

- New Australian varieties – further footage has been recorded with Michelle
- Carpophilus Beetle – the video is nearing the editing phase
- Carob Moth – the first video is being edited, with two more in the pipeline

In A Nutshell articles

- Food safety – will be included in the next edition
- Emergency Plant Pest Response Deed (EPPRD) – complete.
- Budwood report – complete.
- R&D Forum – draft program has been circulated within the Committee waiting on approval. Speaker invitations to be sent out in the first week of May. Registrations to open at the start of June.

Field days

- Machinery (in association with the R&D Forum) – planning has commenced with invites to be sent to exhibitors in the first week of May.
- Rootstocks – Invites have been sent to be held on May 25.

Fact sheets

- Food safety – waiting for sign-off by Chin Gouk.
- Mouse control – complete.

The above activities are in addition to the quarterly committee meetings, the regional meetings in July and the R&D Forum in October.

Josh was also selected by HIA to participate in a trial across horticulture, livestock and broadacre cropping investigating 'Adviser Pathways – creating career pathways for new entrants and professionals in the agriculture sector'. As a part of the program, Josh was required to have a mentor and Andrew Downs is fulfilling this role and participating in the program as well. The trial involves three workshops for Josh where a work program is formulated for 12 months and to provide information and experiences about the extension services provided in the horticulture sector. With a strong influence on networking between the participants, this provides a great opportunity for Josh work with young professionals from diverse roles and experiences and to bring his learnings back into our extension team.

12.2 - Extension Activities

Prepared by: Andrew Downs

Since the last Board meeting, the following activities from the extension workplan have been either completed or progressed.

Videos

- New Australian varieties – further footage has been recorded with Michelle Wirthensohn
- Carob Moth – the video is completed
- Carpophilus Beetle – video part 1 and 2 is nearing completion of the editing phase

In A Nutshell articles

- Food Safety – will be included in the next edition
- Emergency Plant Pest Response Deed (EPPRD) – process is nearing completion with an activation date anticipated to be 1st October 2017.

Field days

- Machinery (in association with the R&D Forum) – all invites have been sent to exhibitors with 10 places confirmed.
- Rootstocks – a successful day was held on May 25 with 52 participants attending the session at Lacton.
- Varieties – a field day covering flowering of the breeding trials will be held on 25th August. An invitation has been sent with 22 people registered @ 14/8/17.
- Regional meetings were conducted in 1st week of July.

Fact sheets

- Food safety – complete.
- Mouse control – complete.
- Vela (Almond 10) – complete.

Other Activities

- Development actions for the Experimental Orchard including ground preparations (ripping, rotary hoeing and row marking), commencement of construction of the new roadway, plans submitted to Loxton Council and PIRSA, installation of the CIT connection, fencing quotes and removal and preparation for the installation of the pumps and mainline.
- Hail Recovery Committee participation
- Budwood program and visit to John McDonald nursery in Goondiwindi and Tim Millen in Robinvale.
- HIN – Brett attended a HIN meeting on the topic of WHS. A follow up meeting was held by Andrew and Shannon was held with Safe Ag Systems which is an online WHS monitoring platform.
- Xylella fastidiosa Conference – Andrew attended the Xylella conference in Brisbane to gain a greater understanding of the impacts of a possible incursion.
- Water management and planning meeting in Renmark.
- Andrew was the guest presenter at the Loxton Ag Bureau AGM.
- The ID team have started keeping a log of industry stakeholder support over the phone as part of improved reporting measure to HIA. In the last month, the team has received a dozen calls totalling approximately 3 hours.

The above activities are in addition to the quarterly/monthly committee meetings for the Plant Improvement, Pollination, Production and Almond Centre Committees.

Josh Fielke attended the second session of the 'Adviser Pathways – creating career pathways for new entrants and professionals in the agriculture sector' program in Melbourne. The session had a guest speaker, Robbie Sefton who is well renowned for her rural and regional marketing and advisory skills from farm to ministerial level, receiving the 2002 RIRDC NSW rural woman of the year award. The session covered techniques on how to continually learn, emphasising the importance on motivation with a work-life balance. The day also covered challenges faced by some of the participants discussing the best way to deal with situations they may or are facing.

12.1 - Extension Activities

Prepared by: Andrew Downs

A meeting was held between Andrew, Josh and Brett to plan the next twelve months of extension activities to satisfy the milestone requirements for AL16000 (Communications) and AL16001 (Extension). The list of activities is below:

Videos

- Propagation Material
- Season Wrap-up (Gulfoods)
- Sprayer Calibration
- Pollination Best Practice

Grower Tour (Domestic)

- Grower Tour to be conducted to the Riverina (April)

In A Nutshell articles

- R&D Forum
- Budwood Report
- Glyphosate Management
- IDM Project
- Delta T
- Preparing for pollination
- Economics of replanting
- Almond Centre of Excellence

Field days

- New Varieties – Harvest results
- Stockpile Management
- Integrated Disease Management Workshops
- Pollination (featuring Gordon Wardell)
- Spray Guide/Almond Centre of Excellence

Fact sheets

- Glyphosate Management
- Maxima
- Delta T
- Spring leaf sampling for nutrient analysis
- Economics of replanting

Other activities:

- Development actions for the Experimental Orchard including Development Applications submitted to Loxton Council for the variation of the placement of the shipping container and transportable building on-site, clearing of native vegetation along the easement for the mainline installation, induction of contracting staff and Control Group meetings with PIRSA and Brendan Sidhu.
- Andrew & Josh participated in the US Study Tour and attended the Almond Conference in Sacramento.
- Andrew delivered a presentation 'Australian Industry's Vision for the Future' as a part of "The Update from Our Friends Down Under: What's Truly Applicable to California" session.
- Uploading of the Almond Production spreadsheet, Charles Burks presentation from the Carpophilus Beetle workshop held in Robinvale and the presentation delivered during the Plant Pathology workshops held in November.

- Andrew and Ross met with researchers from AgVic, who are members of the new Integrated Disease Management project.
- Investigation into the Bacterial Spot issue with Maxima.
- Josh has completed a short course in Digital Communication Strategy as a part of the University of Melbourne Professional Development in Agriculture Course. The opportunity to participate in this course was an off-shoot of Josh's participation in the Young Adviser Pathways trial held last year.
- Discussions with BASF about Merivon revealing that all registration data has been submitted. Reports are that the APVMA are back up to normal processing capacity and should have the product registered within 12 to 18 months (Regulatory staff are always conservative).
- From mid-November to early January, Brett and Josh were completing a successful budwood season.

The above activities are in addition to the quarterly committee meetings, the regional meetings in July and the Almond Conference in October/November.

Following is the 2018 Annual Workplan:

2018 Annual Work Plan		January 2018 - December 2018											
Activity		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Extension Activities	Field Days												
	Grower Tour												
	Almond Board of Australia Conference												
	Grower enquiries												
Communications	Fact Sheets												
	Videos												
	In a Nutshell Articles												
Stakeholder Communication	Board Meetings												
	Regional Meetings												
	Plant Improvement Committee Meetings												
	Production Committee Meetings												
	Pollination Committee Meetings												
	Almond Centre of Excellence Meetings												
Cross-Industry	Horticulture Innovation Network (Participant)												
Project Work and Assistance	Evaluation of Prunus Rootstocks (AL16006)												
	Almond Budwood Repository Management												
	Australian Almond Breeding Program (AL12015)												
	IDM Project Milestone Due												
International	Almond Board of California Conference												
Correspondance	Review of International papers												

Extension Update – May 2018

Prepared by: **Brett Rosenzweig**

Extension activities

- The Plant Improvement, Pollination and Production committee meeting were attended by Andrew, Brett and Josh.
- Brett hosted Holly King in the Riverland on 21st February. Holly has just been elected to the Almond Board of California and was holidaying in Australia with her partner Steve.
- Brett participated in the Horticulture Innovators Network (HIN) study tour to Tasmania. Places visited include the Tasmanian Institute of Agriculture and Fruit Growers Tasmania at Hobart, Sorell Fruit Farm at Sorell, Kate's Berry Farm and Walnuts Australia at Swansea, Hazelbrae at Hagley and the TIA research farm at Devonport where Pyrethroids and Hemp are being trialled.
- Brett hosted the Manan Co-operative directors from 13-16th March. Manan is a Spanish grower co-operative that grows and processes almonds, olives, wine grapes and table grapes in the Alicante region.
- During the last quarter Brett took five weeks parental leave, Josh took a small amount of annual leave and Andrew finished working for the ABA on 16th March.
- In the last quarter, Josh published a flowering synchronisation tool, articles on glyphosate and haloxyfop use, further updates on orchard sanitation best practice management, a video for Gulfoods and a revision of the Maxima fact sheet regarding the ongoing investigation of severe Bacterial Spot type symptoms in one of the three commercial trial sites.
Brett liaised with SARDI and Agromillora regarding the requirements for R&D trials to be planted in winter 2018.

Non extension activities

- Cutting of dormant budwood started on 21st March and continued for 15 days for Brett and Josh. The budwood cut was destined for two nurseries.
- Two days were spent collecting samples for the rootstock project at Lindsay Point. Soil and leaf samples were taken for nutritional analysis and further soil samples were taken for presence of nematodes.
- A further two days were spent preparing and harvesting the rootstock trial. The clearing of windfalls between sample and non-sample trees occurred early in March, with shaking and windrowing occurring soon after. The actual picking up of the crop only occurred in early April due to the need to wait for the availability of a Weiss McNair pickup. Last season, the local contractor One Farm Harvesting provided a Weiss McNair pickup for the harvest but unfortunately it was located interstate for the duration of this season. Instead we waited until CMV Farms had spare time during their harvesting schedule.
This highlights the need for the ABA to purchase its own harvester, preferably one that can fit on a trailer that can be towed by a standard utility i.e. three tonne or less. The harvester needs to be easily movable and not rely on the participating orchard to supply machinery other than the initial shaking of the tree and ideally can sweep and pick up the shaken crop whilst retaining the ability to weigh sample trees in one pass down the row. Examples worth investigating are Monchiero and Sicma, both are made in Italy for other nut crops i.e. Hazelnuts, Macadamias. Whilst they would not be suitable for commercial almond harvesting, they might fill the role for harvesting sample trees and the Horizon 3 plantings at the ACE experimental orchard.

Extension Update – August 2018

Prepared by: Josh Fielke

Extension activities

- On the 6th of June Brett and Josh attended a meeting with SARDI and Agriculture Victoria's staff to discuss data correlation at the Almond Centre of Excellence and its various trials.
- The industry development staff briefed Greg Buchanan on the current projects and happenings relating to pest management on June 26.
- An extension update was provided at the regional meetings by Josh Fielke 2nd-4th July.
- The Almond Board of Australia Almond flowering reporting tool was released on the 6th of July. This tool allows growers to record and compare flowering seasons. Collaboration with Dane Thomas and the production committee guided the development of this tool. Two SARDI Phenology fact sheets by Dane Thomas were also released.
- An orchard hygiene video was filmed on the 29th of May with funding from the the local NRM board and Hort Innovation. After reviewing by all stakeholders, some minor amendments are to be made with release of the video to follow shortly.
- The best practice fact sheet for orchard hygiene was released on the 30th of July with input from the Production Committee, Brendan Sidhu and ABA staff.
- Trees for planting out at the experimental orchard have all been delivered and stored at Loxton Cold Stores in half tonne bins. Trees have been sealed in bin liners ready for planting when irrigation has been installed.
- Josh & Brett have assisted Anthony in the planning and planting of the experimental orchard.
- Orchard hygiene field days were ran from the 8th-10th August. A total of 108 attendees participated across the three main growing regions. Photos of these sessions can be found on the following [page](#).
- Efforts have been made by IDO staff to promote the Industry Disease survey from Agriculture Victoria and has been run in Almond Bytes. Josh has suggested to have a station at the conference for industry members to be able to fill out the survey and talk about the project with project staff.
- Horticulture Innovation Network Meetings were attended by Brett on the 15th May and Josh on 5th June.
- Milestone 105 was lodge for the industry development project.
- Almond Bytes content was provided monthly by staff.
- Review of current website structure has been conducted and a new website structure for grower resources will be available when the new website is released.
- SARDI held a site demonstration at the experimental orchard for the New Horizon Slurry Injection ripper and a Farmax Spader. Images of these are on the following [page](#).
- Ross assisted in the development of the two videos featuring Dr Jacqueline Edwards and Dr Paul Cunningham. These videos are available on the links below.
Intergrated Disease Management -
Intergrated Pest Managemnet -

Non extension activities

- All information relating to the rootstock trial has been collected and is in the process of being reported to HIA through its milestone report. Data will be presented to stakeholders in September

with emphasis on not drawing conclusions on results provided. The reason for this is that the trial is still young and more rigorous data analysis is needed in future years.

- The Adelaide University Breeding trial at Lindsay Point has undergone analysis and is in the process of reporting the data through a variety portal online, with updated yield, flowering and fact sheet portal.



Figure 1 - Robinvale session at Dennis Dinicola's (27 Attendees)



Figure 2 - Sunraysia Session at Selects Carina Orchard (42 Attendees)



Figure 3 - Riverland Session at Century Orchards (39 Attendees)



Figure 4 - Machinery Example at Century Orchards



Figure 5 - New Horizon Slurry Injection Ripper



Figure 6 - Farmax Spader

Extension Update – November 2018

Prepared by: Josh Fielke

With the conference being held during this reporting period, organisation for this event took a significant time from normal extension activities. Brett Rosenzweig completed work for the Almond Board on September 28 and Ben Wiblin started with the ABA on Monday, November 5. Ben participated in the post conference tour at the Riverland, Sunraysia and Riverina regions.

The list below details some of the activities from September to November 2018.

Extension activities

- ASDS Symposium was attended by Brett, Josh and Peter with Hort Innovation provided tickets.
- Brett presented to interested agriculture stakeholders in Narromine for Hort Innovation on August 27.
- Josh took two weeks annual leave at the start of October.
- Efforts have been made by IDO staff to promote the Industry Disease survey from Agriculture Victoria and has been run in Almond Bytes.
- Almond Bytes content was provided monthly by staff.
- Josh created a fertigation tool for the budwood site which helps to report applications in units and parts per million on the site for critique and knowledge transfer. (Attached in Email distributed) This can potentially be released to growers for use if beneficial but was predominantly designed for budwood management and reporting purposes.
- Virus testing of Monash was conducted on the 19 and 22nd of October 2018.
- Monash Budwood management has had weekly foliar sprays and preparations have been made for the upcoming cutting season.
- Assisted with the filming of the Experimental Orchard Video that was shown at the conference.
- Orchard Hygiene extension activities can be found in Briefing note 7.2. Besides the workshops with David Haviland and Brent Holtz other visits included; Century Orchards, CMV Farms, Lacton, Almas Almonds, Dinicola Orchard.
- In the Adelaide Plains Post Conference Tour session Tammy Leggett, a ranger from the Adelaide Mt Lofty Ranges NRM board presented on identification and compliance regarding bird control in almonds.
- Josh Fielke and Ben Wiblin visited Guna at Select Harvest Carina West processing plant to view the research being conducted involving using the waste material from the Cogeneration Plant as a soil ameliorant.

Thank you

2010 Australian Almond Conference

Funding was provided by
Almond Board of California
California Department of Pesticide Regulation

Authors also thank Pacific Biocontrol, Semios, Trécé, Sutera and cooperating farmers and pest control advisors

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Figure 2: David Haviland presenting at the Riverland Session

7.2 – Orchard Hygiene (Extension Activities)

Prepared by: Josh Fielke

The Almond Board of Australia staff has now run seven field days covering the topic of Orchard Hygiene with a total of 206 participants.

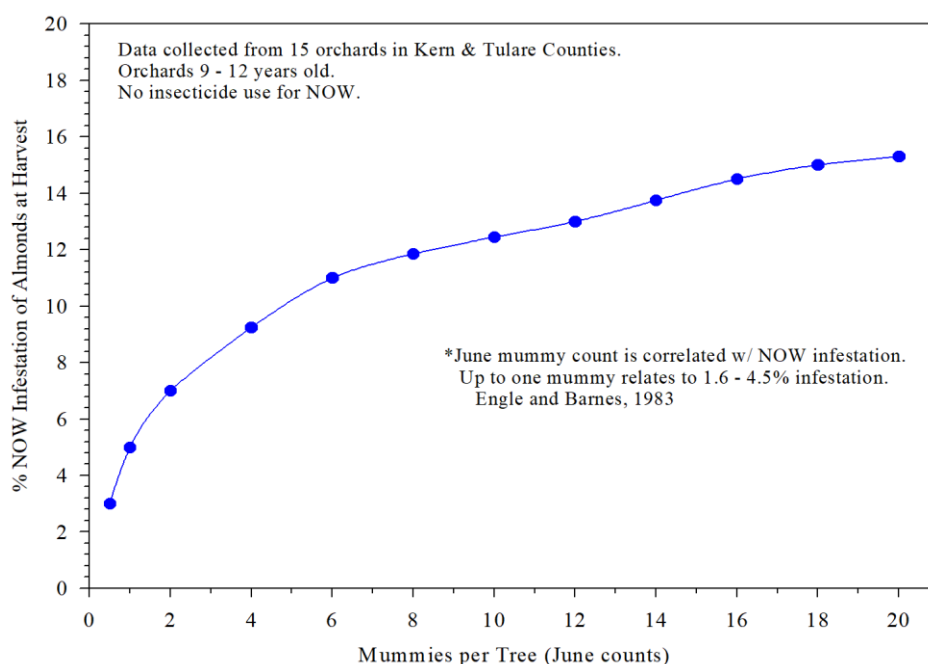
As mentioned in the previous meeting there was three sessions run by Brett Rosenzweig an Orchard with attendance was as follows. Riverina 27, Sunraysia 42, Riverland 39 (108 total). In these sessions the focus of the talk was to discuss practical solutions to Orchard Hygiene.

The Post Conference tour was also well attended with the distribution of attendance as follows: Adelaide plains 24, Riverland 32, Sunraysia 22 and Griffith 20 (98 total). In these sessions Brent Holtz discussed Hull Rot management. In Brent's opinion the best way to manage the disease is to mildly 'stress' the trees at -14 bars during the two weeks of Hull Split using the Pressure Bomb. He also emphasised the importance of monitoring the stress levels of your trees to get the best results, as at -14 bar you should not see an effect. The following link is the site that Brent uses to purchase the tool.

<https://www.pmsinstrument.com/resources/measuring-stem-water-potential-swp>

David Haviland then discussed what sanitation means in California to get successful control and continually get under 2% damage from the Navel Orange Worm. This covered right from planting densities to sanitation practices. A key point in his research, shown in the graph below is that whether you have 100 or 50 nuts left in the tree, you will continually get 15% damage. Therefore, if your spending a little bit of money on sanitation and achieving that sort of number, you are wasting your money in the Californian Context. Hence it becomes economical when you get down to less then 2 mummies per tree. Overall to get this number the annual cost for hygiene is approximately \$800 AUD per hectare. The large proportion of this is the manual polling crews.

Both Dave and Brent will both write an article about what they presented on the tour.



Extension Update –February 2018

Prepared by: Josh Fielke

Since the last group of committee meetings in the third week of November budwood distribution has taken up most of the time before completing the spring season in the first week of January.

Grower Enquiries

During the budwood season Josh still provided general advice to growers with the most popular query being about mites therefore raising the need for a potential fact sheet on the pest. General information about the pest can be found on Agriculture Victoria's page where information would just need to be transferred with chemical recommendations added. Common new grower advice was also provided on varieties and planting densities, as well as general growing information.

Pre-Harvest study tour

Work has been conducted recently on organising a pre-harvest study tour that will have a focus on Pest and Disease while providing updates on other elements of the industry. Buses and meals are provided through the study tour component of the extension project. The itinerary can be found on the following page.

Pollination Directory

Coming up to pollination season and varying issues in getting hives. It is time to consider if the ABA should have a free service section on the website where Bee Keepers can call up and let us know how many hives they have available and the location. If this was to occur, it would be recommended having this available by May.

STUDY TOUR



Wednesday, February 6th

6:30 - 10:00	Travel to Lake Powell Orchard
10:30	Almond Board of Australia and Select Harvest introduction
11:30	Integrated Pest Management Update & SHV Trials
12:00	Lunch
12:45	Integrated Disease Management Update & Product Updates
13:45	Michael Treeby - Spur Management, project update
14:15	Afternoon Tea
14:45	Field Walk & Machinery Demonstration
16:45	Wrap up of the Day
17:45 - 19:15	Dinner & Accommodation

Thursday, February 7th

7:30 - 8:00	Breakfast
8:00 - 8:30	Travel
9:00 - 12:00	Orchard Visits
12:00	Lunch
12:45 - 16:15	Travel

Extension Update – May 2019

Prepared by Josh Fielke and Ben Wiblin

Field Days

- **Select Harvest Lake Powell Orchard**

Josh and Ben were involved in organising and running the field day that was held on the 6th and 7th of February at Robinvale aiming to build more knowledge regarding pest management and orchard hygiene as well as providing updates in other areas of industry. The session was well attended and was well received. Organisation of another field day of the like for the following season is recommended.

Guest Speakers

- Ben Brown (General Manager of Horticulture, Select Harvest)
- Ross Skinner (ABA CEO)
- Frank Gallucio (Sumitomo)
- David Madge and Blaire Grossman (Ag Vic, Integrated Pest Management)
- Jason Robinson (Seed Terminator, Select Harvest)
- Peta Faulkner (Ag Vic, Integrated Pest Management)
- Edward Iouw (BASF)
- Hugh Armstrong (Bayer – Luna Sensation update)
- Michael Treeby (DJPR)

- **David Madge Integrated Pest Management Field Day**

As a part of the Integrated Pest Management project, David is responsible for holding field days on the project. David is currently working on a date to hold the discussion and is scheduled in for May.

Professional Development

Horticulture Industry Network Meetings

- Josh and Ben both participated in a meeting at Mildura on the 6th and 7th of March visiting a table grape business, Boundary Bend Olives, a vegetable enterprise, OLAM cracking plant and a temperate nut research orchard.
- Josh and Ben attended a meeting in Attwood on the 16th April to hear and discuss biosecurity with representatives from Plant Health Australia discussing reactions to pest incursions.

Other

- Ben visited Century Orchards on the 13th of March where he was able to see all facets of harvesting.

Milestones

Milestone 106 for the Industry Development and the final report for Monash Remediation were submitted and approved for payment. Milestone 104 for the Rootstock Stage 2 project will be completed by the completion of April with all actions needed to be completed now conducted.

Trial Work (Outside of the ACE Farm)

- **Rootstock Trial**
 - Ben visited the trial site to collect soil and leaf samples for nutrition and nematode testing. Results for these tests have now been returned.
 - Trial was prepared for harvest with sample trees re-marked for harvest.
 - On the 11th of April Josh managed the pickup and weighing of the trials. As done previously, Tony Spears shook the trees while CMV allowed the use of their pickup and operator to collect the samples into the wool bag system.
 - The fact sheet for the trial will be updated and put onto the website in May.
- **Breeding Trial**
 - Harvest of the product was conducted in early April and was weighed on April 18. Work with Michelle Wirthensohn the trial fact sheet will be updated in May/June.

Grower Enquiries

- Josh and Ben visited a local property with Peter Magarey to see and discuss an action plan regarding a phytophthora outbreak that infected a plot of young Vela trees.
- Josh continued to take calls and respond to enquiries over the phone and via email.
- Josh and Ben followed up on enquiries and further questions concerning the Vela leaf curling. Leaf samples were taken, and it has been concluded that the curling may be a result of a micronutrient deficiency and an adaptive technique to reduce the surface area of the leaf during hot weather.

Magazine Articles

Two editions of the Nutshell have been released since the last group of Almond Board meetings. Extension articles were written on the following topics:

- Mite influx due to the dry weather
- Select Harvest Lake Powell Field Day
- Harvest update for the 2019 season with interviews from some Grower Directors and Production respondents to a survey.

12.1 - Extension Update – August 2019

Prepared by Josh Fielke and Ben Wiblin

Field Days

- **Select Harvest Lake Powell Orchard**

Josh and Ben were involved in organising and running the flowering field walk that was held on the 14th of August at Lindsay Point. The purpose of this event was to give growers an update on the trials currently being run at CMV and Lacton. In total there was four project updates and the speakers included:

- Zel Marie Coetzee (DPI Victoria, Spur management project)
- Everard Edwards (SARDI, Root system resilience)
- Tonya Weichel (Agriculture Victoria, Integrated Disease Management – Hull Rot)
- Brittany Oswald (SARDI, Integrated Disease Management – Trunk Pathogens)
- Michelle Wirthensohn (Adelaide University – Breeding program)

- **Extended Non-ABA field days**

- South Australian Apiarists Association Best Practice for Pollination Workshop – Loxton (8/5/2019)
- Agriculture Victoria's Integrated Disease Management update – Irymple (21/5/2019)
- Agspec Bio-stimulants workshop - Renmark, Mildura & Griffith (28,29,31/5/2019)
- EE Muirs Almond Tech day – Mildura (5/6/2019)

- **Regional Meetings**

- Adelaide Plains, Riverland, Sunraysia & Riverina (1-3/7/2019)

Professional Development

Horticulture Industry Network Meetings

- J. Fielke & B. Wiblin – Biosecurity Incident SOPs & Surveillance Strategies (16/4/2019)
- J. Fielke & B. Wiblin – Community surveillance/ Energy efficacy (25/7/2019)

Milestones

- Milestone 107 for the Industry Development project has been submitted and is awaiting approval. Milestone 105 for the Rootstock Stage 2 project will be submitted in the coming week, with an updated handout produced.

Trial Work (Outside of the ACE Farm)

- **Rootstock Trial**

- The first plantings of stage 2 has occurred at the experimental orchard, however the planting of the heavy soil site at the Loxton Research Centre will need to be carried over a year to be planted out in the following season.

Magazine Articles

In A Nutshell Spring / Summer 2019 (appendix 10)

- In the Orchard – What mite this be?
- Almond project expands into three states (Plant & Food Research Australia)

Fact Sheets

Viruses in the Australian almond industry (appendix 8)

<https://2q1ee4456oc52trll42uctl1-wpengine.netdna-ssl.com/wp-content/uploads/2019/08/Bacteria-Viruses-and-Viroids-in-Australian-almonds.pdf>

Updated the Haloxypop fact sheet (Reduction of spray drift: appendix 9)

<https://2q1ee4456oc52trll42uctl1-wpengine.netdna-ssl.com/wp-content/uploads/2019/08/Reducing-the-Risk-of-Spray-Drift-Haloxypop.pdf>

Website activity/ interest

The following table describes the activity on the Industry website and what viewers are interested in looking at

Growing Resources (Over 10 Views)	Page Views	Unique Page Views	Avg. Time on Page (Seconds)
Crop Update - Australian Almonds	899	710	83.07
In a Nutshell - Australian Almonds	756	633	156.36
2018 Australian Almond Conference Presentations Slides - Australian Almonds	572	469	303.99
Guide to Almonds - Australian Almonds	256	226	192.56
Pollination 101 - Australian Almonds	172	144	366.41
Water & Irrigation - Australian Almonds	152	128	115.29
Almond Centre of Excellence - Australian Almonds	142	115	124.44
18 th Australian Almond Conference - Australian Almonds	121	110	71.62
Interactive Flowering Graph - Australian Almonds	94	85	112.19
Archived Event Presentations - Australian Almonds	55	50	195.23
ABA Flowering Observation Tool - Australian Almonds	51	43	144.24
Carpophilus Beetle Guidelines 16/17 - Australian Almonds	49	36	234.17
Renewable Energy Production from Almond Waste - Australian Almonds	27	19	311.29
Carob Moth in Almonds Pest Facts - Australian Almonds	26	22	106.75
David Madge on Carob Moth - Australian Almonds	22	21	76.40
Water Budgeting - Australian Almonds	21	13	98.57

ABA Best Practice Videos

To be scripted and filmed by Industry Development Staff

High Priority <-----> Low Priority

Priority 1

Pollination Part 1: Placement Hive health / inspections Timing of introduction / removal Part 2: Code of practice Forage crops Spraying / chemicals	AUGUST
Pest & Disease Managing Orchard Hygiene	
A year in an Almond Orchard Various Farms	All Year

Priority 2

New Varieties How the breeding program works ie from determining what to cross, to doing the crosses, assessing crosses and selections, determining those for orchard testing against the criteria and final evaluation phases, including market testing and the commercialisation arrangements with IP, royalties etc <i>Michelle Wirthensohn</i>	AUGUST
Enhanced Production Systems Enhanced production systems Overview of advanced production system – “The Vision” Tree architecture (Grant Thorp) Density Pruning Central leader	
Irrigation Irrigation efficiencies with Mark Skewes Soil moisture monitoring, plant monitoring, application systems, yield and \$'s per megalitre	DECEMBER
New Harvesting System - Rosella Shake and Catch & Silo Storage	FEBRUARY
All about Almond Spurs Providing information based on results produced through the project funded through Hort Innovation	AUGUST

Priority 3

Varieties in the Australian Industry What Varieties and why? Grower Opinions	
Pollination Interview with a bee keeper about why they like participating in almond pollination. Almond industry requirements now and going forward.	
Irrigation - Solar power for pumps -Irrigation requirements – monitoring systems, pan, soil and plant sensors - Metering water use in almond orchards and horticulture in general and in relationship to allocations for consumptive use that are determined by governments after environmental requirements are decided.	
ACE Farm Experimental Orchard update	SEPTEMBER
Rootstock Trial Project update	
Crop Management Stockpile management	
Nutrition Select Harvests Nutrition program	

Priority 4

Processing How Almonds are processed - Almondco	
Climate Dane Thomas - Managing Micro-climates	
Orchard Management Cover crops	
Tree Planting Best practice	
Tree Management Pruning best practice	
Biosecurity What is biosecurity in Almonds?	
Crop management Uses of almond hull	

12.1 - Extension Update – November 2019

Staffing

- Deidre Jaensch commenced her employment as the Industry Development Manager for the Almond Board of Australia on October 14, 2019.

Field Days

- **R&D Forum**

ABA Staff organised and ran the R&D Forum held on the 30th & 31st October. There were approximately 250 registrations with updates from the current projects that are taking place along with topical speakers from outside the industry. A special mention should be made to Citrus Australia who brought out 'the spray guy' Jason Devour from Ontario and presented on the second day.

- **Extended Non-ABA field days**

- Elders & Pasture Genetics pollinator blend workshop
Included: vetch, brassica, mustard, clover & radish

- **Industry Representative Meetings**

- Young people in agriculture (23/9/19)
- Mallee Sustainable Farming – broadscale area wide weed management project (24/9/19)
- Select Harvest & DPI – Potential new project (20/9/19)

Professional Development

- **Horticulture Industry Network meeting**

- J. Fielke & B. Wiblin – APVMA and mrl workshop and discussion (23/10/2019)

- **Soil Science Australia workshop at Select Harvest – Soil Carbon for soil N and moisture management**

- J. Fielke & B. Wiblin (19/9/19)

Trial Work

- **Breeding Trial**

- The first primary evaluation plantings have been planted at the ACE orchard.
- Almond Board of Californian variety evaluation – Sent over 15Kg of all commercial Australian varieties.

Magazine Articles

- 'Rootstock Trial - evaluating the yield findings' – In a Nutshell article
- 'Virus detection and prevention' – In a Nutshell article
- 'ACE Experimental Orchard Update' – In a Nutshell article

Industry Promotion

- Glossop High School presentation on the almond industry (11/9/19)

- Production of video promoting a career pathway in our industry.
<https://vimeo.com/371302161/ebc4e28c37>
- Two videos were produced for presentation at the Delhi seminar. One of Ben Brown providing an update on the reduction of risk for pest damage and some footage of Paul Cunningham's R&D forum talk on current research for the IPM project.

Project Milestones/ Reports

- The tender for the almond extension project 2020-2023 was released and the ABA have applied to undertake the project. If you would like to see the application let one of the ABA staff know. The ABA is also in process of applying for an extension in time to the 1st April 2019 for the current Extension project AL16001 to provide time for Hort Innovation Board to review the new application.
- Milestone 105 for Stage 2 of the rootstock project was been submitted and has been approved.

12.1 Extension Update – January 2020

Best Practice Resources

- **Videos**

Currently various videos including highlights from the R & D Forum are being put together to promote some key updates on research projects as well as some messages on best practice. The plan is to create videos on the following topics pending approvals from the relevant organisations:

- The development of a trap and kill method for *Carpophilus*
- Orchard Hygiene, an update from the IPM team
- Irrigation best practice – Mark Skewes, what and how to monitor your system
- Irrigation best practice – what the system audit showed
- Australian Almond Breeding program – Michelle Wirthensohn
- The importance of tree structure – Part of Grant Thorps project background
- Water market and how prices are determined along the Murray.

- **Fact Sheets**

- A drought strategy fact sheet was released in January to be a point of reference, enabling easy access to information readily available from work conducted throughout Australia as well as links to US management responses.

- **Best Practice Guide**

- Plan is to publish an Australian version of the best practice guide for pollination to be completed before the 2020 pollination season. The text has been transformed to a word document with appropriate changes being made by IDO staff, which will then be put to review from the pollination committee, as well as additions from the Biosecurity code of practice staff members from SA, State Apiarist Associations.

ABA Field days – Boundary Bend and Century Orchards

- Orchard hygiene and Irrigation System audits

Extended Non-ABA field days

- Invitation was sent out for a field walk of Grahame's Factree Independence orchard.

Industry Representative Meetings

- Met with Ella Winnall from the Loxton Waikerie council to discuss the LoraWAN network being installed by the council.
- FluroSat discussion with Marie, a new Microsoft invested, plant health monitoring system.
- Deidre and Josh met with Peter Ebner and Tyson Milne from Lower Murray Water to discuss the current water situation and gain a greater understanding of the system.

Professional Development

- Josh Fielke attended the 2019 Almond Board of California conference in Sacramento, including a chemical pipeline tour in North Carolina (December 4-14).
- Josh Fielke will be attending Evoke Ag on February 18-19, an international Agtech conference looking at new technologies coming onto the marketplace throughout all of agriculture.
- Ben Wiblin will be attending the AdvanceAg - South Australia's first AgTech showcase, in Adelaide, Monday 24 February 2020

Horticulture Industry Network meetings

- Xylella surveillance and inspection of the quarantine facilities attended by Deidre, January 30.

In a Nutshell Articles

- Key notes from the R&D Forum
- Industry-wide survey of diseases in Australian almond orchards (IDM team authored)

Industry Promotion

- Ben Wiblin was involved in selling almond tins in Rundle Mall to raise money for the Australian bushfires.

Project Milestones/ Reports

- AL16001 has been extended until 1 April 2020 to continue extension services until the new project with Hort Innovations can commence.
- Milestone 105 for Stage 2 of the rootstock project has been submitted and has been approved and signed by HIA.

Extension Review

As a part of the final report for AL16001 a survey needs to be conducted identifying how technology and practices have progressed throughout the project.

Additionally, we would like to ask members what they would more information on so that we can prepare for the future project.

Consultation & feedback

- South Australian – draft Planning and Design Code - PIRSA is planning a small initial workshop session in Adelaide to run through some planning (horticulture) scenarios and then another briefing and consultation sessions for industry – presumably in February.
- National Temperate Fruit Biosecurity Surveillance Strategy & Implementation Plan – see paper
- Victorian Mallee Irrigation Land and Water Management Plan – presentation by Mallee CMA

Appendix J – ABA website and mail chimp analytics

Website Analytics

The Following tables use data collected through Google Analytics for the ABA website before and after reconfiguration. These websites were as follows:

Current (September 1, 2018 – April 1, 2020): www.industry.australionalmonds.com.au

Previous (February 1, 2017 - August 30, 2018): www.australionalmonds.com

With the upgrade of the website halfway through the project, analytical data collected, requires some collating to provide a complete list.

Factsheets

The following data collected is made up of page visits to specifically download fact sheets.

Factsheet title	Page Views	Avg. Time on Page
In A Nutshell	3,824	1,408
Conference Achieved Presentations	2,012	1,147
Forum Achieved Presentations	1,329	426
Carpophilus Beetle	1,161	931
Carob Moth	871	923
Vela	687	299
Pollination 101	652	478
Interactive Flowering Graph	617	268
Almond Bud initiation	518	267
Food Safety Risks	458	197
Water Budget	416	380
Maxima	388	221
Mice	379	761
Rhea	360	245
Carina	314	344
Leaf Tissue Analysis	298	466
Rust	294	328
Capella	280	388
Pit hardening	238	302
Canker and Trunk Diseases	232	451
Orchard Hygiene	229	566
Mira	228	283
Permits	211	480
Assessing Phenology	201	206
Breeding for SF varieties	199	229
Flowering Observation Tool	196	112
It's not just NPK	188	184
Super Soils	179	310

Profile establishment	166	386
Dormancy Breaking	163	291
Crop Nutrient Removal	146	169
Almond NRS Survey	133	330
Better Almond Pollination	121	199
Variety updates	117	272
Post-Harvest Nutrition	99	281
Timing of inputs	86	151
Balancing Nutrients	79	191
CT trial Statistics	66	304
Renewable Energy from Almond Waste	62	215
Phenology Standards for Almonds	34	97
Video: About the IPM Project	32	118
Video: About the IDM Project	21	68
Soil Acidification	14	109
Reducing Spray Drift	13	30
Regent Parrot	9	95

Topics where multiple fact sheets can be download

The following table presents website access based on topic and includes all products on this topic including factsheets, tools and videos. Most of this data was collected from the new website.

Topic	Page Views	Avg. Time on Page
Orchard Management	2,862	671
Pest and Disease	2,275	627
Publications	2,110	196
Economics of Almond Production	1,901	201
Irrigation and Soil	1,704	537
Conferences/ Forums	1,269	191
Processing	1,201	369
Growing Principals	1,149	404
ACE Farm	843	621
Almond Production	823	442
Water and Irrigation	752	236
Pollination	628	971
Variety Selections	560	248
Almond Physiology	415	314
Biosecurity	256	153
Food Safety	239	275
Sustainability	196	153
Renewable Energy	185	141
Quality and Food Safety	129	256

Industry Directory

The following data is information collected through the industry directory providing growers contacts with industry products and services.

Topic	Page Views	Avg. Time on Page
Budwood and Nursery	1,850	571
Machinery	1,808	323
Chemical and Fertiliser	1,048	273
Harvest	865	228
Hulling and Shelling	760	303
Consultancy	352	164
Transport	166	214
Finance	139	135

Mailchimp Analytics

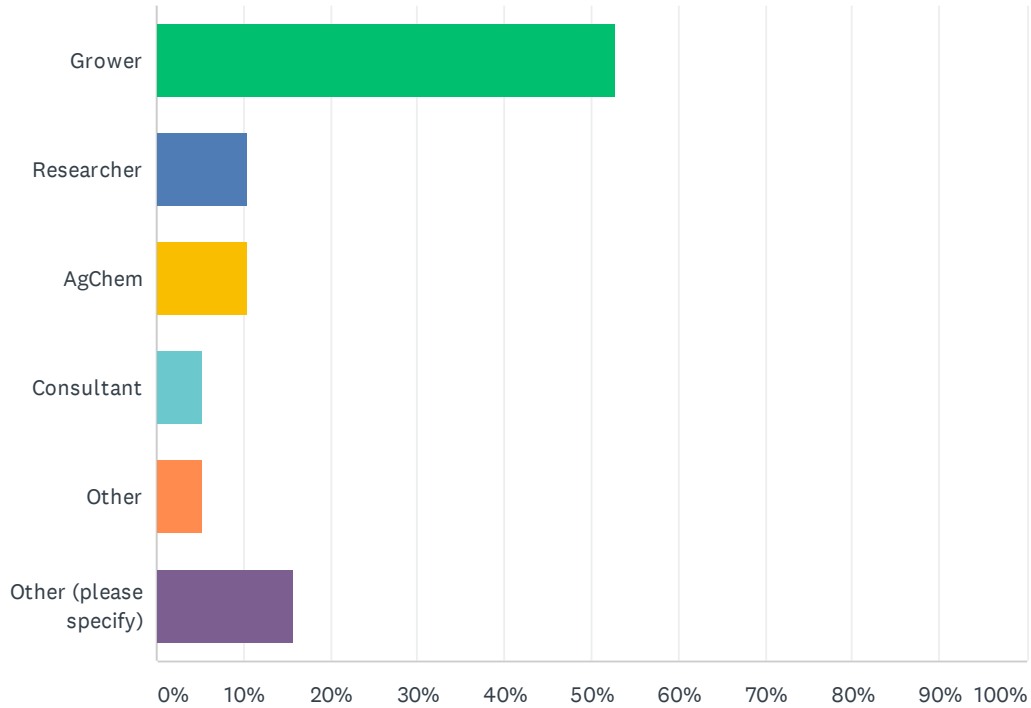
The ABA utilises Mailchimp to distribute information to various segments of the database that now holds 1,486 recipients. This data is categorised to demonstrate the effectiveness of communication of the various forms of media. Note the benchmark set by mailchimp for agriculture is an open rate of 23.31

(<https://mailchimp.com/resources/email-marketing-benchmarks/>).

Purpose	Number Sent	Ave. Total Opens	Ave. Open Rate	Ave. Total Clicks
ABA Field Day	34	612	48.13%	37
Fact Sheet	9	408	50.11%	44
External Field Day Field Day	5	515	50.65%	40
In a Nutshell	13	1560	43.26%	404
Media Release	4	2357	44.46%	118
Meeting Notification	10	597	47.32%	80

Q1 What role do you play within the industry?

Answered: 19 Skipped: 0

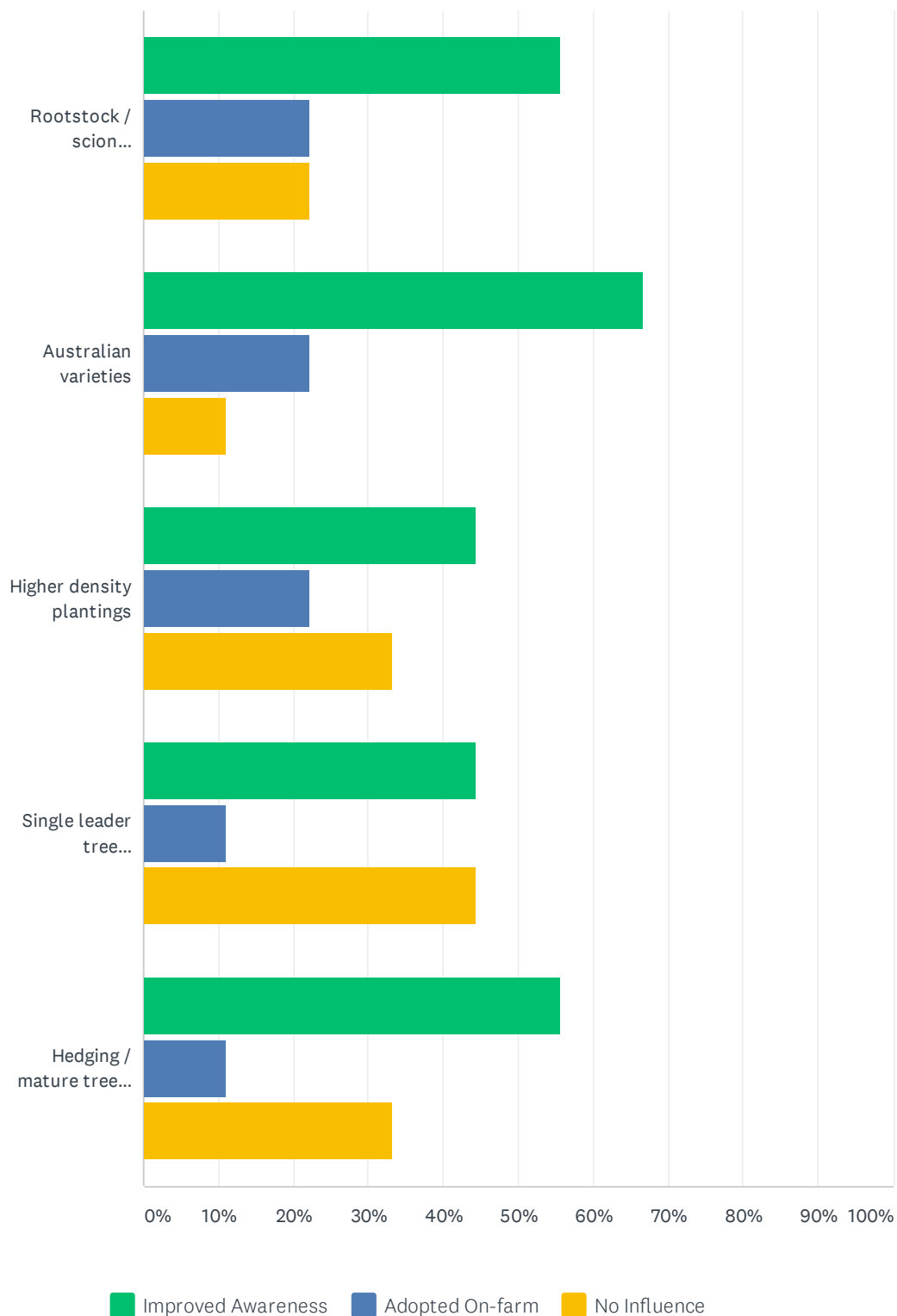


ANSWER CHOICES	RESPONSES	
Grower	52.63%	10
Researcher	10.53%	2
AgChem	10.53%	2
Consultant	5.26%	1
Other	5.26%	1
Other (please specify)	15.79%	3
TOTAL		19

#	OTHER (PLEASE SPECIFY)	DATE
1	Employee of Handler - Grower Liaison	3/13/2020 11:42 AM
2	Orchard nutrition, specialty liquid fertiliser	3/11/2020 1:25 PM
3	Logistics	3/4/2020 5:20 PM

Q2 Have our extension activities influenced your orchard establishment strategies on the following?

Answered: 18 Skipped: 1

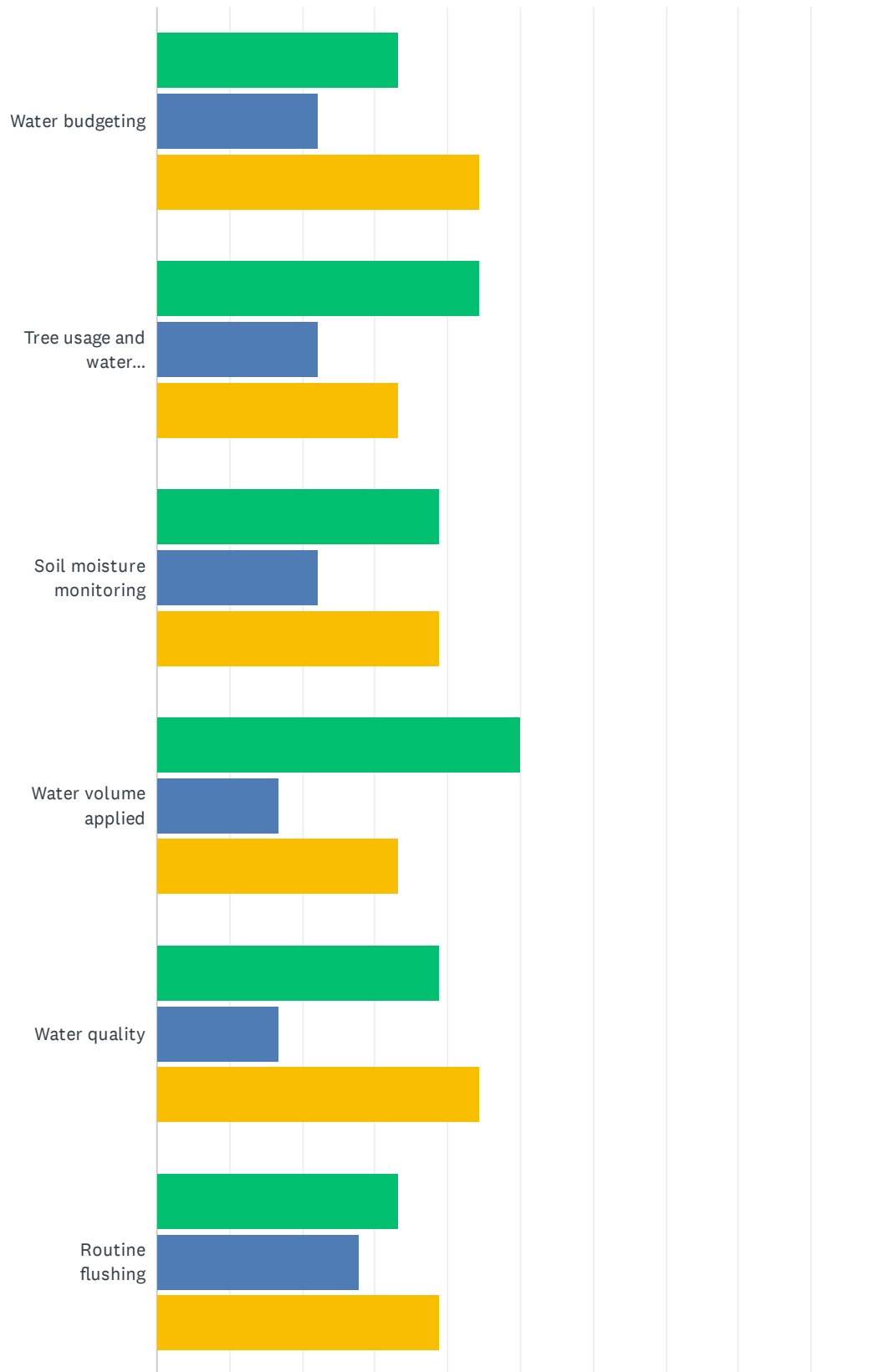


Almond Board of Australia Extension Survey

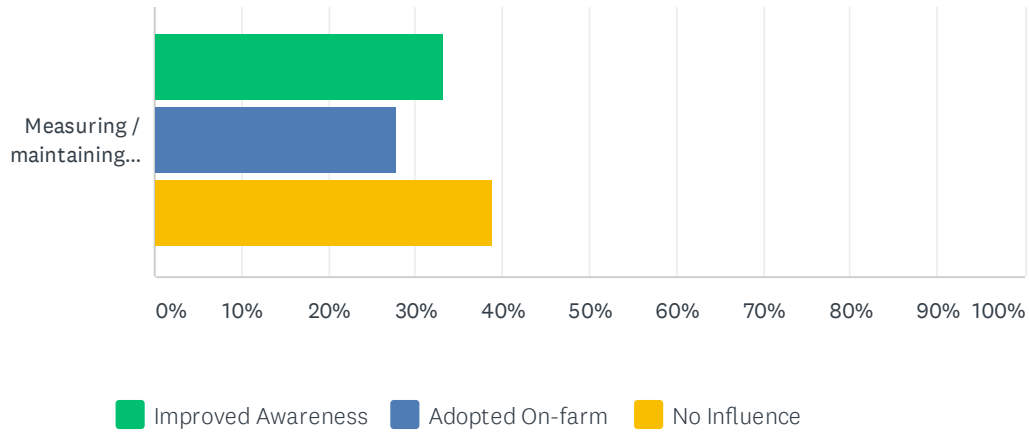
	IMPROVED AWARENESS	ADOPTED ON- FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Rootstock / scion combinations	55.56% 10	22.22% 4	22.22% 4	18	1.67
Australian varieties	66.67% 12	22.22% 4	11.11% 2	18	1.44
Higher density plantings	44.44% 8	22.22% 4	33.33% 6	18	1.89
Single leader tree architecture	44.44% 8	11.11% 2	44.44% 8	18	2.00
Hedging / mature tree pruning strategies	55.56% 10	11.11% 2	33.33% 6	18	1.78

Q3 Have our extension activities on irrigation influenced your management strategies on the following?

Answered: 18 Skipped: 1



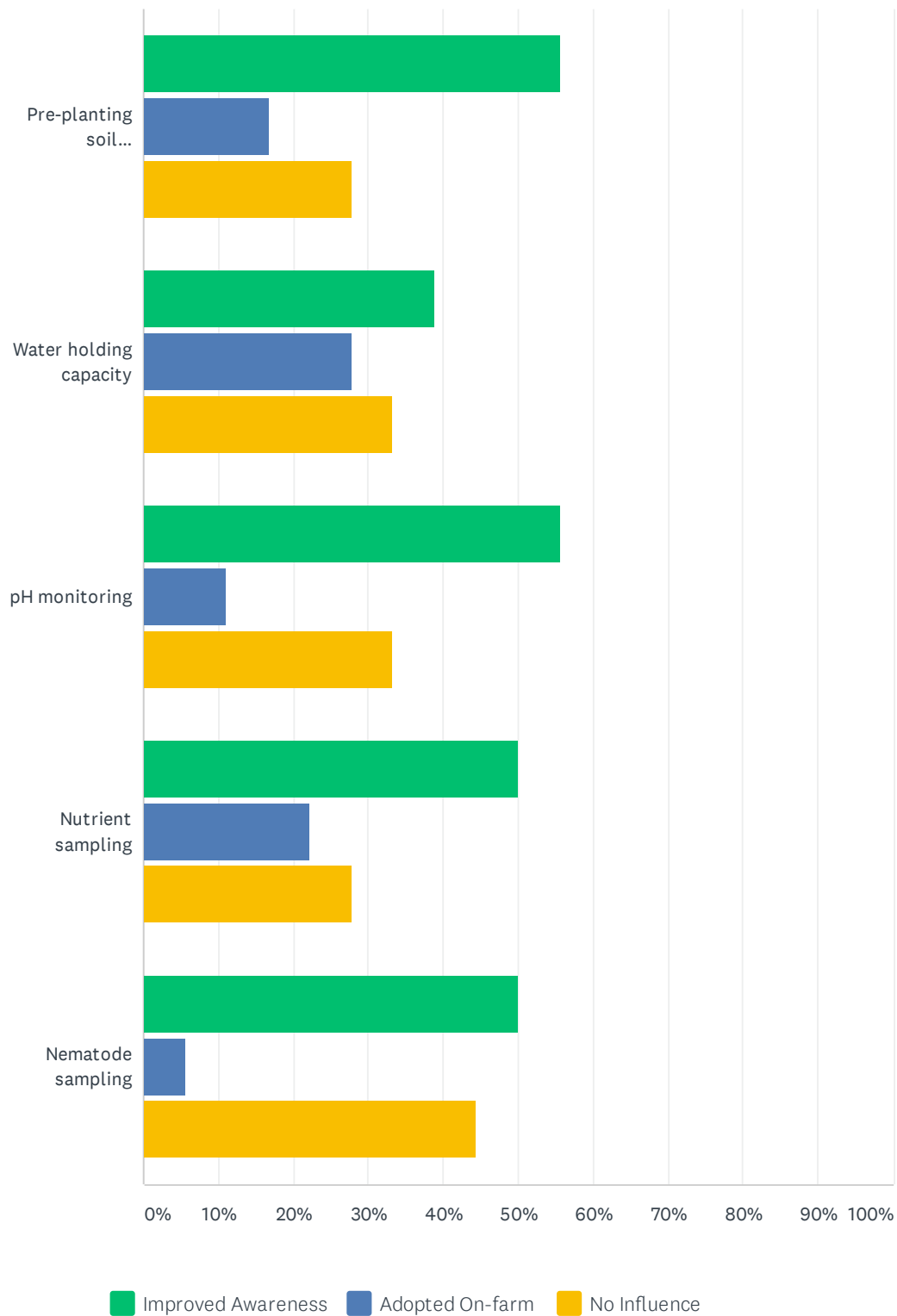
Almond Board of Australia Extension Survey



	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Water budgeting	33.33% 6	22.22% 4	44.44% 8	18	2.11
Tree usage and water scheduling technology	44.44% 8	22.22% 4	33.33% 6	18	1.89
Soil moisture monitoring	38.89% 7	22.22% 4	38.89% 7	18	2.00
Water volume applied	50.00% 9	16.67% 3	33.33% 6	18	1.83
Water quality	38.89% 7	16.67% 3	44.44% 8	18	2.06
Routine flushing	33.33% 6	27.78% 5	38.89% 7	18	2.06
Measuring / maintaining drip line uniformity	33.33% 6	27.78% 5	38.89% 7	18	2.06

Q4 Have our extension activities on soil characteristics influenced your management strategies on the following?

Answered: 18 Skipped: 1

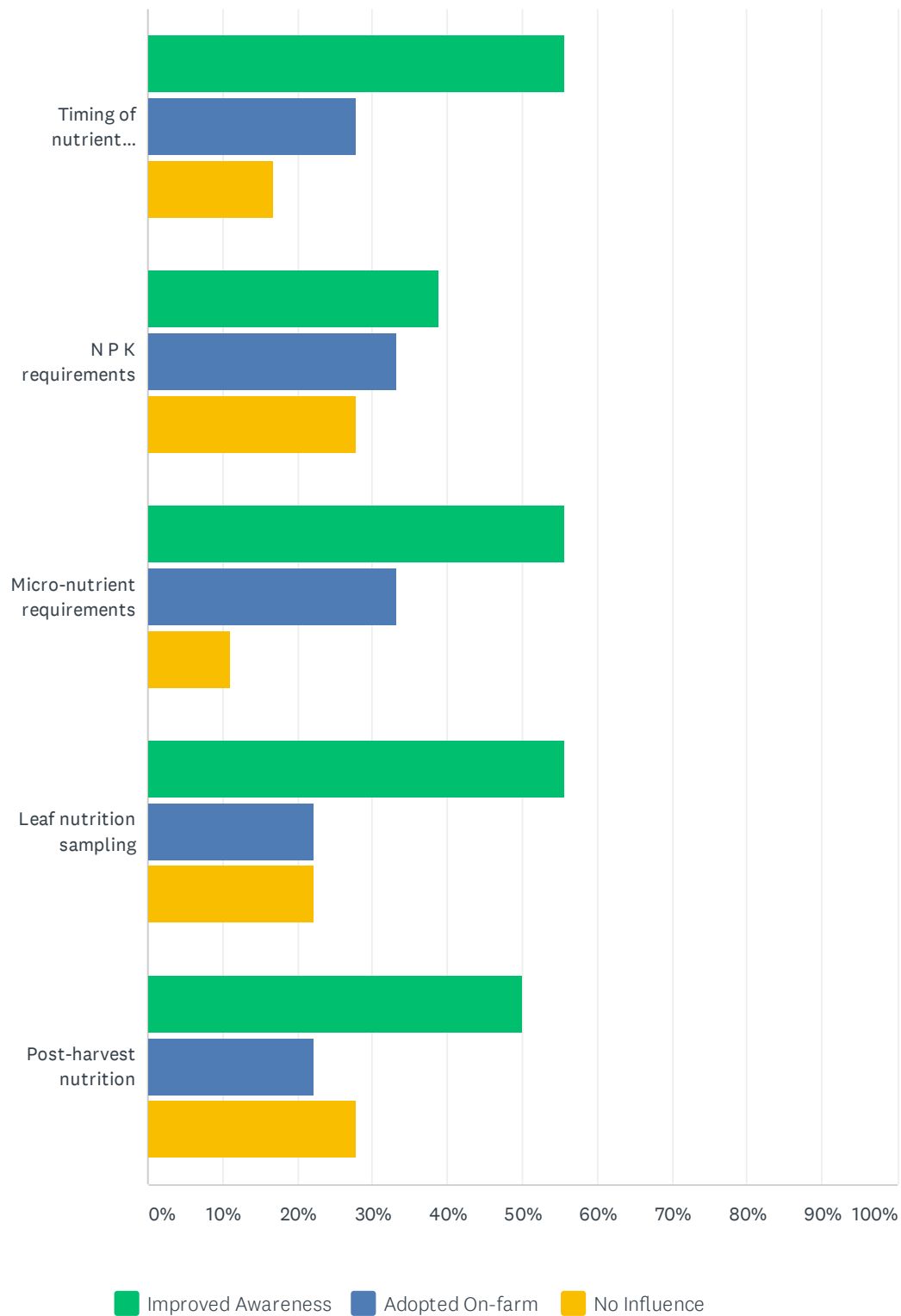


Almond Board of Australia Extension Survey

	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL
Pre-planting soil requirements	55.56% 10	16.67% 3	27.78% 5	18
Water holding capacity	38.89% 7	27.78% 5	33.33% 6	18
pH monitoring	55.56% 10	11.11% 2	33.33% 6	18
Nutrient sampling	50.00% 9	22.22% 4	27.78% 5	18
Nematode sampling	50.00% 9	5.56% 1	44.44% 8	18

Q5 Have our extension activities on nutrition influenced your annual crop management strategies on the following?

Answered: 18 Skipped: 1

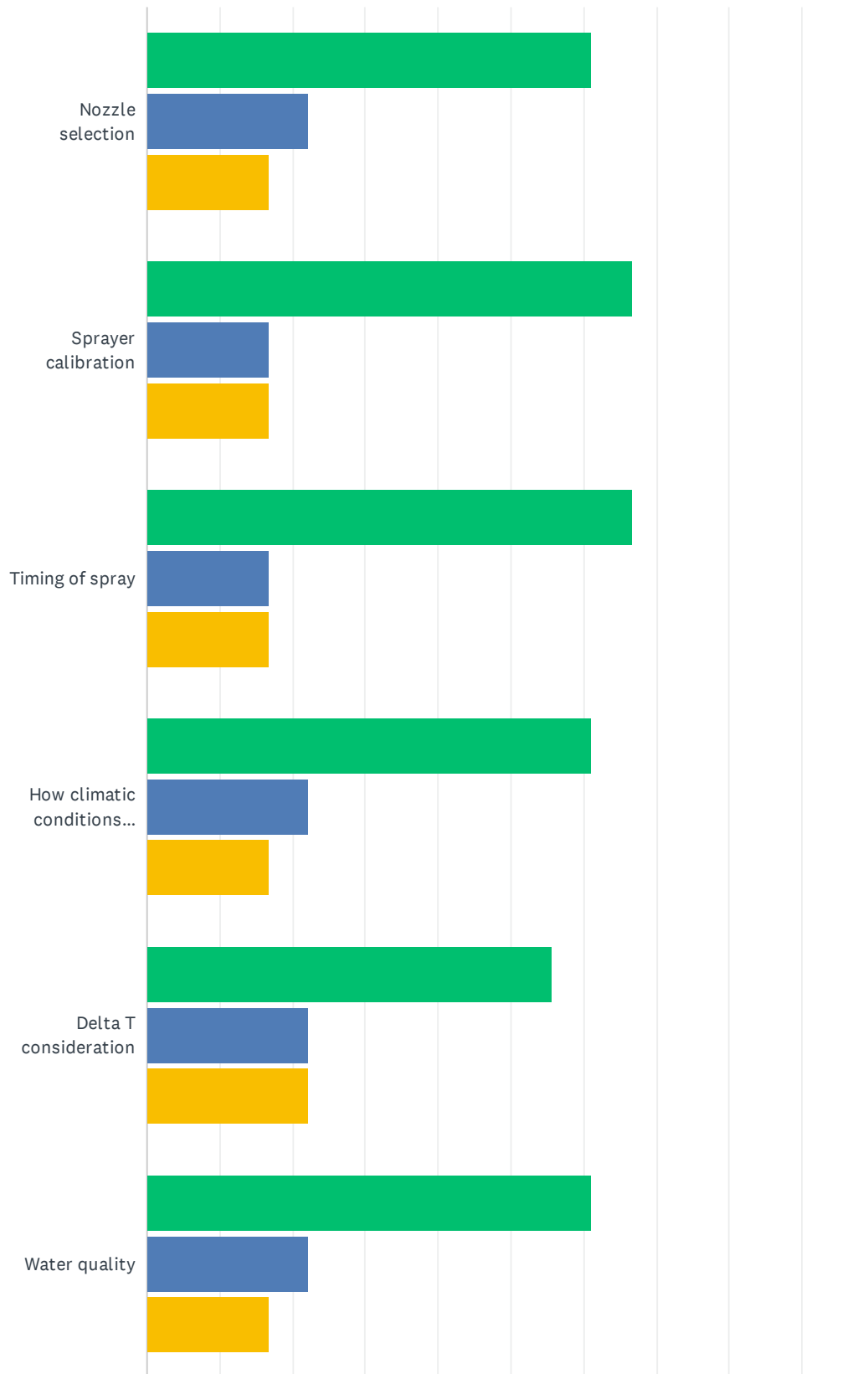


Almond Board of Australia Extension Survey

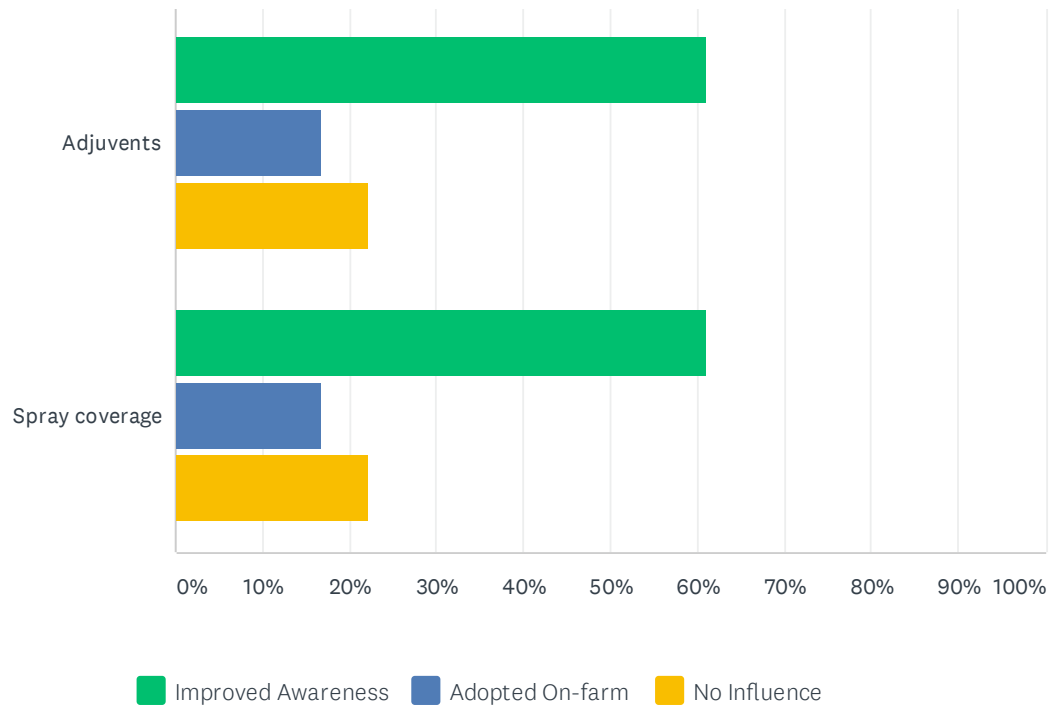
	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL
Timing of nutrient applications	55.56% 10	27.78% 5	16.67% 3	18
N P K requirements	38.89% 7	33.33% 6	27.78% 5	18
Micro-nutrient requirements	55.56% 10	33.33% 6	11.11% 2	18
Leaf nutrition sampling	55.56% 10	22.22% 4	22.22% 4	18
Post-harvest nutrition	50.00% 9	22.22% 4	27.78% 5	18

Q6 Have our extension activities on spray efficacy influenced your practices on the following?

Answered: 18 Skipped: 1



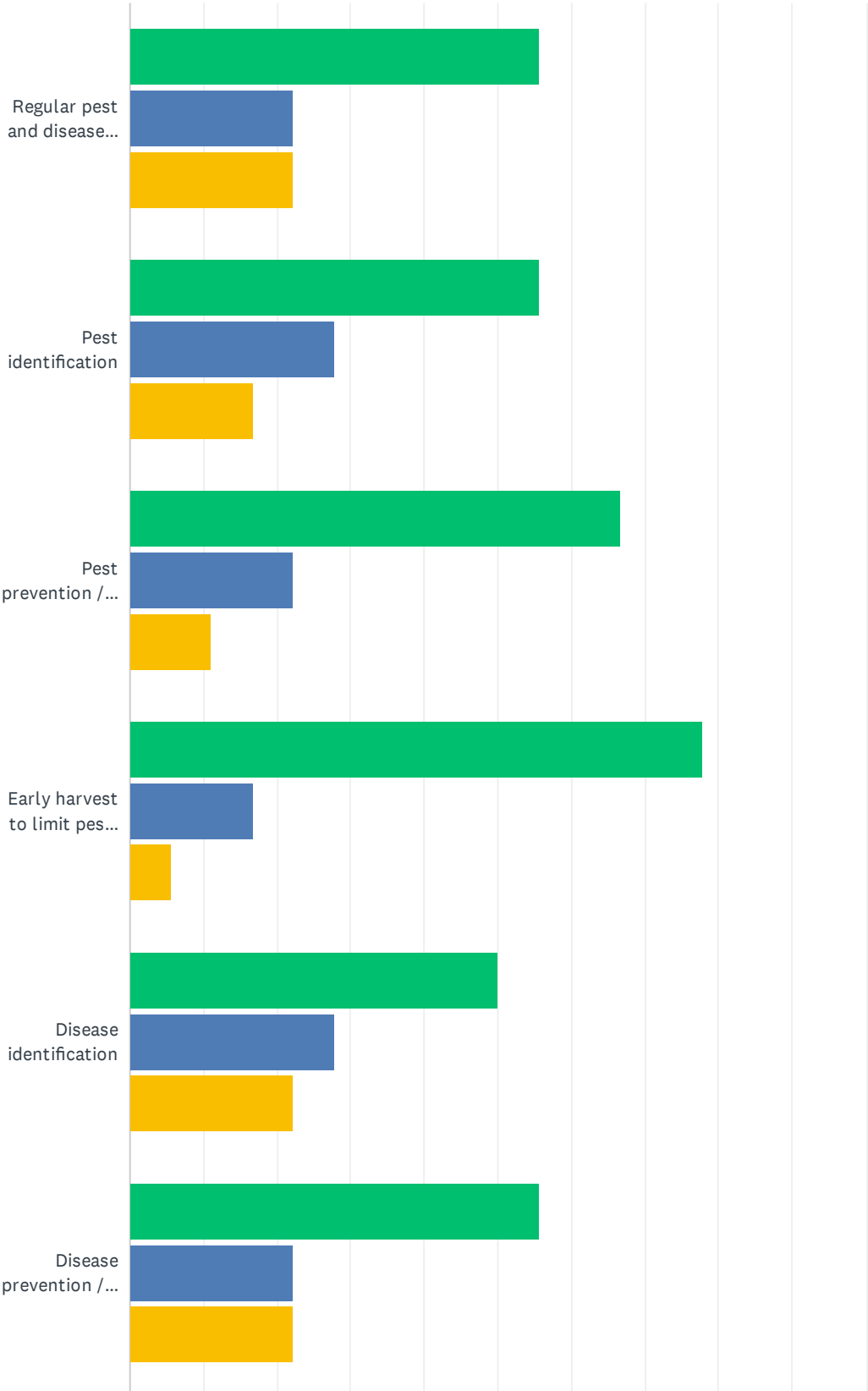
Almond Board of Australia Extension Survey



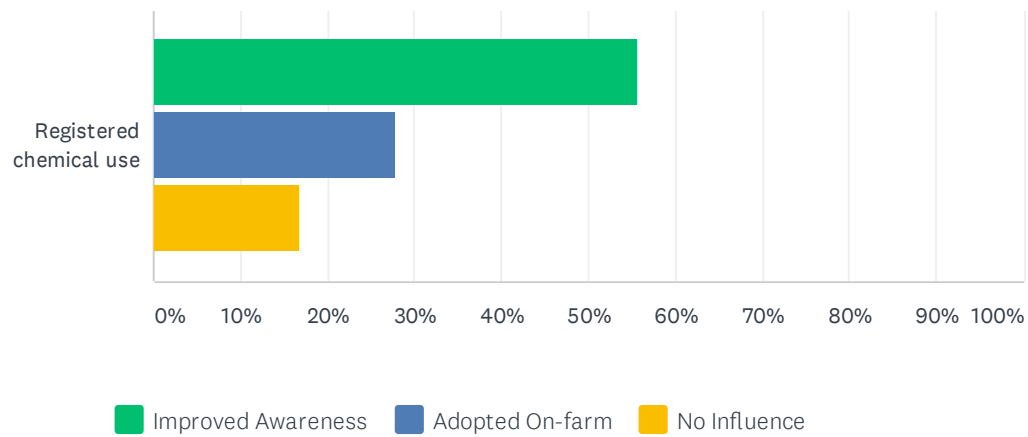
	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL
Nozzle selection	61.11% 11	22.22% 4	16.67% 3	18
Sprayer calibration	66.67% 12	16.67% 3	16.67% 3	18
Timing of spray	66.67% 12	16.67% 3	16.67% 3	18
How climatic conditions affect droplets	61.11% 11	22.22% 4	16.67% 3	18
Delta T consideration	55.56% 10	22.22% 4	22.22% 4	18
Water quality	61.11% 11	22.22% 4	16.67% 3	18
Adjuvents	61.11% 11	16.67% 3	22.22% 4	18
Spray coverage	61.11% 11	16.67% 3	22.22% 4	18

Q7 Have our extension activities influenced your pest and disease management strategies on the following?

Answered: 18 Skipped: 1



Almond Board of Australia Extension Survey

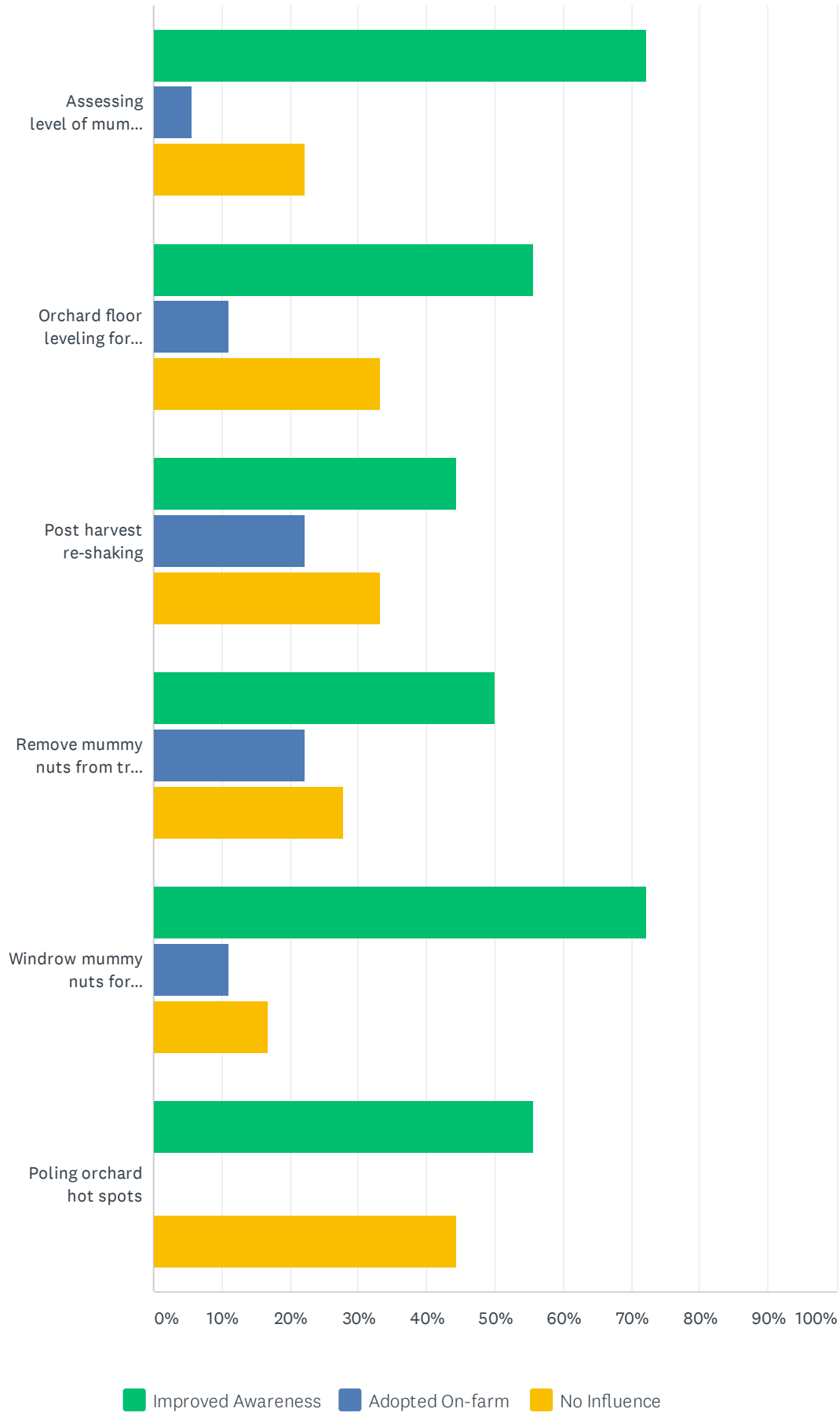


	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Regular pest and disease monitoring	55.56% 10	22.22% 4	22.22% 4	18	1.67
Pest identification	55.56% 10	27.78% 5	16.67% 3	18	1.61
Pest prevention / control	66.67% 12	22.22% 4	11.11% 2	18	1.44
Early harvest to limit pest breeding cycles	77.78% 14	16.67% 3	5.56% 1	18	1.28
Disease identification	50.00% 9	27.78% 5	22.22% 4	18	1.72
Disease prevention / control	55.56% 10	22.22% 4	22.22% 4	18	1.67
Registered chemical use	55.56% 10	27.78% 5	16.67% 3	18	1.61

Q8 Have our extension activities on orchard hygiene influenced your management strategies on the following?

Answered: 18 Skipped: 1

Almond Board of Australia Extension Survey

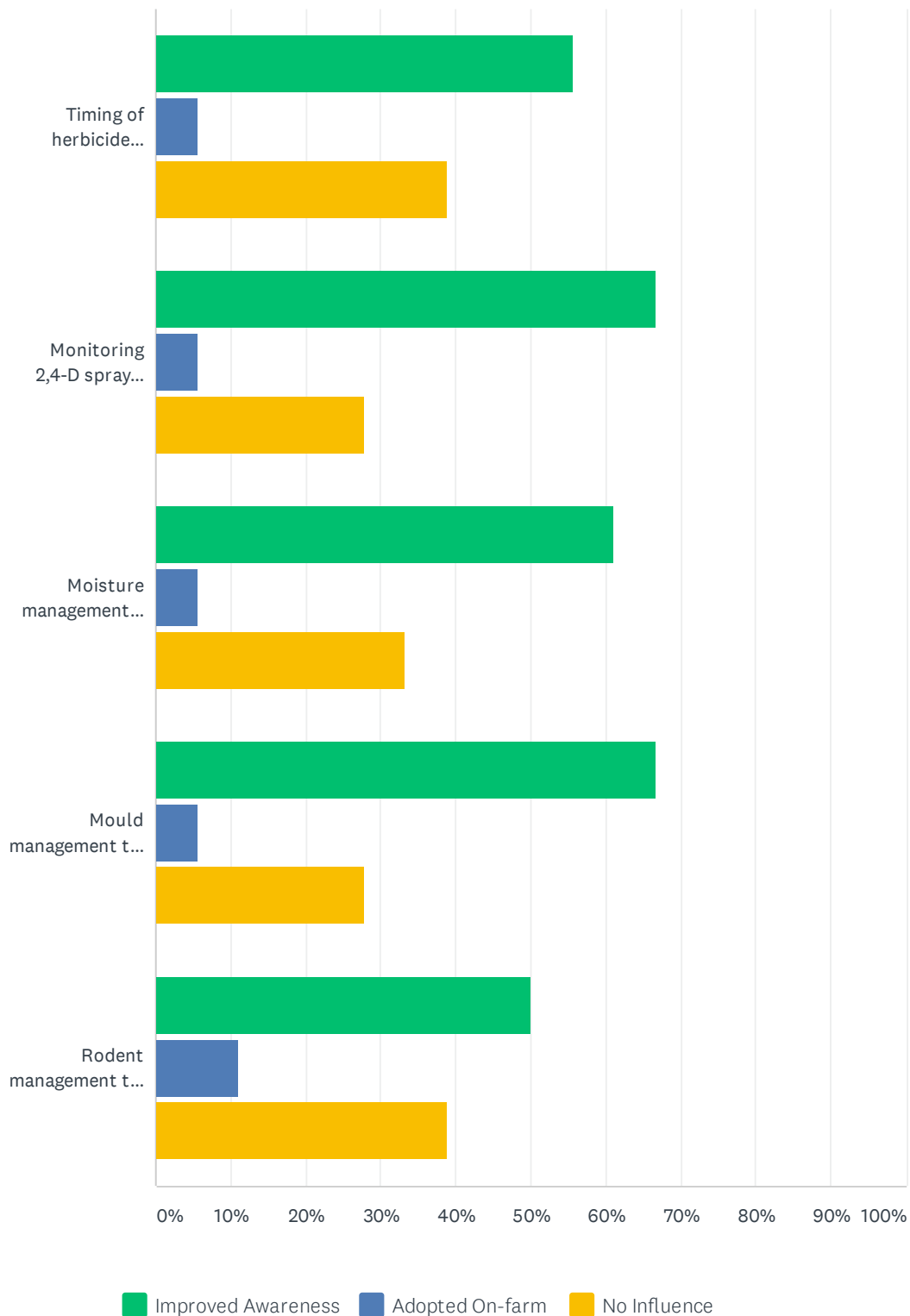


Almond Board of Australia Extension Survey

	IMPROVED AWARENESS	ADOPTED ON- FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Assessing level of mummy nuts	72.22% 13	5.56% 1	22.22% 4	18	1.50
Orchard floor leveling for efficient harvesting	55.56% 10	11.11% 2	33.33% 6	18	1.78
Post harvest re-shaking	44.44% 8	22.22% 4	33.33% 6	18	1.89
Remove mummy nuts from tree & drip lines	50.00% 9	22.22% 4	27.78% 5	18	1.78
Windrow mummy nuts for removal / destruction	72.22% 13	11.11% 2	16.67% 3	18	1.44
Poling orchard hot spots	55.56% 10	0.00% 0	44.44% 8	18	1.89

Q9 Have our extension activities on food safety and quality influenced your management strategies on the following?

Answered: 18 Skipped: 1

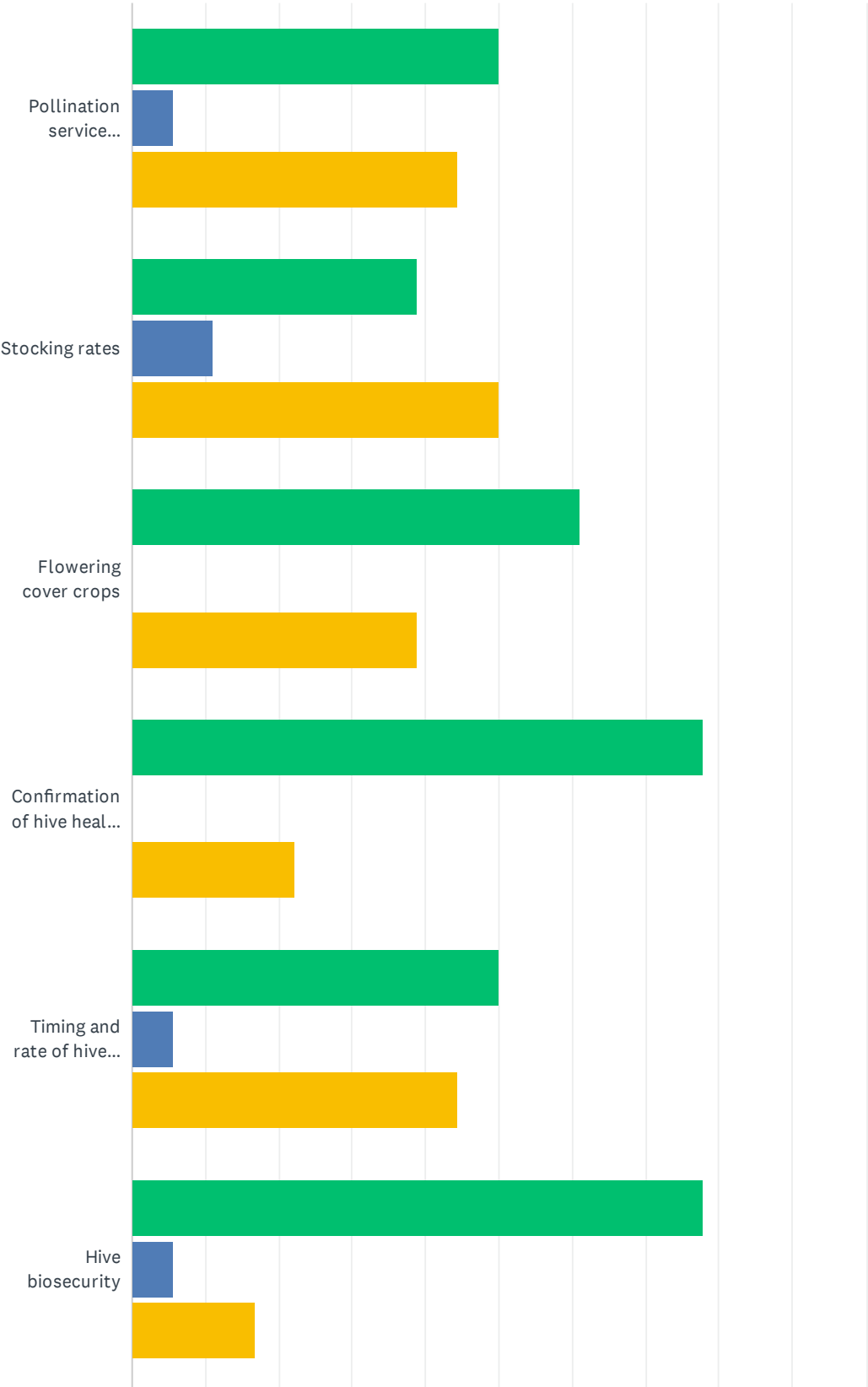


Almond Board of Australia Extension Survey

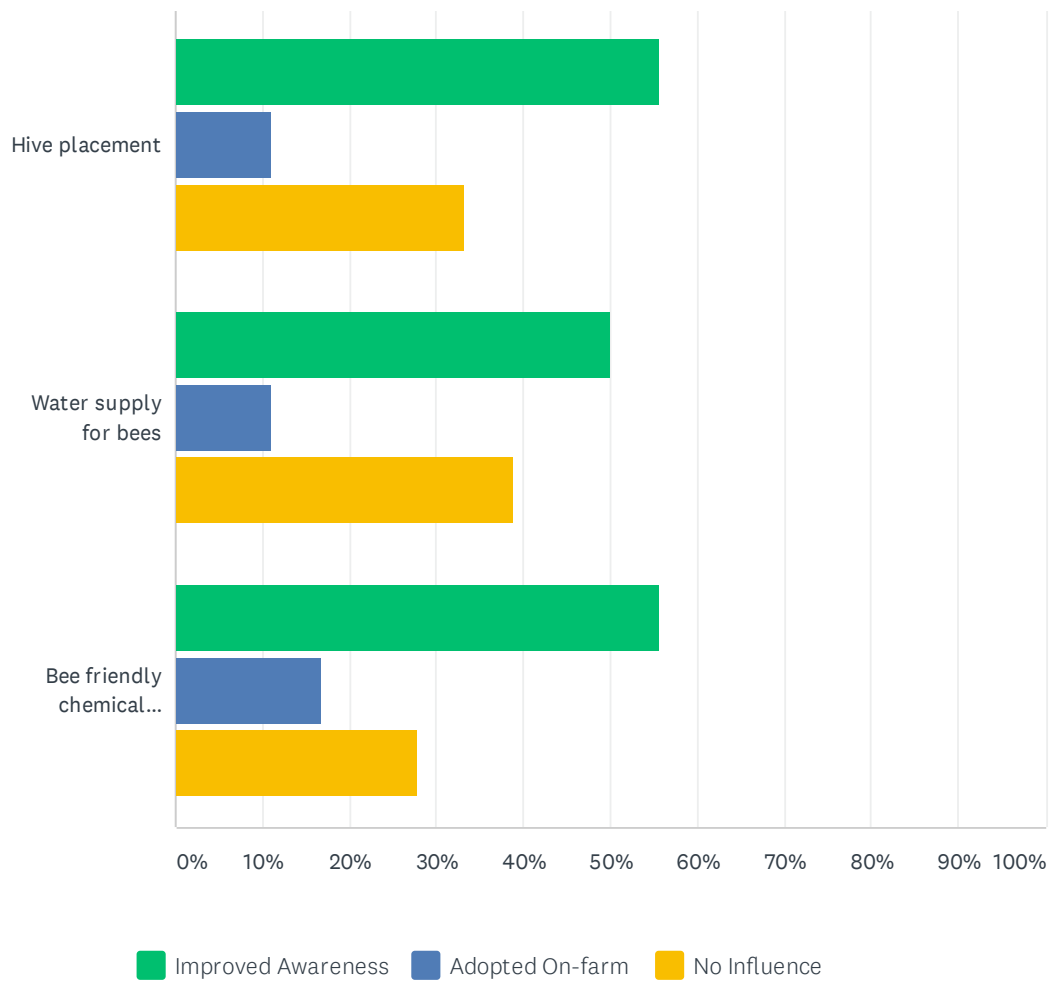
	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Timing of herbicide application to prevent residues in windfalls	55.56% 10	5.56% 1	38.89% 7	18	1.83
Monitoring 2,4-D spray drift from neighbouring broadacre properties	66.67% 12	5.56% 1	27.78% 5	18	1.61
Moisture management through aeration to optimise colour and prevent rancidity	61.11% 11	5.56% 1	33.33% 6	18	1.72
Mould management to prevent aflatoxins	66.67% 12	5.56% 1	27.78% 5	18	1.61
Rodent management to prevent bacterial contamination	50.00% 9	11.11% 2	38.89% 7	18	1.89

Q10 Have our pollination extension activities influenced your management strategies on the following?

Answered: 18 Skipped: 1



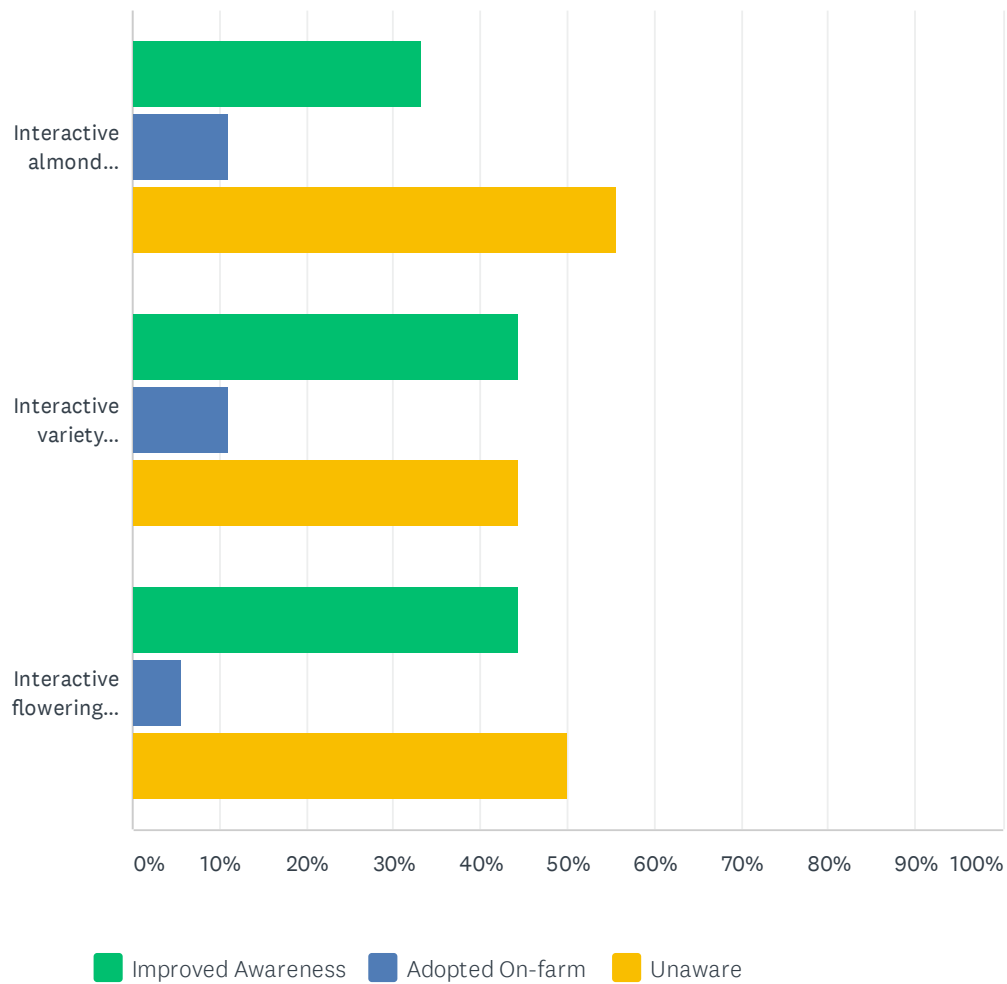
Almond Board of Australia Extension Survey



	IMPROVED AWARENESS	ADOPTED ON-FARM	NO INFLUENCE	TOTAL	WEIGHTED AVERAGE
Pollination service contracts	50.00% 9	5.56% 1	44.44% 8	18	1.94
Stocking rates	38.89% 7	11.11% 2	50.00% 9	18	2.11
Flowering cover crops	61.11% 11	0.00% 0	38.89% 7	18	1.78
Confirmation of hive health and frame numbers	77.78% 14	0.00% 0	22.22% 4	18	1.44
Timing and rate of hive build up and removal	50.00% 9	5.56% 1	44.44% 8	18	1.94
Hive biosecurity	77.78% 14	5.56% 1	16.67% 3	18	1.39
Hive placement	55.56% 10	11.11% 2	33.33% 6	18	1.78
Water supply for bees	50.00% 9	11.11% 2	38.89% 7	18	1.89
Bee friendly chemical spraying	55.56% 10	16.67% 3	27.78% 5	18	1.72

Q11 Were you aware that the following tools are available on our website?

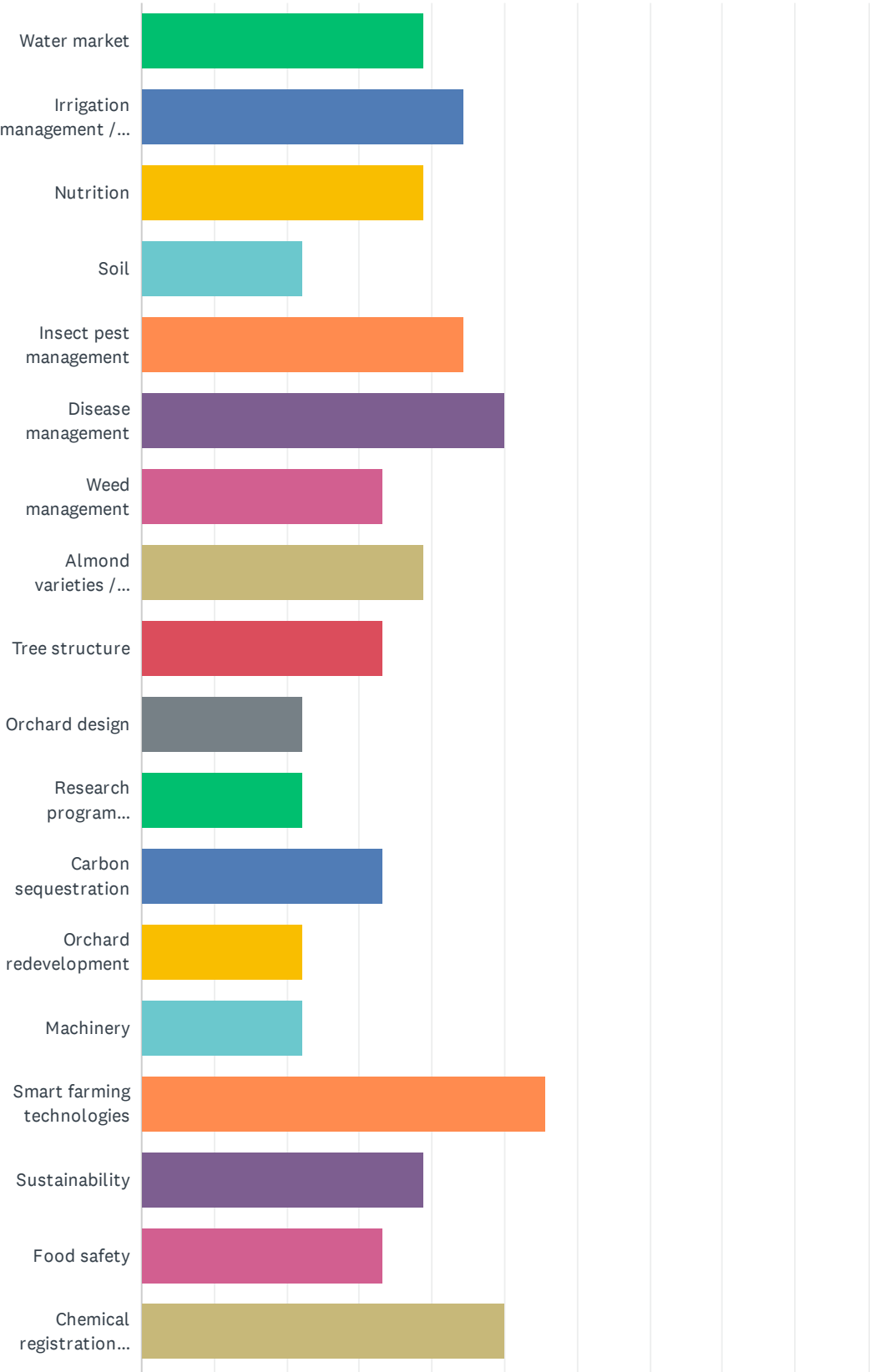
Answered: 18 Skipped: 1



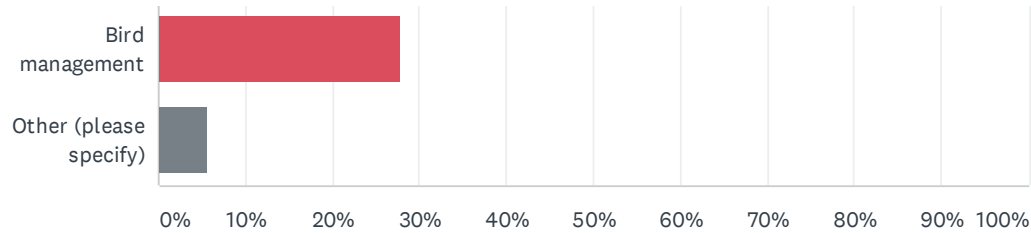
	IMPROVED AWARENESS	ADOPTED ON-FARM	UNAWARE	TOTAL
Interactive almond production tool	33.33% 6	11.11% 2	55.56% 10	18
Interactive variety flowering tool	44.44% 8	11.11% 2	44.44% 8	18
Interactive flowering observation tool	44.44% 8	5.56% 1	50.00% 9	18

Q12 What topics would you like to have more information on? Tick all that apply.

Answered: 18 Skipped: 1



Almond Board of Australia Extension Survey

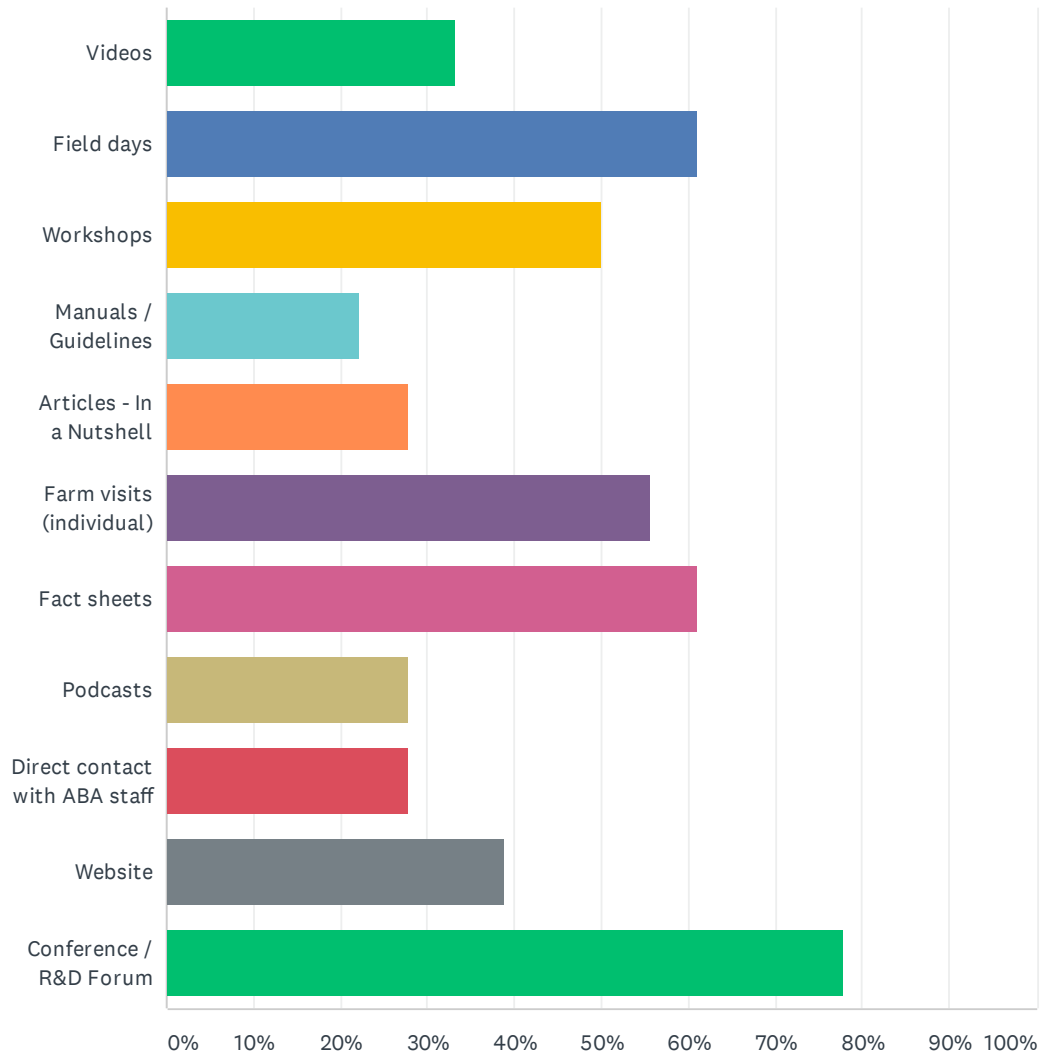


ANSWER CHOICES	RESPONSES	
Water market	38.89%	7
Irrigation management / water saving strategies	44.44%	8
Nutrition	38.89%	7
Soil	22.22%	4
Insect pest management	44.44%	8
Disease management	50.00%	9
Weed management	33.33%	6
Almond varieties / rootstocks	38.89%	7
Tree structure	33.33%	6
Orchard design	22.22%	4
Research program development	22.22%	4
Carbon sequestration	33.33%	6
Orchard redevelopment	22.22%	4
Machinery	22.22%	4
Smart farming technologies	55.56%	10
Sustainability	38.89%	7
Food safety	33.33%	6
Chemical registration / permits	50.00%	9
Bird management	27.78%	5
Other (please specify)	5.56%	1
Total Respondents: 18		

#	OTHER (PLEASE SPECIFY)	DATE
1	Early harvest/drying/storage/ waste utilisation	3/11/2020 1:37 PM

Q13 Please tick your preferred method(s) of receiving information

Answered: 18 Skipped: 1



Almond Board of Australia Extension Survey

ANSWER CHOICES	RESPONSES	
Videos	33.33%	6
Field days	61.11%	11
Workshops	50.00%	9
Manuals / Guidelines	22.22%	4
Articles - In a Nutshell	27.78%	5
Farm visits (individual)	55.56%	10
Fact sheets	61.11%	11
Podcasts	27.78%	5
Direct contact with ABA staff	27.78%	5
Website	38.89%	7
Conference / R&D Forum	77.78%	14
Total Respondents: 18		

#	OTHER (PLEASE SPECIFY)	DATE
1	emails	3/11/2020 7:53 AM

Q14 How can the delivery of extension information to growers be improved?

Answered: 9 Skipped: 10

#	RESPONSES	DATE
1	Tailored to the individual growers requirements	3/12/2020 7:57 AM
2	It's pretty good at the moment just keep abreast of trends i guess	3/11/2020 1:37 PM
3	3IP programs mean there are a number of new entrants in the industry, ensure basic information provided, assume low level of knowledge	3/11/2020 9:24 AM
4	Do not be "faceless" people	3/11/2020 7:53 AM
5	It is very thorough with what we are receiving now.	3/11/2020 6:53 AM
6	Onsite visits on a Friday arvo with a slab	3/2/2020 7:52 AM
7	Perhaps more reasearch and information on off ground harvesting. I would be good to be infront of the US as a point of difference i the market place.	2/28/2020 9:39 AM
8	More emphasis on speaking techniques. Working with researchers to ensure messages are clear and concise.	2/28/2020 9:26 AM
9	N/A	2/28/2020 8:35 AM

Q15 Have you implemented any new practices over the last 3 years? If so, what practices were the most beneficial to improving farm efficiency / profitability?

Answered: 11 Skipped: 8

#	RESPONSES	DATE
1	Hygiene within orchard, improving Insect damage in the crop to low threshold levels from 7.6% down to 1.15%. Comment: I have answered some of these questions carefully, it is difficult to answer correctly that the ABA have influenced my decisions to execute certain tasks as these lessons have been learnt over a long period (16 years) in the Almond industry from trial and error.	3/12/2020 7:57 AM
2	We are in R&D and site management is usually carried out by our hosts with some input from us. In general we work with people that are innovative and implement new technology constantly.	3/11/2020 1:37 PM
3	n/a	3/11/2020 9:24 AM
4	Water / Nutrient management	3/11/2020 7:53 AM
5	Nutrition management, Spraying when bees are in, Orchard Hygiene,	3/11/2020 6:53 AM
6	I've implemented a Friday arvo slab policy	3/2/2020 7:52 AM
7	I am a retired grower and read almond news for interest.	2/29/2020 12:22 PM
8	Trellis system on young trees. Medium density plantings.	2/28/2020 9:39 AM
9	New varietal options.	2/28/2020 9:26 AM
10	N/A	2/28/2020 8:35 AM
11	Sub Soil compost application	2/28/2020 7:12 AM

Appendix L - Benchmarking decision support model

Background

Benchmarking may be undertaken by businesses to compare processes or performance against industry standards to increase efficiency and profitability. Internal benchmarking is also useful in identifying an area within the business that could be enhanced through adopting best practice or new technology.

The Australian almond industry is a highly innovative horticultural sector that is recognised for readily adopting new technology in order to enhance on-farm production processors and maintain competitive performance. A wide range of new technologies and practices are regularly presented to growers. This benchmark decision support model provides growers with a framework that maybe used when evaluating the options available to make the best decision. Providing a framework for comparing operational and cost efficiencies for each option may help the decision making process and stimulate practice change.

The framework has four phases. The first phase involves planning and investigating the best option; the second phase integrates or tests the best option through small-scale farm trials. The third phase acts on the learnings from the trial and incorporates the new technology across the whole property. The **final** decision consolidates all considerations made during the process.

Dividing the benchmarking process in to four phases ensures growers do not over invest in new practices or technologies that may not be suitable to their production system either physically or financially. The framework is only a guide and may be modified for different situations. For example, if a grower is to purchase a new tractor they may invest more time in the planning phase and inspecting the machine on other properties and skip the trial phase. However, if the grower was to apply a new chemical, the four phases would be employed so the grower is able to undertake on-farm trials to measure and compare the performance before deciding to apply across the whole property.

Phase 1: Planning

The planning phase is the first and most important phase in the benchmarking process as it provides the basis and guidance for the next three phases. It is important that sufficient time is devoted to planning, to ensure all available information is known to make an informed decision.

Step 1. Identify where on-farm efficiency and profitability can be improved.

This initial step in the internal benchmarking process identifies a component of the business that can be improved through adopting best practice or new technology. During this step it is important to clarify the extent or scope of the change, as this will determine who needs to be involved in the decision-making process (management and staff). Once this occurs, all parties that may be impacted in the change should be consulted to collect experiences and opinions before moving on to step 2.

To define the scope of business improvement the following questions may be asked:

- What is the extent of operations impacted by change? For example, harvest or whole-of-farm.
- Where are the biggest losses in time and expenses?
- What component has the greatest improvement potential?
- What are the components where improvements are the most essential?

The answers to these questions will define the business need. Documenting them enables them to be referenced during the process.

Step 2. Identify a product or process that meets business requirements

The second step involves identifying what type of product or process is needed to address the business need identified in step 1 and that suits your business physically and financially.

To identify an appropriate product or process the following questions may be asked:

- What are the products or process available?
- What are the features that will help address the business need identified in step 1?
- What would be the total cost / savings of making this change?
- What is the available budget?

Step 3. Study the product / process

The third step is crucial to finding the best fit for the production system by listing and investigating each option. It is important to get information from multiple sources including, demonstration events, visiting businesses where similar processors have been used. Seek advice from growers who have already adopted the product / process to get their opinion and learn from their experience. Consult with the ABA industry development staff. Make a list of all options including brands, distributors and suppliers.

For each option the following questions may be asked:

- How effectively can the product be adapted to the operating system?
- Has a gap analysis been performed to determine potential benefits or limitations?
- Has the product been successful on other properties?
- Are there other additional changes/expenses needed to implement the product / process?
- Is it considered industry best practice?

Review all options and select the best product / process that suits the production system and budget and highlight any additional requirements needed to implement the change.

Step 4. Establish SMART goals to be reached within a designated timeline

This is the final step in the planning phase of the internal benchmarking process. Once a product has been selected it is important to establish SMART (specific, measurable, achievable, realistic and timebound) indicators that describe the expectations for the product / process which will inform the on-farm trialling.

The following questions may be asked to identify SMART measures:

- What are the expected improvements?
- What are the known seasonal (or other) influences on product performance? Identifies acceptable variance from expectation?
- How will the improvement be measured?
- Is there appropriate expertise and labour available to implement the change?
- What is the timeframe before expectations may be achieved?
- Does the budget allow for all expectations to be achieved?

Once the SMART goals are established, convey with management and staff to make sure the expectations are clear; known; and shared by all parties involved in the operations.

Phase 2: Integrate

The integration phase commences with a small on-farm trial. During this phase the process is closely monitored and tailored to suit the business.

Step 1. On-farm trial

During step one of the integration phase a trial is designed to ensure the changes are measurable. For example, if a new fertiliser is the chosen option, appropriate data to determine its influence may include: yield; soil and leaf analyses; as well as recording any issues with application or handling. It is important to collect data from a similar area that is untreated for comparison.

The following questions can be asked during the trial to ensure the options can be assessed:

- Has the required data and observations been recorded accurately?
- Has the product / system been trialed in line with operating procedures?
- Does the trial design give the product adequate opportunity (in time and space) to succeed?

Collate all data recorded for each option.

Step 2. Review product based on the goals established in the planning phase

During this step the goals and expectations that were established in the planning phase are referred to determine if the product has achieved the desired result. The data collected in the trial is reviewed and the product is evaluated in terms of costs, ease of integration and efficiency gains.

The following questions may be asked:

- Have all issues been documented?
- Have the established expectations been reached?
- Did the trial design work as expected? What changes were/ are needed?
- Did the operator meet all requirements when using the product?
- Was the integration process simple? What changes can occur for this to be better?
- Did the trial meet the allocated budget?

The answers to these questions may result in abandoning the option, trialling again with modifications, implementing across the whole property.

Phase 3: Action

The action phase consists of three steps and involves integrating the product / process business wide. During this phase, it is important that all learnings are applied, and all staff members involved are familiar with the planed integration of the product / process.

Step 1. Create a plan for business wide product integration

Create a business plan which demonstrates how the product will be integrated. The plan should also include a detailed timeline of desired achievements, staff members that will be responsible for utilising the product and safety guidelines for when the product is in use. Ongoing data collection and note taking will continue throughout this phase.

The following questions may be asked:

- Have all adjustments / recommendations been applied to the product / process?
- Have all staff members involved in the change been notified?
- Have the new tasks been assigned with appropriate staff members?
- What is the start date and date for review? Is this adequate time for the goal to be achieved?
- What data is needed to monitor improvements?
- Are the safety guidelines adequate?

Once the plan has been finalised the product / process is ready to be integrated business wide.

Step 2. Business wide product integration

This step involves fully integrating the product throughout the business. It is important that all staff involved have met the training requirements and have a clear understanding of the safety guidelines on how to use the product.

The following questions may be asked:

- Are all staff involved using the product / process correctly?
- Was the business wide integration smooth and error free?
- Have there been unexpected costs involved with integrating business wide?

Step 3. Collate data and notes for final product evaluation

Step 3 involves completing a final evaluation of the product. All data and notes are collected, staff that used the product/ implemented the system are consulted and a report is generated. The goals that were established in Phase 1 should be reviewed to determine if the product achieved the desired effect within the nominated timeframe.

The following questions may be asked:

- What data exists that demonstrates the goals have been met?
- Is there enough information to make a confident decision on the future use of the product?
- Has the product delivered financial gains?
- Has there been an increase in task efficiency?

Phase 4: Review

The review phase involves all parties involved in the operation to determine whether the product has successfully achieved the initial goals identified in Phase 1 after a specified period. It is important that all information generated during the process is available. If the product / process isn't meeting expectations consideration may be given to addressing some of the limitations identified earlier.

The following questions may be asked during the review:

- Does the product need additional investment to maximise efficacy and suitability to the business?
- Is the product suitable but a competitor offers a cheaper product?
- Do modifications need to be made to the product to get a better result?
- Is it financially appropriate to continue using this product?

The review phase may be done on an annual basis or as needed. The outcome of the review phase may identify a new business need whereby the benchmarking process would start again.

Conclusion

Benchmarking new technology to stimulate practice change provides a great advantage for growers as they're able to measure the extent of on-farm improvement. By providing growers with a step by step framework on how to plan, integrate and review new technology will give them strong direction in making informed decisions and continuously improving on-farm profitability and efficiency.