WORKSHOP
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WORKSHOP REPORT

Workshop Acari

11-12 June 2014

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Published April 2015

Plant Health
AUSTRALIA

About the report

The Report for Workshop Acari was authored by Plant Health Australia (PHA) with contributions from the planning committee[1]. The purpose of this report is to provide a summary of activities and a critical analysis of the outcomes and learnings.

The recommendations presented in the report were developed by the authors with the intent of providing direction on potential approaches to implement the learnings of the exercise. These recommendations have not been endorsed by all relevant stakeholders. Nonetheless, PHA will work with its members with the intent of implementing the recommendations, where appropriate.

Any feedback or questions in relation to this report, or the Workshop Acari activities and outcomes can be directed to PHA through the details below.

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In referencing this document, the preferred citation is: Plant Health Australia (2015) *Workshop Acari: Workshop Report.* Plant Health Australia, Canberra, ACT.

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[1] Refer to Appendix 4.1 for details on the planning committee.

Executive summary

Workshop Acari investigated preparedness and response options for the honeybee and pollination-dependent industries, primarily almonds, for a potential Varroa mite (*Varroa destructor*) incursion in Australia utilising a simulated scenario where the pest is detected in Melbourne. The workshop was delivered as part of the "*Model for industry planning and preparedness for an incursion of Varroa mite*" project funded by Horticulture Australia Limited[2] (HAL) and was conducted on the 11th and 12th of June 2014 in Mildura with 32 participants representing ten PHA member organisations.

Through a combination of research presentations and discussion exercises, Workshop Acari achieved its aim and objectives, and generated the following key outcomes:

- Restricting the movement of managed honey bee hives is an effective tool for limiting the spread of Varroa mite following its detection, but this approach can threaten production in a range of crops through the inability to access adequate hives to achieve full pollination. Key aspects in managing this risk include rapid and transparent decision making regarding the implementation and review of movement restrictions, together with clear communications to affected stakeholders.
- Australia's Varroa mite early detection surveillance program is a critical preparedness activity, benefiting the honey bee and pollination dependent industries. There is an opportunity to review the current program to identify aspects that limit its effectiveness.
- Broadening surveillance to formally engage growers and bee keepers provides an opportunity to significantly increase detection sensitivity without significant increases in required resources.
- Changes in pollination practices can limit the impact of Varroa mite on honey bees and the ability to achieve satisfactory pollination.
- Current Varroa mite preparedness activities are focused on the honey bee industry, leading to an opportunity for pollination-dependent industries to better engage and ensure collaborative approaches are implemented across the honey bee, agricultural and horticultural sectors.
- There are identified gaps to the provision of Owner Reimbursement Costs (ORCs) to all affected stakeholders in a Varroa mite response.
- Underpinning communication messages relating to Varroa mite are consistent across production sectors.

In consideration of the outcomes from Workshop Acari, six recommendations have been developed (Table 1).

Table 1. Summary of recommendations from Workshop Acari[3]

Recommendation 1	All beneficiaries of the National Bee Pest Surveillance Program to contribute to the implementation of the program
Recommendation 2	Undertake a review of the National Bee Pest Surveillance Program to ensure its resources are being implemented effectively
Recommendation 3	Document Varroa mite response options from the almond industry perspective
Recommendation 4	Prioritise Varroa mite preparedness research funding to address identified gaps
Recommendation 5	Develop a training plan for Affected Parties in a Varroa mite response
Recommendation 6	Finalise the ORC Evidence Framework for the Almond Industry

[2] Now Horticulture Innovation Australia Limited

[3] Additional explanation of the recommendations is provided in Section 3.

Image courtesy of Trevor Monson, Australian Pollination Services

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Acronyms

ABA	Almond Board of Australia
AHB	Asian Honey Bee
AHBIC	Australian Honey Bee Industry Council
CCEPP	Consultative Committee on Emergency Plant Pests
DAFWA	Department of Agriculture and Food, Western Australia
EADRA	Emergency Animal Disease Response Agreement
EHB	European Honey Bee
EPP	Emergency Plant Pests
EPPRD	Emergency Plant Pest Response Deed
HAL	Horticulture Australia Limited
HPP	High Priority Pest
IBP	Industry Biosecurity Plan
ILC	Industry Liaison Coordinator
ILO	Industry Liaison Officer
IP	Infected Premises
NMG	National Management Group
NSW DPI	New South Wales Department of Primary Industries
NZ	New Zealand
ORC	Owner Reimbursement Costs
PHA	Plant Health Australia
PIRSA	Primary Industries and Regions, South Australia
RIRDC	Rural Industries Research and Development Corporation
Vic DEPI	Victorian Department of Environment and Primary Industries[4]

[4] Now Victorian Department of Economic Development, Jobs, Resources and Transport

1 Workshop overview

1.1 Background

Over 65% of the horticultural and agricultural crops produced in Australia are pollination-dependent, relying on commercial European honey bee (*Apis mellifera*)[5] pollination services or the large wild honey bee populations[6]. This reliance poses a threat to crop production should a serious exotic pest that impacts on honey bees, such as Varroa mite, become established in Australia.

Varroa mites are external parasites that feed on the haemolymph of drone, worker, larvae, pupae and adult bees. This feeding weakens the bees, shortens their lives, and makes them more susceptible to viruses that otherwise would cause little harm. Without external management, infested colonies will slowly decline until all honey bees are dead[7].

Australia is the only major beekeeping country to remain free from Varroa mite, and our honey bee and pollination-dependent industries are investing in biosecurity activities to ensure this remains the case. However, they are also investigating options for mitigating the impact should it arrive and becomes established.

As part of these preparedness activities, Workshop Acari provided representatives from the almond and honey bee industries, together with government representatives, the opportunity to explore the issues arising from the early stages of a Varroa mite incursion, particularly focusing on the likely imposed movement restrictions and their impact on access to pollination services.

1.2 Aim and objectives

The design of Workshop Acari was based on the agreed aim and objectives as outlined in Table 2.

Table 2. Workshop Acari aim and objectives

Aim	To encourage the almond industry (and other pollination-dependent industries) to prepare for, and mitigate the effect of, a Varroa mite incursion on their business continuity and to encourage future planning between pollination providers and pollination-dependent industries to ensure ongoing honey bee biosecurity
Objectives	1. Test the ability of the almond industry to minimise the impact of possible movement restrictions as a consequence of emergency response actions. 2. Improve the awareness of pollination dependent industries on the current research on Varroa mite management and alternative pollination techniques. 3. Identify the role that pollination-dependent industries can provide to support honey bee biosecurity. 4. Identify recommendations for future contingency planning activities to be undertaken by pollination dependent industries in relation to maintaining their business continuity during a Varroa mite emergency response.

1.3 Planning

The planning of Workshop Acari was overseen by a planning committee (Appendix 4.1) comprising of members from Plant Health Australia (PHA), Almond Board of Australia (ABA), Rural Industries Research and Development Corporation (RIRDC), HAL, an independent pollination provider, New South Wales Department of Primary Industries (NSW DPI), Victorian Department of Environment and Primary Industries (Vic DEPI) and

[5] Herein referred to as “honey bees”.

[6] *Varroa Mite Preparedness of Pollination Dependent Industries*, a report prepared by PHA within the same project as Workshop Acari.

[7] Goodwin M and Taylor M (2007) Control of Varroa – A guide for New Zealand Beekeepers, New Zealand Ministry of Agriculture and Forestry.

the Australian Government Department of Agriculture. The planning committee developed the workshop aim, objectives, scope, activity structure and scenario. The activities and inputs were developed by PHA with technical contributions received from Vic DEPI.

1.4 Participating organisations

The participants included representatives from the almond industry, honey bee industry and government bodies. A full list of participants is outlined in Appendix 4.2.

1.5 Overview of workshop activities

The two day workshop was structured to include a variety of key note speakers and simulation activities (Table 3). For the simulation activities, participants worked together in groups of 6 to 8 people, with outcomes presented to the entire workshop for discussion. Participants worked together to compile overarching outcomes and future recommendations. A summary of the key points in each presentation is provided in Appendix 4.3.

Table 3. Summary of the presentations and simulation activities delivered at Workshop Acari

Session	Day 1 – 11th June 2014	Day 2 – 12th June 2014
Morning	Presentations: • Introduction and background (Ashley Zamek) • New Zealand experience with Varroa mite (Mark Goodwin) • Complexities of Australian beekeeping (Trevor Monson)	Presentations: • Owner Reimbursement Costs (Sophie Peterson) • Impacts of Varroa mite on crop pollination (Saul Cunningham)
Afternoon	Simulation activities: • Emergency response course of action • Industry representation and involvement • Effects of a hive standstill on pollination services	Simulation activities: • Development of key messages • Drafting of communications material • Identification of top impacts • Identification of top priorities

1.6 Workshop management and evaluation

The conduct of the workshop was managed by PHA, who were responsible for facilitating the workshop and group activities, together with monitoring the workshop activities to ensure the objectives were met.

Participant feedback forms and informal debriefing activities were used by PHA to evaluate the workshop against the aim and objectives, with a summary of the participant feedback provided in Appendix 4.4. Independent evaluation was considered, with the Planning Committee agreeing that it was not required due to the size of the workshop and no identifiable benefit from undertaking this role.

1.7 Scenario summary

The scenario for the workshop simulation activities was based around a fictional detection of Varroa mite in hives at two locations at the Port of Melbourne (Figure 1). This location was selected as it has been identified as a high risk entry site for the arrival of Varroa mite into Australia[8].

[8] Risk assessment of ports for bee pests and pest bees (2013) RIRDC. More information can be obtained from **www.rirdc.gov.au**.

In this scenario the initial detection was made as part of the National Bee Pest Surveillance Program and resulted in the implementation of response activities and movement restrictions for hives, beekeeping equipment and bees (Figure 2).

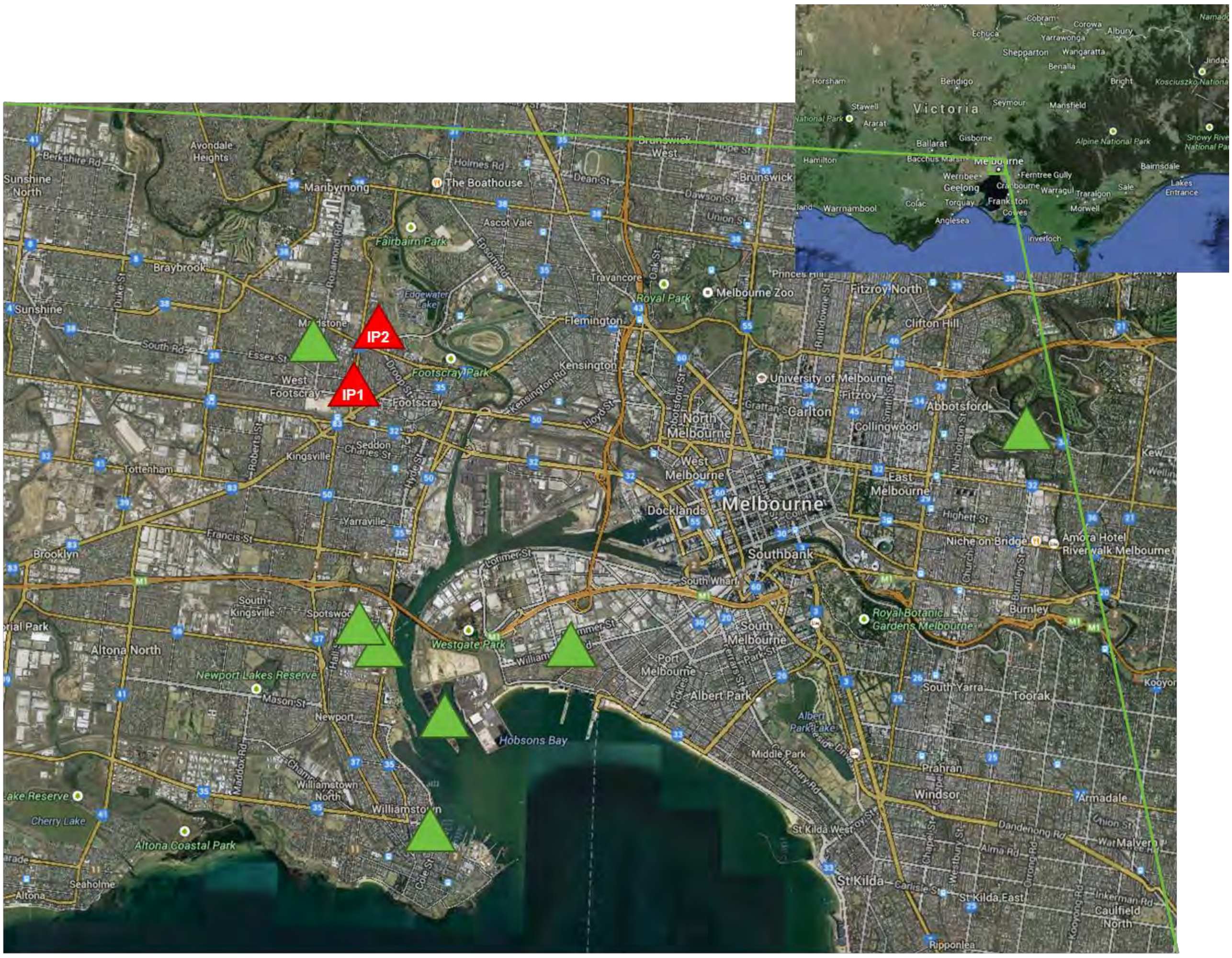

Figure 1. Location of the Varroa mite detections in the Workshop Acari scenario. Sentinel hives are located at the Port of Melbourne (green triangles), including the initial detection occurred (IP1, red triangle). The subsequent detection (IP2, red triangle) was located in a suburban backyard.

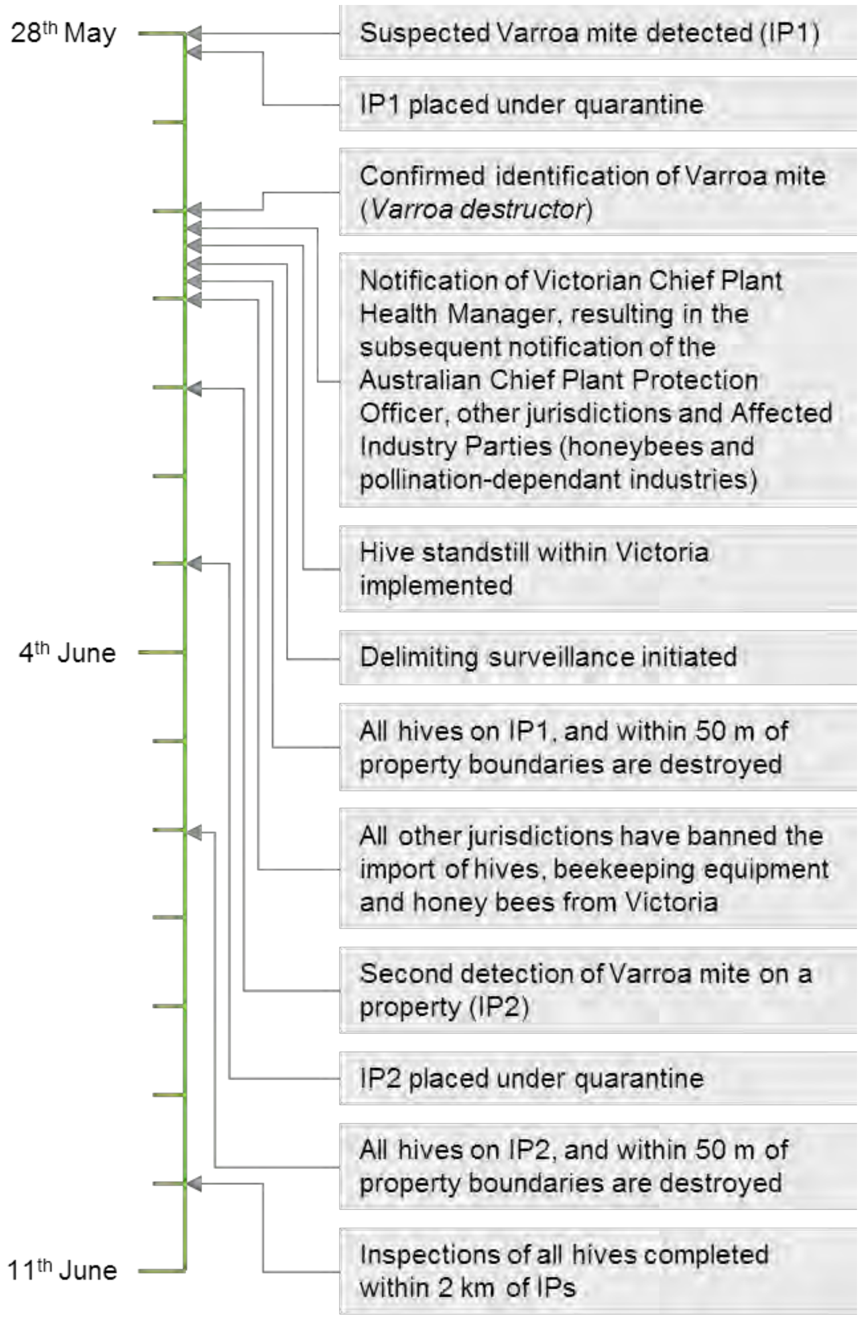

Figure 2. Workshop Acari scenario timeline

2 Analysis of workshop activities

2.1 Overview

Four key themes were identified based on the Workshop Acari structure, discussions and outcomes, and are used for grouping the analysis of workshop activities in this report. These themes are:

1. The impact of movement restrictions (page 12).
2. Varroa mite control and pollination alternatives (page 15).
3. The role of pollination-dependent industries in honey bee biosecurity (page 18).
4. Grower and beekeeper engagement (page 20).

Under each theme, a summary of the workshop activities and discussions are presented, together with the outcomes identified by participants. Throughout the summaries and identified outcomes, key points are highlighted in break out boxes to the right hand side.

Workshopping communication strategies to support a Varroa mite response.

2.2 The impact of movement restrictions

2.2.1 Summary of activities and discussions

Australia's unique beekeeping industry

Beekeeping in Australia is nomadic and locations vary year to year.

Australia's beekeeping industry is nomadic in nature, making it unique among major beekeeping countries. This is driven by our large geographic size, the inconsistencies of environmental conditions leading to an unpredictability in the location of quality floral resources for honey bee feeding, and the distribution of horticultural and agricultural industries requiring pollination services.

To highlight the hive movements seen in the industry, a real life example was presented where in a single year 1,500 hives were transported from the south coast of NSW, to Robinvale in Victoria and then up to Queensland through a total of eight separate movement events.

As a result of the nomadic and unpredictable nature of beekeeping, there are significant difficulties in predicting the location of hives at any given time point. For example, in 2009 the Batemans Bay region of NSW had an unusually high amount of hives in the area from May to July due to the local spotted gums flowering at an uncharacteristically higher rate[9]. In the following years, this flowering event was not repeated hence there was only a small number of hives needed in this region.

Accessing hives for pollination under movement restrictions

Hive movement restrictions are a likely response approach following a Varroa mite detection.

Hive movement restrictions would have a direct impact on the production of crops.

Pollination services provided to horticultural and agricultural industries may be sourced from outside the local area, aligning with the nomadic nature of the beekeeping industry described above. Therefore, should any level of movement restrictions be implemented for hives as a result of a Varroa mite detection, there is the potential for significant impacts on crop production. Outcomes from the activities held in Workshop Acari resulted in a realistic response approach, being that all states and territories closed their borders to hives from Victoria, and a state-wide hive standstill was implemented.

While some industries source the majority of their pollination contracts locally, there are a number, such as almonds and pomefruit, which identified that more than 70% of the pollination contracts are sourced from outside the local area[6]. Taken together with the limited timeframes for pollination (one or two months for most crops), the implementation of hive movement restrictions is likely to have a direct impact on crop productivity through loss of pollination.

Further, the variability of hive locations throughout and between years, means that the development of contingency strategies to respond to the application of movement restrictions will be difficult.

[9] Collection of data and information about pollination-dependent agricultural industries and the pollination providers (2009) Department of Agriculture, Fisheries and Forestry.

Hive standstills

The implementation of a hive standstill in the event of a Varroa mite incursion is a documented response policy in some jurisdictions and would be a potential following any detection of Varroa mite in Australia. Hive standstills are an effective approach to limiting the spread of the pest, and participants supported this method of containment under the Workshop Acari scenario.

The impact of a hive standstill is dependent on its timing, with each pollination-dependent crop having a defined window for pollination[9]. The Workshop Acari scenario was identified as having limited impact on almond pollination due to the May-June timeframe, but any delay in removing the hive standstill and it continuing into July would see immediate impacts on the production of almonds for that season.

Hive standstills are supported as an effective containment response for Varroa mite.

Owner Reimbursement Costs

The implementation of an agreed Response Plan to eradicate Emergency Plant Pests[10] (EPPs) is likely to result in a financial loss to the owners of crops or honey bees. To encourage the reporting of suspect EPPs, the Emergency Plant Pest Response Deed (EPPRD) allows the provision of ORC to owners impacted in this way.

ORC provided a focus for discussions during Workshop Acari, with participants highlighting the benefits of having them in place, but noted two areas that require further investigation:

1. ORCs are potentially available to owners of pollination-dependent crops due to the unavailability of pollination services. However, the pollination service providers are not eligible for ORCs to cover the loss of income from not fulfilling pollination contracts.
2. The ownership arrangements for almond production can be complex, where a significant proportion of the almond trees in production are owned by investors, not the growers. These arrangements may impact on grower's ability to be defined as an Owner[11] under the EPPRD, which would impact on their eligibility for ORC.

ORCs do not cover pollination providers for loss of pollination contracts.

Almond crop ownership arrangements may limit growers' access to ORCs.

[10] Definition of an Emergency Plant Pest can be found in the EPPRD (**www.planthealthaustralia.com.au/EPPRD**).

[11] Clause 1.1 of the EPPRD (**www.planthealthaustralia.com.au/EPPRD**).

2.2.2 Outcomes identified

The implementation of movement restrictions and a state-wide hive standstill were supported by participants as a response approach to a Varroa mite detection. However, the significant impacts on pollination-dependent industries were identified and two key polices for the implementation of hive standstills were proposed to limit this impact:

- Defining the timeframe of the hive standstill at implementation, followed by undertaking regular reviews of the operational need for it to remain in place. The intent of this is to ensure the standstill is only in place when necessary. Regular reviews will also provide comfort to growers in the knowledge that the hive standstill will not be permanent.
- Enabling the transition into a more localised hive standstill through intense delimitating surveillance to identify the highest risk area while allowing pollination-dependent industries outside of this smaller area to access pollination services.

Limit the impact to pollination-dependent industries through the regular review of hive standstills.

Furthermore, alternative operational approaches were proposed through the workshop discussions that have the potential to effectively restrict Varroa mite distribution together with limiting the impact on pollination-dependent industries:

- Regionalisation of restricted areas in contrast to a state-wide hive standstill, to allow access to pollination services from known safe areas.
- Allowing the import and direct transportation of hives from interstate to almond production areas to complete the required pollination services. Once onsite, imported hives would not leave the area, either remaining on site and managed or destroyed.
- Pollination-dependent industries always have the option to manage their own hives on site, or at least locally, to ensure there is a local source of bees at all times. However, this may not be viable to all growers due to the costs and labour requirements of owning and managing hives.

Alternative approaches that limit the impact of movement restrictions on pollination-dependent industries should be explored.

To facilitate these proposals, there is a substantial importance placed on swift decision making during the response, particularly through the Consultative Committee on Emergency Plant Pests (CCEPP) and the National Management Group (NMG). As an Affected Industry Party, ABA acknowledged it should play a major role in driving these decisions.

Swift decision making is required at CCEPP and NMG.

Developing the ORC Evidence Framework for the Almond Industry will provide the appropriate platform for investigating the options relating to almond ownership in relation to reimbursement payments.

Complete the almond ORC Evidence Framework.

2.3 Varroa mite control and pollination alternatives

2.3.1 Summary of activities and discussions

Varroa mite in New Zealand

Varroa mite was first detected in New Zealand in 2000, and despite an eradication response, the pest is now established. Beekeepers must maintain good hive hygiene to minimise the impact of Varroa mite and allow them to continue producing honey and beeswax, and provide pollination services. While beekeepers are able to continue to provide these services, the increased input costs have resulted in the average fee for pollination double in comparison to prior to Varroa mite establishment. A similar increase in pollination service costs can be reasonably expected to occur in Australia if Varroa mite was to become established.

Establishment of Varroa mite causes a significant increase in pollination service costs.

In combination with good hive hygiene approaches, miticides are utilised to reduce the Varroa mite numbers in managed hives. While this is an effective management technique, there is developing miticide-resistance being detected in New Zealand. It is thought that the resistance is being driven by the use of miticide (i.e. active ingredient) concentrations that are below the recommended dose together with the failure to replace miticide stripes at the recommended times.

Miticide-resistant Varroa mites are a developing issue.

This developing resistance has the potential to not only impact on New Zealand's beekeepers, but translates into an increased risk to Australian industries. The early detection system for Varroa mite in Australia relies on miticide strips in sentinel hives. Should the source of an incursion in Australia be a miticide-resistant population from New Zealand, it is likely that the National Bee Pest Surveillance Program will not effectively detect their presence. This delay to detecting the mite could have a significant impact on the ability of Australia to eradicate the pest.

A model for Varroa mite response and management

No Varroa mite eradication response has been successful to date, but there are valuable lessons to be learned from past attempts. Through presentations to the workshop, participants were encouraged to engage with experts from countries dealing with Varroa mite to build on their knowledge specifically in the areas of the restriction of Varroa mite spread and the successful management following establishment.

Australia can learn from overseas experience with Varroa mite.

Surveillance for early detection

The workshop participants highlighted the need to review the National Bee Pest Surveillance Program to ensure it meets the early detection needs of Australia's industries. The need for a review became apparent due to the potential detrimental effects of miticide-resistance on surveillance sensitivity, in combination with the comparatively small number of hives in place. For example, there are approximately 140 hives deployed under the National Bee Pest Surveillance Program, where the surveillance program implemented to detect a Varroa mite incursion on the South Island of New Zealand utilised approximately 20,000 hives.

The sensitivity of Australia's Varroa mite early detection surveillance should be assessed.

Pollination method effectiveness and alternatives

If Varroa mite was to enter and become established in Australia, the estimated cost would be an average of $30 million a year for the next 30 years[12], primarily through the loss of pollination services. To mitigate this impact, the honey bee and pollination-dependent industries are proactive in funding and undertaking research into alternative pollination techniques and improvements on current practices.

Hive densities can be reduced through alternative placements in almond groves.

Managed honey bee hive placement throughout an almond grove has a substantial impact on the effectiveness of the pollination service provided. Current practice is using 6-7 hives per hectare, placing them in large placements of approximately 120 hives that are 500 m apart. In the event of Varroa mite establishment there would be a drive to reduce hive numbers due to availability and cost. To enable this, trials have demonstrated the same fruit set percentage can be reached in almonds by using only 4 hives per hectare. To achieve this, hives need to be placed with approximately 15 hives per placement, with each placement being about 200 m apart.

Improvements to current honey bee pollination practices can improve efficiencies, but in some scenarios almond producers may have no access to managed honey bees. In these instances, the options for pollination are the use of mechanical pollination or self-fertile varieties, neither of which are viable for almonds at this time.

Mechanical pollination is effective, but not viable on a cost basis.

Mechanical pollination is highly effective in almonds, with over half of the flowers converted to nuts (higher than honey bee pollination). The down side is the intensive labour requirements, resulting in extreme input costs that mean that mechanical pollination is only viable to supplement low hive numbers, not as a standalone option.

Self-fertile almond cultivars are a long term option.

Self-fertile varieties of almonds that yield similar quantities and quality of nuts as the current in use varieties would provide a suitable alternative. This is a research focus in the almond industry, but it is in its early stages without any commercially viable outcomes. This is a long term risk mitigation strategy that should and will continue to be developed.

Management of wild honey bee populations

Within the Australian native environment there is a large population of wild honey bees, a combination of escaped European honey bees and other native bee species. This provides advantages to horticultural and agricultural producers as they provide free pollination services. However, these populations also pose a significant risk as alternative hosts of Varroa mite.

Wild honey bees would be a significant factor in a response to Varroa mite.

If not managed under eradication response operations, these wild populations would enable the rapid spread and hidden reservoirs of Varroa mite. Transmission of the mite to these populations could occur through direct contact or by using flowers as the transfer vehicle, as mites can live up to three days off their hosts. Therefore, consideration and treatment of the wild honey bee populations must be integral to an eradication response.

[12] Predicting the economic impact of an invasive species on an ecosystem service (2007) Cooke D, Thomas M and Cunningham S, *Ecological applications*, **17**(6), 1832-1840.

2.3.2 Outcomes identified

Through the consideration of the current research outcomes and the experience of managing Varroa mite in New Zealand, participants identified four research priorities relating to Varroa mite preparedness:

Four research priorities identified for Varroa mite preparedness.

1. Analysis of the surveillance system in place for early detection of Varroa mite in Australia, for
   a. Sensitivity based on hive numbers and placements.
   b. Sensitivity based on the developing miticide-resistance observed in other countries.
2. Development of self-fertile almond varieties that are commercially viable, enabling their deployment prior to Varroa mite establishment.
3. Breeding of Varroa mite resistant honey bees.
4. Improvements in tracking and destroying wild honey bee populations.

In conjunction with prioritising research relating to Varroa mite preparedness, participants noted the potential of implementing the alternative hive placements, small numbers closer together, to gain the same outcome utilising less hives. To facilitate this, awareness of this research needs to be raised through communication to growers and pollination service providers.

Promote alternative hive placements.

2.4 The role of pollination-dependent industries in honey bee biosecurity

2.4.1 Summary of activities and discussions

Varroa mite is not a death sentence for the honey bee industry. By implementing good hygiene practices the impacts of Varroa mite can be limited. Nonetheless, following the establishment of Varroa mite in other bee keeping countries, there has been a sudden decline in the number of available hives, mainly caused by the increased costs driving beekeepers from the industry. This results in a reduction in the number of hives available for pollination services in the short and medium term.

Honey bee biosecurity preparedness

The decline in available hive numbers would impact on the viability of the honey bee and pollination-dependent industries, and as such, the costs of honey bee biosecurity preparedness activities should be borne by all beneficiaries, not only the honey bee industry. As such, participants unanimously agreed that there needs to be an improved working relationship between the honey bee and pollination-dependent industries in relation to biosecurity.

Honey bee biosecurity must be undertaken collaboratively by all beneficiaries.

AHBIC, together with RIRDC, HAL and PHA, currently deliver biosecurity preparedness programs, such as the National Bee Pest Surveillance Program. As beneficiaries, the almond industry supported contributing funds and direction to these programs in collaboration with the honey bee and other pollination-dependent industries.

A formal mechanism linking the honey bee and pollination-dependent industries on biosecurity is the EPPRD. Fourteen EPPRD Parties have been identified as Affected in the case of an exotic honey bee pest Incident, and all potentially contribute to the decision making and funding. On the other hand, there are a number of pollination-dependent industries that are not a Party to the EPPRD, such as the melon and berry industries. As beneficiaries of the implementation of honey bee biosecurity, participants reinforced their support for these industries to sign the EPPRD and contribute to honey bee biosecurity research outcomes.

Pollination-dependent industries that are not Party to the EPPRD should contribute to honey bee biosecurity.

Workshop participants developed communication plans (documentation of communication objectives, audiences and key messages) and material (such as fact sheets) that are relevant to a Varroa mite response. Separate versions of each were developed targeting beekeepers and pollination-dependent crop producers. Identified messages and underpinning approach aligned between the audiences, further highlighting the justification for a close collaboration of the honey bee and pollination-dependent industries.

Communication to beekeepers and pollination-dependent industries closely align.

2.4.2 Outcomes identified

Broad engagement on honey bee biosecurity was supported by all participants, with three key areas identified as a focus – surveillance, contingency planning and communications.

Contributions to the National Bee Pest Surveillance Program by pollination-dependent industries would help ensure the programs future. In addition, the resourcing from pollination-dependent industries would enable an analysis of the sensitivity of the system and its expansion into additional geographical areas, increasing the likelihood of detecting Varroa mite early.

Improvements to the National Bee Pest Surveillance Program.

A coordinated and rapid response to Varroa mite under the EPPRD would be facilitated by the implementation of a relevant contingency plan. These documents provide a source of applicable information to guide response operations, strategic decisions and the development of Response Plans. Currently, there is a Varroa mite contingency plan that was specifically developed for the honey bee industry. The almond industry has identified the requirement to have a contingency plan that also covers specific requirement of a pollination-dependent industry.

The desired outcome is the development of a single contingency plan addressing all the needs, in preference to multiple documents. This outcome can be achieved through a collaboration to develop a supporting document or appendices to the current contingency plan.

Inclusion of almond considerations in the Varroa mite contingency plan.

Communication to beekeepers and pollination-dependent crop producers regarding honey bee biosecurity preparedness and a response is closely aligned. The collaborative development of communication material is essential to reduce duplication of effort and to ensure the provision of consistent messages. Therefore, all affected stakeholders should be contributing to honey bee biosecurity communications prior to, and in the event of, detection of Varroa mite.

All affected stakeholders require aligned communications relating to Varroa mite.

2.5 Grower and beekeeper engagement

2.5.1 Summary of activities and discussions

General surveillance

The National Bee Pest Surveillance Program provides one approach to monitoring for Varroa mite entering the country. Workshop participants identified the benefit of supplementing this program with additional surveillance activities provided by beekeepers monitoring their own hives specifically for Varroa mite. The provision of training and support material, such as surveillance fact sheets, would enable this surveillance to be carried out and as a result, improve the likelihood of early detection.

In addition, almond producers could promote honey bee biosecurity by requesting all hives entering their properties are certified to be free from Varroa mite and other bee pests based on appropriate testing (which would need to be determined).

Improved beekeeper surveillance can supplement the National Bee Pest Surveillance Program.

Response roles for industry participants

Industry participants will be engaged in a response to Varroa mite at the strategic decision making and the operation level. Workshop participants highlighted the following areas where training is required to support those personnel potentially involved:

- Industry liaison roles in control
- Surveillance methods and testing protocols
- CCEPP and NMG roles and responsibilities
- Communication roles and protocols of Affected Parties

Training for emergency response roles is desired for industry participants.

Accurate and auditable production data

A key focus of Workshop Acari was to investigate how to facilitate the provision of ORC in a honey bee pest emergency response under the EPPRD. Together with the work on the ORC Evidence Frameworks to be undertaken by the peak industry bodies (see Section 2.2), participants identified that the growers and beekeepers need to play a more active role in ensuring they have access to fair reimbursements in the event of ORC being available. Specifically, beekeepers and producers of pollination-dependent crops must keep accurate, thorough and auditable records of their production costs and product sale values.

Accurate and auditable data should be collected by producers and beekeepers.

2.5.2 Outcomes identified

Supporting beekeepers to undertake surveillance for Varroa mite in their own hives will supplement the early detection surveillance activities of the National Be Pest Surveillance Program. To enable this to occur, training on surveillance techniques and the identification of exotic bee pests must be made readily available and communicated. This should be achieved in conjunction with the promotion of how growers and beekeepers can report a detection of Varroa mite appropriately.

Encourage surveillance conducted by beekeepers through training and awareness activities.

The production of guidance material that outlines the requirements and supports the collection and recording of accurate and auditable production records is required. The promotion of this material to growers and beekeepers through the peak industry bodies will support the calculation of ORCs in a Varroa mite response.

Guidance for, and awareness of, production data recording required.

Developing a fact sheet to inform and engage bee keepers during a Varroa mite response.

3 Future considerations

The following recommendations were generated as a result of activities and presentations at Workshop Acari, consolidating the outcomes identified in Section 2 of this report.

Recommendation 1	**All beneficiaries of the National Bee Pest Surveillance Program to contribute to the implementation of the program**

The National Bee Pest Surveillance Program provides an early detection monitoring tool for exotic bee pests, which benefits the pollination-dependent industries together with the honey bee industries. The provision of resources from all beneficiaries would solidify the programs future and enable it to grow.

Recommendation 2	**Undertake a review of the National Bee Pest Surveillance Program to ensure its resources are being implemented effectively**

To ensure the National Bee Pest Surveillance Program can effectively detect exotic bee pests a review covering the following areas was identified:

- Modelling analysis of the hive locations, numbers and density at each site and at a national level.
- A benefit cost analysis to demonstrate the value of the program and analyse the outputs of the modelling analysis above.
- Understanding the impact of Varroa mite resistance on surveillance efforts and determining alternative approaches to ensure continued sensitivity.

Recommendation 3	**Document Varroa mite response options from the almond industry perspective**

The Varroa mite contingency plan developed for the honey bee industry should be broadened (through provision of a supplement or separate document) to provide response options from the almond industry's perspective. This should cover an analysis, based on scientific evidence and response experience, of the options explored in this workshop, including :

- Hive standstill and movement restriction alternatives.
- Potential regulated hive movements in low risk areas to undertake pollination services.
- Communication templates and distribution mechanisms.
- Wild honey bee management/control.

Recommendation 4	**Prioritise Varroa mite preparedness research funding to address identified gaps**

The identified gaps in Varroa mite preparedness for the almond industry that would benefit from research prioritisation were:

- The development of self-fertile almond varieties that are commercially viable.
- Varroa mite tolerance in commercial honey bee populations.
- Improved methods for wild honey bee colony detection, quarantine and eradication.

Recommendation 5	Develop a training plan for Affected Parties in a Varroa mite response

The delivery of training for exotic pest surveillance and emergency response roles was identified as a potential biosecurity preparedness activity. As the breadth of training identified throughout the workshop was large, a training plan that identifies the target audiences, key learning outcomes and priorities for training delivery should be developed to focus efforts.

Recommendation 6	Finalise the ORC Evidence Framework for the Almond Industry

Completion and endorsement of the ORC Evidence Framework for the Almond Industry will support the provision of fair and timely potential reimbursements to growers in the event of a Varroa mite Incident. Through this process, the almond industry will also gain clarity around the ownership complexities and how they impact on ORCs. A completed Evidence Framework will also support the provision of guidance to growers to ensure they collect and record accurate and auditable production data.

4 Appendices

4.1 Planning committee

Table 4. Membership list for the exercise planning committee

Name	Organisation	Name	Organisation
Ashley Zamek (chair)	PHA	**Melinda Black**	Vic DEPI
Stephen Dibley	PHA	**Doug Somerville**	NSW DPI
Peta Hudson	PHA	**Trevor Monson**	Monsons honey
Ben Brown	ABA	**Wendy Coombes**	Vic DEPI
Enrico Perotti	Department of Agriculture	**Dave Alden**	RIRDC
Mike McDonald	Department of Agriculture		

4.2 Attendees

Table 5. List of participants and their affiliated organisations

Name	Organisation or affiliation	Name	Organisation or affiliation
Neale Bennet	Almond Board of Australia	**Sophie Peterson**	PHA
Ben Brown	Almond Board of Australia	**Joe Riordan**	Vic DEPI
Greg Buchanan	Horticulture Australia Limited	**Brett Rosenzweig**	Almond Board of Australia
Mary Cannard	Select Harvests	**Craig Scott**	Pollination provider
Domenic Cavallaro	Cavallaro Angle Vale Almonds Trust	**Alison Seyb**	NSW DPI
Peter Cavallaro	Walker Flat Almonds	**Brendan Sidhu**	Jubillee Almonds
Saul Cunningham[13]	CSIRO	**Ross Skinner**	Almond Board of Australia
Stephen Dibley	PHA	**Brian Slater**	Macquarie Agricultural Services
Mark Goodwin	Plant and Food Research, New Zealand	**Elizabeth Smee**	PIRSA
Andrew Hobbs	CMV Farms	**Michael Stedman**	PIRSA
Graham Johns	RMONPRO Developments	**Jenny Treeby**	Vic DEPI
Daniel Martin	Vic DEPI	**Bill Trend**	DAFWA
Peter McDonald	AHBIC	**William Wang**	Olam Orchards Australia
Trevor Monson	Monson Honey	**Karla Williams**	DPIPWE
Tim Orr	Lake Cullulleraine Almonds	**Brenton Woolston**	Almondco Australia Ltd
Enrico Perotti	Department of Agriculture	**Ashley Zamek**	PHA

[13] Present only for the second day of the workshop

4.3 Workshop presentations

An introduction to Workshop Acari and four key note presentations were delivered at the workshop. A summary of the key information presented is provided below.

4.3.1 Welcome and introduction to Workshop Acari

Presenter: Ashley Zamek, PHA

- For every year Australia remains free of Varroa mite, industries receive a benefit of $50.5 million per year in saved management costs. Pollination can account for up to 50% increases in fruit set and Australian pollination-dependent industries represent over 65% of all the horticultural and agricultural crops in Australia.
- In 2013, PHA was commissioned by RIRDC and HAL to explore how the impact of honey bee movement restrictions potentially implemented as a result of Varroa mite incursion would affect pollination-dependent industries. A part of this project was a report that aimed to highlight the reliance of 10 key pollination-dependent industries on wild and managed honey bees and in turn the possible impact a Varroa mite incursion could have on both short term and long term pollination.
- Almonds, as an industry that is 100% dependent on honey bees and with most pollination occurring through managed hives were identified as an industry that was particularly at risk from the effects of a Varroa mite incursion. They identified Varroa mite as a high risk to their livelihood.
- The demand for honey bees by almond growers is at its peak in August with requirements estimated at over 23,000 hives. An important aspect to consider when determining the availability of hives for almond pollination is the location of hives in July. Throughout the year pollination providers will transport hives to source nectar and pollen before fulfilling pollination contracts to ensure bees are healthy and robust enough to be effective pollinators. This means there is no guarantee when trying to predict the location of hives before almond pollination as it directly correlates to the floral resources available at that time.
- In 2009, the Department of Agriculture (formerly DAFF) and PHA held a workshop to explore the impacts of a Varroa mite incursion and to identify potential improvements to Australia's response strategies and arrangements. The main outcomes were that the move of managing exotic honey bee pests from EADRA to EPPRD was logical as it incorporated pollination dependent industries; Australia has limited chemical options available to use against Varroa mite; enforcing a hive standstill during an incursion will be difficult; and feral hives will be a major problem during an eradication response.
- Over the last 5 years:
    - Chemicals (Apistan, Bayvarol, Apiguard and MAQS) have been registered and are available in Australia to use when Varroa mite is suspected.
    - Fifteen industries in total are identified as potentially affected industries in the event of a bee pest incursion.
    - Administrative changes to the honey bee levy are being conducted which raise funds for R&D and cover membership payments to PHA.
    - More than $1 million has been invested in Honey bee R&D since 2007 through the RIRDC pollination program.

4.3.2 The New Zealand experience with Varroa mite

Presenter: Mark Goodwin, Plant and Food Research New Zealand

- Since 1904, the spread of Varroa mite has been documented around the world; starting in Indonesia and spreading to all honey producing countries except Australia by 2014. Varroa mite was found in NZ 2000.
- In New Zealand the pre-2000 Varroa mite surveillance programs used Apistan despite it being known that Varroa mite has some resistance. The program targeted “high risk” areas based on human density

with surveillance concentrated on major cities and ports such as Auckland. However, the program was changed to only test commercial beekeepers who, primarily, are not located in the major cities.

- As predicted, when the Varroa mite was detected in New Zealand, it was found in Auckland and was close to where surveillance hives would have been kept. The first step was a hive standstill that was initiated to give time to decide what to do. This was possible due to the incursion being discovered in autumn when hives were not being moved much in any case.
- The decision not to eradicate was based on level of spread and potential cost of the response.
- Biosecurity legislation in New Zealand states any action that results in losses requires compensation. This covered issues such as initial hives losses, honey losses and pollination fees and was around $2 million in total.
- Once the spread of Varroa mite was determined, authorities attempted to slow the spread by creating a non-movement line to prevent hives from being moved to different region. Two lines were created; one dividing north island and the other dividing the south island. Hives could move within these zones but not across the lines.
- The North Island non-movement line was based on geographical terrain and the fact that bee movement did not usually occur across this area. From the time of the initial incursion in 2003 there was very little spread of Varroa mite below the line giving the industry located below the line two years of not requiring treatment.
- The results on the South Island were more successful, giving the industry located below the non-movement line an additional 8 to 9 years of without requiring treatment for Varroa mite. Additionally, New Zealand redesigned their Varroa mite surveillance program for the south island. The program was based on research that analysed the surveillance method sensitivity, natural spread of Varroa mite, beehive movements and what the region was prepared to eradicate (this determines the required sensitivity of the surveillance methods).
- The modelling in the South Island surveillance program identified Nelson, Picton, Christchurch, Leeston, Pleasant Point and Balfour as the key sites at most risk to a Varroa mite incursion. By focusing surveillance on these areas, it was predicted that a 90-95% probability of Varroa mite being detected early enough to be eradicated from the South Island.
- The surveillance strategy was funded by beekeepers, growers and some local councils. The program cost $760,000 per annum and included the surveillance of 20,000 hives.
- In 2007 Varroa mite was found on the South Island in Nelson (one of the identified high risk sites), however there was a decision not to undertake eradication at this location.
- New Zealand tried to use expertise and experience from overseas incursions to help combat the effect of Varroa mite. For example, Canada relies heavily on the broodless period over winter to manage Varroa mite, but this period does not always occur in New Zealand.
- The New Zealand government held a two day course for every beekeeper in New Zealand to be advised on Varroa mite management methods including Integrated Pest Management methods. They also produced a guide on how to control Varroa mite and taught beekeepers sampling methods for Varroa mite detection. In spite of what they were taught, New Zealand beekeepers when straight to using chemical control using the three registered chemicals, Apistan, Bayvarol and Apivar. This lead to no organic beekeeping and a calendar of chemical treatments that border key honey flow times.
- Before Varroa mite occurred in New Zealand, hive numbers were already declining due to low honey prices. From 2000, when Varroa mite occurred in New Zealand, there was a sharp reduction in hive numbers. After the first year of incursion, 16% of hives on the infected side of the North Island disappeared due to no treatment for Varroa mite. Most beekeepers in New Zealand are hobbyist while most hives in New Zealand are owned by contract pollinators. The initial loss of hives was mainly by hobbyists with some by contractors.
- The effect of Varroa mite on a beekeeping business per year is a $30 increase to hive costs, four extra hive visits and some losses to colonies and production. It is estimated that overall cost associated with these changes is at least $50 more per hive each year.

- In 2006, New Zealand also encountered deformed wing virus which was quite detrimental to the industry when paired with Varroa mite.
- Additionally, American foulbrood was in the midst of being eradicated before Varroa mite entered New Zealand, and because Varroa mites spread viruses, there was a spike in the percentage of American foulbrood in New Zealand. However, the spike was not too large due to American foulbrood being intensively managed at the time.
- Economics is a major issue that has arisen with the incursion of Varroa mite to New Zealand. Beekeepers needed to develop manageable processes that cost approximately $50 more per hive and continue to develop better managing practised. As previously stated, declining honey prices were having a negative impact on the economics of the beekeeping industry in New Zealand prior to the Varroa mite incursion. The arrival of Varroa mite to New Zealand resulted in a further decline in beekeeping numbers.
- As already stated, hive numbers initially dropped after the Varroa mite incursion. In the 14 years since there have multiple factors that have led to hive numbers increasing to 200,000. By chance, in 2002 China lost their export market due to chemical residues detected in their honey. New Zealand was able to meet the demand left behind leading to an increase in New Zealand's export sales. Moreover, the increase in popularity of Manuka honey has led to an export market now worth $100 million compared to the pre-2006 New Zealand honey export value of $30. The increase is primarily based on an increase in the price per kg rather than increased production. Manuka honey can bring in $80/kg which can mean an operation of 20 hives can result in generating an income of $40,000 a year on honey.
- Before the incursion of Varroa mite to New Zealand, there was little incidental pollination from wild honey bee colonies to crops that required commercial hives for pollination. Therefore, little has changed for pollination-dependent growers as they still have to lease hives. The largest impact to pollination-dependant growers is the price of hives, which has doubled since Varroa mite was found in New Zealand.
- Currently, the biggest issue to beekeeping in New Zealand is the resistance of Varroa mite to the chemical control methods. Resistance is predicted to increase the costs of beekeeping exponentially therefore cost of pollination will also increase. Beekeepers are likely with lose more hives, require more staff and have more of an issue with viruses (such as American foulbrood) that were previously under control.

4.3.3 Complexities of the Australian beekeeping industry

Presenter: Trevor Monson, Monson Honey, Pollination Co-ordinator

- To start a pollination business consisting of 1000 hives it costs a beekeeper $255,000 to set up and $80,000 per year for ongoing management.
- On average in Australia, bees are shifted five times a year.
- In Australia, it is not economically feasible to purely be a pollination provider and make a return on the investment of beekeeping.
- Key flowering events occur once every three years, hence the same feeding locations are not used every year.
- Competition for pollination at the same time as almonds includes blueberries, macadamias and seed canola. These crops are located in northern NSW and southern Qld. This is quite far away from the key almond areas centralised in Robinvale, northern Victoria.
- The bee industry is trying to convince the seed canola industry to delay planting so that key pollination times do not occur at the same time as almond pollination times.
- An example of beekeeper movement: 1500 hives moved from the south coast of NSW to Robinvale Victoria up to Qld. There were eight shifts in the year. This is considered an "average" type of schedule and includes a mixture of pollination contracts and available nectar flow.
- Varroa mite will remove inexperienced/lazy beekeepers from the industry.

- Varroa mite might even improve the business for pollination providers as Varroa mite will remove the wild honey bee pollination that provides free pollination.
- Varroa mite will therefore hit the agricultural industries reliant on pollination the hardest.

4.3.4 Owner Reimbursement Costs and pollination-dependent industries

Presenter: Sophie Peterson, PHA

- The EPPRD only operates for an eradication response of exotic plant pests
- ORCs are present in the EPPRD to promote early reporting and aim to reduce the financial impact of a response on the growers.
- A successful eradication aims to lower costs in the long term.
- ORC formulae are determined by crop types, currently there are 6 formulae present in the EPPRD covering broad acre to perennial etc.
- Guidance is needed to help advise and apply the formulae which is why evidence frameworks were created to provide agreed data sources to ensure consistency of application.
- The method for claiming ORC is in the EPPRD and includes a 90 day time limit to submit claims to the lead agency of the response following an order.
- ORC can be claimed for direct eradication costs, value of destroyed crops, enforced fallow periods, destroyed capital items and losses incurred from periods of non-bearing in crops.
- ORC only apply when a response plan has been approved by the National Management Group.
- ORC do not include the cost different between preferred and alternative crop and actual replanting costs (except for perennial crops).
- ORC are only paid to “owners” – does not cover managers/schemes.
- ORC only applies to EPPRD parties and productive/commercial growers; this excludes “backyard” and “hobbyists”.
- However the line between these two types of growers is not clearly defined.
- In the EPPRD, the honey bee industry is considered an Affected Party, however, only the hive, colony, honey and wax are eligible for ORC, and pollination services are not included.
- The pollination dependent industries involved in a response can receive ORC to losses in pollination services as it long as it is directly due to a response action.
- Thirteen industries (signatory to the EPPRD) are identified as pollination-dependent and will be an “affected” party for any honey bee pest response in conjunction to the honey bee industry.
- This list is not definitive; it can change when new industries become EPPRD signatories and are identified as pollination-dependent.
- Transition to Management phase is being looked at to consider the responses that are deemed to be unsuccessful and need to be removed from the EPPRD structure. Currently there is no process to determine how to do this and is solely managed by states.

4.3.5 Pollination of crops and the role of honey bees

Presenter: Saul Cunningham, Research Scientist, CSIRO

- There is a wide spectrum of reliance of crops on pollination ranging from 0% (self-pollinated crops) to 100% (entirely reliant on pollinators). However the majority of crops fall between the 65-95% range of dependence.
- Nevertheless, if you use the total volume of yield produced by plants, most crops are 0% reliant on pollination.
- The crops that are moderately reliant on pollination (i.e. 20-80% range) rarely use managed pollination and most likely receive pollination through incidental means (i.e. wild honey bees).

- Research modelling the impact Varroa mite could have on Australia predicts damage of approximately $30 million a year over 30 years.
- This figure indicates how much money should be spent on mitigation/biosecurity/research activities to prevent an incursion of Varroa mite in Australia.
- There are mixed experiences with Varroa mite overseas with the USA and Russia encountering declines in hive numbers attributed to Varroa mite and the diseases they spread. China and Argentina on the other hand, have had an increase in hive numbers. This could be credited to more money and effort spent on managing honey bees. This also indicates that Varroa mite is not the only reason people are leaving the beekeeping profession and that it is more likely a combination of factors.
- Pollination fees in California post Varroa mite have increased due to an increase in demand from pollination services.
- The most vulnerable grower group to Varroa mite are the crops that currently have a high reliance on wild honey bees to pollinate their crops and who only sometimes use pollination services. Growers in this category will now have to solely rely on pollination services, which will increase in price, and compete with growers/crops that already have established contracts hence there may be reduced hive availability.
- Research has been conducted into fruit set from hand pollination and open pollination. Hand pollination will give the highest fruit set in comparison the pollination that occurs from honey bees (open pollination).
- Hive density and arrangements matter. There is a disadvantage from setting hives farther away from trees. More hives per hectare does increase fruit set, yet specific arrangements of hives can make a difference to fruit set.
- Given a fixed number of hives, smaller placements closer together give a better fruit set outcome. If hives are in short supply, or more expensive, this will increase motivation to use different hive arrangements to obtain the best outcome per hive.
- Mechanical pollination will have a cost, and probably support rather than replace bees.

4.4 Participant feedback

Participants at Workshop Acari completed a questionnaire at the end of activities to support the evaluation of the event. Overall, participants provided positive feedback on the activities and the resulting learnings (Figure 3 and Table 6).

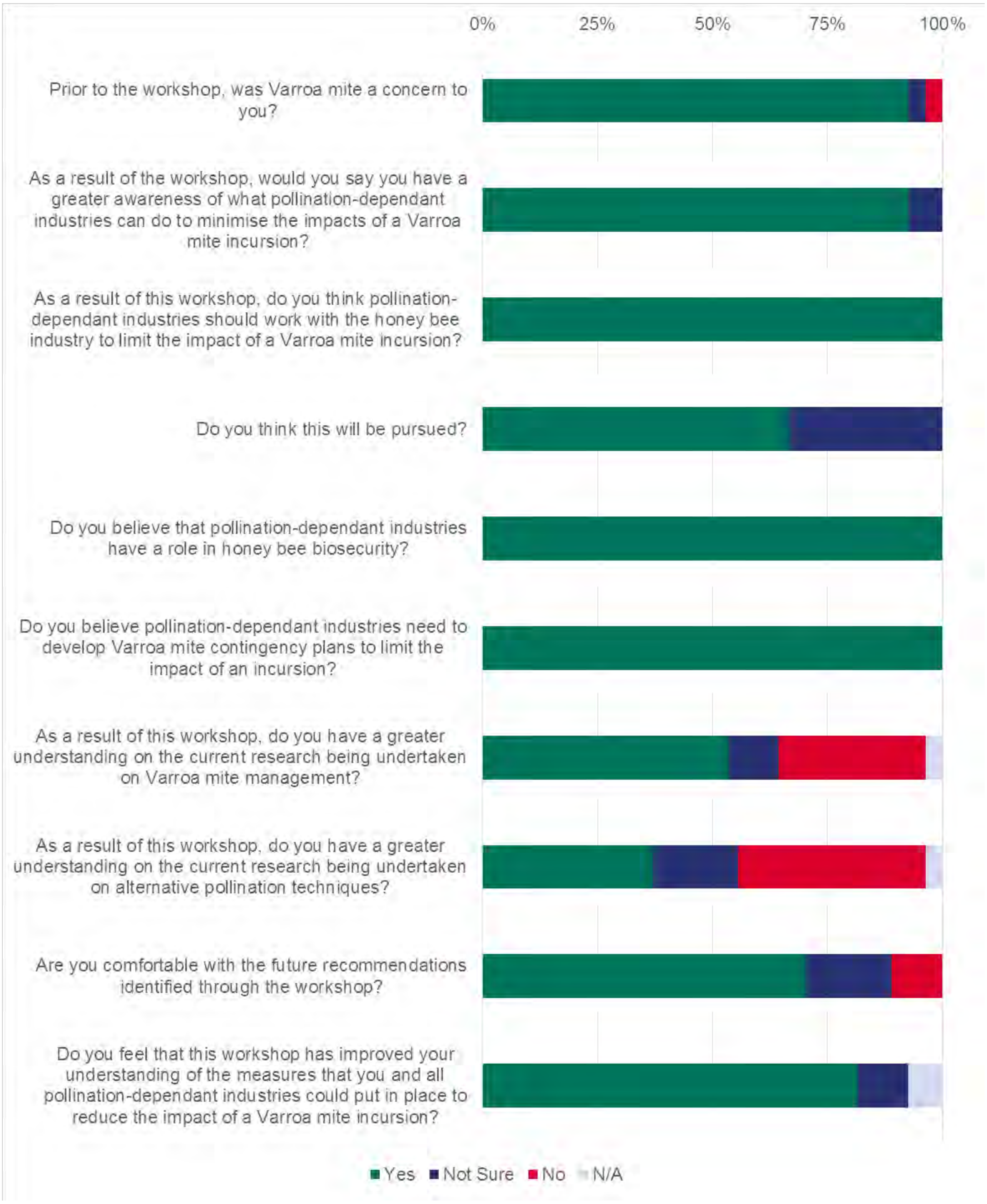

Figure 3. Collation of the quantifiable responses to the participant questionnaire for Workshop Acari.

Table 6. Top participant responses to free text questions on the feedback questionnaire

Question	Top responses[14]
Based on the workshop, what are the impacts that a Varroa mite incursion could have on almond production?	• Loss of pollination, leading to lower production, yield and income • Increased costs of pollination • Competition for hives • Loss or market confidence
What would be the most important measure to put in place to limit these impacts?	• Increase in resources towards surveillance • Contingency planning activities • Education and training for all pollination-dependent industries
In your opinion, what is the highest priority action to come out of this workshop?	• Surveillance methods for Varroa mite to New Zealand to be tested for their sensitivity • Develop an almond-specific contingency plan for Varroa mite
What were the best aspects of the workshop?	• Group discussions and interactions • Increased understanding of the impact of Varroa mite on pollination-dependent industries • A chance to hear from all aspects of the industry (beekeepers, growers and government) and expertise available

[14] Note that responses have be rephrased to allow collation

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