Understanding practices in key pollination areas

Mark Leech
TQA Australia

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Melon
Onion

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(May 2014)

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HAL Project Number
MT13027

Date
30 May 2014

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Purpose
The purpose of this report was to investigate current pollination practices in the apple and pear, cherry and blueberry industries through an online survey and series of face-to-face interviews.

Acknowledgements
This project has been funded by the Rural Industries Research and Development Corporation and Horticulture Australia Limited (HAL) and matching funds from the Australian Government.

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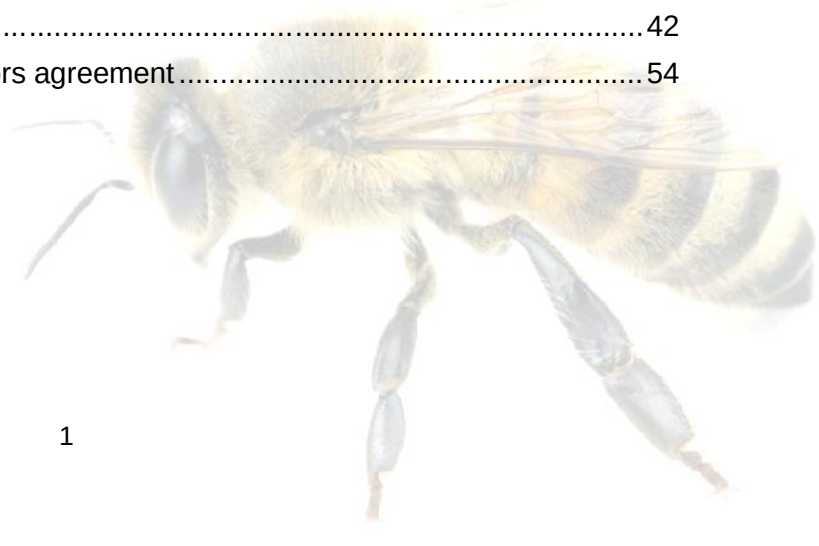


Media summary

This project sought to better understand current pollination practices in the blueberry, apple and pear, and cherry industries. The primary aims of the project were to identify regionalised approaches and weaknesses in pollination practices, and highlight obstacles to adopting best practice. Australia remains the last *Varroa destructor* free continent, and a future incursion could devastate many of our pollination-dependent industries.

An online survey was widely distributed by relevant peak industry bodies and promoted through traditional and social media. Almost 100 responses were received and the survey was supplemented by 25 face-to-face interviews in four key regions.

Key messages identified from the survey and face-to-face interviews:

- Growers in the target industries have a high level of pollination awareness.
- There is significant use of and reliance on feral honeybees for pollination of these commodities, often caused by financial constraints.
- Relationships between beekeepers and growers are not generally underpinned by written, performance-based contracts, only verbal agreements.
- Growers have a desire to gain more pollination-related skills and knowledge and to better understand the contribution native insects and bees make to the commodities they grow.

Recommendations from this project are for the industry, beekeepers and growers to:

- Consider further research into the use and management of native bees;
- Provide guidance on orchard design and hive placement to optimise pollination;
- Develop a method to predict levels of feral bee populations;
- Develop and provide growers with well-timed, tailored learning opportunities;
- Develop a simple diagnostic tool to be used by growers and beekeepers;
- Develop generic performance-based agreements and / or an accreditation scheme'
- Develop training for small beekeepers.

Technical summary

This project seeks to better understand current pollination practices in the apple and pear, blueberry and cherry industries. The primary aims of the project were to identify regionalised approaches and weaknesses in pollination practices, and highlight obstacles to adopting best practice. Australia is the last continent to be *Varroa destructor* free, and a future incursion could devastate many of our pollination-dependent industries.

Managed and wild / feral populations of European honeybees provide pollination services to an estimated 65% of horticultural and agricultural production systems in Australia (Keogh, et al., 2010). Reliance on feral, unmanaged honeybees for pollination is a high risk management strategy.

Australia's honeybee population shows no resistance to *Varroa destructor* (Oldroyd, 2012).The establishment of the *Varroa* mite will have severe consequences to the honeybee population, with the loss of the majority of feral populations and significant colony loss of managed honeybees.

This project was guided by information identified in the Blueberry, Apple and Pear and Cherry Pollination Aware case studies and from *Pollination of Crops in Australia and New Zealand* (Goodwin, 2012). These publications provided a significant technical foundation for best practice pollination.

Materials and methods

This project was undertaken by TQA Australia on behalf of Horticulture Australia and Rural Industries Rural Development Corporation. A reference committee was formed upon project commencement with representatives from CSIRO, Apple and Pear Australia Limited, the Australian Blueberry Growers Association, Cherry Growers Association and a commercial pollination expert. This committee provided invaluable assistance in the development of the survey questions.

The project was split into two phases; the first being an online survey and the second a series of face-to-face interviews with key growers. The final survey consisted of 24 questions that sought responses from growers about their understanding of insect pollination, the importance of feral honeybee populations to their business and the wider horticultural industry, and the management and engagement of commercial pollination services.

Survey questions were uploaded to Survey Monkey and a link to the online survey was emailed by relevant peak industry bodies to their members. The survey was promoted extensively through traditional and social media. In an effort to increase the number of responses, the Project Team offered 2 iPad Mini's as incentives to growers that completed the entire survey.

In total, 96 completed survey responses were collected; 25 of these came from face-to-face interviews. Responses to all questions in the survey were graphed in Excel to provide ease of assessment of survey responses.

Major research findings and industry outcomes

The survey highlighted the existing high level of pollination awareness and bee-safe spraying practice across the target and non-target industries. Most growers still believe there is more to know about pollination, especially the role that native insects play. There is a high level of measured use and reliance on feral honeybee populations (up to 62% of respondents of the survey) with many growers using the minimum number of managed honeybee colonies when feral bee populations are known to exist.

The majority of respondents to the survey believe that a shortage of feral and/or managed honeybees will have an effect on their crop and industry. Given a shortage, more than half believed that the quantity of their crop would be significantly affected and more than 70% believed crop quality would be seriously compromised.

Most growers engaged beekeepers directly, maintaining a good relationship with no formal agreement or written performance measures. While many growers reported having no problems with their beekeepers, the most common problem reported by those engaging commercial pollination services was hive quality.

There was a high level of interest in furthering pollination skills and knowledge, particularly around developing a better understanding of the contribution that native bees and other insects make, and their potential to be better managed.

Recommendations

- Consider further research into the use and management of native bees;
- Provide guidance on orchard design and hive placement to optimise pollination;
- Develop a method to predict levels of feral bee populations;
- Develop and provide growers with well-timed, tailored learning opportunities;

- Develop a simple diagnostic tool to be used by growers and beekeepers;
- Develop generic performance-based agreements and / or an accreditation scheme'
- Develop training for small beekeepers.

Blueberry orchard, northern NSW

Introduction

There is increasing global awareness of our dependence on successful crop pollination and the dominant role honeybees play in this process. Australian horticulture increasingly relies on managed honeybee pollination services. Around the world, both wild and managed honeybee populations are under pressure from changing environments, agricultural practices, pests and diseases.

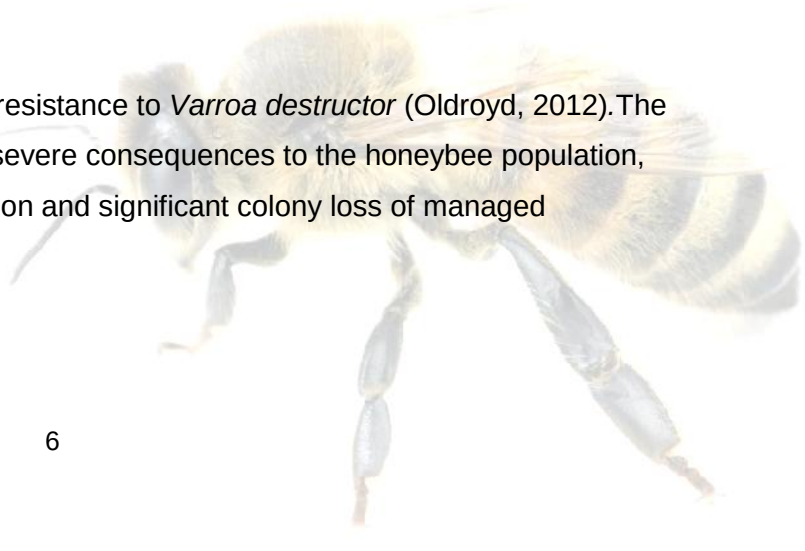
A pest of significance to the horticultural industry is *Varroa destructor*, commonly known as the *Varroa* mite. *Varroa* has not been detected in Australia but is considered the 'greatest pest threat to the European Honeybee industry' (Department of Agriculture, Fisheries and Forestry, 2013). Varroa has been detected on all other continents and an incursion of this destructive pest would have disastrous consequences in Australia. It has the potential to destroy most of the feral bee population, affecting many small beekeepers, and causing significant management costs and losses in the commercial honeybee and pollination industries.

The need for managed pollination services grows annually with the increasing establishment of intensive horticulture. At the same time the apiary industry is facing pressure, creating an inability to service pollination demands. Aside from a major disease outbreak, the greatest threat to the apiary industry is changing land tenure and reduced access to native flora.

This project seeks to better understand current pollination practice in the blueberry, apple and pear, and cherry industries. The primary aims of the project were to identify regionalised approaches and weaknesses in pollination practices, and highlight obstacles to adopting best practice. Australia remains the last *Varroa* free continent, and a future incursion could devastate many of our pollination-dependent industries.

Managed and wild / feral populations of European honeybees provide pollination services to an estimated 65% of horticultural and agricultural production systems in Australia (Keogh, et al., 2010). Reliance on feral and unmanaged honeybees for pollination is a high risk management strategy.

Australia's honeybee population shows no resistance to *Varroa destructor* (Oldroyd, 2012).The establishment of the *Varroa* mite will have severe consequences to the honeybee population, with the loss of the majority of feral population and significant colony loss of managed honeybees.



This project is consistent with the Pollination Five Year R&D Plan 2009-2014, developed and managed by the Rural Industry Research and Development Corporation (RIRDC) which outlines the need to better understand current crop pollination practices in order to:

- better prepare for and manage a response to the impacts of *Varroa* mite establishment in Australia; and
- increase the effective use of managed honeybee populations for crop pollination.

This project is part of the Pollination Program, a joint venture between Horticulture Australia Limited (HAL) and the Rural Industries Research and Development Corporation (RIRDC). A series of case studies, the *Pollination Aware* series, have been produced as part of this program for a number of pollination-critical industries.

This project was guided by information identified in the Blueberry, Apple and Pear and Cherry case studies and *Pollination of Crops in Australia and New Zealand* (Goodwin, 2012). These publications provided a significant technical foundation for best practice pollination and are readily available online at RIRDC's web site www.rirdc.gov.au.

The outcome of this project was to provide important insight into current pollination practices, and demonstrate grower strengths in terms of awareness and commitment to improvement.

Intensive horticulture in the Adelaide Hills

Materials and methods

This project was undertaken by TQA Australia on behalf of HAL and RIRDC. A reference committee was formed upon project commencement. The Reference Committee consisted of Saul Cunningham (CSIRO), Jesse Reader (Apple and Pear Australia Limited), Greg McCulloch (Australian Blueberry Growers Association), Simon Broughy (Cherry Growers Association) and Trevor Monson (Monson's Honey). The Project Manager held initial discussions with each member of the reference committee to discuss the aims and outcomes of the project.

The project was initially delayed due to a change in Project Manager, but commenced in October 2013 with survey work being undertaken within original project timelines.

The project was to be split into two phases. The first phase was the development and distribution of an online survey to growers from each of the key industries. The second phase was a series of face-to-face interviews with growers from each industry, identified by the respective peak industry bodies.

Phase 1 – Online survey development and distribution

Draft survey questions were initially developed by the Project Team, and were distributed to all members of the reference committee for review and feedback. Committee members provided comprehensive and detailed feedback to help refine the questions in order to gather the most pertinent information.

The final survey consisted of 24 questions. These questions sought responses from growers about their understanding of insect pollination, their thoughts on the importance of feral honeybee populations to their business and the wider horticultural industry and the management and engagement of commercial pollination services. The complete survey can be found in Appendix 1.

Survey questions were uploaded to Survey Monkey, a web-based survey tool. This method was chosen as the most cost effective and rapid means of response, providing data that could be quickly downloaded and analysed. A link to the survey was emailed by the Project Team to members of the reference committee, who had agreed to forward the link to their members.

In addition, the survey was promoted extensively through traditional media sources, including rural newspapers, industry magazines and industry newsletters, and social media such as Facebook, Twitter and LinkedIn.

The project team have conducted national surveys of horticultural growers in the past, with varying levels of success, and are aware that growers are regularly inundated by online survey requests. In an effort to increase the number of responses, the Project Team offered two iPad Mini's as incentives to growers to complete the entire survey.

In total, 96 completed survey responses were collected. 25 of these came from the face-to-face interviews.

Responses to all questions in the survey were graphed to provide ease of assessment of survey responses. A number of graphs are included in the Results section of this report, with all graphs included in Appendix 2.

Phase 2 – Face-to-face interviews

Phase 2 was to conduct face-to-face interviews with growers from within the targeted industries. Each peak industry body (APAL, CGA and ABGA) provided contact details for one or two key growers in each of the four key growing regions. The purpose of the face-to-face interviews was to obtain more detailed information than could be provided in the online survey. A total of 25 growers were interviewed face to face by the Project Manager, with locations outlined in Fig 1.

State	Blueberry	Apple / pear	Cherry	Total visits
NSW[1]	1	3	3	6
VIC	1	2	4	7
TAS[2]	1	4	5	7
SA	1	2	3	5
Total	4	11	15	25

Fig. 1 – Location on face-to-face visits by State

Face-to-face interviews yielded a good response, and provided more in-depth information across a range of issues. Full results are included in Appendix 2.

[1] 1 grower grew both apples and cherries
[2] 3 growers grew both apples and cherries

Results

The online survey was initially distributed in early November 2013. High numbers of responses were received within the first two weeks of the survey being distributed, with the response rate slowing in the week leading up to Christmas. In late January, in order to encourage more growers to complete the survey, more promotion of the survey was conducted via email and social media, and another iPad was offered as an incentive. The response rate jumped up again after this promotion of the survey, but slowed after two weeks. The survey was closed at the end of March to allow time for analysis of the responses.

Over 100 surveys were started, but only 96 were fully completed. A number of these surveys were completed by the Project Manager during the face-to-face visits. A significant number of the online survey responses were from non-target industries, indicating the success of the media campaign. The results from Survey Monkey were downloaded and analysed using Microsoft Excel.

Summary of respondent demographics

A small amount of demographic information was gathered as part of the survey. Of particular interest were the following results:

- The surveyed population had a majority age greater than 45 years (64%) with 38% of respondents aged over 55. According to Australian Bureau of Statistics data from 2009-10, the average age of managers of horticultural businesses was 54.
- The results showed a relatively even spread of responses in the key growing States (NSW, Vic, Tas, SA).
- A breakdown into industry groups showed a dominance of the target industries by cherries (31-43%) from each of the key growing States.
- Over 66% of respondents were from operations sized 49ha or less.

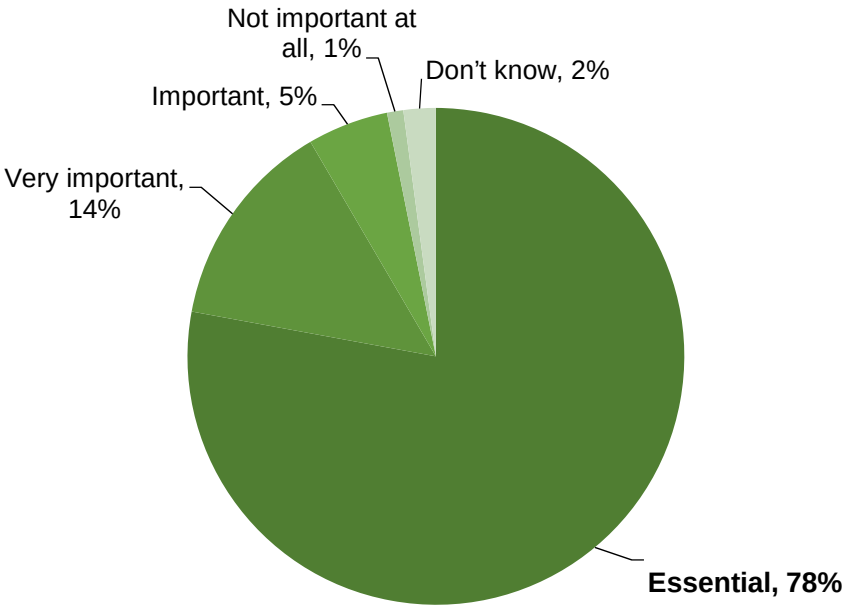
Figure 2 provides more insight into the scale of investment by commodity.

Industry	**1-4**	**5-9**	**10-19**	**20-49**	**50-99**	**100-199**	**200-299**	**300-499**	**>500**
Overall	*16%*	*11%*	*18%*	*21%*	*9%*	*11%*	*5%*	*2%*	*6%*
Cherry	42%	66%	29%	28%	31%	34%	50%	--	13%
Apple / pear	20%	17%	25%	31%	57%	36%	34%	--	13%
Blueberry	15%	--	11%	--	6%	--	---	--	--
Other	15%	17%	32%	38%	6%	18%	16%	67%	74%
Vegetable	8%	--	3%	3%	--	12%	--	33%	--

Fig. 2 – Size of orchards by industry (ha)

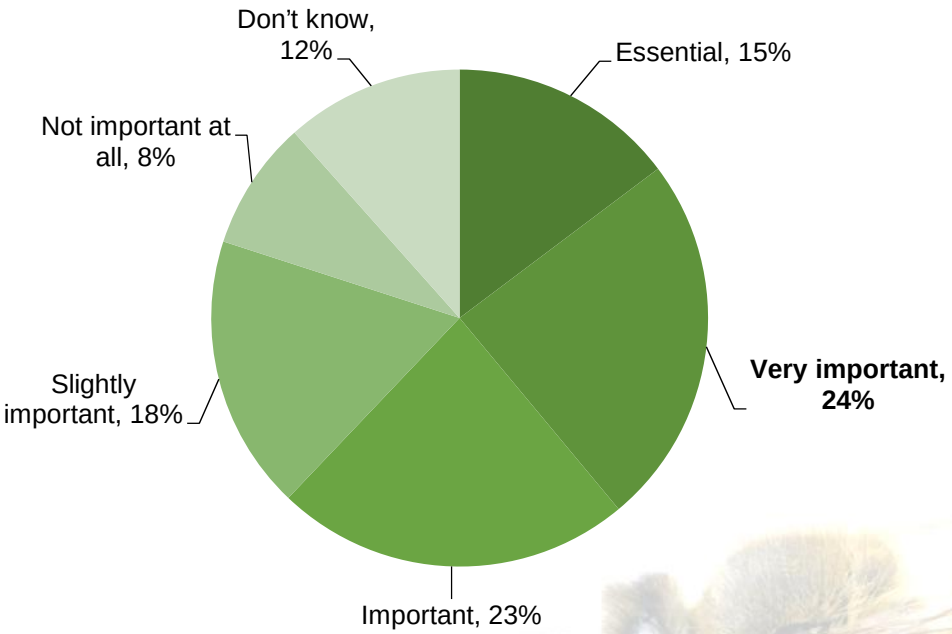
Survey responses

Q: How important is insect pollination to your business?



This graph clearly illustrates the overwhelming importance all growers, regardless of commodity, place on the contribution of insects to pollination.

Q: How important is feral (wild) honeybee pollination to the success of your crop?



The graph above details the level of importance that respondents to the survey place on feral honeybees. This paints an alarming picture, indicating that 62% of all growers rely to some extent on feral, wild or unmanaged honeybees to provide pollination services.

Assuming that an answer of 'slightly important' to this question implies an understood benefit but non-reliance on feral honeybees for pollination, then 18% of growers are gaining a low risk benefit from feral honeybee populations.

A further breakdown of these results has been conducted to identify industry differences in the presence and / or level of reliance on feral honeybee populations. Figure 3 provides an analysis of reliance on feral bees by industry group for the growers interviewed face to face, and the survey as a whole.

Industry	Essential	Very important	Important	Slightly important	Not important at all	Don't know
Cherry (survey)	21%	29%	21%	13%	4%	12%
Cherry (interview)	27%	20%	33%	7%	7%	7%
Apple / pear (survey)	13%	30%	33%	17%	7%	--
Apple / pear (interview)	18%	18%	36%	18%	9%	--
Blueberry (survey)	22%	11%	33%	22%	--	22%
Blueberry (interview)	25%	25%	25%	--	--	22%
Total	15%	24%	23%	18%	8%	12%

Fig. 3 – Importance of feral (wild) honeybee pollination to the success of the crop (by commodity)

Q: 'Improved pollination will raise productivity in my industry.'

Respondents were asked if they agreed or disagreed with the above statement. 57% of respondents strongly agreed, with a further 33% agreeing with the statement. Only 3% of respondents disagreed or strongly disagreed with the statement, all of whom were from non-target industries.

Q: How often do you use commercial pollination services?

84% of respondents indicated that they always or sometimes use commercial pollination services. The table below indicates differences between industries.

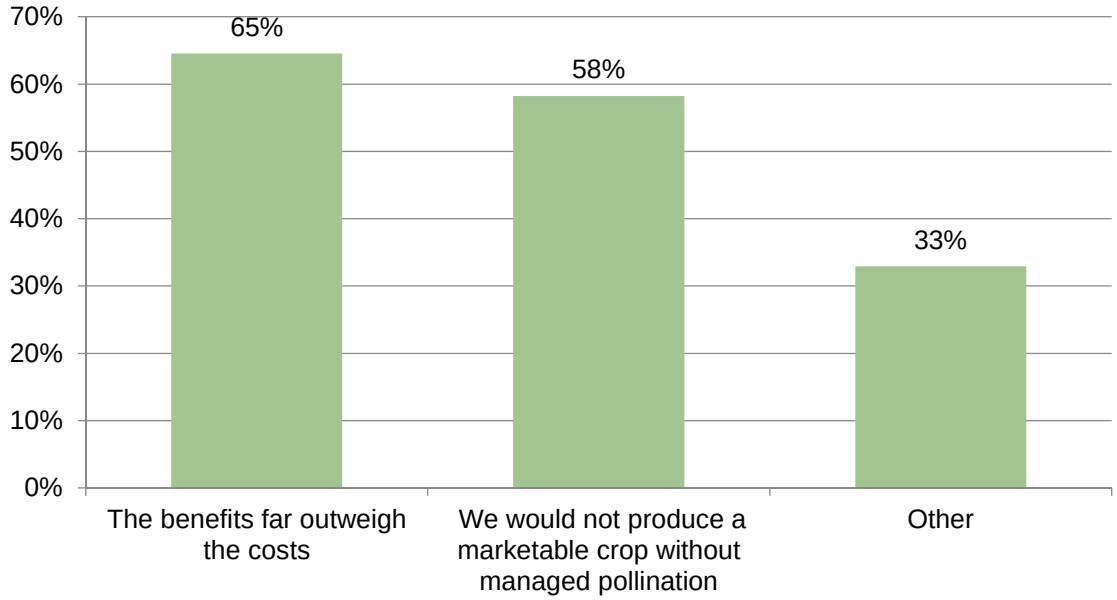
Industry	Always	Sometimes	Never
Cherry	75%	12%	13%
Apple / pear	57%	23%	20%
Blueberry	78%	--	22%
Non-target	68%	11%	21%

Fig. 4 – Use of pollination services (by commodity)

The reason why the remaining 16% of respondents do not use commercial pollination services is presented later in this report.

Q: What are the reasons you use commercial pollination services?

This question was designed to understand the reasons that respondents used a commercial pollination service in their operation. Many of the respondents that provided comments related to this question stated that engaging commercial beekeepers for pollination was 'insurance' that they consider necessary.



When analysing the results by commodity, it was identified that 52% of respondents that grew apples and pear indicated that they would not have a marketable crop without successful pollination, a significantly higher response than for other commodities.

Industry	Benefits outweigh the costs	Not produce a marketable crop	Other
Cherry	58%	25%	25%
Apple / pear	52%	52%	29%
Blueberry	56%	11%	44%
Target	56%	32%	28%

Fig. 5 – Reasons for using commercial pollination services (by commodity)

Q: Do you pay to use pollination services?

Q: How much per hive do you pay?

Q: How many hives per hectare do you use?

Q: How did you determine this number?

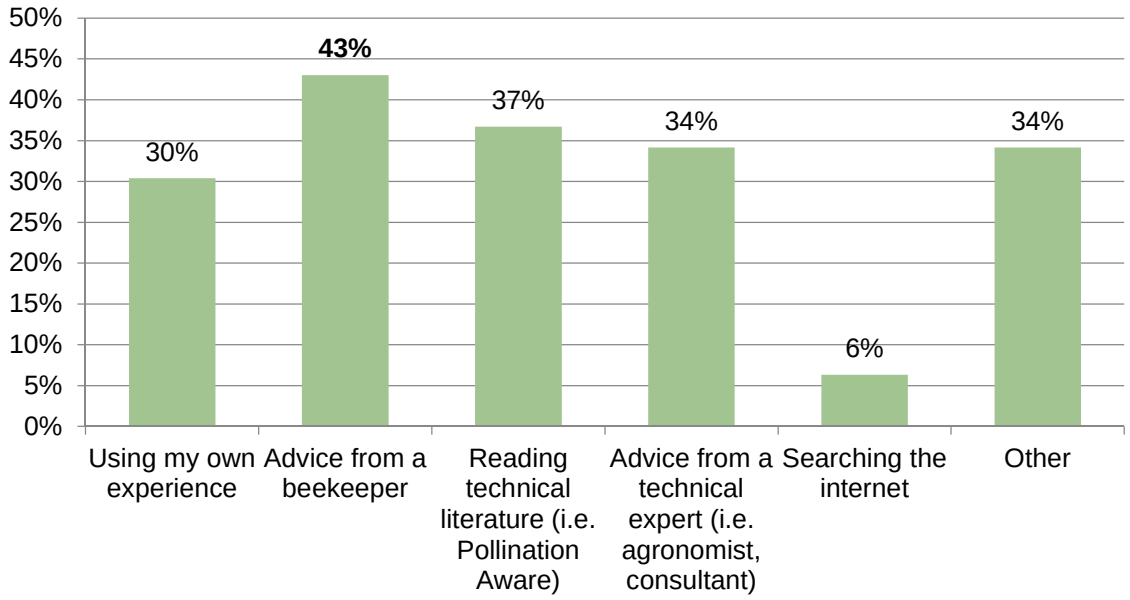
The majority (95%) of respondents pay to use commercial pollination. Those that do not pay generally have some form of *quid pro quo* arrangement that provides mutual benefit to both parties. This may be based on a longer term relationship that provides the beekeeper with a honey crop and the grower with pollinators.

Figure 6 compares the recommended hive densities, taken from Pollination Aware[3], and the range and averages found through the survey. The price range for each industry is presented along with a weighted average. The weighted average was based on using the median area within the area range, e.g. for 20-49 ha the median area used would be 35ha.

Commodity	Rec. density/ha	Survey density/ha	Cost range	Cost weighted average
Blueberry	3	2-6	$50-$130	$93
Apple / pear	3	1-6	$27-$125	$70
Cherry	3	1-14	$45-$150	$76

Fig. 6 – Comparison of recommended hive density to results from survey

Hive densities were determined by a range of means. The two most common ways to determine hive density were through advice provided by a beekeeper and from technical literature i.e. Pollination Aware.



During one face-to-face visit, a trellis cherry orchardist near Young in NSW indicated that he required up to 14 hives per hectare on a 60m diamond grid within the orchard. Hive density in cherry orchards also varies dependent on variety, with growers increasing hive density on varieties that are harder to pollinate.

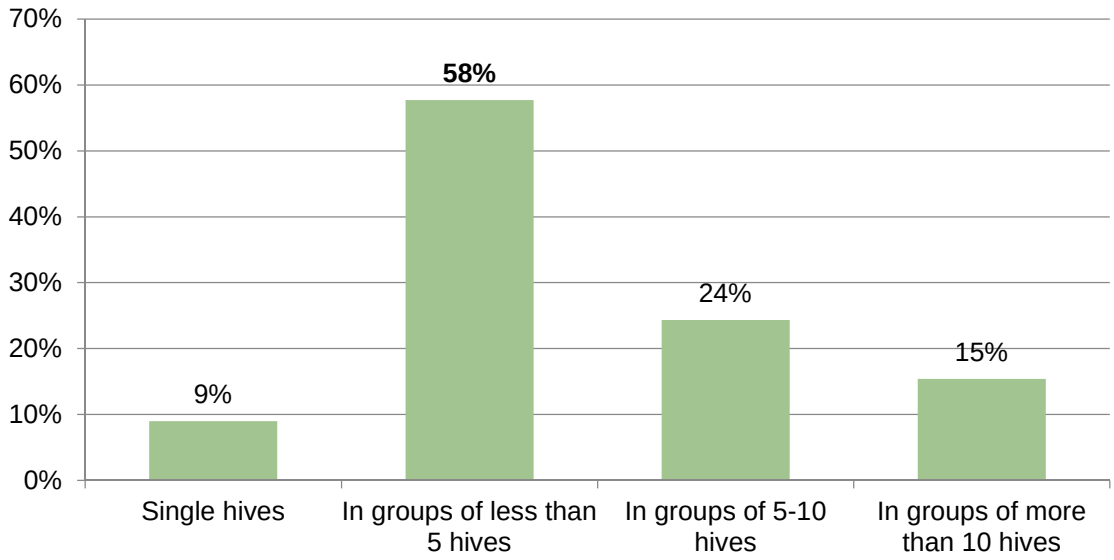
[3] Pollination Aware –The Real Value of Pollination in Australia fact sheet

Q: How are the hives placed?

Q: How are the hives arranged?

Q: How are the hives spaced?

According to survey respondents, hives are predominantly placed at the heads of rows (69%) where there is more available space for movement of vehicles or machinery required to move hives into position. Hives are generally delivered on pallets in groups of less than 4. Very few operations use single hives due to the extra cost of handling and movement; however there are some orchard designs that require more even placement of hives within rows.



Hive spacing is more difficult for growers to influence, as most hives are grouped on pallets. However 67% of respondents indicated that their hives were spaced less than 150m apart.

Q: Do you use netting in your operation?

42% of respondents indicated that they did not use netting in their operation. Of the remaining 58% that did use netting, 32% used full netting of their operation, and 26% used partial netting.

Hail netting over apples in the Adelaide Hills

Effect of netting

47% of survey respondents indicated that netting can reduce pollination effectiveness. The effect of netting on pollination varied with the type of net, netting design, whether the netting was draped and the timing of netting. In Tasmania, the majority of netting is used for bird control on cherries and can also be used to reduce the wind velocity. One South Australian orchardist believed that wind could be reduced by up to 50% under hail netting.

During the visits, a number of orchardists stated that netting can prevent bees from returning to their hives (particularly from overhead) and can also reduce the effectiveness of feral bees coming into the crop. A number of growers commented that they can significantly reduce the number of hives and increase the spacing between hives in orchards with no netting, a clear indication of feral bee activity.

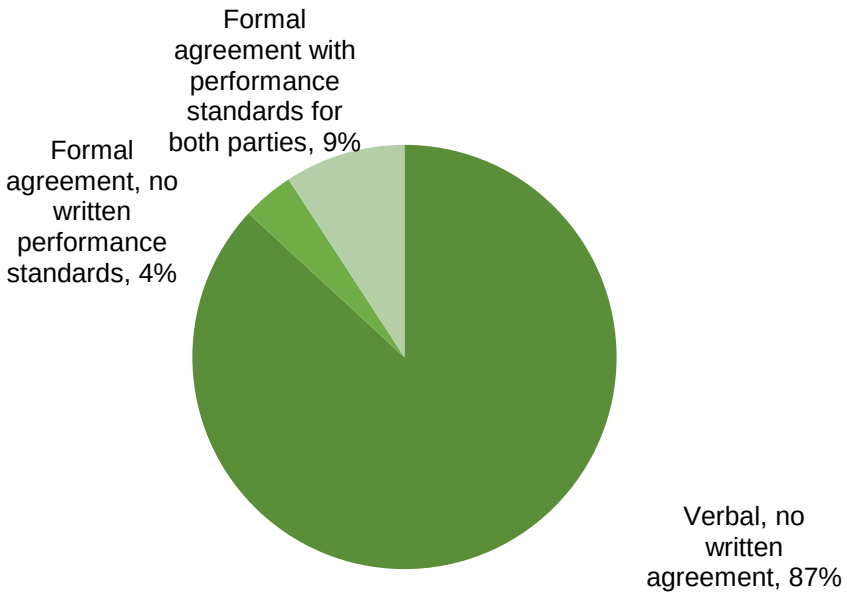
Q: When you have hives in your orchard, how is your spraying program affected?

Only 28% of respondents indicated that they made no changes to their spraying program when hives are located in the orchard. Of those that indicated a change was made, it was the timing of spraying that was often altered.

During the face-to-face visits, it was confirmed that growers are very aware of using safe spraying practices and chemicals when commercial bees are active in their orchards. This is reflected in the comments that growers did not spray insecticides while bees are in the orchard, and generally preferred to spray other chemicals when the bees were inactive, either early in the morning or at night.

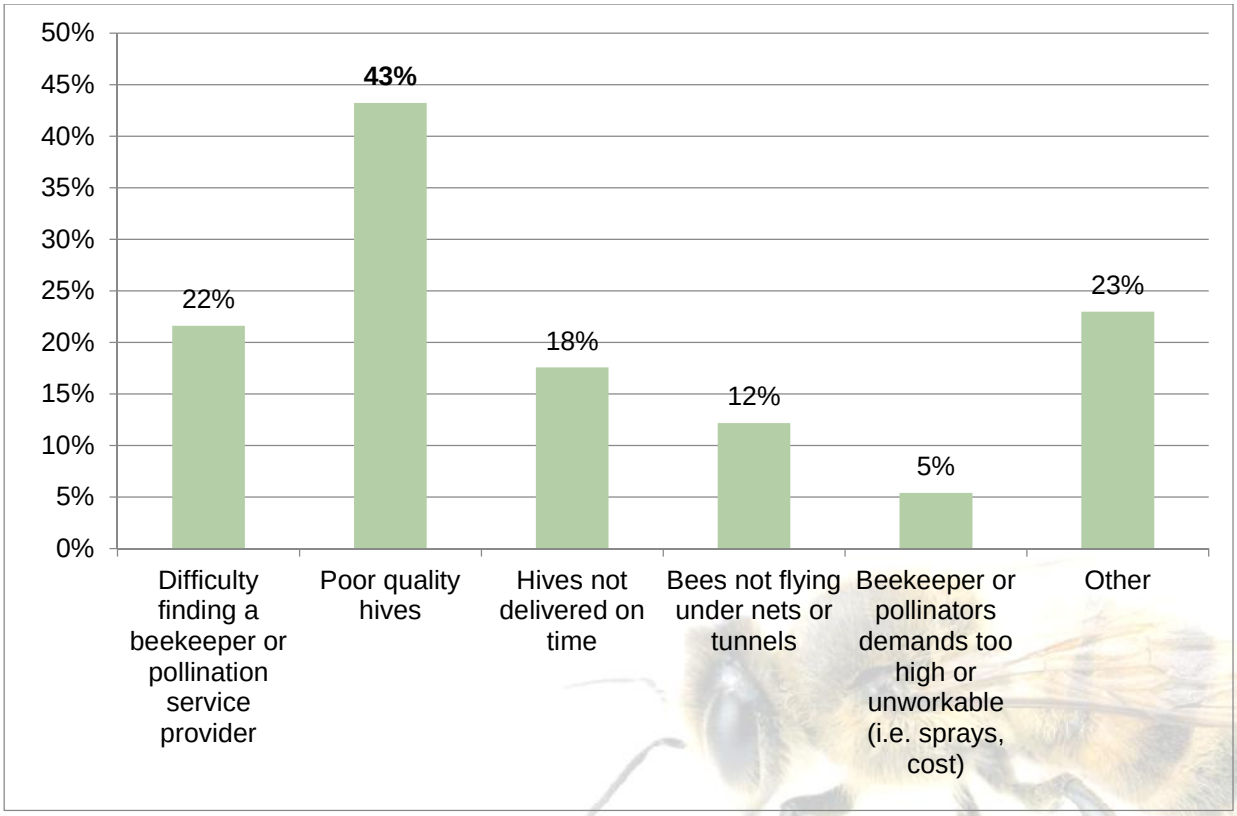
Q: What arrangements do you have with the beekeeper or pollination service provider?

According to the survey, the majority of growers from the target industries deal directly with the beekeeper and do not have a written agreement. Respondents from the non-target industries, such as almond growers, tend to have written formal contracts with performance standards for both parties. One of these growers noted that they had an independent audit undertaken of hive strength.



Q: Have you encountered any of the following issues?

While 38% of respondents indicated that they have encountered no issues in dealing with commercial pollinators, the remainder have experienced various issues as outlined in the graph below, the most common of which is poor quality hives. In many cases, the respondents indicated that the beekeeper replaced the hives as soon as notified.



Q: Do you believe that a shortage of feral or managed honeybees would have an effect on your crop / industry?

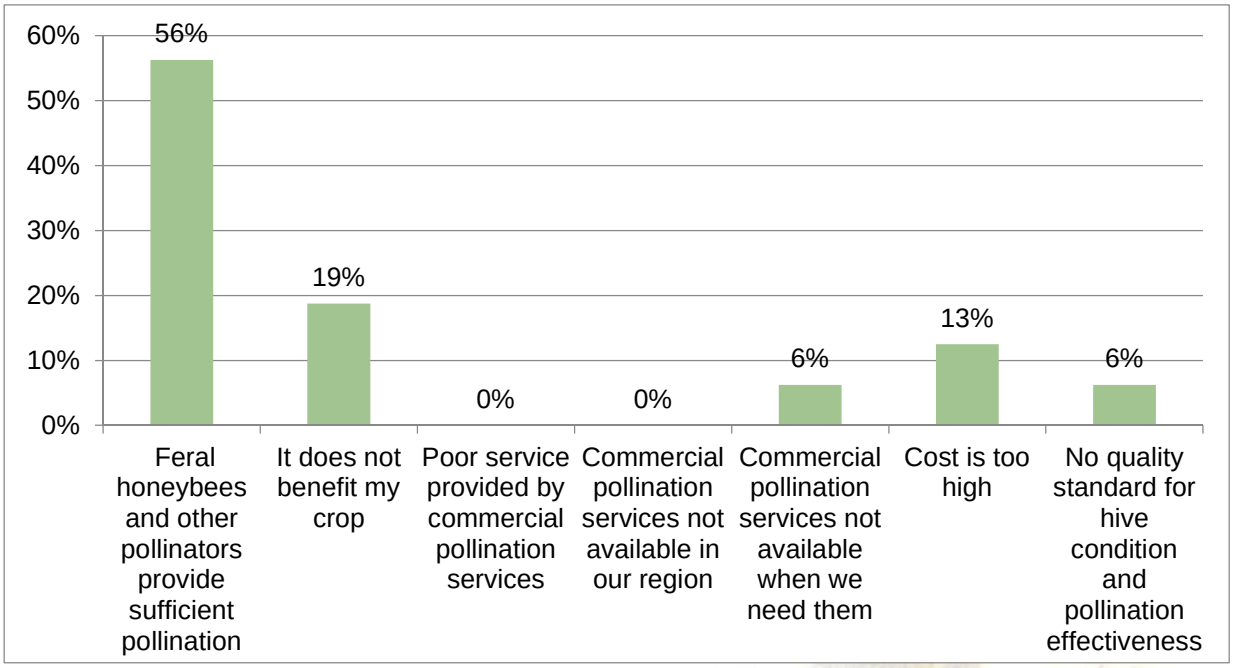
The overwhelming majority of respondents (96%) indicated that a shortage of feral or managed honeybees would have an adverse effect on their crop and or industry.

Respondents were asked what, if any, significance a shortage of honeybees would have on their crop quality and quantity, on the cost of pollination, on their industry and on other horticultural industries.

Effect on:	Significant effect	Some effect	Little effect	No effect
Crop quality	55%	25%	17%	3%
Crop quantity	74%	24%	2%	-
Cost of pollination	67%	25%	7%	1%
My industry	74%	23%	3%	-
Other horticultural industries	68%	32%	-	-

Q: Why don't you use commercial pollination services?

17% of respondents to the survey did not use commercial pollination services. 15% of the target industries (cherry, apple and blueberry) did not use commercial pollination services; half of these respondents indicated that they had their own hives.



Improving skills and knowledge

87% of survey respondents indicated that they would be very interested or interested in improving their pollination-related skills and knowledge. Most (26%) indicated they preferred to learn through workshops and field days or a combination of learning opportunities. Only 5% of respondents wanted to learn in a classroom setting.

Discussion

A number of other issues related to pollination were identified during analysis and review of the online survey, and through discussions held with growers during the face-to-face interviews. These issues included the use of native bees, other insects and bumblebees, owning hives and planting flora to improve bee health while not adversely affecting target crop pollination.

Native bees

Native bees and their contribution to pollination were recognised by a significant number of respondents to the survey and growers visited. While there was not a question in the online survey specifically aimed at understanding attitudes to and perceived benefits of native bees, there was considerable interest shown by growers. 20 comments relating to native bees from 14 growers were recorded. 50% of growers interviewed made positive comments about native bees and their contribution and / or importance in the pollination of their crop. There does not appear to be a direct correlation between crop or property size and comments relating to native bees.

Comments

Industry	State	Size	Comments (summary)
Cherry	NSW	50-99	Moths at night may be important to cherries.
	SA	1-4	We have surrounding bush and native bees visiting too. Would also value information about encouraging native bee population growth.
	SA	5-9	Reduced to 1-2 hives/ha outside nets due to native bees and ferals. Bee Scent was used as a spray, attractive to native bees.
	SA	100-199	Native bees are critically important, but not sure how effective they are.
	TAS	1-4	Uncovered orchards seem to have higher populations of wild bees / insects.
	VIC	200-299	All moths, native bees etc. are very important. Not many native bees about this year.
	WA	1-4	I have developed a very diverse habitat suited to both feral and indigenous bees and other insects so am not dependent on commercial bees or even feral bees.
Cherry, Apple / Pear	Tas	150-199	The orchard is removed from the bush; there are less natives and ferals.
Apple / Pear	NSW	5-9	Concerned about the effect of European wasps on ferals and native bees. There are many hives in our neighbourhood and some natives.
Blueberry	NSW	50-99	Native bee hives will be placed singly about 20m apart. We are seeing a decline in ferals, neighbours bees and natives.
Apple / Pear	NSW	50-99	There are a lot of native bees around. We need to know more about native bees. When it's wet and windy something is out there pollinating.
Apple / Pear	SA	20-49	With no nets, insects other than bees, feral and native bees play an important role and there was a higher population of native bees this year. We reduce the number of hives outside nets.

Managing native bees at Otto Saek's 'Blueberry Fields" in northern NSW

Bumblebees (*Bombus terrestris*)

A number of growers showed particular interest in bumblebees as an alternative pollinator. This was more related to blueberries and in areas of poor weather at flowering time. Bumblebees are an exotic 'pest' species that were first found in Tasmania in 1992 and have spread widely throughout the state. They only produce very small colonies (40 to 400 workers compared to European honeybees which have 20,000 to 50,000 workers per hive) however they have the ability to fly in much poorer weather conditions and are more effective pollinators for some flowers.

Comments

Industry	State	Size	Comments (summary)
Cherry	TAS	1-4	Netting affects wild insects getting in, but there were large numbers of bumblebees.
	NSW	20-49	Bumblebees are the preferred pollinator (for tomato plants) but are not allowed on mainland Australia. I would like to see bumblebees allowed for pollination in Australia.
	VIC	20-49	Bumblebees would be very helpful in areas of poor weather.
Blueberry	NSW	50-99	Bees are a cost we didn't have 10 years ago, they are a bit hit and miss, would rather use bumblebees they are a better pollinator. Honeybees are becoming quite expensive especially when compared to European bumblebee service.
Cherry, Blueberry	TAS	1-4	Bumblebees are the most important pollinators for blueberries.
Cherry, Apple / Pear	TAS	20-49	Questioned about bumblebees and their management. They would be useful especially when poor weather at the time of flowering.

Owning bees

A number of growers owned their own bees, or intended to commence beekeeping to assist or provide the pollination required for their crop. One blueberry grower bought in his hives and engaged a beekeeper to manage them.

Comments

Industry	State	Size	Comments (summary)
Cherry	SA	1-4	May reconsider keeping our own hives due to price hike from $30 to $100/hive.
Blueberry	NSW	50-99	I provide the pollination service by buying the bees and engaging a beekeeper to help manage them.
	TAS	1-4	Ideally I would like about 10 hives and considering buying my own.
Cherry, Apple / Pear	TAS	20-49	Interested in having own hives as an insurance.
		50-99	Have own hives.
Cherry, Apple / Pear	WA	5-9	Have become a registered beekeeper for pollination of our orchard. I used a local beekeeper to establish our original hives and for beekeeping lessons and advice. Beekeeping is an enjoyable pastime and prefer not to have to rely on others.

Key grower interviews

While the results from the face-to-face grower interviews were entered into the online survey, and were included in the general analysis of results on previous pages, the interviews yielded more detailed information.

The following section provides an analysis for each main question, or group of questions identified specifically during the face-to-face interviews. Included are key grower comments reflecting the majority view, and comments that provide additional information or a differing view. Where comments are provided, they have not been changed other than minor editing and are annotated with State, Industry and Size of operation.

How important is insect pollination to your business?

Consistent with the results of the online survey, the overwhelming majority of growers interviewed (96%) considered insect pollination essential or very important to their operation however they did not understand the role or significance of native pollinators.

Comments

Industry	State	Size	Comments (summary)
Apple / Pear	SA	20-49	Outside netted orchards feral bees and native bees and insects are essential to providing pollination. We can use less hives outside nets due to this background pollination.
Cherry, Apple / Pear	NSW	50-99	We know that bees pollinate but don't know what other insects are pollinating.
Cherry	NSW	50-99	Not sure what other bees contribute. I believe moths at night may be very important with cherries. We often see them in blossom at night in large numbers.

How important is feral (wild) honeybee pollination to the success of your crop?

The majority (76%) of growers interviewed considered feral honey bee populations to be essential, very important or important to the success of pollination.

Comments

Industry	State	Size	Comments (summary)
Apple / Pear	SA	20-49	We still have enough remnant bush surrounding and within our property to "house" feral bee populations and they provide a significant background to pollination. We do not rely on them.
Cherry	SA	5-9	It is very important with early flowering.
	VIC	200-299	If you knew what was happening you would increase your hives. There is a lot of adjacent bush. We had a low flowering, it was a dry autumn and a lot of back burning is being done.
Blueberry	SA	1-4	We do not rely on them.

'Improved pollination will raise productivity in my industry'

The majority (85%) of growers across all commodities agreed or strongly agreed that improving pollination processes and outcomes would raise productivity in their industry.

How often do you use commercial pollination services?

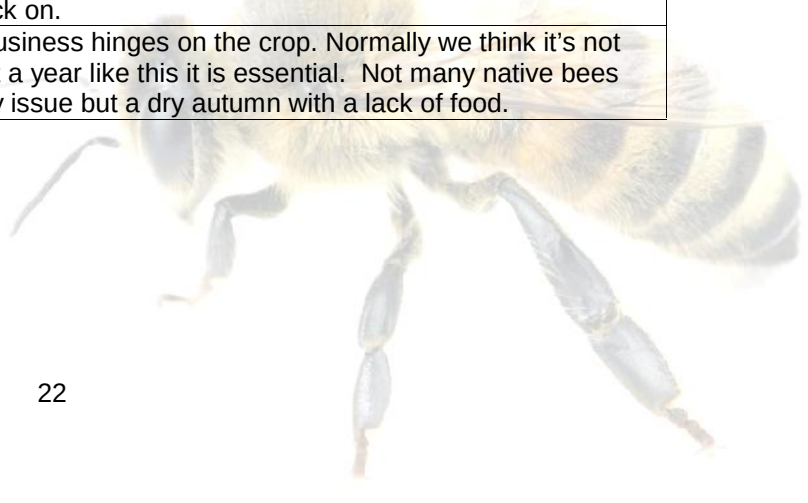
The majority (96%) of growers interviewed always used commercial pollination services.

What are the reasons you use commercial pollination services?

Benefits outweigh the costs	No marketable crop without pollination	Other
69%	65%	69%

Comments

Industry	State	Size	Comments (summary)
Apple / Pear	SA	20-49	We would get a marketable crop outside the nets. It's really a 12 month insurance policy. In my working life I may grow 50 crops, how many can you afford to stuff up?
	SA	20-49	In apples it improves seed content that gives a better shape and keeping qualities.
Blueberry	SA	1-4	We consider it an insurance. This year demonstrates it's important as we were late with pollination. The berries need to be multiply pollinated with more than 20 seeds each seed needs individual pollination. Better pollination gives bigger berries, + 20-30%.
Cherry	VIC	20-49	Costs are starting to creep up. But in this district there is no fruit set without pollination services due to very poor weather.
Cherry	VIC	200-299	It is good insurance. We can always take fruit off the tree but cannot put them back on.
Cherry	VIC	200-299	Our whole business hinges on the crop. Normally we think it's not an issue, but a year like this it is essential. Not many native bees about. Many issue but a dry autumn with a lack of food.



Cost per hive

The high variability in hive cost was not directly related to industry or crop size and ranged from $27 to $112/hive

Size of operation	1-4	5-9	10-19	20-49	50-99	100-199	200-299	300-499	>500
$/hive	$50	$100	$85-$112	$50-$100	$27-$67	$80-$112	$48-$66	--	--

Hive density, arrangement and spacing.

	Apple	Cherry	Blueberry
Hives / ha from grower interviews	1-5 3-5 under nets	0.8-10 10-14 trellis	4-5
Hives / ha from Pollination Aware	2-4 3-5 high density planting	2-3	2-5

Most growers used a variety of information sources to derive the hive density. The following comments provide insight to the different site and/or regional requirements.

Comments

Industry	**State**	**Size**	**Comments (summary)**
Apple / Pear	SA	20-49	I am a primary producer, we make observations e.g. 2 years in a row we have had a higher fruit set.
Cherry	TAS	50-99	The density varies according to varietal structure and difficulty of pollination. Bees prefer some varieties more than others.
	VIC	200-299	Calculating the risk at each location based on the weather. Where its wetter we increase hive density.
	VIC	20-49	We balance what we are getting with background pollination. Hives are focussed mainly on cherries.
	NSW	50-99	We were traditional orchardists with a different bee distribution and density. We took over an MIS Trellis orchard and found we needed much higher densities of hives.
	NSW	100-199	Used to have higher numbers but reduced from experience as hives are now much stronger coming off the pollination of almonds.
	SA	100-199	What was good enough in the past is not good enough now. Constantly increasing, 10% per year.
Cherry, Apple / Pear	TAS	100-199	2-4 hives/ha has been drilled in to us. As the orchard is not all flowering at once we bring the bees in in stages.

Placement

Placement of hives within orchards varied widely, and many operations used a combination depending on varieties grown. Most hives were palletised in groups of 4 per pallet for ease of handling.

Comments

Industry	State	Size	Comments (summary)
Apple / Pear	SA	20-49	A bit of both. Where a block is separated by a headland, in the middle, otherwise 15m in from the end) Beekeeper advise to position at the bottom of slope as bees work uphill?
Cherry, Apple / Pear	SA	20-49	Varies but we try to place them at the heads of rows. Also at the tops of hills to give them more sun, work earlier and longer.
Cherry	NSW	50-99	Hives are "Diamond" spaced at about 60m on the diamond within the trellis system. It does vary on block to block and on variety or stage of trees.
	VIC	20-49	Placed at heads of rows to get morning sun and to keep away from herbicide application.

Spraying program

All growers interviewed had a high level of awareness of sprays and a bee-friendly approach to spraying. This may have included spraying at night with non-toxic (to bees) spray, or adjusting their spray program while bees are present and not spraying any insecticide at that time.

Most growers interviewed did not spray insecticide while the bees are in their orchards, and if absolutely necessary, it was completed at night with a recommended bee-safe chemical. There was a general acceptance that spraying fungicide at night was acceptable however one grower expressed concern at this practice mentioning research that has been done (Pettis et. al., 2013) and believes this needs further research in the Australian context.

Arrangements with beekeepers

All growers interviewed dealt directly with the beekeeper; no growers indicated that they used a pollination broker. Their preference was to build a relationship with a beekeeper, and maintain this relationship as long as the beekeepers service was acceptable. Only three growers had a formal agreements with beekeepers providing accountability for both parties, with the remaining growers having only a verbal agreement. The majority of growers interviewed expressed the importance of good communication with the beekeeper to ensure hives are delivered on time, in good condition and healthy at the time of delivery.

Issues with beekeepers

Interviewed growers tended to have less issues than the overall survey indicated.

Difficulty finding a beekeeper	Poor quality hives	Delivery issues	Difficulty flying under nets	Beekeeper demands too high	No issues
15%	27%	15%	15%	----	46%

Comments

Industry	State	Size	Comments (summary)
Blueberry	VIC	10-19	No serious issues that can't be overcome with the beekeeper. Non-performing hives are replaced.
Cherry, Apple / Pear	TAS	10-19	We are very happy with our beekeeper. Other orchardists have visited and commented on the quality of the hives and how well the bees are working.

Shortage of feral bees and/or managed honeybees

The majority of growers indicated that they believed there would be a significant effect on crop quality and quantity, costs to pollination and their industry should there be a shortage of feral or managed honeybees. Only three growers believed there would be little effect on crop quality as a result of a honeybee shortage.

Pollination skills and knowledge

The majority of interviewed growers were interested to very interested in improving their pollination-related skills and knowledge.

Non-target industry survey responses

The survey yielded a number of responses from non-target industries (i.e. they did not grow apples or pears, cherries or blueberries). In the surveys, the crops grown could not be identified and were simply categorised as 'other fruit' or 'vegetable'. This group did include some comments that allowed identification of crops as almonds, apricots, plums, macadamias, tomatoes and vegetable seed.

The high number of non-target responses, representing 29% of completed responses, is indicative of the success of the broad based media campaign that included industry newsletters, journals, regional newspapers and social media.

State	Number	Other fruit	Veg	Size ha
NSW	6	5	1	<1 to >500
Vic	6	5	1	10 to >500
SA	6	6		20 to>500
Tas	2	1	1	<1 to 199
Qld	3	3		20 to 299
WA	4	3	1	5 to 49

Response rate to online survey

The survey response was disappointing given the promotional effort made by RIRDC, HAL, the relevant peak industry bodies and TQA Australia. The total number of completed surveys received was 96, with 25 of these coming from interviews. Only 43 surveys were completed by target industries as a result of industry group contact and media promotion.

The link to the survey was sent out by the peak industry bodies to their members via email. This was followed up by a promotional campaign that continued throughout the survey process. The low response rate may be due in part to the season; most of the duration of the survey occurred in harvest time for the target industries.

The Project Team are grateful to the growers that made themselves available to undertake the survey and explore the issues during a face-to-face interview. These discussions, and the occasional orchard visits, highlighted a number of areas of concern to growers and further compounded the survey result that growers are generally very interested and well informed of pollination requirements within their industry.

Pollination awareness

The survey clearly demonstrates a high level of pollination awareness across the survey respondents whether they use commercial pollination or not. There remain many unknowns and a desire to better understand the role native bees and other insects play. One example of awareness with no understanding of the reason or effects is the observation of large moth populations and activity associated with cherry blossoms at night time.

Reliance on feral bee populations

The use of feral bee populations is an understandable management strategy but one that is high risk, not because of some perceived future threat, but because changing climates, increased fuel reduction burns, other pests and diseases can all act independently or in concert putting pressure on wild honeybee colonies.

Varroa incursion in other countries has resulted in devastation to wild honeybee populations and a negative effect on pollination-dependent industries that relied too much on these populations. While the range of hive densities reported by respondents fits within the published and recommended ranges, it is very site and variety dependent.

The level of caution required in relying on feral honeybee populations is highlighted by the importance respondents to the survey placed on feral honeybee populations.

Education and skills

The majority of respondents expressed a desire to improve their pollination skills and understanding and considered a combination of learning opportunities the best fit. A number of the larger growers stated that they are doing some of their own research and regularly travel

overseas to inform themselves of new plant varieties and trends in horticulture and processing. A cautionary note was made about offering learning opportunities for growers. It is important that they occur outside the peak growing and harvesting season, that they are targeted and that time spent learning is kept to a minimum.

Contractual agreements

Setting up a pollination accreditation scheme for beekeepers and growers could present a way of formalising the relationship between beekeeper and grower, rather than the informal agreements with no performance standards that appear to be the preferred arrangement for most in the industry at present. The use of a simple pre-delivery protocol by the beekeeper, and training in bee-friendly practices for the grower, could add strength to the existing relational, mutual recognition approach.

Technology transfer

The results of the survey have been presented to members of the Reference Committee.

A teleconference was held in late May to discuss the survey findings and present recommendations. Attendees to this teleconference included representatives from Horticulture Australia Limited, Rural Industries Research Development Corporation and members of the Honeybee and Pollination Program Committee.

A presentation was also made in late May to the Tasmanian Beekeepers Association at their annual conference.

A media release will be developed once the report has been approved and will be released through Cox Inall Communications, a public relations firm, that are closely involved with the pollination industry. Other opportunities to disseminate information to the wider industry will be sought over the coming months.

Recommendations

Develop and provide growers with well-timed, tailored learning opportunities

The majority of growers expressed a desire to increase their pollination knowledge and skills. It is essential to provide learning opportunities that are timed appropriately and tailored for the specific industry. Two specific areas of training that would be of benefit to growers include:

- Risks associated with reliance on feral honeybees; and
- Owning honeybees – a specific course developed for growers who have hives or intend getting hives.

Develop a simple diagnostic tool to be used by growers and beekeepers

The development of a simple-to-use diagnostic tool could assist both growers and beekeepers. The tool would be designed to enable growers to audit hive strength and condition and inform the beekeeper of signs that may indicate a problem with the bees.

Conduct research into use and management of native bees

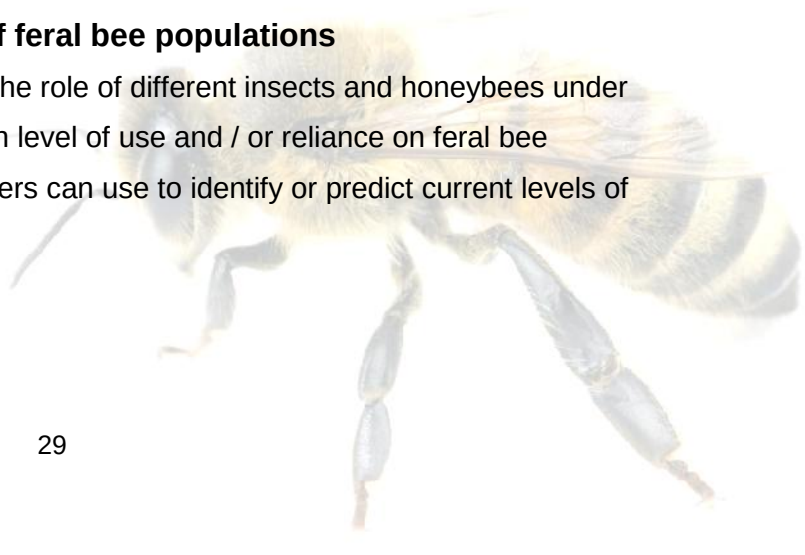
There is significant interest in understanding native bees and other insects and their contribution to pollination. Commodity-specific research into the contribution native bees and other insects make to pollination will allow growers to better understand the potential risks associated with reliance on feral bees. Should growers then make an informed decision to rely on native bees, providing information on how to enhance and manage native bee habitats within the context of a commercial orchard will be essential.

Provide guidance on orchard design and hive placement to optimise pollination

There were a number of comments from growers about placement of hives and the need to increase hive density for varieties that are difficult to pollinate. Providing guidance to growers on orchard layout and design and hive placement will assist them to optimise pollination within their operation.

Develop a method to predict levels of feral bee populations

There was considerable uncertainty about the role of different insects and honeybees under certain conditions. With an increasingly high level of use and / or reliance on feral bee populations, development of methods growers can use to identify or predict current levels of feral bees could help reduce risk.



Develop generic performance-based agreements and / or accreditation scheme

While there was little use of performance-based agreements within the target industries and a general satisfaction with grower-beekeeper relationships, many growers indicated they had encountered various issues when dealing with commercial pollination services. The development of a generic agreement may assist in avoiding future issues. The agreement should outline performance measures for both parties. An example of an agreement that is currently being used by pollinators in Tasmania is attached (see Appendix 3).

There may also be a benefit to developing a simple accreditation scheme that both growers and pollination providers could implement within their operation. Involvement in the scheme would be evidence that both parties are aware of general pollination issues including hive health, hive placement and bee-friendly chemical management.

Develop training for small beekeepers

Smaller beekeepers are often not involved in providing pollination services to the horticultural industry due to a lack of skills and / or knowledge. There is the potential for these beekeepers to provide a valuable service to horticulture, particularly in peri-urban areas. To encourage their involvement in providing pollination services, training in good pollination practices for small beekeepers should be developed.

Apple blossom in southern Tasmania

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RIRDC case studies:

- Apple: Pollination Aware Case Study 2, RIRDC Publication No 10/109
- Blueberry: Pollination Aware Case Study 5, RIRDC Publication No 10/112
- Cherry: Pollination Aware Case Study 8, RIRDC Publication No 10/115

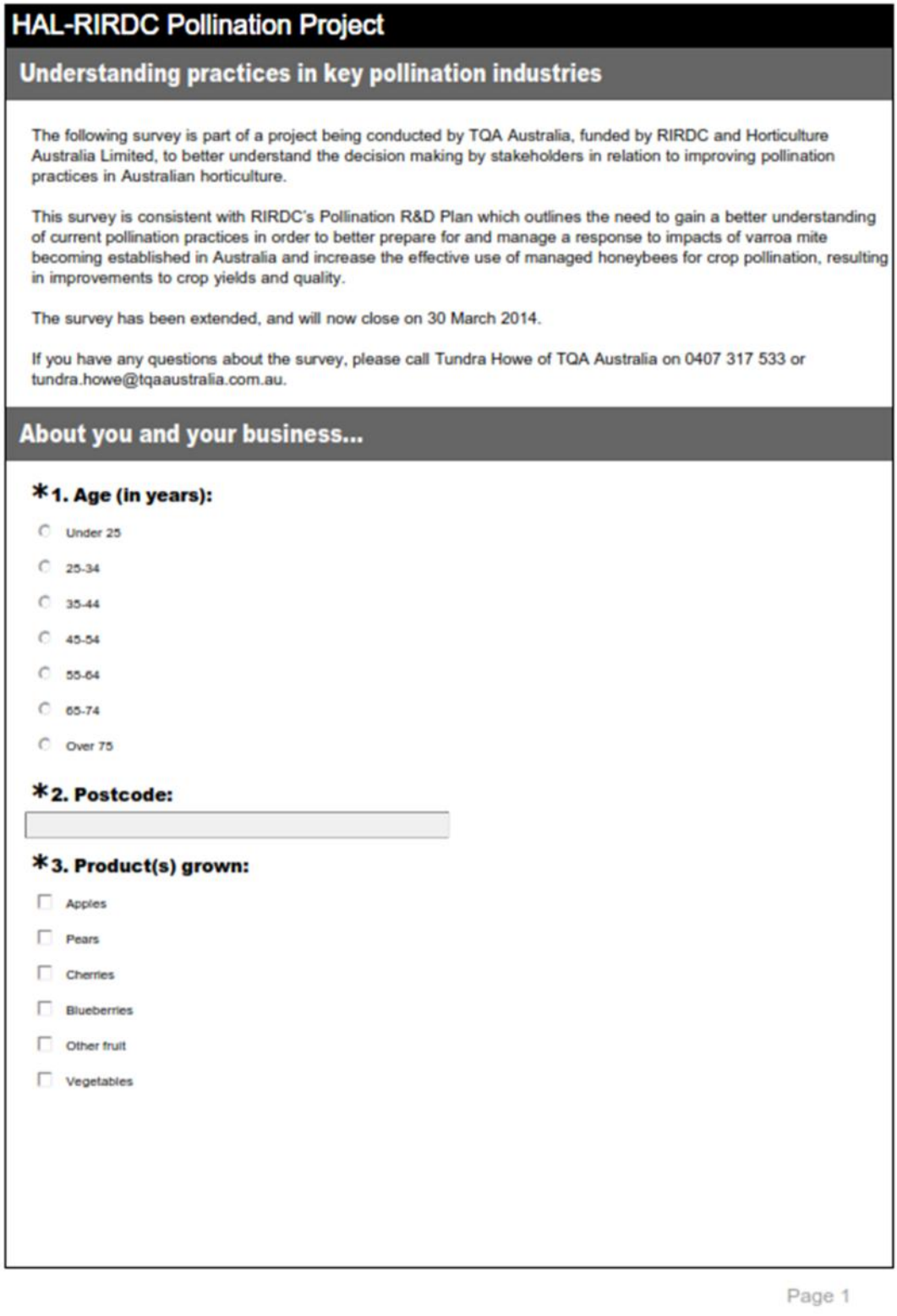
Appendices

Appendix 1 – Online survey

Appendix 2 – Graphs

Appendix 3 – Tasmanian Crop Pollinators agreement

Appendix 1 – Online survey



HAL-RIRDC Pollination Project

Understanding practices in key pollination industries

The following survey is part of a project being conducted by TQA Australia, funded by RIRDC and Horticulture Australia Limited, to better understand the decision making by stakeholders in relation to improving pollination practices in Australian horticulture.

This survey is consistent with RIRDC's Pollination R&D Plan which outlines the need to gain a better understanding of current pollination practices in order to better prepare for and manage a response to impacts of varroa mite becoming established in Australia and increase the effective use of managed honeybees for crop pollination, resulting in improvements to crop yields and quality.

The survey has been extended, and will now close on 30 March 2014.

If you have any questions about the survey, please call Tundra Howe of TQA Australia on 0407 317 533 or tundra.howe@tqaaustralia.com.au.

About you and your business...

***1. Age (in years):**

- ○ Under 25
- ○ 25-34
- ○ 35-44
- ○ 45-54
- ○ 55-64
- ○ 65-74
- ○ Over 75

***2. Postcode:**

***3. Product(s) grown:**

- ☐ Apples
- ☐ Pears
- ☐ Cherries
- ☐ Blueberries
- ☐ Other fruit
- ☐ Vegetables

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***4. Size of operation (in hectares):**

- <1
- 1-4
- 5-9
- 10-19
- 20-49
- 50-99
- 100-199
- 200-299
- 300-499
- >500

Importance of pollination...

Where space for comments has been provided, we encourage you to add any comments relevant to that question. Comments are not compulsory.

***5. How important is insect pollination to your business?**

- Essential
- Very important
- Important
- Slightly important
- Not important at all
- Don't know

Comments

HAL-RIRDC Pollination Project

***6. How important is feral (wild) honeybee pollination to the success of your crop?**

- Essential
- Very important
- Important
- Slightly important
- Not important at all
- Don't know

Comments

***7. Please rate the following statement. "Improved pollination will raise productivity in my industry".**

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree
- Don't know

Using pollination services...

***8. How often do you use commercial pollination services?**

- Always
- Sometimes
- Never

Comments

Using pollination services...

HAL-RIRDC Pollination Project

***9. What are the reasons you use commercial pollination services? Please select all that apply.**

- [ ] The benefits far outweigh the costs
- [ ] We would not produce a marketable crop without managed pollination
- [ ] Other (please specify)

***10. Do you pay to use commercial pollination services?**

- ○ Yes
- ○ No

Cost of using pollination services...

11. How much per hive do you pay?

Details of pollination services...

***12. Approximately how many hives per hectare do you use?**

***13. How did you determine this number?**

- [ ] Using my own experience
- [ ] Advice from a beekeeper
- [ ] Reading technical literature (i.e. Pollination Aware)
- [ ] Advice from a technical expert (i.e. agronomist, consultant)
- [ ] Searching the internet
- [ ] Other (please specify)

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***14. Where are the hives placed?**

- [ ] Within rows
- [ ] At the head of rows
- [ ] Other (please specify)

***15. How are the hives arranged?**

- [ ] Single hives
- [ ] In groups of less than 5 hives
- [ ] In groups of 5-10 hives
- [ ] In groups of more than 10 hives

Other (please specify)

***16. How are the hives spaced?**

- ○ Less than 150m apart
- ○ Greater than 150m apart

Comments

***17. Do you use netting in your operation?**

- ○ Yes, full netting used
- ○ Yes, partial netting used
- ○ No

Using pollination services...

HAL-RIRDC Pollination Project

***18. Does netting:**

- ○ Improve pollination outcomes
- ○ Reduce pollination effectiveness
- ○ Neither

Comments

Using pollination services...

***19. When you have hives in your orchard, how is your spraying program affected?**

- ☐ Timing of spraying altered
- ☐ Do not spray while hives in the orchard
- ☐ Does not affect spraying program
- ☐ Other (please specify)

***20. Do you deal directly with the beekeeper or do you use a third party broker of pollination services?**

- ○ Deal direct with beekeeper
- ○ Use third party broker
- ○ Other (please specify)

***21. What arrangements do you have with the beekeeper or pollination service provider?**

- ○ Verbal, no written agreement
- ○ Formal agreement, no performance standards
- ○ Formal agreement with performance standards for both parties

Comments

HAL-RIRDC Pollination Project

***22. Have you encountered any of the following issues when using beekeepers or pollination service providers?**

- [ ] Difficulty finding a beekeeper or pollination service provider
- [ ] Poor quality hives
- [ ] Hives not delivered on time
- [ ] Bees not flying under nets or tunnels
- [ ] Beekeeper or pollinators demands too high or unworkable (i.e. sprays, cost)
- [ ] Have encountered no issues
- [ ] Other (please specify)

Not using pollination services...

***23. Why don't you use commercial pollination services? Please select all that apply.**

- [ ] Feral honeybees and other pollinators provide sufficient pollination
- [ ] It does not benefit my crop
- [ ] Poor service provided by commercial pollination services
- [ ] Commercial pollination services not available in our region
- [ ] Commercial pollination services not available when we need them
- [ ] Cost is too high
- [ ] No quality standard for hive condition and pollination effectiveness
- [ ] Conflict between spraying regimes and safety of honeybees
- [ ] Other (please specify)

Potential future impacts...

***24. Do you believe that a shortage of feral or managed honeybees would have an effect on your crop / industry?**

- ○ Yes
- ○ No

Potential future impacts...

HAL-RIRDC Pollination Project

***25. Please rate the significance that a shortage of feral or managed honeybees will have on:**

	Significant effect	Some effect	Little effect	No effect
Crop quality	○	○	○	○
Crop quantity	○	○	○	○
Cost of pollination	○	○	○	○
My industry	○	○	○	○
Other horticultural industries	○	○	○	○

Comments

Skills and knowledge...

***26. How interested are you in improving your pollination-related skills and knowledge?**

- ○ Very interested
- ○ Interested
- ○ Slightly interested
- ○ Only if it is free
- ○ Not interested

***27. What ways do you prefer to gain skills and knowledge? Please select all that apply.**

- ☐ Classroom lectures
- ☐ Field days and/or workshops
- ☐ Online learning
- ☐ A combination of the above
- ☐ Other (please specify)

Further comments...

28. Do you have any further comments?

HAL-RIRDC Pollination Project

29. Would you be interested in completing a more detailed interview by phone or at your property?

If yes, please provide contact details.

Name:

Phone Number:

Respond to win a prize...

30. The first 100 people to answer this survey and provide their details will go into a draw to win an iPad mini. To enter, please provide your details below.

If you are not interested, please click 'Next' at the bottom of the page.

Details will not be provided to any other persons or organisations.

Name:

Company:

Address 1:

City/Town:

State:

Post Code:

Email Address:

Phone Number:

Thankyou

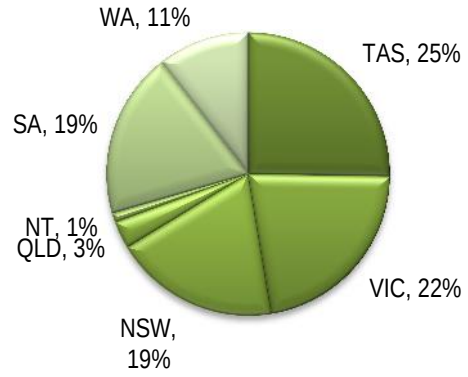
Thankyou for participating in this survey. The results of this survey and more detailed interviews will be collated into a report for Horticulture Australia Limited.

If you have any questions about the survey or the project, please don't hesitate to contact Tundra Howe of TQA Australia on 0407 317 533 or tundra.howe@tqaaustralia.com.au.

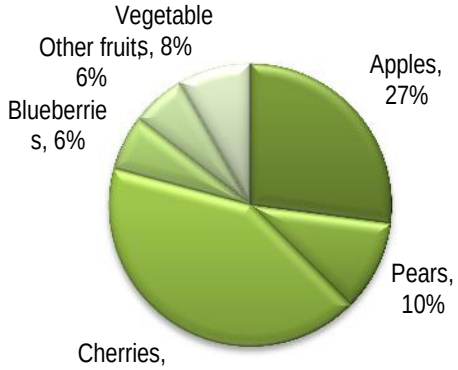
Appendix 2 – Graphs

Demographics

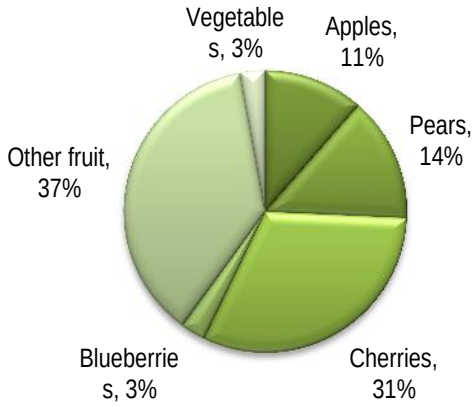
Postcode



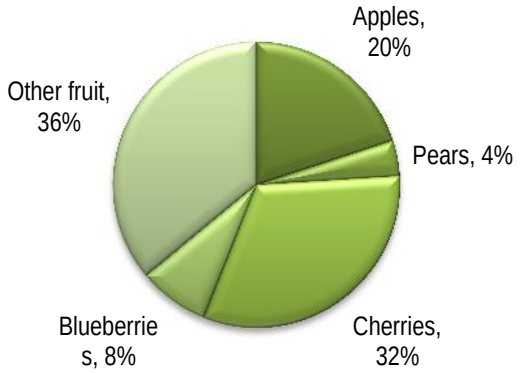
Commodity by state - TAS



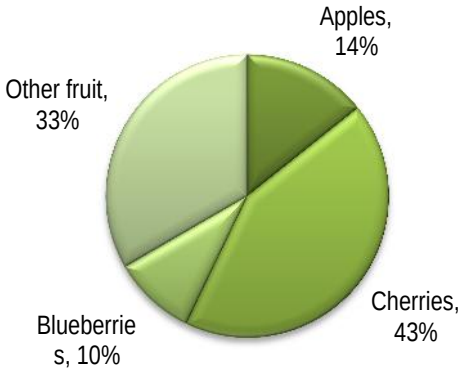
Commodity by state - VIC



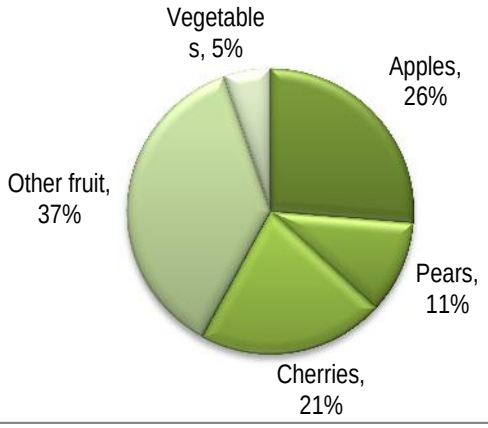
Commodity by state - NSW

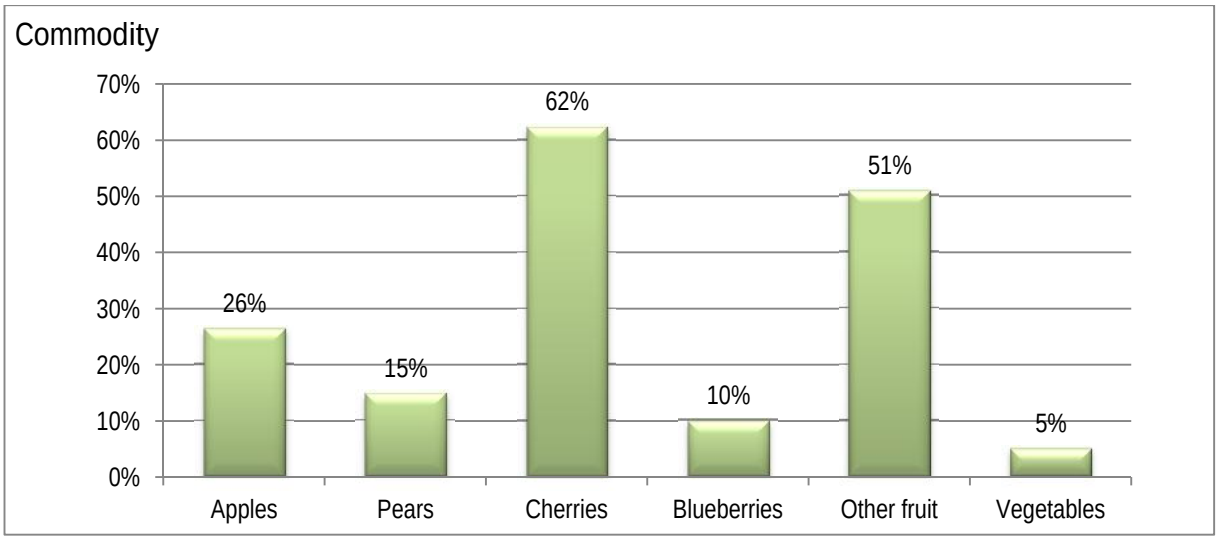


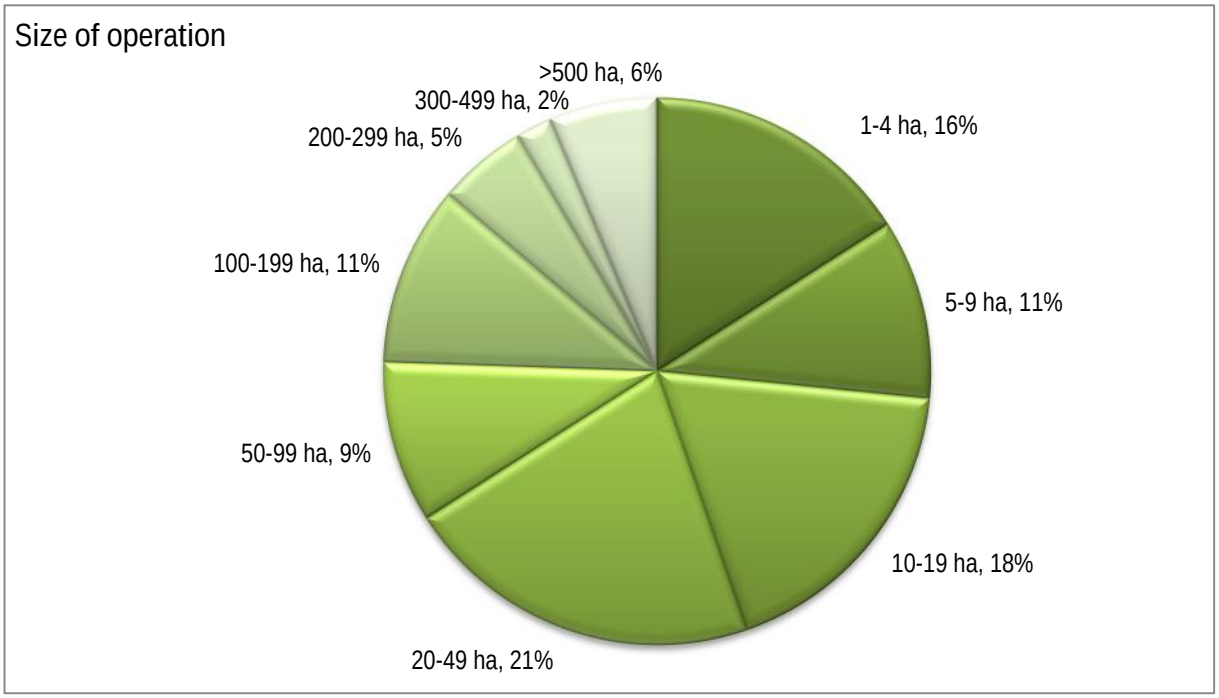
Commodity by state - SA



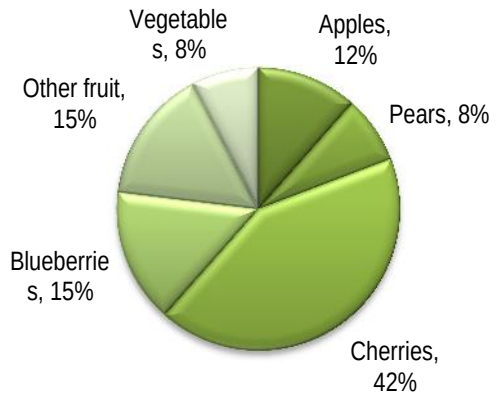
Commodity by state - WA



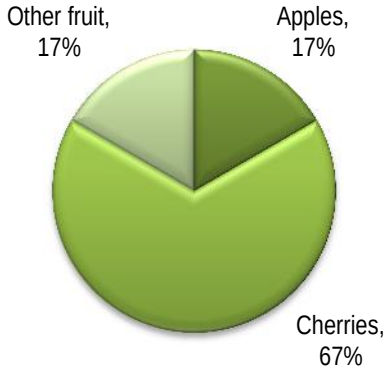

Commodity
70%
60%
50%
40%
30%
20%
10%
0%
26%
15%
62%
10%
51%
5%
Apples
Pears
Cherries
Blueberries
Other fruit
Vegetables


Size of operation
>500 ha, 6%
300-499 ha, 2%
200-299 ha, 5%
1-4 ha, 16%
100-199 ha, 11%
5-9 ha, 11%
50-99 ha, 9%
10-19 ha, 18%
20-49 ha, 21%

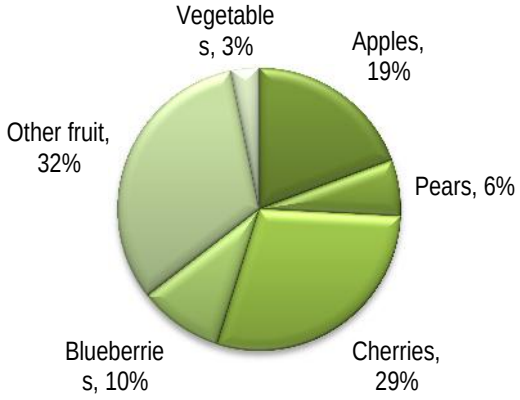
Commodity by hectares - 1-4 ha



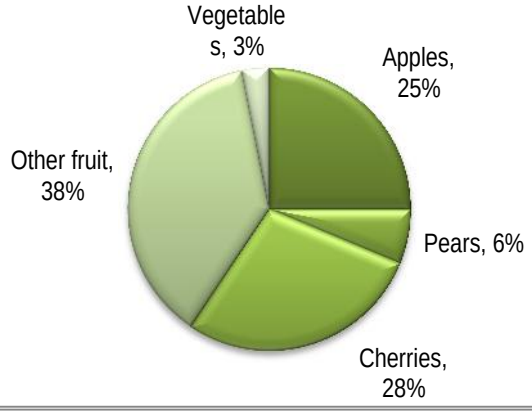
Commodity by hectares - 5-9 ha



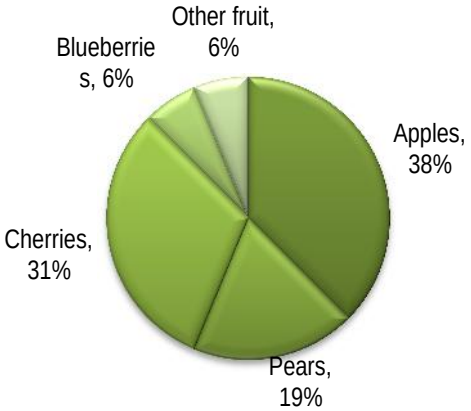
Commodity by hectares - 10 -19 ha



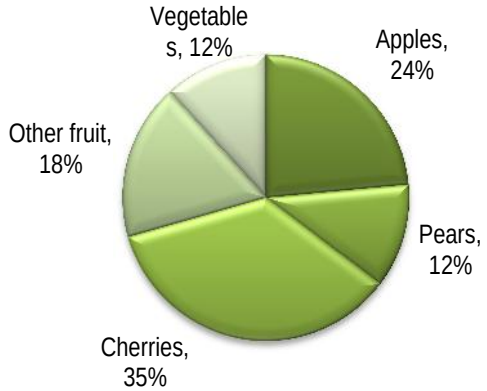
Commodity by hectares - 20-49 ha



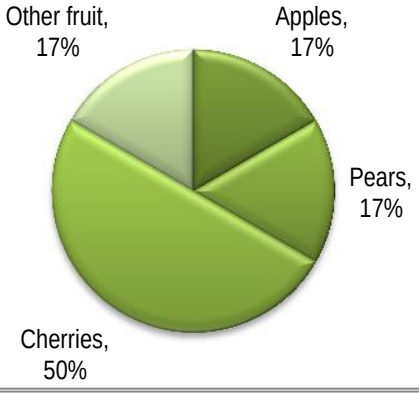
Commodity by hectares - 50-99 ha



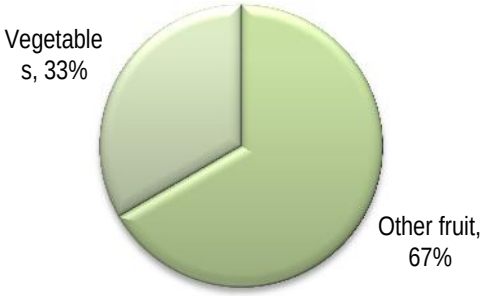
Commodity by hectares - 100-199 ha



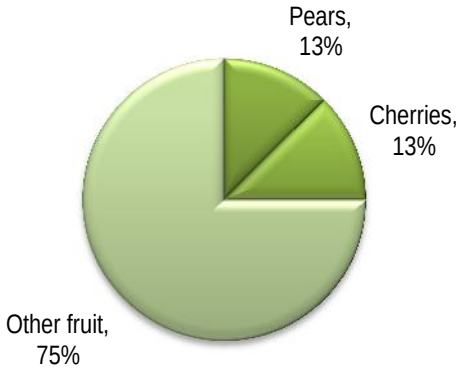
Commodity by hectares - 200-299 ha



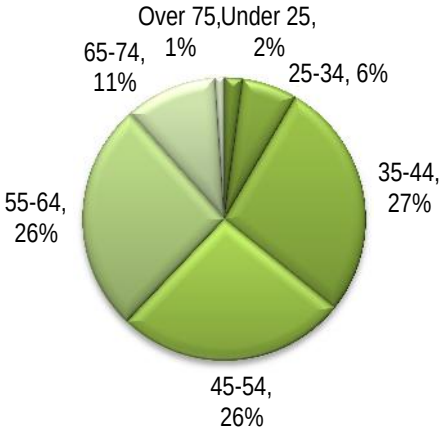
Commodity by hectares - 300-499 ha



Commodity by hectares - >500 ha

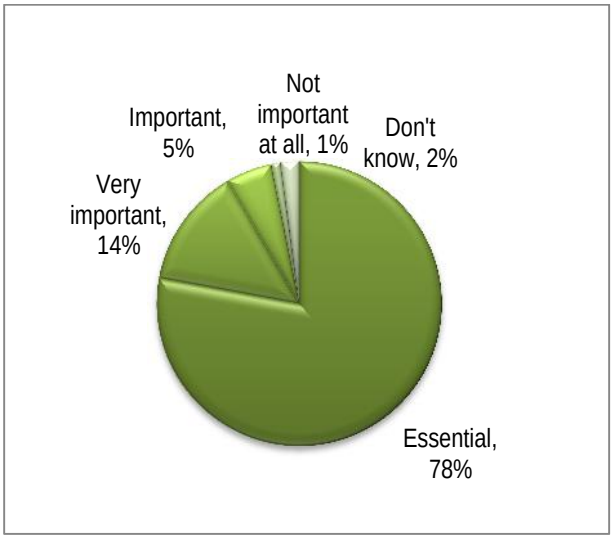


Growers' age

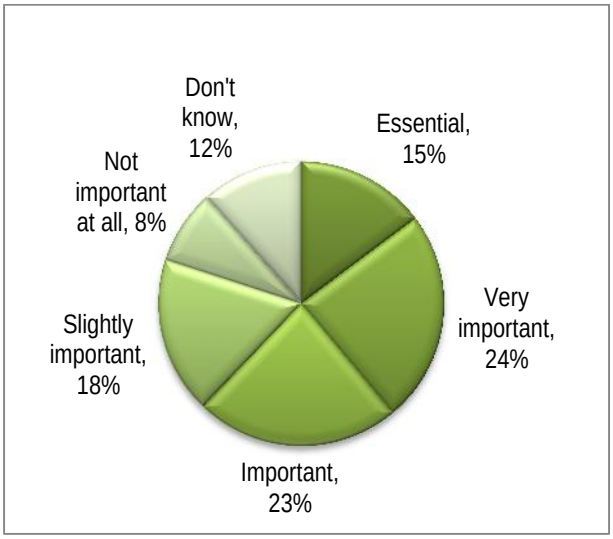


Importance of pollination

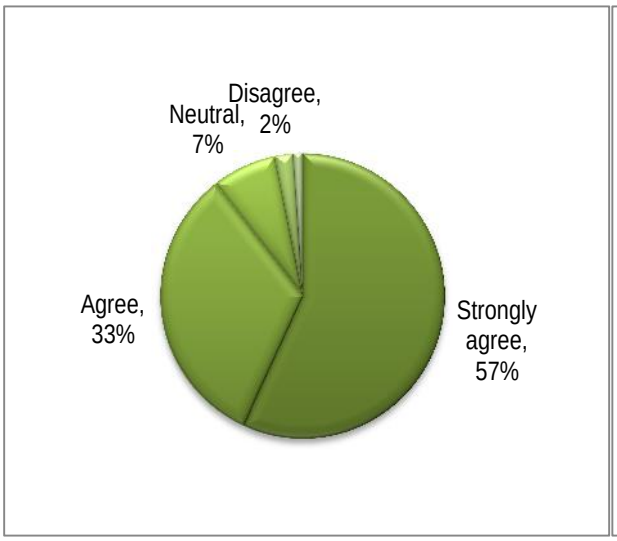
How important is insect pollination to your business?



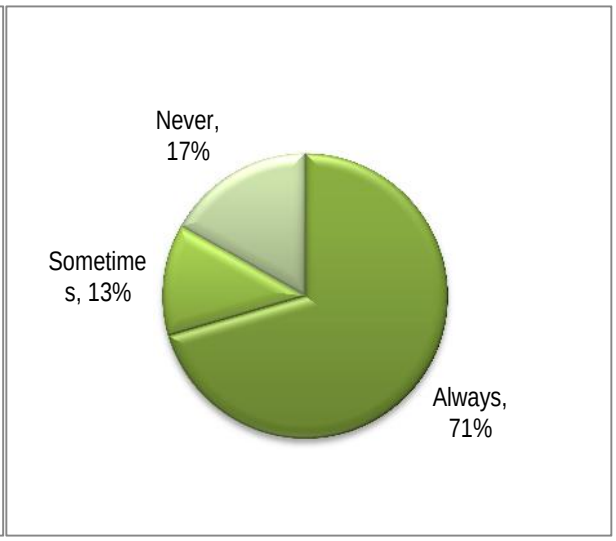
How important is feral (wild) honeybee pollination to the success of your crop?



"Improved pollination will raise productivity in my industry".

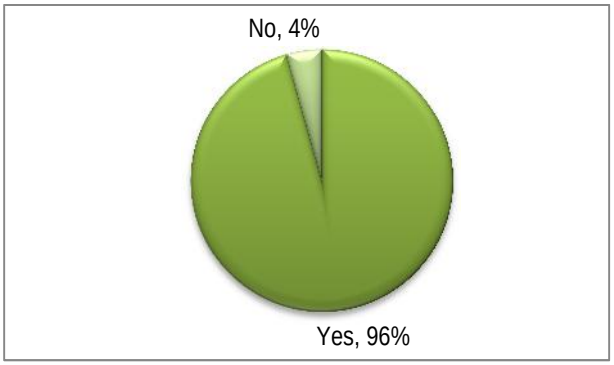


How often do you use commercial pollination services?



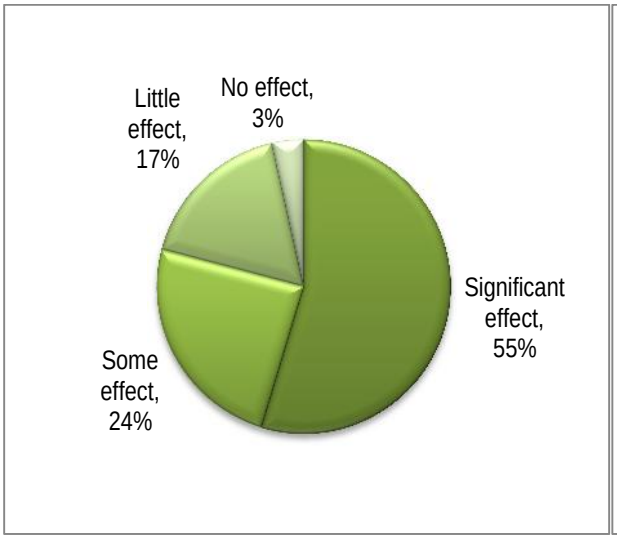
Potential effects of a shortage of feral or managed honeybees

Do you believe that a shortage of feral or managed honeybees would have an effect on your crop / industry?

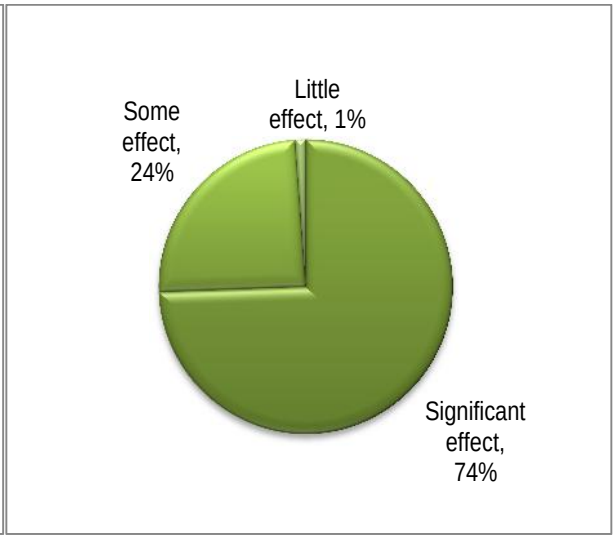


Please rate the significance that a shortage of feral or managed honeybees will have on:

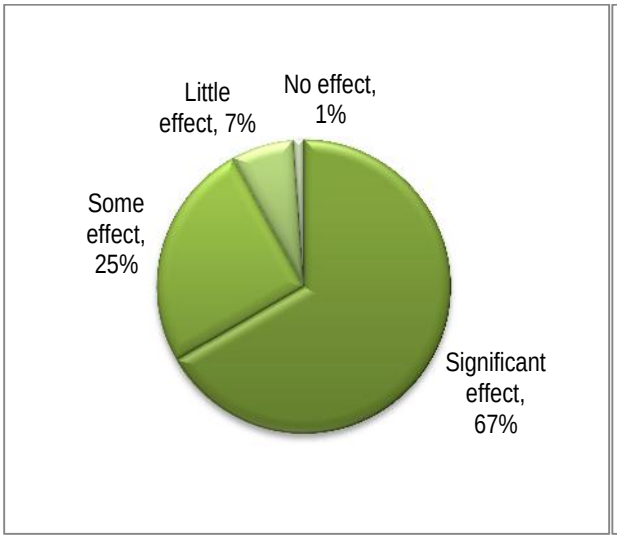
Crop quality



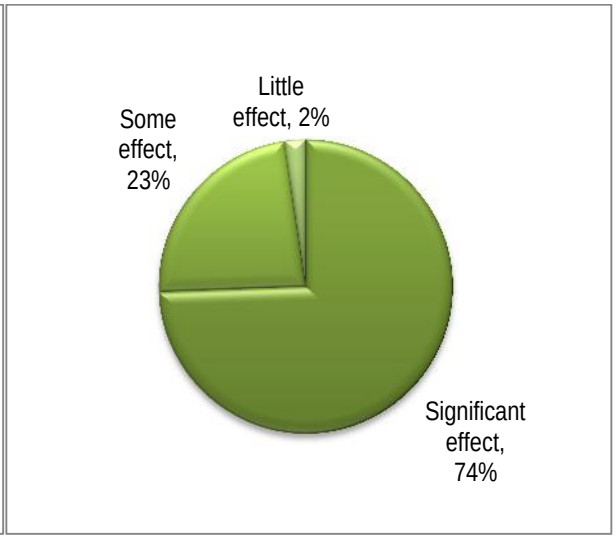
Crop quantity



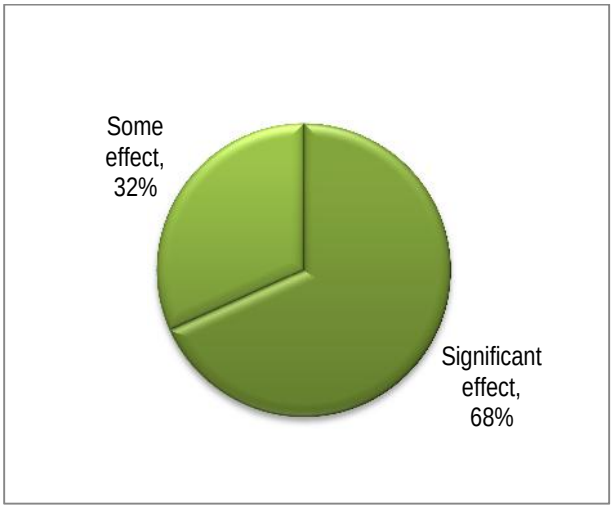
Cost of pollination



My industry

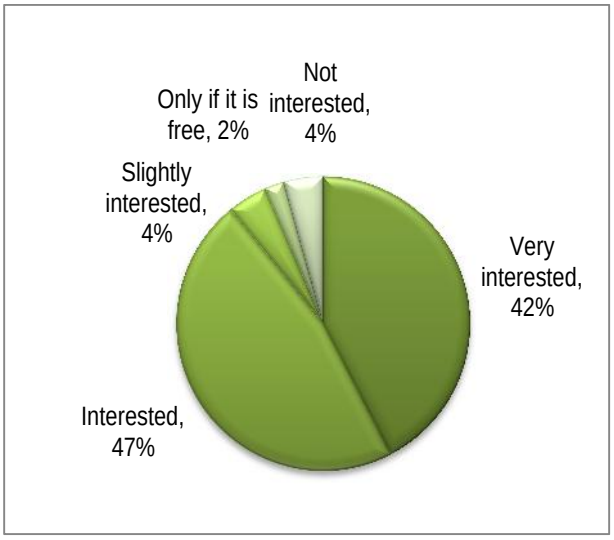


Other horticultural industries

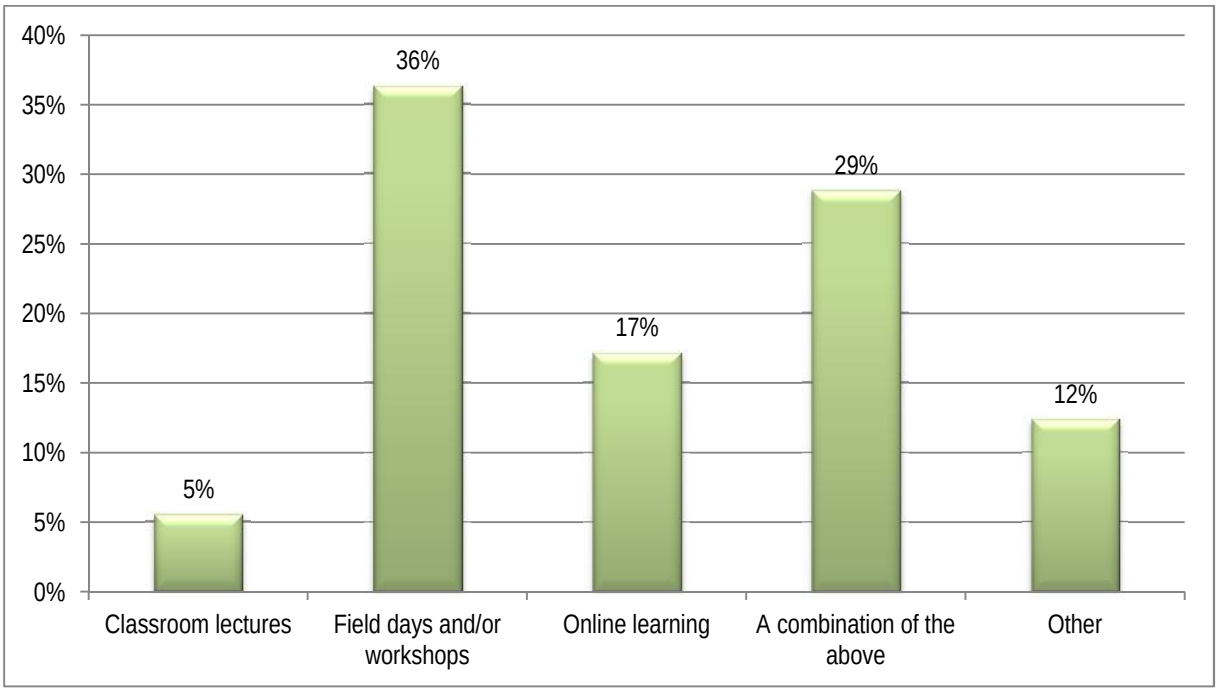


Improving skills and knowledge

How interested are you in improving your pollination-related skills and knowledge?

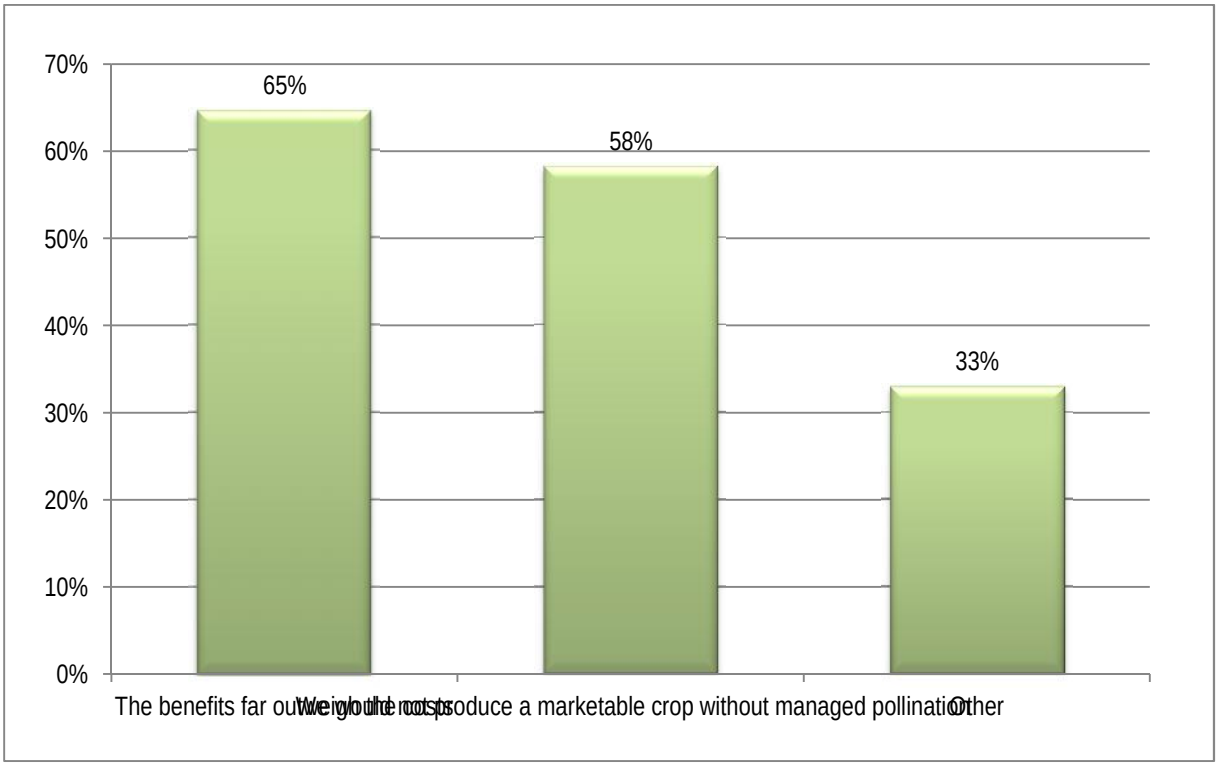


What ways do you prefer to gain skills and knowledge?

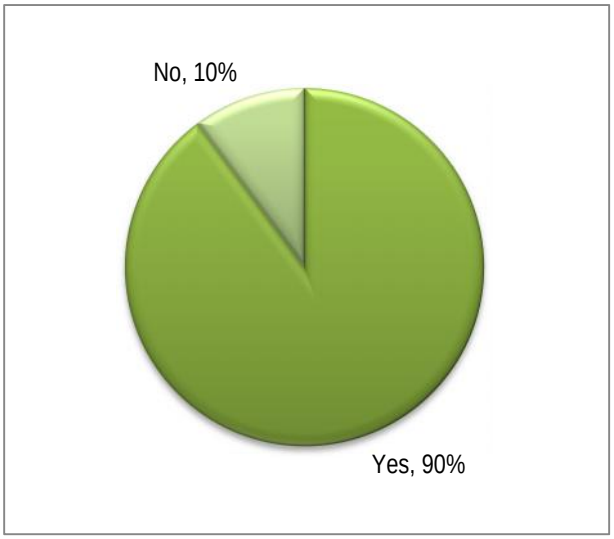


Using pollination services

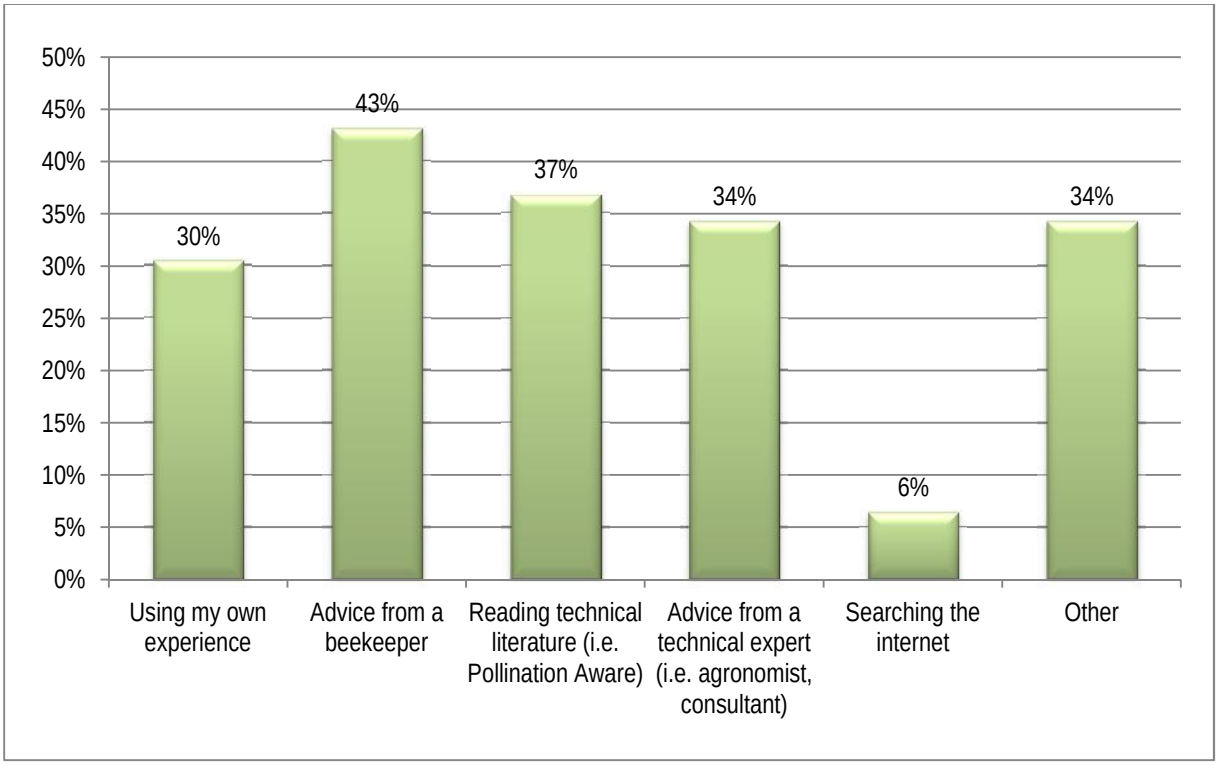
What are the reasons you use commercial pollination services?



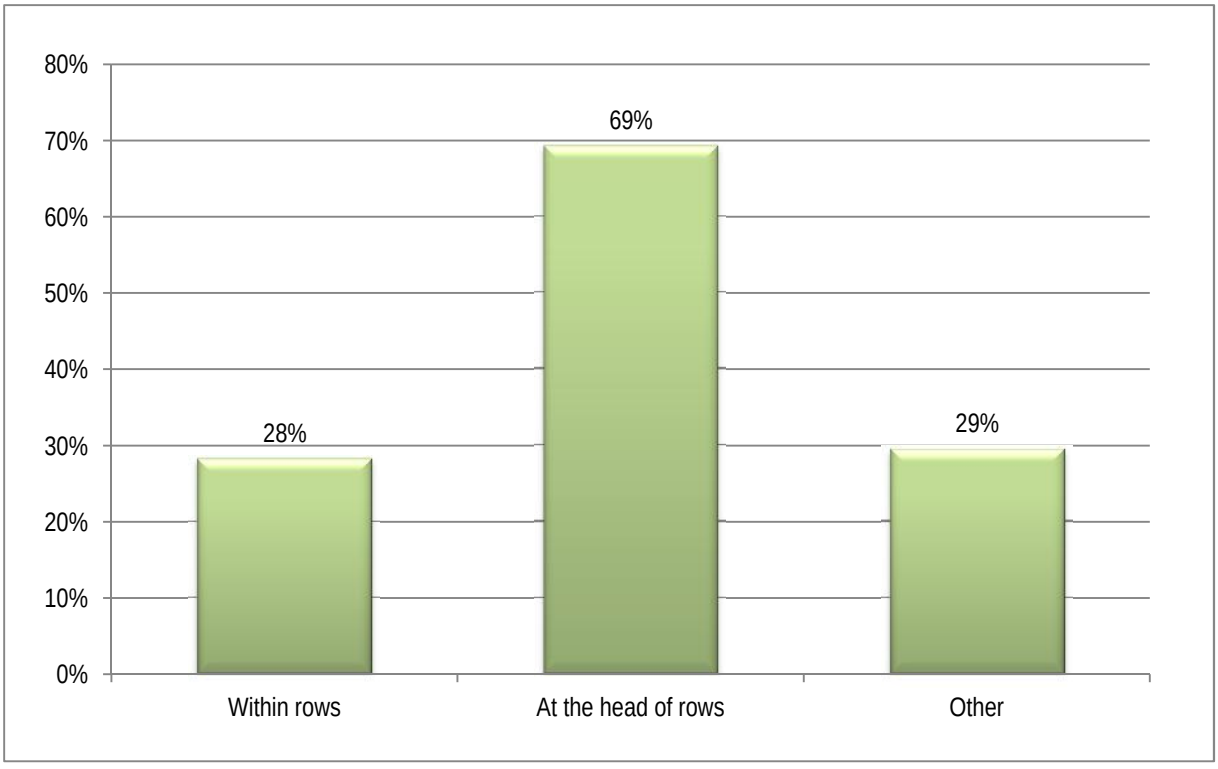
Do you pay to use commercial pollination services?



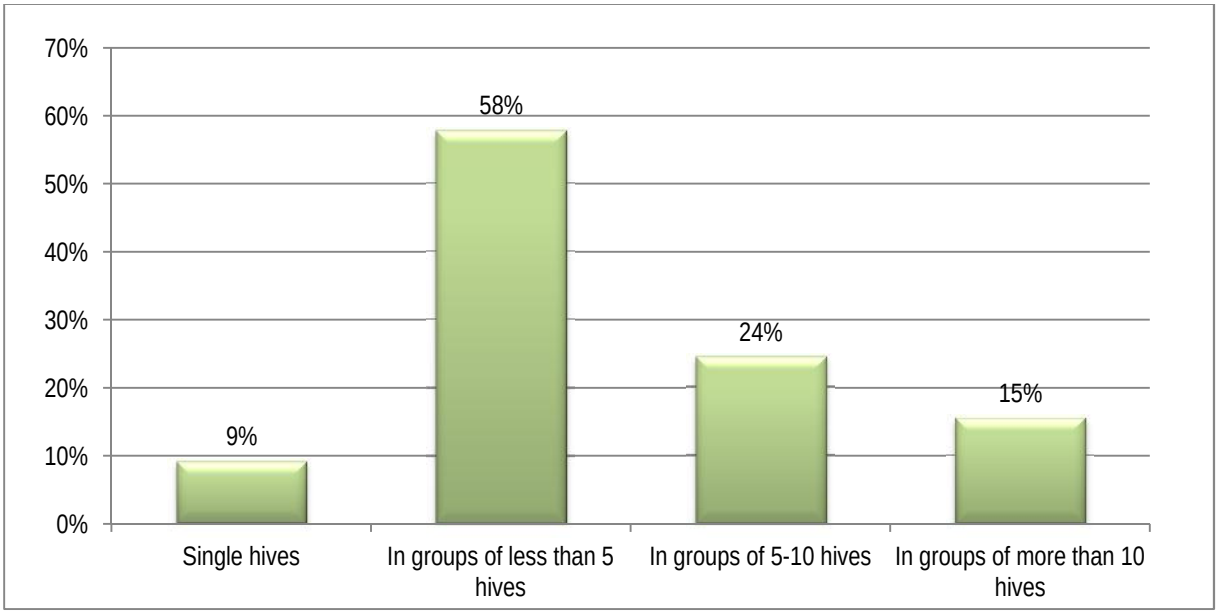
How did you determine this number?



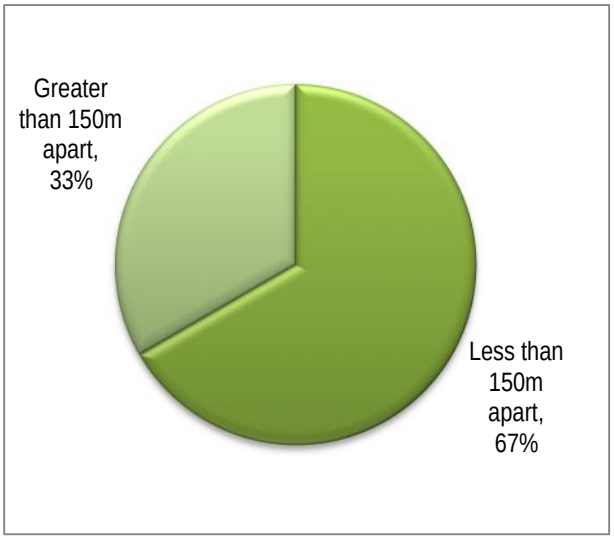
How are the hives placed?



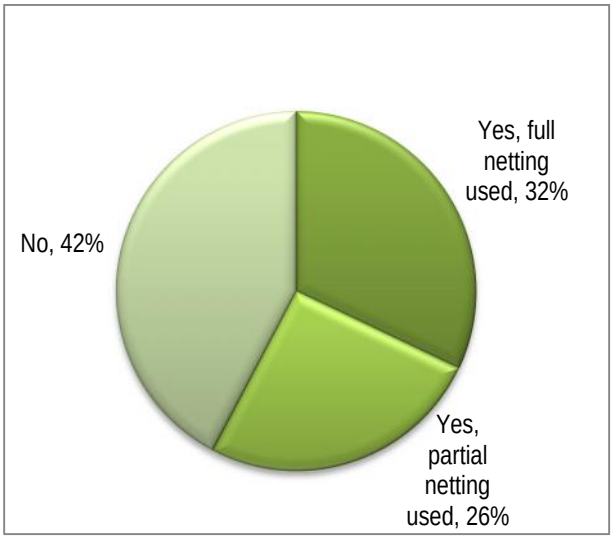
How are the hives arranged?



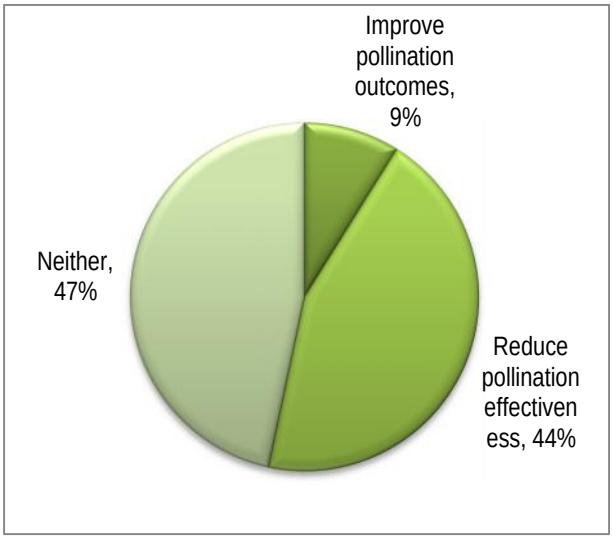
How are the hives spaced?



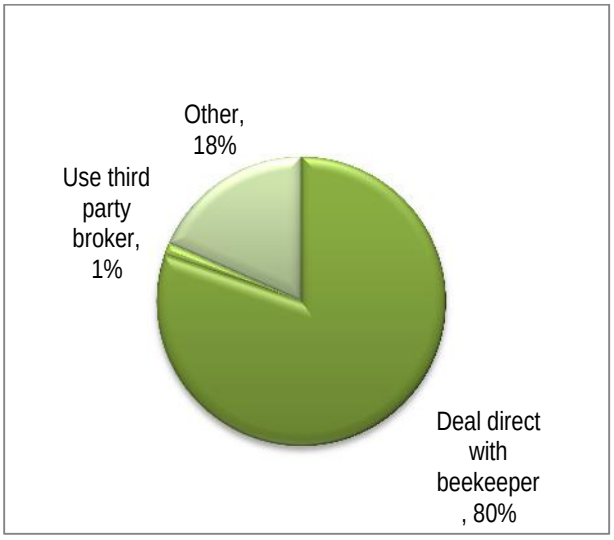
Do you use netting in your operation?



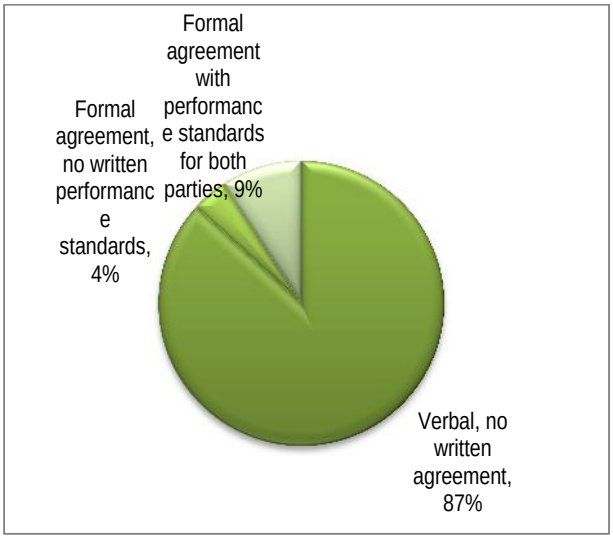
Does netting:



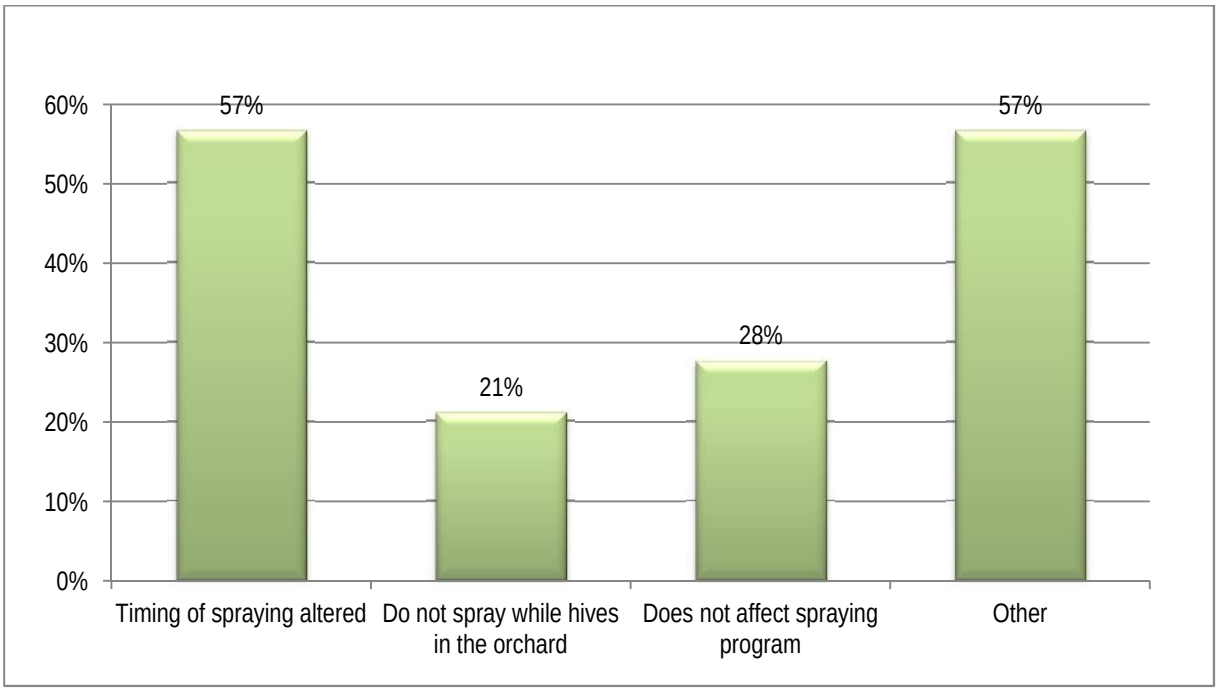
Do you deal directly with the beekeeper or do you use a third party broker of pollination services?



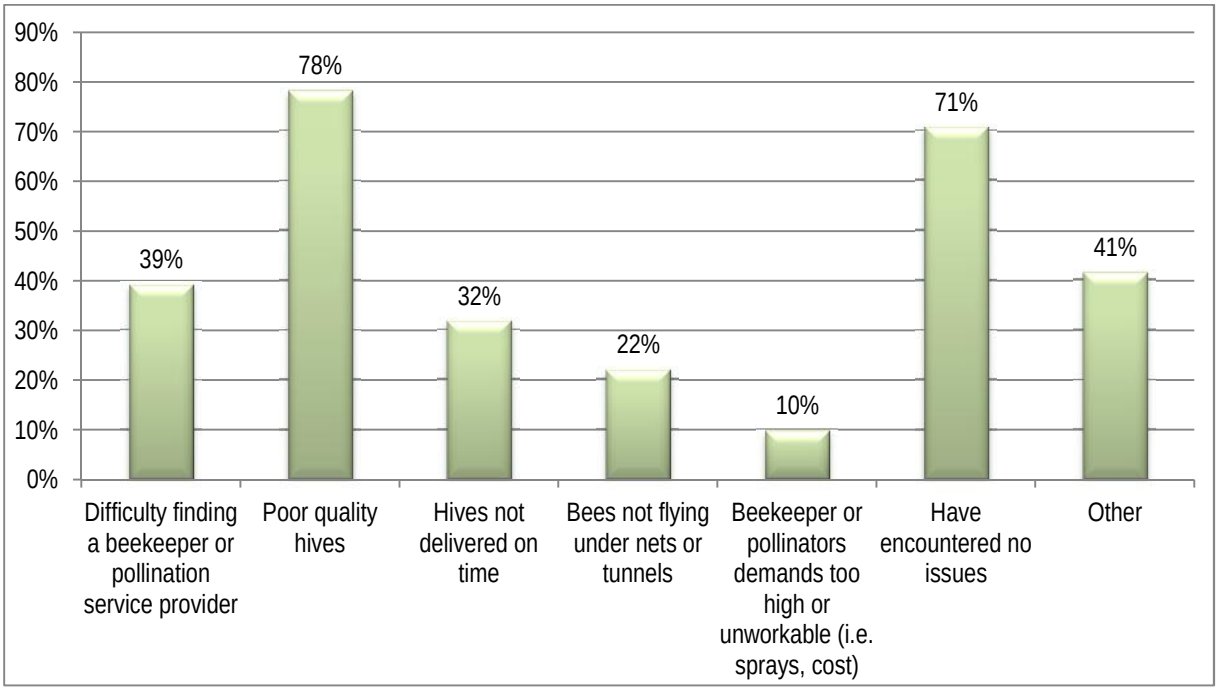
What arrangements do you have with the beekeeper or pollination service provider?



When you have hives in your orchard, how is your spraying program affected?

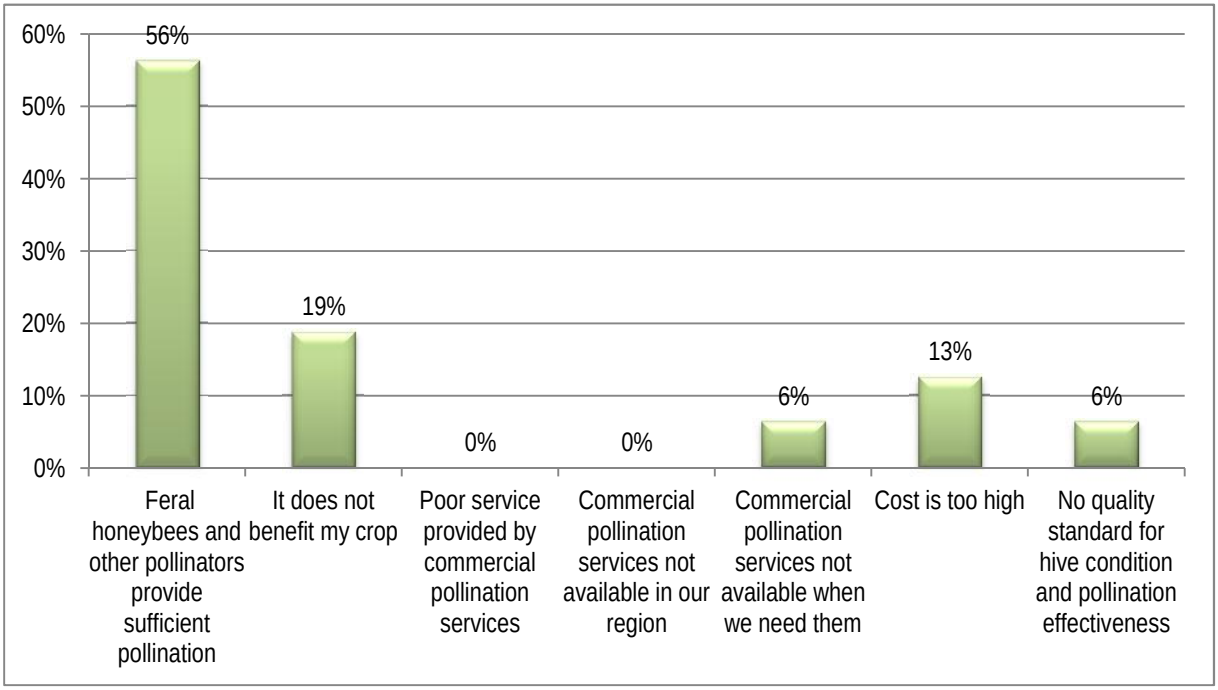


Have you encountered any of the following issues when using beekeepers or pollination service providers?



Not using pollination services

Why don't you use commercial pollination services?



Appendix 3 – Tasmanian Crop Pollinators agreement

Appendix 2
Grower's Copy

POLLINATION AGREEMENT

THIS AGREEMENT is made this _____ day of _____ 20____,

Between _____ of _____,
(Pollination Provider)

and _____ of _____,
(Grower).

TERMS OF AGREEMENT. The Pollination Provider agrees to supply to the Grower

_____hives at the cost of $ _____ **(plus GST)** per hive, for____days/weeks, under the

following conditions:

Pollination Provider shall:

(a) Supply hive/hives containing a minimum of ____ (as per code of practice).

(b) Supply hive/hives free of disease.

(c) Place hives in position decided in previous consultation with the Grower.

(d) Leave all gates as they are found.

(e) To deliver hives within _____hours of confirmation.

(f) To facilitate a hive inspection within 48 hours of request by the Grower.

(g) To supply within 24 hours additional hive/hives to compensate for any hives found to be below minimum standard at no extra cost to the Grower.

(h) To carry public liability insurance.

The Grower shall:

(a) To liaise with the Pollination Provider well in advance of delivery of hives and allow the Pollination Provider prior inspection of orchard in daylight.

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(b) To provide suitable place to locate the hives as previously agreed with the Pollination Provider.

(c) To allow the Pollination Provider entry onto the property whenever necessary to service the bees.

(d) To give the Pollination Provider at least _____ hours notice that bees are required to be placed in orchard.

(e) Not to shift or examine hive/hives without the Pollination Provider's approval.

(f) To give the Pollination Provider at least _____ hours notice to remove hive/hives from orchard.

(g) To advise the Pollination Provider of any spray program and be prepared to give hours notice of the intent to spray.

(h) To accept liability for damage to hive/hives from livestock, vandalism and/or spray damage.

(i) To pay the agreed hive services rental within the time specified on the invoice/account. Interest may be charged on overdue accounts.

Arbitration:

If the Grower is dissatisfied with the quality of hives supplied his first recourse shall be to the Pollination Provider. Such complaints shall be lodged as soon as possible and in no case after the hives are removed from the orchard.

In the event of any unsettled dispute between the Pollination Provider and the Grower, both parties agree to abide by any decision of an Arbitration Committee, composed of one Beekeeper appointed by the Tasmanian Crop Pollination Association, one Grower appointed by Fruit, Vegetable or Seed Growers and one other mutually agreed to by the Beekeeper and Grower representatives.

Signed:_____Provider

Address:_____

Signed:_____Grower

Address:_____

Appendix 3
Beekeeper's Copy

POLLINATION AGREEMENT

THIS AGREEMENT is made this _____ day of _____ 20____.

Between _____ of _____,
(Pollination Provider)

and _____ of _____,
(Grower).

TERMS OF AGREEMENT. The Pollination Provider agrees to supply to the Grower

_____hives at the cost of $ _____ **(plus GST)** per hive, for____days/weeks, under the

following conditions:

Pollination Provider shall:

(a) Supply hive/hives containing a minimum of …….. (as per code of practice).

(b) Supply hive/hives free of disease.

(c) Place hives in position decided in previous consultation with the Grower.

(d) Leave all gates as they are found.

(e) To deliver hives within _____hours of confirmation.

(f) To facilitate a hive inspection within 48 hours of request by the Grower.

(g) To supply within 24 hours additional hive/hives to compensate for any hives found to be below minimum standard at no extra cost to the Grower.

(h) To carry public liability insurance.

The Grower shall:

(a) To liaise with the Pollination Provider well in advance of delivery of hives and allow the Pollination Provider prior inspection of orchard in daylight.

(b) To provide suitable place to locate the hives as previously agreed with the Pollination Provider.

(c) To allow the Pollination Provider entry onto the property whenever necessary to service the bees.

(d) To give the Pollination Provider at least _____ hours notice that bees are required to be placed in orchard.

(e) Not to shift or examine hive/hives without the Pollination Provider's approval.

(f) To give the Pollination Provider at least _____ hours notice to remove hive/hives from orchard.

(g) To advise the Pollination Provider of any spray program and be prepared to give hours notice of the intent to spray.

(h) To accept liability for damage to hive/hives from livestock, vandalism and/or spray damage.

(i) To pay the agreed hive services rental within the time specified on the invoice/account. Interest may be charged on overdue accounts.

Arbitration:

If the Grower is dissatisfied with the quality of hives supplied his first recourse shall be to the Pollination Provider. Such complaints shall be lodged as soon as possible and in no case after the hives are removed from the orchard.

In the event of any unsettled dispute between the Pollination Provider and the Grower, both parties agree to abide by any decision of an Arbitration Committee, composed of one Beekeeper appointed by the Tasmanian Crop Pollination Association, one Grower appointed by Fruit, Vegetable or Seed Growers and one other mutually agreed to by the Beekeeper and Grower representatives.

Signed:_____Provider

Address:_____

Signed:_____Grower

Address:_____