

Australian avocados... green by nature? Environmental stocktake of the Avocado industry

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TQA Australia

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Australian avocados... green by nature?

An environmental stocktake of the Australian avocado industry

HAL project AV08001

September 2009

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Executive summary

This project identifies for the avocado industry the current level of understanding and implementation of environmentally responsible agricultural practices among growers. It also provides complementary and contextual information relating to community attitudes and chemical residues from which to consider the results. Information was collected through surveys and interviews of 328 growers, representing around 40% of the industry. Involvement in the-survey process alone has helped raise the environmental awareness of all participating growers.

Avocados are generally grown in porous soil and, where water availability allows, good groundcover is established in orchards. Together this ensures that erosion is not a significant environmental hazard associated with growing avocados in Australia. In those areas where the risk of soil erosion is higher, it is being well managed through proper drainage.

Soil structural decline which has the potential to cause compaction, increased run-off and nutrient depletion is largely being prevented through nutrient application based on leaf and/or soil testing, the maintenance of permanent groundcover, as well as the minimum tillage practices that are associated with most tree crops. Soil acidity, alkalinity and sodicity are not significant issues for most avocado orchards.

Most growers implement some form of soil moisture monitoring and the use of micro irrigation is widespread. Efficient water use is something that the industry does particularly well.

Most growers are independently audited and certified to various quality assurance (QA) standards demanded by their customers. As a result, most orchards have reasonable chemical storage and at least one person on most farms has completed recognised chemical users training. It should be noted however that the chemical storage and training requirements of some QA standards, whilst reflecting a reasonable degree of storage in terms of food safety and OHS, do not necessarily address *best practice* with regards to responsible environmental management. Further, in some instances the standard required under QA does not meet the standard required under legislation. Despite this, most chemical storage areas on avocado farms are secure and structurally sound. Many avocado growers use little or no pesticides/herbicides. Those that do are generally aware of the risks associated with chemicals and use them responsibly. The industry's reliance on endosulfan to control Spotting Bug is a significant environmental issue which needs to be addressed

while recognising that this chemical is currently the most appropriate means of controlling this pest. Breaches of legal limits for chemical and heavy metal residues are very uncommon, which is a reliable indicator of responsible chemical use among Australian avocado growers. The industry should note that the trend among international markets is for zero tolerance of chemical residues in produce. Chemical residue detection (within the legal limits) in avocados is common, as it is in any horticultural products.

Opportunities exist for increased adoption of Integrated Pest Management principles, particularly for phytophthora control for which there is currently a reliance on phosphoric acid. Although the issue is being reasonably well managed at present, there is also a need among growers for guidance on *best practice* disposal of post harvest chemicals. An opportunity also exists to improve the preparedness of growers for a chemical spill, an event which few avocado growers are currently prepared for or equipped to deal with.

Australian avocado growers generally store and apply nutrients responsibly. It is common for growers to seek independent recommendations on nutrient levels based on soil and/or leaf testing. There is however room for improvement in the area of nutrient application among growers that only do soil or leaf testing; best practice is to use a combination of both methods. There is also an opportunity to improve the practices of those growers who use animal manures and composts, as many of them do not test the nutrient content of those products prior to application. Nutrient loss to the environment is an issue which is becoming increasingly monitored and regulated by government, particularly in Queensland. The industry may therefore consider a program of nutrient loss monitoring in order to provide scientific evidence to support the findings in this report.

Generally, areas of biodiversity such as creeks and areas of native vegetation are valued by those avocado growers who have them on their property. Many of these growers are committed to protecting or improving these areas. Often these areas, combined with the scenery of the avocado orchard itself, add considerably to the scenic amenity of the areas in which the orchards are located. This is particularly noticeable around Pemberton in Western Australia and the Sunshine Coast and Mt Tamborine in Queensland. There is an opportunity however for increased awareness of declared weeds and the responsibilities associated with managing them. Unless managed appropriately, declared weeds can degrade biodiversity values.

Most avocado growers are committed to recycling where the facility is available, however an opportunity exists for increased awareness of the local facilities offered for recycling.

The creation of dust, smoke and noise is not a significant environmental hazard associated with avocado orchards. Where the risk of this occurring is significant, most growers are managing this responsibly by notifying neighbours and/or giving careful consideration as to the timing of the activities responsible for dust, smoke and noise.

Regular machinery maintenance, carefully planned machinery use and the adoption of renewable energy all lead to improved energy efficiency. In addition to the environmental benefits associated with this, the potential exists for cost reduction. This is an area that many growers are interested in. Whilst most avocado growers implement some form of improving energy efficiency, the opportunity exists to investigate the environmental and financial cost/benefit associated with less commonly implemented measures.

Most avocado growers have not accessed government funding or participated in programs to help them manage the environment on their farm. Many of those that have participated in programs reported a negative experience. In order to increase participation in these opportunities, the industry needs to overcome the issues of red tape and perceived irrelevance, and consideration needs to be given to methods for making opportunities more readily identifiable and accessible by or on behalf of growers.

Whilst avocado growers have a reasonable understanding of the good agricultural practices that contribute to responsible environmental management, there is the need for a simple checklist that growers can use to informally monitor their performance. This should be an industry specific, accessible, quick reference guide containing a few memorable key messages, as opposed to the hefty volumes in existence.

The community attitudes survey conducted in the Bundaberg region suggests that the impacts that fruit growing can have on the environment and on human health in particular are an important concern for most people. With the exception of farm chemical use however, non-environmental issues such as food quality and price were more commonly identified as causes of concern than were environmental issues such as land clearing, water use efficiency and biodiversity. Whilst reduced environmental impacts should be the goal of all Australians, including avocado growers, the drivers for such goals need to be monitored regularly and understood rather than being assumed, as a failure to do so could lead to costly and ineffective investment decisions by industry.

The long term nature of the crop and the locations in which avocados are grown contribute to avocado growing having less environmental impacts associated with it than does the

growing of other horticultural produce. Where environmental hazards specific to avocado growing do exist, growers are generally managing them reasonably to very well, depending on the region and the specific issue. Responsible environmental management involves a process of continual improvement, and this report contains recommendations for the industry's consideration. The existing level of industry skills and knowledge, the healthy state of most avocado orchards, the positive attitude of most growers and the proactive approach already demonstrated by Avocados Australia will help the industry to embrace continual improvement and to secure its reputation as an environmentally sustainable provider of food for Australian and international consumers.

Abbreviations and acronyms

CEO	Chief Executive Officer
EPA	Environmental Protection Agency
HACCP	Hazard Analysis Critical Control Point. An internationally recognised risk assessment method commonly used to manage food safety and quality.
HAL	Horticulture Australia Limited
NSW	New South Wales
ML	Maximum Level. The amount of a heavy metal legally allowed in produce.
MRL	Maximum Residue Limit. The amount of chemical residue legally allowed in produce.
QA	Quality Assurance
QLD	Queensland
QPIF	Queensland Primary Industries and Fisheries, a division of the Department of Employment, Economic Development and Innovation.
R and D	Research and Development
SQF	Safe Quality Food. An international food safety and quality standard.
VIC	Victoria
WA	Western Australia
WQA	Woolworths Quality Assurance.

Background

The avocado industry identified the need for an environmental audit¹ in its 2005 Strategic Plan. The purpose of conducting an environmental audit was to provide the avocado industry with data to support its management of natural resources, to demonstrate those practices to interested parties and to identify opportunities for improving on farm practices. This goal was in line with Horticulture Australia Limited's (HAL) research and development priorities which include:

- positioning agriculture as a good environmental steward;
- meeting the requirements of consumers and key customers; and
- enhancing the efficiency, responsiveness and product integrity of the supply chain.

The environmental audit was also in line with the Australian Government's Rural Research and Development Priorities, which include:

- Supply Chain and Markets; Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.
- Supporting the Rural Research and Development Priorities; Improve the skills to undertake research and apply its findings.
- Natural Resource Management; Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable.

TQA Australia was engaged by HAL to undertake this project. The avocado industry was represented by Avocados Australia through all stages of project development and implementation. TQA Australia's initial meeting with Avocados Australia was held in August 2008 and the project was completed in September 2009.

Environmental issues are increasingly important to both primary producers and the community in general. All of the major avocado growing regions in Australia have well publicised environmental issues. They are:

¹ The project team decided to use the term 'environmental stock take' to describe the process of collecting industry wide environmental data, as opposed to the term 'environmental audit'.

Tri State

- Salinity in the Murray Darling Basin.
- Water availability.

South-West Western Australia

- Tension between vineyard operators and other land users with regard to burning off (potential to cause smoke taint in grapes) and spray drift.
- Increased area-reliance on ecotourism applying pressure on agriculture.

Northern Queensland

- The potential for agricultural silt, chemical and nutrients to contaminate the Great Barrier Reef.

Bundaberg region

- Water quality and availability.
- Peri-urban conflict (predominantly spray drift).

South-East and Southern Queensland

- Peri-urban conflict (predominantly spray drift).
- Potential for agriculture to negatively impact regional biodiversity and specifically the water quality in Ramsar listed wetlands.

Northern New South Wales

- Peri-urban conflict (predominantly spray drift).

Central New South Wales

- Potential for agriculture to negatively impact the Gosford-area water catchment.
- Increased area-reliance on ecotourism applying pressure on agriculture.

It is intended that this report will help address these issues and prevent similar issues developing in the future.

Objective

To determine the current level of understanding and implementation of environmentally responsible agricultural practices among Australian avocado growers.

Methodology

Formation of the project team

The project was developed and managed by Daryl Connelly of TQA Australia. Queensland Primary Industries and Fisheries (QPIF) staff were sub contracted by TQA Australia to assist with this project and to ensure that the project team had the right combination of management skills, technical expertise and industry experience necessary to complete the task. Simon Newett (QPIF) brought a wealth of avocado related experience to the project

and John Bagshaw (QPIF) provided a sound understanding of on farm environmental issues, and an ability to work closely with farmers to understand their knowledge-base and practices. Antony Allen, CEO of Avocados Australia provided input into the project design and helped the project team make contact with avocado growers.

Identification of environmental hazards and associated good agricultural practices

The HAL Guidelines for Environmental Assurance in Australian Horticulture were used to ensure that a consistent approach to hazard identification was applied in this project. The good agricultural practices recommended in the guidelines were adapted where necessary to ensure relevance to avocado growing. This allowed the project team to develop a list of responsible environmental management best practices in avocado orchards which was then finetuned in consultation with growers.

Comprehensive e-survey

An e-survey was developed containing 44 questions directly related to whether or not the grower implemented a given good agricultural practice. For each question the grower was required to answer 'yes', 'no', 'sometimes' or 'not applicable' and also to select from 'A greater understanding of this topic is needed' or 'A greater understanding of this topic is not needed'. In addition to the 44 questions addressing good agricultural practices, the e-survey contained a number of questions relating to the demographics of the grower and their attitude towards environmental management. A link to the e-survey was emailed to all growers on Avocado Australia's database, along with an explanation from Avocados Australia. A total of 67 growers responded to the e-survey.

Mail-out survey

The project team used the e-survey results to identify topics where further investigation was required to verify and/or better understand the information collected. A mail-out survey was developed containing 14 questions directly related to good agricultural practices and a further 2 questions relating to the demographics of the grower. In general the results from both survey formats were consistent. Where significant variations existed, this has been highlighted. The mail-out survey was sent to all growers on Avocados Australia's database, along with an explanatory letter. Both the e-survey and the mail-out survey were completed anonymously. To avoid duplication of answers, growers were asked not to complete the mail-out survey if they had already responded to the e-survey. A total of 219 growers responded to the mail-out survey.

Verification through on-farm visits

On-farm visits were conducted with 43 growers across all of the major avocado growing regions in Australia. The visits were scheduled to be representative of the number of growers in that region. A prompt sheet was developed to collect information on the key issues under investigation. The main purpose of the interviews was to ensure accurate interpretation of the-survey data.

Community attitudes survey

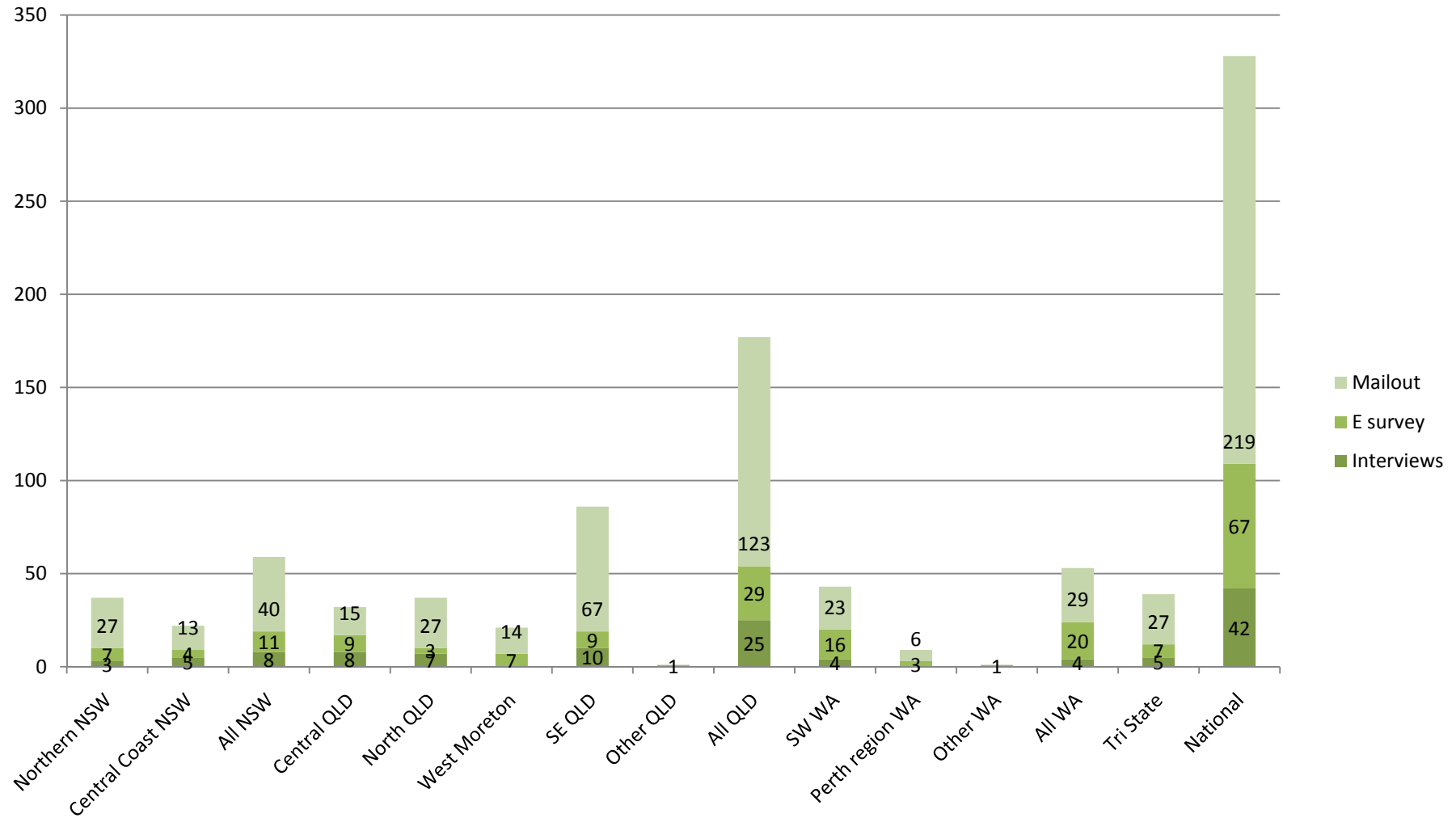
The QPIF Business Information Centre (call centre) was sub-contracted to complete a phone-survey of 100 members of the Bundaberg community in order to gauge consumer attitudes towards fruit growers. Avocados were not specifically mentioned by the interviewer to avoid potential skewing of the-survey results.

Analysis of chemical residue and heavy metals data

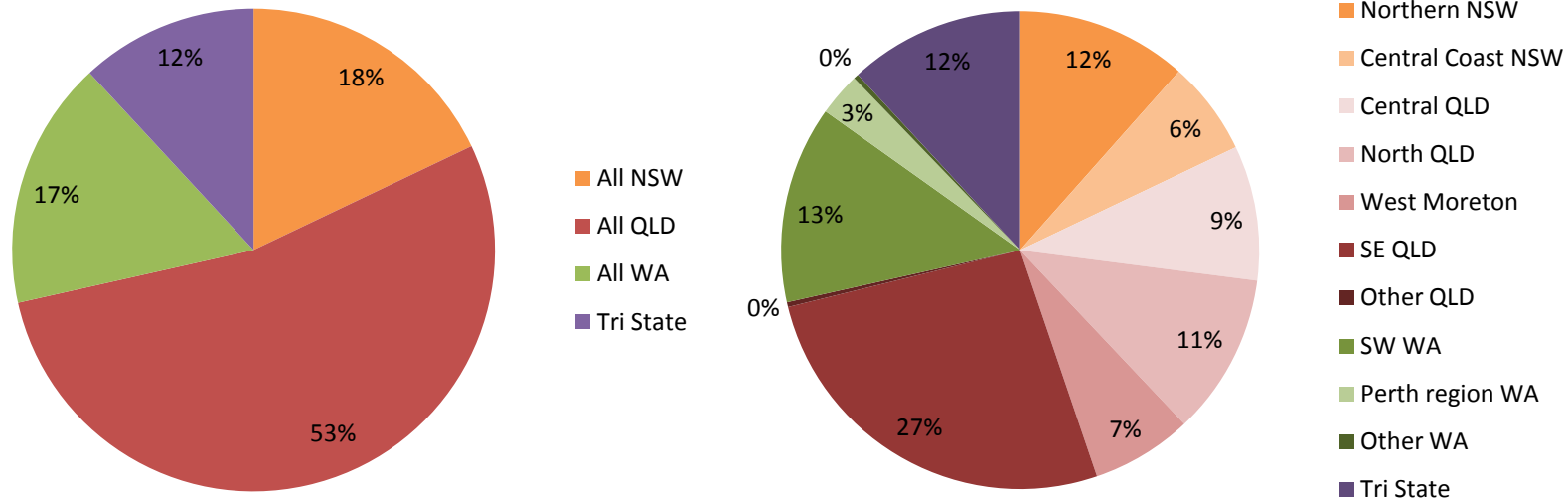
Chemical and heavy metal residue results were obtained from FreshTest Australia, based at the Sydney markets. This information was analysed to provide the avocado industry with data on past and present chemical use. Such insights were intended to assist the industry with management of the trend in some export markets towards zero tolerance of residues in produce

Demographics of respondents surveyed and interviewed

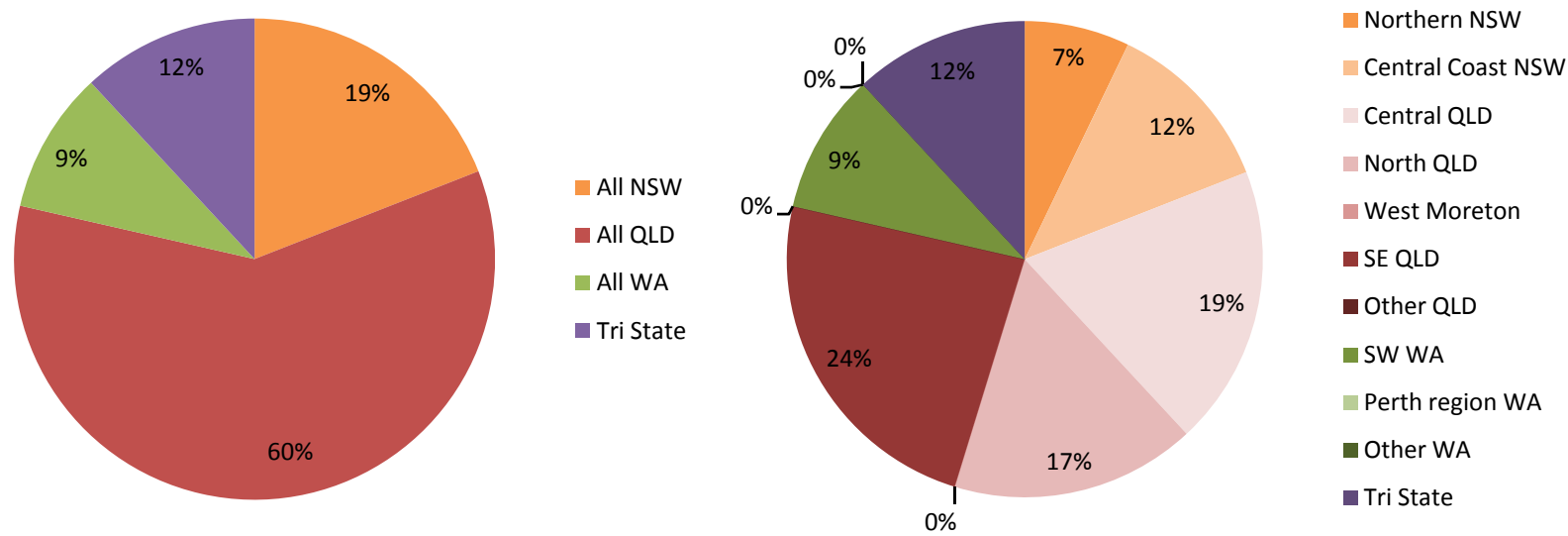
Number of growers by region



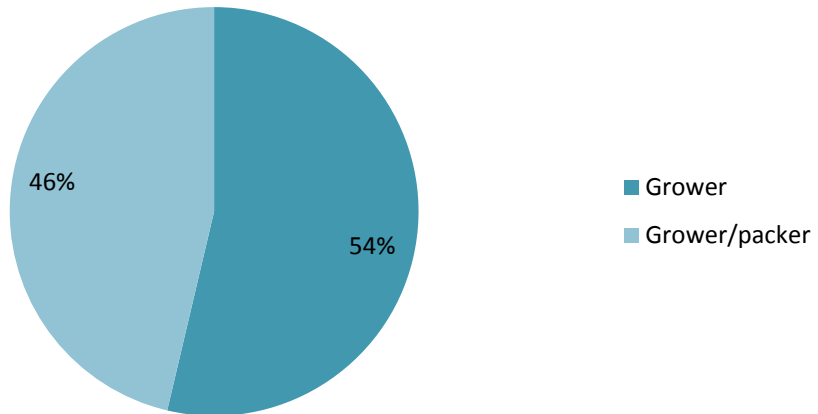
Grower representation by region - e-survey and mail-out survey



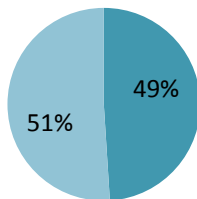
Grower representation by region - grower interviews



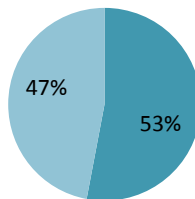
Grower and grower/packer representation nationally and by region



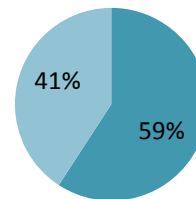
NSW



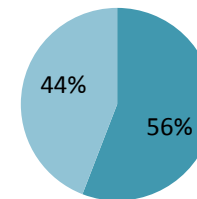
QLD



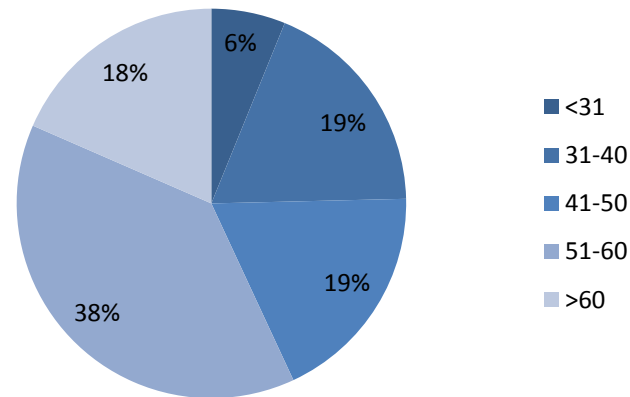
WA



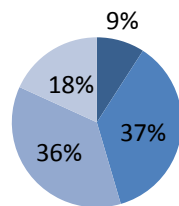
Tri State



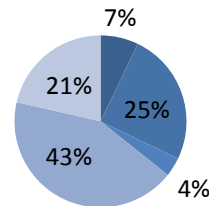
Age of e-survey respondents nationally and by region



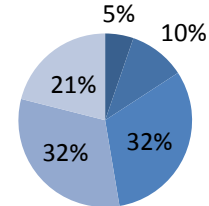
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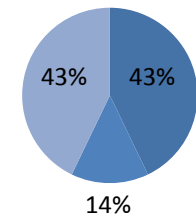
QLD



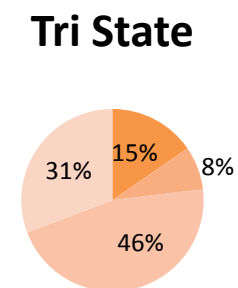
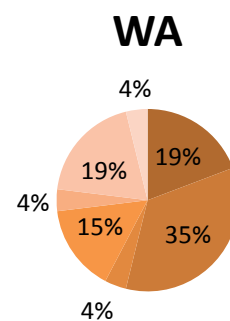
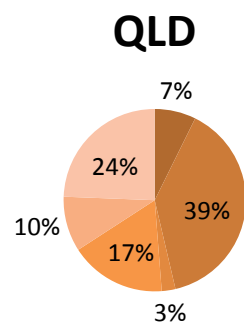
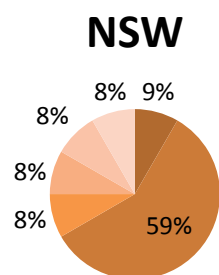
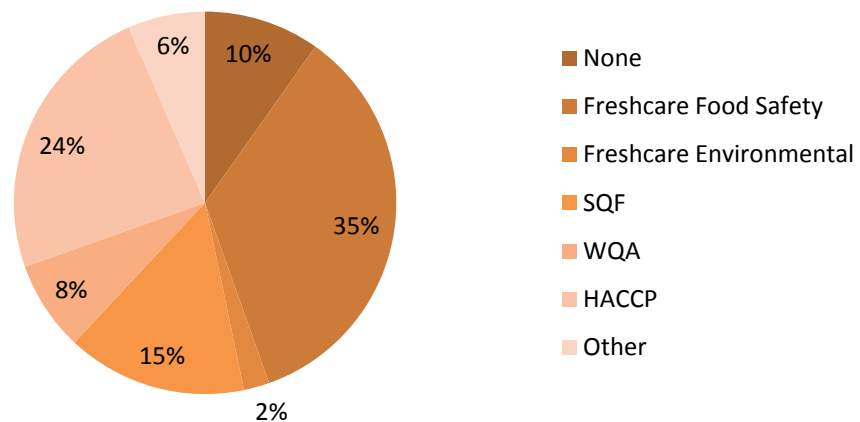
WA



Tri State

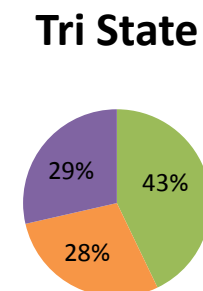
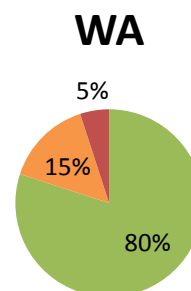
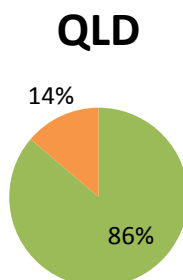
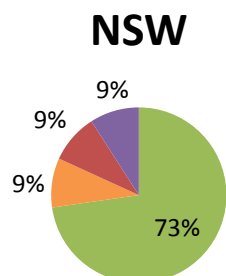
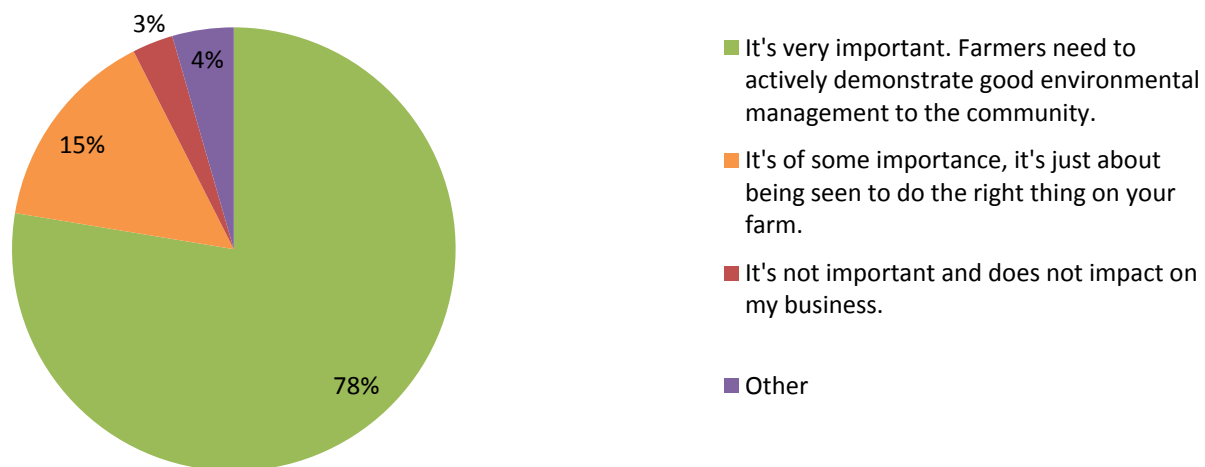


Quality Assurance standards implemented by e-survey respondents nationally and by region

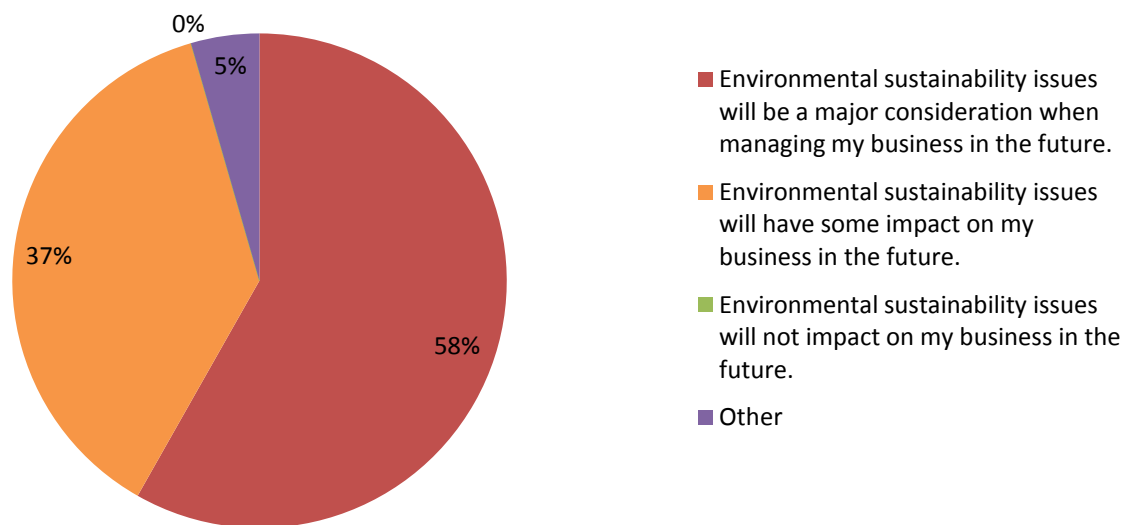


E-survey opinions nationally and by region

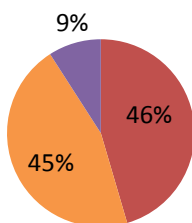
a) 'How important do you feel that it is for the community to view primary producers as being good environmental managers'?



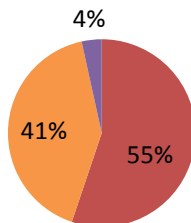
b) 'How important do you think environmental sustainability issues will be for your business in the future'?



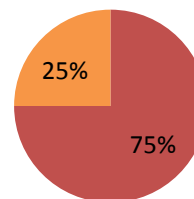
NSW



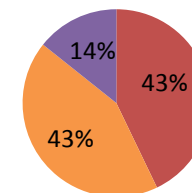
QLD



WA



Tri State



Results

Explanation

E-survey and mail-out survey respondents were asked to answer either 'yes', 'no', 'sometimes' or 'not applicable' to a range of questions regarding environmental practices. The information below summarises these responses.

Results analysis includes those respondents who answered 'not applicable'. This inclusion should be kept in mind when reviewing the figures provided for 'yes', 'no', and 'sometimes' answers.

Where terms such as 'level of implementation' or 'level of support' are used below, they relate only to the 'yes' responses and do not include the 'sometimes' responses. Where national figures are reported this reflects all the growers surveyed, regardless of location. The national figure therefore does *not* reflect an average of the-surveyed regions.

1. Land and soil management

1.1 Site selection

The e-survey showed that nationally, 54% of growers test new sites for soil nutrients at least 6 months prior to planting. This figure varied greatly between regions, being 65%, 59%, 36% and 29% in WA, QLD, NSW and Tri State respectively. The level of growers reporting that they did not apply this practice was 29%, 27%, 25% and 14% in Tri State, NSW, WA and QLD respectively. 25% of growers in WA indicated that a greater understanding of this topic was needed, while 18% of NSW growers, 17% of QLD growers, and no Tri State growers reported the same.

Nationally, 43% of e-survey respondents reported that when selecting new sites consideration was given to avoiding areas where neighbours may be affected by noise, chemicals, smoke and dust. A further 40% felt that these considerations were not applicable to their operation. Nationally, 10% of e-survey respondents said that they support this practice sometimes and only 6% said that they do not support this practice even if it is applicable to their operation. This non-support figure was 10%, 9%, 3% and none in WA, NSW, QLD and Tri State respectively.

Nationally, 52% of e-survey respondents reported that they test soil for sodicity and salinity prior to establishing new sites. The highest level of support for this practice was in the Tri State region, where 86% of growers reported that they implement this practice. NSW had the

lowest level of support, with only 9% of e-survey respondents implementing this practice, 36% reporting that they do not test for salinity and sodicity, and 45% answering 'not applicable'. The percentage of growers in each region indicating that a greater understanding of this topic was needed was inversely related to the level of support for this practice. The greatest demand for additional information was among NSW growers at 55%, and was 38%, 25% and 14% in QLD, WA and Tri State respectively.

Nationally, 72% of growers reported that they test soil pH prior to establishing a new site. The level of implementation among individual regions ranged from 69% to 75%. WA had the greatest percentage of e-survey respondents reporting that they do not test soil pH prior to establishing new sites (20%). The percentage of growers reporting that a greater understanding was needed ranged from 36% in NSW down to 14% in Tri State. Nationally this figure was 27%.

1.2 Erosion and soil structure

43% of e-survey respondents reported that stable drains were established on new areas to manage water run-off and prevent erosion during soil preparation and planting. In NSW, QLD, WA and Tri State, the level of support for this practice was 73%, 59%, 20% and 0% respectively. WA had the highest level of respondents not supporting this practice, being 30%. In NSW this figure was 9% and in both QLD and Tri State it was 0%. Only 9% of NSW growers believed that it was not applicable to their operation, though this figure was 100% in Tri State, 50% in WA and 28% in QLD. 45% of growers in WA felt that a greater understanding was needed. Nationally, the figure reflecting a need for greater understanding of this topic was 30%. Responses correlated very closely with those provided to the e-survey question 'Where the slope is greater than 5%, do you establish diversion banks above new areas before ground preparation begins, to direct water to grassed drains?'. Again, growers in NSW reported the highest level of implementation of this practice, and more WA growers felt that greater understanding was needed than did those in any other region.

In all regions except QLD (48% 'yes', 10% 'sometimes'), over 70% of e-survey respondents reported that they aimed to reduce the number of cultivations during site preparation and cover crop management. Most growers nationally (>73%) felt that no additional understanding of this area was needed, the exception being in WA where 45% of growers reported that a greater understanding was needed.

Nationally, 79% of e-survey respondents reported that they aimed to minimise the time that the soil was bare during site preparation and cover crop management. Support for this

practice was 100%, 91%, 85% and 66% in Tri State, NSW, WA and QLD respectively. Less than 10% of growers reported that they support this practice only sometimes, or that it was not applicable to their operation. Growers in QLD were the only exception with 24% stating that this practice was not applicable to their operation.

The answers to a related question 'Do you establish and maintain permanent inter-row grass cover as soon as possible after ground preparation to prevent erosion and to provide the soil with a source of organic matter?' showed a similar level of support for these types of practices. Nationally, over 86% of growers indicated that they adhered to this practice, in addition to other growers that reported adhering to it 'sometimes'. The exception to this was in Tri State, where only 57% of e-survey respondents reported that they adhere to these practices, plus an additional 14% reporting that they adhere to it 'sometimes'. The mail-out survey responses showed a 77% level of implementation in the Tri State region, and 85%, 78% and 75% in NSW, QLD and WA respectively.

1.3 Mulch

NSW reported the highest level of support (91%) for the practice of applying mulch to the tree line once young trees are planted, despite this 55% of NSW e-survey respondents indicated that a greater understanding of this area was needed. This figure reflected the need for greater understanding was less than 31% in each of the other regions. The lowest level of support for this practice was in Tri State at 57%, and only 14% of these growers felt that greater understanding was needed in relation to this topic.

1.4 Regular pH testing

Support for the practice of testing soil pH every 2-3 years to assess the need for adjustment was high, ranging from 80% to 90% in all regions, except for Tri State. Only 29% of growers in this area reported that they implement this practice and a further 29% reported that they implement it sometimes. 43% of growers in the Tri State region reported that they do not implement the practice at all, compared with a national result of 12%.

1.5 Run-off

The e-survey showed that 82% of growers in NSW have used silt traps/dams/vegetated filter strips/grass to collect run-off water from their farm prior to its release off site. The remaining 18% of growers in NSW reported that this was not applicable to their operation. In Tri State, only 29% of growers reported that they implement this practice, with the remaining 71% reporting that it was not applicable to their operation. The results provided by WA and QLD growers were similar across both regions with 48% and 45% of growers respectively, reporting that they implement the practice, and 24% and 30% of growers reporting that it

was not applicable to their operation. 50% of growers in WA indicated that a greater understanding of this topic was needed. This figure was <26% in all other regions.

Grower interviews reinforced the widespread implementation of practices to capture run-off including dams and grass buffer strips. The interviews also showed that on slopes, in field constructions were often used.

1.6 Key findings

- It is encouraging that most Tri State growers test for salinity and sodicity prior to establishing new sites, given that this is an issue in that region. Salinity and sodicity are not known to be an issue for most avocado growing areas in NSW, QLD or WA, which explains the lower level of implementation of this practice among those growers. Despite this, many growers in NSW and QLD indicated that they need a greater understanding of this issue.
- Except for those in the Tri State region, most growers are testing soil pH and trying to maintain it between 6 and 7, with the use of additives as necessary (e.g. lime, gypsum). Many Tri State growers do not undertake testing of soil pH every 2-3 years that would enable problem identification and adjustments. This may result in excessive fertiliser use and subsequent nutrient loss to the environment.
- Generally avocados are being grown in porous soils where runoff is not an issue. Where it is an issue, it is generally being well managed.
- Good stable drains were commonly found where needed in QLD and NSW (steep, erosion-prone areas) and are not as necessary in the Tri State region (flat, low rainfall country) or WA (well draining soils not prone to erosion). Many growers in WA indicated that they would like a greater understanding of this topic.
- Generally, QLD growers carefully plan the timing of cultivation to minimise soil damage and compaction (i.e. done in the dry).
- Many QLD growers plant directly into grass sward without cultivation, which explains the low percentage of e-survey respondents that indicated that they aim to minimise the time that soil is bare during site preparation and cover crop management.
- Most growers aim to establish and maintain inter row cover in their orchards, either through sowing grass or allowing volunteer growth. A lower level of support for this practice in the Tri State region can be attributed to a lack of water. Maintaining inter row cover is not considered as critical in this region which is generally not prone to erosion.
- Varying degrees of canopy management (generally production related) are implemented, allowing light into inter row grass. Lack of affordable access to chipper machinery discourages some growers from removing larger tree limbs.

- There are some commercial hedging contractors available (one on Sunshine Coast), however hedging is not suitable in regions where there are overlapping crops. Pruning with the assistance of cherry pickers is an expensive and labour intensive alternative.
- Hedging leaves a strip of bare ground under the trees. Some growers reported sowing this area with grass to regenerate groundcover. An opportunity exists for this to be promoted as best practice.
- Tri State growers are less likely to apply mulch to the tree line, except in young orchards. This may be attributed to factors such as frost requiring bare, compacted soil in addition to mulch being less readily available (less prunings and grass than in higher rainfall areas) and the high cost of off-farm mulch (due to drought).
- Although nearly all growers in NSW implement mulching, more than half of NSW growers want a greater understanding of this topic. It may be that information is required on the effectiveness of different types of mulch and other technical variables relating to efficient mulching.
- Grower interviews indicated that purchasing mulch for bigger trees is cost prohibitive.
- One grower reported testing dam water with the aim of identifying nutrient losses from his orchard. This activity was incomplete, however as the Department of Natural Resources and Water (QLD) does not hold baseline data for disturbed landscapes which could be used for comparison. This base data exists in Queensland for watercourses in natural environments only.

2. Chemical management

2.1 Spill kits

Nationally, 49% of e-survey respondents reported that their chemical storage area was equipped with a spill kit and this finding was generally reinforced (although to a lesser proportion) by the on-farm interviews. The level of implementation of this practice was 86%, 55%, 45% and 40% in Tri State, NSW, QLD and WA respectively. The mail out survey closely supported these figures, providing a national implementation level of 51% and slightly lower regional implementation levels (in the range of 38% to 74%). On a sub regional basis, implementation levels ranged from 60% in Central QLD down to 17% in the Perth region.

2.2 Disposal of contaminated soak up material

Almost all growers interviewed reported that they had never had a chemical spill. As a result, most growers had not contemplated how they would manage a spill or dispose of the contaminated soak up material. Although based on small respondent numbers, the replies indicate the serious environmental and OHS implications that could result from such an

event with 11 respondents stating that they were unsure how to manage a spill, 8 opting to tip the material on the ground or bury on farm, 5 choosing to send material to a transfer station, 3 disposing of the material through ChemClear, and 2 electing to burn the material if such an event was to occur.

2.3 Chemical user training

Nationally, 87% of e-survey respondents reported that chemicals are only applied under the supervision of somebody who has completed recognised chemical users training. This figure was 100%, 91%, 90% and 75% in Tri State, NSW, QLD and WA respectively. Nationally only 10% of growers indicated that greater understanding of this topic was needed. This figure was 0% for NSW and Tri State.

2.4 Pest and disease monitoring

Nationally, 90% of e-survey respondents reported that their crop is regularly monitored for insects and disease so that informed decisions can be made relating to when to spray. 100% of NSW growers indicated that they implement this practice, whereas in each of the other regions a number of growers indicated that they only implement this practice sometimes. Despite the generally high level of implementation, 45% of growers in NSW and WA indicated that a greater understanding of this topic was needed, as did 45% of growers in WA.

The mail-out survey provided slightly lower results. The level of implementation indicated by this survey was 73% nationally, and 83%, 70%, 70% and 52% in WA, QLD, NSW and Tri State respectively.

2.5 Chemical selection

Nationally, e-survey results indicated that 73% of growers select softer chemicals over broad spectrum chemicals where possible. This figure ranged from 69% to 86% on a regional basis. On a sub regional basis, this figure ranged from 92% in Central Coast NSW down to 48% in SE QLD. Although no e-survey respondents in the Tri State region indicated that a greater understanding of this topic was needed, those in other regions did, with results of 55%, 40% and 38% in NSW, WA and QLD respectively.

The mail survey provided similar results showing a national figure of 68% of growers selecting softer chemicals where possible and a range from 61% to 73% on a regional basis.

Grower interviews also revealed softer chemical use or the avoidance of chemicals altogether. A third of growers interviewed in areas where Spotting Bug is a problem reported using endosulfan instead of Bulldock. Reasons for endosulfan not being used in some

Spotting Bug areas included fear of livestock contamination and fear of its reputation. In South Queensland and Sunshine Coast the reason for many growers not using pesticides was urban encroachment.

2.6 IPM training

The e-survey results showed that nationally 63% of growers reported that somebody on their farm had attended integrated pest management training. Figures for QLD and NSW were within 2% of the national figure, whereas NSW reported a lower implementation level of 45% and Tri State reported a higher implementation level of 86%. Nationally, 46% of growers indicated that a greater understanding of this topic was needed. On a regional basis, this figure ranged from 60% in WA down to 14% in Tri State.

2.7 Weather conditions

Nationally, 88% of e-survey respondents ensure that spraying is only carried out in appropriate weather conditions to avoid spray drift. The implementation levels for this practice were 100%, 90%, 86% and 80% in NSW, QLD, Tri State and WA respectively. In WA and Tri State, 15% and 14% of growers respectively reported that this practice was not applicable to their operation, probably because they do not apply sprays. Nationally, 10% of respondents indicated that a greater understanding of this topic is needed.

Interviews showed that in addition to spraying only in correct weather conditions, other management practices included planting of windbreaks/hedges, observation of buffer areas, droplet size selection, use of a spray shroud, and appropriate staff training.

2.8 Likely dangers of spray drift

The main danger of spray drift mentioned by interviewees was the potential impact on neighbours and neighbouring businesses such as child-care centres. Other dangers raised included impacts on adjacent cattle farms, vineyards and other sensitive crops.

Only a small number of interviewees raised the dangers that spray drift posed to environmental assets, demonstrating a lack of concern for adjacent bushland and other environmentally sensitive areas.

2.9 Chemical container disposal

Nationally, 75% of growers reported that unwanted chemical containers were disposed of using an approved program or contractor. Regionally, this figure ranged from 86% in Tri State down to 60% in WA. 27% of growers in NSW indicated that they implemented this practice some of the time. 25% of growers in WA indicated that a greater understanding of

this topic was needed, whereas this figure was <12% nationally and in each of the other regions.

When asked whether unwanted chemical containers were stored where people cannot access them while waiting for disposal, WA e-survey respondents reported the lowest level of implementation (35%). The Tri State and national figure was 57%, and the QLD and NSW figures were 69% and 64% respectively. 29% of Tri State growers reported that they sometimes apply this practice. 25% of growers in WA indicated that a greater understanding of this topic was required.

2.10 Informing neighbours

The mail-out survey revealed that 59%, 43%, 38%, and 22% of respondents in Tri State, NSW, QLD and WA respectively do not inform close neighbours before spraying on farm. Nationally this figure was 34%. On a sub regional basis, the percentage of growers not informing their neighbours ranged from 46% in Central Coast NSW down to 13% in SE QLD.

When interviewed in person, the growers were more likely to indicate that close residential neighbours are usually informed prior to spraying. This is also the case with cattle farmers, vineyards and organic growers. In many cases where close residential neighbours are not informed, the grower reported taking other actions to reduce annoyance such as spraying when the neighbours are not home, and avoiding spraying trees adjacent to the neighbour.

2.11 Disposal of post harvest fungicide and insecticide dips/sprays

Nationally, 39% of e-survey growers reported disposing of post-harvest chemicals onto soil away from waterways and drainage areas. This ranged from 60% in NSW down to 20% in the Tri State region. Off site disposal by a professional contractor was not used in NSW or WA with 22% and 20% of growers in QLD and Tri State areas opted for this method respectively. 60% of Tri State growers surveyed treated the chemicals to deactivate them before pumping onto suitable land. This incidence was higher than the national average of 29% and in NSW this method was not reported at all. NSW and QLD reported the use of evaporation pits/traps which were not raised in WA or the Tri State region creating a lower national average of 16%. 60% of WA respondents wanted a greater understanding of this topic, followed by 40% in NSW and 33% in QLD. These results were reinforced by grower interviews. No Tri State growers surveyed felt the need for a greater understanding of this topic.

Grower interviews also revealed that in some cases small quantities of post harvest fungicide are sprayed onto the orchard.

2.12 Key findings

- Growers only tend to have a spill kit if a) they believe that they need it for QA reasons or b) a local authority has been actively checking farms in the region. Typically, spill kits consisted of sand/sawdust/kitty litter/lime, spade, some protective gear.
- Nearly all growers are unsure of how to dispose of contaminated soak-up material following a chemical spill and report that it is very difficult to find clear information relating to regulatory requirements/best practice.
- Nearly all growers have completed chemical user training. This may be attributed to QA and/or legal requirements.
- Legal drivers for chemical user training (e.g. access to chemicals such as Endosulfan in QLD/right to apply chemicals) vary between jurisdictions.
- There is a lot of interest in IPM. This was shown through the e-survey results and reinforced in the interviews, however it was reported that IPM is not an appropriate management strategy for Spotting Bug.
- Tri State growers often implement IPM for their citrus crops, but not for their avocados, which may be attributed to the feeling among growers in this region that pests and diseases are not a significant problem for avocados.
- Where used, consultants are greatly valued and generally result in reduced pesticide use or the selection of softer chemicals. As an example, growers interviewed in North QLD often used a consultant for this purpose, whereas very few growers across all of the other regions utilised consulting resources for this purpose.
- Endosulfan is used by growers to control Spotting Bug in QLD and NSW. Some growers consider it to be a 'soft' chemical due to its relatively low impact on beneficial insects however it is long lasting in the environment and has been banned in many countries, including New Zealand and those of the European Union. Growers using Endosulfan are generally very mindful of both the real and perceived dangers that this chemical poses to the community and environment if used inappropriately, and are very careful in subsequent usage. Growers reported avoiding use of this chemical in certain areas (e.g. close to neighbours or cattle farms), spraying at 3am (to avoid spray drift), and notifying their neighbours as ways of managing these risks. A simple internet search, available to almost any member of the public, reveals a plethora of negative publicity about this chemical and the impacts that it has on the environment and human health. Many readers of these articles may not consider how well these claims are substantiated.
- It should be noted that there are no soft alternatives available for Endosulfan (various tradenames). This chemical is known to have resulted in fish kills and contamination

of livestock. Other chemicals registered for Spotting Bug such as Beta-cyfluthrin (Bulldock), Methidathin (Supracide) and Trichlorfon (Lepidex) are all broad spectrum.

- Currently, Endosulfan is the most appropriate option available for Spotting Bug control in Australia, however due to the issues highlighted above, alternatives are urgently needed. Harry Fay of QPIF is currently involved with a number of projects looking at alternatives to Endosulfan. The avocado industry, along with other sub-tropical and tropical tree fruit industries, would benefit from supporting and learning from these projects. Growers also reported a need for more dedicated resources towards finding alternative controls for Spotting Bug.
- Not all of the growers interviewed use Endosulfan, even in areas where Spotting Bug is a problem. In some these cases it was reported that after tolerating a level of damage, natural control appeared to take over. This was particularly reported in areas such as Mt Tamborine and the Sunshine Coast hinterland. Full investigation of these claims would be required taking into consideration that some of these growers have an economic buffer against insect damage, such as off farm income.
- There is a reliance on phosphorous acid as the main management tool for phytophthora. More training and information is needed to promote the aspects of phytophthora management according to the Pegg Wheel.
- The drumMUSTER program is widely used where available.
- The development of industry best practice guidelines may help ensure that the large number of growers disposing of post harvest fungicide and insecticide dips/sprays onto soil (away from waterways and drainage areas), are doing so in an environmentally responsible manner. Such a document will need to consider the suitability of different methods of disposal for different quantities and soil types.
- Some growers reported spraying chemicals on adjacent bushland to control Spotting Bug, a practice which is illegal, bad for the environment and has the potential to result in negative publicity for the industry.

3. Nutrient management

3.1 Fertiliser storage

Nationally, 90% of e-survey respondents reported that synthetic/non-organic fertilisers are stored in a manner that prevents contamination of the environment. Only 1% of growers across Australia said that they did not implement this practice and 9% reported that it was not applicable to their operation (i.e. they may not use/store fertiliser). On a regional basis, implementation levels ranged from 100% in Tri State down to 82% in NSW. 'Not applicable' response levels of 18% and 15% contributed to the lower levels of implementation reported in NSW (82%) and WA (85%) respectively.

On a related question, 'Are your bulk animal manures sited and managed in a way that ensures rain/run-off water will not cause nutrients from the heaps to be washed into waterways?', 57% of e-survey respondents nationally indicated that this practice was not applicable to their operation. This figure ranged from 60% in WA down to 43% in Tri State. 14% of Tri State growers reported that they do not implement this practice. This figure was 0% in NSW and WA, and 3% in QLD. QLD was the only region where growers indicated that they implement this practice sometimes (3%). 35% of growers in WA indicated that a greater understanding of this topic was needed compared with 18%, 7% and 0% in NSW, QLD and Tri State respectively.

3.2 Soil nutrient testing

Nationally, 91% of e-surveyed growers support their fertiliser decisions with soil testing at least every 2-3 years or leaf testing annually. Regional figures generally ranged from 90% to 97% except for Tri State, which showed an implementation level of 71%. 14% of Tri State growers report that they implement this practice sometimes and a further 14% report that it was not applicable to their operation which contributes to the lower level of implementation evident in this region. On a regional basis, the percentage of growers indicating that greater understanding was needed ranged from 36% in NSW down to 14% in Tri State.

The mail-out survey indicated 19% of growers nationally do not implement soil testing every 2-3 years. On a sub regional basis, non-implementation of this practice ranged from no growers in West Moreton, QLD to 30% of Northern NSW growers, except for Tri State, where 44% of growers reported non-implementation of this practice.

With regard to leaf testing, the mail-out survey showed that nationally, 23% of growers do not implement this practice. On a sub regional basis, this figure ranged from no growers in Perth region, WA to 24% of growers in SE QLD, with the exception of Northern NSW, where this figure was 48%.

3.3 Animal manure and compost nutrient testing

Nationally, 49% of e-survey respondents reported that testing animal manures and composts for nutrient status before use was not applicable to their operation and 24% reported that they do not implement this practice. This figure ranged from 36% of growers in NSW down to 17% of growers in QLD. Nationally, 28% of growers indicated that a greater understanding of this topic was needed. This ranged from 45% in NSW down to 14% in Tri State.

3.4 Application equipment

E-survey results for the question 'Is your fertiliser application equipment calibrated at least annually?' varied greatly between regions. It is not understood why so many growers reported that this was not applicable to their operation with 30%, 18%, 14%, and 14% in WA, NSW, QLD and Tri State respectively responding in this way. The level of growers reporting that they do not implement this practice was 27%, 10%, 3% and 0% in NSW, WA, QLD and Tri State respectively. 40% of growers in WA indicated that a greater understanding of this topic was needed. This figure was 36% for NSW, 14% for QLD and 0% for Tri State.

3.5 Key findings

- Nearly all growers are doing either leaf or soil testing to inform nutrient decisions.
- Many growers rely partly on an independent nutrient analysis, however they adjust the recommendation based on their own view and budget.
- Many growers are sceptical of the recommendations made by chemical suppliers, and will seek independent verification.
- Nutrient loss to the environment is an increasing issue and is being more closely monitored. Fertiliser programs based on good monitoring will become important in the future. In QLD for example, new legislation requires some agricultural producers (adjacent to the Great Barrier Reef) to implement a nutrient management plan.

4. Water management

4.1 Moisture monitoring

The e-survey showed that nationally, 79% of growers use soil moisture monitoring data to manage irrigation. On a regional basis, the implementation level of this practice ranged from 100% in Tri State to 85% in WA, with the exception of NSW which was 36%. An additional 36% of NSW growers reported that they implement this practice sometimes. 38% to 55% of growers in each region indicated that greater understanding was needed in relation to this topic, with the exception of Tri State where only 14% of growers indicated the same.

The e-survey showed that tensiometers were the most commonly used moisture monitoring device with 58%, 57%, 50% and 36% of e-survey respondents in QLD, Tri State, WA and NSW respectively. Other devices used in each region included capacitance probes, EnviroScan and gypsum blocks. Many growers reported using rainfall data.

4.2 Salinity

Nationally, 39% of e-survey respondents reported that they test irrigation water at least annually in areas where it is potentially saline. 42% of growers reported that this was not applicable. On a regional basis, this not applicable figure was 82%, 40%, 34% and 14% in NSW, WA, QLD and Tri State respectively. Nationally and in NSW, QLD and WA, the

percentage of growers reporting that they do not implement this practice was less than 16%, except for Tri State where this figure was 29%, despite this region having the least number of 'not applicable' responses. 14% of Tri State growers did, however, indicate that they implement this practice sometimes. Across the regions, 34% to 36% of growers indicated that a greater understanding of this topic was needed, except for Tri State where this figure was 14%.

4.3 Irrigation system maintenance

The e-survey showed that more growers in NSW annually check the uniformity of sprinkler output across blocks of trees than in any other region (27%). This figure was 14%, 10% and 0% in Tri State, QLD and WA respectively. The percentage of growers indicating that a greater understanding of this topic was needed varied between regions being 45%, 28%, 15% and 0% in NSW, QLD, WA and Tri State respectively.

4.4 Rainwater used in packing shed

Nationally, the e-survey showed that 66% of packers capture rainwater for use in the packing shed. This figure was 100% in NSW, 66% in QLD, 60% in Tri State and 50% in WA. 23% of growers nationally indicated that a greater understanding of this topic was needed.

In response to the e-survey question 'Where appropriate, is packing shed water (e.g. fruit washing and water dumps) recycled (other than sprays and fungicides)?', 55% of growers nationally reported that they did not implement this practice. 8% of growers reported that they did, 11% said that they implement it sometimes and 26% said that it was not applicable to their operation. On a regional basis, the percentage of growers reporting that they did not implement this practice was 80% in NSW, 70% in WA, 44% in QLD and 40% in Tri State. 40% of Tri State growers and 39% of QLD growers reported that this was not applicable to their operation. This figure was 10% in WA and 0% in NSW.

The percentage of growers indicating that a greater understanding of this topic was needed was 50%, 40%, 28% and 0% in WA, NSW, QLD and Tri State respectively.

4.5 Key findings

- Many growers in the Tri State region do not test irrigation water for salinity, even though it is known to be potentially saline, particularly in South Australia. Many of these growers do however have access to salinity data from external sources.
- A greater awareness of the benefits of checking sprinkler output uniformity is required in NSW.

- The high level of soil moisture monitoring, combined with the widespread use of micro sprinkler and drip irrigation shows that avocado growers generally use water very efficiently.

5. Biodiversity management

5.1 Assessing property flora and fauna

Nationally, the e-survey showed that 66% of growers had assessed whether or not any significant flora/fauna exists on their property. The level of implementation was similar in NSW, WA and QLD being 73%, 70% and 69% respectively. This figure for the Tri State region was lower at 29%. 14% of growers in the Tri State region indicated that it was not applicable to their operation and 14% of growers in this region reported that they implement this practice sometimes. 45% of growers in NSW indicated that a greater understanding of this topic was needed. This figure was 35%, 29% and 24% in WA, Tri State and QLD respectively.

Grower interviews showed that approximately a quarter of properties were completely cleared. Approximately half of the properties had a significant area of native vegetation, some of which were proactively encouraging biodiversity in these areas. Methods included participating in Land for Wildlife, excluding livestock, and developing wildlife corridors.

5.2 Protecting sensitive areas

Nationally, 64% of e-survey respondents reported that they manage and protect sensitive areas such as waterways, wetlands and areas of native vegetation. On a regional basis, this figure ranged from 73% in NSW down to 57% in Tri State. In NSW 36% of growers indicated that greater understanding of this topic was needed, compared to less than 25% of growers in other regions feeling this way.

The mail-out survey closely supported these figures showing that nationally, 71% of growers managed sensitive areas to protect them, with this figure ranging from 79% in WA down to 63% in Tri State.

On a related question 'Do you control environmental weeds and feral animals in these areas?' 71%, 65% and 64% of e-survey respondents in Tri State, WA and NSW respectively reported that they do. Only 48% of growers in QLD reported that they implement this practice, however 24% of growers in QLD reported that it was not applicable to their operation. Nationally, only 19% of growers indicated that a greater understanding of this topic was needed.

5.3 Declared weeds

Nationally, 49% of e-survey respondents indicated that they are able to identify all of the declared weeds in their region. This figure ranged from 60% to 71% across the regions except for QLD where only 31% of growers indicated that they implement this practice. 28% of growers in QLD reported that they only implement this practice sometimes, whereas this figure was less than 14% in the other regions. 64% of growers in NSW indicated that a greater understanding of this topic was needed. This figure was 45%, 45% and 0% in QLD, WA and Tri State respectively.

5.4 Revegetation of land unsuitable for agriculture

Nationally, the e-survey showed that 61% of growers encouraged revegetation of land that is unsuitable for agriculture. While many growers indicated that this practice was not applicable to their operation, only 10%, 5%, 0%, and 0% in QLD, WA, NSW and Tri State respectively indicated that they do not implement this practice. Nationally, 10% of growers reported that they support this practice sometimes. 24% of growers nationally indicated that a greater understanding of this topic was needed. This figure was higher in NSW, being 36%.

The mail-out survey results closely supported these figures, showing that nationally 68% of growers encouraged revegetation of areas unsuitable for agriculture and that 14% of growers implement this practice sometimes. 14% of mail-out survey respondents said that this practice was not applicable to their operation.

During grower interviews, one grower mentioned that they were replanting these areas specifically to attract Glossy Black Cockatoos. 'Encouraging revegetation' referred to either allowing these areas to regenerate naturally or replanting.

5.5 Key findings

- Nearly all growers that have areas of bush value those areas.
- QLD growers whose properties have regulated bush areas (under EPA) were aware of them and observe the relevant restrictions.
- In WA, Sunshine Coast, Mt Tamborine and parts of South QLD many orchards are located in scenic areas and the orchard trees and the environmental assets managed by the owner contribute to the scenic amenity of the region. Scenic amenity is often valued by local government. The avocado industry may consider investigating benefits (e.g. funding/marketing/eco labelling) that can be derived from scenic locations.
- There is a need for increased awareness of declared weeds specific to each region, their control methods, and legal obligations within remnant vegetation areas/wetlands.

- Generally, avocado growers are committed to protecting or improving the biodiversity value of their property.

6. Waste management

6.1 Rejected produce

Nationally, 84% of e-survey respondents reported that they dispose of rejected produce in a manner that will not disturb neighbours or allow it to enter waterways. On a regional basis, this figure ranged from 90% in QLD down to 71% in Tri State. Less than 15% of growers in each region indicated that a greater understanding of this topic was needed, except in WA, where 35% of growers responded in this way.

6.2 Recycling

The e-survey showed that nationally, 69% of growers separate materials for recycling. On a regional basis, this ranged from 65% to 82% except in Tri State, where this figure was 57%. More Tri State growers indicated that they do not implement this practice (29%) than in any other region. Nationally, 24% of growers indicated that a greater understanding of this topic was needed. On a regional basis, this ranged from 14% in Tri State to 30% in WA.

The mail-out survey closely supported these figures showing that nationally, 74% of growers separate waste materials for recycling. The mail-out survey also showed that more growers in the Tri State region (22%) do not support this practice than in any other region.

Grower interviews showed that there is a lack of recycling facilities in Tri State, South West WA and Northern NSW. The interviews also showed that around half of growers recycled oil and around a quarter of growers reuse it on farm (e.g. wood preservation). There were only two growers interviewed that reported unacceptable uses, these being burning oil for frost control and applying oil to the ground as a dust suppressant. Grower interviews showed that tyres and batteries are also commonly recycled.

6.3 Key findings

- Generally, rejected produce is disposed of in a responsible, manner however many growers in WA would like a greater understanding of this topic.
- An opportunity exists for increased awareness of the impact of organic material entering waterways and affecting aquatic life (Biological Oxygen Deficit).
- Generally, avocado growers are committed to recycling where facilities are accessible.
- An opportunity exists to develop regionally specific guides outlining the available recycling options for various waste types, particularly in South West WA, Tri State

and Northern NSW. This guide could also address the appropriate storage of waste products while waiting for off farm recycling (e.g. oil and batteries).

7. Air management

7.1 Informing neighbours

The e-survey showed that nationally, 9% of growers do not inform close neighbours before undertaking farm activities that may result in significant dust, smoke or noise. This figure ranges from 9% to 10% across the regions except for Tri State, where none reported that they do not implement this practice. Nationally, less than 18% of growers indicated that a greater understanding of this topic was needed.

According to the mail-out survey, 16% of all growers do not implement this practice, 22% implement it sometimes and 14% reported that it was not applicable to their operation. On a sub regional basis, West Moreton, QLD had the highest percentage of growers who were not informing close neighbours before undertaking farm activities that may result in significant dust, smoke or noise and SW WA had the lowest percentage of growers reporting the same (9%).

Grower interviews showed that avocado growers generally do not generate a significant amount of noise or dust. Around half of the growers interviewed said that they do inform their neighbours and/or the local fire authority when burning. In some regions, this was regulated.

7.2 Burning waste

The e-survey showed that 90% of growers nationally avoid burning wet material, plastic and rubber. This ranged from 100% of growers in Tri State down to 85% in WA. With the exception of NSW (18%) <10% of growers in each region indicated that greater understanding of this topic was needed.

The mail-out survey showed that nationally, 99% of growers implemented this practice. On a regional basis, this ranged from 98% in NSW down to 89% in Tri State.

The number of instances of burning waste on farm reported during grower interviews was quite low. Burning of waste on farm has a negative impact on the environment and is readily observable by the community.

7.3 Planning night time activities to avoid disturbance

The e-survey showed that 27% of growers in NSW do not plan night time activities so that their neighbours are least effected by noise. This figure was 14% in QLD and 0% in the other

regions. More NSW growers indicated that they require a greater understanding of this topic (27%) than growers in any other region.

Grower interviews showed that one of the ways in which the timing of noise disturbances are managed is to commence early morning tractor operations as far from neighbours as possible.

7.4 Key findings

- Generally, dust and noise are not major issues associated with avocado orchards.
- Generally, growers are mindful of the annoyance that they can potentially create from dust, noise and smoke.
- Annoyance from smoke seems to be well managed, which may be attributed to regulation in some areas.
- Most growers manage burning responsibly.

8. Energy management

8.1 Maintenance and energy efficiency

Nationally, the e-survey showed that 85% of growers maintain vehicles/equipment as per the manufacturer's recommendations to ensure fuel efficiency. In NSW, 100% of growers implemented this practice. In QLD, 76% of growers said that they implemented this practice with a further 21% saying that they implemented this practice sometimes. 95% of growers in WA and 71% of Tri State growers implemented this practice. A further 14% in Tri State reported that they implement it sometimes. Nationally, 12% of growers indicated that a greater understanding of this topic was needed. This figure was less 15% on a regional basis, except for NSW where it was 27%.

On a related topic, the e-survey showed that 64%, 59%, 57% and 55% of growers in NSW, QLD, Tri State and WA respectively view fuel/electricity efficiency as a major consideration when purchasing new vehicles and equipment. Nationally this figure was 58%. Less than 16% of growers in each region indicated that a greater understanding of this topic was needed, except in NSW where 36% of growers responded this way.

8.2 Alternative energy sources

The e-survey showed that the vast majority of growers in each region do not use renewable energy alternatives for any equipment traditionally powered by non renewable energy. The percentage of growers responding in this way was 91%, 86%, 80% and 62% in NSW, Tri State, WA and QLD respectively. Nationally, this figure was 75%. The percentage of growers

in each of the regions indicating that a greater understanding of this topic was needed was 82%, 50%, 31% and 29% in NSW, WA, QLD and Tri State respectively.

In response to the e-survey question 'Do you purchase accredited Green Power from your electricity supplier?', 13% of growers nationally said that they did, 78% said that they did not, 3% said that they did sometimes and 6% said that it was not applicable to their operation. The percentage of growers indicating that they would like a greater understanding of this topic ranged from 29% in Tri State to 45% in WA.

8.3 Key findings

- Many growers indicated that they maintain some of their equipment to maintain energy efficiency. It seems that the focus is on new/high value machinery, and that older/lower value machinery may not be as well maintained.
- As only around half of growers consider energy efficiency when purchasing new equipment, there is room for improvement in this area.
- Although few growers use renewable energy on farm, there is a high demand for additional information in relation to this topic.
- An opportunity exists to use case studies to investigate and illustrate any cost and environmental benefits associated with equipment selection and maintenance. Energy efficiency is an area that many growers are interested in, partly due to the potential that it presents for cost reduction.
- The ecoBiz program provided by Queensland Environmental Protection Agency involves an EPA officer visiting farms, completing an energy audit and providing recommendations for reduced energy use. Consideration may be given to promoting this concept across the industry.

9. Funding and/or other assistance

E-survey participants were asked whether or not they had accessed government funding or participated in programs to help them manage the environment on their farm. Nationally, 34% of growers reported that they had. This figure was 57% in Tri State, 35% in WA, 31% in QLD and 27% in NSW.

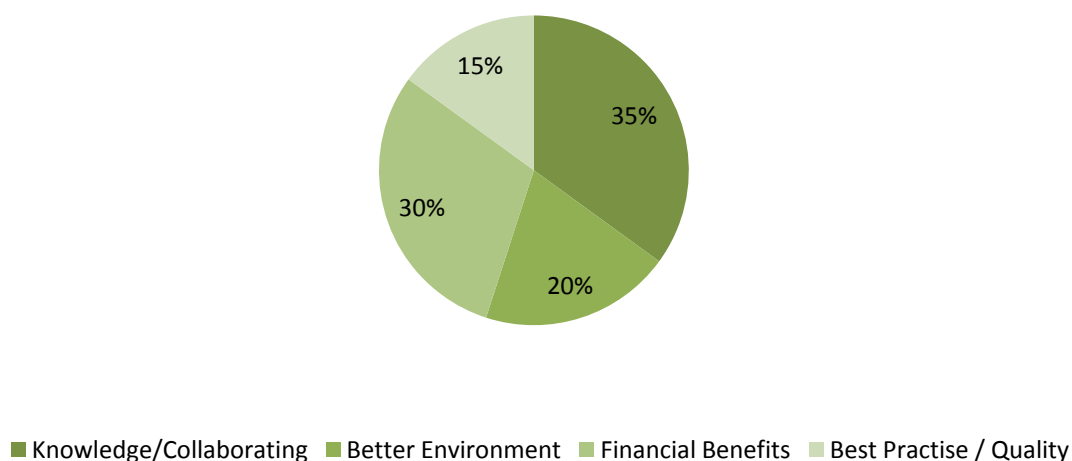
9.1 Positive feedback

Respondents identified four key areas where the programs and funding opportunities were most positive. The positive aspects covered both inputs (such as finance) and outputs (such as knowledge and on-farm results).

Respondents' most often nominated increased knowledge, information sharing and collaboration opportunities as a positive of the programs, closely followed by financial

support or reduced costs. 20% of the positives identified were in the general category of improving environmental outcomes with 15% recognising their ability to encourage best practices and improved quality.

General categories of positive feedback

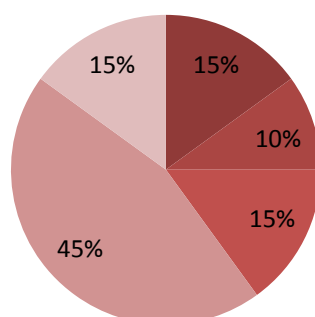


9.3 Negative feedback

Negative feedback was heavily weighted towards the difficulties in accessing information and associated red tape perceived with the programs or funding opportunities. Almost half of all negative feedback related to this perception of excess bureaucracy (45%).

In equal measures the national respondents mentioned the general categories of insufficient information or results, costs, and the lack of industry involvement. 10% of participants raised issues relating to gaps between program perceptions and reality which negatively influenced their sense of program relevance.

General categories of negative feedback

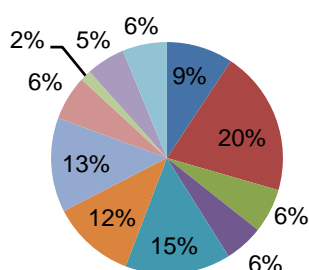


■ Cost ■ Perception/reality gap ■ Insufficient info/results ■ Red tape ■ Insufficient industry involvement

9.5 Additional environmental assistance

E-survey participants were asked to nominate the three areas that they would most like assistance with if environmental management funding or other assistance was available. Water and irrigation assistance was most commonly raised when respondents were asked to nominate the areas where they would like additional funding or program support. This was closely followed in equal measure by chemical / fertiliser management, sustainable practices / energy efficiency, and biological farming. Training subsidies and financial assistance or tax relief were mentioned only 9 times out of a total of 129 unprompted assistance areas mentioned.

Areas of requested environmental management funding or assistance



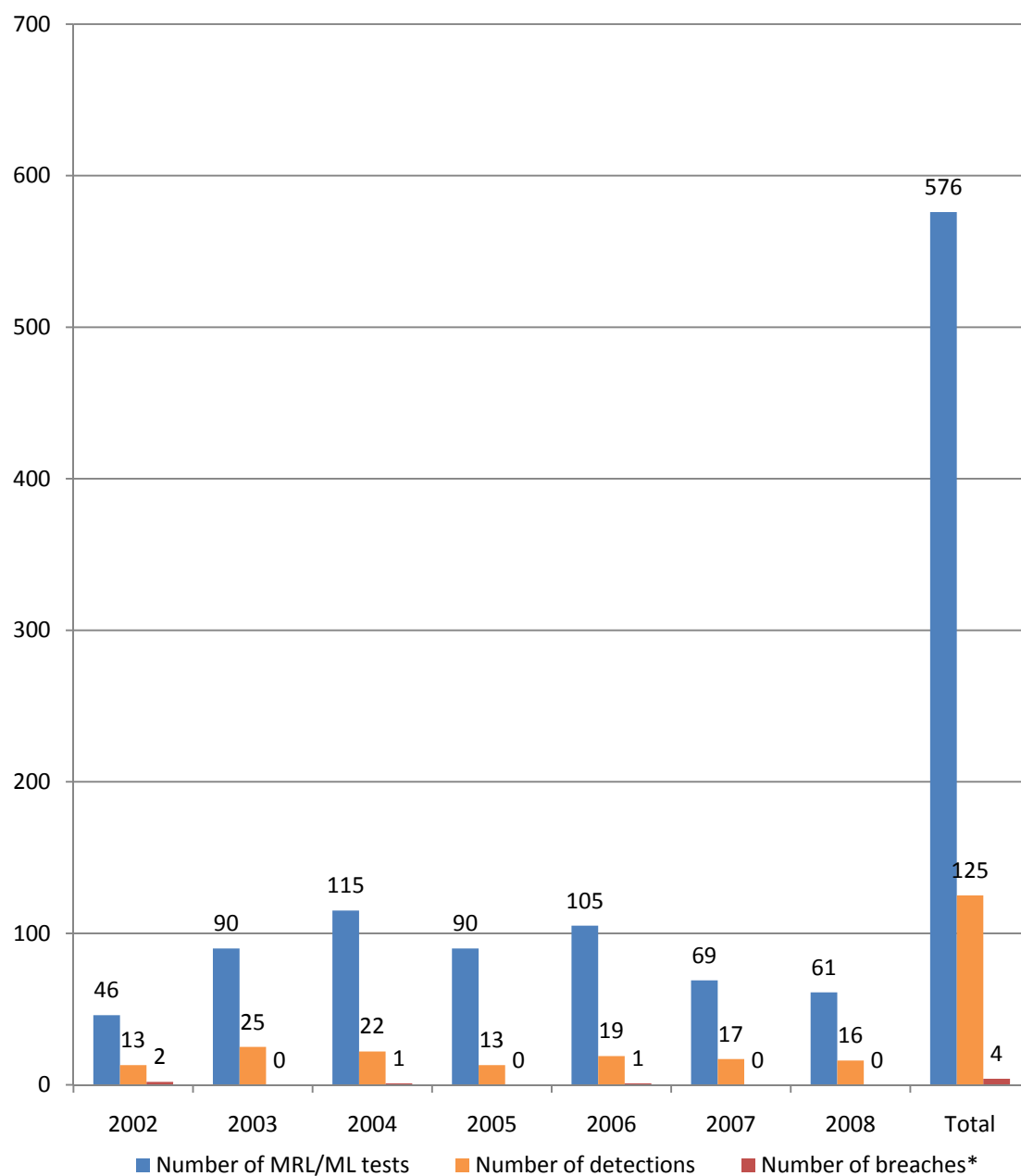
■ Weed management
■ Revegetation/wind breaks
■ Chemical use / fertilizers
■ Sustainable practices / energy sources / efficiency
■ Training subsidies
■ Other
■ Water/irrigation
■ Soil health
■ Biological farming / biodiversity
■ Pest management
■ Financial help / tax relief

9.7 Key findings

- Grower perceptions of red tape, bureaucracy, irrelevance need to be overcome when designing funding programs.
- This may be overcome by utilising an industry based funding coordinator(s). This would offer the following advantages:
 - Build up trust with grower base
 - Efficient opportunity recognition, funding application and reporting
 - Coordinating regional/industry wide projects for greater results
- Growers need to be convinced of industry consultation and real results.
- There is a genuine desire for additional funding/assistance in the areas of water management, chemical use, nutrition, sustainable practices, energy efficiency and biodiversity. There is a gap in the availability of funding/assistance in the areas of sustainable practices, energy efficiency and biodiversity.
- The fact that many growers nominated water management, chemical use and nutrition as areas in which greater funding/assistance contradicts the existing availability of programs in these subjects.

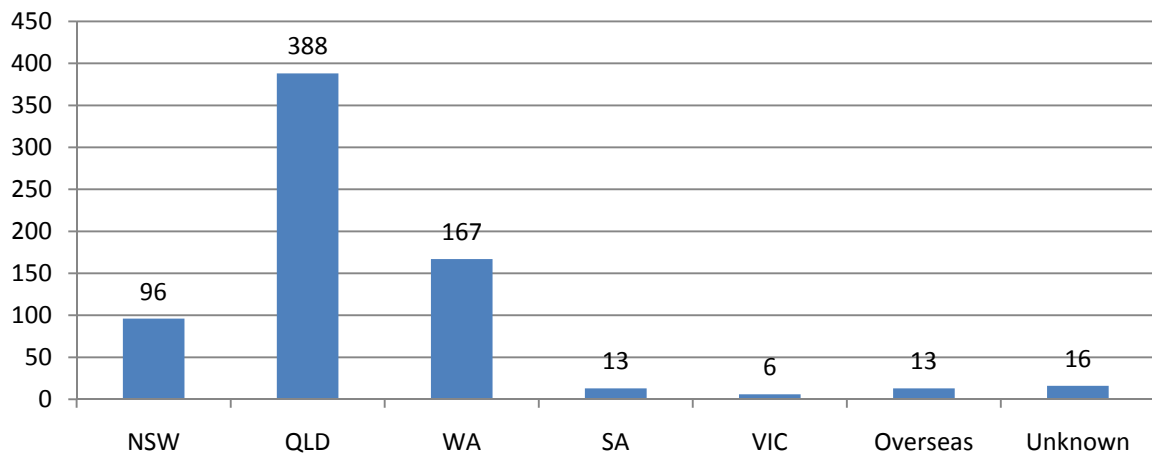
10. Chemical and heavy metal residue data

Number of MRL/ML tests, detections (within legal limits) and breaches (outside of legal limits)
2002-2008



*Breaches: Cadmium 2700% WA; Cadmium 3100% WA; Cypermethrin 130% WA; Imazalil 8000% SA.

Number of MRL/ML tests completed 2002-2008 by area of origin

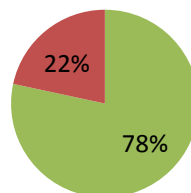


MRL/ML test detections (within legal limits) 2002-2008 by area of origin

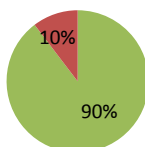
■ Tests did not detect a residue

■ Tests detected a residue

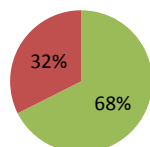
Total (excluding Overseas)



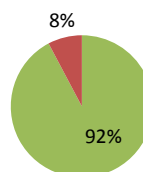
NSW



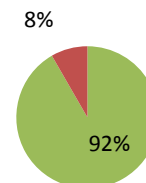
QLD



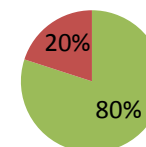
WA



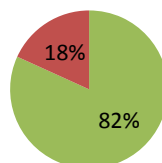
SA



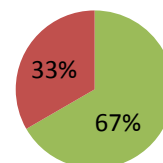
VIC



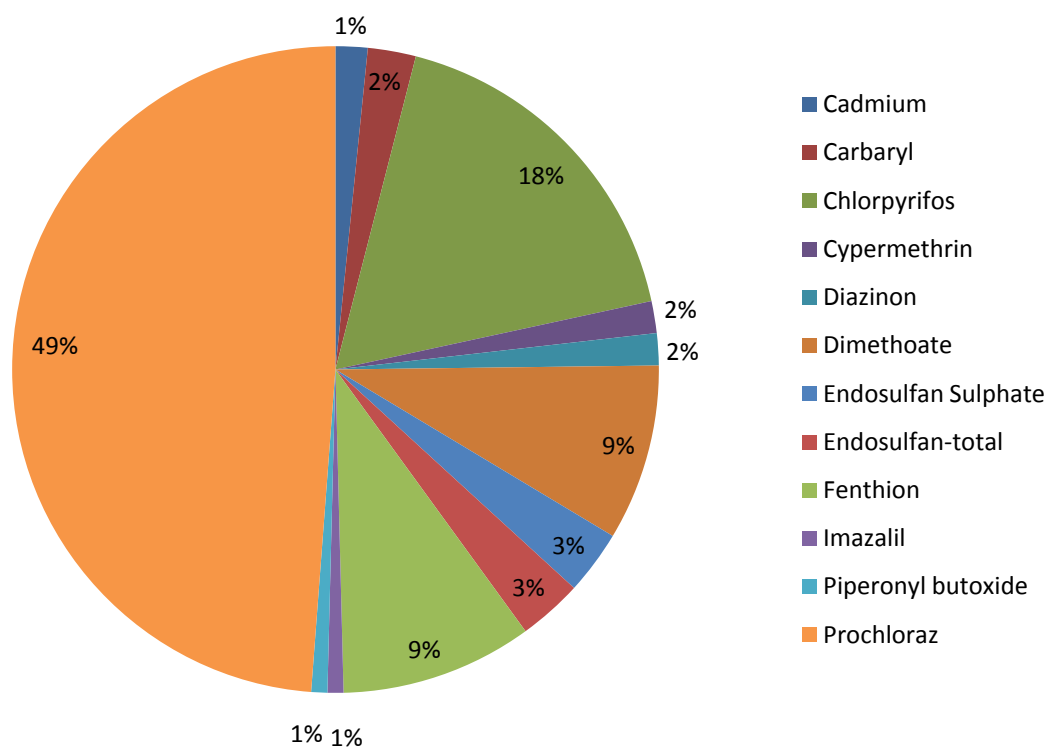
Overseas



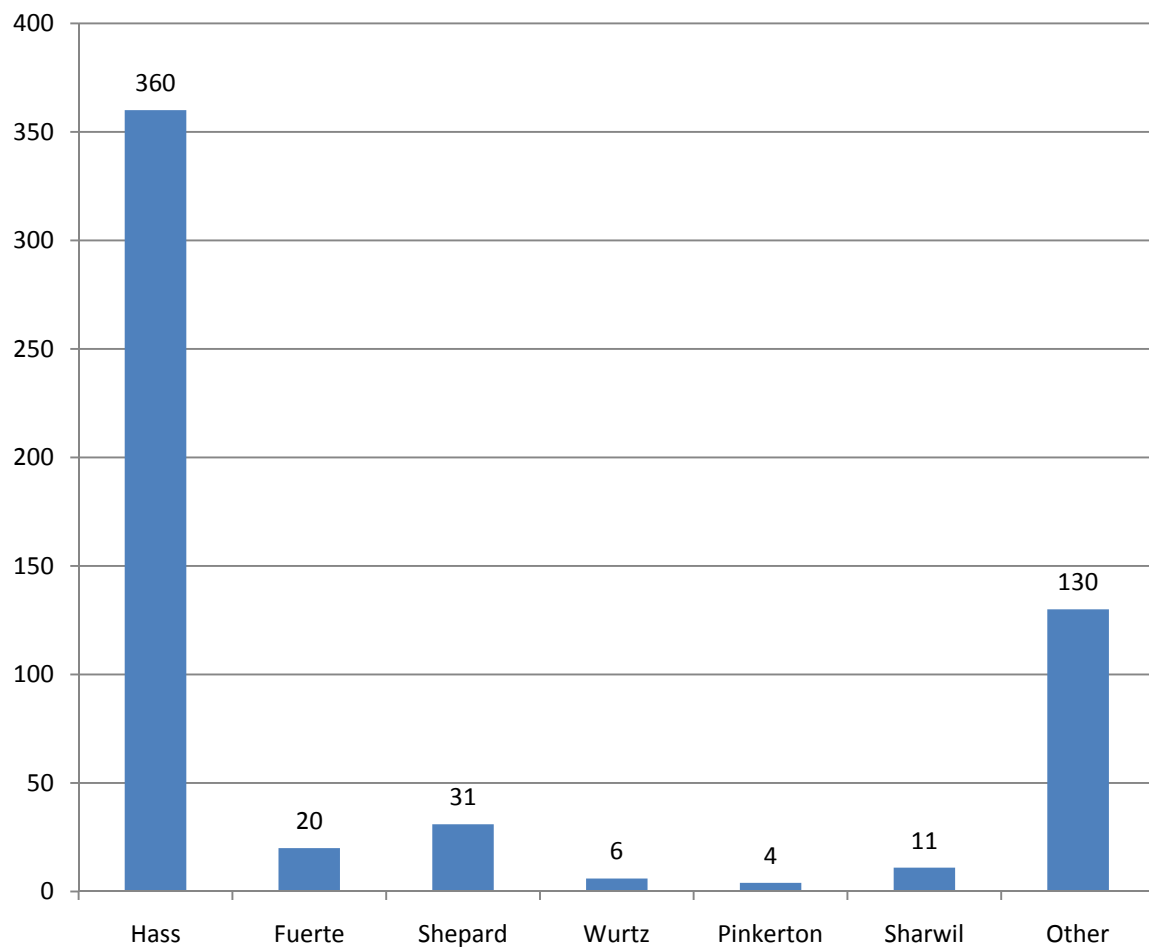
Unknown



MRL/ML detections (within legal limits) 2002-2008 by type



Number of MRL/ML tests completed 2002-2008 by variety

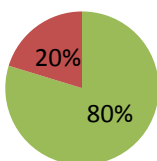


MRL/ML test detections (within legal limits) 2002-2008 by variety

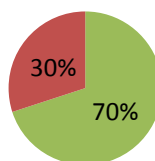
■ Tests did not detect a residue

■ Tests detected a residue

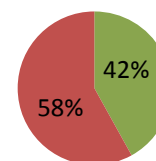
Hass



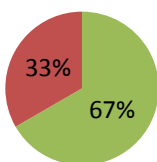
Fuerte



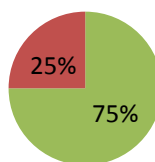
Shepard



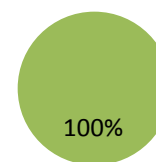
Wurtz



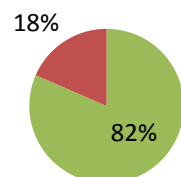
Pinkerton



Sharwil



Other



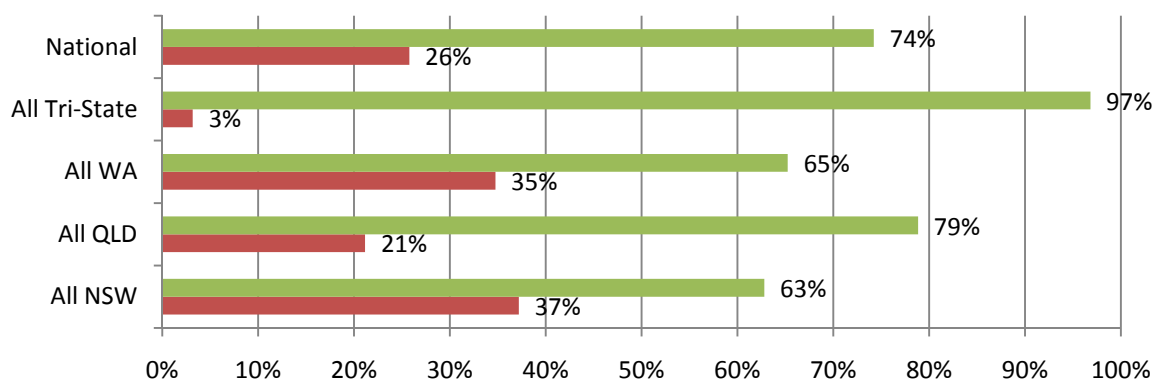
10.7 Key findings

- Of 576 tests completed for chemicals and heavy metals, 125 tests detected residues within legal limits and 4 tests detected a breach of the legal limit.
- QLD (32%) and VIC (20%) had higher levels of detection than SA, WA and NSW which were all 10% or less.
- The trend in European markets is towards zero tolerance (i.e. imported fruit is required to have no chemical residues). The New Zealand apple industry is researching methods and opportunities for marketing 'residue free apples'.
- Prochloraz, a post harvest fungicide treatment was responsible for 49% of detections.
- Chlorpyrifos, a pre harvest pesticide, was responsible for the second greatest number of detections being 18%.
- Fenthion and dimethoate, post harvest fruit fly treatments were each responsible for 9% of detections. It should be noted that the UK has a zero tolerance for these chemicals.
- More of the Shepard variety of avocados showed a residue when tested (58%) than any other variety. Less than 33% of tests completed on all other varieties detected a residue.

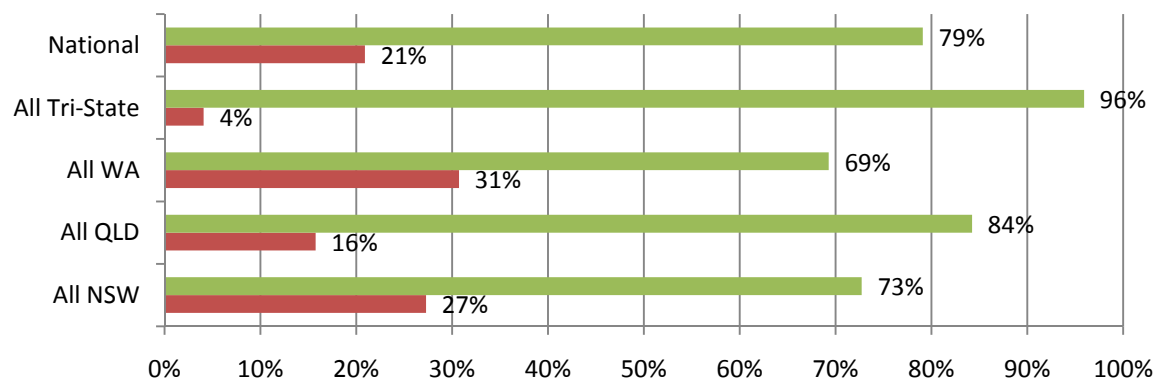
11. Grower knowledge and understanding

Chemical related questions

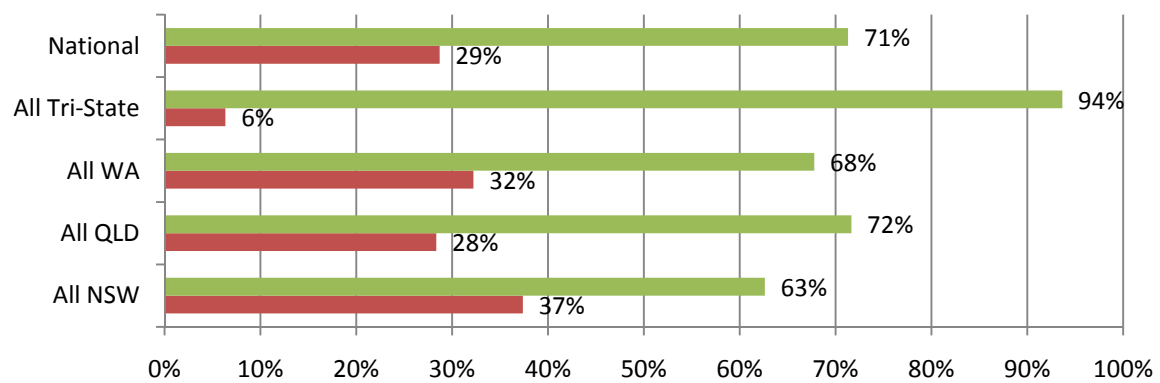
■ A greater of this topic is not needed ■ A greater understanding of this topic is needed



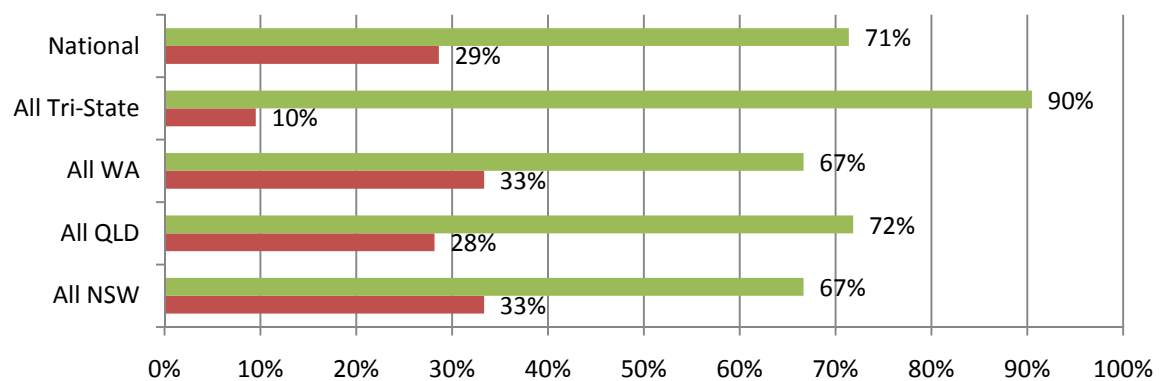
Nutrient related questions



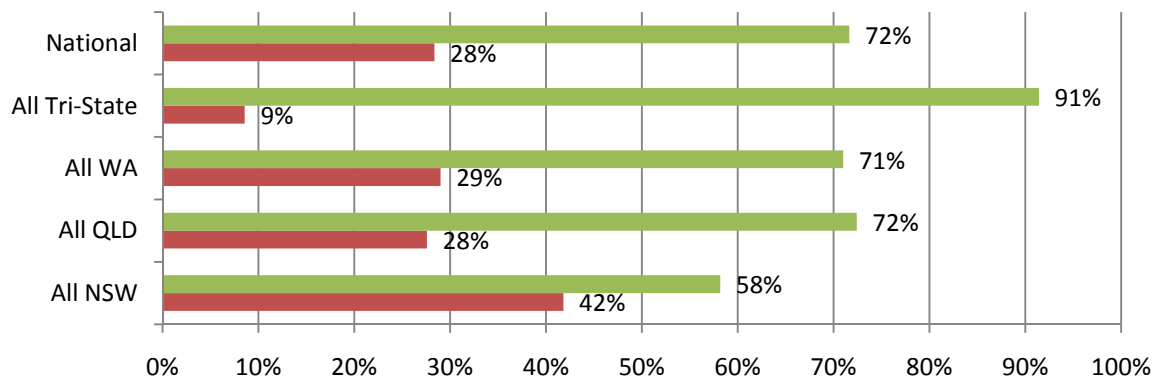
Land and soil management related questions



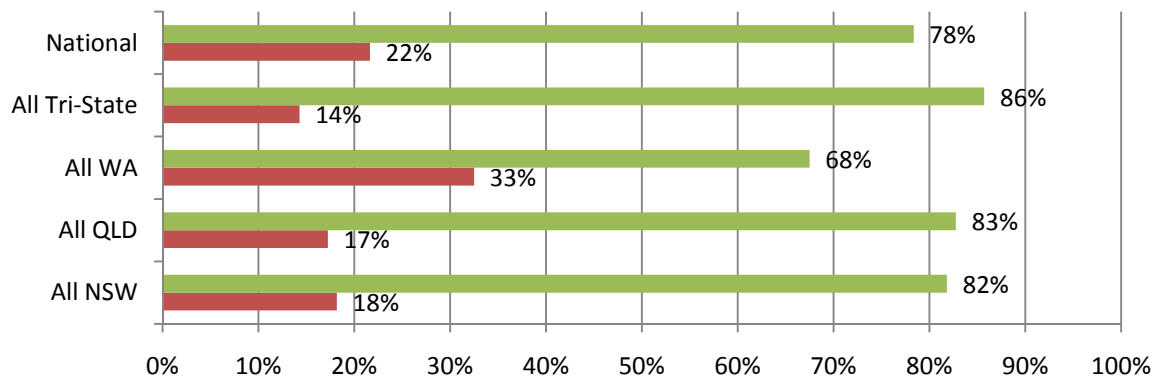
Water management related questions



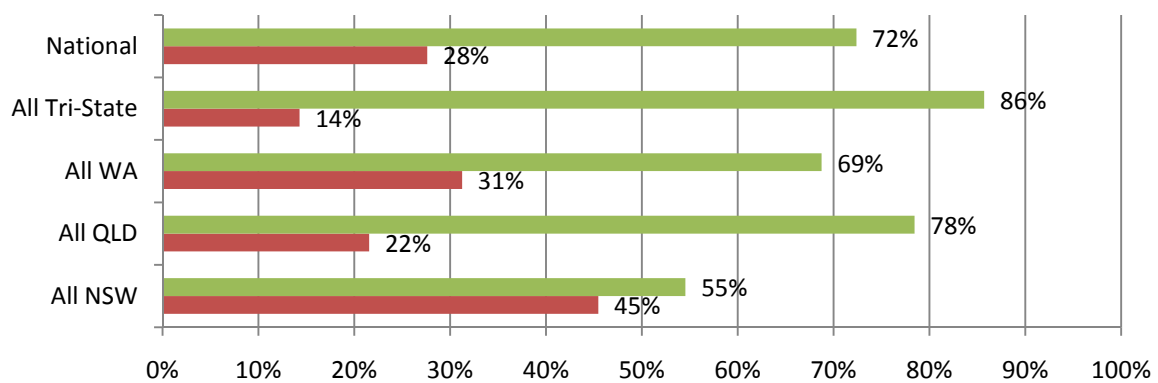
Biodiversity management related questions



Waste management related questions



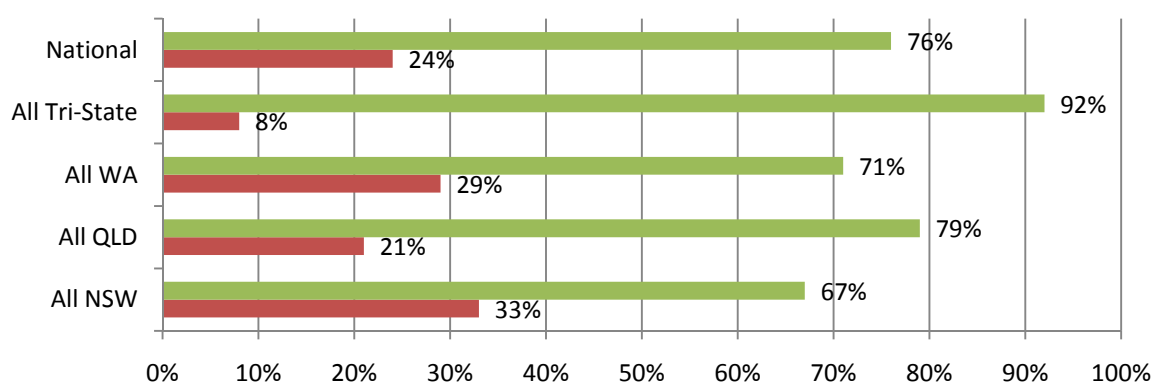
Energy management related questions



Air management related questions



Average across all sections



11.10 Key findings

- In general, NSW growers were the most likely to indicate that a greater understanding of the topics addressed in the e-survey was needed (33% of growers on average), followed by WA (29%), QLD (21%) and Tri State (8%).
- Grower interviews revealed that almost half could not think of a topic in which additional information/training was needed to assist with responsible environmental management.
- Following this, the most common response provided during the grower interviews was carbon storage/trading/credits. Generally, an increased understanding of this topic is wanted, as opposed to training or participation in a trading scheme.
- Consideration could be given to the development of a brief checklist of environmental best practice for avocados. It is felt that such a document would need to be something more basic and more easily grasped than existing tools such as HALs Guidelines for Environmental Assurance in Australian Horticulture, FarmSAT (Farm Self Assessment Tool) and Environmental Management Systems such as Freshcare.

- It would be essential for this document to integrate with additional, more comprehensive tools that may be desired by those growers wishing to progress to more rigorous programs.
- The highest level of request for more information among e-survey respondents was 42% of NSW growers for biodiversity related information and 45% of NSW growers for energy related information.

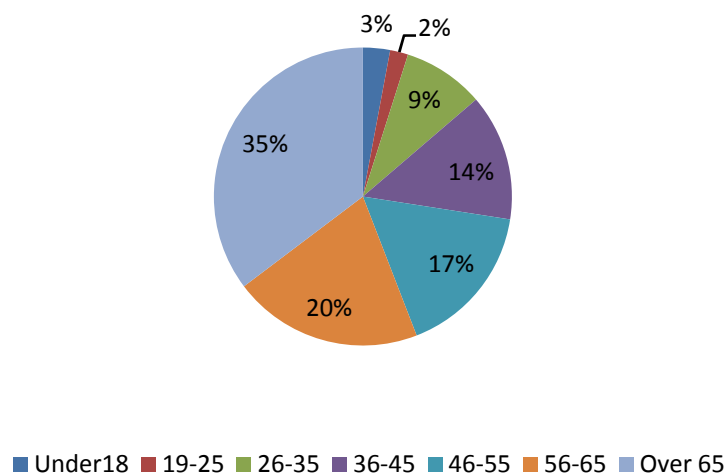
12. Community attitudes survey

A total of 307 calls were made to sample community attitudes to fruit production during the telephone-survey phase of this project. These calls resulted in 102 completed surveys upon which the following analysis is based.

12.1 Overview of surveyed individuals

The majority of individuals interviewed did not work in environmental organisations (92%) or in agriculture (87%), nor did they have children at home (70%). Respondents were most likely to be over 55 years with the biggest participant group being over 65 years (34%). Only 14% of respondents were less than 36 years of age.

Age of respondents



12.3 Attitudes to fruit production

Most people surveyed regarded themselves as either somewhat or very concerned about the impacts of fruit production on human health and to a lesser degree on the environment with people under 45 typically expressing more of a concern in these areas.

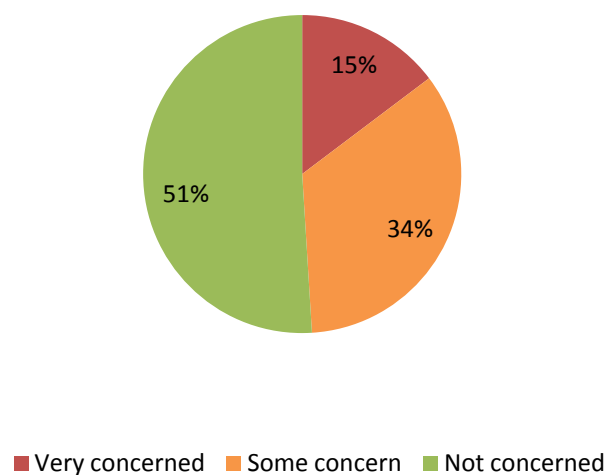
The survey found that concerns regarding the impacts of fruit production on human health were felt more than impacts on the environment with 65% of respondents being somewhat

or very concerned about health versus 49% somewhat or very concerned about the environment.

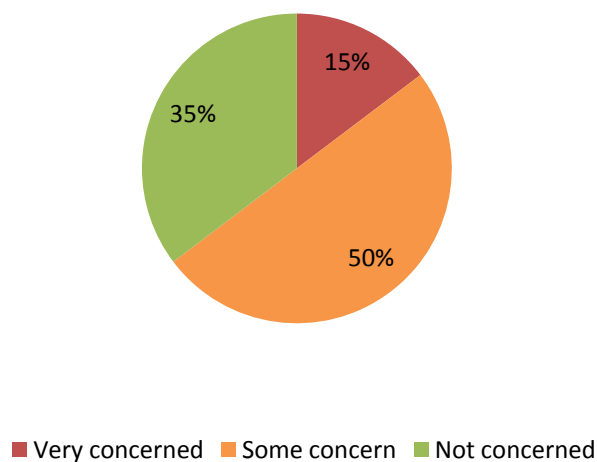
This priority of health impacts over environmental impacts was also reflected in the responses given by participants when asked about key areas of concern in fruit production. Fruit spraying and the potential consumption of chemicals were most frequently raised in reply to this unprompted question. Refer to 'Fruit production concerns' below.

12.4 Level of concern about the impact of fruit growing

Level of concern about impact on the environment



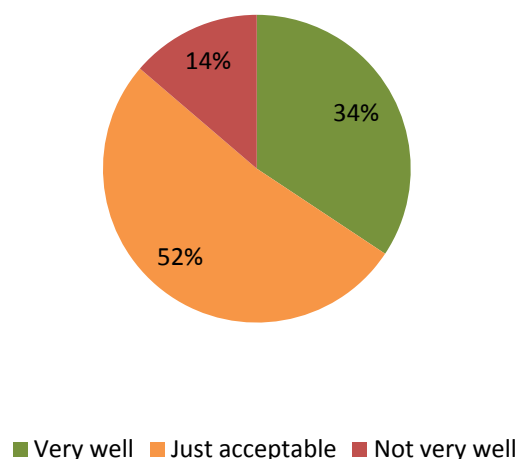
Level of concern about impact on human health



Overall, respondents held a positive view of fruit growers' protection of the environment and human health, however more than half can see room for improvement. 86% of participants

rated the grower's efforts as acceptable or better. Only 14% of respondents felt that fruit growers did not protect the environment or human health very well.

How well fruit growers are protecting the environment and human health



12.8 Fruit production concerns

A wide range of fruits and vegetables were raised when participants were asked to name the types of fruit crops and growing activities that concerned them the most. The most nominated crops were:

1. Tomato and banana (equal first in number of unprompted mentions)
2. Macadamia, apple and general citrus fruit
3. Mango, sugar cane and capsicum
4. Rockmelon, rice, zucchini and avocado

When prompted to specify the area or cause for their concerns, respondents perceived the following issues (in order of frequency of mention):

1. Chemical spraying and consumption of sprays
2. Quality/safety of imported fruit
3. Increasing price of fruit
4. Chemicals in waterways, genetic modification, land clearing and artificial ripening
5. Flying foxes and prevention methods, poor fruit quality and inefficient water use.

Of the 31 respondents who identified specific crops or areas of concern, 35% had subsequently reduced the amount of fruit consumed or purchased. The types of behavioural changes mentioned by participants included reducing or cutting out purchase and

consumption, growing their own, using roadside stalls instead of supermarkets, buying organic, and buying Australian owned.

12.9 Key findings

- Most people-surveyed regarded themselves as either somewhat or very concerned about the impacts of fruit production on human health and to a lesser degree on the environment.
- People under 45 typically expressed more of a concern in these areas.
- Overall, respondents held a positive view of fruit growers' protection of the environment and human health, however more than half can see room for improvement.
- 34% of participants rated the growers' efforts as 'very well' and 52% of participants, (including all of those with children at home), rated the growers' efforts as 'just acceptable'. Only 14% of respondents felt that fruit growers did not protect the environment or human health very well.
- Of 31 participants that nominated crops of concern, only one mentioned avocados.
- 35% of these people subsequently reduced the amount of that product purchased/consumed.
- When prompted to specify the area or cause for their concerns, respondents perceived the following issues (in order of frequency of mention):
 1. Chemical spraying and consumption of sprays
 2. Quality/safety of imported fruit
 3. Increasing price of fruit
 4. Chemicals in waterways, genetic modification, land clearing and artificial ripening
 5. Flying foxes and prevention methods, poor fruit quality and inefficient water use.

Conclusion

This project has identified that among growers in the avocado industry there is currently a moderate to high level of understanding and implementation of environmentally responsible agricultural practices, with a few areas that warrant improvement and/or monitoring. Recommendations to ensure continued strong performance and the raising of best practice standards are listed below.

The contextual information in this report relating to community attitudes revealed a persistent concern for the implications of fruit production on human health, particularly relating to chemical spraying, and to a lesser degree on the environment. Surveys in the Bundaberg community returned only one mention of avocado growing in the unprompted answers which demonstrates the relatively good or neutral position that the avocado industry holds in the minds of fruit consumers.

Additional contextual information on chemical heavy metal residue testing determined high levels of Australian legal limit compliance. A watching brief and preparatory grower education on the international market trend towards zero tolerance is required however to ensure that the Avocado industry remains at the forefront of innovative and good agricultural practices.

Environmental scorecard

The environmental scorecard shown below is an attempt to highlight regional variations in the level of responsible environmental management currently employed. The scorecard utilises the environmental hazards and impacts that were used as the basis for developing the e-survey and mail-out survey questions for this project. This information was obtained from the HAL Guidelines for Environmental Assurance in Australian Horticulture.

The following ratings have been used:

1. Managed very irresponsible
2. Managed irresponsibly
3. Managed somewhat irresponsibly
4. Managed neither responsibly or irresponsibly
5. Managed somewhat responsibly
6. Managed responsibly
7. Managed very responsibly

Environmental scorecard

Hazard to be managed/avoided	Environmental impacts which may results if this hazard is not managed appropriately	Score			
		QLD	NSW	WA	Tri State
Soil erosion	<ul style="list-style-type: none"> • Sedimentation of rivers/waterways • Reduction of water quality as a result of chemicals and fertilisers entering waterways 	6.5	6.5	6	6
Soil structural decline	<ul style="list-style-type: none"> • Compaction • Increased run-off • Nutrient depletion 	6.5	6.5	6.5	6.5
Salinity increase	<ul style="list-style-type: none"> • Reduction of arable land • Spread of saline water and land • Loss of biodiversity 	n.a	n.a	n.a	6
Soil acidity and alkalinity	<ul style="list-style-type: none"> • Loss of productivity • Reduction of arable land 	6.5	6.5	6.5	3
Inefficient use of water resources	<ul style="list-style-type: none"> • Inadequate environmental flow • Depletion of water table • Loss of biodiversity 	6.5	6.5	6.5	6.5
Inappropriate chemical application	<ul style="list-style-type: none"> • Contamination of surface/groundwater • Loss of biodiversity • Adverse impact on neighbours • Soil contamination 	3	4	5	5
Inappropriate fertiliser application	<ul style="list-style-type: none"> • Contamination of surface/groundwater • Loss of biodiversity • Atmospheric pollution • Soil acidification • Reduction of water quality - eutrophication 	5.5	5.5	5.5	5.5
Destruction of significant habitats	<ul style="list-style-type: none"> • Loss of biodiversity 	6	6	6	6
Dust	<ul style="list-style-type: none"> • Adverse impact on neighbours • Sedimentation of waterways • Soil erosion 	6.5	6.5	6.5	4
Smoke	<ul style="list-style-type: none"> • Atmospheric pollution • Adverse impact on neighbours 	6	6	6	6
Noise	<ul style="list-style-type: none"> • Adverse impact on neighbours 	6	6	6	6
Inadequate chemical spill preparedness and response	<ul style="list-style-type: none"> • Contamination of surface/groundwater • Soil contamination • Loss of biodiversity 	3	5	3.5	5

Hazard to be managed/avoided	Environmental impacts which may results if this hazard is not managed appropriately	Score			
		QLD	NSW	WA	Tri State
Inappropriate disposal of post harvest chemicals.	<ul style="list-style-type: none"> Contamination of surface/groundwater Loss of biodiversity Soil contamination 	5.5	5.5	5.5	6
Inappropriate fertiliser storage	<ul style="list-style-type: none"> Contamination of surface/groundwater Soil contamination Loss of biodiversity 	6	6	6	6
Greenhouse gas emissions/inefficient energy use	<ul style="list-style-type: none"> Atmospheric pollution Depletion of non renewable resources 	4	4	4	4
Inappropriate waste disposal- chemical containers	<ul style="list-style-type: none"> Contamination of soil and water Loss of biodiversity Atmospheric pollution Adverse impact on neighbours 	6	6	6	6.5
Inappropriate waste disposal-other waste	<ul style="list-style-type: none"> Contamination of soil and water Loss of biodiversity Atmospheric pollution Adverse impact on neighbours 	5	5	5	4.5

Recommendations

The recommendations below have been split into 'quick wins' (i.e. low cost, high impact) and 'major projects' (i.e. high cost, high impact). Within these categories, the projects have been ranked from highest priority to lowest. The highest priority has been given to those projects that will provide the optimum balance between investment and environmental effectiveness.

The industry should however consider these in line with its own investment and strategic objectives. The costings are approximate only and are based on TQA Australia's experience in project design and management. Avocados Australia have been provided with confidential suggestions on how these recommended projects could be designed and executed. Within budgetary constraints, alternative approaches could be designed to achieve similar outcomes.

Quick wins

1. Development of three brief, best practice guidelines and a one page environmental management checklist:

- Post harvest chemical disposal guideline: outlining the most appropriate disposal method for various quantities and types of chemicals.
- Waste disposal and recycling guideline: outlining responsible waste storage and handling practices and providing regionally specific details of outlets/collection options for various types of waste.
- Post canopy management inter-row restoration guideline: outlining the cost and benefits associated with sowing the narrow strip of bare earth that is often left following canopy management.
- Environmental management checklist: outlining a few key principles/practices that growers can adhere to for improved environmental management. These key messages would form part of a fully integrated communications plan (e.g. *'Have you earned your green ticks this week?'*) and would be reinforced by Avocados Australia at every opportunity. The aim is for these key messages to become part of the Australian avocado growing vernacular. An opportunity also exists to incorporate this document into a broader campaign (e.g. *Avocados... Green by Nature*).

Need: This project revealed that growers' practices would be improved in these areas if sufficient information was available.

Indicative cost: \$15,000-\$20,000.

2. An investigation into to the most appropriate way of coordinating industry participation in funding and incentive programs.

Need: This project revealed that many of the growers who have previously accessed government funding and incentives to assist with environmental management had a negative experience. This was usually associated with bureaucracy, irrelevance and difficulty in identifying and applying for appropriate opportunities. Despite this, high participation rates in these sorts of programs provide the industry with an excellent opportunity to further reduce

its environmental impact. It is essential therefore for these barriers to be overcome. This project would look at the issues and costs associated with employing regional experts to facilitate two way communication between funding providers and avocado growers.

Approximate cost: \$15,000-\$20,000.

3. Communication of the environmental and financial cost/benefit associated with the adoption of energy efficient practices.

Need: This report showed that growers are interested in implementing energy efficient practices, however there is little information available that clearly illustrates the financial and environmental cost/benefit associated with practices such as servicing all farm machinery regularly (not just new equipment) and utilising renewable energy where practical.

Cost: \$15,000-\$20,000.

Major projects

1. An investigation into options for attracting and retaining IPM specialists (and possibly other agricultural services providers) in avocado growing regions.

Need: This project revealed that there is a strong interest in IPM, however IPM specialists are not widely accessible to growers with some notable exceptions. It is felt that wider use of qualified IPM specialists would result in reduced chemical use, use of softer chemicals and perhaps reduced input costs. There is an opportunity to investigate this assumption further and illustrate the outcomes in case studies. This project would aim to quantify what the benefit of additional specialists would be and would consider strategies for attracting and retaining them.

Cost: \$25,000-\$35,000.

2. Monitoring of nutrient loss from avocado orchards near the Great Barrier Reef.

Need: Whilst this project showed that avocado growers managed nutrients reasonably well, the issue of nutrient loss is being increasingly monitored and regulated by government, particularly in those areas of Queensland where catchments impact the Great Barrier Reef. In light of this, it is suggested that the industry set up a monitoring program to collect scientific data relating to the amount of nutrients being lost to the environment from avocado orchards. Such a project would also provide an opportunity to test the effectiveness of low cost nutrient testing tools so that a determination can be made as to whether or not regular testing by growers

Further research and discussion with local service providers is needed to collect the information necessary to cost this recommendation and to identify appropriate sources of funding.

Sources of funding

There are many funding programs available aimed at improving the uptake of environmentally responsible practices. Whilst the eligibility criteria relating to participants and the types of activities to be funded varies greatly between programs, it is likely that a funding opportunity exists for each of the projects outlined above. As discussed elsewhere in this report, identifying these opportunities thoroughly can be a complex and time consuming process.

Major sources of funding include:

HAL projects

An 'Industry call' for funding applications occurs around October-November annually. This call is for applications seeking funding for projects that address the specific research and development priorities of a particular industry. These projects are usually funded by industry levies.

A 'General call' for funding applications occurs around January-March each year. This call is for applications seeking funding for projects aimed at meeting more general research and development needs than those identified in industry priorities. These projects are usually partly funded by a voluntary contribution from a public or private organisation such as an agribusiness or other research institution.

Caring for our Country

Caring for our Country encompasses many sub-programs, including Reef Rescue and the recently announced Community Action Grants. Currently, all calls for funding applications are closed. The date for the next call has not yet been announced. The guidelines for Community Action Grants (for small group projects worth up to \$20,000) are expected to be announced in October.

FarmReady Industry Grants

These grants provide up to \$80,000 for projects that involve working with a group of primary producers. The current call for funding applications closes 30.09.09. The next call has not been announced.

Appendices

Appendix 1: E-survey used

Avocados Australia Environmental Management Survey

1. About this survey

Thank you for taking the time to complete this confidential survey.

With the support of Horticulture Australia Limited, Avocados Australia has commissioned this survey to determine the types of things that growers and packers are doing to reduce the impact that their operations have on the environment. The survey will also help us to identify any gaps in knowledge or practice so that these areas can be targeted through future Avocados Australia initiatives. Ultimately, this project will enable us to demonstrate to our customers and to the wider community, our industry's commitment to responsible environmental management.

It is important that you answer these questions as accurately as possible. The answers that you provide will remain confidential. At the completion of this survey, face to face surveys will be conducted with a number of growers and packers in order to gain more detailed information.

This is your opportunity to provide input into the way that our industry's funds are managed with regard to improving and promoting our environmental performance. If you have any questions regarding the survey, please contact Daryl Connelly from Tasmanian Quality Assured Inc, who is managing the project on our behalf. Daryl can be contacted on 0439 139 436 or daryl.connelly@tqainc.com.au.

The survey will take approximately 15 minutes to complete. This is page 1 of 11. Your progress can be seen below. Click 'next' to move to the next page, which contains further instructions on how to complete the survey.

Thanks again for your support.

Antony Allen
Chief Executive Officer
Avocados Australia
P: (07) 3846 6566

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Avocados Australia Environmental Management Survey

2. Instructions - PLEASE READ BEFORE PROCEEDING

When you click 'Submit survey' on the last page, your responses will automatically be saved to a remote website which can only be accessed by the Project Manager.

Important points:

As you have now accessed the survey, you must complete it before exiting. You will not be able to access it again from the same computer.

Please answer every question. Some questions are compulsory. If you have left a compulsory question unanswered, you will not be able to proceed to the next page and a message will appear above the unanswered questions asking you to answer them.

Many of the questions ask you to choose between the answer 'I HAVE ALL OF THE KNOWLEDGE THAT I REQUIRE ON THIS TOPIC' and 'I WOULD LIKE TO HAVE A GREATER UNDERSTANDING OF THIS TOPIC'. When selecting your answer, remember that primary producers will increasingly be under pressure from the community, government and customers to have a sound understanding of all aspects of environmental management. By indicating that you would like to have a greater understanding, this will allow Avocados Australia to develop programs that will help growers to acquire the knowledge and skills that are needed most, in order to show the community that the industry manages the environment responsibly.

Please note, some questions require you to select an answer from TWO drop down menus.

You can use the mouse to move between questions, or you can use the 'tab' key.

Please don't hesitate to contact me if you need help.

I appreciate your participation.

Kind regards,

Daryl Connelly
Project Manager
Tasmanian Quality Assured Inc
daryl.connelly@tqainc.com.au
P: (03) 6423 6008
M: 0439 139 436

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Avocados Australia Environmental Management Survey

3. Land and Soil Management

Part 1- Please select an answer from each of the drop down menus.

	Practice	Knowledge
Have stable drains been established on new areas to manage water runoff and prevent erosion during soil preparation and planting?	<input type="text"/>	<input type="text"/>
Do you avoid establishing new sites where neighbours may be affected by noise, chemicals, smoke and dust?	<input type="text"/>	<input type="text"/>
Do you test for sodicity and salinity before establishing new sites?	<input type="text"/>	<input type="text"/>
Do you test soil pH before establishing a new site?	<input type="text"/>	<input type="text"/>
Where the slope is greater than 5%, do you establish diversion banks above new areas before ground preparation begins, to direct water to grassed drains?	<input type="text"/>	<input type="text"/>
Do you aim to reduce the number of cultivations during site preparation and cover crop management?	<input type="text"/>	<input type="text"/>

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Avocados Australia Environmental Management Survey

Do you aim to minimise the time that soil is bare during site preparation and cover crop management?	<input type="text"/>	<input type="text"/>
Do you establish and maintain permanent inter-row grass cover as soon as possible after ground preparation to prevent erosion and to provide the soil with a source of organic matter?	<input type="text"/>	<input type="text"/>
Do you apply mulch to the tree line once young trees are planted?	<input type="text"/>	<input type="text"/>
Do you test soil pH at least every 2-3 years to assess the need for adjustment?	<input type="text"/>	<input type="text"/>
Part 2 - Please tell us about the other things that you do to prevent land and soil degradation. <input type="text"/>		

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4. Water Management

Part 1 - Please select an answer from each of the drop down menus.

	Practice	Knowledge:
Do you monitor soil moisture and use that information to manage irrigation?	<input type="text"/>	<input type="text"/>
In areas where irrigation water is potentially saline, do you test for water salinity at least annually?	<input type="text"/>	<input type="text"/>
Do you check the uniformity of sprinkler output across blocks of trees at least annually?	<input type="text"/>	<input type="text"/>
Do you capture rainwater for use in the packing shed?	<input type="text"/>	<input type="text"/>
Where appropriate (e.g. fruit washing and water dumps), is packing shed water recycled (other than for fungicide sprays)?	<input type="text"/>	<input type="text"/>
Do you use silt traps/dams/vegetated filter strips/grass drains to collect run-off water from your farm before release off site?	<input type="text"/>	<input type="text"/>

Part 2 - Please tell us how you monitor soil water so that irrigation water is applied efficiently, without leaching nutrients into the environment (e.g. rainfall and evaporation data, tensiometers)?

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Avocados Australia Environmental Management Survey

Part 3 - Please tell us about any other things that you do to manage your water efficiently.

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5. Chemical Management

Part 1 - Chemical storage. Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Is your chemical storage area equipped with a spill kit?	<input type="text"/>	<input type="text"/>

Part 2 - Chemical Use. Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Are chemicals applied only under the supervision of staff that have completed recognised chemical users training?	<input type="text"/>	<input type="text"/>

	Practice	Knowledge
Is your crop regularly monitored for signs of insects and disease so that you can make informed decisions on when to spray?	<input type="text"/>	<input type="text"/>

	Practice	Knowledge
Where possible, do you use 'softer' chemicals instead of broad spectrum chemicals (e.g. tebufenozide/Mimic instead of chlorpyrifos)?	<input type="text"/>	<input type="text"/>

	Practice	Knowledge
Do you ensure that spraying is only carried out in appropriate weather conditions to avoid spray drift?	<input type="text"/>	<input type="text"/>

	Practice	Knowledge
Has anybody on-farm attended Integrated Pest Management	<input type="text"/>	<input type="text"/>

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Avocados Australia Environmental Management Survey

training?

Part 3 - Chemical container disposal. Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Are your unwanted chemical containers disposed of through an approved program (e.g. Drum Muster/ChemClear) or contractor?	<input type="text"/>	<input type="text"/>

	Practice	Knowledge
Are your unwanted chemical containers stored where people cannot access them when waiting for disposal?	<input type="text"/>	<input type="text"/>

Part 4 - How do you dispose of postharvest fungicide & insecticide dips/sprays?

	Practice	Knowledge
Please select an answer.	<input type="text"/>	<input type="text"/>

Other (please specify)

Part 5 - Please tell us about any other things that you do to manage your chemical use so that it does not harm the environment.

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6. Nutrient Management

Part 1 - Nutrient Storage. Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Are your synthetic/non-organic fertilisers stored in a manner that prevents contamination of the environment?	<input type="text"/>	<input type="text"/>
Are your bulk animal manures sited and managed in a way that ensures rain/run-off water will not cause nutrients from the heaps to be washed into waterways?	<input type="text"/>	<input type="text"/>

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Avocados Australia Environmental Management Survey

Part 2 - Nutrient Application. Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Do you test new sites for soil nutrients at least 6 months before planting?	<input type="text"/>	<input type="text"/>
Do you carry out soil testing at least every 2-3 years or leaf testing annually to make informed fertiliser decisions?	<input type="text"/>	<input type="text"/>
Do you test animal manures and composts for nutrient status before use?	<input type="text"/>	<input type="text"/>
Do you avoid applying fertiliser when heavy rainfall is forecast?	<input type="text"/>	<input type="text"/>
Is your fertiliser application equipment calibrated at least annually?	<input type="text"/>	<input type="text"/>

Part 3 - Please tell us about any other things that you do to manage nutrients so that they do not harm the environment.

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Avocados Australia Environmental Management Survey		
7. Biodiversity Management		
Part 1 - Please select an answer from each of the two drop down menus.		
	Practice	Knowledge
Have you assessed whether or not any significant flora/fauna exists on your property?	<input type="text"/>	<input type="text"/>
Do you manage sensitive areas such as waterways, wetlands and areas of native vegetation to protect them (e.g. restrict stock and human access)?	<input type="text"/>	<input type="text"/>
Do you control environmental weeds and feral animals in these areas?	<input type="text"/>	<input type="text"/>
Are you able to identify all of the declared weeds that occur in your region?	<input type="text"/>	<input type="text"/>
Do you encourage revegetation of land that is unsuitable for agriculture (e.g. restrict stock and human access/plant native vegetation in these areas)?	<input type="text"/>	<input type="text"/>

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Part 2 - Please tell us about any other things that you do to encourage biodiversity on your farm.	
<input type="text"/>	

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8. Waste Management		
Part 1 - Please select an answer from each of the two drop down menus.		
	Practice	Knowledge
Do you dispose of rejected produce in a manner that will not disturb neighbours or allow it to enter waterways?	<input type="text"/>	<input type="text"/>
Do you separate materials for recycling?	<input type="text"/>	<input type="text"/>
Part 2 - Please tell us about any other things that you do to reduce/manage waste.		
<input type="text"/>		
<input type="text"/>		

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Avocados Australia Environmental Management Survey		
9. Air Management		
Part 1 - Please select an answer from each of the two drop down menus.		
	Practice	Knowledge
Do you inform neighbours that may be affected before undertaking farm activities that may result in significant dust, smoke or noise?	<input type="text"/>	<input type="text"/>
Do you avoid burning wet material, plastics and rubber?	<input type="text"/>	<input type="text"/>
Do you plan night time activities so that neighbours are least effected by noise?	<input type="text"/>	<input type="text"/>
Part 2 - Please tell us about any other things that you do to prevent air contamination (noise, dust and smoke).		
<input type="text"/>		
<input type="text"/>		

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10. Energy Management

Part 1 - Please select an answer from each of the two drop down menus.

	Practice	Knowledge
Do you maintain vehicles/equipment as per the manufacturer's recommendations to ensure fuel/electricity efficiency?	<input type="text"/>	<input type="text"/>
When purchasing new vehicles/equipment, is fuel/electricity efficiency a major consideration?	<input type="text"/>	<input type="text"/>
Do you use renewable energy alternatives (wind/solar) for any equipment that is traditionally powered by non renewable energy?	<input type="text"/>	<input type="text"/>
Do you purchase accredited 'Green Power' from your electricity supplier?	<input type="text"/>	<input type="text"/>

Part 2 - Please tell us about any other things that you do to manage energy efficiently.

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Avocados Australia Environmental Management Survey

11. General information

The purpose of this section is to provide us with information that will enable us to analyse the data in a meaningful way. We are not collecting any information which will allow you to be identified.

Your location

- ☐ North Queensland
☐ Central Queensland (Incl. Bundaberg/Childers)
☐ South East Queensland Coastal ('Sunshine Coast to NSW border)
☐ West Moreton, Queensland
☐ Northern NSW
☐ Central Coast, NSW
☐ Tri-State
☐ Perth region, WA
☐ South West WA
☐ Other (please specify)

What is your age?

How many years have you been involved with horticulture? THIS QUESTION MUST BE ANSWERED IN ORDER TO PROCEED BEYOND THIS PAGE.

How many hectares do you have planted with avocados? THIS QUESTION MUST BE ANSWERED IN ORDER TO PROCEED BEYOND THIS PAGE.

What best describes your avocado operation?

- ☐ Grower only
☐ Grower and packer

Have you accessed government funding or participated in programs (e.g. Catchment Management Authority/Natural Resource Management projects, Landcare) to help you manage the environment on your farm?

- ☐ Yes
☐ No
☐ Unsure

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Avocados Australia Environmental Management Survey

In your view, what is something positive about these sorts of programs and funding opportunities?

In your view, what is something negative about these types of programs and funding opportunities?

What QA/Food safety/environmental management standards are you certified to?

☐ None

☐ Freshcare Food Safety

☐ Freshcare Environmental

☐ WQA

☐ SQF

☐ HACCP

☐ Other (please specify)

How important do you feel that it is for the community to view primary producers as being good environmental managers?

☐ It's not important and does not impact on my business.

☐ It's of some importance, it's just about being seen to do the right thing on your farm.

☐ It's very important. Farmers need to actively demonstrate good environmental management to the community.

☐ Other (please specify)

How important do you think environmental sustainability issues will be to your business in the future?

☐ Environmental sustainability issues will not impact on my business in the future.

☐ Environmental sustainability issues will have some impact on my business in the future.

☐ Environmental sustainability issues will be a major consideration when managing my business in the future.

☐ Other (please specify)

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Avocados Australia Environmental Management Survey

If funding or other assistance was available to help me with environmental management, the three areas that I would most like assistance with are:

1

2

3

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Appendix 2: E-survey results

General information

Region	Number	% of total respondents	Growers	Grower %	Grower / packers	Grower / packer %	Average age (years)
All NSW	11	16%	6	21%	5	13%	53
All QLD	29	43%	11	38%	18	47%	51
All WA	20	30%	10	34%	10	26%	49
All Tri State	7	10%	2	7%	5	13%	46
National	67		29		38		

Have you accessed government funding or participated in programs (e.g.: Catchment Management Authority / Natural Resource Management projects, Landcare) to help you manage the environment on your farm?

Region	Yes	Yes %	No	No %	Unsure	Unsure %
All NSW	3	27%	8	73%	0	0%
All QLD	9	31%	20	69%	0	0%
All WA	7	35%	11	55%	2	10%
All Tri State	4	57%	2	29%	1	14%
National	23	34%	41	61%	3	4%

What QA/Food Safety/Environmental management standards are you certified to?

Region	None	Freshcare Food Safety	Freshcare Environment	WQA	SQF	HACCP	Other
All NSW	1	7	0	1	1	1	1
All QLD	3	16	1	4	6	10	0
All WA	5	9	1	1	4	5	1
All Tri State	0	0	0	1	2	6	4
National	9	32	2	7	13	22	6

How important do you feel that it is for the community to view primary producers as being good environmental managers?

Region	Very important	Very important %	Some importance	Some importance %	Not important	Not important %	Other	Other %
All NSW	8	73	1	9	1	9	1	9
All QLD	25	86	4	14	0	0	0	0
All WA	16	80	3	15	1	5	0	0
All Tri State	4	57	2	29	0	0	1	14
National	53	79	10	15	2	3	2	3

How important do you think environmental sustainability issues will be to your business in the future?

Region	Major consideration	Major consideration %	Some impact	Some impact %	Other	Other %
All NSW	5	45	5	45	1	9
All QLD	16	55	12	41	1	3
All WA	15	75	5	25	0	0
All Tri State	3	43	3	43	1	14
National	39	58	25	37	3	4

Land and Soil Management

Have stable drains been established on new areas to manage water runoff and prevent erosion during soil preparation and planting?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	1	9	1	9	1	9	4	36	7	64
All QLD	17	59	0	0	4	14	8	28	7	24	22	76
All WA	4	20	6	30	0	0	10	50	9	45	11	55
All Tri State	0	0	0	0	0	0	7	100	0	0	7	100
National	29	43	7	10	5	7	26	39	20	30	47	70

Do you avoid establishing new sites where neighbours may be affected by noise, chemicals, smoke and dust?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %
All NSW	3	27	1	9	2	18	5	45
All QLD	14	48	1	3	4	14	10	34
All WA	9	45	2	10	1	5	8	40
All Tri State	3	43	0	0	0	0	4	57
National	29	43	4	6	7	10	27	40

Do you test for sodicity and salinity before establishing new sites?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	1	9	4	36	1	9	5	45	6	55	5	45
All QLD	13	45	6	21	1	3	9	31	11	38	16	55
All WA	15	75	4	20	0	0	1	5	5	25	15	75
All Tri State	6	86	0	0	1	14	0	0	1	14	6	86
National	35	52	14	21	3	4	15	22	23	34	42	63

Do you test soil pH before establishing a new site?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	0	0	2	18	1	9	4	36	7	64
All QLD	20	69	3	10	0	0	6	21	9	31	20	69
All WA	15	75	4	20	0	0	1	5	4	20	16	80
All Tri State	5	71	0	0	2	29	0	0	1	14	6	86
National	48	72	7	10	4	6	8	12	18	27	49	73

Where the slope is >5%, do you establish diversion banks above new areas before ground preparation begins, to direct water to grassed drains?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	4	36	0	0	2	18	5	45	3	27	8	73
All QLD	7	24	2	7	4	14	16	55	9	31	20	69
All WA	2	10	3	15	1	5	14	70	8	40	12	60
All Tri State	0	0	0	0	0	0	7	100	0	0	7	100
National	13	19	5	7	7	10	42	63	20	30	47	70

Do you aim to reduce the number of cultivations during site preparation and cover crop management?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	0	0	0	0	3	27	3	27	8	73
All QLD	14	48	3	10	3	10	9	31	7	24	22	76
All WA	16	80	1	5	2	10	1	5	9	45	11	55
All Tri State	5	71	0	0	2	29	0	0	0	0	7	100
National	43	64	4	6	7	10	13	19	19	28	48	72

Do you aim to minimize the time that the soil is bare during site preparation and cover crop management?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	0	0	0	0	1	9	3	27	8	73
All QLD	19	66	1	3	2	7	7	24	8	28	21	72
All WA	17	85	1	5	1	5	1	5	6	30	14	70
All Tri State	7	100	0	0	0	0	0	0	0	0	7	100
National	53	79	2	3	3	4	9	13	17	25	50	75

Do you establish and maintain permanent inter-row grass cover as soon as possible after ground preparation to prevent erosion and to provide the soil with a source of organic matter?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	0	0	1	9	0	0	4	36	7	64%
All QLD	25	86	1	3	0	0	3	10	7	24	22	76
All WA	19	95	1	5	0	0	0	0	6	30	14	70
All Tri State	4	57	1	14	1	14	1	14	0	0	7	100
National	58	87	3	4	2	3	4	6	17	25	50	75

Do you apply mulch to the tree-line once young trees are planted?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	1	9	0	0	0	0	6	55	5	45
All QLD	24	83	3	10	1	3	1	3	9	31	20	69
All WA	15	75	3	15	2	10	0	0	6	30	14	70
All Tri State	4	57	0	0	2	29	1	14	1	14	6	86
National	53	79	7	10	5	7	2	3	22	33	45	67

Do you test soil pH at least every 2-3 years to assess the need for adjustment?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82%	1	9%	1	9%	0	0%	4	36%	7	64%
All QLD	26	90%	2	7%	0	0%	1	3%	7	24%	22	76%
All WA	16	80%	2	10%	2	10%	0	0%	5	25%	15	75%
All Tri State	2	29%	3	43%	2	29%	0	0%	1	14%	6	86%
National	53	79%	8	12%	5	7%	1	1%	17	25%	50	75%

Water Management

Do you monitor soil moisture and use that information to manage irrigation?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	4	36	1	9	4	36	2	18	6	55	5	45
All QLD	25	86	1	3	2	7	1	3	11	38	18	62
All WA	17	85	0	0	3	15	0	0	9	45	11	55
All Tri State	7	100	0	0	0	0	0	0	1	14	6	86
National	53	79	2	3	9	13	3	4	27	40	40	60

In areas where irrigation water is potentially saline, do you test for water salinity at least annually?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	1	9	1	9	0	0	9	82	4	36	7	64
All QLD	13	45	4	14	2	7	10	34	10	34	19	66
All WA	9	45	3	15	0	0	8	40	7	35	13	65
All Tri State	3	43	2	29	1	14	1	14	1	14	6	86
National	26	39	10	15	3	4	28	42	22	33	45	67

Do you check the uniformity of sprinkler output across blocks of trees at least annually?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	3	27	3	27	3	27	2	18	5	45	6	55
All QLD	21	72	3	10	4	14	1	3	8	28	21	72
All WA	15	75	0	0	5	25	0	0	3	15	17	85
All Tri State	2	29	1	14	3	43	1	14	0	0	7	100
National	41	61	7	10	15	22	4	6	16	24	51	76

Do you capture rainwater for use in the packing shed?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	5	45	1	9	0	0	5	45	1	9	10	91
All QLD	16	55	5	17	0	0	8	28	5	17	24	83
All WA	7	35	5	25	0	0	8	40	4	20	16	80
All Tri State	3	43	2	29	0	0	2	29	0	0	7	100
National	31	46	13	19	0	0	23	34	10	15	57	85

Where appropriate, is packing shed water recycled (other than for fungicide sprays)?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	1	9	4	36	1	9	5	45	3	27	8	73
All QLD	4	14	10	34	2	7	13	45	7	24	22	76
All WA	1	5	8	40	1	5	10	50	7	35	13	65
All Tri State	2	29	2	29	0	0	3	43	1	14	6	86
National	8	12	24	36	4	6	31	46	18	27	49	73

Do you use silt traps/dams/vegetated filter strips/grass drains to collect runoff water from your farm before release offsite?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82	0	0	0	0	2	18	3	27	8	73
All QLD	14	48	7	24	1	3	7	24	8	28	21	72
All WA	9	45	5	25	0	0	6	30	10	50	10	50
All Tri State	2	29	0	0	0	0	5	71	1	14	6	86
National	34	51	12	18	1	1	20	30	22	33	45	67

Chemical Management

Is your chemical storage area equipped with a spill kit?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	6	55	5	45	0	0	0	0	9	82	2	18
All QLD	13	45	14	48	0	0	2	7	6	21	23	79
All WA	8	40	9	45	0	0	3	15	11	55	11	55
All Tri State	6	86	1	14	0	0	0	0	0	0	7	100
National	33	49	29	43	0	0	5	7	26	39	43	64

Are chemicals applied only under the supervision of staff that have completed recognised chemical users training?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	1	9	0	0	0	0	0	0	11	100
All QLD	26	90	1	3	0	0	2	7	3	10	26	90
All WA	15	75	0	0	1	5	4	20	4	20	16	80
All Tri State	7	100	0	0	0	0	0	0	0	0	7	100
National	58	87	2	3	1	1	6	9	7	10	60	90

Is your crop regularly monitored for signs of insects and disease so that you can make informed decisions on when to spray?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	11	100	0	0	0	0	0	0	5	45	6	55
All QLD	26	90	1	3	1	3	1	3	8	28	24	83
All WA	17	85	0	0	2	10	1	5	9	45	11	55
All Tri State	6	86	0	0	1	14	0	0	0	0	7	100
National	60	90	1	1	4	6	2	3	22	33	48	72

Where possible, do you use 'softer' chemicals instead of broad spectrum chemicals (e.g.: tebufenozide/Mimic instead of chlorpyrifos?)

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82	0	0	1	9	1	9	6	55	5	45
All QLD	20	69	3	10	5	17	1	3	11	38	18	62
All WA	14	70	0	0	0	0	6	30	8	40	12	60
All Tri State	6	86	0	0	0	0	1	14	0	0	7	100
National	49	73	3	4	6	9	9	13	25	37	42	63

Do you ensure that spraying is only carried out in appropriate weather conditions to avoid spray drift?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	11	100	0	0	0	0	0	0	0	0	11	100
All QLD	26	90	0	0	2	7	1	3	3	10	26	90
All WA	16	80	0	0	1	5	3	15	4	20	16	80
All Tri State	6	86	0	0	0	0	1	14	0	0	7	100
National	59	88	0	0	3	4	5	7	7	10	60	90

Has anybody on farm attended Integrated Pest Management training?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	5	45	6	55	0	0	0	0	6	55	5	45
All QLD	18	62	11	38	0	0	0	0	12	41	17	59
All WA	13	65	7	35	0	0	0	0	12	60	8	40
All Tri State	6	86	1	14	0	0	0	0	1	14	6	86
National	42	63	25	37	0	0	0	0	31	46	36	54

Are your unwanted chemical containers disposed of through an approved program (e.g.: DrumMuster/ChemClear) or contractor?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	0	0	3	27	0	0	1	9	10	91
All QLD	24	83	3	10	1	3	1	3	2	7	26	90
All WA	12	60	2	10	2	10	4	20	5	25	15	75
All Tri State	6	86	0	0	1	14	0	0	0	0	7	100
National	50	75	5	7	7	10	5	7	8	12	58	87

Are your unwanted chemical containers stored where people cannot access them when waiting for disposal?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	3	27	0	0	1	9	2	18	9	82
All QLD	20	69	4	14	4	14	1	3	4	14	25	86
All WA	7	35	7	35	2	10	4	20	5	25	15	75
All Tri State	4	57	1	14	2	29	0	0	0	0	7	100
National	38	57	15	22	8	12	6	9	11	16	56	84

How do you dispose of postharvest fungicide and insecticide dips/sprays?

Region	Dispose of onto soil away from waterways and drainage areas	%	Off site disposal by a professional contractor	%	Treat to deactivate and then pump it onto suitable land	%	Use evaporation pits/traps	%	Other	%	Understanding needed	%	Understanding not needed	%
All NSW	4	36	0	0	0	0	1	9	6	55	7	64	4	36
All QLD	9	31	1	3	7	24	3	10	9	31	9	31	20	69
All WA	5	25	1	5	0	0	2	10	12	60	8	40	11	55
All Tri State	1	14	1	14	0	0	0	0	5	71	1	14	6	86
National	19	28	3	4	7	10	6	9	32	48	25	37	41	61

Nutrient Management

Are your synthetic/non organic fertilisers stored in a manner that prevents contamination of the environment?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82	0	0	0	0	2	18	3	27	8	73
All QLD	27	93	1	3	0	0	1	3	6	21	23	79
All WA	17	85	0	0	0	0	3	15	5	25	15	75
All Tri State	7	100	0	0	0	0	0	0	0	0	7	100
National	60	90	1	1	0	0	6	9	14	21	53	79

Are your bulk animal manures sited and managed in a way that ensures rain/run off water will not cause nutrients from the heaps to be washed into waterways?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	5	45	0	0	0	0	6	55	2	18	9	82
All QLD	10	34	1	3	1	3	17	59	2	7	27	93
All WA	8	40	0	0	0	0	12	60	7	35	13	65
All Tri State	3	43	1	14	0	0	3	43	0	0	7	100
National	26	39	2	3	1	1	38	57	11	16	56	84

Do you test new sites for soil nutrients at least 6 months before planting?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	4	36	3	27	2	18	2	18	2	18	9	82
All QLD	17	59	4	14	1	3	7	24	5	17	24	83
All WA	13	65	5	25	1	5	1	5	5	25	15	75
All Tri State	2	29	2	29	2	29	1	14%	0	0	7	100
National	36	54	14	21	6	9	11	16	12	18	55	82

Do you carry out soil testing at least every 2-3 years or leaf testing annually to make informed fertiliser decisions?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	1	9	0	0	0	0	4	36	7	64
All QLD	28	97	0	0	0	0	1	3	6	21	23	79
All WA	18	90	1	5	1	5	0	0	5	25	15	75
All Tri State	5	71	0	0	1	14	1	14	1	14	6	86
National	61	91	2	3	2	3	2	3	16	24	51	76

Do you test animal manures and composts for nutrient status before use?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	2	18	4	36	1	9	4	36	5	45	6	55
All QLD	3	10	5	17	2	7	19	66	5	17	24	83
All WA	5	25	5	25	3	15	7	35	8	40	12	60
All Tri State	2	29	2	29	0	0	3	43	1	14	6	86
National	12	18	16	24	6	9	33	49	19	28	48	72

Do you avoid applying fertiliser when heavy rainfall is forecast?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	0	0	0	0	1	9	1	9	10	91
All QLD	21	72	2	7	5	17	1	3	4	14	25	86
All WA	18	90	2	10	0	0	5	25	5	25	15	75
All Tri State	4	57	0	0	0	0	0	0	0	0	7	100
National	53	79	4	6	5	7	7	10	10	15	57	85

Is your fertiliser application equipment calibrated at least annually?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	4	36	3	27	2	18	2	18	4	36	7	64
All QLD	23	79	1	3	1	3	4	14	4	14	25	86
All WA	11	55	2	10	1	5	6	30	8	40	12	60
All Tri State	6	86	0	0	0	0	1	14	0	0	7	100
National	44	66	6	9	4	6	13	19	16	24	51	76

Biodiversity Management

Have you assessed whether or not any significant flora/fauna exists on your property?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	3	27	0	0	0	0	5	45	6	55
All QLD	20	69	6	21	0	0	3	10	7	24	22	76
All WA	14	70	5	25	0	0	1	5	7	35	13	65
All Tri State	2	29	3	43	1	14	1	14	2	29	5	71
National	44	66	17	25	1	1	5	7	21	31	46	69

Do you manage sensitive areas such as waterways, wetlands and areas of native vegetation to protect them (e.g.: restrict stock and human access)?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	8	73	1	9	1	9	1	9	4	36	7	64
All QLD	18	62	3	10	0	0	8	28	6	21	23	79
All WA	13	65	1	5	2	10	4	20	5	25	15	75
All Tri State	4	57	1	14	1	14	1	14	1	14	6	86
National	43	64	6	9	4	6	14	21	16	24	51	76

Do you control environmental weeds and feral animals in these areas?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	0	0	4	36	0	0	3	27%	8	73
All QLD	14	48	6	21	2	7	7	24	6	21	23	79
All WA	13	65	0	0	6	30	1	5	4	20	16	80
All Tri State	5	71	0	0	2	29	0	0	0	0	7	100
National	39	58	6	9	14	21	8	12	13	19	54	81

Are you able to identify all of the declared weeds that occur in your region?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	3	27	1	9	0	0	7	64	4	36
All QLD	9	31	11	38	8	28	1	3	13	45	16	55
All WA	12	60	7	35	1	5	0	0	9	45	11	55
All Tri State	5	71	1	14	1	14	0	0	0	0	7	100
National	33	49	22	33	11	16	1	1	29	43	38	57

Do you encourage revegetation of land that is unsuitable for agriculture (e.g.: restrict stock and human access/plan native vegetation in these areas)?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	0	0	1	9	3	27	4	36	7	64
All QLD	16	55	3	10	2	7	8	28	8	28	21	72
All WA	14	70	1	5	4	20	1	5	4	20	16	80
All Tri State	4	57	0	0	0	0	3	43	0	0	7	100
National	41	61	4	6	7	10	15	22	16	24	51	76

Waste Management

Do you dispose of rejected produce in a manner that will not disturb neighbours or allow it to enter waterways?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82	0	0	0	0	2	18	1	9	10	91
All QLD	26	90	0	0	1	3	2	7	4	14	25	86
All WA	16	80	1	5	1	5	2	10	7	35	13	65
All Tri State	5	71	1	14	0	0	1	14	1	14	6	86
National	56	84	2	3	2	3	7	10	13	19	54	81

Do you separate materials for recycling?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	9	82	0	0	1	9	1	9	3	27	8	73
All QLD	20	69	4	14	4	14	1	3	6	21	23	79
All WA	13	65	2	10	5	25	0	0	6	30	14	70
All Tri State	4	57	2	29	1	14	0	0	1	14	6	86
National	46	69	8	12	11	16	2	3	16	24	51	76

Air Management

Do you inform neighbours that may be affected before undertaking farm activities that may result in significant dust, smoke or noise?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	1	9	3	27	0	0	2	18	9	82
All QLD	16	55	3	10	6	21	4	14	3	10	26	90
All WA	10	50	2	10	1	5	7	35	2	10	18	90
All Tri State	3	43	0	0	3	43	1	14	0	0	7	100
National	36	54	6	9	13	19	12	18	7	10	60	90

Do you avoid burning wet material, plastics and rubber?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	10	91	1	9	0	0	0	0	2	18	9	82
All QLD	26	90	1	3	0	0	2	7	3	10	26	90
All WA	17	85	1	5	1	5	1	5	2	10	18	90
All Tri State	7	100	0	0	0	0	0	0	0	0	7	100
National	60	90	3	4	1	1	3	4	7	10	60	90

Do you plan night time activities so that neighbours are least affected by noise?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	6	55	3	27	0	0	2	18	3	27	8	73
All QLD	15	52	4	14	2	7	8	28	3	10	26	90
All WA	5	25	0	0	2	10	13	65	2	10	18	90
All Tri State	4	57	0	0	3	43	1	14	0	0	7	100
National	30	45	7	10	7	10	24	36	8	12	59	88

Energy Management

Do you maintain vehicles/equipment as per the manufacturer's recommendations to ensure fuel/electricity efficiency?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	11	100	0	0	0	0	0	0	3	27	8	73
All QLD	22	76	0	0	6	21	1	3	2	7	27	93
All WA	19	95	0	0	1	5	0	0	3	15	17	85
All Tri State	5	71	1	14	1	14	0	0	0	0	7	100
National	57	85	1	1	8	12	1	1	8	12	59	88

When purchasing new vehicles/equipment is fuel/electricity efficiency a major consideration?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	7	64	2	18	2	18	0	0	4	36	7	64
All QLD	17	59	5	17	5	17	2	7	4	14	25	86
All WA	11	55	1	5	8	40	0	0	3	15	17	85
All Tri State	4	57	1	14	2	29	0	0	0	0	9	129
National	39	58	9	13	17	25	2	3	11	16	58	87

Do you use renewable energy alternatives (wind/solar) for any equipment that is traditionally powered by non renewable energy?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	1	9	10	91	0	0	0	0	9	82	2	18
All QLD	7	24	18	62	1	3	3	10	9	31	20	69
All WA	2	10	16	80	1	5	1	5	10	50	10	50
All Tri State	1	14	6	86	0	0	0	0	2	29	5	71
National	11	16	50	75	2	3	4	6	30	45	37	55

Do you purchase accredited 'Green Power' from your electricity supplier?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	Not applicable	Not applicable %	Understanding needed	Understanding needed %	Understanding not needed	Understanding not needed %
All NSW	2	18	8	73	0	0	1	9	4	36	7	64
All QLD	5	17	23	79	0	0	1	3	10	34	19	66
All WA	1	5	16	80	1	5	2	10	9	45	11	55
All Tri State	1	14	5	71	1	14	0	0	2	29	5	71
National	9	13	52	78	2	3	4	6	25	37	42	63

Appendix 3: Mail-out survey

PLEASE DO NOT RESPOND TO THIS SURVEY IF YOU HAVE ALREADY COMPLETED THE EXTENSIVE ONLINE-SURVEY THAT WAS EMAILED FROM AVOCADOS AUSTRALIA BETWEEN NOVEMBER AND FEBRUARY.

1. Where is your avocado operation located?

- North QLD ☐
- Central QLD (incl. Bundaberg/Childers) ☐
- South East QLD (Sunshine Coast to NSW border) ☐
- West Moreton, QLD ☐
- Northern NSW ☐
- Central Coast, NSW ☐
- Tri-State ☐
- Perth Region, WA ☐
- South West WA ☐
- Other (please specify)

2. What best describes your avocado operation?

- Grower only ☐
- Grower and packer ☐

3. Is your chemical storage area equipped with a spill kit? Yes ☐ No ☐

4. Is your crop regularly monitored for signs of insects and disease so that you can make informed decisions on when to spray?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?

5. Where possible, do you use 'softer' chemicals instead of broad spectrum chemicals?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?

6. How do you dispose of postharvest fungicide and insecticide dips/sprays?

- Off-site disposal by a professional contractor ☐
- Treat to deactivate and then pump onto suitable land ☐
- Use evaporation pits/traps ☐
- Dispose of onto soil away from waterways and drainage areas ☐
- I do not use postharvest fungicide and insecticide dips/sprays ☐
- Other (please specify)
.....

7. Do you encourage growth of inter-row vegetation as soon as possible after ground preparation when establishing a new orchard?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?

8. Do you have a soil test completed at least every 2-3 years to make informed decisions on fertiliser application?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

9. Do you have a leaf test completed annually to make informed decisions on fertiliser application?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

10. Do you avoid applying fertiliser when heavy rainfall is forecast?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

11. Do you manage sensitive areas such as waterways, wetlands and areas of native vegetation to protect them (for example prevent stock/human access or control environmental weeds and feral animals)?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

12. On land that is unsuitable for cropping, do you encourage revegetation (for example by restricting stock/human access, and replanting with native vegetation)?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

13. Do you inform close neighbours before undertaking farm activities that may result in them being affected by dust, smoke or noise?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

14. Do you inform close neighbours before spraying part or all of your farm?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

15. Do you avoid burning wet material, plastics and rubber?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

16. Do you send any waste materials off-site for recycling?

Yes ☐ No ☐ Sometimes ☐ Not applicable ☐ (Why N/A?)

OPTIONAL

Please use this space to share any other comments/issues/concerns that you have in relation to the environment, community expectations or this project?

Appendix 4: Mail-out survey results

Where is your avocado operation located?

Region	Number	Regional %	National %
Central Coast, NSW	13	33	-
Northern NSW	27	67	-
All NSW	40	-	18
Tri State	27	-	12
Perth Region	6	21	-
SW WA	23	79	-
All WA	29	-	14
Central QLD	15	12	-
North QLD	27	22	-
SE QLD	67	55	-
West Moreton	14	11	-
All QLD	123	-	56
National number	219	-	-

What best describes your avocado operation?

Region	Grower	Grower %	Grower/packer	Grower/packer %
Central Coast, NSW	7	54	6	46
Northern NSW	12	44	15	56
All NSW	19	48	21	53
Tri State	17	63	10	37
Perth Region	3	50	3	50
SW WA	16	70	7	30
All WA	19	66	10	35
Central QLD	7	47	8	53
North QLD	9	33	18	67
SE QLD	45	67	21	31
West Moreton	8	57	6	43
All QLD	69	56	53	43
National number	128	58	104	48

Is your chemical storage area equipped with a spill kit?

Region	Yes	Yes %	No	No %
Central Coast, NSW	7	54	4	31
Northern NSW	8	30	18	67
All NSW	15	38	22	55
Tri State	20	74	7	26
Perth Region	1	17	4	67
SW WA	12	52	11	48
All WA	13	45	15	52
Central QLD	9	60	6	40
North QLD	13	48	13	48
SE QLD	26	39	37	55
West Moreton	8	57	5	36
All QLD	56	46	61	50
National number	112	51	111	51

Is your crop regularly monitored for signs of insects and disease so that you can make informed decisions on when to spray?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	10	77	1	8	2	15		0
Northern NSW	18	67	2	7	2	7	5	19
All NSW	28	70	3	8	4	10	5	13
Tri State	14	52	4	15	4	15	5	19
Perth Region	3	50		0	2	33	1	17
SW WA	21	91		0	1	4	1	4
All WA	24	83	0	0	3	10	2	7
Central QLD	15	100		0		0		0
North QLD	23	85	2	7	2	7		0
SE QLD	38	57	3	4	16	24	10	15
West Moreton	10	71	1	7	2	14	1	7
All QLD	86	70	6	5	20	16	11	9
National number	160	73	13	6	32	15	28	13

Where possible, do you use 'softer' chemicals instead of broad spectrum chemicals?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	12	92	0	0	0	0	1	8
Northern NSW	17	63	2	7	3	11	5	19
All NSW	29	73	2	5	3	8	6	15
Tri State	18	67	0	0	2	7	7	26
Perth Region	4	67	0	0	1	17	1	17
SW WA	19	83	2	9	0	0	2	9
All WA	23	79	2	7	1	3	3	10
Central QLD	14	93		0	1	7	0	0
North QLD	19	70	1	4	7	26	0	0
SE QLD	32	48	3	4	14	21	14	21
West Moreton	10	71	1	7	2	14	1	7
All QLD	75	61	5	4	24	20	15	12
National number	150	68	10	5	32	15	37	17

How do you dispose of postharvest fungicide and insecticide dips/sprays?

Region	Dispose of onto soil away from waterways and drainage areas	% Dispose of onto soil away from waterways and drainage areas	I do not use postharvest fungicide and insecticide dips/sprays	% I do not use postharvest fungicide and insecticide dips/sprays	Treat to deactivate and then pump onto suitable land	% Treat to deactivate and then pump onto suitable land	Evaporation Pit	Evaporation pit %	Other	Other%	Offsite disposal by professional contractor	% Offsite disposal by professional contractor
Central Coast, NSW	3	23	6	46	2	15	0	0	1	8	0	0
Northern NSW	6	22	15	56	2	7	0	0	2	7	2	7
All NSW	9	23	21	53	4	10	0	0	3	8	2	5
Tri State	1	4	16	59	1	4	0	0	2	7	0	0
Perth Region	1	17	4	67	0	0	1	17		0	0	0
SW WA	2	9	16	70	1	4	0	0	3	13	1	4
All WA	3	10	20	69	1	3	1	3	3	10	1	3
Central QLD	5	33	7	47	2	13	0	0	1	7	0	0
North QLD	13	48	7	26	3	11	1	4	2	7	1	4
SE QLD	11	16	33	49	9	13	3	4	5	7	6	9
West Moreton	0	0	10	71	2	14	0	0	1	7	1	7
All QLD	29	24	57	46	16	13	4	3	9	7	8	7
National number	43	20	122	56	24	11	5	2	19	9	12	5

Do you encourage growth of inter-row vegetation as soon as possible after ground preparation when establishing a new orchard?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	11	85	0	0	0	0	2	15
Northern NSW	23	85	1	4	3	11		0
All NSW	34	85	1	3	3	8	2	5
Tri State	21	78	1	4	5	19		0
Perth Region	5	83	0	0	1	17	0	0
SW WA	17	74	3	13		0	3	13
All WA	22	76	3	10	1	3	3	10
Central QLD	13	87	0	0	2	13	1	7
North QLD	25	93	1	4	0	0	1	4
SE QLD	46	69	3	4	5	7	13	19
West Moreton	12	86	0	0	1	7	1	7
All QLD	96	78	4	3	8	7	16	13
National number	185	84	9	4	17	8	23	11

Do you have a soil test completed at least every 2-3 years to make informed decisions on fertiliser application?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	10	77	1	8	2	15	0	0
Northern NSW	18	67	8	30	1	4	0	0
All NSW	28	70	9	23	3	8	0	0
Tri State	11	41	12	44	4	15	0	0
Perth Region	3	50	1	17	2	33	0	0
SW WA	19	83	2	9	1	4	1	4
All WA	22	76	3	10	3	10	1	3
Central QLD	14	93	0	0	1	7	0	0
North QLD	24	89	2	7	1	4	0	0
SE QLD	43	64	12	18	10	15	2	3
West Moreton	14	100	0	0	0	0	0	0
All QLD	95	77	14	11	12	10	2	2
National number	166	76	41	19	23	11	3	1

Do you have a leaf test completed annually to make informed decisions on fertiliser application?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	9	69	1	8	3	23	0	0
Northern NSW	6	22	13	48	8	30	0	0
All NSW	15	38	14	35	11	28	0	0
Tri State	16	59	5	19	6	22	0	0
Perth Region	3	50	0	0	3	50	0	0
SW WA	17	74	5	22	1	4	0	0
All WA	20	69	5	17	4	14	0	0
Central QLD	11	73	1	7	3	20	0	0
North QLD	18	67	6	22	3	11	0	0
SE QLD	33	49	16	24	16	24	3	4
West Moreton	13	93	1	7	0	0	0	0
All QLD	75	61	24	20	22	18	3	2
National number	135	62	50	23	46	21	3	1

Do you avoid applying fertiliser when heavy rainfall is forecast?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	12	92	0	0	1	8	0	0
Northern NSW	23	85	0	0	2	7	2	7
All NSW	35	88	0	0	3	8	2	5
Tri State	13	48	6	22	4	15	4	15
Perth Region	6	100	0	0	0	0	0	0
SW WA	17	74	4	17	1	4	1	4
All WA	23	79	4	14	1	3	1	3
Central QLD	13	87	2	13	0	0	0	0
North QLD	14	52	1	4	2	7	0	0
SE QLD	52	78	4	6	6	9	3	4
West Moreton	11	79	1	7	2	14	0	0
All QLD	90	73	8	7	10	8	3	2
National number	169	77	20	9	19	9	13	6

Do you manage sensitive areas such as waterways, wetlands and areas of native vegetation to protect them?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	12	92	0	0	1	8	0	0
Northern NSW	11	41	4	15	1	4	1	4
All NSW	23	58	4	10	2	5	1	3
Tri State	17	63	4	15	1	4	5	19
Perth Region	4	67	1	17	0	0	1	17
SW WA	19	83	1	4	0	0	3	13
All WA	23	79	2	7	0	0	4	14
Central QLD	12	80	0	0	2	13	1	7
North QLD	20	74	3	11	2	7	2	7
SE QLD	45	67	7	10	8	12	6	9
West Moreton	7	50	0	0	3	21	1	7
All QLD	84	68	10	8	15	12	10	8
National number	156	71	20	9	18	8	25	11

On land that is unsuitable for cropping, do you encourage revegetation?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	10	77	2	15	0	0	1	8
Northern NSW	19	70	4	15	2	7	1	4
All NSW	29	73	6	15	2	5	2	5
Tri State	18	67	1	4	0	0	8	30
Perth Region	3	50	2	33	0	0	1	17
SW WA	15	65	5	22	0	0	3	13
All WA	18	62	7	24	0	0	4	14
Central QLD	9	60	2	13	2	13	2	13
North QLD	15	56	6	22	3	11	3	11
SE QLD	44	66	12	18	6	9	5	7
West Moreton	8	57	1	7	1	7	3	21
All QLD	76	62	21	17	12	10	13	11
National number	149	68	38	17	14	6	30	14

Do you inform close neighbours before undertaking farm activities that may result in them being affected by dust, smoke or noise?

Region	Yes	Yes%	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	6	46	2	15	4	31	1	8
Northern NSW	15	56	7	26	3	11	2	7
All NSW	21	53	9	23	7	18	3	8
Tri State	8	30	5	19	10	37	4	15
Perth Region	3	50	1	17	2	33	0	0
SW WA	14	61	2	9	3	13	4	17
All WA	17	59	3	10	5	17	4	14
Central QLD	12	80	2	13	1	7	0	0
North QLD	16	59	4	15	5	19	2	7
SE QLD	33	49	7	10	18	27	8	12
West Moreton	3	21	4	29	3	21	3	21
All QLD	64	52	17	14	27	22	13	11
National number	117	53	35	16	49	22	30	14

Do you inform close neighbours before spraying part or all of your farm?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	1	8	6	46	3	23	3	23
Northern NSW	6	22	11	41	2	7	8	30
All NSW	7	18	17	43	5	13	11	28
Tri State	4	15	16	59	4	15	3	11
Perth Region	0	0	2	33	3	50	1	17
SW WA	6	26	9	39	3	13	5	22
All WA	6	21	11	38	6	21	6	21
Central QLD	7	47	5	33	3	20	0	0
North QLD	9	33	8	30	9	33	1	4
SE QLD	23	34	9	13	16	24	18	27
West Moreton	1	7	6	43	3	21	4	29
All QLD	40	33	28	23	31	25	23	19
National number	60	27	75	34	46	21	51	23

Do you avoid burning wet material, plastics and rubber?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	13	100				0		0
Northern NSW	26	96			1	4		0
All NSW	39	98	0	0	1	3	0	0
Tri State	24	89			2	7	1	4
Perth Region	6	100				0		0
SW WA	21	91			1	4	1	4
All WA	27	93	0	0	1	3	1	3
Central QLD	13	87			2	13		0
North QLD	26	96			1	4		0
SE QLD	61	91			1	1	5	7
West Moreton	14	100				0		0
All QLD	114	93	0	0	4	3	5	4
National number	216	99	0	0	8	4	9	4

Do you send any waste material off-site for recycling?

Region	Yes	Yes %	No	No %	Sometimes	Sometimes %	NA	NA %
Central Coast, NSW	10	77	1	8	2	15		0
Northern NSW	22	81	4	15	1	4		0
All NSW	32	80	5	13	3	8	0	0
Tri State	17	63	6	22	1	4	3	11
Perth Region	3	50	2	33	1	17		0
SW WA	19	83	1	4	2	9	1	4
All WA	22	76	3	10	3	10	1	3
Central QLD	12	80	1	7	1	7	1	7
North QLD	16	59	8	30	2	7	1	4
SE QLD	42	63	8	12	10	15	5	7
West Moreton	9	64	2	14	3	21	1	7
All QLD	79	64	19	15	16	13	8	7
National number	161	74	34	16	24	11	13	6