Avocado best management practices and internet based information delivery

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Background

Australian avocado producers need to improve their yields and fruit quality and lower their costs of production in order to expand the market in Australia and compete with expected avocado imports from countries such as Chile, Mexico and Peru.

In 2010 when the project commenced there were no up-to-date production guidelines for Australian growers. The hardcopy Agrilink Avocado Information Kit published in 2001 was out-of-print and out-of-date and the AVOMAN orchard management software was last updated in 2003.

The information and technology required to achieve higher yields and better fruit quality is available in Australia and has been successfully adopted by the most progressive growers. The objective of this project was to update and package the information so that it was easily accessed and understood by the majority of Australian avocado growers.

Project objectives

The project aimed to provide Australian growers with easy access to up-to-date information resources to assist with the production of higher yields of good quality avocados in a competitive and sustainable manner.

The project activities

The main activities of the project were to generate and provide growers easy access to various new information resources using a range of delivery mechanisms.

Key outputs

1. The 'Avocado Problem Solver Field Guide', a 221 page A5 sized spiro bound field guide was produced. This book illustrates and describes nearly 100 pests, diseases and other disorders of avocado in Australia, and provides advice on their prevention and treatment. It also includes illustrations and information on beneficial insects and high risk exotic pests and diseases. The guide is printed on water-resistant paper, contains over 400 colour photographs and is arranged in distinct colour coded sections for easy reference. In order to achieve maximum uptake of the information one or more copies were distributed to every known commercial avocado grower in Australia (via the Avocados Australia Ltd membership database).

2. The framework for the Growing section of the online 'Best Practice Resource' (BPR) framework was developed in collaboration with Avocados Australia Ltd and the website design company. It was designed to accommodate all the information relating to the growing of avocados.

3. A total of 124 articles covering almost all aspects of avocado production were written and uploaded to the Growing section of the new online Best Practice Resource (BPR) hosted by Avocados Australia Ltd. The BPR is available to all Australia avocado growers once they have registered with Avocados Australia Ltd.

4. Twelve crop management calendars based on the phenological cycle were generated to cater for each major production region and they were made available on the BPR.

5. Three instruction videos were made on important orchard practices and uploaded to the BPR. The topics were tree injection for Phytophthora root rot, installing tensiometers and checking the uniformity of irrigation systems.

6. A detailed survey was done of the practices and philosophy of five of the best avocado irrigators in the industry. This information was studied and the key information leading to their success as irrigators incorporated in two reports which were made available to growers via the BPR and the industry magazine.

7. A self-assessment questionnaire was produced for growers to be able to check their orchard practices against agreed best practices. It has been rolled out by Avocados Australia Ltd through their regional Qualicado workshops. It is also now available on the BPR.

8. Users of the AVOMAN orchard management software were provided with support when needed.

9. A poster was produced on the key elements of Phytophthora root rot management and distributed to every known commercial avocado grower in Australia.

Key outcomes

The intended outcomes from this project were that Australian avocado growers would be better equipped to produce higher quality avocado fruit in a more cost effective manner. This has been achieved by providing up-to-date, practical and easily understood information that can be accessed 24 hours per day through different delivery methods.

The hardcopy ‘Avocado Problem Solver Field Guide’ helps growers to identify almost 100 pests, diseases and disorders that they are likely to encounter on their orchards and provides advice on managing and preventing each problem. The language and layout of the guide makes it easy to use and understand, and the illustrations are presented in order of symptom for intuitive searching. One or more free copies were distributed to every avocado producing business in the country so that every grower could have direct access to the information.

The ‘Best Practice Resource’ provides practical and easily understood information online on almost every aspect of growing avocados. All 124 articles prepared for the BPR have been written over the three years of the project using the most up-to-date information available; the language used is direct and easily understood. Access to the BPR is available to every commercial avocado grower in Australia 24 hours a day at no cost (provided they have the Internet) once they have been through the simple registration process with Avocados Australia Ltd.

The material available on the BPR also includes the results of the irrigation study, three specially made instructional videos, the ‘Qualicado’ self-assessment questionnaire, the regional growth cycles, and the 42 copies of minutes and PowerPoint presentations generated by the previous project AV06003.

The ‘Qualicado’ grower self-assessment questionnaire was launched by AAL at a regional workshop in each of the eight major production regions where the process has been explained and where attendees had the opportunity to complete it. The template is now available on the BPR which enables those not

able to attend the workshops to participate in the process.

In order to tackle the issue of Phytophthora root rot which is nationally the biggest on-farm issue, a special poster titled 'Manage Phytophthora root rot' was designed and printed and sent to every commercial avocado grower in the country. Considerable effort went into the design of this poster to capture the key practices and present them in a way which would be easy to follow.

Although the benefits of making the information available to growers are likely to take a few years to manifest themselves the project evaluation survey revealed that some growers believed they were already gaining from changes made as a result of the information provided, quoting benefits per year ranging from $1,000 to $300,000.

It is recommended that future projects update the information on the BPR as necessary and more is done to promote the information resources now available. Now that the industry has access to this comprehensive suite of information products, the next project backs this up by direct contact with growers at workshops to encourage adoption of the available technology.

Keywords

Avocado; disorders; extension; field guide; information; Internet; irrigation; online; poster; video.

Introduction

Australian growers must improve their fruit quality and lower their costs of production in order to (a) expand the market in Australia, (b) compete with expected avocado imports from countries with lower production costs such as Chile, Mexico and Peru, and (c) to compete in overseas markets. Having up-to-date information on crop production practices available to growers is a fundamental pre-requisite for achieving these goals.

Achievable and sustainable avocado yields are currently estimated to be in the order of 15 to 20 t/ha in the Australian industry but average yields have only been about 8 t/ha. Although this low figure includes crop from a significant proportion of young orchards it should still be appreciably higher. It is acknowledged that the necessary information and technology to achieve these yields is available and it has been successfully adopted by more progressive growers to achieve high yields and good quality fruit. The objective of this project has been to package this information into a form that is easier to follow and understand by the wider range of producers, and to make it easier to access.

Assuming a reasonable level of adoption, the productivity and fruit quality of Australian orchards will rise and we will be in a better position to compete with expected imports. An improvement in fruit quality is also expected to result in higher consumer confidence to purchase Australian avocados and thus expand the market.

The hardcopy Agrilink Avocado Information Kit, used as the standard reference by Australian growers was published in 2001 and is therefore out of date; in addition it was out of print by 2007. The AVOMAN orchard management software was last updated in 2003 and is therefore also out of date. In 2010 at the time of commencing this project there were no up-to-date best practice production guidelines for Australian growers.

The previous avocado extension project (AV06003) conducted between 2006 and 2010 delivered 42 grower workshops in the main avocado growing regions of Australia. Each workshop focused on a key production topic and included as invited speakers one or two experts for each topic covered. Detailed information was collected and documented into comprehensive illustrated minutes from each of these 42 workshops, this information provided a major resource for compiling the new information products created by this project.

The overall objectives of this project have been firstly to package up-to-date best practice information into 'grower-friendly' information products that can be easily understood by the majority of Australian avocado growers and secondly to make this information more readily accessible to growers. The information produced includes the hardcopy 'Avocado problem Solver Field Guide', 124 articles covering almost every aspect of growing avocados, three instructional videos, twelve crop cycles, key practices for effective irrigation generated by a special study, a grower self-assessment questionnaire to compare orchard practices against best practice, and a Phytophthora root rot management poster.

These have been the first steps in the process to achieve improved adoption of best practice. The next step in this process is to directly communicate with growers in a series of 42 regional workshops around the country to reinforce and drive the adoption of this information, this step is part of the next avocado extension project AV14000 which commences late 2014.

Project AV10002 addresses Objective 1 in the Australian Avocado Industry Strategic Plan 2011-2016, viz. "To build a sustainable and competitive supply of Australian avocados to meet consumer needs". It also addresses the government priority 'Productivity and Adding Value'.

Methodology

The project addressed its objectives by using the following approaches.

1. Producing a hardcopy problem solver field guide to assist growers identify pests, diseases, nutrient and other disorders and to outline ways to manage and avoid them. To achieve the best possible adoption of this information a copy was provided for free to every grower in the industry. This guide also describes and illustrates beneficial insects and key exotic pests and diseases.

2. Development of an online system for delivering up-to-date information to growers in various formats including articles, reports and videos. Internet delivery of information has become an accepted method of making information available and benefits include the ability to quickly update information and the low cost of publishing the information as well as updating it.

3. Re-writing the best practice information on all topics associated with growing high yields of good quality avocados and, in partnership with Avocados Australia Ltd publishing it online in the 'Growing' section of the industry's Best Practice Resource (BPR) so that it is available to growers and is easy and low-cost to update. These articles are written in 'grower friendly' style and include illustrations.

4. Creating crop calendars for each of the two main varieties and for each major production region in order to assist growers use the correct timing for orchard practices and as memory joggers for important tasks around the orchard.

5. Producing three YouTube videos where a ‘how to’ instructional video was seen to be the best method of communicating how particular practices needed to be done, and making them available via the BPR.

6. An area of orchard management that has relatively recently emerged as being a key factor to achieve high yields of large and good quality fruit is the need for a very high level of soil moisture management. The conundrum for avocados is that they have a high water requirement but at the same time are sensitive to wet conditions. Avocado has a unique root system that helps explain how sensitive it is to anything other than optimum soil moisture throughout the year. It is inefficient at sourcing moisture because it has a very shallow feeder root system and these feeder roots have no root hairs making them inefficient at gathering moisture, so greater quantities of water have to be applied but on the other hand its roots have an above average oxygen requirement so it is therefore sensitive to over irrigation. These factors mean that the optimum range of soil moisture for avocado is small and the Readily Available Water in the soil is also low and therefore a high degree of management is required to get it right. To tackle this management issue a study of five top irrigators was undertaken and the results assessed so that the key practices could be outlined and explained to growers. This approach was chosen also because growers often turn to their peers to learn. The results of the study were published in two articles that are now available on the BPR. One was reprinted in the industry magazine.

7. It was considered that a check list of important orchard practices would be useful to growers to compare their orchard practices against to see if they were addressing key measures. The ‘Qualicado’ self-assessment questionnaire was further developed from the ‘Positive Points’ questionnaire originally developed in AV06003. It was rolled out as part of Avocados Australia Ltd project AV12012 ‘Co-ordination of data management and avocado quality improvement and extension program’ via regional workshops across Australia.

8. The ‘AVOMAN’ orchard management software was last updated in 2003 and a survey conducted in 2010 indicated that a significant number of growers were still using it. This project undertook to support these users and provide hands-on training sessions if necessary.

9. An additional activity that was not part of the original project proposal was undertaken to fulfill an urgent need, that of getting better adoption of measures to manage Phytophthora root rot (the highest priority production issue in Australia). This additional activity was prompted by the revelation in the ‘Australian avocado industry benchmarking program’ (AV11026) that adoption of management practices for this serious disease was disappointing. A special poster was designed which if effective has the potential to significantly improve yields and fruit quality across the industry through a greater awareness of the disease and by communicating key practices needed to manage it. A copy was distributed free to every commercial avocado grower in Australia.

A steering group was formed consisting of the project team members, a few key growers and the Communications Officer at Avocados Australia Ltd. This steering group provided guidance in delivering products that were needed and usable by growers.

The project had a national reach and attempted to cater for all growing regions in Australia. The main

strategy to achieve this was to have on the project team staff from North Queensland (Matt Weinert, DAFF Qld), Central Queensland (Danielle Le Lagadec, DAFF Qld), SE Queensland (Simon Newett and Peter Rigden, DAFF Qld), NSW (Sandra Harding, NSW DPI, Gosford), Tristate (Lisa Martin, consultant, Ripe Horticulture) and Western Australia (Alec McCarthy, DAFWA, Bunbury). The project also frequently sought input from plant pathologists, entomologists, consultants and others. All these people were invaluable in contributing to and vetting information before it was published.

The project leader was often a presenter at the eight regional avocado industry 'Qualicado' field day events and took the opportunity to promote the outputs of the project.

In early 2013 a mid-term review was conducted to review progress and to consider any changes or strategies which might assist with delivery of the second half of the project.
The target audience for the project included all commercial avocado growers, avocado consultants, researchers, extension officers and agricultural re-sellers.

Outputs

The tangible deliverables of this project are described below.

1. The 'Avocado Problem Solver Field Guide'

The 'Avocado Problem Solver Field Guide' is a hard copy book that was produced to enable growers, consultants, extension officers, researchers, agricultural re-sellers, wholesalers and market agents to identify all known pests, diseases and disorders in the Australian avocado industry and to provide advice on their prevention and treatment. In addition this book also contains a section on identifying beneficial insects, and another on the seven top priority exotic pests and diseases that the industry would like to prevent from entering and becoming established in Australia. The book covers almost 100 pests, diseases and disorders, contains over 400 colour photographs and consists of 221 pages. For ease of reference it contains Contents pages, includes an index and is divided into colour coded sections. The first section contains the photographs of the disorders and these are arranged by symptom for intuitive searching. The guide is designed for practicality, being A5 in size with spiro binding (to allow it lay flat at any opening) and with splash proof pages. At least one copy (more for bigger businesses) was sent at no cost to every commercial avocado grower in Australia on the AAL database. The breakdown of the distribution of the 850 copies that were printed is given in Table 1.

Table 1. Distribution of copies of the 'Avocado Problem Solver Field Guide'

Recipient	Quantity
Growers	659
Research, extension officers & biosecurity staff, information centres	47
Fertiliser and agricultural chemical resellers	36
Wholesalers	29
Other AAL clients	28
Consultants	13
Overseas – collaborative researchers and extension staff	11
Library & higher government	8
HAL	3
Remaining in stock	16
TOTAL PRINTED	850

Subsequently there has been interest in bulk orders of the book from the South African and New Zealand industries and a second printing is anticipated. The project leader has been working with Avocados Australia Ltd to make arrangements for its sale in these countries.

Please refer to Appendix 1 to see the front cover of this field guide.

2. The 'Growing' section of the Avocados Australia Ltd online Best Practice Resource (BPR)

Originally this project was going to develop its own 'Content Management System' however when it became known that Avocados Australia Ltd was re-designing its website and planning to include an information section for growers it was decided to join forces. The design of the 'Growing' section was therefore a joint effort between Avocados Australia Ltd, the AV10002 project team and the commercial website developers. In this way the Avocados Australia Ltd website would be a 'one stop shop' for growers. This makes the BPR easier to locate and more convenient for all. The web address for the BPR is: https//bestpraqctice.avocado.org.au.

AV10002 was responsible for populating the 'Growing' section of this online resource. This section aims to providing up-to-date information for growers for the production of high yields of good quality avocados. A total of 124 articles were prepared and uploaded to the BPR. In addition three 'how to'

videos were produced on topics where this media was considered the most appropriate way of getting the information across. Twelve crop cycle calendars were prepared for the major varieties, ‘Hass’ and ‘Shepard’, to cater for the major production areas where they are grown. Details for these articles, videos and crop cycles are provided in the tables below.

Project team members have access rights to the ‘Growing’ section of the BPR which allows them to upload and edit information at any time.

3. Best Practice Resource articles

In all, 124 articles have been prepared and uploaded to the BPR during this project. The topics covered and the number of articles prepared for each topic is listed below. A complete list of articles can be found in Appendix 1 together with two examples.

Table 2. Articles prepared and uploaded to the online ‘Best Practice Resource’

Topic	No. of articles
Site selection	7
Rootstock selection	5
Selecting varieties and pollinisers	8
Soil health	6
Nutrition	19
Irrigation	14
Phytophthora root rot	15
Anthracnose disease	5
Other diseases	12
Spotting bug	3
Other insects and mites	24
Pollination	1
Using mulch	1
Irregular and alternate bearing	4

Being web-based the information can be readily updated in the future, and some changes have already been made.

In addition to the main sections prepared and uploaded to the BPR (described below), copies of the 42 sets of detailed, illustrated minutes prepared during the previous project (AV06003) and the MS PowerPoint presentations made at these 42 regional workshops are now available from the Growing section of the BPR.

4. Crop management calendars

Twelve crop management cycles were produced for Hass and Shepard for each major production region in Australia. They illustrate to growers the typical phenological cycle of the crop in each region and pin the timing of major orchard management practices to it, not only to assist growers with correct timing of management practices but also as memory joggers at different times of the year. An example is shown in Appendix 4. The cycles produced and published on the BPR are as follows:

Table 3. List of the twelve crop management cycles produced

Production region	Variety
North Queensland	Hass
North Queensland	Shepard
Central Queensland	Hass
Central Queensland	Shepard
Sunshine Coast	Hass
West Moreton	Hass
NNSW	Hass
Central Coast NSW	Hass
Mid N Coast NSW	Hass
Tristate	Hass
Perth	Hass
Pemberton	Hass

5. Videos

The online information system enables YouTube-style videos to be easily accessed by growers. This method of information delivery is also a popular one amongst growers and has been widely used by other industries including macadamia and mango. The DAFF Queensland HortSmart team that has produced most of these tree crop videos is based at the Maroochy Research Facility and this project took advantage of their expertise and equipment to make three instructional videos to complement the written information prepared for them on the BPR. On the advice of the HortSmart team the videos were kept to about 6 to 9 minutes each. The three produced are listed in the table below.

Table 4. List of videos produced by project and length

Name of video	Duration
Tree injection	6 minutes 40 seconds
Tensiometer installation	9 minutes 30 seconds
Measuring irrigation uniformity	8 minutes 15 seconds

6. Irrigation study

Attention to detail in avocado irrigation has emerged as a hitherto largely unrecognized necessity for producing good yields of high quality avocados. Some growers have achieved very good results by assigning great importance to their irrigation and paying great attention to detail in this area. Five of these growers, believed to be amongst the best, were interviewed in some depth about their practices and approach. Orchard locations of these five were North Queensland, West Moreton, Victoria, South Australia and SW Western Australia. The information was collected, assessed and compared.

Two reports were prepared and uploaded to the BPR.

a) 'The irrigation practices of five Australian avocado growers' also referred to as 'What the good irrigators do'. This is a 10 page report including all the technical data that was collected. It is available in the 'Resources' section of the BPR.

b) 'Key practices for effective irrigation' summarises the full report. This article was also published in the Winter edition 2014 (Volume 25 No. 2) of the industry magazine "Talking Avocados".

The articles contain a lot of new information and observations and include key quotes from the five growers on their approach and philosophy of irrigation.

Results of this study were also presented and discussed in a workshop entitled "Irrigation to suit Horticulture – Macadamias and Avocados" at the "Irrigation Australia Conference and Exhibition" on 4 June 2014 at the Gold Coast Convention and Exhibition Centre.

7. Qualicado self-assessment

The Qualicado orchard management self-assessment questionnaire was developed further from its early beginnings in AV06003. The assessment lists key management practices in nine areas of orchard management (pre-harvest) and asks the grower to give him/herself a score based on how well they have addressed these practices. (Harvest and fruit quality are also covered in this assessment but were not prepared by this project). The nine areas of pre-harvest management are as follows:

i. Rootstocks and varieties

ii. Phytophthora root rot control

iii. Climate and aspect

iv. Irrigation

v. Nutrition

vi. Anthracnose management

vii. Insect management

viii. Pollination

ix. Canopy management

The questionnaire has been rolled out at each of the eight regional workshops by Avocados Australia Ltd as part of their project AV12012 'Co-ordination of data management and avocado quality improvement and extension program'. The questionnaire was made available to all growers attending these events and 157 completed it during the events across the eight production regions. There is no way of telling how many have downloaded the questionnaire from the BPR and completed it. The self-assessment scores from across the industry may be useful to industry in identifying areas of orchard management that require extra attention. In the second round of meetings growers will have the opportunity to complete the assessment again and compare with their previous score to see where they have improved and identify areas that still require attention. Please refer to Appendix 2 to see a copy of the Qualicado self-assessment questionnaire.

8. AVOMAN

A number of support calls were fielded but there was no strong demand for hands-on software training so none was conducted. Since the program was last updated in 2003 it is now considered out of date so a decision was made not to sell further copies, however support will continue to be provided when requested. Several 'services' provided by AVOMAN (the general growing information and crop cycles) are now catered for in products to come out of AV10002 but customized recommendations and the record keeping and reporting system cannot be.

9. Phytophthora management poster

This was an unplanned addition to the project that was undertaken to get better adoption of measures to manage Phytophthora root rot (the highest priority production issue in Australia). This additional activity was prompted by the revelation in the 'Australian avocado industry benchmarking program' (AV11026) that adoption of management practices to tackle this serious disease was disappointing.

An A1 sized colour poster was produced to communicate the key steps of Phytophthora root rot management to growers. The aim was to capture the main practices necessary for the successful management of the disease on one page. A poster was chosen as the delivery medium in the belief that if it was seen to be a potentially useful, easy to follow and attractive item it was more likely that growers would hang it in their shed or office. This would mean that it would be seen on a regular basis and growers would be reminded of the importance of controlling the disease and know what to do about it at different times of the year as indicated on a generic crop cycle. Input was received from plant pathologists and consultants. Please refer to Appendix 5 to see an A4 version of this poster.

It has been distributed to all know commercial avocado growers in the country at no cost to them. Being produced and distributed right at the end of the project meant that it has not been possible evaluate its impact on growers.

Outcomes

Assuming a reasonable level of adoption, the productivity and fruit quality of Australian orchards will rise and we will be in a better position to compete with expected imports. An improvement in fruit quality is also expected to result in higher consumer confidence to purchase Australian avocados and thus expand the market.

The intended outcomes from this project as stated in the project proposal were that Australian avocado growers will be better equipped to produce higher quality avocado fruit in a more cost effective manner through:

Up-to-date practical information that can be easily accessed and understood

'The Avocado Problem Solver Field Guide' and the 'Growing' section of the 'Best Practice Resource' (BPR) are up-to-date information resources that provide practical and easily understood information. The book and all the articles in the BPR were written during the course of the project using the most recent information available.

As its name implies the guide has been designed to be used in the field (A5 size, spiro binding and splash proof pages). It uses descriptive photographs arranged in symptom order as the main means of identifying problems and the advice for treatment and prevention is written in concise simple language. The evaluation survey revealed that 100% found it easy or very easy to use and 96% found it useful.

The information in the on-line BPR was also written in a 'grower-friendly' style.

Access to new information in a timely manner

Every known commercial avocado grower was sent a free copy of the Field Guide; larger businesses received more than one copy upon request to cater for multiple staff. Therefore every Australian grower has direct access on hand.

The 124 articles prepared for the BPR are accessible to all those with Internet facilities once they have been through the straightforward process of registering for access with Avocados Australia Ltd. So long as they have an Internet connection they can access information from their offices or homes at any time and at no cost other than their Internet use. The material available also includes the results of the irrigation study, the specially made instructional videos, the Qualicado self-assessment, the regional growth cycles, the 42 copies of minutes and PowerPoint presentations generated by the previous project and more.

Able to compare management practices against agreed industry guidelines

The 'Qualicado grower self-assessment template' which focusses on orchard management practices was developed for the industry. It lists the key best practice guidelines and has a maximum score associated with it based on the relative importance of that practice. The participating grower allocates him/herself a proportion of that score based on how well they meet the recommended practices. This is designed to make the grower aware of what the key practices are, how important each one is and in the process through the scoring process highlights where practices need to change.

The self-assessment template was launched by AAL at regional workshops in each of the eight major production regions where the process has been explained and where attendees have had the

opportunity to complete a self-assessment. The template is now available on the BPR which enables those not able to attend the workshops to participate in the process.

Information from the project evaluation showed that 49% of respondents had completed a self-assessment, 61% found it useful or very useful and 36% found it OK. Most growers (61%) reported that it was valuable “to check that they were on the right track with regard to orchard practices” whilst 50% found it useful “as a memory jogger for things they should be doing in their orchards”.

Although its ease of use was not asked in the survey, there have been no major problems encountered by participants in its use during Qualicado workshops.

Better equipped to produce premium quality avocados in a more cost effective manner

This is a difficult outcome to assess but the responses to the last part of the evaluation survey (see below) suggests that for some growers at least the project is equipping them with the knowledge to achieve this intended outcome. However it should be borne in mind that changes in orchard practices can take several seasons to show results and they are also at the mercy of seasonal differences. This sentiment was backed up by a grower who stated in the survey ‘No benefit to date but confident the benefits will be seen in the next few years’. That said, some growers have already reported significant benefits ranging from $1,000 to $300,000 in value per year derived from the information provided by the project. This is considered a good early result.

The growers who have already reported financial benefits attributed these gains to changes in the following areas of orchard management.

- Better nutrition 7
- Better irrigation 5
- Better yields 5
- Better quality fruit 5
- Larger fruit 4
- Better root rot management 4
- Healthier trees 2
- Less disease 2
- Soil health 1
- More even cropping 1
- Reduced losses from FSB and anthracnose 1

Actual changes that were made include:

- Mulching

- Investigating tensiometers
- Anthracnose: changed spray and frequency
- Identified and sprayed for bugs when required
- Nutrition: added different types of fertiliser
- Timing of irrigation
- Frequency of fertilising
- Applying liquid gypsum through fertigation
- Annual maintenance of irrigation system (flushing of lines)
- Changing the timing of fertilizer applications
- The amount of irrigating
- The products purchased for pest and diseases
- Irrigation applications
- Increase the frequency of irrigation applications
- Spraying or injecting of phosphonates
- Root sampling and analysis
- Timing of nutritional inputs
- Spotting bug: changes to timing of insecticide applications and chemicals
- Nutrition: understanding the role of specific nutrients especially boron, zinc and nitrogen

Able to use the AVOMAN orchard management software

As mentioned earlier a number of support calls were fielded but there was no strong demand for hands-on software training so none was conducted. A decision was made not to sell any further copies of the program, it being too expensive to update and having been superseded to some extent by the BPR.

Evaluation and Discussion

The evaluation of the project has been derived from direct feedback after distribution of the 'Avocado Problem Solver Field Guide', demand for more copies of this guide from Australia and overseas, the latest figures on grower registration for access to the Best Practice Resource and an electronic survey conducted towards the end of the project.

Direct feedback after distribution of the 'Avocado Problem Solver Field Guide'

Shortly after distributing the guide the project team received a large number of unsolicited positive comments from recipients. Some of these are listed below.

"I wish to thank you for the receipt of a copy of the booklet and those involved in the production and distribution of this Field Guide. A quick read of the guide revealed to me a most excellent and wide ranging problem solver for the grower of avocados. It has also indicated just how useful the application of levies can be to the industry."

"... the photos are outstanding, the coverage as wide as it is possible to be, and the text succinct and informative."

"I just wanted to congratulate you on a really polished and easy to navigate publication. It is rare to see a guide that is really good on both content and format."

"I received your book in the mail yesterday, it is absolutely fantastic, it's like having an expert with you all the time to help identify problems."

Requests for more copies of the 'Avocado Problem Solver Field Guide'

Since the original mail out of 717 books to all known commercial growers and other industry people we have had numerous requests for more copies, predominantly from new growers, larger producers wanting more copies and agricultural re-sellers. As a result of these requests a further 118 copies have been supplied. There are now only a handful in stock but a second print run is anticipated. Please refer to Table 1 for details of the distribution of the first print run of 850 copies.

Overseas interest in the 'Avocado Problem Solver Field Guide'

A few copies of the guide were sent to key researchers and extension staff with whom we regularly network overseas in New Zealand, South Africa, California and Chile. As a result we have received interest in bulk orders from the industries of New Zealand and South Africa. Prices and quantities for a second printing are being finalised, based on enquiries to date another 300 copies may be printed and this will include some for further needs in Australia. Avocados Australia Ltd is managing this process.

Registrations for the Best Practice Resource (BPR)

Table 5 below shows the number of growers registered for the BPR as of 19 November 2014. Note that of the 564 known commercial growers in Australia there are 65 (12%) that don't have email addresses so it is unlikely that they have the Internet and are able to register.

Table 5. Number of growers registered for the Best Practice Resource (as at 19 Nov 2014)

Region	No. grower 'users' using the BPR	Total no. growers in the region	Percentage take up
NQ	25	78	32%
CQ	34	45	75%
Sunshine Coast	20	45	44%
South Queensland (West Moreton)	26	59	44%
Tamborine/Northern NSW	17	74	23%
Central NSW	41	82	50%
Tristate	53	64	83%
Western Australia	50	117	43%
Total	**266**	**564**	**47% (53% of those with email)**

Data supplied by Avocados Australia Ltd.

The number registered has grown 40% since the end of May 2014 (five months ago) when the number registered stood at 190.

Every opportunity is taken to encourage growers to register for the resource.

Results from electronic evaluation survey of project

An electronic survey was prepared and sent to approximately 500 growers (65 growers on AAL's database do not have email addresses) plus a few packers, marketers, advisors and consultants via the Avocados Australia Ltd (AAL) email list in late October 2014. Recipients were given 11 days to complete it and a reminder was sent out 5 days after the initial request. Feedback was anonymous.

A total of 69 responses were received (about 13.5 %) which was a little disappointing but nevertheless enough to provide some useful information.

The survey results are provided in detail in Appendix 6. The main points are summarised here.

The 'Avocado Problem Solver Field Guide' (distributed to growers March 2013)

Receipt of book?

Surprisingly 12 (18%) of 65 respondents said they hadn't received a copy of the Field Guide, this was unexpected because at least one copy was sent to every known grower on the AAL postal list. Staff at AAL pointed out that some farming business emails are received by a different person to the person

receiving material sent by post, but given the publicity surrounding the book it is still puzzling. AAL will soon be doing a re-print of the book for local and overseas requests but this time the book will need to be purchased by the recipient. The first print run was 850 copies and these were distributed as outlined in Table 1.

Usefulness?

- 96% of recipients said that they found the guide very useful (82%) or useful (14%).

Frequency of use?

- 96% of recipients of the book said they used the guide weekly (8%), monthly (39%) or several times per year (49%). Only 4% said they used it rarely.

Ease of use?

- 100% found the book very easy (49%) or easy (51%) to use.

What growers used the guide for

- Identifying problems (86%)
- Managing problems (65%)
- Learning about potential problems (49%)
- Information on beneficial insects (31%)
- Information on exotic pests and diseases (33%)

Comments (in addition to unsolicited feedback listed above)

- *"As a new industry grower it is what I call 'the bible' "*
- *"Excellent field reference publication – I wish I could buy a few more"*
- *"Excellent, very comprehensive"*

Study of leading irrigators (published winter 2014)

- 44% of respondents reported that they had read one or both of the reports prepared from this study. Although this figure is less than half, the reports had only been available for two months at the time of the survey.
- 85% respondents who read the reports found them very useful or useful.

The on-line Best Practice Resource (BPR) (launched April 2013)

Registered to use the BPR?

- 60% of survey respondents had registered for access to the BPR
- 33% had not but they intend to

- 7% do not plan to, reasons given were retiring, going out of farming, don't have time and didn't receive the information.

Frequency of referring to BPR?

- 50% accessed it several times per year, 20% weekly or monthly, 23% rarely and 6% never.
- 73% found the information in the BPR very useful or useful.

Ease of use?

- 94% found it very easy or easy to use. Only 6% found it tricky or difficult.

Topics in BPR most frequently referred to

- Nutrition (94%)
- Phytophthora root rot (83%)
- Irrigation (56%)
- Spotting bug (56%)
- Mulching (50%)
- Harvesting (39%)
- Anthracnose (33%)
- Other insect pests (22%)
- Other diseases (11%)
- Site selection (11%)

Several articles were added to the BPR after the evaluation survey was conducted and could therefore not be assessed; these included varieties, rootstocks, polliniser varieties, site selection, soil health, irregular and alternate bearing. Other articles including 'Site selection' were added only two weeks prior to the survey being distributed.

Other information that growers would like to see in the BPR

- Packing
- Available chemicals
- Soil management
- Updated gross margins
- More detailed nutrition specific to the growth cycle

Videos

- 41% had watched the tree injection video
- 9% had watched the tensiometer installation video
- 18% had watched the irrigation uniformity video
- 59% had watched none of them

Video clarity?

- 100% viewers found the videos easy to follow.

Usefulness of videos?

- 100% of viewers found the videos they watched to be useful or very useful.

Suggestions for future videos?

- Canopy techniques and management (raised twice)
- Beneficial vs. problem pests
- Identifying nutritional disorders and diseases
- Identifying the major growth phases
- Soil management

Crop management calendars

- 53% had referred to the crop calendars.
- 94% of those who viewed them found them useful or very useful.

Qualicado self-assessment

- 49% had completed a Qualicado orchard management self-assessment form
- 35% had not
- 16% had not had the opportunity to do so (until recently they have only been available at Qualicado field days, they are now available on the BPR)

Usefulness of Qualicado self-assessment?

- 61% found it useful or very useful
- 36% found it OK
- 3% did not find it useful (only 1 respondent)

What was valuable in the self-assessment?

- 61% ‘to check that I was on the right track with regards to orchard practices’
- 50% ‘as a memory jogger for things I should be doing on my orchard’
- 25% ‘the maximum points allocated to each section helped me understand the relative importance of each area of management’
- 25% ‘the potential to compare (in the next round of meetings) my management practices to see if I have made progress’

Practice change

New practices or changes as a result of this project?

- 9% had implemented new practices
- 51% had made changes to existing practices
- 44% had not made any changes

Orchard practices where changes have been made?

- Nutrient management (72%)
- Phytophthora root rot management (56%)
- Irrigation management (38%)
- Mulching (38%)
- Spotting bug management (19%)
- Management of other insect pests (19%)
- Harvesting (13%)
- Anthracnose management (9%)
- Management of other diseases (6%)
- Site selection (6%)

Details of actual changes made

- Mulching x2
- Investigating tensiometers
- Anthracnose: changed spray and frequency
- Identified and sprayed for bugs when required
- Nutrition: added different types of fertiliser

- Timing of irrigation
- Frequency of fertilising
- Applying liquid gypsum through fertigation
- Annual maintenance of irrigation system (flushing of lines)
- Changing the timing of fertilizer applications
- The amount of irrigating
- The products purchased for pest and diseases
- Irrigation applications
- Increase the frequency of irrigation applications
- Spraying or injecting of phosphonates
- Root sampling and analysis
- Timing of nutritional inputs
- Spotting bug: changes to timing of insecticide applications and chemicals
- Nutrition: understanding the role of specific nutrients especially boron, zinc and nitrogen

Estimate of the financial benefit per year to businesses

Four respondents couldn't answer this question, they either didn't know, were unsure or found it too difficult. One respondent said 'No benefit to date but confident the benefits will be seen in the next few years'.

16 answered with a $ estimate:

- $0 3
- $1000 -$10,000 4
- $10,001 - $30,000 5
- $30,001 - $100,000 3
- $300,000 1

Some answered with an estimate of % increase:

- About 15%
- At least 25% in net returns

Summary of comments on how the financial benefit was derived

- Better nutrition 7
- Better irrigation 5
- Better yields 5
- Better quality fruit 5
- Larger fruit 4
- Better root rot management 4
- Healthier trees 2
- Less disease 2
- Soil health 1
- More even cropping 1
- Reduced losses from FSB and anthracnose 1

Further comments about the project or ideas for information delivery in the future

- *More emphasis on nutrition relative to the growing cycle – e.g. after harvest, pre-flowering, during flowering, at spring flush hardening, at summer flush, before summer fruit drop, at spring root flush.*
- *Canopy management relative to each growing area* (Simon Newett's comment: a booklet produced by AAL a few years ago has been updated and is about to be uploaded, it was not directly part of AV10002 although the project leader did review the booklet and suggest changes).
- *Start a blog where growers can discuss things with each other online on the avocado website.*
- *A strong focus on irrigating, irrigating and irrigating!*

Summary of electronic evaluation survey

Avocado Problem Solver Field Guide

By all accounts 'The Avocado problem Solver Field Guide' has been very well received. Growers have found it easy to use and useful and almost every copy from the first print run has been taken up. Most growers are using it regularly to identify and manage problems. The decision by the industry to fund a copy for every known commercial grower was seen as a positive move for the good of industry productivity and fruit quality. The book has also aroused the interest of the New Zealand and South African avocado industries and they may place bulk orders soon.

BPR articles

The 'Growing' section of the Best Practice Resource includes 124 articles covering almost all the main aspects of growing avocados, three videos, two reports from a detailed study of the practices of top

irrigators and 12 crop calendars. There has been strong growth in grower registrations for access to the BPR (a 40% increase in the past five months) and 47% of industry growers now are now registered to use it. The most popular topics in the BPR have been tree nutrition and Phytophthora root rot.

The vast majority of registered growers are using the BPR regularly and are finding it easy to use and useful.

Crop calendars

53% of respondents had referred to a crop calendar and 95% found them to be useful.

Videos

Although the number of people who have watched one or more of the three videos produced by this project has been rather low (41% of respondents), 100% of those who did have found them to be useful and easy to follow. More publicity is needed for the videos. The most popular video has been the one on tree injection but this one has also been available for longer.

Irrigation study

Similarly the number of people reading the outcomes of the irrigation survey was also relatively low (44%) although they have only been available since mid-June 2014. However 85% of those who have accessed these reports have found them useful. Again more publicity is needed.

Qualicado self-assessment

49% of respondents had completed a Qualicado self-assessment and 61% found them to be useful, mostly for checking that they were on the right track with their management practices but also as a memory jogger for practices that needed to be carried out in the orchard.

Phytophthora management poster

The Phytophthora management poster was distributed in November to all growers on the AAL database so it is too early to evaluate the response of recipients.

Practice change

56% of survey respondents reported that they had made changes on their orchards as a result of the project and most of these were in the areas of tree nutrition management and Phytophthora root rot management, these were followed by irrigation and mulching.

Financial benefit

Some growers have already reported a financial gain from the project, the amount ranging from $1,000 to $300,000 per year and this was attributed to better yields and fruit quality (including fruit size) from better nutrition, irrigation and disease control.

Recommendations

Continue to promote registration and use of all aspects of the ‘Best Practice Resource’ (BPR) amongst growers. Strategies should include:

- Promoting and using the information products from this project during the course of the new avocado extension project AV14000;
- Referring to the products in ‘Talking Avocados’ magazine articles;
- Referring to the products in the industry email newsletter ‘Guacamole’ especially when new material has been uploaded and when there is information in the BPR related to a current issue.

Update articles in the BPR as required.

Produce new material for the BPR from time to time, including videos, to keep growers coming back to the BPR on a regular basis.

Continue to supply copies of ‘The Avocado Problem Solver Field Guide’ and the poster ‘Manage Phytophthora root rot’ to new growers.

Now that the industry has comprehensive, up-to-date and easily accessible information resources available, it is time return to the strategy of regular face-to-face contact with growers at regular technical workshops in the regions (AV14000) to reinforce and help extend best management practices.

Acknowledgements

The project leader would like to acknowledge the following people and organisations.

Team members

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NSW DPI: Sandra Harding in Gosford

Lisa Martin, Ripe Horticulture in Mildura

DAFWA: Alec McCarthy in Bunbury, Western Australia.

Collaborators

The project frequently sought input from plant pathologists, entomologists, consultants and others in the compilation of the information resources. They included:

Justin Bartlett, Paul Campbell, Terry Campbell, Lindy Coates, Tony Cooke, Liz Dann, Harry Fay, Andrew Geering, Fiona Giblin, Kathy Grice, Ed Hamacek, John Hargreaves, Peter Hofman, Ken Pegg, Luke Smith, Tim Smith (DAFF Qld); Geoff Waite (formerly from the Department of Primary Industries and Fisheries, Queensland); Ruth Huwer and Craig Maddox (NSW DPI); Stewart Learmonth (DAFWA); Eddy Dunn (Hortus); Tony Whiley (Sunshine Horticultural Services); Leonie Wittenberg (LW Crop Services) and Mary Lu Arpaia (University of California, Riverside).

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Funding bodies

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Project steering group members

AAL board members Daryl Boardman and Lachlan Donovan, AAL CEO John Tyas and communications officer Courtney Vane who was replaced by Anna Petrou when Courtney Vane left AAL.

Appendices

Appendix 1. Front cover of the 221 page ‘Avocado Problem Solver Field Guide’

Appendix 2. List of the 124 articles prepared and uploaded to the Best Practice Resource (BPR)

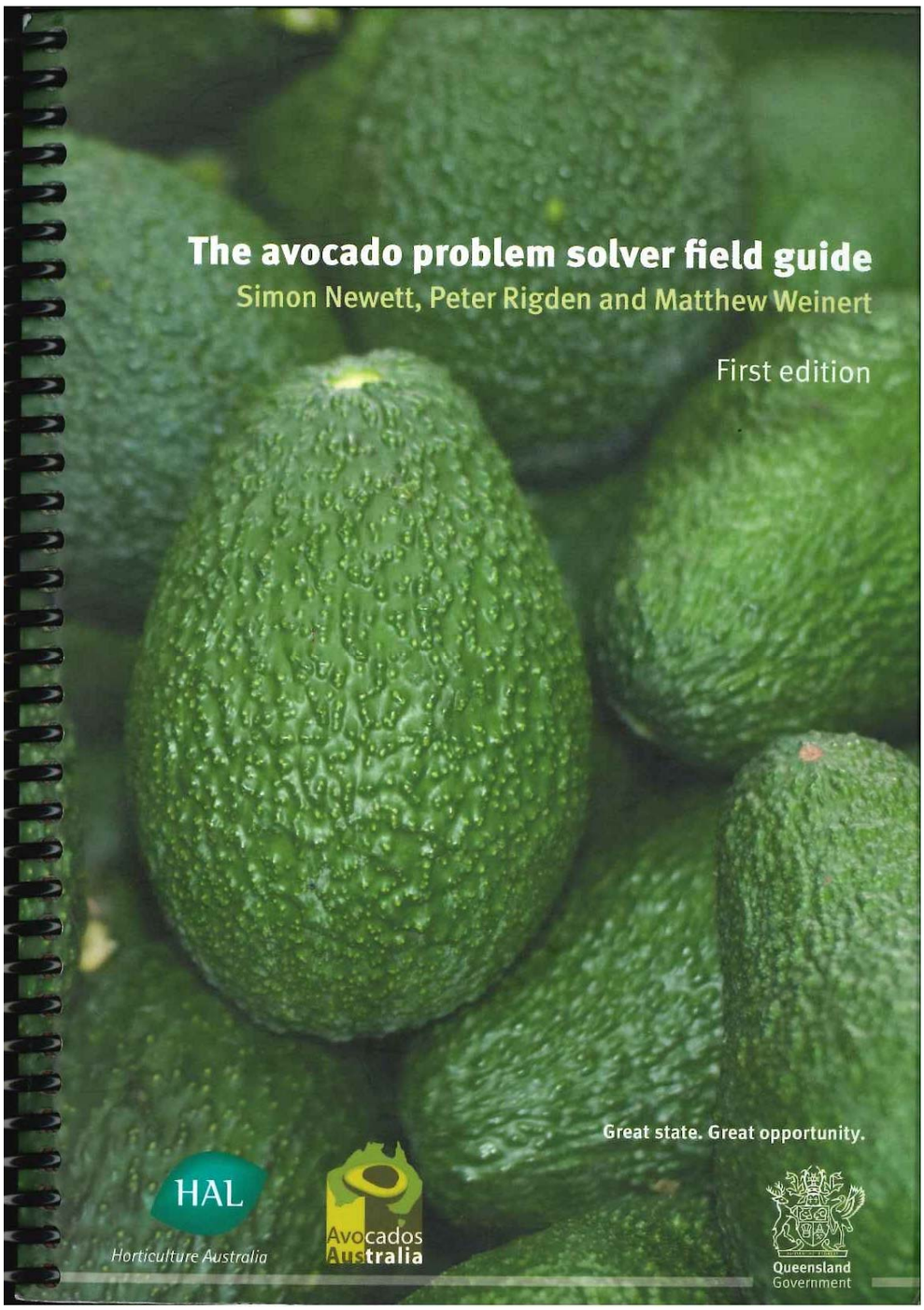
Appendix 3. Qualicado self-assessment questionnaire

Appendix 4. Example of a crop management calendar

Appendix 5. Phytophthora root rot management poster

Appendix 6. Project evaluation e-survey results

Appendix 1. Front cover of the 221 page 'Avocado Problem Solver Field Guide'



Appendix 2. List of the 124 articles prepared and uploaded to the Best Practice Resource (BPR)

Site selection

- Overview
- Plan the orchard layout
- Assessing soil drainage
- What is well-drained soil
- Why is soil drainage so important?
- Soil properties
- Site issues other than soil drainage

Rootstock selection

- Overview
- Rootstock research in Australia
- Rootstocks for Australian orchards
- Seedling or clonal rootstocks?
- Understanding rootstock genetics

Selecting varieties and pollinisers

- Overview
- What makes a good variety?
- Hass
- Shepard
- Reed
- Sharwil
- Fuerte
- Wurtz
- Pollinisers

Soil health

- Overview
- Indicators of soil health
- Assessments
- Measuring soil properties and health
- Biological activity on and in the soil
- What can you do to encourage soil biology?

Nutrition

- Overview
- Managing nutrition
- Leaf and soil analysis
- Soil pH
- Timing and intervals
- Fertiliser application and placement
- Handy nutrition information
- Nitrogen

- Potassium
- Phosphorus
- Calcium
- Magnesium
- Sulphur
- Copper
- Zinc
- Iron
- Manganese
- Boron

Irrigation

- Overview
- Importance of good management
- Factors affecting water demand and availability
- Basic design requirements
- Soil moisture monitoring systems
- Positioning monitoring tools
- Tensiometers
- Soil moisture sensors
- Capacitance probes
- Evaporation replacement
- Managing with limited water
- New irrigation developments
- Guide to irrigation requirements in Australia
- Key practices for effective irrigation
- What the good irrigators do

Plus the two videos: ‘Tensiometer installation’ and ‘Measuring irrigation uniformity’

Phytophthora root rot

- Overview
- Cause
- Identification
- Young trees
- Tree injection
- Foliar application
- Phosphorous acid
- Monitor root phosphonate
- Nursery hygiene
- Rootstocks
- Drainage
- Irrigation
- Nutrition
- Soil health
- Orchard quarantine

Plus the video ‘Tree injection’.

Anthracnose disease

- Overview
- Identification
- General comments
- Field management

- Post-harvest management

Other diseases

- Brown root rot
- Pepper spot
- Algal leaf spot
- Bacterial soft rot
- Black root rot
- Cercospora spot
- Phytophthora trunk canker
- Sooty blotch
- Sooty mould
- Stem end rot
- Sunblotch viroid
- Verticillium wilt

Spotting bug

- Overview
- General comments and damage
- Identification
- Management

Other insects and mites

- Queensland fruit fly
- Leaf rollers
- Red shouldered leaf beetle
- Avocado bark beetle
- Avocado dimpling bug
- Avocado fruit borer
- Citrus blossom bug
- Mediterranean fruit fly
- Garden weevil
- Light brown apple moth
- Looper caterpillars
- Orange fruit borer
- Pinhole borer
- Planthopper
- Scale insects
- Swarming leaf beetles
- Tea mosquito bug
- Tea red spider mite
- Thrips
- Tussock moth
- Whitefly
- Zebra shield bug

Pollination

- Pollination

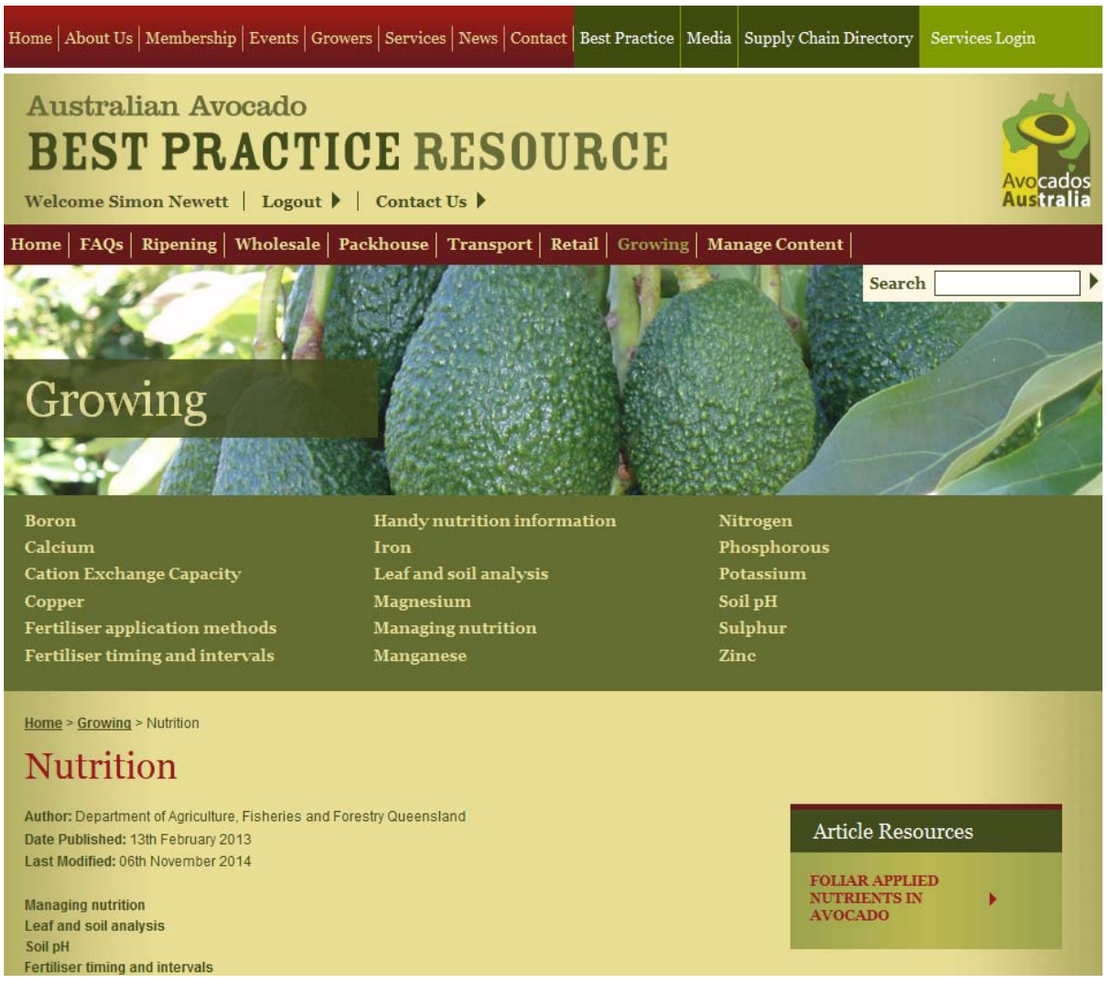
Using mulch

- Using mulch

Irregular and alternate bearing

- Overview
- Definitions and occurrence
- Factors of alternate bearing
- Factors of irregular bearing
- Reducing the occurrence of alternate and irregular bearing

Two screen shots from within the BPR are illustrated below. The first is the 'Nutrition' title page which shows the start of the overview page plus the links to the other 18 articles within this topic. On the bottom right hand side it also lists the name of an associated independent 'Article Resource' which is relative to the topic and has been made available to users of the BPR.



The screen shot (below) shows the start of the calcium nutrition article from within the nutrition section of the BPR. On the right hand side is a feature of the BPR which draws the attention of the reader to the latest new articles that have been uploaded to the BPR.

Calcium

Author: Department of Agriculture, Fisheries and Forestry Queensland
Date Published: 13th February 2013
Last Modified: 04th November 2014

Common calcium fertilisers

- Calcium sulphate – gypsum (18 to 20% Ca, 14 to 18% S).
- Calcium nitrate (18 to 19% Ca; 15% N)
- Calcium carbonate – lime (35 to 40% Ca).
- Calcium and magnesium carbonates – dolomite (12 to 15% Ca, 8 to 12.5% Mg).
- Calcium ammonium nitrate – CAN (8% Ca, 27% N)

Calcium function

- Plays an important role in cell division and cell development in leaves, fruit and root tips. Calcium is required to produce robust fruit quality.
- There is growing evidence that high fruit calcium concentrations suppress the development of fruit diseases such as anthracnose, reduce the potential for chill injury and increase the shelf-life of fruit.

Calcium behaviour in soil and plant

- Relatively immobile in the soil
- Mobile within the tree in an upwards direction towards the leaf tips with little remobilisation downwards.
- Required in relatively large amounts.

Back to top

Calcium deficiency and toxicity

- Insufficient calcium can cause the flesh at the basal end of the seed cavity to show a diffuse grey to brown discolouration that may spread throughout the flesh. Symptoms develop only on ripening.
- Excessive application of lime and dolomite may raise the soil pH above 7 (alkaline) which can reduce uptake of manganese, zinc, boron, copper and phosphorus causing deficiency symptoms for these nutrients to appear.
- Deficiency can be caused by an imbalance of calcium, magnesium and potassium in the soil.
- Symptoms of toxicity have not been recorded.

Latest Articles

Measuring soil properties and health
Acknowledgements: These notes are adapted from information dev...

Reducing the occurrence
Harvest time Once it is mature, the earlier in the season yo...

Factors of irregular bearing
Any event, climatic or management related, which negatively affe...

Factors of alternate bearing
Time of harvest Late harvesting was the orchard practice com...

Appendix 3. Qualicado self-assessment questionnaire

Please refer to the next eight pages.

Grower Pre-Harvest Qualicado Assessment for Maximising Avocado Yields and Quality

1. CLIMATE & ASPECT

			Max. points	Your score	Your score
1	Row direction, winds, frosts & aspect.	Tree rows run north-south where the slopes allow it. Orchard is not prone to frosts and is protected from strong prevailing winds (naturally or with windbreaks). Steeper blocks in have predominantly E, NE or N aspects.	5		1
	TOTAL		5		

2. ROOTSTOCKS AND VARIETIES

			Max. points	Your score	Your score
2a	Suitability of varieties	The varieties you grow are suitable for your environment.	2		2a
2b	Rootstocks	Rootstocks have a proven history of good performance, are uniform, have some tolerance to *Phytophthora* root rot and do not make fruit unduly susceptible to anthracnose.	6		2b
	TOTAL		8		

3. PHYTOPHTHORA ROOT ROT CONTROL

			Max. points	Your score	Your score
3a	Surface and internal drainage	There is at least 1.5 metres of well-drained soil (sandy, sandy loam, loam, or well-structured clay loam). Trees are planted on mounds. Underground drains have been installed if necessary to eliminate any wet spots. Water drains away quickly after rain and does not pond anywhere in orchard.	6		3a
3b	Nursery trees	Trees are purchased from ANVAS accredited nurseries. Upon arrival at the orchard, trees are never placed on	3		3b

		the ground but are stored on an open mesh structure above the ground to prevent infection by *Phytophthora* and to allow excess water to drain away immediately.			
3c	Early establishment	Ground is prepared according to best practice recommendations with cover crops and incorporation of manure or compost and calcium well before planting. Young trees are mulched with coarse free draining material and preventative *Phytophthora* root rot control measures taken e.g. metalaxyl (e.g. Ridomil®) granules are applied to the soil, and trees drenched with phosphorous acid the day before planting.	3		3c
3d	Soil health	Steps are taken to improve the root environment especially in the under-tree area. These measures include maintaining a 10+cm mulch of coarse free draining material under tree canopies and adopting practices to minimise/alleviate soil compaction. Other practices could include the application of good quality compost.	3		3d
3e	Application of phosphorous acid	Root phosphonate levels are monitored annually and the results used to tailor phosphorous acid treatments. Healthy trees are treated in autumn either by injecting 20% phosphorous acid or by several 0.5% phosphorous acid foliar sprays. Sick trees are treated by injection, both in autumn and late spring. Timing of applications strictly follow recommended times (linked to the growth cycle).	5		3e
3f	Irrigation and nutrition	Irrigation and nutrition must be managed carefully to ensure adequate moisture and nutrient balance at all times; excessive or insufficient water and nutrients cause stress in avocado trees which pre-disposes them to Phytophthora root rot.	2		3f
	TOTAL		22		

4. IRRIGATION

			Max. points	Your score	Your score
4a	Water quantity & quality	For each season there are between 9-16 megalitres (depending on locality) of irrigation water available per hectare of planted orchard area. The water supply is tested regularly and contains less than 80 mg/kg chloride and a conductivity of less than 0.6 dS/m (384 ppm). If conductivity is higher than this adequate leaching irrigations are applied.	4		4a
4b	Irrigation system	An irrigation system appropriate for the orchard conditions is used. The system uniformly waters each tree in the orchard and is regularly inspected. The uniformity of the system is tested at least once per year.	4		4b
4c	Irrigation scheduling	Irrigation scheduling is based on the readings from a reliable soil moisture monitoring system which is read several times per week. Special care is taken not to overwater or underwater trees. During the period starting from flowering through till the completion of rapid fruit growth, soil moisture is monitored more frequently and irrigations are more responsive. Irrigation to *Phytophthora* affected and smaller trees in the block (e.g. replants) is reduced to prevent waterlogging.	7		4c
	TOTAL		15		

5. NUTRITION

			Max. points	Your score	Your score
5a	Monitoring	Full leaf tissue analysis is conducted between April and May every year. Full soil analysis is conducted at least every 3 years.	5		5a
5b	Fertiliser applications	Fertiliser applications are based on interpretation of soil and leaf analysis by an expert. Crop load is also	4		5b

		taken into account, as soon as it is apparent, in determining nitrogen rates (higher rates for heavier crop loads). Foliar boron sprays are applied at flowering time to supplement soil applications if leaf levels are deficient.			
5c	Application interval	The interval between applications of nitrogen, potassium and boron is appropriate for the soil texture (e.g. ranging from weekly on sands to every 2 to 3 months on clay loam krasnozems)	3		5c
	TOTAL		12		

6. ANTHRACNOSE MANAGEMENT

			Max. Points	Your Score	Your Score
6a	Fungicide applications	Regular applications of copper fungicides are applied as foliar sprays between fruit set and harvest. The interval of 28 days during fine weather is shortened to 21 days following rain and 14 days during prolonged wet weather. Azoxystrobins (e.g. Amistar®) are used and specific anti-resistance guidelines are followed.	7		6a
6b	Other preventive measures	Other measures are applied including orchard hygiene (removal of old fruit, dead twigs and branches), good ventilation through the tree (achieved by means of canopy management), good insect control, and snipping rather than snap picking during humid conditions.	5		6b
	TOTAL		12		

7. INSECT MANAGEMENT

			Max. Points	Your Score	Your Score
7a	Monitor insect pests	Regular pest monitoring (scouting) is conducted for the main avocado insect pests that can occur in your area e.g. fruitspotting bug, fruit fly, leaf eating beetles, ivy leaf roller, scale insects, caterpillars, tea red spider	2		7a

		mite.			
7b	Sprayer	Sprayer configuration and spray volumes are appropriate for the orchard. Sprayer is calibrated at least once per year and takes into account tree size.	3		7b
7c	Control of insect pests	Appropriate registered pesticides are applied effectively when required.	5		7c
	TOTAL		10		

8. POLLINATION

			Max. points	Your score	Your score
8	Bees and pollinisers	Insect pollinators are plentiful at flowering, beehives are brought in if necessary. In cool production areas effective polliniser varieties are interplanted in the orchard to assist with pollination and fruitset.	5		8
	TOTAL		5		

9. CANOPY MANAGEMENT

			Max. points	Your score	Your score
9a	Access	Harvesters are able to reach all fruit.	3		9a
9b	Pruning	A suitable canopy management system has been chosen and is carried out as part of a planned program on a regular cycle. Trees are kept at a manageable size to facilitate effective spraying, efficient harvesting and adequate light penetration through the canopy (as judged by there being ground-cover plants (e.g. grass) in the inter-row space and minimal shading of lower branches).	8		9b
	TOTAL		11		

Grower Post-Harvest Qualicado Assessment for Maximising Avocado Yields and Quality

1. HARVESTING

			Max. Points	Your score	Your score
1a	Rain	Prior to rain events foliar fungicide program was maintained. After rain or heavy dew fruit is completely dry before harvesting and harvesting is delayed by 48 hours in the case of heavy or prolonged rain.	5		1a
1b	Maturity	Ripening and dry matter tests are conducted on fruit before harvesting. Only Hass with a minimum of 23% Dry Matter or Shepard with 21% Dry Matter are harvested.	9		1b
1c	Equipment	Regular maintenance is conducted on harvesting equipment and there is adequate suspension on bin trailers/runners.	5		1c
1d	Training	Pickers have been fully trained and instructed on which blocks to harvest and which fruit to pick. Pickers know that fruit dropped from more than 30cm is unmarketable and should be rejected. Fruit is handled gently.	8		1d
	Training	Pickers are trained to assess each piece of fruit for physical damage that would render it unmarketable and therefore should be rejected.	8		
1e	Field Bins	Immediately after filling, field bins are covered to reduce risk of sunburn. Within 30 minutes of filling, filled bins are collected from blocks to protect against sunburn and to bring the core temperature down. Bins are not overfilled.	5		1e
	TOTAL		40		

2. QUALITY ANALYSIS

			Max. Points	Your score	Your score
2a	Receival Bin Analysis	Bins are assessed for quality and picking issues such as harvesting damage and sunburn.	10		2a
2b	Reject Bin Analysis	If your packhouse produces Reject Bin Analysis Reports, this information is used to identify areas for improvement.	10		2b
	TOTAL		20		

SUMMARY – Pre-Harvest

		Max. points	Your score
1	**CLIMATE & ASPECT**	5	
2	**ROOTSTOCKS & VARIETIES**	8	
3	**PHYTOPHTHORA ROOT ROT CONTROL**	22	
4	**IRRIGATION**	15	
5	**NUTRITION**	12	
6	**ANTHRACNOSE MANAGEMENT**	12	
7	**INSECT MANAGEMENT**	10	
8	**POLLINATION**	5	
9	**CANOPY MANAGEMENT**	11	
TOTAL		100	

SUMMARY – Post-Harvest

		Max. points	Your score
1	**HARVESTING**	40	
2	**QUALITY ANALYSIS**	20	
TOTAL		60	

1. What was your average yield over the last 3 years?

☐ Less than 10 tonnes/hectare ☐ 10 – 15 tonne/hectare

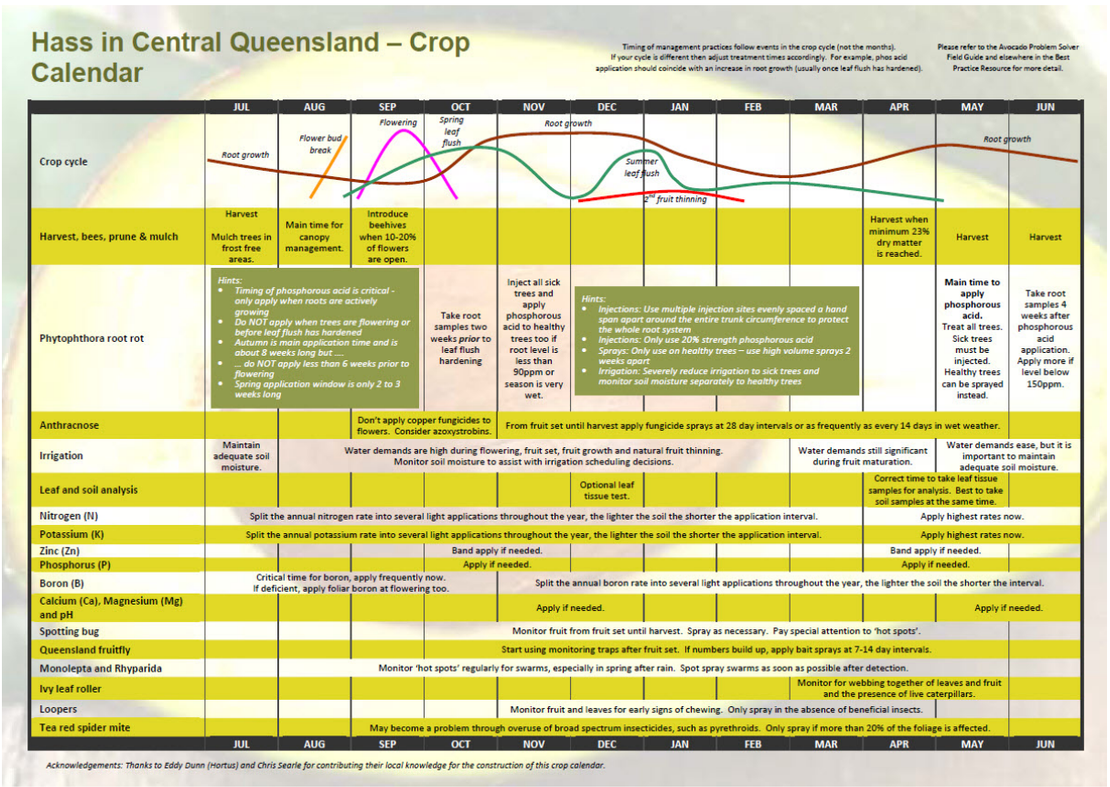
☐ More than 15 tonnes/hectare

2. What was your overall percentage of marketable fruit last season?…….

3. Based on the Australia Avocado Grading Guide, as a percentage of the total amount of marketable fruit:

……..% Class 1 fruit ……..% Class 2 fruit ……..% Class 3 fruit

Appendix 4. Example of a crop management calendar



Hass in Central Queensland – Crop Calendar

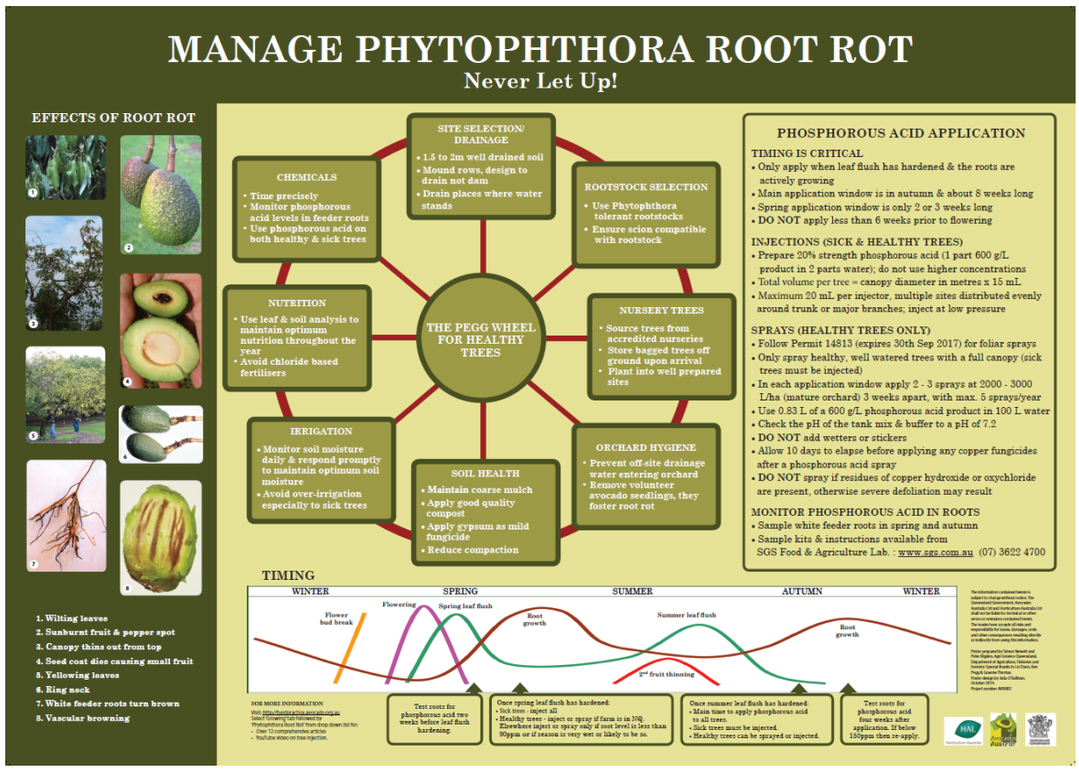
Timing of management practices follow events in the crop cycle (not the months). If your cycle is different then adjust treatment times accordingly. For example, phos acid application should coincide with an increase in root growth (usually once leaf flush has hardened).

Please refer to the Avocado Problem Solver Field Guide and elsewhere in the Best Practice Resource for more detail.

	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Crop cycle	*Root growth*	*Flower bud break*	*Flowering*	*Spring leaf flush*	*Root growth*	*Summer leaf flush*	*2nd fruit thinning*				*Root growth*	
Harvest, bees, prune & mulch	Harvest Mulch trees in frost free areas.	Main time for canopy management.	Introduce beehives when 10-20% of flowers are open.							Harvest when minimum 23% dry matter is reached.	Harvest	Harvest
Phytophthora root rot	*Hints:* • *Timing of phosphorous acid is critical - only apply when roots are actively growing* • *Do NOT apply when trees are flowering or before leaf flush has hardened* • *Autumn is main application time and is about 8 weeks long but ....* • *... do NOT apply less than 6 weeks prior to flowering* • *Spring application window is only 2 to 3 weeks long*			Take root samples two weeks *prior* to leaf flush hardening	Inject all sick trees and apply phosphorous acid to healthy trees too if root level is less than 90ppm or season is very wet.	*Hints:* • *Injections: Use multiple injection sites evenly spaced a hand span apart around the entire trunk circumference to protect the whole root system* • *Injections: Only use 20% strength phosphorous acid* • *Sprays: Only use on healthy trees – use high volume sprays 2 weeks apart* • *Irrigation: Severely reduce irrigation to sick trees and monitor soil moisture separately to healthy trees*					**Main time to apply phosphorous acid.** Treat all trees. Sick trees must be injected. Healthy trees can be sprayed instead.	Take root samples 4 weeks after phosphorous acid application. Apply more if level below 150ppm.
Anthracnose			Don't apply copper fungicides to flowers. Consider azoxystrobins.	From fruit set until harvest apply fungicide sprays at 28 day intervals or as frequently as every 14 days in wet weather.								
Irrigation	Maintain adequate soil moisture.	Water demands are high during flowering, fruit set, fruit growth and natural fruit thinning. Monitor soil moisture to assist with irrigation scheduling decisions.							Water demands still significant during fruit maturation.		Water demands ease, but it is important to maintain adequate soil moisture.	
Leaf and soil analysis						Optional leaf tissue test.				Correct time to take leaf tissue samples for analysis. Best to take soil samples at the same time.		
Nitrogen (N)	Split the annual nitrogen rate into several light applications throughout the year, the lighter the soil the shorter the application interval.									Apply highest rates now.		
Potassium (K)	Split the annual potassium rate into several light applications throughout the year, the lighter the soil the shorter the application interval.									Apply highest rates now.		
Zinc (Zn)				Band apply if needed.						Band apply if needed.		
Phosphorus (P)				Apply if needed.						Apply if needed.		
Boron (B)	Critical time for boron, apply frequently now. If deficient, apply foliar boron at flowering too.				Split the annual boron rate into several light applications throughout the year, the lighter the soil the shorter the interval.							
Calcium (Ca), Magnesium (Mg) and pH					Apply if needed.						Apply if needed.	
Spotting bug				Monitor fruit from fruit set until harvest. Spray as necessary. Pay special attention to 'hot spots'.								
Queensland fruitfly				Start using monitoring traps after fruit set. If numbers build up, apply bait sprays at 7-14 day intervals.								
Monolepta and Rhyparida			Monitor 'hot spots' regularly for swarms, especially in spring after rain. Spot spray swarms as soon as possible after detection.									
Ivy leaf roller									Monitor for webbing together of leaves and fruit and the presence of live caterpillars.			
Loopers					Monitor fruit and leaves for early signs of chewing. Only spray in the absence of beneficial insects.							
Tea red spider mite			May become a problem through overuse of broad spectrum insecticides, such as pyrethroids. Only spray if more than 20% of the foliage is affected.									
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN

Acknowledgements: Thanks to Eddy Dunn (Hortus) and Chris Searle for contributing their local knowledge for the construction of this crop calendar.

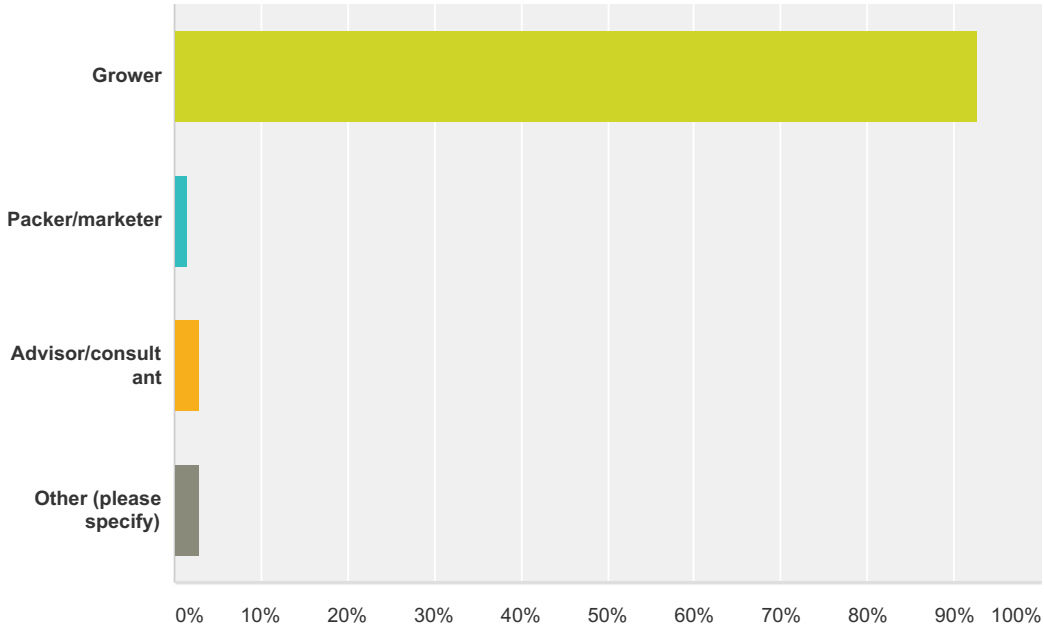
Appendix 5. Phytophthora root rot management poster



Appendix 6. Project evaluation e-survey results

Q1 Please select which option best describes your involvement in the avocado industry:

Answered: 69 Skipped: 0

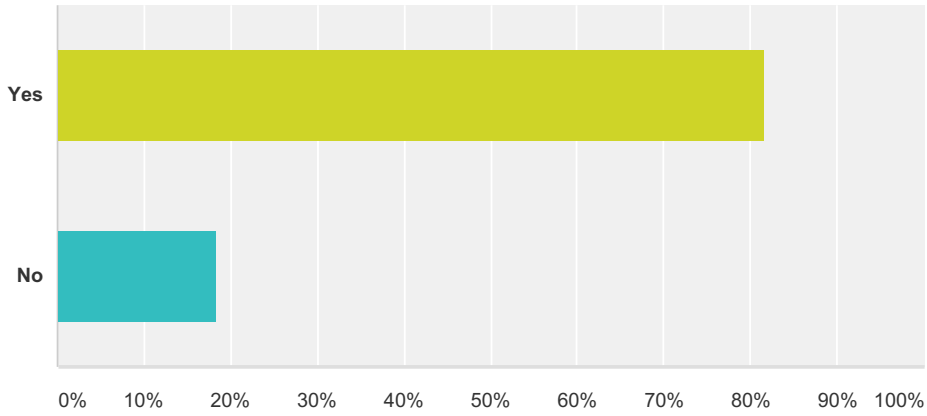


Answer Choices	Responses	
Grower	**92.75%**	64
Packer/marketer	**1.45%**	1
Advisor/consultant	**2.90%**	2
Other (please specify)	**2.90%**	2
Total		**69**

#	Other (please specify)	Date
1	grower and packer.	11/7/2014 6:09 AM
2	Grower/packer	11/5/2014 10:43 AM

Q2 Did you receive this book?

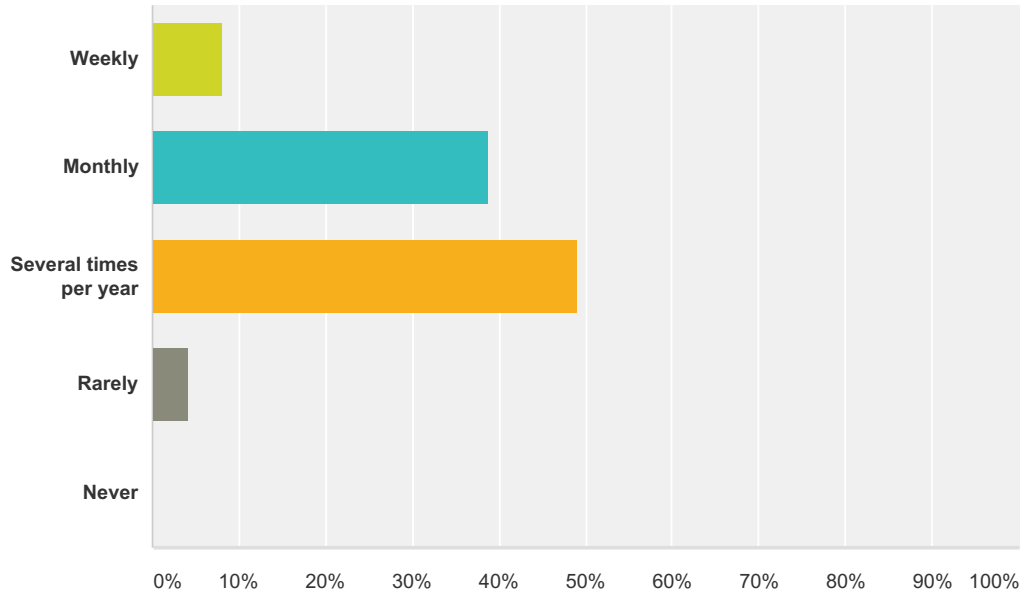
Answered: 65 Skipped: 4



Answer Choices	Responses	
Yes	**81.54%**	53
No	**18.46%**	12
Total		**65**

Q3 Roughly how often do you use it?

Answered: 49 Skipped: 20

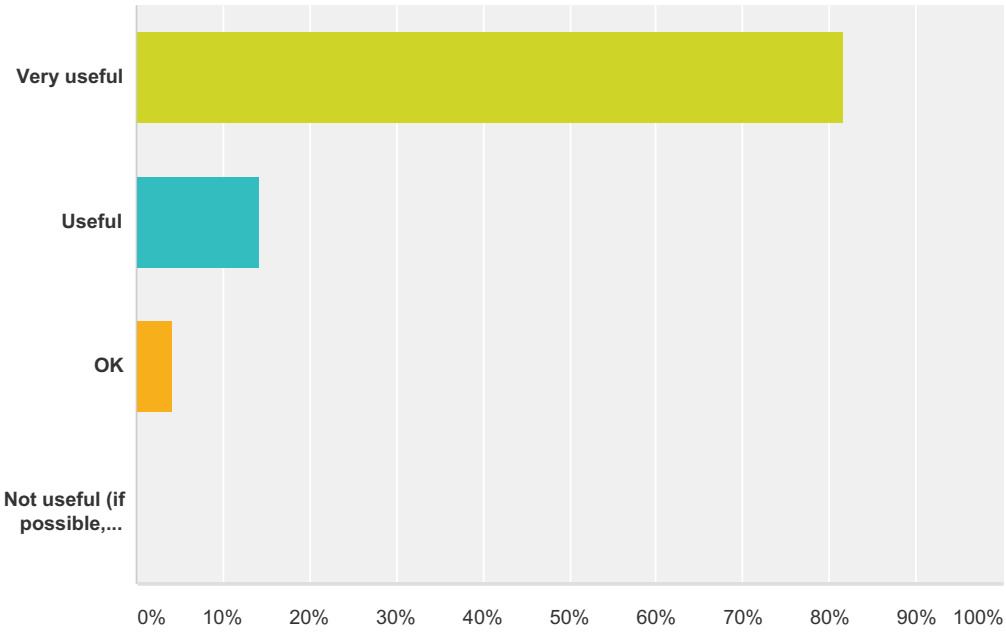


Answer Choices	Responses	
Weekly	**8.16%**	4
Monthly	**38.78%**	19
Several times per year	**48.98%**	24
Rarely	**4.08%**	2
Never	**0.00%**	0
Total		**49**

#	Comments	Date
1	Very good publication	11/6/2014 4:43 AM
2	Very helpful pics	11/4/2014 5:36 PM
3	as required	11/3/2014 10:01 PM
4	Excellent field reference publication - I wish I could buy a few more.	11/1/2014 5:37 PM
5	As a new to industry grower it is what I call the Bible.	10/31/2014 11:54 PM
6	Used as a backup when I have questions	10/31/2014 8:23 PM

Q4 How useful have you found it?

Answered: 49 Skipped: 20

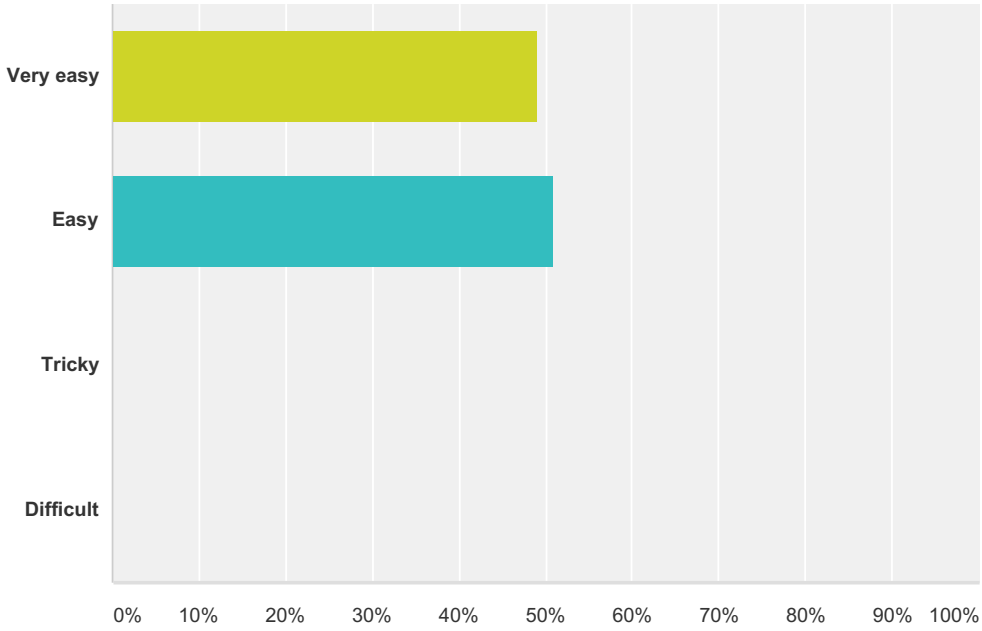


Answer Choices	Responses	
Very useful	**81.63%**	40
Useful	**14.29%**	7
OK	**4.08%**	2
Not useful (if possible, please indicate why in Comments)	**0.00%**	0
Total		**49**

#	Comments	Date
1	Excellent Very Comprehensive	11/5/2014 10:07 AM
2	Excellent descriptive photos	11/1/2014 5:37 PM

Q5 How easy/intuitive have you found it to use with respect to layout, order, index, contents pages etc?

Answered: 49 Skipped: 20

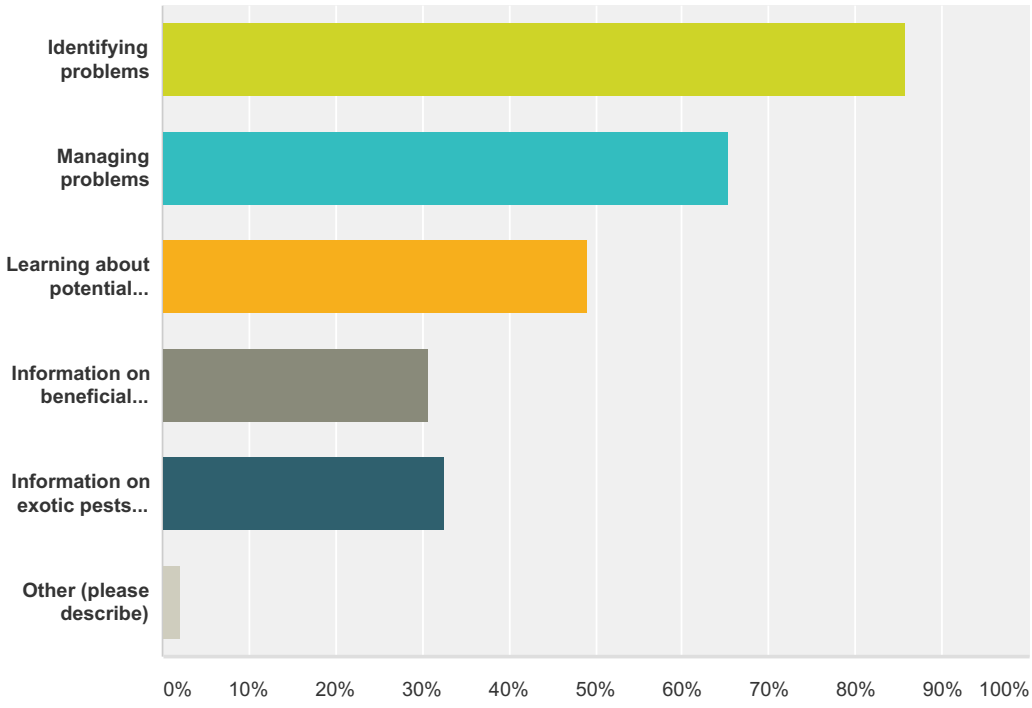


Answer Choices	Responses	
Very easy	**48.98%**	24
Easy	**51.02%**	25
Tricky	**0.00%**	0
Difficult	**0.00%**	0
Total		**49**

#	Comments	Date
	There are no responses.	

Q6 What have you used if for? (select all that apply)

Answered: 49 Skipped: 20

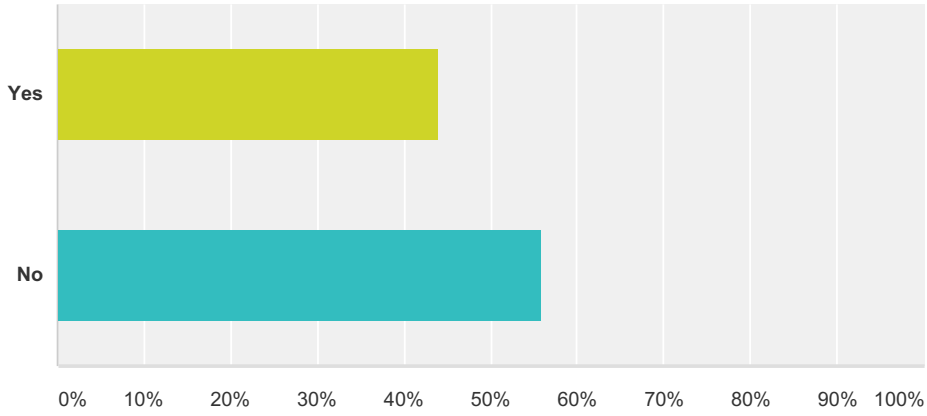


Answer Choices	Responses	
Identifying problems	**85.71%**	42
Managing problems	**65.31%**	32
Learning about potential problems	**48.98%**	24
Information on beneficial insects	**30.61%**	15
Information on exotic pests and diseases	**32.65%**	16
Other (please describe)	**2.04%**	1
Total Respondents: 49		

#	Other (please describe)	Date
1	Very useful	11/6/2014 4:43 AM

Q7 Have you read either or both of the two articles? “Key practices for effective irrigation?" or "What the good irrigators do?"

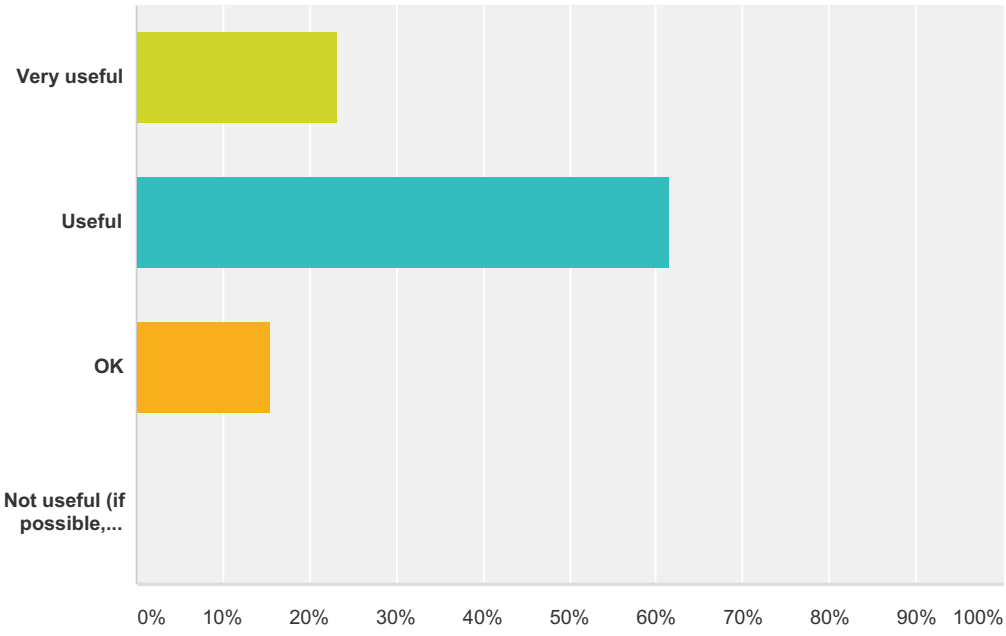
Answered: 59 Skipped: 10



Answer Choices	Responses	
Yes	**44.07%**	26
No	**55.93%**	33
Total		**59**

Q8 How useful did you find the information?

Answered: 26 Skipped: 43

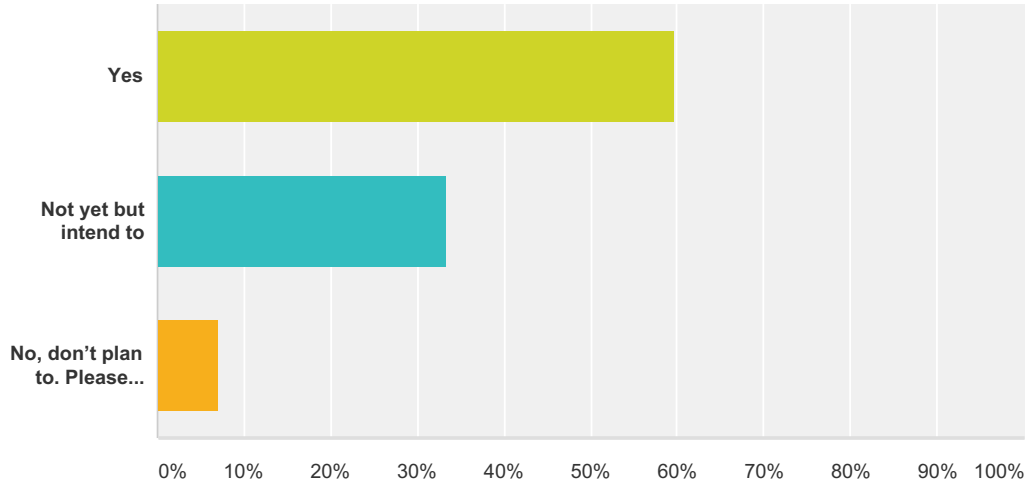


Answer Choices	Responses	
Very useful	**23.08%**	6
Useful	**61.54%**	16
OK	**15.38%**	4
Not useful (if possible, please indicate how it could have been more useful)	**0.00%**	0
Total		**26**

#	Comments	Date
1	Good support of irrigation needs, but displayed in confusing manner.	11/5/2014 9:29 AM
2	Was interesting to see the differences between regions, with all growers obviously having high yielding properties	11/4/2014 5:37 PM

Q9 Have you registered to use the Avocados Australia Ltd 'Best Practice Resource'?

Answered: 57 Skipped: 12

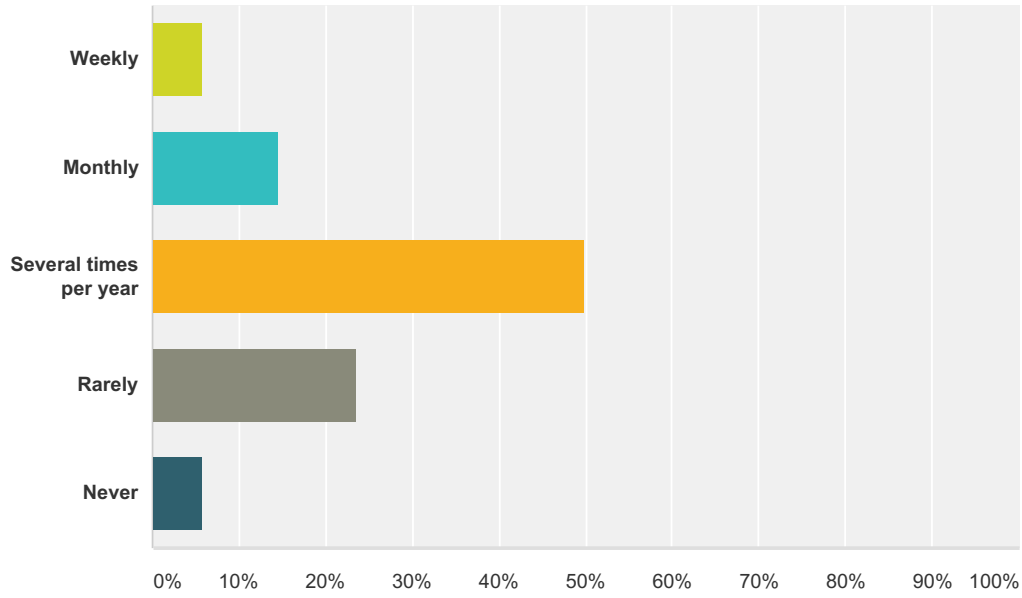


Answer Choices	Responses	
Yes	**59.65%**	34
Not yet but intend to	**33.33%**	19
No, don't plan to. Please indicate why:	**7.02%**	4
Total		**57**

#	No, don't plan to. Please indicate why:	Date
1	too old. winding down and going out of farming	11/5/2014 11:39 AM
2	Did not receive the info	11/5/2014 10:16 AM
3	Don't have time	11/3/2014 8:23 PM
4	Because we are retiring	11/1/2014 8:32 AM

Q10 On average, how often have you accessed material in the 'Growing' section?

Answered: 34 Skipped: 35

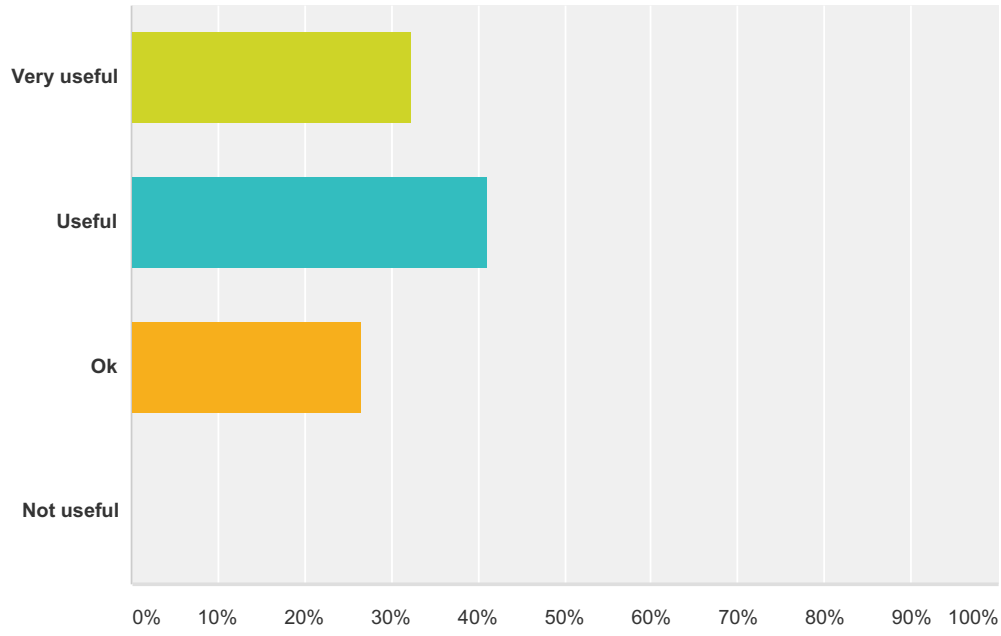


Answer Choices	Responses	
Weekly	5.88%	2
Monthly	14.71%	5
Several times per year	50.00%	17
Rarely	23.53%	8
Never	5.88%	2
Total		34

#	Comments	Date
	There are no responses.	

Q11 How useful have you found the information?

Answered: 34 Skipped: 35

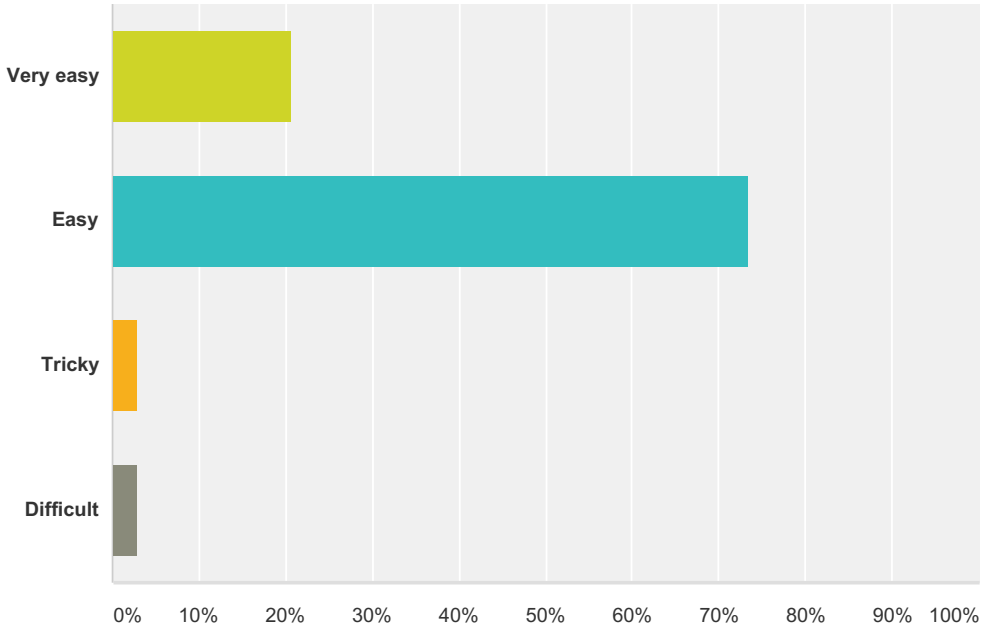


Answer Choices	Responses	
Very useful	**32.35%**	11
Useful	**41.18%**	14
Ok	**26.47%**	9
Not useful	**0.00%**	0
Total		**34**

#	Comments	Date
	There are no responses.	

Q12 How easy/intuitive have you found the Growing section to use with respect to layout, order, links and content etc?

Answered: 34 Skipped: 35

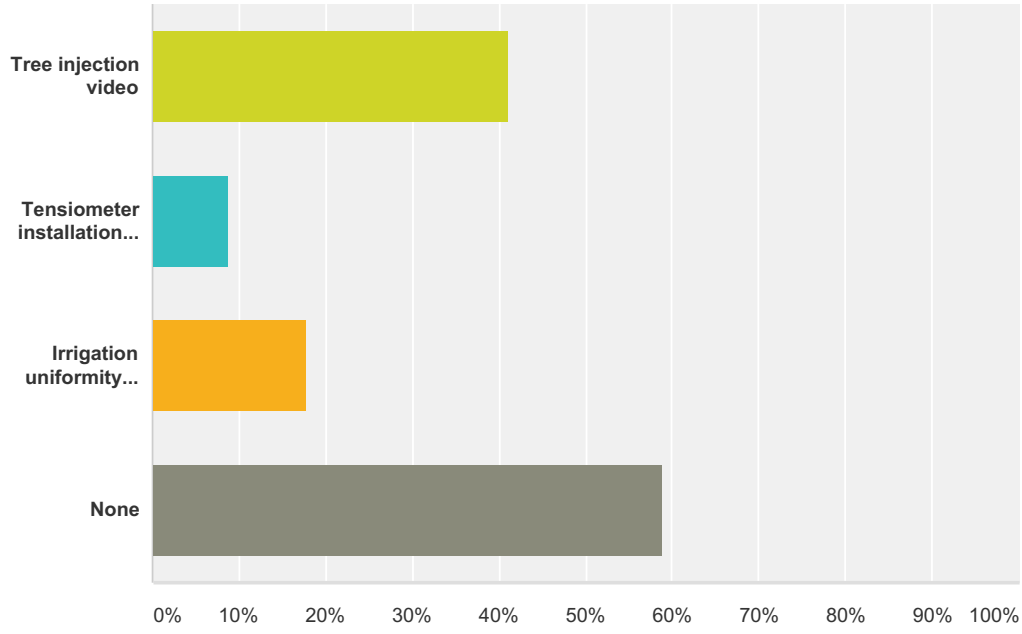


Answer Choices	Responses	
Very easy	**20.59%**	7
Easy	**73.53%**	25
Tricky	**2.94%**	1
Difficult	**2.94%**	1
Total		**34**

#	Comments/suggestions for improvements:	Date
	There are no responses.	

Q13 Which of the following videos made especially for the 'Growing' section have you watched? (Select one or more)

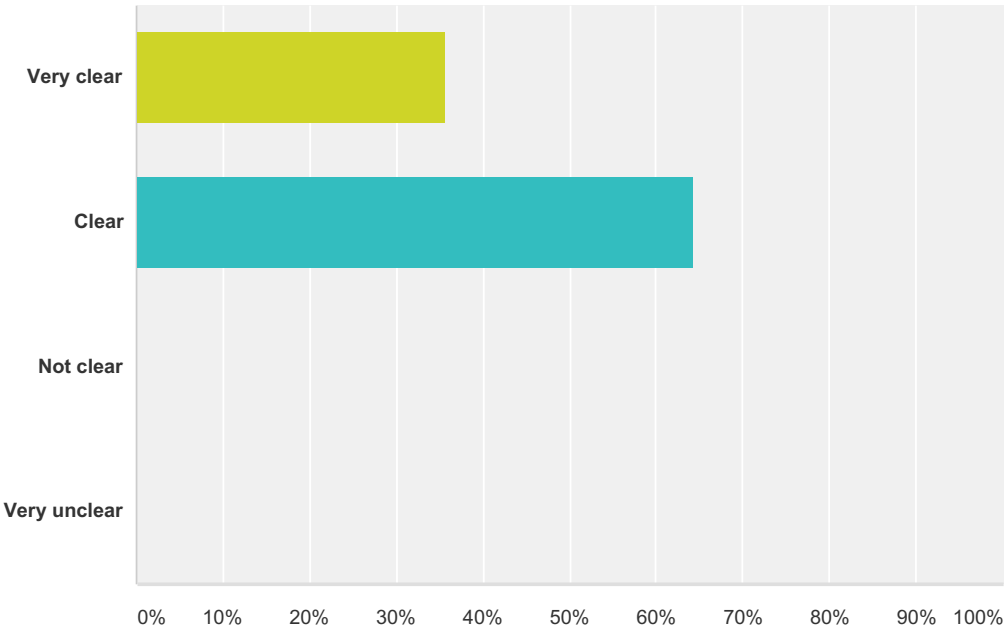
Answered: 34 Skipped: 35



Answer Choices	Responses	
Tree injection video	**41.18%**	14
Tensiometer installation video	**8.82%**	3
Irrigation uniformity video	**17.65%**	6
None	**58.82%**	20
Total Respondents: 34		

Q14 Did you find the videos that you watched easy to follow?

Answered: 14 Skipped: 55

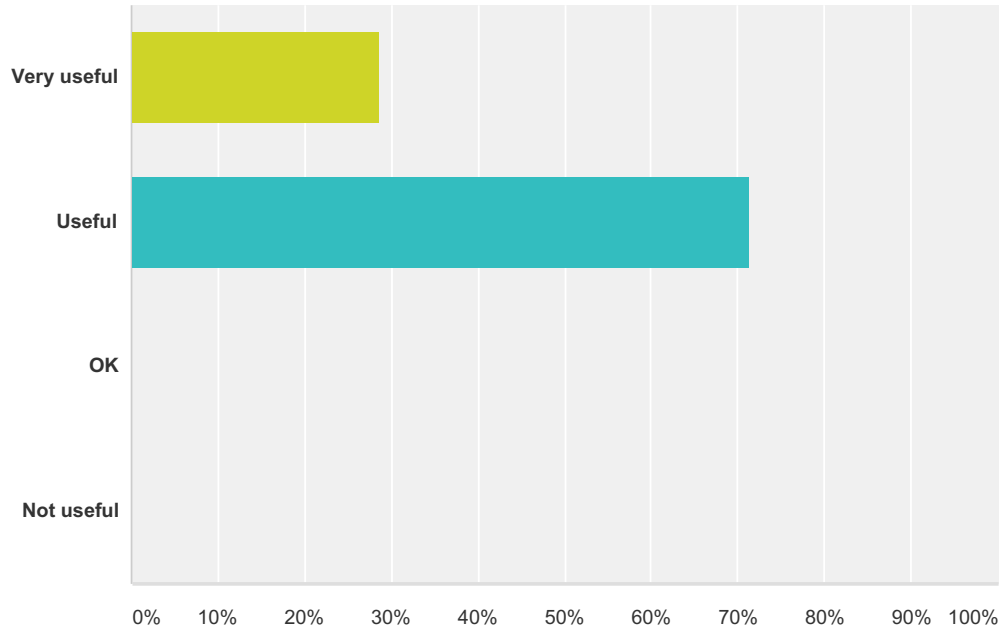


Answer Choices	Responses	
Very clear	**35.71%**	5
Clear	**64.29%**	9
Not clear	**0.00%**	0
Very unclear	**0.00%**	0
Total		**14**

#	Comments	Date
	There are no responses.	

Q15 How useful have you found the videos?

Answered: 14 Skipped: 55



Answer Choices	Responses	
Very useful	**28.57%**	4
Useful	**71.43%**	10
OK	**0.00%**	0
Not useful	**0.00%**	0
Total		**14**

#	Comments	Date
	There are no responses.	

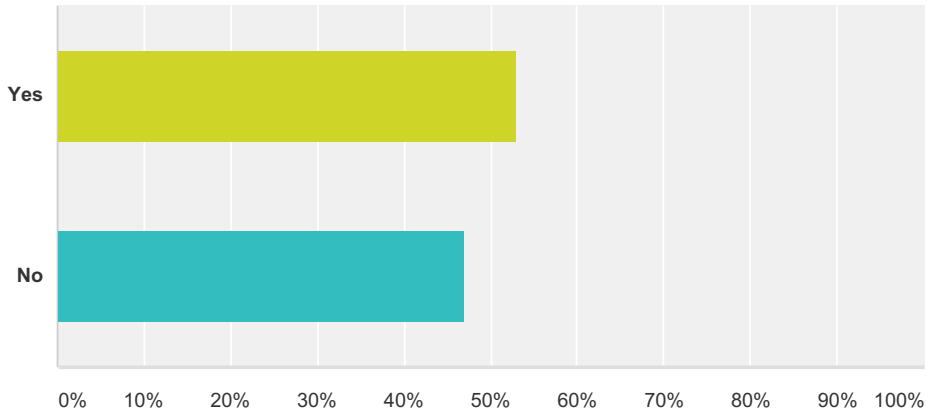
Q16 Do you have ideas for other videos you would find useful?

Answered: 7 Skipped: 62

#	Responses	Date
1	Not at this stage Thank you	11/6/2014 1:26 PM
2	Tree pruning	11/6/2014 4:46 AM
3	No not at this point	11/5/2014 8:00 PM
4	All videos about everything would be extremely useful, I just need a computer capable of playing them :(	11/5/2014 10:35 AM
5	beneficial Insects Versus Pests Identifying nutritional Diseases Identifying the major growth Phases	11/4/2014 5:41 PM
6	Yes Soil management	11/2/2014 4:17 PM
7	Pruning techniques & management	11/1/2014 5:49 PM

Q17 Have you referred to one or more of the crop calendars?

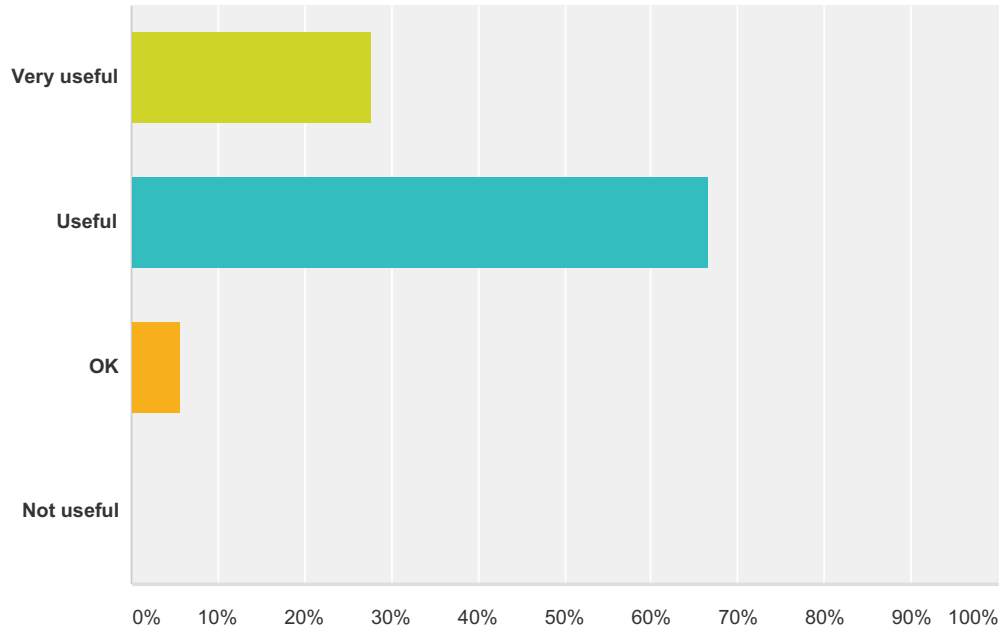
Answered: 34 Skipped: 35



Answer Choices	Responses	
Yes	**52.94%**	18
No	**47.06%**	16
Total		**34**

Q18 How useful have you found the crop calendar(s)?

Answered: 18 Skipped: 51

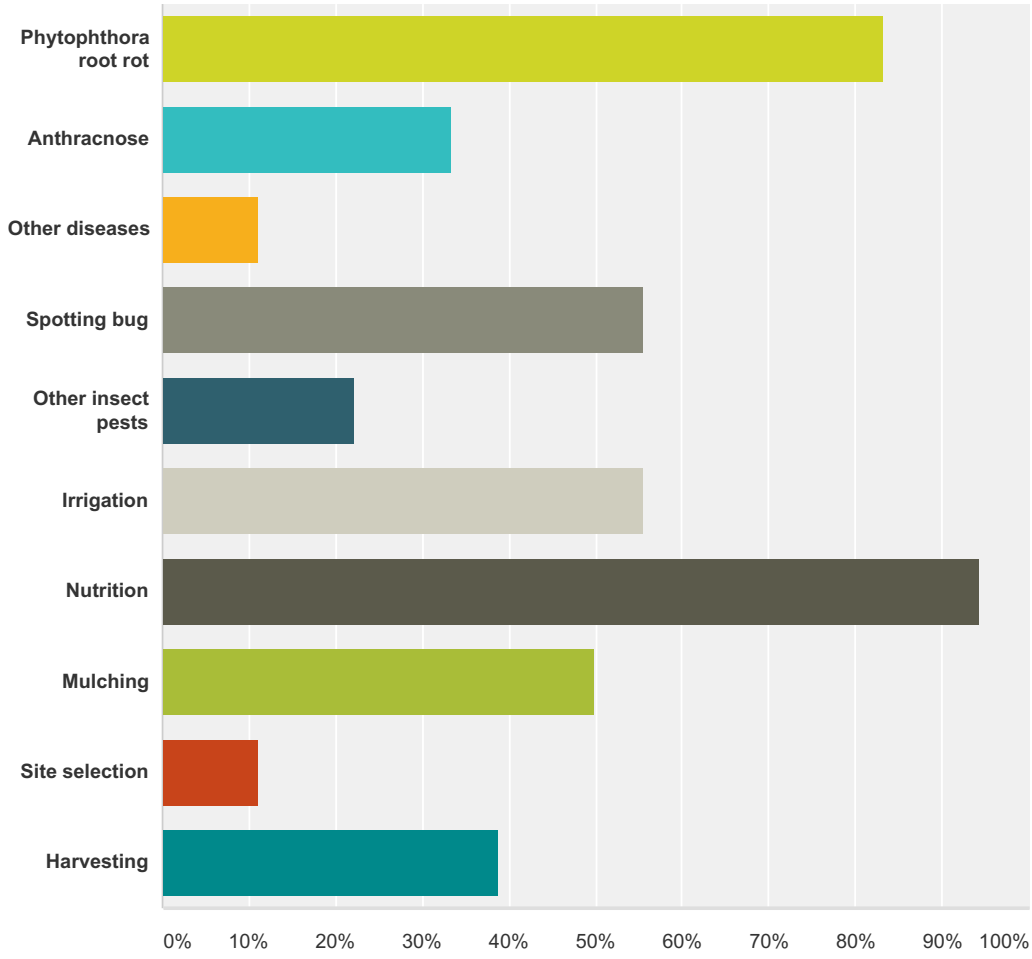


Answer Choices	Responses	
Very useful	**27.78%**	5
Useful	**66.67%**	12
OK	**5.56%**	1
Not useful	**0.00%**	0
Total		**18**

#	Comments/suggestions for improvements	Date
1	The time frame for our area seems to be a little out-of-whack	11/5/2014 10:36 AM

Q19 Which of the following sections in the Best Practice Resource have you mostly referred to? (select all that apply)

Answered: 18 Skipped: 51



Answer Choices	Responses	
Phytophthora root rot	83.33%	15
Anthracnose	33.33%	6
Other diseases	11.11%	2
Spotting bug	55.56%	10
Other insect pests	22.22%	4
Irrigation	55.56%	10
Nutrition	94.44%	17
Mulching	50.00%	9
Site selection	11.11%	2
Harvesting	38.89%	7
Total Respondents: 18		

#	Comments	Date
	There are no responses.	

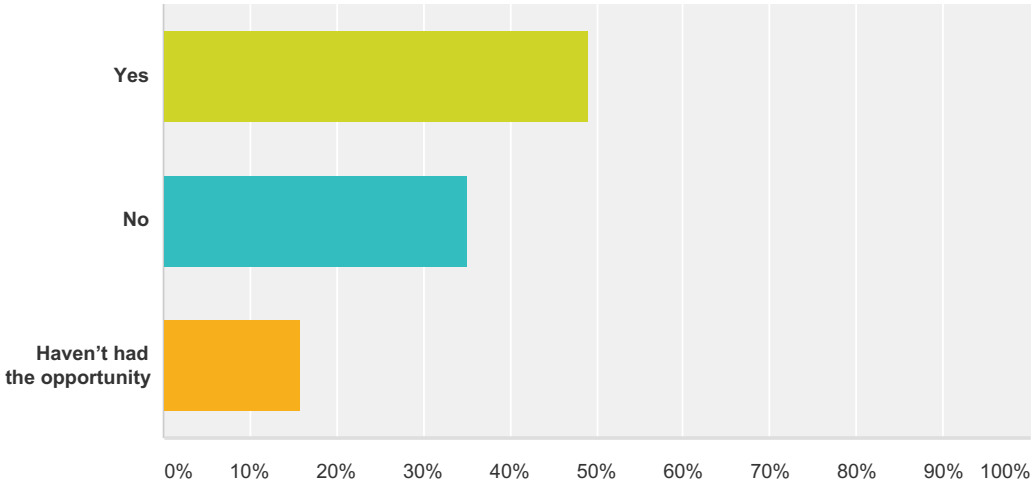
Q20 Is there any other information you would like to see in the Best Practice Resource?

Answered: 5 Skipped: 64

#	Responses	Date
1	More information on packing e.g. pattern packing to assist with staff training	11/5/2014 10:48 AM
2	Available Chemicals that can be used for pests and diseases	11/5/2014 10:37 AM
3	Soil Management	11/2/2014 4:42 PM
4	Updated gross margin anaysis	11/1/2014 5:51 PM
5	more detailed nutrition specific to the growing cycle	10/31/2014 6:30 PM

Q21 Have you completed a Qualicado self assessment? (at an AAL Qualicado field day)

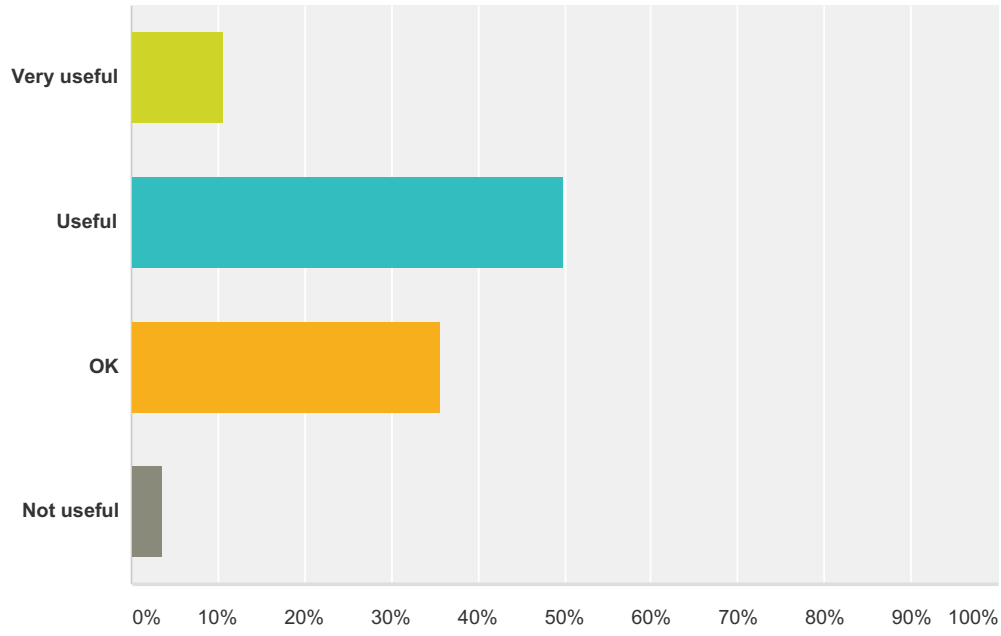
Answered: 57 Skipped: 12



Answer Choices	Responses	
Yes	**49.12%**	28
No	**35.09%**	20
Haven't had the opportunity	**15.79%**	9
Total		**57**

Q22 If you participated in this self assessment, how useful did you find it?

Answered: 28 Skipped: 41

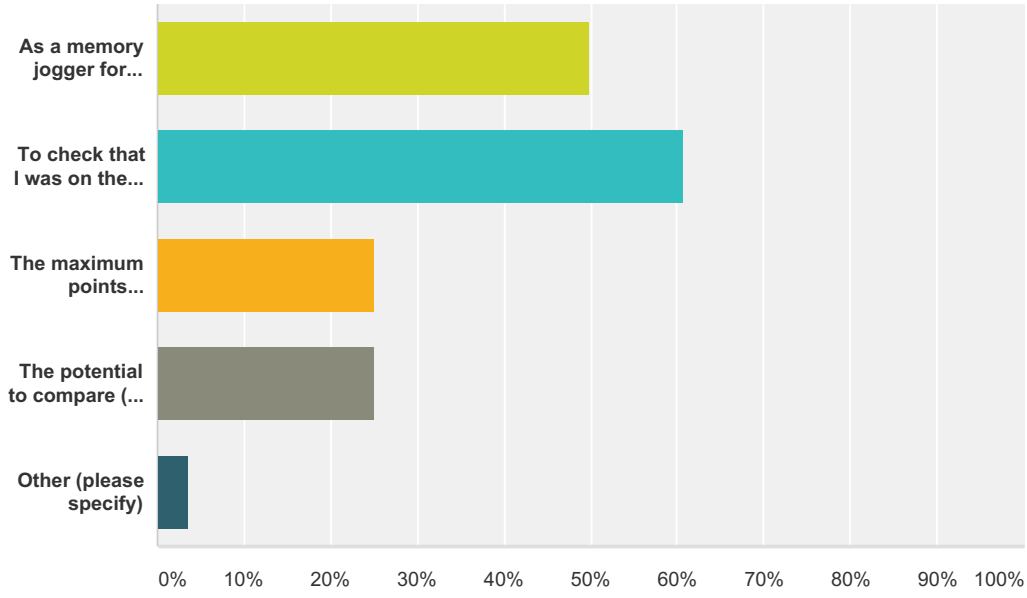


Answer Choices	Responses	
Very useful	**10.71%**	3
Useful	**50.00%**	14
OK	**35.71%**	10
Not useful	**3.57%**	1
Total		**28**

#	Comments	Date
	There are no responses.	

Q23 What was it about the self-assessment that you found of value? (select all that apply)

Answered: 28 Skipped: 41

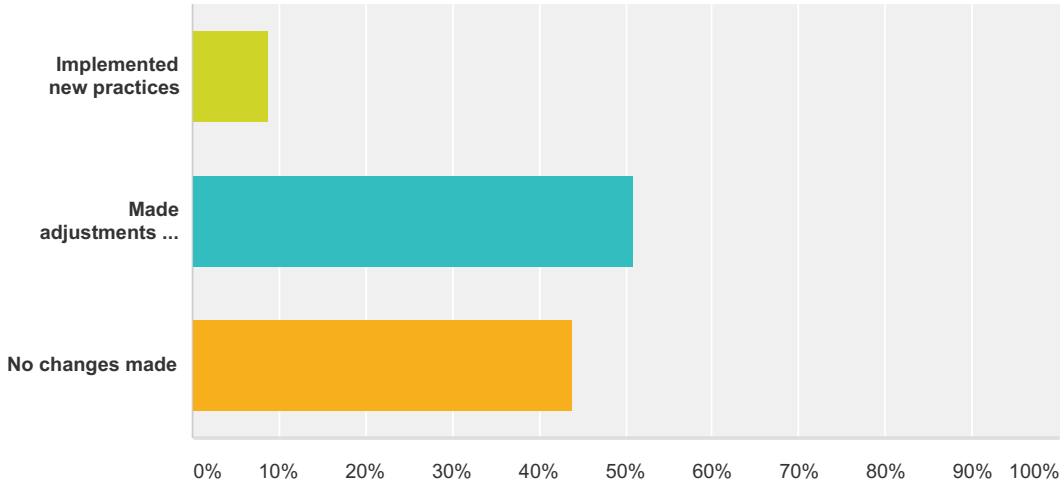


Answer Choices	Responses
As a memory jogger for things I should be doing on my orchard	**50.00%** 14
To check that I was on the right track with regard to my orchard practices	**60.71%** 17
The maximum points allocated to different sections helped me understand the relative importance of each area of management	**25.00%** 7
The potential to compare (in the next round of meetings) my management practices to see if I have made progress	**25.00%** 7
Other (please specify)	**3.57%** 1
Total Respondents: 28	

#	Other (please specify)	Date
1	Nothing	11/5/2014 1:25 PM

Q24 As a result of this information project have you implemented new practices or made changes? (Select all that apply)

Answered: 57 Skipped: 12

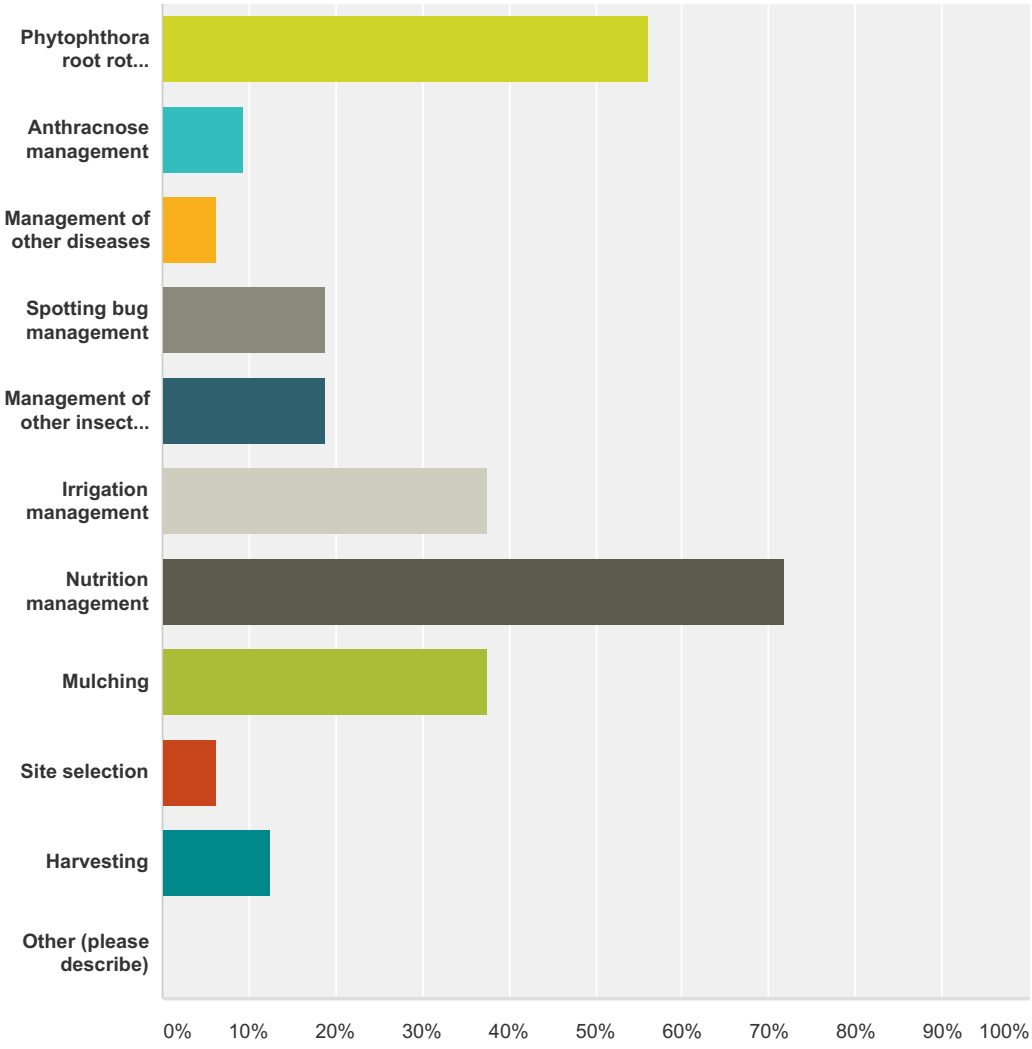


Answer Choices	Responses	
Implemented new practices	**8.77%**	5
Made adjustments to existing practices	**50.88%**	29
No changes made	**43.86%**	25
Total Respondents: 57		

#	Comments	Date
1	I don't believe I have seen any info to implement, may have missed it	10/31/2014 10:08 PM
2	Mulching	10/31/2014 6:45 PM

Q25 Please select from the following list, practices that you have implemented or changed. (Select all that apply).

Answered: 32 Skipped: 37



Answer Choices	Responses	
Phytophthora root rot management	56.25%	18
Anthracnose management	9.38%	3
Management of other diseases	6.25%	2
Spotting bug management	18.75%	6
Management of other insect pests	18.75%	6
Irrigation management	37.50%	12
Nutrition management	71.88%	23
Mulching	37.50%	12
Site selection	6.25%	2
Harvesting	12.50%	4

Other (please describe)	**0.00%**	0
Total Respondents: 32		

#	Other (please describe)	Date
	There are no responses.	

Q26 Please briefly describe some of the changes you have made.

Answered: 10 Skipped: 59

#	Responses	Date
1	Commenced mulching program. Investigating tensiometers	11/10/2014 12:21 AM
2	Anthracnose = changed spray and frequency. Insect pest = identified and spray for bugs when required Nutrition = Added different types of fertilisers	11/6/2014 1:30 PM
3	Timing of water Frequency of fertilising	11/6/2014 8:14 AM
4	Applying Liquid Gypsum through fertigation system and mulching.	11/5/2014 12:33 PM
5	Annual maintenance e.g. flushing lines. Other changes will follow when time permits.	11/5/2014 10:50 AM
6	Changed the timing of fert applications, the amount of irrigating, the products purchased for pest and disease etc	11/5/2014 10:39 AM
7	Irrigation application	11/5/2014 10:09 AM
8	Increase the times the trees get irrigated more frequent	11/2/2014 4:45 PM
9	Spraying cf injecting phosphonates Root sampling & analysis IPM Timing of nutritional inputs	11/1/2014 5:53 PM
10	spotting bug: changes to insecticide timing and specific chemical use Nutrition: understanding the role of specific nutrients especially boron, zinc and nitrogen.	10/31/2014 6:32 PM

Q27 Finally, it is important to try & quantify the financial benefit (current & expected within the next few years) of the project. Please try & put a dollar ($) figure per year on how valuable the project has been to your business.

Answered: 23 Skipped: 46

#	Responses	Date
1	30,000	11/6/2014 2:49 PM
2	possibly about 15%,	11/6/2014 1:32 PM
3	Increase production 25% $25k	11/6/2014 8:16 AM
4	Difficult	11/6/2014 4:50 AM
5	50,000	11/5/2014 8:10 PM
6	Dont Know	11/5/2014 1:27 PM
7	30,000	11/5/2014 12:37 PM
8	0	11/5/2014 12:21 PM
9	300,000	11/5/2014 11:32 AM
10	$10,000	11/5/2014 10:54 AM
11	0.00	11/5/2014 10:42 AM
12	$25000	11/5/2014 10:11 AM
13	$10,000 to $100,000	11/5/2014 9:34 AM
14	$100,000	11/5/2014 9:29 AM
15	$10,000	11/4/2014 5:44 PM
16	?????	11/3/2014 10:04 PM
17	Not sure	11/3/2014 8:31 PM
18	1000	11/1/2014 5:55 PM
19	about $2000. There are too many variables and we have have floods and droughts over the past 3 years confusing our numbers	11/1/2014 8:36 AM
20	There has been no beneffet to date,but are confident the benifeits will be seen in the next few years	11/1/2014 12:09 AM
21	Not implemented	10/31/2014 10:10 PM
22	20% increase possibly amounting to $15000	10/31/2014 6:47 PM
23	at least 25% increase in nett returns.	10/31/2014 6:41 PM

Q28 Please comment on how your $ figure has been derived (e.g larger fruit, more attention to irrigation needs, addressing nutrient deficiencies etc.)

Answered: 27 Skipped: 42

#	Responses	Date
1	Better fruit quality	11/9/2014 8:41 PM
2	larger fruit nutrition attention	11/6/2014 2:49 PM
3	due quality and quantity of fruit	11/6/2014 1:32 PM
4	More even cropping	11/6/2014 8:16 AM
5	Trees recovering after difficult climatic past few seasons	11/6/2014 4:50 AM
6	Increased yeild aswell as fruit size (more fruit in 20-23 range)	11/5/2014 8:10 PM
7	N/A	11/5/2014 1:27 PM
8	Improving soil health of low/non productive trees.	11/5/2014 12:37 PM
9	will conduct same crop practice as previously	11/5/2014 12:21 PM
10	Due to uncertainties such as price,weather,yield and many others it is impossible to estimate.	11/5/2014 12:20 PM
11	all of the above	11/5/2014 11:32 AM
12	More efficient irrigation + addressing nutrient deficiencies + treating phytopthera = healthier trees = larger fruit	11/5/2014 10:54 AM
13	This is our first year so will let you know next year if our changed management practises affect anything. Cheers	11/5/2014 10:42 AM
14	More fruit Larger fruit Better packouts Better understanding of market conditions and requirements	11/5/2014 10:11 AM
15	Project supports interaction which leads to confirmation and knowledge transfer... really can't put a number on it. But, it is useful and important and Simon's knowledge is invaluable. Estimate is projected from profitability related to volume of fruit.	11/5/2014 9:34 AM
16	increased yield from reducing disease	11/5/2014 9:29 AM
17	Improved root health = improved tree nutrition = improved fruit set & improved fruit size	11/4/2014 5:44 PM
18	impossible to say at this point in time	11/3/2014 10:04 PM
19	Not sure	11/3/2014 8:31 PM
20	Attention to irrigation and pest and diseases	11/3/2014 7:49 AM
21	Better/ repeat consultations	11/1/2014 5:55 PM
22	Less unmarketable fruit. More attention to irrigation.	11/1/2014 8:36 AM
23	addressing nutrient deficiencies will be the biggest plus	11/1/2014 12:09 AM
24	N/A	10/31/2014 10:10 PM
25	Nutrition deficiencies are critical	10/31/2014 8:27 PM
26	Irrigation and nutrient deficiencies	10/31/2014 6:47 PM
27	1. increase if fruit size from better nutrition and better irrigation 2. increase in first grade packout with reduced losses from FSB and anthracnose 3. keeping trees health from Pc and keeping trees in production for longer and getting through NQ wet seasons.	10/31/2014 6:41 PM

Q29 Do you have any further comments about the project or ideas for information delivery in the future?

Answered: 11 Skipped: 58

#	Responses	Date
1	No	11/6/2014 1:32 PM
2	Not at this stage	11/6/2014 4:50 AM
3	Maybe after a period of references a coment could be made on that.	11/5/2014 8:10 PM
4	No	11/5/2014 1:27 PM
5	As the qualicado workshop was only held in this area a month ago it is too early to quantify benefits as we are still looking at prioritising the things we want to modify. At present we have a strong focus on irrigating, irrigating and irrigating!	11/5/2014 10:54 AM
6	Keep up the good work... Start a Blog where growers can discuss things with each other online on Avocado Website	11/5/2014 10:42 AM
7	Where can I find this information?	11/5/2014 10:18 AM
8	Access to Infocado results by industry farm advisors	11/1/2014 5:55 PM
9	All excellent	11/1/2014 8:36 AM
10	I would like a copy to read and perhaps make some changes	10/31/2014 10:10 PM
11	1. more emphasis on nutrition relative to the growing cycle ie after harvest, pre flowering, during flowering, at spring flush hardening, at summer flush, before summer fruit drop, at spring root flush etc. 2. canopy management relative to each growing area to suit the trees of that area. 3. Infocado needs to be developed further to teach growers how to access and use past data, and what lessons that data can provide. 4. smaller growers need a simple data recording system to allow preparation of data in a form easily transferred (manually or electronic) into Infocado.	10/31/2014 6:41 PM

Avocado best management practices and internet based information delivery

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