

# **Horticulture Innovation Australia**

## **Final Report**

### **Improving on-farm productivity and sustainability of the Australian macadamia industry**

Robbie Commens  
Australian Macadamia Society Limited

Project Number: MC10003

## MC10003

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Fax: (02) 8295 2399

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## Summary

This document provides a summary of work undertaken within the project MC10003, the methods utilised, the outputs achieved as well as the outcomes acquired by the industry. Project MC10003 was undertaken by the macadamia industries peak industry body, the Australian Macadamia Society (AMS) over a five and a half year period (*from August 2010 through to February 2016*). It is a development, innovation and adoption focused project. The project effectively funded a single full time resource, a macadamia industry Productivity Development Officer (PDO) [*Robbie Commens*], and a range of industry extension and development platforms (*activities and events*) coordinated and facilitated by the PDO. The key objectives of this project was to improve the on-farm productivity and sustainability of the Australian macadamia industry.

The Australian Macadamia industry comprises of over 750 growers along the east coast of Australia from Atherton in North QLD to Nambucca in the Central Coast of NSW and as far west as Emerald in QLD and Casino in NSW. The PDO was a single resource (PDO), with administration and communication assistance from other AMS staff members (*\*Please note that the PDO is part of the AMS team, the results achieved are very much the returns from a team effort. However for the purposes of this report the information presented is focusing on the PDO work to date*). It is important to gain both grower input on production issues and to update growers on the latest R&D and production outcomes, however it is logistically impossible for the PDO to contact all of the growers in the industry. Consequently, the PDO sought to undertake this in another manner, with the assistance of industry “extension stakeholders” (*processor grower liaison officers, NSW DPI staff, QDAF staff, rural retailer representatives, crop protection company representatives and researchers – in effect they are the industry resource stakeholders that have a major influence in the industry with growers*).

This project identified, engaged and attracted *extension stakeholders* into the extension program as early as possible to acquire their input into the extension program and assist to deliver a consistent extension message to growers. To achieve this the project utilised 5 strategic phases;

- Phase 1: Build the value of the project, the service provider, the extension network and the PDO as industry extension leaders
- Phase 2: Identify, engage and attract industry extension stakeholders into the extension program
- Phase 3: Identify and agree on the key production issues for the industry (*with the assistance of the extension stakeholders*)
- Phase 4: Understand the key production issue in greater detail (*with the assistance of the extension stakeholders*), develop extension material on the key production issue, with industry agreement on the key consistent messages that would be extended to growers (*with the assistance of the extension stakeholders*)
- Phase 5: Deliver consistent messages and extension material out to the industry (*with the assistance of the extension stakeholders*)

Phase 1 and 2 were ongoing initiatives that occurred throughout the life of the project, with Phases 3 to 5 being systematically replicated and repeated by topic each year. The topics identified, understood, developed and delivered during the timeframe of this project included; fertiliser investment, lace bug management, spray coverage, integrated orchard management (IOM) and integrated orchard nutrition (ION). This strategic process enabled the project to undertake operational work in a strategic manner. Ultimately, this led to a major benefit for individual macadamia growers, and the entire macadamia industry.

During the past 5 years this project has been able to deliver the following key outcomes;

- Attendance at grower meetings (MacGroups) have risen from 13% of the industry to over 53%, further establishing the AMS, this project and the PDO as extension leaders in the macadamia industry (*an important outcome for Phase 1*)
- Identified, engaged and attracted over 90 key industry extension stakeholders into the industries extension program (*an important outcome for Phase 2*)
- Gained industry agreement on the key consistent messages for growers across the following key production issues; Lace Bug management, Spray Coverage, Integrated Orchard Management (IOM) and Integrated Orchard Nutrition (ION). (*an important outcome for Phase 3*)
- An increased detailed understanding on the key production issues stated above, through both R&D knowledge as well as leading grower practices (*an important outcome for Phase 4*)

- The development of a wide range of extension material for each key production issue, with industry agreement on the key consistent messages for each issue (*an important outcome for Phase 4*)
- The delivery of consistent messages on each key production issue out to the majority of the industry (*an important outcome for Phase 5*)

These “micro” outcomes combine to deliver the greater “macro” outcomes of improved on-farm productivity and sustainability. This is evident in the increase in the industry average production of nut in shell (NIS) per hectare from 1.9t/ha in 2011 to 2.9t/ha in 2015, the timeframe of this project.

*\*Please note: This project was not wholly and solely responsible for these outcomes, rather a major contributor along with other R&D projects to achieve these excellent industry outcomes.*

In addition to the production outcomes stated above, based on recent industry surveys (2015) of over 200 growers and stakeholders it is fair to conclude that this project was very well received growers and the wider industry. The survey results indicate this project; delivered a strong and positive return on investment to the industry, was able to reach and engage with the majority of the industry and assisted to increase both farm sustainability and productivity. A further commendation for this project, the service provider, HIA and the PDO is that the surveys indicated there was 100% agreement to support a similar project in the future.

## **Keywords**

Macadamia, Extension, industry development, adoption, productivity, officer, sustainability, profitability, innovation, development.

## Introduction

A key challenge for the macadamia industry, and most Australian horticultural industries, is the adoption of research and development outcomes by growers and the wider industry. This project was designed to specifically address this need in the macadamia industry. It drove practice change with an increased level of levy payer engagement with the extension (R&D) program and the introduction of innovation into the macadamia industries extension program.

As an extension focused project, this project had both a reactive and a proactive focus and capacity. The project needed to have capacity and resources to manage emerging issues that are by their nature unforeseen. Assisting growers to manage issues such as emerging pests (*Sigastus Weevil in 2014*), challenging environmental conditions (*cyclone damage in 2013*) or even registration and permits of pesticides needed to be undertaken within this project. However, to avoid the risk of the reactive elements demanding excessive resources (*time, funds and energy*) of the project, this project focused the majority of the time and resources on the proactive strategic issues. This balance enabled the project to assist with the management of emerging issues each year, but not get lost in them. Effectively, it enabled the project to undertake operational work in a strategic manner, and assisted the industry to strategically move forward. As evident in the productivity gains during the period of this project.

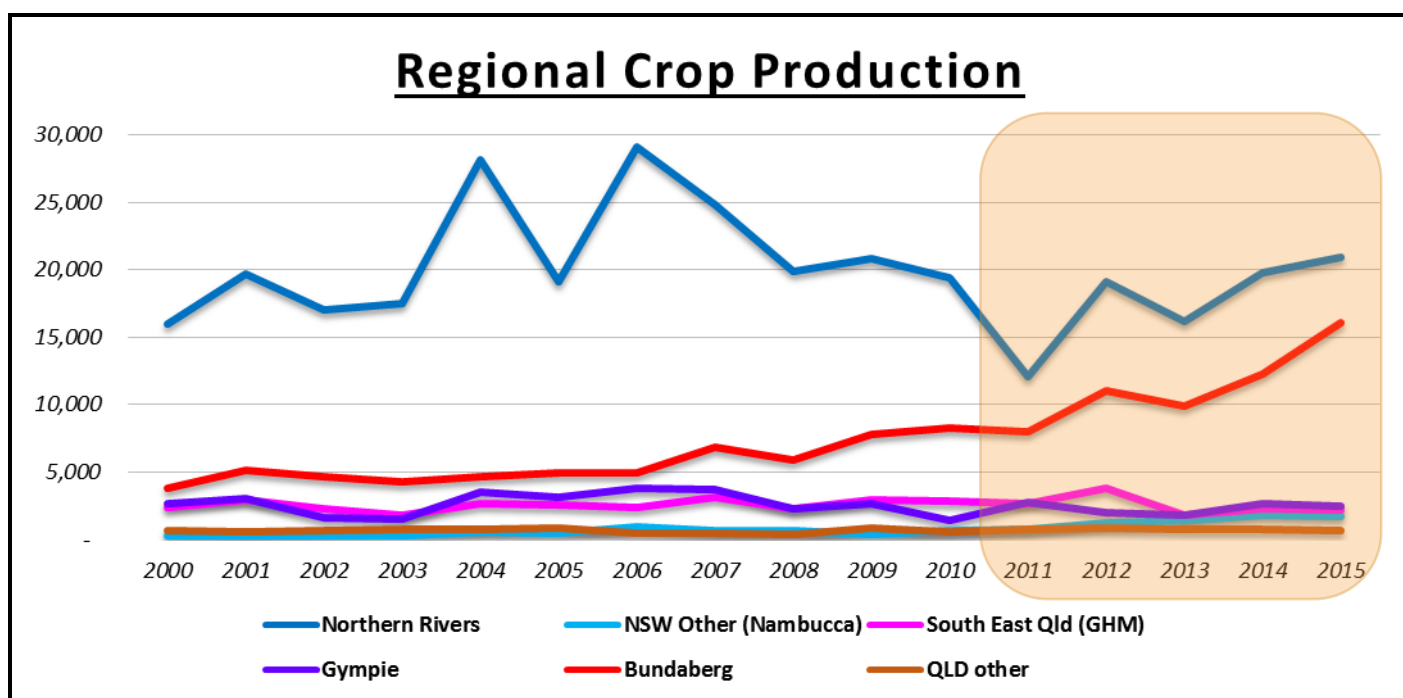
In regards to the proactive strategic focus of this project, it is important to note that this project focused on the key opportunities for growers to increase production, it did not rely only on “new” R&D outcomes from currently funded projects. This project sought to identify key production issues, understand those issues in further detail (*with the assistance of historical R&D projects as well as leading grower practices*), develop relevant and suitable extension material for growers, gain industry agreement on the key messages and deliver that material out to growers and the wider industry. It was effectively a development, innovation and adoption project. Not a traditional “extension” project that extended new R&D outcomes to growers.

*\*Please note that when new R&D outcomes were released this project did not dismiss them, it worked with those service providers to communicate the key messages to growers and the wider industry in a strategic manner, the issue of lace bug management is an excellent example of this. The point being made above is to highlight that this project did not rely on those outcomes, it also identified, understood, developed and delivered other “non funded” production opportunities, the issue of spray coverage and IOM are excellent examples of this.*

### Industry Brief

The PDO was given a brief from the industry at the start of the project to identify the key opportunities for growers to increase production in mature macadamia orchards and extend that out to the industry. The focus on mature orchards production was for the following key reasons;

- There was industry concern over a lack of knowledge on how to manage mature orchards
- The majority of the Australian macadamia industry was being considered as “mature” (over 15yo)
- The major production region of Northern Rivers NSW (*Inland NSW*) was made up of predominantly mature orchards (*compared to the Bundaberg region that was predominantly comprised of “young” orchards < 15yo*) and was incurring substantially reduced production from 2008 on compared to the production achieved in 2004 and 2006. *This is outlined in the regional production graph below;*
- Understanding how to improve mature orchard management would assist to maintain production in young orchards (*preventing them from ever suffering from mature orchard production losses*) and would assist to increase production in mature orchards through a rejuvenation program.
-



Graph 3 – Industry regional breakdown graph (source AMS). This graph illustrates the previous substantial downward trend in production in the Northern Rivers region from 2006 to 2011. It also highlights (in orange) the upward trend in production in the Northern Rivers, Bundaberg, Gympie and Nambucca from 2011 through to 2015. (\*Drought conditions in South East QLD had major effects on crops from 2012 to 2015)

It was identified through this project that the major issues (*and consequently, the major opportunities*) in mature orchard management were; fertiliser investment, lace bug management, spray coverage, Integrated Orchard Management (IOM – *canopy mgt, orchard floor mgt and drainage mgt*), and Integrated Orchard Nutrition. This project was instrumental in working with “*extension stakeholders*” (*explained in further detail in methodology*) to identify these issues, understand them in more detail, gain industry agreement on the key messages to extend to growers, develop relevant and suitable extension material and deliver them out to growers across a wide range of platforms (*events and activities*). The work this project undertook greatly assisted in achieving the increases in production from 2011 to 2015 (*as highlighted in the graph above*).



## Methodology

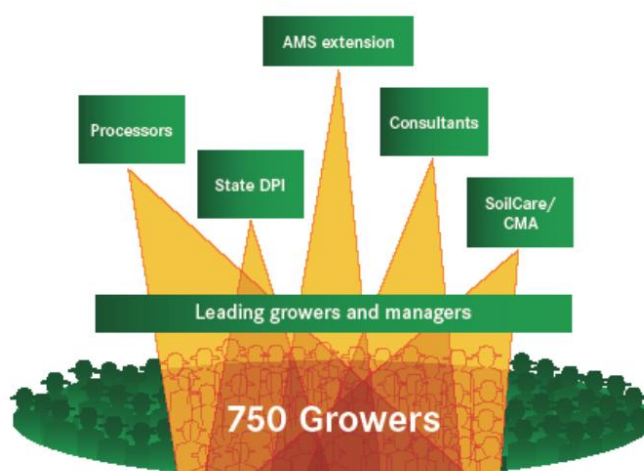
It is generally accepted in extension that there is great value in consistent messages across an industry (*to increase grower confidence*) and great value in one on one engagement with growers (*when an improved practice is discussed in detail with a grower for their specific orchard with an individual that the grower already knows and trusts, there is a far greater opportunity to achieve that adoption transaction, [the moment when a grower adopts an improved practice]*). The historical extension system of government funded extension officers undertaking one on one engagement with growers is no longer viable due to increasing costs and reducing state government investment in this area. Technology such as webinars, email and videos cannot fill the entire gap. Consequently industries in horticulture and agriculture need to find new ways to resource extension programs. Resourcing an extension program does not need to mean financial resourcing, the resources (*such as consultants, rural retailers, processor rep and leading growers*) that exist in industries may present a greater opportunity. This project utilised this concept, and assisted to deliver substantial results back to the industry, and ultimately macadamia growers.

The methodology used to achieve these substantial practice changes are outlined below;

### Using existing stakeholder resources in an industry extension program

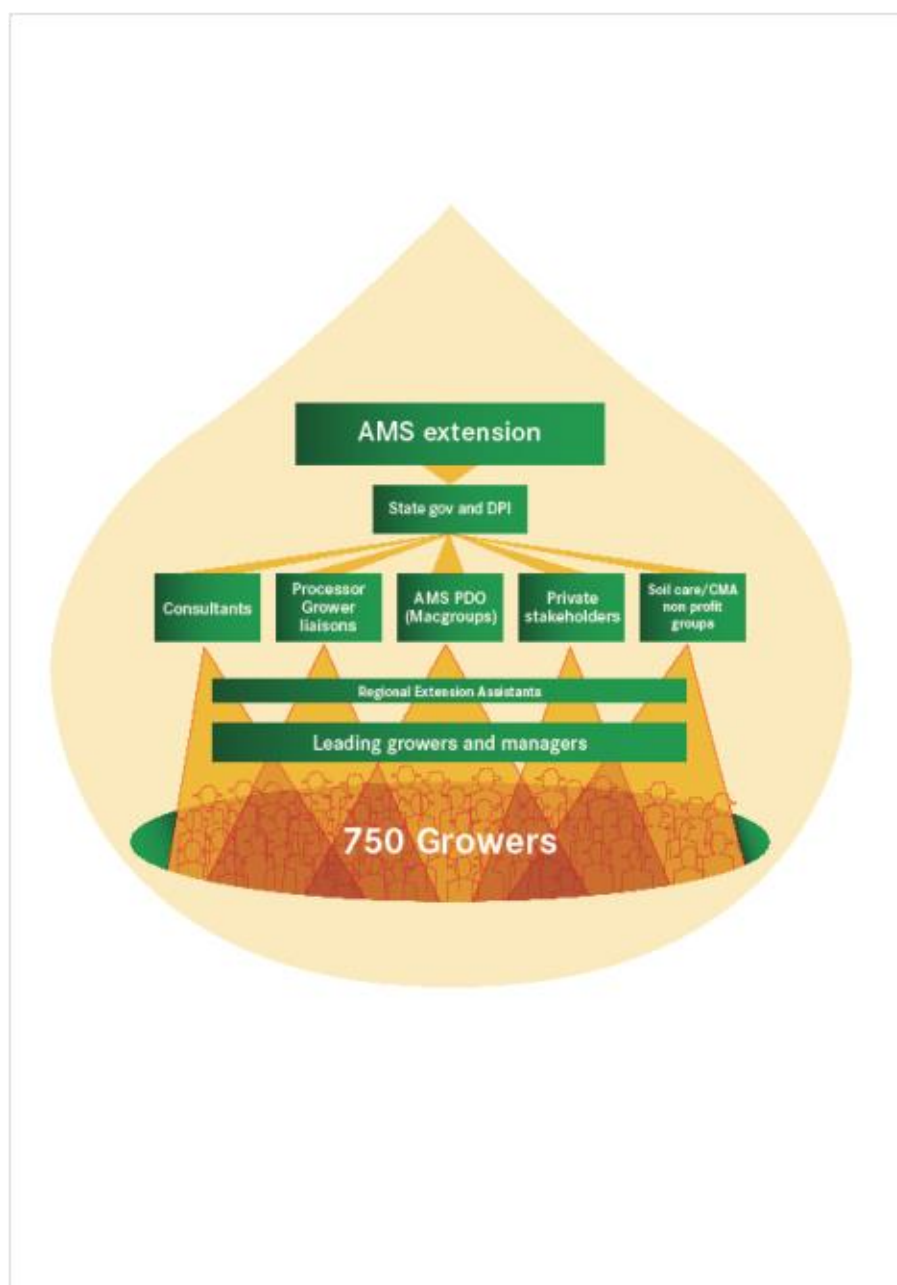
The PDO is a single resource, the Australian Macadamia industry comprises of over 750 growers along the east coast of Australia from Atherton in North QLD to Nambucca in the Central Coast of NSW and as far west as Emerald in QLD and Casino in NSW. It is logistically impossible for the PDO to undertake one on one extension with all of the growers. Alternatively the PDO identified existing human resource stakeholders within the Australian macadamia industry that could be utilised as extension program advocates, these group of resources were termed “*extension stakeholders*”. The macadamia industry has a unique dedicated asset in these “*influencers*”, they have a very substantial reach out to the industry and they have an established relationship with those growers. Both of these aspects are very valuable “*extension assets*”. As they are able to reach a large number of growers across a wide range of growing regions in a short timeframe and that information is valued by the growers as there is an established relationship in place already.

Previously the industry did not necessarily have a strategically targeted or coordinated approach to this group. The illustration below outlines the previous structure of these key influencing stakeholders. There was a large number of people within the extension program, but focused on a wide range of very different issues and delivered inconsistent messages across a wide range of production issues to growers. This often caused confusion and took confidence away from growers to adopt improved practices.



*Illustration 1 – an illustration outlining the previous extension structure (lacking structure and strategic direction)*

This project worked on engaging and attracting these influential stakeholders into a strategic targeted program. This is illustrated in the illustration 2 below.



*Illustration 2 – the new strategic extension structure (key stakeholders engaged and working in a common productive direction)*

With this new and improved version of the extension program, the key extension stakeholders are engaged early to acquire input into the industry extension program, offered the opportunity to contribute to the key messages contained in the extension program, collectively agree on the key messages to extend to growers and are asked to assist with the extension of that consistent key message out to growers. This has resulted in a consistent message going out to growers and an increase in grower confidence to adopt improved practices.

To achieve the structural change in the industries extension program the following key phases were implemented;

- Phase 1: Build the value of the project, the service provider, the extension network and the PDO as industry extension leaders
- Phase 2: Identify, engage and attract industry extension stakeholders into the extension program
- Phase 3: Identify and agree on the key production issues for the industry *(with the assistance of the extension stakeholders)*
- Phase 4: Understand the key production issue in greater detail *(with the assistance of the extension stakeholders)*, develop extension material on the key production issue, with industry agreement on the key consistent messages that would be extended to growers *(with the assistance of the extension stakeholders)*

- Phase 5: Deliver consistent messages and extension material out to the industry (*with the assistance of the extension stakeholders*)

*\*Each of these phases are summarised further below*

### **Phase 1 – Build the value of the project, the service provider, the extension network and the PDO as industry extension leaders**

It was identified that the key asset that the PDO had that would attract the key extension stakeholders was *early access* to the current R&D information and the ability to attract grower audiences to events. These were both key assets that would position the industry networks and the PDO as extension leaders in the macadamia industry, provided it was leveraged strategically.

The first crucial step within this phase was to attract people to events. No matter how good the information being presented at an event is, without growers and industry stakeholders to listen to it, discuss and potentially agree with it (*adoption*) it is useless. By attracting both growers and extension stakeholders to events and activities coordinated within this project, the PDO would be able to build the value of the extension network and the PDO as an extension leader. This would then attract potential industry stakeholders to the networks and to the PDO. The PDO invested time, energy and resources during the early parts of this project to undertake direct contact with growers and potential extension stakeholders, this was undertaken to build relationships and increase the likelihood of them attending extension platforms (*activities and events*).

The second crucial step within this phase was to ensure the information presented at all of the platforms was;

- of value to the audience (*growers, extension stakeholders*)
- was held in a relevant time period (*harvesting focused meetings held just prior to harvest, not after*)
- the information was professionally presented at a high standard in the suitable language (*either as a professional written summary document or as a professional presentation, both in a grower language*).

This project was instrumental in ensuring these outcomes were achieved at all events and activities. This further assisted to build the value of the industries own networks and the PDO as extension leaders, and further assisted to attract potential industry stakeholders to the industries own networks and the PDO.

*\*Note – the additional HIA investment into the PDO to undertake the emerging leadership course with Russell Cummings greatly aided, as the course provided new tools for the PDO to utilise to help undertake operational activities in a strategic manner.*

This phase was the major focus of the project in the first 3 years (2011 to 2013) with substantial investment of resources (*time & energy*) utilised during that period. Once an adequate level of perceived value was achieved this phase was not dropped off, but rather moved to an ongoing maintenance focus.

### **Phase 2 – Identify, engage and attract key extension stakeholders within macadamia extension build relationships with those people.**

The PDO has worked hard to identify stakeholders within the industry and then verify they have the capacity, ability and interest to assist with extension within the macadamia industry (*effectively becoming an extension stakeholder*). Identified stakeholders include but are not limited to; leading proactive and industry minded growers, the 12 processing companies (*total of 20 grower liaison officers*), NSW DPI, QDAF, SoilCare, Bundaberg Fruit and Vegetable growers association, three regional Catchment Management Authority (CMA) organisations (*Nth Rivers, Burnett-Mary River, Hunter Valley*), Macadamia Industry Consultants, commercial crop protection enterprises, rural retailers, Landcare, and more recently the NSW Local Land Services (NSW LLS, an evolution of NSW CMA). A summary of the total number of extension stakeholders that were identified, engaged and attracted into the industries extension program was over 90.

This phase was the major focus of the project in the three years (2011 to 2013) with substantial investment of resources (*time & energy*) utilised during that period. Once an adequate level of extension stakeholders were identified this phase was not dropped off, but rather moved to an ongoing maintenance focus with continual monitoring for new extension stakeholders.

### Phase 3 – Identify and agree on the key production issues

The project funded extension planning meetings, these were utilised as the catalyst for this phase. Acting as a distinct platform for extension stakeholders to provide input into the key production issues that the industries extension program should focus on over the next 4 years. ). Two state based meetings were held in 2013/14, one in Wollongbar NSW and one in Bundaberg QLD. Both meetings were very well attended.

This event and information obtained was crucial to guide the industry extension program over the coming years, but even more importantly it enabled the key industry extension stakeholders an opportunity to provide input into the industries extension program and develop ownership of the program. They helped to guide the program, and consequently were more likely to help it succeed. The extension planning meeting was an early step to help encourage the extension stakeholders to become extension program advocates.

The key outcome of those meetings was for the industry to move to a more proactive extension program. After these meetings it was agreed that the extension program will have only one *key macro extension issue* annually, to ensure that each issue obtains the required investment of time, energy and resources. The dominant timing for extension delivery will be in June, July and August annually. This is due to the timing of on-farm operations, as the majority of the orchard improvements take place from August to October. Focusing the extension delivery in June, July and August will provide growers with information in a timely manner that will enable and empower them to adopt the improved practices for the upcoming orchard improvement period. Delivering extension platforms in October or November were too late for growers to utilise and adopt that information.

The remainder of the year the extension program will have a major focus on the development phase for the following year's delivery and introducing the upcoming issue to growers. The completion of the development phase will occur prior to the dominant extension delivery period of June to August. Further information on the develop phase is outlined in the following section. The table below illustrates the continual evolution of the extension program, moving from the development phase into the delivery phase for one issue followed directly by then back into the development phase for the next issue.

(orange indicates planning and preparation work, red indicates the deadline or date of implementing an event)

	2014												2015							
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Extension delivery																				
Extension Development																				

The key macro extension issues identified were; spray coverage and lace bug management, canopy, drainage and orchard floor management (*this evolved into the Integrated Orchard management [IOM] concept*), Fertilising, soil health and tree nutrition (*this evolved into the Integrated orchard Nutrition [ION] concept*) and finally Harvesting. These issues were prioritised based on the highest return to growers in the immediate timeframe (*effectively, the greatest opportunity to increase production*) and consequently nominated as the annual macro extension issue over the next 4 years. The table below summarises;

	Delivery	Development
<b>2014</b>	Spray Coverage and Lace Bug Control	<i>Orchard Floor and Canopy Management</i> Integrated Orchard Management (IOM) (Drainage, Orchard Floor and Canopy Mgt)
<b>2015</b>	<i>Orchard Floor and Canopy Management</i> Integrated Orchard Management (Drainage, Orchard Floor and Canopy Mgt)	Nutrition
<b>2016</b>	Nutrition	Harvesting

*\*Please note: the terms used to describe a key macro extension issue evolved as they were understood and agreed upon by the industry, as evident by Orchard and canopy floor management evolving to IOM. This was perceived as positive from the industry, having both flexibility and a proactive strategic focus.*

#### Managing emerging issues throughout the year

The extension program also required some capacity and resources to manage emerging issues, that are by their nature unforeseen. This can be issues such as emerging pests (*Sigastus Weevil in 2014*), challenging environmental conditions (*cyclone damage in 2013*) or even registration and permits of pesticides. The extension program accommodated these emerging issues as they arose, but focused the majority of the time and resources on the proactive key macro extension issues.

***Phase 4: Understand the key production issue in greater detail (with the assistance of the extension stakeholders), develop extension material on the key production issue with industry agreement on the key consistent messages that would be extended to growers (with the assistance of the extension stakeholders).***

Phase 4 started with the formation of an industry Investigative Committee (IC). The investigative committee group consisted of 15 – 25 extension stakeholders that had expertise and experience on the key macro extension issue for that year. This project, and the PDO coordinated and facilitated all aspects of this initiative. The method used within the investigative committee was a weeklong event that;

1. Identified the leading mature orchards
  - a. *Achieved through the industries benchmarking program, industry production awards and processor nominations*
2. Understood the management systems and inputs
  - a. *Achieved through a detailed grower survey*
3. Reviewed current knowledge
  - a. *A workshop on the first day to identify knowledge gaps, points of agreement and points for further investigation during the orchard visits.*
4. Viewed the leading mature orchards
  - a. *Achieved through a 3 day field tour visiting orchards in across South East QLD, Bundaberg and Northern NSW*
5. Agreed upon recommendations to the industry to improve production in mature orchards
  - a. *Achieved through a full day debrief meeting to summarise notes and agree on industry recommendations.*

The table below summarises the system used and the associated timeframes;

	Timing
<b>Form an industry Investigative Committee (IC) with expertise on the macro issue (<i>the group of people varied year to year depending on the macro issue; pest related or nutrition related for example</i>)</b>	August
<b>Undertake the IC. (<i>as outlined above</i>)</b>	October to December (5 consecutive days held at some stage during this period)
<b>Develop and document a summary of the agreed outcomes from the IC</b>	December to February
<b>Work with HIA to acquire funding to update industry guidelines, or develop new industry guidelines</b>	February
<b>Work with HIA and relevant service provider to update or develop new industry guidelines</b>	February to May

*\*This methodology has been successfully used for the macro issues of; Spray coverage and lace bug control, IOM and ION in 2013, 2014 and 2015 respectively.*

***Phase 5: Deliver consistent messages and extension material out to the majority of the industry (with the assistance of the extension stakeholders)***

This phase was strategically undertaken in manner that further added value to the extension stakeholders, ensuring ongoing involvement with the industries extension program. The delivery of the final draft extension information was undertaken through the annual consultants meeting to the wider group (>90) of extension stakeholders in June each year. With updated final extension material delivered out to growers and the wider industry through a wide range of events and activities from July through to August each year. The timing of the grower focused extension period has been strategically selected as this is just before the time of year when growers are undertaking orchard improvements for the upcoming crop (*harvesting finishes in July, with flowering for the next crop occurring in September-October*). Grower feedback indicated that they were simply too busy working on the orchard during other parts of the year, and this timing gives growers the chance to make improvements for the upcoming crop. The strategic *staged* system utilised to deliver the extension messages is summarised below.

*Annual consultants meeting – June annually.*

Once the final draft material had been developed it was presented to the wider extension stakeholder group through the annual consultants meeting. This provided the extension stakeholders an opportunity to provide further feedback and refinement on extension material, provided an opportunity for wider industry discussion and ultimately agreement on the key messages to extend to growers (*the smaller group of extension stakeholders in the IC had already agreed upon what they felt were the key messages, but this meeting provided an opportunity for ask for wider input, avoiding a “preaching” approach and enabling a collaborative and consultative approach*) and added value to the businesses of the extension stakeholders as they were “pre-armed” with up to date and detailed information on the macro extension issue for that year.

*Key macro extension issue grower platforms*

Following the annual consultants meeting in June, a combination of extension platforms (*MacGroups, field trips, bulletin articles, case studies, macsmart videos and fact sheets*) were utilised to extend the key extension material out to growers and the wider industry. The activities vary according to the suitability of each one to the macro issue of the year (*for example, field trips are more suitable for IOM, however a field day and case studies are more suitable for spray coverage and lace bug management*). Extension stakeholders provided input on which events and which activities they thought most suitable each year, depending on the macro issue for the year.

This element of the project effectively had a simultaneous dual focus, to introduce the key messages to growers and promote the value of extension stakeholders to growers. This dual focus was strategically deliberate, with the goal being to achieve “*mass industry*” introduction of an agreed issue (*for example, IOM or spray coverage*) and to encourage growers to engage extension stakeholders to get further specific information for their orchard.

In regards to the development, promotion, documenting, coordinating and facilitating of the wide range of events and activities (*extension platforms*), this project was the driving force for these events. This project funded and resourced these platforms across all growing regions in the industry, with over 18 MacGroups, 3 field trips, 12 News Bulletin articles, 4 field days and 3 fact sheets completed annually (*for further information on these platforms please refer to the outputs section*). Across all of the extension platforms great care was taken to ensure that the agreed key messages were consistently being delivered across the wide range of activities and events.

The process provided positive outcomes for all involved, including;

- Growers were able to receive and understand WHAT the key message was on a specific issue (*through the extension platforms*), and knew where to go to get more information on the HOW for their orchard.
- Extension stakeholders value increased in growers eyes, as; they were promoted by this project as industry assets that can add value to growers, they had received an in depth update on the key macro extension issue for that year, they had an existing relationship with a large number of growers. Consequently, they were able to help growers understand the HOW aspect of the key macro extension issue specifically for their orchard. This directly

added value to the growers business.

- The industry extension program was able to achieve a wide reach across the industry, with both a consistent message and with a quality one to one system utilised with a very modest budget.

#### Other year round extension delivery platforms

The PDO and the extension program maintain year round contact with growers and the wider industry through other existing extension platforms. This project ensured those platforms were complimentary to the overarching key macro issue extension focus. These other events include;

- AMS News bulletin contribution
  - Four editions annually
  - Each issue will focus on issues that are relevant and timely to growers in accordance to the crop stage (*for example harvest information prior to harvesting, not after*)
- The AMS bi-annual conference
- Three rounds of MacGroup meetings in each major growing region annually
  - The February round will be focused on harvesting and marketing information, primarily as this is a key interest for growers at this time period as it coincides with harvest (*Feb through to June*)
  - The July MacGroups will incorporate the macro issue annually
  - The November/December MacGroups focused on introducing leading growers activities and orchards for the next years macro issue.

#### Annual Extension Operating Plan (AEOP)

To keep track of the priority operations each year this project followed the direction of HIA staff and developed an Annual Extension Operating Plan (AEOP) each year. The AEOP outlined the key activities, events and associated timings for the upcoming 12 month period. In the macadamia industry the AEOP worked on a May to May period, rather than an annual calendar or a financial year. This is due to the key industry extension delivery period being June to August, and effectively working back from those periods each year. This was an excellent initiative driven by HIA staff, and they should be commended for it. For further information on the AEOP please refer to previous milestones.

## Outputs

	Target Audience	Method of communication	Estimated number of each Output completed in this project	Topics covered
<b>MacGroups</b>	Growers	<ul style="list-style-type: none"> <li>- verbal presentations</li> <li>- summary written information</li> <li>- visual demonstration</li> <li>- practical demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>- 18 individual meetings per year (3 rounds held per year, with 6 meetings per round).</li> <li>- 5 year period</li> <li>- &gt;90 meetings in total</li> </ul>	<i>Fertilising, IOM, ION, lace bug management, spray coverage, orchard floor management, canopy management, drainage management (before the IOM concept), disease management, insect pest management,</i>
<b>AMS News Bulletin</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Consultants</li> <li>- Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- Written communication only</li> </ul>	<ul style="list-style-type: none"> <li>- 3 articles per bulletin</li> <li>- 4 bulletins per year over a 5 year period</li> <li>- &gt;60 bulletin articles in total</li> </ul>	<i>Fertilising, IOM, ION, lace bug management, spray coverage, orchard floor management, canopy management, drainage management (before the IOM concept), disease management, insect pest management,</i>
<b>Consultants meeting</b>	<ul style="list-style-type: none"> <li>- Extension Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- verbal presentations</li> <li>- written summary information</li> <li>- detailed information presented</li> </ul>	<ul style="list-style-type: none"> <li>- one per year over 5 years</li> <li>- 5 in total</li> <li>- over 90 key extension stakeholders attracted to the event annually</li> </ul>	<i>Update R&amp;D outcomes, Fertilising, IOM, ION, lace bug management, spray coverage, orchard floor management, canopy management, drainage management (before the IOM concept), disease management, insect pest management,</i>
<b>Field Days</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Extension Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- visual examples</li> <li>- potential for verbal presentations</li> <li>- grower talks</li> <li>- summary written information</li> <li>- practical demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>- 4 per year on average, over a 5 year period</li> <li>- 20 field days I total</li> <li>- involvement with grower based events increased from 13% to over 53% during the life of this project</li> </ul>	<i>Spray coverage, new machinery innovation, orchard floor management, pest and disease management</i>
<b>Field Trips</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Extension Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- visual examples</li> <li>- potential for verbal presentations</li> <li>- grower talks</li> <li>- summary written information</li> <li>- practical demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>- 3 per year on average over a 5 year period</li> <li>- 15 in total</li> <li>- involvement with grower based events increased from 13% to over 53% during the life of this project</li> </ul>	<i>orchard floor management, canopy management, drainage management (before the IOM concept), IOM (after the concept was developed).</i>



<b>Fact Sheets (summary sheets)</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Consultants</li> <li>- Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- written summary information</li> <li>- visual examples</li> </ul>	<ul style="list-style-type: none"> <li>- 3 per year on average, over a 5 year period</li> <li>- 15 fact sheets in total</li> </ul>	<i>Specific pests, specific diseases, recovering from storm damage, monitoring for maturity, fertilising</i>
<b>Industry Conference</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Extension Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- verbal presentations</li> <li>- potential for written summary information</li> </ul>	<ul style="list-style-type: none"> <li>- an annual conference for first three years of project</li> <li>- biannual conference from 2014</li> <li>- 5 conferences in total</li> </ul>	<i>Fertilising, IOM, ION, lace bug management, spray coverage, orchard floor management, canopy management, drainage management (before the IOM concept), disease management, insect pest management,</i>
<b>MacSmart</b>	<ul style="list-style-type: none"> <li>- Growers</li> <li>- Extension Stakeholders</li> </ul>	<ul style="list-style-type: none"> <li>- visual examples</li> <li>- verbal presentation</li> </ul>	<ul style="list-style-type: none"> <li>- PDO was involved with 6 MacSmart video's</li> </ul>	<i>Leading grower practices, orchard floor management, harvesting practices, machinery innovation,</i>

## Outcomes

The major outcome of this project was a contribution to increased grower production and sustainability. This is evident across the industry average per hectare production, increasing from 1.9t of Nut in Shell (NIS)/ha in 2011 to 2.9t NIS/ha in 2015. This increase in the industry average production is an insight into the increases that individual growers experienced, as an industry is simply a grouping of growers. For industry average production to have increased, a large number of individual growers average production needed to have increased also. Across the entire industry, this increase in the average per hectare production has equated to an additional 19,800t of crop. A substantial increase in productivity over a 5 year period.

With this increased production an increase in gross income came also. *(Please note that the NIS price has increased substantially over the past 5 years, from \$2.90/kg in 2011 to \$4.75/kg in 2015. For the purpose of this assessment, a modest price of \$3.50/kg has been utilised. This project did not have any involvement in the marketing program, and therefore cannot claim any contribution to the price increases. The price increases can and should be contributed to the marketing program).* Using a conservative price per kg of \$3.50, the average gross income for growers in 2011 was approximately \$6,650/ha (at 1.9t/ha). With the increased production per hectare obtained in 2015 of 2.9t/ha the average gross income can be estimated at \$10,150/ha (at \$3.50/kg). This represents a modest estimated increase of gross income of \$3,500/ha, which is effectively a 152% increase over the 5 years using \$3.50/kg.

With previous QDAF macadamia specific economic research indicating that the average cost of production was approximately \$5,650/ha, the increase in net return over the past 5 years is substantial. In 2011 the average net income was \$1,000/ha (\$6,650 - \$5,650), whereas in 2015 the average net return to growers was \$4,500/ha (\$10,150 - \$5,650). This is an increase in the average net return to growers of 450%. A very substantial increase in growers sustainability over a 5 year period.

From an industry perspective, the increase in industry farm gate value over the period of this project can be conservatively estimated at \$69.3 million *(using a conservative \$3.50/kg price over the additional 19,800t of crop)*. This project is not wholly and solely responsible for these increases, it is however a project that has contributed to these successes. It would be fair to conservatively allocate 20% of this improvement to this project, with the majority (80%) of the credit allocated across other R&D projects *(such as pest and disease management, erosion management, communications and others)*. This, conservatively, equates to a \$13.8 million increase *(20% of \$69.3 million)*. Given the life of project (LOP) investment in this project was \$1,017,470.05 *(over a 5 year period)*, the return on investment into this project can be conservatively estimated at 1,356%. This indicates, that for every \$100 dollars invested into this project, the industry received \$1,356 in return. This is an excellent return, for both the industry and the over 750 individual levy payers (growers).

To further understand how these substantial improvements in productivity and sustainability have been achieved the table below summarises some of the major differences in the industry at the start of this project (2011) and at the conclusion of the project (2016)

\*Please note these are generalised statements outlining the sentiment and mindset of the industry at each time period.

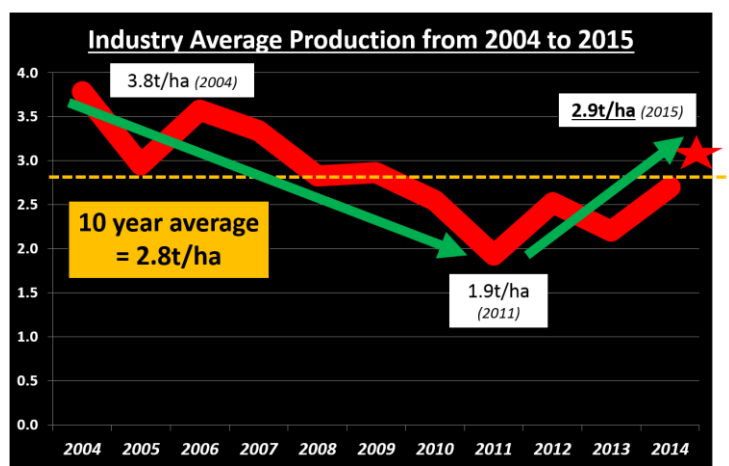
Issue	2011	2016	Supporting Survey Results	Relevant project concept
<b>Orchard Floor</b>	<ul style="list-style-type: none"> <li>- Lack of understanding on the importance of feeder roots, and not having any exposed roots in the orchard</li> <li>- Exposed roots common in orchards</li> <li>- Bare soil common in orchards</li> <li>- Tree row sprayed out for harvesting for majority of the year (<i>even though harvesting was only for half of the year</i>) leaving bare soil.</li> <li>- Consistent evidence of erosion common in orchards</li> <li>- Minimal living ground covers (<i>primarily due to large trees shading out light for them to grow and growers spraying them out for harvest</i>)</li> <li>- Minimal nonliving ground covers invested in (mulch, compost). Minimal to moderate interest in investing organic matter</li> <li>- Minimal investment into covering exposed roots, effectively there was an industry acceptance of exposed roots as a consequence of growing macadamias commercially.</li> <li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- Grower understanding on the importance of the feeder roots, and the need to minimise exposed roots in the orchard</li> <li>- Substantially increased grower investment into covering exposed roots, and minimising any future exposed roots across all growing regions</li> <li>- Reduced level of exposed roots across the industry</li> <li>- Reduced amount of bare soil in orchards, primarily due to an increased investment from growers into establishing living ground covers and spreading non- living ground covers on the orchard floor.</li> <li>- Reduced level of herbicide applied out of the harvest season (and further reduced level of bare soil)</li> <li>- Reduced level of round-up used during harvest season (other products were used such as Basta, and/or growers did not spray at all).</li> <li>- New harvesting technology introduced to the industry that aided in harvesting out of living ground covers on the orchard floor (<i>sweeper harvesters, rather than finger wheel harvesters</i>)</li> <li>- Greatly increased understanding and agreement of the range of orchard floor management options and associated benefits (<i>further info in IOM booklet and milestone reports</i>)</li> <li>- Clear documentation on recommended actions for growers in regards to orchard floor management (<i>IOM booklet</i>)</li> <li>- Greatly increased interest in investing in and spreading organic matter on the orchard floor (<i>nonliving groundcovers</i>), to the point of exhausting local economical sources.</li> <li>- Extension stakeholders in agreement in the issue as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- 87% of growers surveyed felt more confident to identify the highest priority IOM investment on their orchard (<i>July 2015</i>)</li> <li>- 74% stated they would make a positive change in their business as a result attending the IOM focused MacGroup</li> <li>- 85% of growers surveyed are likely increase their investment into orchard floor management</li> <li>- &gt;90% of growers now see orchard floor management as a high priority investment area</li> <li>- &gt;90% of growers have invested in orchard floor improvements over the past 5 years</li> </ul>	- IOM
<b>Canopy</b>	<ul style="list-style-type: none"> <li>- a strong focus from growers and the industry as the sole major issue &amp; opportunity to increase production (<i>minimal to no focus on orchard floor, drainage, spray coverage, Lace Bug Mgt or Fertilising</i>)</li> <li>- excessively tall canopies (<i>greater than 1:1 For row width</i>) and lack of grower understanding on the importance of this ratio</li> <li>- mechanical pruning the main method of pruning trees (<i>and a major focus of the research at the time</i>)</li> <li>- Minimal industry interest and acceptance of other canopy mgt methods, such as limb removal, row removal, replanting or limb rejuvenation.</li> <li>- Mature orchards commonly had dark centres as the majority of the canopy (<i>centre of the tree shaded out and not intercepting any light or photosynthesising</i>).</li> <li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- Greatly reduced focus from growers and the industry as the major opportunity for increasing production. Canopy Mgt is now seen as part of an IOM program, rather than the historical mindset of a standalone high priority issue.</li> <li>- Improved grower understanding on the importance of canopy height, with particular focus on the canopy height : row width ratio (<i>no more than a 1:1</i>)</li> <li>- Greatly reduced grower interest in <i>only</i> mechanically pruning canopies, and increased interest in a wide range of canopy management options</li> <li>- Greatly increased understanding and agreement of the range of canopy management options and associated benefits (<i>light, height or access – further info in IOM booklet and milestone reports</i>)</li> <li>- Clear documentation on recommended actions for growers in regards to canopy mgt (<i>IOM booklet</i>). Effectively, access to grower information on this issue readily available.</li> <li>- Greatly increased grower confidence in identifying the most suitable canopy management action for their orchard, and consequently a greatly increased investment into suitable canopy management operations.</li> <li>- Extension stakeholders in agreement in the issue as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- 87% of growers surveyed felt more confident to identify the highest priority IOM investment on their orchard (<i>2015</i>)</li> <li>- 74% stated they would make a positive change in their business as a result attending the IOM focused MacGroup (<i>2015</i>)</li> <li>- 74% stated they are likely to increase their investment into canopy management (<i>2015</i>)</li> <li>- &gt;80% of growers see canopy management as a high priority investment area (<i>please note that orchard floor has a higher % at &gt;90% than canopy mgt now</i>) (<i>2015</i>)</li> </ul>	- IOM

<b>Drainage</b>	<ul style="list-style-type: none"> <li>- Poorly maintained or non-existent drainage systems on the orchard.</li> <li>- Lack of grower and industry interest in this as a production issue (<i>they could not see value in investing in improving drainage</i>)</li> <li>- Lack of technology to assist growers to develop detailed and strategic orchard drainage plans</li> <li>- Lack of understanding on the importance of living ground covers in drainage systems</li> <li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- Greatly increased grower and industry acceptance on the importance of drainage management, as part of a successful IOM program.</li> <li>- New technologies to assist growers develop orchard specific drainage plans (<i>LIDAR Mapping</i>)</li> <li>- Increased grower and industry investment into developing orchard drainage management action plans</li> <li>- Increased grower and industry investment into orchard specific drainage systems (<i>both installation and maintenance</i>)</li> <li>- Increased understanding on the importance of living ground covers in the drainage systems.</li> <li>- Access to grower information on this issue readily available (<i>IOM booklet</i>).</li> <li>- Extension stakeholders in agreement in the issue as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- 87% of growers surveyed felt more confident to identify the highest priority IOM investment on their orchard (<i>2015</i>)</li> <li>- 74% stated they would make a positive change in their business as a result attending the IOM focused MacGroup (<i>2015</i>)</li> <li>- 75% stated that drainage management was a high priority investment area (<i>2015</i>)</li> <li>- 68% stated that they are likely to increase their investment into drainage management (<i>2015</i>)</li> <li>- 37% had a documented drainage management plan (<i>2015</i>)</li> </ul>	
<b>Lace Bug Mgt</b>	<ul style="list-style-type: none"> <li>- General lack of understanding and appreciation of Lace Bug as a <i>major</i> pest in the industry (<i>particularly in affected regions of Gympie, Glasshouse Mtns, Nth Rivers and Nambucca</i>)</li> <li>- No registered or permitted compound for growers to manage lace bug (<i>after the removal of Endosulfan</i>)</li> <li>- Lack of understanding from growers on the lace bug lifecycle and ideal timing of control applications</li> <li>- Minimal to no crop protection management (<i>insecticide</i>) applied during flowering.</li> <li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- Grower and industry acceptance of Lace Bug as a major industry pest</li> <li>- Greatly increased grower and industry understanding on how to manage lace bug</li> <li>- New crop protection compounds permitted for use (<i>APVMA minor use permits</i>) to manage lace bug in the macadamia industry (<i>Diazinon and Triclorfon</i>).</li> <li>- Greatly increased grower investment into lace bug management practices (<i>spraying at flowering</i>)</li> <li>- Access to grower information on this issue readily available (<i>fact sheets and presentations</i>).</li> <li>- Extension stakeholders in agreement in the issue as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act.</li> </ul> <p><i>*NSW DPI should be acknowledged for their investment of resources into this issue. Without their input the industry would not have been able to achieve these outcomes.</i></p>	<ul style="list-style-type: none"> <li>- 83% of growers applied lace management applications (<i>2015</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- Lace Bug management</li> </ul>
<b>Spray Coverage</b>	<ul style="list-style-type: none"> <li>- Lack of understanding on the limitations of the standard air blast spray equipment (<i>&lt;6m in height, with most mature orchards &gt;8m in height</i>)</li> <li>- Confusion over the recommended/required water volume for mature trees (<i>very large trees</i>)</li> <li>- Lack of understanding on the speed of machinery travel</li> <li>- Lack of understanding on the importance of calibration of equipment</li> <li>- Lack of understanding on the opportunities to improve spray coverage (<i>good understanding on the importance of coverage, however there was an element of “blissful ignorance”</i>)</li> <li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- Increased grower and industry understanding on the limitations of standard air blast spray equipment, and a consequential grower investment into either new spray equipment or improvements to existing spray equipment.</li> <li>- Access to grower information on this issue readily available (<i>fact sheets and presentations</i>).</li> <li>- Increased grower understanding on the need to reduce speed of machinery during spraying</li> <li>- Greatly increased understanding on the importance of calibrating spray equipment, and an increased investment into calibrating equipment specific to an orchard.</li> <li>- Clear understanding on the key opportunities to improve spray coverage consistently extended out to the industry and growers (<i>for further information please see milestone reports and NSW DPI pest management guide.</i>)</li> <li>- Extension stakeholders in agreement in the issue as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act.</li> </ul>	<ul style="list-style-type: none"> <li>- 2014 survey results indicated 60% of growers had “adequate” spray coverage</li> <li>- 2015 surveys results indicate &gt; 90% of growers invested in improving spray coverage (<i>new machinery and/or modifications</i>) and &gt;75% of growers had adequate and suitable spray coverage (<i>an increase over the 2014 results</i>)</li> </ul>	<ul style="list-style-type: none"> <li>- Spray Coverage</li> </ul>

<b>Fertiliser Applications</b>	<ul style="list-style-type: none"><li>- Rural retailer surveys indicated a dramatic decrease in the investment into fertiliser from macadamia growers in the SEQ and NSW growing regions (<i>&gt;80% reduction in fertiliser sold to macadamia growers in 2009 and 2010 compared to 2005 and 2006</i>).</li><li>- A large portion of the growers did not see the value or a justifiable return on investment from fertilising (<i>they were trying to draw upon “reserves” in the soil due to low NIS prices at the time</i>)</li><li>- The number of applications was reduced, with 1 – 2 annual applications quite common in SEQ and NSW growing regions (<i>Bundaberg region maintained consistent applications</i>)</li><li>- Growers lacked confidence in engaging a qualified fertiliser consultant</li><li>- Extension stakeholders not in agreement in this issue as a major production issue, and inconsistent messages going out to growers from them. This resulted in greatly reduced grower confidence to act.</li></ul>	<ul style="list-style-type: none"><li>- Dramatic increase in fertiliser sold to macadamia growers in the SEQ and NSW growing regions (<i>as reported by rural retailers</i>)</li><li>- Growers see value in investing into fertiliser, with macadamia specific information readily available to growers (<i>industry bulletin articles and presentations</i>). The modest return on investment was estimated at 200% (<i>ie; for orchards that had not invested into fertiliser for period of time every \$100 spent on fertiliser, was likely to deliver a \$200 return through increased production</i>)</li><li>- Growers and extension stakeholders have a greatly increased understanding of the importance of the timing of application in regards to the physiological stages of the macadamia tree and crop, with 4 physiologically timed applications recommended as the minimum number of applications. (<i>for further information please refer to previous milestone reports</i>)</li><li>- Growers had increased confidence in engaging a professional fertiliser consultant to assist them develop a fertiliser program specific to their orchard.</li><li>- In December 2015 a new industry concept was identified and agreed upon by the extension stakeholders. This concept was Integrated Orchard Nutrition (ION). In 2016, this concept will undergo the process of being; further understood (<i>with the assistance of HIA to fund a literature review of knowledge to date</i>), extension material being developed and that material being delivered to growers.</li></ul> <p><i>*please note – up to 2015 survey data collected was based on understanding the changes in growers practices specific to increasing number of fertiliser applications, increasing amount of fertiliser applied and the level of engagement between growers and consultant. As ION is a new industry concept, developed in December 2015 (through this project) only initial survey data has been collected on ION to date regarding grower and industry initial understanding on the ION concept.</i></p> <ul style="list-style-type: none"><li>- Extension stakeholders in agreement in ION as a high priority production issue and in agreement on the key issues to extend to growers resulting in consistent key messages going out to growers. This resulted in greatly increased grower confidence to act. (<i>ION</i>)</li></ul>	<p><i>Prior to the ION concept being developed (2010 – Nov 2015), key goal is to increase amount an number of applications;</i></p> <ul style="list-style-type: none"><li>- &gt;70% of growers have increased the amount of fertiliser applied to their orchards</li><li>- &gt;70% of growers have increased the number of applications of fertiliser per year</li></ul> <p><i>ION introduced to growers and industry in December 2015, with a key goal to increase the level of engagement between growers and consultants</i></p> <ul style="list-style-type: none"><li>- of the growers surveyed that currently did not engage a professional consultant to assist them, 60% stated they would now engage a consultant to assist them with ION</li><li>- of growers that do already engage a professional consultant, 72% stated that they would increase their investment into their consultant in regards to ION</li></ul>	<ul style="list-style-type: none"><li>- Fertilising (2010- Nov 2015)</li><li>- ION (Dec 2015-2016)</li></ul>
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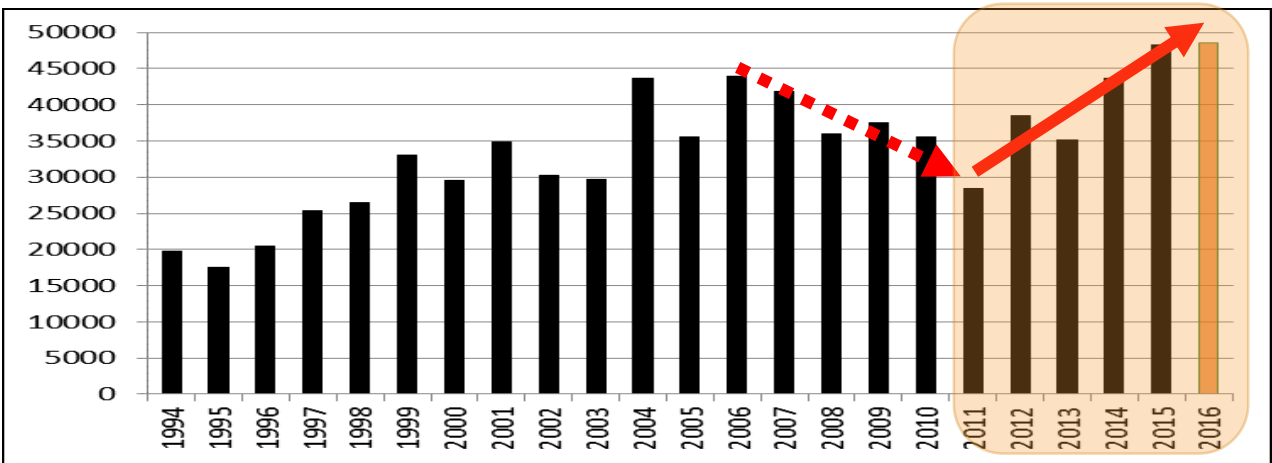
Evaluation and Discussion

This project has strategically achieved a wide range of “micro” outcomes that combine to deliver the greater “macro” targeted outcomes of improved on-farm productivity and sustainability. This is evident in the increase in the industry average production of nut in shell (NIS) per hectare from 1.9t/ha in 2011 to 2.9t/ha in 2015. The graph below illustrates the improvements over the past 10 years. This graph illustrates that the production per hectare had been decreasing from 2006 to 2011, however from 2011 through to 2015 (the same period of this project) that trend was reversed and production per hectare began increasing.



Graph 4 – The Australian macadamia industry average production per hectare from 2004 to 2015.

As illustrated in the graph below, the total industry production increased from 28,500t in 2011 (the crop at start of this project) to the industry record crop of 48,300t crop in 2015 (2016 crop will be harvested by August 2016 and is expected to be another record crop at 48,500t). It should be noted that the increase in total industry production is not simply due to new plantings (more hectares). The increase has been driven by increased production per hectare, indicating increased improved grower productivity.



Graph 5 – Australian Macadamia industry production, with the time period the PDO has been in the industry highlighted in orange. The 2015 crop was a record crop of 48,300t, with the 2016 crop expected to be another record crop of 48,500t.

*\*Please note: This project was not wholly and solely responsible for these outcomes, rather a major contributor along with other R&D projects to achieve these excellent industry outcomes.*

In addition to the production outcomes stated above, based on recent industry surveys (2015) it is fair to conclude that this project was very well received growers and the wider industry. The survey results indicate that growers and the wider industry felt that this project; delivered a strong and positive return on investment to the industry, was able to reach and engage with the majority of the industry and assisted to increase both farm sustainability and productivity. This conclusion is based upon survey results from over 200 growers and stakeholders indicating;

- > 90% agreement that this project assisted to increase farm sustainability
- > 95% agreement that the PDO project has assisted to increase grower production
- > 95% agreement that the industry has benefitted positively from the life of project investment of \$1,017,470.05 over 5 years into this project
- > 95% agreement that this project engaged with the majority of the growers in the industry

A further commendation for this project, the service provider, HIA and the PDO is that the surveys indicated there was 100% agreement to support a similar project in the future.

#### Recognition through horticultural leadership and agricultural extension awards

Further acknowledgement on the value that this project, the service provider and the PDO (Robbie Commens) has been able to deliver, was the recognition from the broader horticultural and agricultural industries in the form of the **HAL 2013 award for Leadership for young people in Horticulture** and the **2015 Australasian Pacific Extension Network (APEN) award for excellence in extension by a young professional**. This project, the investment from the industry and HIA, and the AMS staff that the PDO is fortunate enough to work with were all instrumental in the PDO being successful in receiving these awards.

#### Direct feedback from growers and extension stakeholders

In addition to these points, the PDO has been able to secure direct grower and extension stakeholder feedback on their opinions on this project over the past 5 years. Some examples of the feedback is listed below (*please note – the surveys are anonymous to encourage feedback, names are listed if they were provided on the survey, if not they are left anonymous*)

*“The AMS team have lifted the level and quality of support and now exceeds my expectations. We as growers are very appreciative of your support. Please keep up the good work as it helps us to become more successful farmers, stay current and apply new innovations and developments as leaders of the industry to remain globally competitive” (feedback from the IOM focused events)*

*“It is certainly a very good program (extension program) as it is currently running”*

*“Robbie (PDO) is good value for money. Communicates well and is well accepted by growers. Displays a good work ethic and is now becoming the link man between growers and the R&D program. A good stable and forward developing relationship”.*

*“It was a very engaging meeting and really enjoyed the orchard tour that had great discussions. There was a comment made that the meetings provided the what and the why. Equally important - it would be great for the opportunity for farmers and consultants alike to share the 'how'. Cheers”*

*“Very well presented, especially Robbie (PDO). Everyone who is a macadamia grower should attend, to gain valuable information”*

*“Hi Robbie (PDO), Congratulations on your achievements during 2015, you are a great asset to the Macadamia industry”*

*“We are seeing an unprecedented amount of restoration work going on in orchards in all regions which will place us in a good position over the coming years.” (Larry McHugh, GM of Macadamias International, the largest macadamia marketing company in the world)*

*“Congrats Robbie on an excellent event. I'll have to commend you on the work you've done since your entry into the Macadamia Society in your role as a development officer. I've witnessed a tectonic shift in attitude and responsibility within the industry since you came in. And it hasn't been just about nut prices chemicals and diseases. Thanks for the opportunity. Keep in touch”. (Gerry Ryan, private consultant – previously with Northern Rivers CMA).*

*“Hi Robbie, Just a quick e-mail to say well done on an excellent meeting. I thought the Consultants meeting was very rewarding to myself, PJ and Paul. Good info and presentations! Sorry I had to leave early I had meetings here in Bundy this morning and wasn't too keen on driving home late last night. Next year I will stay another night or fly. Cheers” (Clayton Mattiazzi, Farms Operations Manager Hinkler Park Plantation – the largest macadamia orchard in Australia)*

*“Hi Robbie, Only just heard about your award, well done and thoroughly deserved. You have come a long way since starting with the AMS. It shows the amount of hard work you have put into it and the respect that you have generated throughout the industry. Well done” (Kim Wilson, General Manager Gray Plantations)*

*“Hi mate very good day yesterday lot different to the mac groups from years ago I think there is a large change in growers attitude” (Greg James, Northern Rivers grower)*

The methodology used in this project has potential to assist other horticulture industries, as the challenge of resourcing extension in agriculture is a constant challenge. The historical extension system of government funded extension officers undertaking one on one engagement with growers is no longer viable due to increasing costs and reducing state government investment in this area. Technology such as webinars, email and videos cannot fill the entire gap. Consequently industries in horticulture and agriculture need to find new ways to resource extension programs. Resourcing an extension program does not need to mean financial resourcing, the resources that exist in industries present a greater opportunity.

Developing extension programs that engage and attract these resources (*extension stakeholders*) is a major opportunity across all of agriculture and horticulture in Australia. Working with these resources/extension stakeholders to discuss, debate and agree upon industry recommendations is the challenge. However, when agreement between these extension stakeholders is achieved the “extension power” generated can change industries for the better, in a very modest period of time, as demonstrated by this project. The methodology used has potential to assist other horticulture industries, as the challenge of resourcing extension in agriculture is a constant challenge.



## Recommendations

- Increased project timeframes for innovation and adoption projects
  - This will greatly assist in building and maintaining momentum for both industry and HIA. The macadamia industry is a tree crop, and consequently a long term crop. Macadamia growers and industry stakeholders have a long term focus, to help assist these individuals and the industry as a whole longer term perspective's for the R&D program is suggested. Perhaps industry cycles, rather than financial years? With the industry cycles being industry specific.
- Increased timeframe between changeover of projects
  - The AMS would recommend for any future projects a minimum timeframe for a change over or follow on project from a previous project a period of 6-12 months would be suitable, rather than 1-2 months. Explaining to growers that there may or may not be funding for additional assistance de-motivates growers, and takes value away from the overall strategic focus of the project. Establishing consistent program's rather than relying on projects in relevant parts of an industry R&D program would be very beneficial (*programs such as; IPM, disease Mgt, Innovation and Extension, Communications and Marketing research*). This would be based on the program and relevant service providers delivering a positive and suitable return on investment. Such a system would provide strategic benefits to both HIA and industries.
- Move away from written milestones only,
  - Improved and more suitable means of reporting the completion of milestones within a project should be considered. Means that are both more efficient for HIA, the service provider and are more "grower friendly". Some suggestions include; grower interviews of their opinion on the projects progress by HIA, video/skype interviews with service providers, recorded face to face milestone progress interviews with HIA and service providers. These could all be turned into grower friendly short YouTube styled videos that could be distributed across the industry and throughout HIA. Written milestones only are not overly attractive to growers and are time consuming for service providers and HIA to generate and review.
- Keep progressing with annual operating plans
  - The movement towards annual operating plans is a positive one, as it allows some flexibility in the implementation of a plan, whilst encouraging project leaders and team members to focus on the bigger strategic aspects of a project. This initiative has been led by HIA staff and they should be congratulated on this initiative. It has helped the MC10003 project take a more strategic approach to the project.
- HIA should encourage/ensure/invest in more cross industry communication and collaboration in areas of similar fields
  - Areas such as communications, innovation and adoption would be ideal for this. The AMS has initiated and led some cross Industry IDO (*Industry Development Officer*) and communications officer meetings to encourage sharing and comparing of ideas and experiences, however this initiative has been at the cost of macadamia industry resources (*albeit minor resources*). HIA are in a much more suitable place to be able to lead and resource this type of initiative.
  - This could be taken further and within an annual operating plan new projects could outline how they plan on undertaking the cross industry pollination of ideas, with this then being resourced into the projects annual budget also. It could be as simple as attending industry conferences and/or be as complex as regular cross industry study tours, depending on each service provider and/or industry needs.

## **Scientific Refereed Publications**

None to report

## **Intellectual Property/Commercialisation**

No commercial IP generated

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## Appendices

To align with HIA direction on delivering a final report that is concise (HIA recommended word limits), there is only one attachment – the summary of the 2015 PDO project survey. For further information, please refer to previous millstone reports on this project.

### 2015 PDO Project Survey Summary Results

*\*The survey results highlighted are based on over 200 individual replies.*

Are you a levy payer?	
Answer Options	Response Percent
Yes	86.5%
No	13.5%

Do you believe events funded within the PDO project (MacGroups, bus tours, consultants meeting etc) were					
Answer Options	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
of value to growers and attracted their interest	112	20	0	0	0
assisted to increase grower production	102	29	0	0	0
assisted to improve grower sustainability	101	26	2	0	0
coordinated and facilitated in a professional manner	113	16	0	0	0

Do you believe the PDO project has been able to engage with growers and industry?	
Answer Options	Response Percent
Strongly agree	81.4%
Agree	18.6%
Neutral	0.0%
Disagree	0.0%
Strongly disagree	0.0%

What percentage of the industry do you believe the PDO was able to engage with? (if unsure of a % please indicate whether you think it was the minority or majority of production)	
Answer Options	Response Percent
Minority	0.0%
Majority	100.0%

Do you believe the PDO project has assisted to					
Answer Options	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
increase on farm productivity?	66%	33%	2%	0%	0%
increase on farm sustainability?	64%	33%	3%	0%	0%
deliver better outcomes to growers from the R&D program?	69%	31%	0%	0%	0%

Do you believe the AMS has acted as a professional service provider of this project and has consequently been able to deliver value back to growers and the industry?	
Answer Options	Response Percent
Strongly agree	77.6%
Agree	22.4%
Neutral	0.0%
Disagree	0.0%
Strongly disagree	0.0%

Additional comments please - did Robbie differ in any way that assisted to deliver value to the industry? (Good or bad differences)
Robbie's enthusiasm and energy drive the PDO project
I haven't been involved in many activities and haven't witnessed most of the above
Very diligent - approachable at all times
Robbie's advice and assistance has been particularly valuable to date. He should be commended for his efforts
Hope he stays around. He would be hard to replace
Good difference
Approachability and sound one on one advice
Commitment/passion
Very active in the industry
He is a top person for the job
Used plenty of examples from other industries. Made it easy to understand how to improve
Robbie is time pressed to visit smaller farms
Very professional computer presentation. Very good knowledge of the industry
Robbie was very helpful and informative as I am new to the industry
Good. Knowledge is excellent
Very engaging
Well versed and knowledgeable communication
He has been great for the industry
Showed pictures of a future mac grower
At our level with the right type of personality
Logical thinker and has strong industry knowledge. Enthusiastic presenter, very professional approach
MacGroups are great for industry engagement thus improving industry productivity
Empathy with growers, genuine interest in assisting improved outcomes service and commitment beyond normal
Good
He is very approachable and he will give specific advice
Robbie really connects with growers

Always approachable
Robbie is a fountain of knowledge and he delivers that knowledge in a friendly, inviting manner. The role works so well because of him
Good communication, concerned and reactive
Hi enthusiasm encouraged me to get going more

Do you believe that the industry has benefited positively from the levy investment into this project?	
Answer Options	Response Percent
Strongly agree	77.0%
Agree	22.1%
Neutral	0.8%
Disagree	0.0%
Strongly disagree	0.0%

Would you support a similar PDO project in the future?	
Answer Options	Response Percent
Strongly agree	78.6%
Agree	21.4%
Neutral	0.0%
Disagree	0.0%
Strongly disagree	0.0%

Do you have any additional comment in regards to this project?
Crop yields have generally decreased over the past 10 years. This is due to canopies closing in, soil loss, lack of light, insect pests - lacebug and weather. This project will help restore much of the crop losses on some orchards and ensure new plantings don't make the same mistakes
Keep up the good work! We are very lucky to have an organisation such as this
The output achieved by the PDO during the present contract period has been phenomenal. An illustration of this is the growth and relevance of MacGroups which have improved immeasurably
Great to have professional group providing relevant information and assistance to the industry. Particularly beneficial to newcomers. Judging on comments from established growers the project has been well receive and of great interest.
An excellent project. Does need updating I think over the years to come
The orchard management guide and explanation and workshop is an invaluable strategy and resource
A great inclusive project that has brought growers, DPI and industry players together in a collegiate efficient manner
Very informative, very valuable
I would come on the next day with the PDO project and Robbie
As a newcomer to the industry I have learnt a great deal from visiting the farms where experienced growers have achieved good measurable results
Excellent project pulling together industry expertise and ensuring industry engagement. Producing on farm outcomes

Must be managed by the industry body - the AMS. Has been a lot more information output from the AMS in the last 5 years. A great deal of ground breaking changes have been coming out, sourced locally and around the world and adapted to local conditions
A great achievement which will benefit all
Very worthwhile
This project and Robbie is a major benefit to growers. We need such commitment to continue
Robbie does a great job! Project is good use of my levy
Highlighted how much work I need to do
Invaluable to the industry. Make sure the role and Robbie continue to provide it
This program is an essential part of the industry. Funding is essential. For me, almost as important as the service
Continue with your excellent positive approach
Seek to get growers who don't attend to participate
Very difficult to replace Robbie
Robbie does an excellent job
It is an important project coordinating information flow within the industry particularly the flow of information from R&D projects
An excellent project that will ultimately further the sustainability of Australian macadamia industry over other orchard crops
Essential that this role continues!!
A role such as this in the industry is essential
Direct measure of success is participation in events - increased attendance through project term. Benchmarking study outcomes demonstrate improvements in production - importantly low production increases and good production from improvements. Engagement of industry expertise is higher at a time of reduced support and focus for continued service providers.
I'm only new to macadamias so might have some more valuable input next year
Should be expanded and increases to include an 'on farm grower trials' person to assist and monitor grower R&D
Focus on consultant engagement leverages ability to drive change, good model
Less baby photos
Obvious positive engagement of industry (consultants and growers). Connections to research and delivery is great
Continue to keep it simple
Robbie has worked in a collaborative way with growers and other agencies for the industry's benefit. I believe the continuation of the PDO will build upon success
It is imperative that it be continued
Over the past 3-4 years the project has gained momentum and professionalism
Grower and industry involvement was outstanding
Try and ensure that the PDO project is continued into the future
Keep up the good work

Do you have ideas and/or suggestions on how to improve the PDO project in the future?
No doubt records will be maintained and the better production will be measured. Seeing is believing
More of the same please!
Robbie, thank you so much. Us newbies need as much help as we can get and Saturday was just what we needed
I think most farmers do not have a very good understanding of how to stop a 4 year old orchard from slowly being eroded around the base of the trees and down rows as the years of harvesting continue. If there was



some sort of guide for this, replanting's won't end up like the orchards of today
Workshops on weekends
Ongoing events for growers. Follow up with growers as a group
Must engage/encourage young farmers/managers/farm hands etc before learning bad habits. Try incentives to encourage owner/investor to nominate employees to attend. Look into the possibility that they think they are not members so can't attend field days
Keep up the good work
Very happy with current set up
It's certainly a very good program as it's currently running
Provide more admin support for PDO
Consolidate the PDO role giving confidence to the production sector
Very happy with current project
Jeremy's chemical guide
More use of videos via the internet to transfer information and reach a wider audience
No
Expand coverage to ensure all growers have opportunity to benefit from this role. AMS membership is of enormous benefit to growers but need to embrace all levy payers
To be as inclusive as possible of all people in industry and of all different types of farming practices
Continued networking and engagement of industry. Regional focus. AMS take on Macsmart/benchmarking projects and expand resources accordingly
Follow similar steps as previously taken with the right personalities to engage and change industries for the better
Have overnight tours with growers
Encourage input and interaction with a wide cross section of the industry and other industries
2 Robbies!
Perhaps look at other successful horticultural (speakers) and see if there are any opportunities to learn from their successes/failures
Maintain focus on coordination of activities, not be the deliverer of content/messages all the time
Strong Kernel (NIS) Price will make a lot of farms more profitable. It will provide more capital to hundreds of farmers to improve their property and crop
Mailing list for non-members
More information on the grower. Excellent job guys
Perhaps another option may be to have growers invited to speak on their farms and issues they have faced