

# AUSTRALIAN MACADAMIA SOCIETY

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**NEWS BULLETIN**

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## Contents

- 4 Market report
- 6 Leoni's orchard rounds

### Industry news

- 8 Ruth Huwer calls it a day after a long and successful career
- 35 Macadamia growers lead the way in Reef Certification
- 58 Successful macadamia open day for MCT

### Pest and disease

- 11 MC21001 – an integrated disease management approach for the Australian macadamia industry
- 15 Project MC21000 – an integrated systems-based approach for pest management in Australian macadamia
- 19 Around the regions with pest scouts
- 22 Varroa mites – small size, big impact
- 24 Avoiding pesticide resistance
- 26 Inadequate coverage limits pest and disease management

### Far North Queensland macadamias

- 28 Growers take on the challenge in FNQ
- 31 Taking advantages of opportunities in FNQ

### Flowering

- 41 Managing macadamia flowering
- 44 Visual monitoring for flower health
- 46 Effective pollination helps increase yield

### New application technology feature

- 53 Positive reaction to electrostatic sprayers
- 56 AgTech on trial at Bundaberg

### Flood recovery

- 60 Disaster funding helps recovery for Rous orchard
- 62 Floods and rain test resilience

### Marketing news

- 64 Australian food personality Magdalena Roze shares her macadamia farm experience
- 66 Macadamias flip the script on fat as consumers seek satiety and heart healthy ingredients

### Feature articles

- 48 Off the shelf is out of the box for floodplain farm
- 51 How macadamias and ice cream helped to rebuild a nation
- 68 Australian macadamia minor use and emergency permits

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*Front cover. Featured in this edition is a case study on Greg and Wendy O'Neill's orchard in Far North Queensland. One of the features of the farm is that it is an aggressive abnormal vertical growth site. To combat the effects of AVG, Greg has successfully implemented an annual program of cincturing his 741 trees, which are especially susceptible to the condition.*

## Our Mission

The Australian Macadamia Society Limited is established to promote all aspects of the macadamia nut industry; to encourage a free interchange of ideas and information amongst macadamia growers and marketers of macadamia nuts and by-products; and to foster and promote goodwill among members of the Society in furtherance of its objects.

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## What's On

DATE	EVENT	LOCATION	CONTACT
29 August	CEO Clare Hamilton-Bate begins	Brisbane	Clare Hamilton-Bate E: clare.hamiltonbate@macadamias.org
20 September	AMS Board meeting (financials)	TBA	Susan Vallis P: 02 6622 4933 E: susan.vallis@macadamias.org
6 November	AMS Board meeting	Gold Coast	Susan Vallis P: 02 6622 4933 E: susan.vallis@macadamias.org
7 to 9 November	AusMac 22	Gold Coast	AMS office P: 02 6622 4933 E: admin@macadamias.org
10 November	Consultants meeting	Gold Coast	AMS office P: 02 6622 4933 E: admin@macadamias.org
23 November	AMHA meeting	Brisbane	Jacqui Price P: 0424 107 731 E: jacqui.price@macadamias.org





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- ★ Maximising production through efficient water use management and correct irrigation scheduling
- ★ Understanding and manipulating tree physiology to improve tree health & yield
- ★ Regenerative farming techniques making a big impact in macadamias
- ★ How can growers improve pollination for better yields?
- ★ Grower case studies: The secrets behind the success of our best growers
- ★ Factors influencing total kernel recovery
- ★ Building a strong, sustainable global market (World Macadamia Organisation)
- ★ Sustainable macadamia growing: key opportunities and commercial advantages
- ★ How South Africa became the world's largest macadamia producer
- ★ The technology changing our orchards
- ★ The do's and don'ts of best practice orchard establishment

### Social events

- ★ Golf day
- ★ Welcome cocktail reception
- ★ Women in Macadamias luncheon
- ★ Happy hour
- ★ Celebrity chef breakfast
- ★ Gala dinner

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# Challenges on the horizon as global supply continues to grow

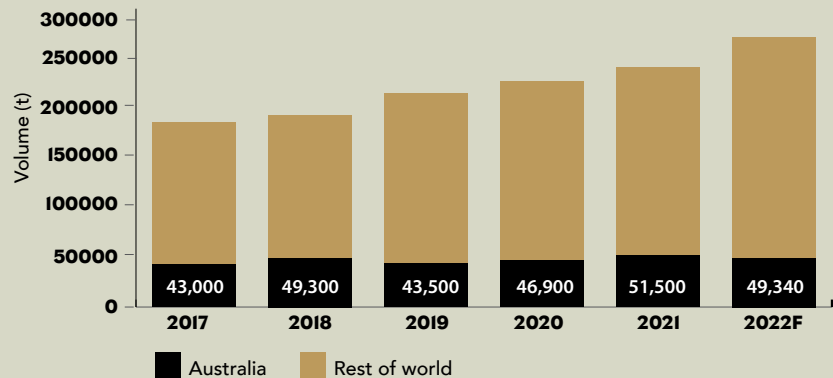
**Jacqui Price** Market Development Manager, AMS **P:** 02 6622 4933 **E:** jacqui.price@macadamias.org



## Global supply

The 2022 global crop is forecast to be up 12% on the 2021 season, driven mainly by forecast increases in the South African and Chinese crops. This is despite Australia forecasting a 10% decrease compared with last season as a direct result of the severe weather and flooding in NSW and south-east Queensland.

The revised Australian forecast is 49,340 t in-shell @ 3.5% moisture (52,900 t in-shell @ 10% moisture). This is still a realistic expectation given



**Figure 1. Global macadamia crop volumes 2017-2022 (tonnes)**  
Source: INC, AMS, SAMAC. All volumes are at 3.5% MC.

Australia's largest producing region of Bundaberg is enjoying a very strong season. South Africa's forecast

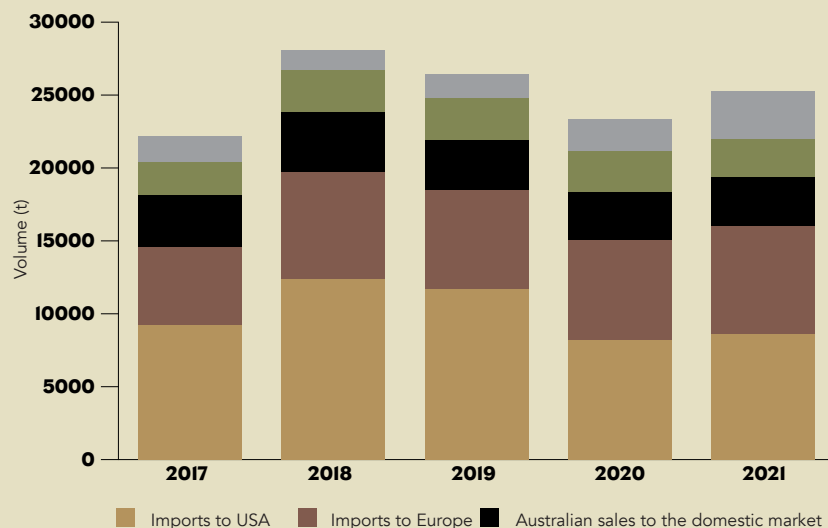
for 2022 is 61,288 t in-shell @ 3.5% moisture, a 14.9% increase on last season.



## Global demand

In the 12 months to June 2022, global macadamia kernel imports to the top five markets combined grew 8% on prior MAT period. All markets were in growth, except for Japan (-5%) and the domestic market (-4%). The major markets of Europe and USA were up +9% and +10% respectively. Total kernel imports to China/HK were recorded at a high of 3,900 t, up 23%. Average price per kg data for imports indicates significant downward price pressures are continuing, particularly in the ingredient styles.

Total in-shell imports to China for the period MAT July to June were the highest on record for many years, being reported at 38,656 t. China Customs data



**Figure 2. Macadamia kernel imports to top 5 markets (tonnes) MAT July to June**  
Sources: USDA, Eurostat, Japan Customs, China Customs, Hong Kong Census & Statistics Department via HIS Markit Inc, AMHA

highlights the major importers of nut-in-shell are South Africa and Australia. Australian imports were at

13,685 t (+15%) and South Africa imports at 14,084 t (+94%) for this period.

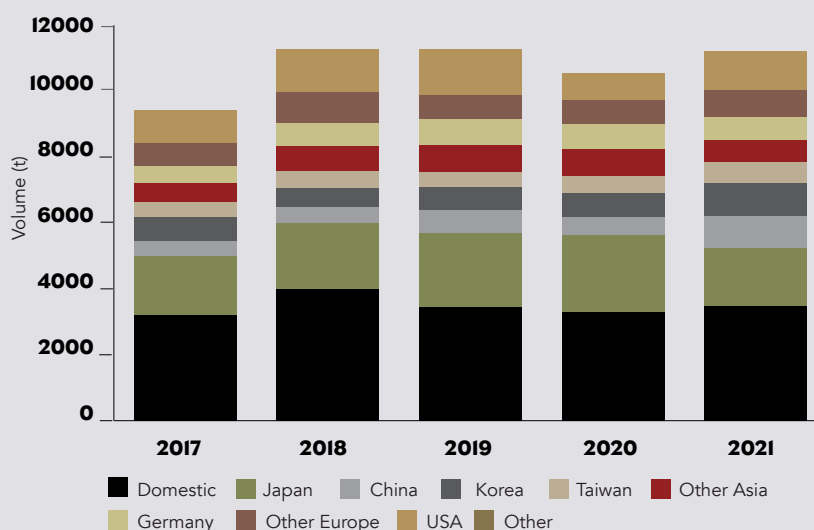




### Australian sales

Australian macadamia sales continue to increase year on year following COVID-19 disruptions. The industry recorded a strong 12 months for the MAT period (July to June), up 8% overall. The increase was driven by strong kernel sales to China/HK with increases also seen in Japan, Taiwan and other Asia. Sales to the domestic, South Korean and other Europe markets softened slightly, while Germany was stable.

Despite the upward sales trend, market conditions remain tough given the increase in supply, intensified price pressure in the ingredient market, and ongoing challenges with the supply chain.



**Figure 3. Australian macadamia sales (tonnes) MAT July to June**  
Source: AMHA. AMHA represents 95% production, sales are adjusted to represent non-AMHA members.



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## Leoni's orchard rounds

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What a season! Almost all growers agree that they have found this season the most challenging for decades. Wet weather impacts on the east coast have severely delayed harvest and in many cases orchards still hadn't been harvested by August. You would have to count yourself lucky if you managed to complete harvest within weeks of a "usual" season. A saving grace has been the surprising quality and kernel recovery this season. On the west coast, the exact opposite is true with long-term dry and warm conditions suppressing yields.

### Pleasing kernel quality

The number of enquiries from growers we have received at the AMS for hand harvesters tells you everything about the season. One positive outcome has been nut quality, with quality reports revealing reject levels have been no higher than average while kernel recovery has been about 1.5 to 2% higher. While individual growers and regions had higher levels of commercial kernel, premium kernel has also generally been marginally higher this season.




Rejects are marginally higher than the 2021 season but lower than 2020. Some of the reject defects of note have been related to insect damage, particularly late damage from fruit spotting bug and other similar stings. Levels of internal discolouration are also higher this season, particularly in the warmer Queensland growing regions. At the start of the season in NSW, a high level of immature kernel was the largest defect.

### Maximising pollination

One of the management issues a lot of growers have been asking about is to do with maximising pollination as we head into spring and flowering. Below I have summarised some of the most relevant recent research to help you develop your approach.

Research shows that cross pollination increases nut set, kernel recovery, kernel size and final yield.

With the pressure on managed pollinators and the uncertainty of the impact of the recent Varroa mite incursion in NSW, there are strategies that growers can implement to increase pollination. The three most important are orchard design, increasing biodiversity and managing pollinators. These are in addition to the foundation of a healthy orchard supporting successful flowers.

Orchard design	Biodiversity	Managed pollinators
		
<b>New orchards</b> Plant multiple cultivars with management in mind, i.e. two to four rows per cultivar.	Support beneficial pollinators and predators that control pests with a food source and harbour.	Introduce managed bee hives, e.g. European honey bees or native bees, rather than relying solely on wild populations.
Plant cultivars with overlapping flowering times (see cultivar flowering timing).	Diverse plantings in the inter row, and riparian or headland areas.	Understand the behaviour of each managed pollinator species.
<b>Existing orchards</b> Sunlit, well-ventilated canopies encourage pollinators.	Reduce mowing of grasses and weeds as they will flower and harbour pollinators.	Ensure there are sites in the orchard that are easy to access so hives can be placed in bee foraging range.
Know your cultivars and their self-compatibility and incompatibility.	Monitor and reduce broad spectrum, disruptive chemical sprays.	Place hives on the borders between cultivars.

### Indicative timing

246	344	816	G	MCT1	A16	A268
741	Daddow	849	R	J	A203	
842	660	814	P	Beaumont	A14	A38
Early flowering			Mid flowering		Late flowering	

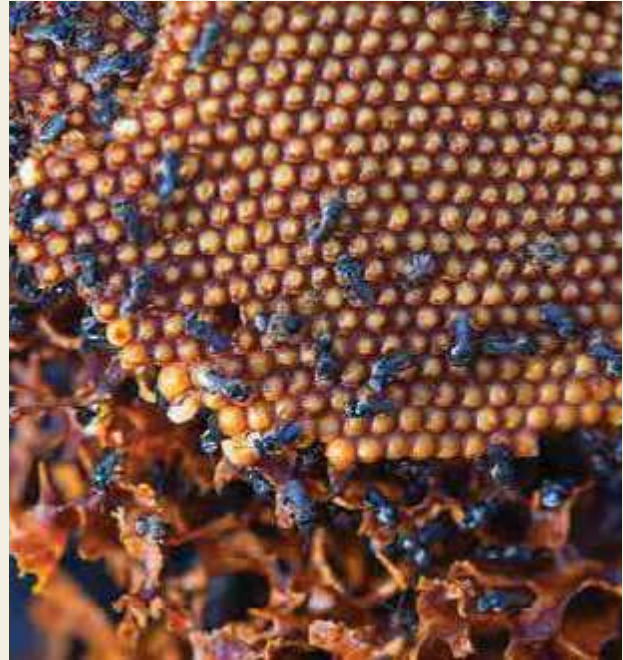


### European honey bees



- Attracted by the 'floral display', e.g. a higher floral intensity is more attractive and bees will travel much further for it.
- Ideal stocking rates are between five and eight hives/ha, with orchard placement crucial.
- If possible, distribute hives within the orchard.
- Be mindful of floral resources on neighbouring properties and if they are sprayed, move hives well away.
- Where blocks are larger, place hives in zones between different cultivars to promote cross pollination.
- Ensure there is a managed water source.
- Prefer sunlit areas.
- Susceptible to diseases, some of which are carried by Varroa mite.

### Australian native bees



- Less drawn to floral displays, rather foraging takes place close to hives.
- More than 95% of native bees are found within 100 m of their hive.
- Stocking rate is unclear but placing hives about 100 m apart is ideal to maximise foraging range.
- Because of this smaller travel radius, distribute hives within blocks.
- Are slower to become active in the morning compared with European bees, so a good strategy is to take advantage of morning sunlit sites.
- Can cope without a managed water source.
- Prefer sunlit areas, and morning sun is critical.
- Not as susceptible to diseases and are not a host of Varroa mite.

### Which managed pollinator is better?

Research demonstrates that native bees are the most efficient pollinators of macadamia with more pollen deposited per visit, more contact with the stigma and more raceme visits per minute than European bees. European honey bees, which are the second most efficient pollinators of macadamia, are the most effective, because of their higher populations and broader activity range, both in distance travelled and over different climatic conditions.

Ensure you know where your bee hives have come from and that they comply with all hive movement and sanitation requirements and restrictions. Consider using a pollination agreement, which will help with clear communication and ensure a mutual understanding of any relevant details. Casual arrangements have resulted in disappointment and misunderstanding. You can

download sample agreements from the AMS industry resources website.

### Information

Read more about the latest work being done to understand the implications of cross pollination and opportunities to maximise it on page 41.

### AusMac2022

Not long now to our long awaited AusMac2022 conference, which will be a highlight of the macadamia calendar. You can get all the event details, program highlights and of course tickets at website <https://www.ivvy.com.au/event/AUSMAC2022>.

I look forward to seeing you there.

**Leoni**

## Ruth Huwer calls it a day after a long and successful career

In July this year, entomologist with NSW DPI Dr Ruth Huwer farewelled the macadamia industry and Australia.

Over her 20-year career with NSW DPI, and before that in Queensland and with CSIRO, Ruth developed a formidable reputation as a highly respected entomologist, both in weed management and in horticultural crops.

One of the areas that Ruth first was involved in in the 1990s was fruit spotting bug, an insect about which little was known. Ruth was an important member of a team that did pioneering work measuring FSB ecology, behaviour and management. This research ultimately led to the development of strategies to better manage FSB than had previously been available.

This involvement in FSB research continued when she began working with NSW DPI in 2002, where she also turned her talents to integrated pest and disease management.

Thanks to Ruth from the AMS for her work which will continue to have an impact on pest control in the macadamia industry for years to come. We wish her all the best settling into her new home, Waratah House, in Laboe on the Baltic Sea in Germany.



*Ruth Huwer has farewelled the macadamia industry and Australia after having made a significant contribution to our understanding of key insect pests of macadamia and their management.*

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## PURE PARTNERSHIPS

As the 2023 season blooms, we look forward to consolidating our continued commitment to our family of growers, so we collectively achieve our full potential for the next season and beyond.

**Rohan Orford**

Grower Technical Manager

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# MC21001 - An integrated disease management approach for the Australian macadamia industry

**Assoc. Prof. Femi Akinsanmi**, The University of Queensland, Centre for Horticultural Science, Queensland, Alliance for Agriculture & Food Innovation, Brisbane

## Snapshot

- MC21001, which is being led by Associate Professor Femi Akinsanmi at the University of Queensland, is a five-year integrated disease management project that began in July this year and will finish in April 2027.
- Its main objective is to develop knowledge and tools to support an integrated management approach to address disease problems in macadamia.
- The project, which will focus on key macadamia priority diseases including flower blight, husk rot and *Botryosphaeria* branch dieback, is expected to deliver national research and extension activities to minimise the impact of diseases across the major macadamia growing regions in Queensland and NSW.

Macadamia growers are faced with increasing disease pressure from endemic and emerging pathogens. In recent years, several new pathogens and diseases have been reported to infect macadamia in Australia and overseas, reducing yield and resulting in tree death.

Emerging diseases are complex, which is why MC21001 seeks to deepen our understanding of them. It will examine disease-disease interactions and the broader impact of the effects of climate change and atypical weather trends, characterised by prolonged drought, wet spring and above-average temperatures, on disease pressure. The project will focus on key macadamia priority diseases, including flower blight, husk rot and *Botryosphaeria* branch dieback. The project team will provide support to the industry including diagnostics of disease issues and information on emerging diseases.

The main project activities are as follows:

- address gaps in knowledge on the biology and epidemiology of key priority diseases
- develop innovative tools and control options to manage the diseases in an integrated system
- build capacity through involvement of high degree research students
- provide pathology expertise for the Australian macadamia industry
- disseminate IDM information to upskill macadamia growers and crop consultants.

## Priority macadamia diseases

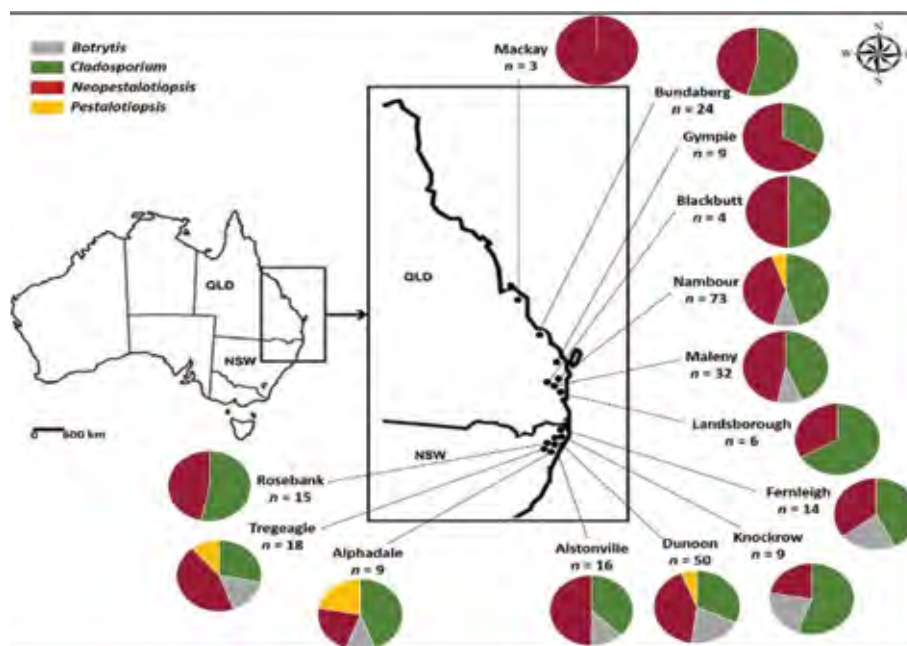
**Flower blight complex (grey mould, green mould and dry flower disease).** There are three types of flower blights in Australia caused by fungal pathogens including several species of *Cladosporium*, *Botrytis*, *Neopestalotiopsis* and *Pestalotiopsis*. Flower blights occur annually in all growing regions, but their impact is influenced by flower stages and climatic conditions.

Previous integrated disease management project MC16018 showed the distribution of pathogens is influenced by climatic parameters. Green mould and dry flower disease pathogens occur in all the major growing regions, whereas grey mould was found to be most consistent in NSW orchards and to a lesser extent in the Sunshine Coast region. It rarely occurs in the central Queensland regions. This suggests that green mould and dry flower disease are more widespread in Australian macadamia orchards, whereas grey mould is restricted to the cooler and wetter regions.

MC21001 will undertake studies to improve knowledge of biology and epidemiology of flower blights and use the information to identify infection risks with specific weather-variable thresholds for predicting flower disease. The project aims to specify the likelihood of disease using climate scenarios for multi-week and seasonal forecasts to facilitate improved management decisions.



Flower blights of macadamia. (A) *Cladosporium* blight (B) dry flower disease and (C) *Botrytis* blight.



Distribution of flower blight pathogens in macadamia. Pie charts indicate relative abundance of each genus per location; n = total number of isolates per location.

These photos show the four stages of flowering. The project is working to identify the susceptibility of flowers at different stages to flower blight.



#### Stage 1

Small green buds to florets on the rachis.

#### Stage 2

Florets are light green to white and partially open with stamens that pull away from the stigmas.

#### Stage 3

Fully open flowers with sepals (peak of pollination). Sepals turn light brown.

#### Stage 4

Sepals are brown and starting to drop off with swollen, fertilised embryos.

**Husk rot (Phomopsis husk rot and anthracnose husk rot).** Husk rot, designated as *Phomopsis* husk rot (PHR) caused by *Diaporthe* spp., and anthracnose husk rot, caused by *Colletotrichum* spp., occur in Australia. In 2009, husk rot designated as black husk rot caused by *Calonectria* spp. was reported in China and South Africa, and in 2020 husk rot caused by *Phytophthora* species was also reported in China.

Husk rot is an insidious disease in Australia. Its economic impact can be severe as it causes premature nut drop, particularly in cultivar HAES 344. PHR occurs in all macadamia growing regions, but it is more frequent and severe in the Central and South-East Queensland regions.

The project seeks to establish the biology and epidemiology of husk rot in the Australian macadamia industry as well as provide key parameters of the husk rot disease cycle and examine the broader impact of the

environment and orchard management on husk rot incidence.

**Botryosphaeria branch dieback (BBD).** BBD is caused by *Botryosphaeria* fungi including several species of *Lasiodiplodia* and *Neofusicoccum*. It affects young and mature macadamia trees resulting in annual yield losses with long-term impact on productivity. The study will focus on the role of pathogens that live naturally in macadamia wood compared with airborne spores on BBD incidence (occurrence). The possible association of climatic parameters and BBD will be examined using climatic data. Understanding the influence of tree phenology and environmental conditions on disease severity is critical for managing the disease.

### Capacity development

A component of the project is capacity building by training three PhD students and upskilling macadamia growers and agronomists.





Symptoms of two types of husk rot disease in macadamia, distinguishable by the concentric rings in the anthracnose husk rot.



Symptoms of Botryosphaeria branch dieback on macadamia trees.

### Industry plant disease clinic diagnostic services

The correct identification of the organism(s) causing diseases in macadamia is critical to the development of treatment and control measures. Samples of diseased or suspected disease issues sent by growers will be assessed by the program through its diagnostic services, and feedback and advice provided, including on the likely cause or causes and possible remedial actions. Growers should contact the project team before sending samples.

### Industry extension, engagement and communication

The project will use a range of platforms for communication extension activities in collaboration with AMS through the Macadamia industry innovation and adoption (MC20000), and the Australian macadamia communication (MC18000) programs.

#### Information

To find out more about the project contact  
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# Project MC21000 - An integrated systems-based approach for pest management in Australian macadamia

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## Snapshot

- Project MC21000 is an interdisciplinary IPM project involving research and support teams from Macquarie University, Cervantes Agritech, Ag Econ and Macadamia Farm Management. The project, which is managed by Dr Bishwo Mainali from Macquarie University, began in June 2022 and will run for five years.
- Its focus is on designing a production system that concentrates on underlying weaknesses that allow an organism to become a pest in an orchard rather than relying on reactive interventions.
- The key aim is to establish a decision support system to help growers make timely and effective pest management decisions to suppress populations of key insect pests so they remain under an economic threshold, ensuring sustained and improved orchard health and productivity.

The macadamia industry has been implementing integrated approaches to pest and disease management for some time and Hort Innovation Project MC21000 will retain this focus. Its aim is to develop a decision support system to help growers and others involved in the industry make timely and effective pest management decisions to suppress populations of key insect pests so they remain under an economic threshold. This will help ensure sustained and improved orchard health and productivity.

The project has three major activities, as follows:

- **Activity 1** focuses on ecological studies across the industry in Queensland and NSW to identify environmental factors affecting the population dynamics of pests and their natural enemies.
- **Activity 2** builds on existing pest monitoring protocols and develops decision support systems to establish evidence-based damage thresholds, tolerance levels and benchmarks of the return from control measures.
- **Activity 3** aims to improve biological control of macadamia pests through field studies to assess seasonal abundance and diversity of natural enemies under changing environmental conditions and resource availability.

MC21000 is a collaboration between Applied BioSciences at Macquarie University, Cervantes Agritech, Ag Econ, and Macadamia Farm Management, with logistic support from the AMS.

## Project team

Applied BioSciences at Macquarie University is the lead agency, with Dr Bishwo Mainali responsible for management.

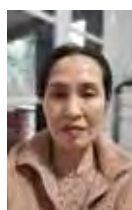
The project team includes investigators from Macquarie University (Drs Bishwo Mainali, Vivian Mendez, Soo Jean Park, Mary Whitehouse and Prof. Phil Taylor), AgEcon (George Revell), Cervantes Agritech (Dr Tania Yonow) and Macadamia Farm Management (Dr Theunis Smit). They have much experience working with a range of horticultural crops, including macadamia, and have expertise in applied entomology, ecological modelling, horticulture, and agricultural economics.



Dr Bishwo Mainali is an applied entomologist with extensive experience with economically important insect pests and their natural enemies. His work includes manipulation of visual and olfactory cues for the development of attract-and-kill devices, and traps that enhance pest control by removing pests and by stimulating the proliferation of natural enemies. He will have overall responsibility for co-ordinating MC21000.



Dr Vivian Mendez studies insect behaviour and reproduction, including responses to pheromones. Recent projects have included use of dietary supplements to enhance mating performance for pest management programs and exploitation of insect chemical signatures for the development of novel management tools. Her main role will be to support experimental design and data analysis of field trials for pests and natural enemies.



Dr Soo Jean Park is a synthetic/analytical chemist who specialises in chemical ecology and insect pest control strategies. Her work has included development of novel attractants, repellents, and toxicants for effective monitoring and control of insect pests.





**Dr Mary Whitehouse** has worked extensively on IPM in the cotton industry. This background, along with her strong grounding in field ecology and pest management through enhancing invertebrate predator communities, will help further develop a robust IPM system in macadamia orchards.



**Prof. Phil Taylor** is expert in developing and applying sustainable pest management tools and in training the next generation of researchers. Most of his research aims to deliver effective pest management while minimising environmental impacts. Phil will provide overarching institutional support for the project and will provide advice with project management and co-ordination.



**Dr Tania Yonow** from Cervantes Agritech is an ecological modeller who has worked with institutions such as CSIRO, Citrus Research Institute and the University of Queensland. Tania has created models for biological control and IPM to help pest managers and policy makers understand where to best apply management interventions. Cervantes Agritech was established to create real-time pest forecasting systems for horticulture, empowering producers to make informed pest management decisions. This project is a perfect fit for the company.



**George Revell** will be responsible for economic analysis to support decision making models. He specialises in investment impact assessments to support improved investment decision making at a farm and industry level. He has applied a range of analytical techniques to evaluate economic, environmental and social impacts across investments including agritech and productivity, biosecurity, genetics and breeding, leadership and training, market development, and supply chain and marketing.



**Dr Theunis Smit** is a macadamia consultant and researcher with extensive experience in production across several countries, including South Africa and Australia. In his time as a student lecturer and completing his master's degree at the University of Pretoria he focused on water use dynamics and is acknowledged as an expert in water relations in macadamia. He has worked in grower liaison and as a consultant in South Africa and is now employed by Macadamia Farm Management in Bundaberg working in macadamia ecophysiology.

## Location of research team

Two full-time staff will be in Northern Rivers and Bundaberg for at least seven months of the year for the next three to four years. While most members will not be located in the macadamia growing areas, they will maintain strong ongoing engagement with all stakeholders to ensure that the research outcomes are of best possible value to the industry.

Team members will also be visiting macadamia farms in both NSW and Queensland to ensure the project maintains a practical focus and operates effectively. The project team will regularly survey industry members to gather feedback and incorporate findings in the project operation.

## Priorities for the next 12 months

Key priorities for next 6 to 12 months will be to lay the foundations for the project.

The project team met with industry representatives (Leoni Kojetin, Megan Boote and Chris Fuller) in July and discussed fine-tuning of the experimental methods and co-ordination between research and industry partners.

Team members also consulted with industry representatives about farm selection and relevant logistics for studies in Queensland and NSW.

Key members of the project research team visited macadamia farms in August 2022 for a much broader engagement with the industry.

Other priorities will be to conduct desktop reviews on the ecology, biology and epidemiology of the focal pests and biocontrol agents and prepare for the first season of large-scale multi-orchard studies. Project team members and industry representatives have agreed to initiate ecological studies as soon as possible.

## Information

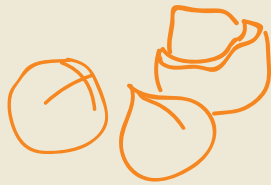
To find out more about the project contact Dr Bishwo Mainali, E: [bishwo.mainali@mq.edu.au](mailto:bishwo.mainali@mq.edu.au)





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## Around the regions with pest scouts

We asked five pest scouts – Eddy Dunn, Mark Duncan, Jarrah Coates, Bob Maier and Chris Fuller – to provide an update on pest and disease pressure around the regions and how growers are responding. One of the things that comes through very clearly is the importance of regular monitoring as a foundation to the timing and design of management strategies for all pests and diseases.

Note. Responses were current as at mid-July 2022.

### Eddy Dunn, Bundaberg



**Seasonal conditions.** As in most areas, seasonal conditions have been much wetter this year than the previous several years as shown by a Bundaberg weather station that recorded 1723 mm in the last financial year, compared to 560 mm, 687 mm and 502 mm in the preceding three years.

**Most significant pests and diseases.** A lot of spotting bug is still in the trees and damage has been much higher this season than recent years, especially in thin-shelled varieties. Growers who are putting out banana spotting bug traps in their blocks are likely to catch bugs, especially in July.

Late nut borer was an issue this season with some premature drop in A203s, and husk spot caused a lot of premature drop in many A16 and A38 blocks.

**Orchard management responses.** Growers will respond to the increased spotting bug damage by being vigilant and implementing a suitable spray program next season, although rainfall can affect spray timing, as it did this year. Fortunately, Anastatus continue to work in the rain.

Growers with late-maturing varieties might apply Prodigy in December or January next season or a release of MacTriX after the last insecticide application.

Many growers are shaking trees with sticktights, but fungicide use will also be increased at matchhead stage next season.

**Key pests and diseases in the coming spring and summer.** Spotting bug, nut borer and husk spot will probably be most prevalent. There is likely to be more spotting bug pressure coming from surrounding bush, as the bugs feed on the new growth of many trees which is more abundant after rain.

**Key management strategies in response to expected pest and disease pressure.** This is a bit hard to answer as I don't know what the next season will be like. In saying that, there is likely to be more husk spot inoculum, so shaking susceptible varieties is recommended if possible.

With the early flowering, flower caterpillar parasites and predators often build up, so I would not rush into an early Prodigy spray.

Limb removal and sprayer calibration, as well as the spray program, are all important for successfully managing spotting bug.

### Chris Fuller, Nutworks, SE Queensland



**Seasonal conditions.** Conditions in South East Queensland have been wet. Very wet, in fact. The rain started early last October and hasn't stopped for more than a couple of weeks at a time. Some of our growing areas have recorded more than 2.4 m of rain, and it also now looks

like it will be wet right through until September, which in a normal year is supposed to be our driest month.

**Most significant pests and diseases.** I have seen some early macadamia flower caterpillar and loopers in the early flower, but these shouldn't get away too much in the cold and have a high ETL (economic threshold limit), especially early in the season.

I have also found lace bug already (early July) which will need to be addressed and should be checked for on orchards with a history of this pest. Flower blights like *Botrytis* and *Cladosporium* will need to be considered if the wet, cold weather persists and the flowers open early.

**Orchard management responses.** Some growers have applied chemistry, depending on the varieties they have and the intensity of early flower, but it is also a tricky time to be spraying this early as most orchards still have crop and withholding/non-harvest periods need to be adhered to.

**Key pests and diseases in the coming spring and summer.** I would think most of our traditional pests will be back this coming season. Fruit spotting bug probably remains as the biggest pest but there are plenty of others that can do significant damage. Even *Leptocoris*, which in theory shouldn't be too prolific in a wet year, was found on plenty of orchards last year in December and January.

**Key management strategies in response to expected pest and disease pressure.** I believe some pesticides and fungicides might be hard to source this year so some thought will have to be given to product selection based on the suite of major and minor pests you are trying to control in any one spray round.

Some of the newer products, while more expensive than a lot of traditional ones, can provide good control of



secondary pests, populations of which can often flare up as a result of the use of more traditional broad-spectrum insecticides.

Correct timing of pesticide application based on the results of good crop monitoring in conjunction with sound cultural practices and biological options are by far the best way to achieve good pest control and a clean crop come harvest time. Monitoring is the cornerstone of any good IPM program.

### Mark Duncan, Northern Rivers



**Seasonal conditions.** Following the initial intense rainfall events earlier in the year, conditions have been relatively normal for June and July with significant wet periods followed by drier periods allowing growers to finally harvest their crop. The difference this season is that the soil profile is full and any rainfall at all makes orchard activities difficult.

**Most significant pests and diseases.** Tree health issues related to the saturated soil profile are significant, especially in the lower lying coastal areas. Any recently planted trees, regardless of elevation, have been showing signs of waterlogging, *Phytophthora* and even excesses in suddenly available nutrients from organic sources.

The presence of *Botrytis* on the early flowering is not surprising because of the wet seasonal conditions, but this is unlikely to cause economic losses until peak flowering. Macadamia lace bug has been recorded in the usual hotspots, but we won't expect significant pressure until late instar nymph colonies start building up on the main flowering when the weather warms up. Populations of secondary pests such as felted coccid don't seem to be as high as previous seasons, and thrips and mites are not significant at present.

**Orchard management responses.** To date, the focus has been on picking up the last of the nuts. Many orchards are still too wet for the heavier spray rigs and machinery. Much of the early flowering has gone through as nut set without impact from significant pests and diseases, and this will influence management decisions.

**Key pests and diseases in the coming spring and summer.** Husk spot is again likely to be in the spotlight due to the carryover from the wet spring and summer of 2021-22 and a wetter than average November again predicted.

Depending on weather conditions at flowering, closed canopy orchards and flower disease hotspots will certainly be vulnerable to *Botrytis*. There are signs that the presence of adult macadamia seed weevil is lower this season, however, once egg laying starts on the early nut set that could change very quickly later. Lace bug is active at present, but effective monitoring and well-timed spray applications are the key to controlling both lace bug and fruit spotting bug.

**Key management strategies in response to expected pest and disease pressure.** As part of our IPM programs we will be focusing on monitoring for the early stages of pests and beneficials and recommending softer chemistries that are directed at the key life stages of the pest. Where possible, broad-spectrum chemistries will be avoided, as the impacts of these treatments can often result in secondary pest issues that require further control measures.

Effective monitoring, spraying only when required, reacting to the crop stage, pest pressure and critical weather event windows are all part of an effective IPM program.

Managing *Phytophthora* will be an ongoing issue for those trees affected by prolonged wet conditions, and with input costs rising, judicious use of treatments and tree assessments will be essential.

### Jarrah Coates, Northern Rivers



**Seasonal conditions.** Conditions have been very wet, to say the least. This has probably been the most challenging harvest season for Northern Rivers macadamia growers on record!

Significant losses of young trees have been reported in saturated heavy clay soils on the coastal flats and floodplain areas.

**Most significant pests and diseases.** Keeping in mind that these questions were answered in mid-July, and we were only a few weeks into the monitoring season, early out-of-season flower set has carried low levels of macadamia lace bug (specifically only *Ulonemia decoris*). *Botrytis* (grey mould) flower blight was also commonly noted.

As the main flower begins to develop, flower abundance is patchy across some orchards and varieties. Lace bug activity appears to be increasing in orchards that have a history of pressure, with the arrival of *Proteatingis howardi* adults now joining persisting low populations of *Ulonemia decoris*.

*Phytophthora* has been affecting trees in poorly drained areas. General tree health has declined in some orchards where nutrition applications have not been possible since December last year.

**Orchard management responses.** The priority for growers in the Northern Rivers has been on harvesting, which in itself has proven to be an immensely challenging task. Some growers with mature closed canopy orchards are struggling to complete a first-round harvest.

Crop protection is shaping up as a daunting prospect if current weather patterns persist, and growers in orchards with difficult terrain may look to explore novel methods to deliver controls.

Chemical withholding periods must be considered with late harvest and crop protection overlap. Importantly, it should be noted that aerial application of some chemistries is not permitted.

**Key pests and diseases in the coming spring and summer.** General predictions can be a trap, as pest and disease pressures will rarely be ubiquitous across an entire growing region. As always, consistent monitoring is key to make informed decisions based on individually specific data gathered from each orchard and its unique set of challenges.

If wet weather continues through critical crop development stages, associated issues may arise, such as flower blight, husk spot, *Phytophthora* and fruit spotting bug.

**Key management strategies in response to expected pest and disease pressure.** Growers should be organised to maximise small windows of opportunity if wet weather continues into main flower and nut development.

### Bob Maier, Nambucca



**Seasonal conditions.** Wetter conditions have prevailed in the mid north coast, and apart from a few cold mornings, milder temperatures have prevailed. These seasonal conditions are likely contributors to the unusual high levels of out-of-season (OS) flower development,

particularly in Hawaiian varieties.

**Most significant pests and diseases.** OS presence is currently contributing to macadamia lace bug build up. Wetter ongoing conditions have also favoured late fruit spotting bug pressure, and 2022 has also seen high levels of husk spot disease pressure.

*Phytophthora* disease symptoms have also spiked in response to waterlogged conditions, especially at sites with poorer drainage. OS combined with present conditions are favouring patches of *Botrytis* blight (grey mould) within the canopy.

**Orchard management responses.** Following the valuable real-time data supplied from DPI, fruit spotting bug monitoring hedge 'drop sheet' work at several sites was planned (April-May) to confirm the extent of late spotting bug presence and treat the pests accordingly. Ongoing wet and late harvesting pressures made this too hard to implement this season.

Growers in our area have been offered tree shaking services again to reduce husk spot pressure and tree numbers are being finalised to see if we have enough demand to make it viable for the contractor to travel to mid north coast.

**Key pests and diseases in the coming spring and summer.** If forecast wet conditions prevail, we are likely to see more of the above pests and diseases plus possible high macadamia nut borer egg activity. *Leptocoris* is another pest to be watchful for.

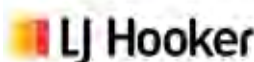
**Key management strategies in response to expected pest and disease pressure.** I am advising growers to monitor their crops regularly and if they haven't already booked their IPDM consultant, do so ASAP. Together you can discuss a range of new and older IPDM tools available that are tailored to your orchard and management needs.



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## Varroa mites – small size, big impact



All macadamia growers would be aware of the heightened threat of Varroa mites, which is the result of *Varroa destructor* being confirmed in hives in NSW in June this year. Since the initial discovery was made in hives near Newcastle, subsequent infestations have been found near Coffs Harbour, Narrabri and the central coast.

While *V. destructor* has been the species most feared by beekeepers, biosecurity agencies and growers, there are other Varroa species, i.e. *V. jacobsoni*, *V. underwoodi*, *V. rindereri* and an un-named species. There is now evidence that *V. jacobsoni* could be reproducing on European honey bees, meaning that it is also a threat to the Australian bee industry.

*Varroa destructor* is a distinctive-looking, parasitic small mite, around 1 mm in diameter. Mites are easily identifiable to the naked eye and are a reddish-brown colour. Photo: © State of Western Australia (Department of Primary Industries and Regional Development, WA)

### About Varroa mites

*V. destructor* is a tiny red-brown external parasite of honey bees which has an impact much greater than its size. This is because of its potential to seriously affect honey production and a wide range of pollination-reliant food crops by debilitating and eventually killing bee colonies. For this reason, they are seen as the most serious pest of honey bees. If they were to establish in Australia, it has been estimated that European honey bees and the pollination services they provide would be reduced by 90 to 100 per cent.

Until the incursion of *V. destructor* in June this year, Australia was the only beekeeping area of the world that had not been infected by this species. It was detected in Victoria in 2018 in a swarm of honey bees arriving in cargo, but the bees were reported by the crew of the arriving vessel and the swarm was eliminated.

*V. jacobsoni*, which looks similar to *V. destructor*, has been detected in Australia previously on exotic honey bees in Townsville in 2016, 2019 and 2020. Each time it was eradicated under the National Varroa Mite Eradication Program to which the macadamia industry contributed. Proof of freedom from *V. jacobsoni* was declared in 2021.

The mite is widely distributed on Asian honey bee throughout Asia. The Asian honey bee has adapted



to withstand *V. jacobsoni* and is its natural host. These mites were not thought to normally reproduce on European honey bees; however, they have recently been observed reproducing on European honey bees at some overseas locations, raising concerns that the same may happen in Australia.

Fortunately, native Australian bees are not affected by Varroa mites.

### Slow death of colonies

Although Varroa mites can feed and live on adult honey bees, they mainly feed and reproduce on larvae and pupae in the developing brood, causing malformation and weakening of honey bees as well as transmitting numerous viruses.

Colonies with low infestation generally show very few symptoms, however, as the mite population increases symptoms become more apparent. Heavy Varroa mite infestations can build up in three to four years and cause scattered brood, crippled and crawling honey bees, impaired flight performance, a lower rate of return to the colony after foraging, a reduced lifespan and a significantly reduced weight of worker bees.

Colony symptoms, commonly called parasitic mite syndrome, include an abnormal brood pattern, sunken and chewed cappings and larvae slumped in the bottom or side of the cell. This ultimately causes a reduction in the honey bee population, replacement of queen bees and eventual colony breakdown and death.

### Managing the NSW outbreak

Since *V. destructor* was found June, NSW DPI has been working with beekeepers across the state to locate infested hives and carry out containment and control activities.

Infested hives are being destroyed humanely to stop its spread, and all movements of hives and equipment onto and off infested premises over the past 12 months are being traced. Surveillance of these premises and a risk analysis are also being conducted, to minimise further spread.

Eradication, surveillance and notification zones have been set up around areas where the mite has been found to manage its spread (the NSW DPI website has comprehensive information about these zones and requirements of beekeepers).

Surveillance of known feral bee hives is also occurring, and moving hives, brood boxes, nucleus hives, packaged bees and queen bees is not permitted anywhere in NSW without a permit.

An industry agreed response plan is in place, with its intent being to eradicate Varroa mite and minimise the impact on businesses, communities, ancillary industries and the environment.

#### Information

For information go to your department of agriculture or primary industries website or the BeeAware website, [www.beeaware.org.au](http://www.beeaware.org.au).

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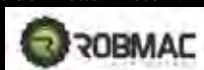
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## Avoiding pesticide resistance

When applying chemistry, it is important not to contribute to pesticide resistance. The key ways to avoid doing this are as follows:

- Alternate different chemicals for the same pest as a way of helping to avoid resistant populations.
- Use chemical mixes with different chemistry (modes of action) to decrease the risk of chemical resistance.
- Use chemicals with two or more modes of action ("targeted genes") to decrease the chance of chemical resistance occurring.

- In general, low dose is better. Higher dose results in higher selective pressure (more rapid development of resistance).
- Avoid chemicals that persist in the environment.

Figure 1 explains how resistance occurs and Figure 2 shows how a resistance strategy can be applied in the orchard.

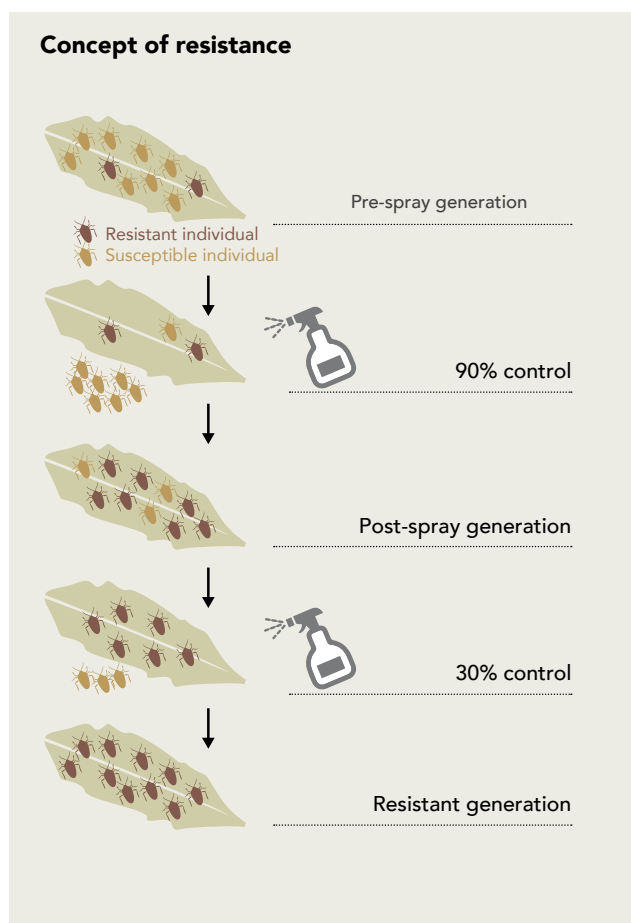


Figure 1. The concept of resistance explained.

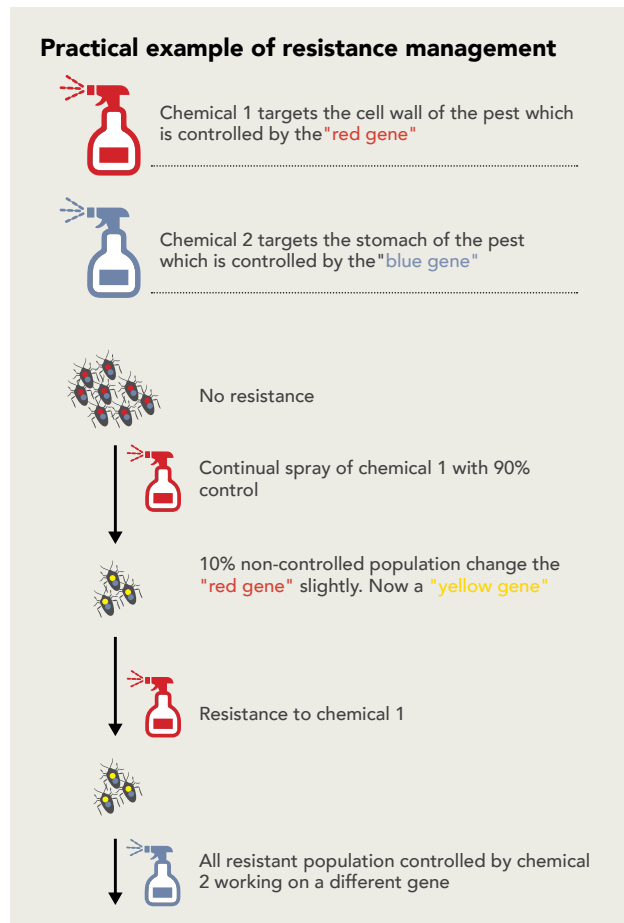
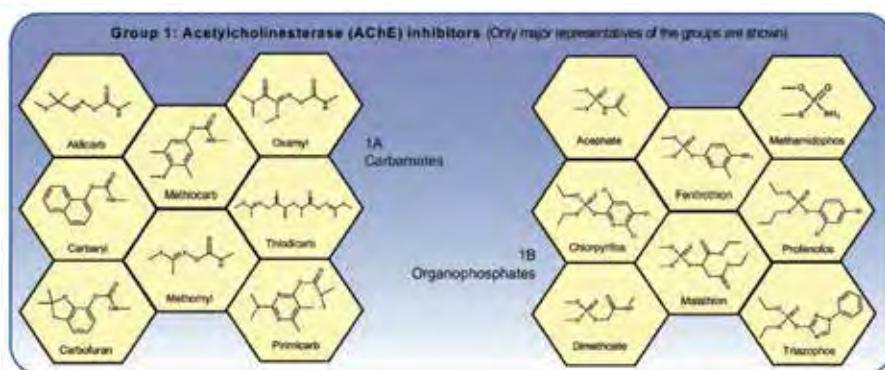


Figure 2. Practical example of resistance management.



The Insect Resistance Action Committee (IRAC) is a global scheme that classifies insecticide modes of action (MoA) and explains how they work at a molecular level. The website (<https://irac-online.org/>) provides information to growers, advisors and crop protection professionals on resistance management strategies.



You can also download a free smartphone app, which has an easy-to-use searchable database by insecticide active ingredient and identifies the respective MoA group.





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# Inadequate coverage limits pest and disease management

One of the persistent issues limiting the effective management of pests and disease is inadequate spray coverage, made worse by ageing trees that are too tall. Dr Jorg Kitt is an internationally recognised expert in application technology in tree crops who was contracted by the AMS to provide his top tips for achieving good coverage. Jorg has authored many grower spray guides, including the Spraywise application handbooks. This article summarises his key messages for the macadamia industry.



## Coverage is key

With the macadamia industry's orchards growing older and taller, it is harder to get sufficient coverage in the tops of trees. The most important aspects of a spray program are to check coverage **at least once a year** and ensure the **correct amount of product** is being applied.

**Check coverage annually.** Trees grow constantly so what was applied 12 months ago will likely not be suitable now. Simple tools to check coverage include water sensitive paper, dye or clay. Don't trust your eyes; looking for spray mist out the top of the canopy is not an indication of good coverage.

Testing allows growers to adjust nozzles, cannons, fan air output and speed. These factors need to work together to achieve good coverage. Often the sprayer's capacity to displace air is a limiting factor for travel speed. If your coverage is poor, test at a lower speed until coverage improves. And vice versa, i.e. when coverage is good, test at a higher speed until coverage becomes poor again.

## Applying the correct amount of product is critical.

Dilute volume is the measurement used to calculate the amount of product required. It is based on reaching the point of runoff (the point at which the liquid applied to a leaf or canopy is at capacity and extra liquid runs off).

The dilute volume differs across orchards and even blocks within an orchard depending on canopy height, volume and density. As trees grow and canopy increases, more liquid is required to reach the point of run off. Some basic principles about dilute volume are:

- larger trees require a greater dilute volume, and smaller trees, a smaller dilute volume
- if the dilute rate is too low, you are under-dosing, risking poor efficacy and resistance
- if the dilute rate is too high, you are wasting money and impacting the environment.



It is important to note that while broadcast dosage rates are stipulated by hectare, product labels for horticultural crops (which are effectively three-dimensional) state a "per 100 L rate".

## The "how to" of effective coverage

**To calculate dilute volume.** Distance-based calibration is the easiest way to work out dilute volume. A macadamia canopy needs as a minimum 25 L per 1 m canopy height per 100 m.

### Example 1: To calculate dilute volume for a 10 m canopy on 10 x 5 m spacing:

#### Per hectare

- Every 100 m driven 1,000 m<sup>2</sup> is covered (100 m distance x 10 m row spacing = 1,000 m<sup>2</sup>). To cover a hectare, which is 10,000 m<sup>2</sup>, you need to drive 100 m ten times.
- Using minimum 25 L per 1 m height, 250 L/100 m is needed (25 L x 10 m tree canopy = 250 L).
- Driving 100 m ten times over the hectare, dilute volume is 2,500 L/ha (250 L x 10 = 2,500 L/ha).

#### Per tree

- Every 100 m driven covers 20 trees (100 m distance/5 m intra-row width = 20 trees).
- As previous, 250 L/100 m is needed and 20 trees per 100 m covered, therefore 12.5 L/tree dilute volume is applied (250 L/20 trees = 12.5 L/tree).

### Example 2: To calculate dilute volume for a 9 m canopy on 8 x 4 m spacing:

#### Per hectare

- Every 100 m driven 800 m<sup>2</sup> is covered (100 m distance x 8 m row spacing = 800 m<sup>2</sup>). To cover a hectare, which is 10,000 m<sup>2</sup>, you need to drive 100 m 12.5 times.
- Using minimum 25 L per 1 m height, 225 L/100 m is needed (25 L x 9 m tree canopy = 225 L).
- Driving 100 m 12.5 times over the hectare, dilute volume is 2,813 L/ha (225 L x 12.5 = 2,812.5 L/ha).

#### Per tree

- Every 100 m driven covers 25 trees (100 m distance/4 m intra-row width = 25 trees).
- As previous, 225 L/100 m is needed and 25 trees per 100 m covered, therefore 9 L/tree dilute volume is applied (225 L/25 trees = 9 L/tree).





**To calculate application rate.** The product's registered dosage rate is multiplied by the orchard's calculated dilute volume to quantify the application rate.

**Example 1: The product requires 50 mL/100 L dosage with an orchard dilute volume of 3,500 L/ha.**

*Application rate*

- The orchard dilute volume is 3,500 L/ha, effectively 35 amounts of 100 L ( $3,500 \text{ L}/100 \text{ L} = 35$ ).
- With 50 mL/100 L dosage rate, 1,750 mL/ha product should be applied ( $50 \text{ mL} \times 35 = 1,750 \text{ mL/ha}$ ).

**Example 2: The product requires 75 mL/100 L dosage with an orchard dilute volume of 2,500 L/ha.**

*Application rate*

- The orchard dilute volume is 2,500 L/ha, effectively 25 amounts of 100 L ( $2,500 \text{ L}/100 \text{ L} = 25$ ).
- With 75 mL/100 L dosage rate, 1,875 mL/ha product should be applied ( $75 \text{ mL} \times 25 = 1,875 \text{ mL/ha}$ ).

## Dilute or concentrate volume and coverage

Increasing dilute volume does not automatically increase spray coverage. With a dilute volume that is too low, you will be under-dosing and running the risk of poor efficacy and poor crop protection. Conversely, with a dilute volume that is too high, you will be over-dosing and wasting money.

While dilute volume is important, growers can also use concentrated rates, provided they are achieving adequate coverage, and if this is specified on the product label. Correct concentrate volumes CANNOT be achieved by simply increasing travel speed or reducing water volumes.

- Increasing travel speed. This will likely reduce coverage as the sprayer is not able to move enough air through the canopy. Travel speed is dictated by fan and pump capacity.
- Reducing water volumes. An appropriate concentration X factor is required in combination with nozzles that put out less water. You are still effectively applying the same active per hectare.

A super spreader can help with coverage if using concentrate volumes but not with dilute volumes as they cause excessive runoff so are not recommended.



Concentrate spraying will not suit all air blast sprayers. Check with your manufacturer and consultant for advice about your situation.

## Get help from a professional

If you are not confident about calculating application rates, working with a trained spray professional will make this process easier. Many agronomists, spray manufacturers and processors offer this service and it is a worthwhile investment.

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# Growers take on the challenge in FNQ

**Leoni Kojetin**, AMS Industry Development Manager



Recently I visited some of Far North Queensland's macadamia orchards, most of which are situated on the Atherton Tablelands. What I found was a group of growers who have done their homework on how to plan and manage their orchards, both established and new, and who are taking advantage of the region's many natural assets in the process.

As a macadamia region, the Atherton Tablelands is small but growing with more orchards being established between Rockhampton and Atherton. It currently represents between 1 and 2 % of national production.

## Working in with the climate

While the region's climate offers a number of opportunities with growing macadamias, it also has its challenges. Its relatively temperate climate is characterised by the following:

- mean daily maximum temperatures around 25 to 29°C, with maximums rarely above 34°C
- mean daily minimum temperatures around 10 to 15°C, with minimum rarely below 5°C
- cooler than coastal regions such as Cairns and Innisfail

- average yearly rainfall around 1400 mm with higher averages in coastal regions
- tropical rains, with most falling between December and April and more distinct, dry winter and spring.

The big challenges for growers are cyclones and east coast lows, rain during harvest and heat.

**Tropical cyclones and east coast lows.** These intense storms have seen significant wind damage as well as flooding. Orchards planted in the late 1990s and early 2000s have been impacted by several storms with some reduced by between 25 and 80% of trees. Growers have responded by not planting wind-prone cultivars such as some of the A cultivars, Daddow and 246, and they have focused on narrower within-row spacing so that trees form a hedgerow sooner and are said to be less susceptible to wind.

**Rain at harvest.** Like many of the growing regions north of Bundaberg, summer rains that continue into autumn pose a problem for harvest, particularly with early dropping cultivars. Some of the new, later dropping cultivars are being trialled as, on paper, they should perform better.

**Heat and vegetative growth.** While temperate conditions can be ideal for vegetative growth, trees shut down in hot conditions. Growers in the region report good initial canopy growth, but on very fertile soils this needs to be balanced to maintain manageable and efficient canopies in the long term.



Along with the challenges of the climate, there are some opportunities, such as higher temperatures and rainfall and an earlier phenological cycle.

**Heat and vegetative growth.** As well as being a challenge, this can also be an opportunity. Macadamias are generally slow growing, and this is mediated in these regions. There is also significant opportunity to grow and use inter-row biomass.

**Earlier phenological cycle and completion of harvest.** Northern growing regions in Australia have an earlier phenological cycle that is roughly two to three weeks earlier than Bundaberg and up to two months earlier than Nambucca Heads. This means that harvest can be completed before flowering and allows growers to repair the orchard floor earlier than is possible in other regions.

**Rainfall.** While the region's annual rainfall supplies most tree water requirements, most orchards are irrigated, which helps trees get through a long dry period as well as mitigate any hot summer conditions. The region has a number of options for access to adequate water and water security is of less concern than it is in other, drier growing regions.

### Management challenges

Growers in the area face several management challenges. One of these is managing wind in new orchards. With tighter spacings being used to improve resilience to wind, trees must be managed earlier than in other regions by either staking or pruning to let wind through the canopies.

Pest management presents different challenges than in regions in the south. With its generally warmer climate, the region's pests don't over-winter and, without a distinct season, can proliferate all year round.

This means that pests must be monitored over a much longer timeframe.

As well, if trees are left to become vegetative, they can be too tall and spray coverage is difficult.

When managing the orchard floor, growers know that ground cover growth can be excessive making species selection in the inter row important.

Because it is a relatively small industry, access to macadamia contractors, consultants and suppliers is limited and growers need to be largely self-reliant when it comes to orchard operations. As well, most consultants and agronomists are generalists, and few have macadamia experience.

Far North Queensland is a long way from other macadamia growing regions and from macadamia processors, the closest of which is at Bundaberg. This means that growers need to have good on-farm post-harvest infrastructure and systems so they can continue harvesting when conditions are good while also quickly reducing nut moisture content and keeping nuts in well-ventilated drying silos.

This is especially important considering that harvest time is likely to be warm and wet, the very conditions under which nut quality rapidly deteriorates.

Another issue to do with the tyranny of distance is higher transport costs for just about any input including fertiliser, parts, experts and nut consignments.

The different conditions on the Atherton Tablelands have prompted some macadamia growers there to approach their enterprises differently and think outside the square when looking at opportunities. In the next article we look at how one grower, Greg O'Neill, has adapted to the different environment to maintain a viable and sustainable macadamia enterprise.

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# Taking advantage of opportunities in FNQ

**Leoni Kojetin**, Industry Development Manager, AMS **M:** 0433 007 925 **E:** leoni.kojetin@macadamias.org

**Growers:** Greg and Wendy O'Neill, Wondaree Macadamias

**Location:** Tolga, Atherton Region, Queensland

**Orchard size and production:** 12 ha, 4t/ha last four years, > 52 t in 2022

**Cultivars and spacing:** A268, 849, 741 and A16 on a 9 x 5 m spacing

**Soil type:** Ferrosols

The different conditions on the Atherton Tablelands have prompted some macadamia growers there to approach their enterprises differently and think outside the square when looking at opportunities. This is certainly the case with Greg and Wendy O'Neill, who established Wondaree Macadamias on their Tolga family farm in 1983.



Greg and Wendy O'Neill established their 12 ha macadamia farm on the Atherton Tablelands in 1983. Over the years it has developed into a highly productive orchard that achieved over 50 t NIS this season.

Greg and Wendy have been through it all - cyclones, pest incursions, trees with AVG and, more recently, COVID and its impact on tourism. For many years, Greg has welcomed bus tours of tourists through the orchard so they can get up close to a working macadamia enterprise.

The small farm is highly productive and achieved over 50 t NIS this season. To increase value from the orchard they also established the retail brand, Wondaree Macadamias, to take advantage of the great story of provenance of the agriculturally rich region and its popularity as a tourist destination. After 32 years Greg and Wendy are winding this retail part of the business down.

The O'Neill family farm is completely self-reliant as far as orchard operations and post-harvest handling are concerned. Greg has also worked to help local agronomists understand what is best for managing macadamias.

Cultivars include A268, 849, 741 and A16 on a 9 x 5 m spacing. If he was starting a new orchard in the region, Greg would opt for A268 and A16 as they perform very well every year (consistently above 5 t/ha, with the original row of 20-year-old A268s at 6 t/ha). They even weathered Cyclone Larry with few losses when it hit the 8-year-old trees. The caveat to this is that he has no experience with some of the newer varietal releases.

The farm is an aggressive AVG (abnormal vertical growth) site, and Greg has embarked on a cincturing program with the 741s whose yield had started to decline. While the trigger for AVG is unknown, the detrimental effect of some Hawaiian cultivars such as 344 and 741 on deep, well-drained, red soils in certain regions is clear.

Greg's solution involves a yearly program, performed at the end of March, where trees are girdled with an approximately 1 cm wide cincture around the trunk of the tree. By the following season the cincture has grown over. He has not seen any long-term tree harm from the practice rather has been delighted with how the 741s recover and their consistent yields of between 4 and 5 t/ha.

## Orchard management

Greg provided an overview of key orchard management strategies, which have been developed over two decades of growing macadamia. He has settled on a streamlined nutrition program and management routine that delivers results for him.

**Nutrition.** The main way of applying fertilisers is through fertigation with the "odd spreader use" to top up some cultivars and negate possible sprinkler





AVG has been an issue on the farm that has affected the 741 trees. Greg has found that an annual cincturing program has successfully restored yields to previous levels.

variation. Greg said that he runs a lean nitrogen regime on the ferrosol soils with 741 and 849 at between 70 and 80 kg/ha, A16 at between 40 and 60 kg/ha, and A268 leaner on between 40 and 50 kg/ha. Leaf nitrogen levels are 1.2 to 1.4 %. Recycled organic matter, including composted husk, is added as well.

After some years in the orchard and developing insights into tree performance, his "gut feel" is important in finetuning the nutrition program. "While I have a program, gauging how the trees are responding and looking throughout the year can mean that I alter nitrogen inputs."

"The tricky one in these soils is phosphorus, and we add small amounts of chicken litter in compost, but not yearly," he added.

Using the fertigation system, he applies a mix of phosphoric acid, molasses and urea in small doses. "Over the last three years we have been using both

fertigation and foliar applications of Supa App, an ammonium polyphosphate, which has a longer chain molecule P, in the hope that the tree has a chance to grab it before lock up. It's an expensive product, but if it works, it will be worth it," he said.

One bonus is that soils are high in potassium so that other than husk recycling in compost, no applications are necessary.

The rest of the nutrition program includes applications of minor nutrients, as follows:

- yearly applications of gypsum as a source of calcium with Endurance Cal (0-0-0-13 + 7.5% calcium) fertigated and added to Balance 3BZM (5% Zn, 5.3% B, 0.23% Mo) for foliar application during flowering, two sprays, one at full green raceme and the other at 80% open bloom
- regular fertigation of very small amounts of boric acid
- annual narrow spray banding of zinc under driplines
- magnesium fertigated as required along with an application before oil accumulation
- keeping the cation balance correct.

**Pruning.** Trees are side-pruned by hand and the AVG rows are topped by machine. Greg said that what guides him in his pruning strategy is the fact that he likes open canopies.

**Harvest.** Harvest is done using a MacMaster Nut Nabba with a front runner pick up head, with all small finger wheels. The front runner is also used to remove nuts from inter-row grass as he mows as inter-row growth rates are high during the early months of nut fall. Harvest rounds are completed frequently.

While ethephon is applied to all cultivars, except 741 which drop cleanly without it, the season is still very protracted because of the mix of cultivars.

### Storage on farm is key

Greg explained that having on-farm post-harvest storage capacity is crucial, particularly during warm, wet periods, which often occur during harvest.

He has two outdoor silos, one with 14 t capacity and the other, 30 t, with air being drawn from inside the dehulling shed. If ambient conditions are moist, a small gas burner assists with drying. Nuts are dried to about 10% moisture, which takes roughly 20 days, and are then bagged into 1 t bulk bags and trucked to the processor.

"We transport nuts to the processor regularly to clear space for different harvest rounds, which range from four to eighteen tonnes," he said.

With few other local growers in the region to network with, one of the things Greg said he is grateful for is the longstanding agronomic and logistic support he has received from his processor, Suncoast Gold, even though it is a long way away. He also said he relies on the AMS, in particular industry information and research outcomes, which are available through channels that remote growers can access such as videos, fact sheets and the *Macadamia News Bulletin*.



Soils on the farm are high in potassium so that other than husk recycling in compost, no applications are necessary.





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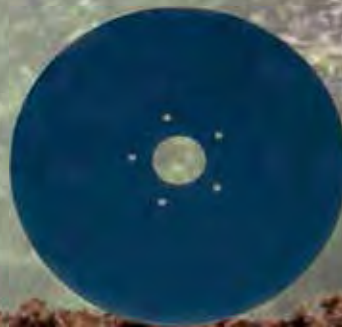
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# Macadamia growers lead the way in Reef Certification

**Michelle Haase**, Hort360 Facilitator in the southern Great Barrier Reef (GBR),  
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The macadamia industry is well and truly leading the way and punching above its weight in the stewardship stakes with a significant number of macadamia growers becoming Reef Certified in the last 18 months.

Reef Certification is a voluntary program and initiative of Growcom that supports the horticulture industry in demonstrating best management practices and stewardship towards improving reef water quality.

Currently there are 81 individual horticulture farms Reef Certified in the Great Barrier Reef (GBR) catchments, with more than half growing macadamias. Collectively, this is nearly 6,000 ha.

## On-farm practices certified as best practice

Being Reef Certified means that the grower has adopted on-farm practices that contribute to improving reef water quality, and that these have been assessed by an independent, third-party auditor.

Best practice for water quality outcomes is contingent on minimising loss of sediment, nutrient, irrigation run-off and pesticide, without impacting production. Horticulture growers can use Growcom's Hort360 program to benchmark their on-farm management practices to understand if they are at best practice. Growers receive a comprehensive report after benchmarking and a snapshot of how they compare to other horticulture growers.

Reef Certified macadamia growers can demonstrate the following:

- grassy inter rows with at least 80% ground cover to increase infiltration and slow run-off
- mulch or other cover in tree lines to minimise loss of topsoil
- functioning, well-maintained headlands, contours and sediment traps to stop sediment loss and erosion
- frequent scouting and monitoring for pests, disease and viruses to help with decision making on chemical use
- precision pesticide and nutrient application to minimise losses and inefficiencies
- soil/leaf and/or sap analysis to inform nutrient budgeting
- use of objective and subjective tools to determine irrigation scheduling.

The interest and support shown by macadamia growers and industry stakeholders by being involved in Reef Certified is true testament to the commitment of the industry towards best practices. Figure 1 shows the

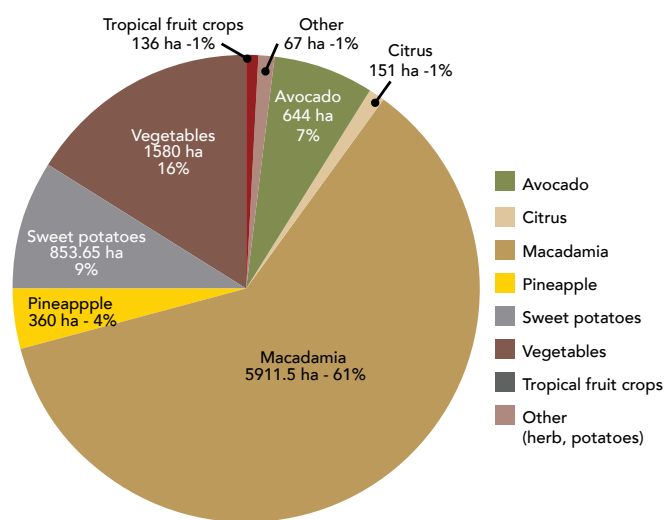


Figure 1. Horticultural industries that have been Reef Certified (in hectares and per cent of total representation).

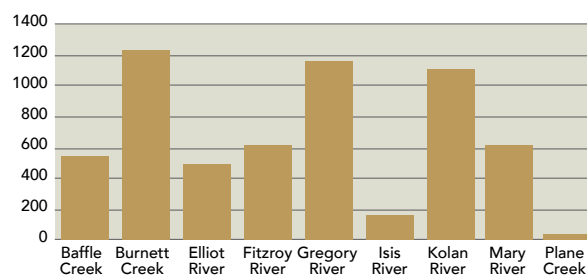


Figure 2. Area in hectares of macadamias that are Reef Certified (catchments and sub-catchment).

other commodities that have come on board with the program, and levels of representation by commodity based on number of hectares.

Currently, the Burnett, Gregory and Kolan catchments in the southern GBR area boast the highest levels of participation for the macadamia industry (Figure 2).

## Certification demonstrates commitment

Growcom is encouraging the macadamia industry to keep the pedal on the metal to maintain momentum with support for this valuable initiative. Growcom has three dedicated facilitators in the GBR who can help growers benchmark practices, make necessary improvements and organise an independent audit.





Johan Oosthuizen with Reef Certified farm gate sign.  
Photo: Michelle Haase

Currently, there is no cost for the audit or to participate in the program, and Reef Certification is only a triennial audit process. Reef Certified growers receive a fully trademarked marketing kit, certificate and farm gate sign.

Benefits to growers are diverse and varied but include:

- evaluating practices and identifying opportunities for improvement
- communicating farm values about commitment to best practice to staff
- demonstrating to government industry commitment to stewardship
- negotiating or leveraging a higher price for produce
- promoting industry values to do with the environment to consumers and the community.

Farm Manager of Alloway Macadamias, Johan Oosthuizen, recently became involved in Growcom's Hort360 BMP program, certifying 285 ha.

"We strive to make a positive difference to the environment through best practices in our orchard, and Reef Certification helps us maintain focus," he said.

#### Information

Reef Certification is an initiative of Hort360 GBR which is funded through the Queensland Government's Queensland Reef Water Quality Program and delivered by Growcom. Growers interested in coming on board and demonstrating commitment to environmental stewardship are encouraged to contact your closest Hort360 Facilitator – we're here to help.

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n. [ *prov-uh-nuhns, -nahns* ]

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# Managing macadamia flowering

Leoni Kojetin and Dr Karina Griffin

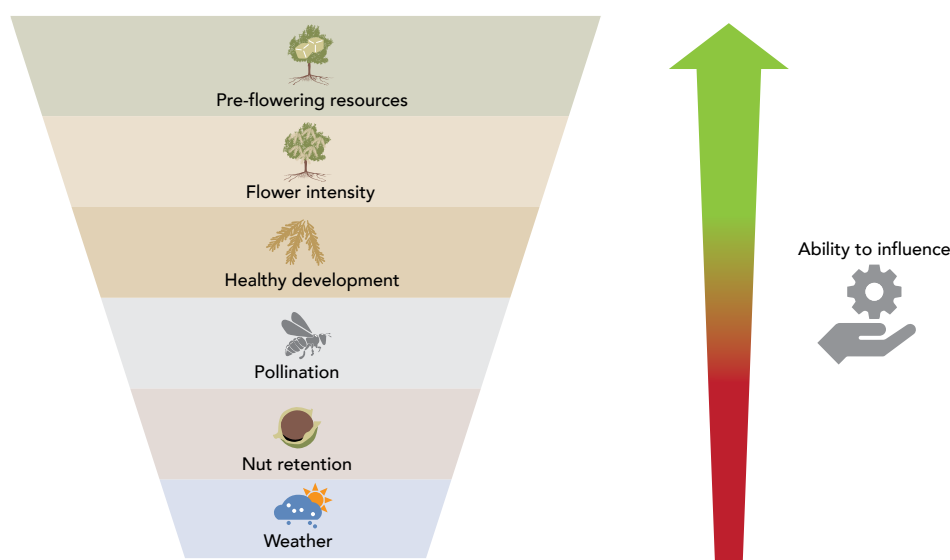
We all know that without the striking period of flowering, there is no macadamia crop. This means it is important to understand the aspects of flowering that are manageable and to identify the real risks or opportunities to focus on.

Macadamias have flowered successfully in their natural habitat for millennia, but in a commercial orchard we want more than just a few nuts to produce offspring; we want a bumper crop every year, and trees need to be well managed to enable that.

## Opportunities to maximise flowering

The factors that need to align for a successful flowering and, more importantly, a good yield include pre-flowering tree resources and the amount and intensity of flowers as well as healthy development, pollination, retention of newly formed nuts and favourable weather. These aren't all equal and many are not within our control, as this trying season has highlighted so clearly.

One helpful way to look at these factors is as a funnel, with those within a grower's control at the top and those the grower has little ability to influence at the bottom.



### Pre-flowering resources



Growers can have the biggest influence on long-term production of tree resources.

Research shows that stored carbohydrates and nutrients are the primary pool fuelling flowering, not current photosynthates.

The larger the pool of resources you have facilitated, the better and more resilient trees will be at flowering.

### Flowering intensity



The number of flowers produced is set in autumn at flower initiation.

Flowers are generally borne on 2- to 3-year-old wood in Hawaiian cultivars and on 1- to 2-year-old wood on A and most new cultivars.

A rejuvenating canopy that allows sites (a scaffold) for flowers is essential.

Macadamia over-flower with up to 3000 racemes per tree and from 100 to 300 florets per raceme.

Whether out-of-season flower detracts from peak flowering is unclear, although research where up to 75% of racemes were removed from a tree showed far less impact on final yield than expected.

There is buffer in over-flowering and this can help set more realistic intervention thresholds.



### Healthy development



This depends on tree resources and favourable weather conditions, with day degrees accounting for 90% of the variation in raceme and floret length.

Other factors affecting development include low humidity, pests, diseases, water availability and nutrient deficiency.

### Pollination



Flowers release pollen up to three days before they are receptive to pollination in a bid to increase cross pollination.

Cross-pollinated nuts are more likely to be retained and increase kernel quality and yield.

Managed species alone are not responsible for pollination, rather a host of naturally occurring species also pollinate macadamia.

### Nut retention



Nut retention is not very well understood but, anecdotally, the greater the nut set, the greater the premature nut drop, which occurs about 60 days after anthesis.

Retention is impacted or exacerbated by hot, dry conditions, as well as pests and diseases.

Less than 1% of flowers develop into nuts that are held through to maturity.

Understanding this process represents a major opportunity to improve productivity.

### Favourable weather



Flower initiation needs minimum temperatures (between 11 and 15°C) and flower development ideally requires a temperature range of between 12 and 18°C.

We can't control the weather, but we can manipulate the orchard to take advantage of natural assets – sunlight, ventilation, biodiversity and orchard floor resilience.

Climate impacts such as rising temperatures, storm intensity and rainfall variability will put pressure on flowering.

## Primary risks to flowering

**Pests.** Several pests can be problematic at flowering and, as with all pests, the overall risk will depend on the region. We can categorise these pests into levels of risk which will be influenced by the orchard and its history.

High risk	Lace bug	<ul style="list-style-type: none"> <li>Not present in all regions</li> <li>Low-moderate populations can cause significant crop loss</li> </ul>
Moderate risk	Flower caterpillar	<ul style="list-style-type: none"> <li>Often sporadic and in populations that are controlled naturally</li> <li>In regions such as Central Qld, can increase rapidly and damage flowers</li> </ul>
Low risk	Felted coccid, thrips and aphids	<ul style="list-style-type: none"> <li>Considered a low risk for flowering, but it is possible for large populations in young trees to cause damage</li> <li>Note that thrips could act as pollinators which adds complexity to the risk</li> </ul>

For more specific information on these pests and their management, see the NSW DPI Plant Protection Guide and talk to your local pest scout.

**Diseases.** The key diseases at flowering are the flower blights caused by the following fungal pathogens:

- Pestalotiopsis macadamaiae* and *Neopestalotiopsis macadamaiae*, the casual agents of dry flower
- Botrytis cinerea*, grey mould
- Cladosporium cladosporioides*, green mould.

Each of these pathogens have specific temperature and humidity ranges within which they are likely to infect and develop in flowers. Monitoring for visual flower defects and weather is crucial.

For more specific information on these diseases including weather ranges conducive to each see the UQ Flower Blight Risk Assessment document and talk to your local pest scout.

**Environment.** As well as the climatic conditions considered ideal for macadamia flowering, risks linked to the orchard environment include dense canopies with poor light penetration, lack of water availability, hot conditions and continual rain over the flowering period.

Nutrient deficiency is another limiting factor that needs to be managed, with the most notable being:

- boron - for its role in healthy pollen tube development
- zinc - for its roles in chlorophyll development
- nitrogen - as a driver of growth
- potassium and calcium - involved in cell function and development as nuts set and grow.

## Managing the risks to flowering

### Pests and diseases

- Know your enemy. Understand pest and disease behaviours, life cycles and signs of damage as well as environmental conditions conducive to incursion.
- Know your risk, monitor and set action thresholds. If you hit your action threshold, know what you are going to do. Understand 'mode of action' and optimal timing for efficacy.
- Avoid using 'rainfast' stickers/adjuvants. They can limit pollen transfer and their effect on pollinators is unknown.
- Read and comply with all label/permit requirements. Check for permit changes to existing products, e.g. volume restrictions.
- Don't just spray as insurance. Just because a pre-flower spray was required last year, don't assume it will be the same this year.
- Minimise impact on beneficials. Complete sprays at pre-flower and not peak flower. Consider spraying in the late afternoon or at night-when bees aren't foraging.
- Manage your orchard environment to reduce risk. Prune for light and airflow, stimulate biodiversity and ensure tree health with good orchard floor practices.

### Environment

- Know your enemy. Understand risky climatic and environmental conditions.
- Manage canopy height, canopy density and alley way to maximise light, airflow, ventilation and access.
- Manage the orchard floor and root zone to mitigate climatic influences, e.g. improve soil health, moisture infiltration and retention, soil biology and drainage.
- Monitor soil moisture. Boots and shovels in the orchard, complemented with remote sensing probes and other technology.
- Adapt irrigation based on monitoring and increase irrigation rates and/or frequency to suit conditions.
- In dryland orchards focus on how you can maximise moisture retention for flowering, e.g. drainage lines, swales, soil health, organic matter and ground cover.
- Assess nutritional requirements in advance.
- Understand nutritional products, i.e. their purpose and role in macadamia, properties that influence tree uptake and optimal application timing.

**Note:** Don't be afraid to critically analyse product claims; if they sound too good to be true, they often are.

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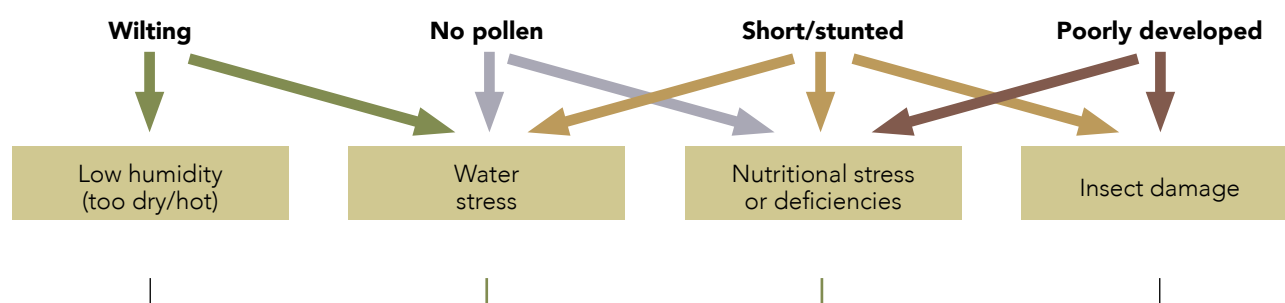
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## Visual monitoring for flower health

An important way of checking flower health is to walk through the orchard and monitor for visual signs that indicate issues with flowering. Indicators of poor and good flowering are shown below.

### Indicators of poor flowering



### Indicators of good flowering

Flourishing white or pink flowers

Large amounts of pollen

Long turgid flowers

Fully formed flowers  
>100 florets/raceme

### Are pollinators active in your orchard?

One way of checking for pollinator activity is to inspect flowers at the middle of the day. If there is no pollen visible on the style of the flower, that is a good indicator of pollinator activity because pollinators remove pollen (seen on the legs of the bee in the photo). Conversely, if you can see pollen clumps on the style, pollinator activity in the orchard is probably low.

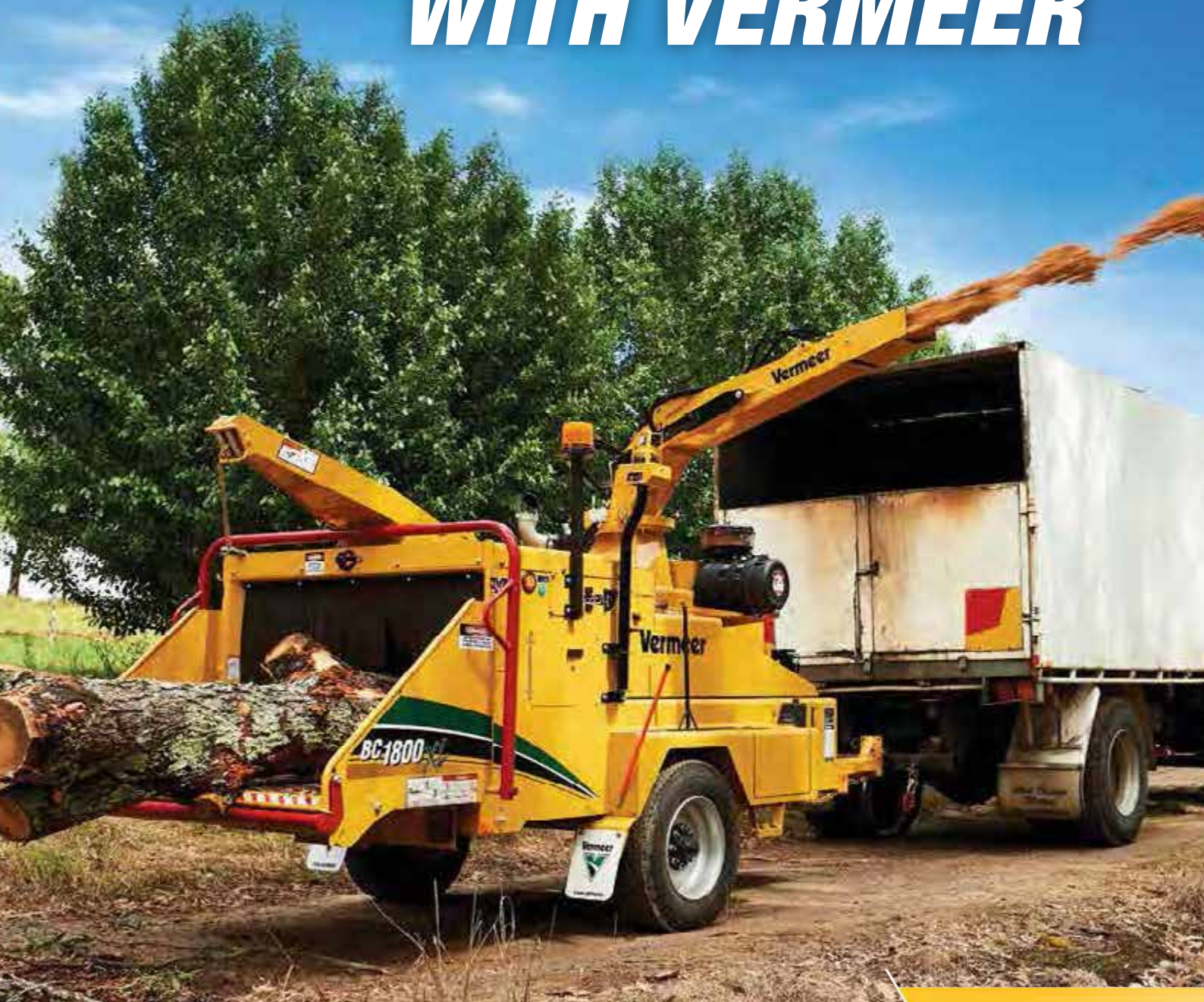
No pollen visible indicating pollinator activity

Pollen visible indicating low pollinator activity



Photo: Chris Fuller

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## Effective pollination helps increase yield

Pollination by agents such as insects underpins production in many crops, including macadamias. Ensuring efficient and effective pollination is one way that growers can increase nut yield in orchards. This article, which explains pollination, is taken from an AMS fact sheet, which you can download from the AMS website.

Research on pollination in macadamias provides pointers to ways growers can manage their orchards and their pollination strategy to ensure effective pollination. Key things to consider are as follows:

- While some varieties can self-pollinate, DNA paternity testing has consistently shown that most nuts come from cross-pollination, highlighting the importance of including pollination strategies in your orchard management plan.
- The most important macadamia pollinators are the honey bee followed by the native stingless bee, although a variety of other naturally occurring species have been identified as macadamia pollinators of lesser importance, including rhinid flies and lycid beetles.
- It is important to monitor pollinator insects in your orchard so you can determine how pollen is being moved between trees and whether there is potential to improve opportunities for cross-pollination.
- Strategies to improve cross-pollination include distributing hives of honey bees or native stingless bees or both through the orchard; incorporating multiple varieties in each orchard block; encouraging foraging by bees by managing the flowering canopy to allow longer periods of sunlight; and testing potential increases from cross-pollination by doing your own hand pollination and comparing results with production from racemes that are naturally pollinated.



Research has shown that most nuts come from cross-pollination by pollinators such as honey bees.

### What is pollination?

When devising a pollination strategy for the orchard it is important to understand what pollination is and how it can occur.

Pollination involves the movement of pollen from the anthers of a flower to the stigma of the same or a different flower.

**Self-pollination** occurs where pollen is moved within and between racemes of the same macadamia variety by a pollinator such as a honey bee or native bee.

**Cross-pollination** occurs where pollen is moved by a pollinator from one macadamia cultivar onto the flowers of a different, compatible cultivar.

An important element in the process of macadamia pollination is fertility.

**Self-fertile** trees can pollinate themselves or trees from the same cultivar and produce nuts (called “selfing”).

**Self-sterile** trees cannot pollinate themselves or trees from the same cultivar to produce nuts, rather they need to be cross-pollinated. **Self-incompatibility** means that there is some constraint that stops self-fertilisation.

Although macadamias are thought to be partially self-incompatible, i.e. they favour fertilisation of the ovule by pollen of another cultivar over its own pollen, research and grower experience has shown that they can produce nuts through self-pollination. Despite this ability for some varieties to self-pollinate, DNA paternity testing by three different research teams in Queensland and New South Wales has consistently shown that most nuts come from cross-pollination. DNA paternity testing has also shown that the nuts produced by self-pollination are often smaller, with lower kernel mass and lower kernel recovery, than the nuts produced by cross-pollination.

Important elements that affect pollination and fertility, hence nut set and production are:

- the nature of the macadamia flower
- floral health
- the presence of pollinators
- weather conditions during flowering
- dietary diversity.

While it was once thought that wind was important for pollination, research has shown that it is not likely to play a significant role. This is in part because macadamia pollen is released in sticky lumps, which are not easily blown around by wind, and because of the small size of the surface of the stigma.

### Information

To find out more about this important topic, download the Pollination fact sheet from the AMS website.



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## Off the shelf is out of the box for floodplain farm

Graham Wessling says he is a great fan of buying equipment off the shelf because it saves time and is often cheaper than having to design and build something to suit a particular situation. And with one of his latest purchases, a skid loader, this is certainly the case.

Graham manages several macadamia farms for LNL Macadamias, including a 100 ha orchard near Lennox Head in the Northern Rivers. Earlier this year, he was looking for a harvester he could use in the orchard, which was still very wet because of the flooding rains that fell in February and March. While the farm did have finger wheel and sweeper harvesters, it was impossible for them to access the orchard because of the risk of getting bogged or creating damaging wheel ruts.

### Off the shelf does the job

After identifying the features he was looking for, Graham searched for a machine that would suit his needs and came up with a 40 hp Vermeer mini skid loader with an 800 kg lift capacity.

"I love off the shelf and that's what this machine is. It is fitted with tracks, which means it can cope with the wet soil in the inter rows without compacting it or getting bogged, and its hydraulic power is the same as an average-sized tractor," he said.

Importantly, the loader has a very tight turning circle so can easily be turned within the row, unlike conventional harvesters. It also has about 60 L/minute auxiliary hydraulic oil flow (which Graham said is ample to run a few augers and brooms when needed) and about 4.5 psi ground pressure.

After designing a simple hybrid harvester that could be attached to the hydraulics of the loader, the finished product was ready to be fitted in three days and has been in use since April. The harvester is fitted with ten finger-wheel packs (off the shelf, of course) and it has a holding bin with a 140 kg capacity.

### Advantages of the machine

Graham said there were several advantages to using the mini loader, one of which is that it is nimble and easy to operate. Once staff are given a safety and operating induction, they can be using the harvester within half a day.

While the holding bin is not big, an experienced operator can harvest up to 6 t of nuts in a day and it can be operated at around the same speed as a conventional harvester.

"That's important to me at times like this when it is so wet because it gets nuts off the ground a lot sooner than I would be able to with our other harvesters. This represents a saving in terms of time and quality, and it keeps the staff busy and the sorting shed ticking over," he said.

Time is of the essence on a floodplain farm like this because of its flat, low-lying topography in what is a swampy area. This means there is often a narrow window for finishing harvest before rain events make the orchard floor too wet for picking up nuts or delay other tasks. Having access to a range of machinery that allows for operations to continue is important.

Graham has done a rough estimate that he can save up to 80 t of nut using the loader because it can access areas in the orchard that the other harvesters can't when the ground is wet. This ability to pick up the nut quickly means rats don't get the opportunity to eat them and quality is likely to be higher.

"We harvest from March until September so anything like the loader that means we won't be held up and can complement our existing machinery when it is wet is a good investment for us. And it means we get a payback year in and year out," he said.

### Version 2 comes next

After having used it in the field for a couple of months Graham said there are a few modifications that can be made such as improving the vision so the wheel packs are easier to see and adding a sweeper that will allow for nuts to be swept out of the inter row and under the trees. They can then be picked up on the return pass.

He said that now he has discovered how flexible the loader is, he is already thinking about other applications that will keep it operating outside of harvest season.

"There are other attachments we can buy, like mulchers, mowers and buckets, again off the shelf, that will be very useful around the orchard," he explained.

Graham emphasised that the loader has been adapted for a particular purpose and, while it is an efficient solution for the Lennox Head farm, it may not suit other growers. He believes that the important thing is that, with a bit of innovative thinking, there could be a solution to a lot of farm issues out there on a shelf somewhere.

"For me, it's great to have something that is so simple, easy to operate and complements our other machinery so well," he said.

His only regret is that he didn't see this solution six months ago as he would have been able to get onto his wet paddocks even earlier.



The mini skid loader has been fitted with a hybrid harvester, which has a holding bin with a 140 kg capacity. In the photo are Graham Wessling (left) and Zac Sullivan, a staff member.



The harvester allows access to the orchard to pick up nuts much sooner than is possible with the farm's sweeper and finger wheel harvesters.



Loading harvested nuts into a skip bin is an easy operation.



Ten off-the-shelf finger wheel packs have been fitted to the harvester and can be easily cleaned.





# Australian Retirement Trust: putting members first

We know from experience that mergers require a huge amount of effort from both organisations. We spoke to Tony O'Mara, Australian Retirement Trust's Regional Manager Central Queensland, about the recent merger, and to gain insights into how Sunsuper and QSuper can leverage each other's strengths to provide better outcomes for their members.



## **Sunsuper and QSuper recently merged to form Australian Retirement Trust, which resulted in one of the country's largest superannuation funds. Why did both organisations decide to merge?**

Extensive due diligence was performed and the boards of both funds agreed that, when combined, the merged fund would be better for members.

Both Sunsuper and QSuper were strong funds individually. Coming together as Australian Retirement Trust has amplified this strength and allowed us to apply the best of both funds' capabilities - using our scale to benefit our members through enhanced services and lower fees."

## **What will the merged fund, Australian Retirement Trust, help to deliver?**

Australian Retirement Trust now has more than \$200 billion and two million members, giving us the strength in markets to access more and larger investment opportunities on behalf of our members.

Initially, Australian Retirement Trust is delivering the same product features, benefits and services members have come to know and trust from their heritage fund. As we look to the future, we'll be looking to provide benefits to members through our increased size and scale."

## **What were some of the things that really stood out to you during the merger?**

Firstly, merging funds has its complexities and requires lots of effort from all areas. We are clearly stronger together and I'm very proud of how we've balanced business as usual on top of the extra effort required to implement such a large merger.

Secondly, our teams have been laser focussed on achieving the best possible outcomes for members. Proactive and ongoing support of our employer clients throughout has ensured a smooth transition and circles back to looking after our members."

We understand you've been running employer information sessions in your region. What are some of the questions employers have been asking about Australian Retirement Trust?

The consensus amongst employers at these sessions is that the use of our clearing house after the merger has been seamless, which pleasingly validates our commitment to employers for a smooth transition.

We've had a few questions about preparing for the Australian Retirement Trust ABN and USI (Universal Superannuation Identifier) changes from 1 July 2022, which of course we will be communicating to all employers to ensure they have what they need to make the change.

## **What will you be focused on over the next 6 to 12 months?**

Will continue servicing our employer clients to make meeting their super obligations as easy as possible. Events such as the recent employer briefing held in Rockhampton allow us to reassure our employers their employees' super is in the best possible hands with Australian Retirement Trust.

## **What excites you about the future?**

With Australian Retirement Trust continuing to grow nationally, I look forward to a wonderful position where we can continue to enhance our services and benefits for members.

Also, our employer clients already leverage some great systems and services and looking toward the future our systems and services will continue to evolve positively which is exciting.

## **Like to join Australian Retirement Trust?**

Are you ready to start making a real difference to you and your employees' retirement by joining Australian Retirement Trust? It's easy to get started.

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Prefer to speak to a member of our team? Call our Contact Centre on **13 11 84** between 8.00am to 6.30pm (AEST) Monday to Friday.



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# How macadamias and ice cream helped to rebuild a nation

Ian McConachie has unearthed this heart-warming story in which macadamias play a starring role. We hope it provides a distraction from floods, lower prices and lace bug, at least for a short while.

In the Caribbean Sea is the beautiful Dominican Republic, mainly known as a landing place in 1492 for Christopher Columbus, who claimed the island for the kingdom of Castile. It is a poor country and in 1979 was devastated by Hurricane David, which killed 2000 people and destroyed 70% of its agriculture and forests.

From 1980 the environmental group Plan Sierra sought to stabilise the denuded hills, partly with macadamias. They also planned that the nuts would provide an income in the future for small farmers, but for many years they were largely ignored because of their hard shells.

In 1997 entered Jesus Moreno, the President of The Loma Quita Espuela Foundation established to conserving the largest rainforest in the Caribbean. The foundation was supported by the ministries of Environment and Agriculture and the International Development Bank.



Moreno was also the founder of Helados Bon, a local ice cream company. To introduce a gourmet line, he added macadamias which became his signature product. For 10 years all local macadamias collected from the forests or from small holders went into the ice cream.

While the macadamias were an essential ingredient in the ice cream, they were performing an even more important role as the ingredient that enabled smallholder farmers to earn an income and allowed the rainforest and its soils to be stabilised.

In 2018 Jesus Moreno established the country's first macadamia processing factory, La Loma Macadamias.

The project is described as the pioneer and the only business model promoting social, sustainable, economic and environmental solutions.

Now there are more than 100,000 orchard trees, more than 200 small growers and 400 ha of forests restored with macadamias.

Well done Sr. Jesus Moreno.

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The Aspirator is used to separate out light debris and to grade nuts by weight. It is available in 24", 36" & 48" widths.



The Pit Elevator is the first stage of many cleaning plants. Savage makes them in several sizes.



The Sizer can be used to size macadamias and as a cleaning reel. It is available with 36", 48" and 60" diameter reels.



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The Stone Remover has two stages: one that removes heavy debris and one that takes out light debris. Available in 36" and 48" widths.



Savage also makes assorted sizes of motorized inspection tables and belt conveyors.



This pre-cleaning assembly incorporates a Pre-vac, Stick Remover, Sizer/Cleaning Reel, and a Trash Conveyor. It is available in three different size configurations.



The Stick Remover uses a rotating sizing chain to remove sticks from the harvested nuts. It is available in 36", 48" & 60" widths.

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## Positive reaction to electrostatic sprayers

All growers know that good spray coverage is a crucial for effective pest and disease management. While this can be achieved in younger orchards without too much difficulty, good coverage becomes more problematic as trees mature and their height increases, with one of the key issues being managing spray drift.

In the last few years, some growers have turned to the option of electrostatic sprayers. We spoke with Steve Morrison from Tisca, a machinery supply company at Nambour on the Sunshine Coast, about why growers are choosing electrostatic sprayers, and their pros and cons.

Steve explained that electrostatic sprayers have been used successfully for some time by macadamia growers in South Africa to apply chemistry. It was on this basis that he decided to see if macadamia growers in Australia were interested.

In the last few years, he has sold several machines to growers, most with mature plantations and tall trees. The key reason for these growers opting for electrostatic sprayers is that spray drift is reduced, and coverage improved in taller trees.

Steve explained that the fact that the droplets are charged means that the spray “sticks to the leaves”. This means lower water volumes are required, and there is reduced drift and improved coverage.

Growers who have bought a sprayer are reporting significant benefits. “One grower has told me that they

achieved at least a 23 per cent increase in yield, while another said their yield has increased by 38 per cent,” he said.

These certainly are significant increases in yield, and it is possible that other orchard management improvements implemented by these growers could have contributed to such positive results.

### Pros and cons

According to Steve, one of the advantages of electrostatic sprayers is that they are much like other spray machinery so there is not a big learning curve involved in using them. Just as with other spray machines, they use Arag spray controllers and can apply the same chemistry as long as it is registered.

The biggest difference is that they are fitted with an electrostatic charger and care must be taken with its operation.

“Operators must be careful that the machine is spraying before they turn on the electrostatic mechanism, otherwise this will cause arcing, he said.



Some growers with mature orchards that have tall trees are opting for electrostatic sprayers because of their potential to reduce spray drift and improve coverage. Photo: Steve Morrison



Tractor size is also important. To spray one side of the row, an 80 hp tractor is needed, while for double-sided spraying a tractor with at least 130 hp is essential.

"Electrostatic sprayers can only be used with a cannon for applying chemistry to the upper part of the canopy," added Steve. "They cannot be used to do the lower part of the canopy with a fan."

### Cost

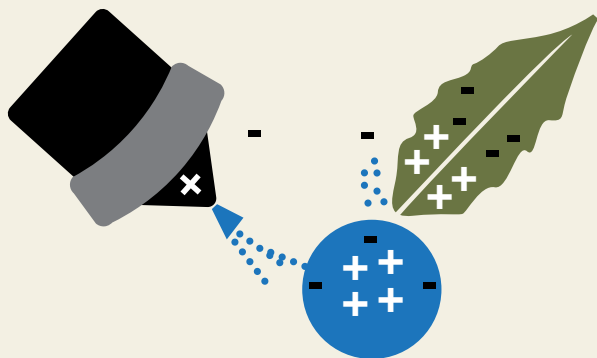
The cost of an electrostatic spray unit depends on tank size, which ranges from 600 to 2000 L. According to Steve, growers looking to buy a machine would need to budget between \$60,000 and \$90,000.

He also made the point that it is growers with older, much taller trees who will benefit from using an electrostatic sprayer because it is effective in reaching the top of canopies and reducing spray drift.

"Growers with smaller trees and younger orchards should be looking at other options for applying sprays," he said.

### The basics of electrostatic sprayers

The key difference between electrostatic sprayers and normal chemical application equipment such as air blast sprayers is that electrostatic sprayers are equipped to impart a positive or negative charge to spray droplets as they are atomised by the spray nozzle. An effect of changing the charge is that the droplet is attracted to a neutral object such as a leaf, which can reduce spray drift (see figure).



**Figure.** The droplet from the nozzle is polarised as it passes through an electric field. The field attracts electrons to the droplet and repels positrons towards the centre. The droplet now has its own field that electrically motivates it to land on neutral objects such as leaves. As the droplets approach the neutral object, the negative charge on the droplet surface repels mobile electrons on the surface of the target (the leaf), which redistribute, creating a relative positive charge on the surface and attract the droplet. Source: *Sprayers 101*, website <https://sprayers101.com/electrostatic/>.

### Feedback from the orchard



*James and Aimee Thomas have used an electrostatic sprayer on their Gympie orchard for several years with the key advantages being good coverage and, as a result, improved pest control.*

James and Aimee Thomas have been using an electrostatic sprayer on their orchard at Gympie. James provides some feedback from the farm on how it has performed.

The Thomas orchard has 8500 trees, mostly a mixture of Hawaiian cultivars aged between 30 and 40 years, with the tallest being between 12 and 14 m high.

James said that they have a 4000 L Trifone vector electrostatic sprayer with two cannons with electrostatic heads and two flower style outlets that are conventional (i.e. non-electrostatic).

"We have been using this for around six years and spray at about 1750 L/ha at a ground speed of 3 km/hr to ensure the best coverage and penetration into the trees," he said.

One of the biggest advantages according to James is that the coverage with the sprayer is excellent and this has had a positive impact on the effectiveness of their pest control: "We consistently reduced the level of insect reject in consignments in the seasons since we swapped from our conventional sprayer and see less damage in the orchard. The Trifone version we are using is very well built and relatively easy to maintain, and we have found that the electrostatic head really improves coverage and gets the spray solution to stay on the target," he said.

For growers thinking about swapping to this method of spray application, James said that based on their experience, the three key things to consider are:

1. With the Trifone and turbine style air system, tractor power is very important as the turbine fan requires more horse power.
2. Ensure that all maintenance is done regularly and clean the sprayer after use to increase its reliability and longevity.
3. As with all sprayers, calibration and set-up needs to be done to suit your individual orchard and tree style.





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*Stephen Hegarty from RDO Australia Group explains how the intelligent spray control rig works.*

## AgTech on trial at Bundaberg

To maintain its position as a global market leader and producer of premium nut, the Australian macadamia industry is constantly on the lookout for innovative ways of growing and processing the crop. One result of this appetite for improving practices is a unique initiative currently underway in the Bundaberg region involving several macadamia orchards. The aim of the initiative is to increase the use of agricultural technology (AgTech).

### AgTech initiative

Central Queensland University's Hinkler AgTech Initiative is funded under the Australian Government's Hinkler Regional Deal and is focused on strong partnerships with agribusinesses to deliver grower-relevant research. The team involved in the initiative is helping AgTech providers trial their technology in real-world, on-farm conditions in partnership with local agribusinesses, with the aim of promoting adoption of the technology on a regional scale.

The team is currently managing more than 50 on-farm trials of AgTech products and services, involving about 35 individual agribusinesses. Thirteen of these trials are on macadamia farms whose managers are testing technologies with direct applicability to the industry. These technologies include autonomous vehicles for operations such as slashing between rows, ground and

drone-based high-resolution crop-scanning imagery for crop health, irrigation and mistletoe monitoring, on-farm connectivity technologies and integrated farm management systems.

The project team is also working with a Bundaberg-based manufacturer to integrate a 'smart' yield monitoring system in a prototype macadamia harvester.

### Smart spray unit being tested

One trial being supported by the initiative involves a partnership between RDO Australia Group and Macadamias Australia. RDO has invested in a smart apply intelligent spray control system. This system incorporates a variable rate spray controller that can be connected to a tower spray unit to deliver varying application rates depending on crop canopy size and density. RDO Integrated Solutions Manager Stephen



Hegarty explained that LiDAR imagery from front-mounted sensors is used to detect tree height and canopy density and the controller then varies spray application rates based on that data.

The LiDAR data also have value in informing other aspects of crop management. "As the operator is spraying, the system records individual tree density data," Stephen said. "This information is combined with Google map overlays to produce crop density heat maps, enabling growers to identify tree stress areas and improve yield forecasts."

John Vaughan, Orchard General Manager at Macadamias Australia, says that initial trial results using the system mounted on a John Deere Gator ATV to simulate a typical macadamia spray rig have been positive. "Our first trial took place in three orchards planted with two-year-old, five-year-old and fully mature trees," he said. "Simulated savings ranged from 16 per cent for mature trees up to 78 per cent for the small trees."

Based on these results, both partners have agreed to advance to Stage 2 of the trial, which involves the system being connected to a fully operational spray rig and evaluated under commercial conditions.

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## Successful macadamia open day for MCT

**Denise Bond**, Executive Officer, Macadamia Conservation Trust, **M:** 0488 432 226 **E:** denise.bond@macadamias.org

Having missed the launch of the Walk with Wild Macadamias, I was very pleased to get to the Community Open Day on 30 July, attended by around 100 people. Russell Bennet's tours, which turned the forest into a living textbook for numerous visitors, were a big hit.

Russell showed me the famous "Amama mini tree", which Ian McConachie has been monitoring for 40 years. This tree is about 1 m tall - the same height as when Ian first saw it in 1980. There are much taller macadamias within a few metres growing in the same soil, and with the same filtered light and access to water, yet the Amama mini tree seems frozen in time, with a trunk not much wider than your thumb. For the first time we saw the tree with new leaf flush on at least three of its branches – proof that it grows though not any bigger. It is also interesting to note that the tree is still only growing serrated juvenile leaves rather than the smoother-edged mature leaves of the surrounding taller trees.

After the crowd thinned out, we took the opportunity to continue along the track to the cascades, which



*Macadamia growing on a rock sustained by little more than leaf litter.*

are looking gorgeous after the recent rain. There we found a macadamia in almost every direction, including one growing in a small depression on a large boulder. Perhaps these trees are tougher than we think in their preferred environment.

### Research ideas stimulated by the Walk with Wild Macadamias

These finds have stimulated discussion on further lessons to be learnt from macadamia habitat. In the words of Chris Searle: "The trees have been shaped over millennia, not only by the climate, but also the soil and its biological life that co-evolved with macadamia, and it's this part of the story we know little about".

With the current interest in soil microbiology, the forest habitat presents a unique opportunity to learn not just about the physical and chemical characteristics of the soil, but also about the bacterial and fungal associations that have evolved along with macadamia. Taking a walk with wild macadamias confirms the importance of preserving macadamia habitat as well as individual macadamia genotypes.

Creating the walk has been a labour of love over the last three years. Many thanks to our partner, the Queensland National Parks and Wildlife Service, and to our sponsors: Suncoast Gold Macadamias, CLMacs, Nutworks, HQPlantations and ArmSign. Finally, thanks to MCT committee members who helped make the launch and the walk such a success and are committed to taking groups on the walk and educating the public about wild macadamias for years to come.



*MCT Committee Member Russell Bennet with 40-year-old Amama tree – inset shows new flush*

## Second delivery of *Macadamia janseni* insurance populations

On a crisp winter morning this July, I arrived at the Tondoon Botanic Gardens in Gladstone to meet curator Brent Braddick and collect a consignment of rare *Macadamia janseni*.

Brent and his team at Tondoon are the guardians of a collection of 44 genotypes of the rarest macadamia species. As the trees grow high enough, nursery staff take cuttings and carefully coax a set of new plants into existence. This work, supported through funding from the Australian Government's National Landcare Program and the Foundation for Saving Australia's Most Endangered Species (FAME), has the aim of creating six living collections of the 44 genotypes at safe sites from Canberra to Bundaberg. To ensure all sites get a complete collection, each cutting must be meticulously labelled from striking stage to 6-inch pot ready for planting.

The first stop was at Bundaberg Botanic Gardens, where the project was launched last year and the first set of trees are now growing happily, and then on to Noosa Botanic Gardens, where MCT Chairperson Paul O'Hare is working with Gardens staff Dallas, Tahlia and Piper to ensure the best conditions for the collection. The third stop was the Maroochy Research Facility, where we hope to grow some of the plants under pollen-exclusion netting to eventually produce pure *M. janseni* nuts and lastly, the Brisbane Botanic Gardens at Mt Coot-tha where the trees will form part of their rare plants collection.

The remaining plants are destined for the North Coast Regional Botanic Gardens at Coffs Harbour and the Australian National Botanic Gardens in Canberra. After these deliveries, most sites will have 75% of the collection, with the final genotypes scheduled to be delivered next year, conditions permitting.



Brent Braddick and Denise Bond taking an inventory of *M. janseni* ready for transport

## NSW DPI Plant Protection Guide available

NSW DPI has just released the 8th edition of its handy Plant Protection Guide. The publication is a key information resource that keeps growers and others in the industry up to date with all aspects of protecting the orchard from pests and diseases.

The guide is available free to macadamia growers and is distributed through all processors. Copies are also available through NSW DPI offices at Wollongbar, the AMS, Local Land Service (NSW) and selected rural stores.

For a hard copy, contact Jeremy Bright at NSW DPI, email [jeremy.bright@dpi.nsw.gov.au](mailto:jeremy.bright@dpi.nsw.gov.au) or you can download a PDF from the NSW DPI website <https://www.dpi.nsw.gov.au/agriculture/horticulture/nuts/growing-guides/macadamia-protection-guide>.

Department of Primary Industries



### Macadamia plant protection guide 2022–23

NSW DPI MANAGEMENT GUIDE



Jeremy Bright

[www.dpi.nsw.gov.au](http://www.dpi.nsw.gov.au)



## Disaster funding helps recovery for Rous orchard

**Owners:** Rowan and Miranda Liebmann

**Orchard:** Rous, Northern Rivers

**Area:** 25 ha

**Cultivars and spacings:** A38 and 203, oldest trees 25 years. Half the area pulled out in 2021 and trees replaced. Spacings are 8 x 5 m and 8 x 4 m with some older tree spacings closer

**Soils and topography:** Ferrosols, flat to slightly undulating

While there has been a lot of information about the devastating effects of the recent floods and severe weather on almost all growers with orchards on the floodplains in the Northern Rivers and in South East Queensland, we have heard less about the impact on growers on the Alstonville Plateau.

We recently spoke with Rowan Liebmann who, with wife Miranda, runs a 25 ha orchard near Rous. Rowan is the first to emphasise that the impact of the severe weather was not as extensive as on the floodplain or in southern Queensland growing areas. Nevertheless, it has resulted in significant damage on his farm, particularly to the orchard floor, which he and Miranda had worked hard to build up since buying the farm eight years ago, as well as to road infrastructure. Fortunately, he was recently successful in applying for a Rural Assistance Authority special assistance grant to help with the recovery.

### Rain and after effects delay harvest

Rowan explained that by the end of March, they had received about 2200 mm of rain, which put paid to any thought of being able to get into the orchard to begin harvest. As with many orchards in the area, showery

weather from March until May meant that access was impossible and began to affect soil health.

"In time, our ground became completely saturated so even small rain events resulted in soil between the trees being washed away, and access was impossible. Each time I tried to get going in the orchard, I got bogged and made a mess," he explained.

While they have lost some nuts, Rowan said that the impact on soil health was the big issue. This was particularly disappointing as he and Miranda had worked for a number of years to build the condition of the orchard floor, which before the rain was very good, as evidenced by the number of earthworms. To see their topsoil and organic matter being washed away was a big blow and it will have an impact on soil microbe populations and the ability of feeder roots to access nutrients, especially in the short term.

As well as dealing with the effects of rain, Rowan said that wind storms caused additional damage: "Some of our trees have lost limbs and we haven't been able to remove them from the orchard so it's still a bit messy. We have one block that has been so impacted that we are going to pull the trees out and replace them".

When the ground started to dry out and they were able to get into the orchard, Rowan discovered that the central roadway that provides access to much of the





*The impact of prolonged wet weather was most severe on the orchard floor, with topsoil and organic matter being washed away.*

orchard was impassable, again making access for harvest machinery impossible and delaying it even further.

Rowan took this delay in his stride, taking the view that because macadamias are “perfectly packaged” to withstand lying for long periods on wet ground in a way that perishable crops aren’t, the delay in harvest could be managed more easily than the physical damage to the orchard floor, trees and roadways.

### **Funding helps with recovery**

The impacts of the wet weather in the first half of the year will be felt by Northern Rivers growers in many ways - including financial, emotional and setbacks to orchard development. Fortunately for Rowan and Miranda and other growers who have been able to access disaster recovery funding, it does provide much-needed assistance.

Rowan said that applying for the grant was a straightforward process that was supported by a case worker at NSW DPI. They applied for funding to improve the quality of their access road, replace soil nutrients lost through the continual rain and replace some trees.

“We gathered photos as evidence of our issues, provided some best estimates on costs and our case worker was very helpful. This is not an easy time and for us it worked well,” he said.

One of the things it doesn’t fund is crop loss, the most significant cause of which until recently was a big population of rats that were sheltering in the long grass and had been “dining out” on the nuts on the orchard floor.

### **Working on priorities**

In June, things were returning to normal as far as the orchard schedule was concerned. The Liebmanns were able to mow some of the long grass that was providing cover for the rats as well as catch up with their harvest. According to Rowan, they are lining up contractors to help with other clean-up activities – if the ground stays dry enough.

Their priority tasks, some of which will be assisted by the funding, are focused on rebuilding soil health, replacing some trees and building a roadway. Rowan explained that they are beginning by replacing organic matter in the orchard by applying chicken litter, composting on-farm and using homemade brews, and mulching over winter. He will be replacing trees by Christmas this year and is planning for the roadway to be built in 2023.

“Things are returning to normal for us, although for many others it will be a much harder road to recovery,” he acknowledged.



## Floods and rain test resilience

**Growers:** Sandra and Olle Lindstrom, Lindols Macadamia

**Location:** Goomboorian near Gympie

**Orchard size:** 45 ha, 11,000 trees

**Cultivars and age:** A variety of cultivars, mainly As, ranging in age from 24 years to less than 12 months (8000 mature)

**Soil type:** Mostly ferrosols with some alluvial loams.

Sandra and Olle Lindstrom are currently in the throes of recovering from the damage caused to their orchard by heavy rain and flooding, not once, but three times this year.

Sandra explained that their orchard was flooded in January, February and May this year, with the February flood being the biggest and the one that caused the most damage. The two creeks running through the orchard contributed to the scale of the problem as the large volume of water that collected in them during the heavy rain meant that it couldn't get away, rather spread out over the orchard, particularly in the flatter areas.

Sandra described a scene of destruction in the orchard with almost 800 of their 18-month-old trees pushed over because of the force of the water, irrigation lines and fences washed away, roads and creek crossings unpassable and older trees damaged by debris such as logs being washed against them.

"At least fifty per cent of the farm has been affected in some way by the flooding, and our estimate is that we will be working on repairs for another six months," said Sandra.



Debris from the flooding was washed into the irrigation shed and into the orchard where it damaged a significant number of trees.

### Establishing priorities for recovery

With such a lot of work in front of the Lindstroms and their two staff, a priority list of actions was essential. Number one was to attend to the block of young trees that had been pushed over by the force of the water as they wanted to maximise their chance of recovery.

This involved the labour-intensive task of straightening the trees and pruning them heavily by 60 per cent to withstand wind and compensate for broken roots. They then applied fertiliser and trace elements and added gravel to areas where soil had been washed away and where the ground was soft. "That took us about three weeks and since then about a third of these trees have died, which means that we now have to graft replacements and replant them," said Sandra.

Next on the list was replacing irrigation lines and essential infrastructure including the electrical board. The electrician's bill of \$30,000 did make them look twice although the good news was that assistance through Queensland Rural and Industry Development Authority will help with this. Fortunately, the sorting and machinery sheds were not affected as they are located on higher ground.



At least half the farm was affected by floodwaters.

The third high priority was to replace creek crossings and roads that had washed out and to clean debris from blocks with older trees. Some of the trees were at 45 degrees, which resulted from debris such as logs knocking up against them, so they had to be straightened and secured. Sandra said that they are still finding debris lodged in the canopies of trees, an indication of the height of the water as it went through the orchard. This clean-up task took another solid three weeks of work.

Harvest is now in progress and while yield is down "a fair bit", Sandra said that this is more a result of premature nut drop than directly related to physical damage to the trees.

Sandra and Olle agreed that the disaster assistance process through QRIDA has been an efficient one. They have supplied photos to support their application and, once approved for assistance, the process is a straightforward one of supplying receipts for paid invoices, which are then reimbursed.

"I understand why this is the case, but it does come at a difficult time from a cashflow point of view as we don't yet have any income from this season's harvest," said Sandra.

#### Next steps

The clean-up is continuing in the orchard, with older trees that were knocked over needing to be replaced. They are also gearing up in the nursery to graft replacements for the younger trees that have died.

"In one way we were fortunate that most damage was done to these younger trees as we have the ability to graft replacements on the farm," said Sandra.

Fencing that was damaged or washed away is yet to be replaced, a job that should be done before year's end.

According to Sandra, they have estimated the damage bill at between \$80,000 and \$90,000 and they believe damage to the trees from the flooding debris has set them back a couple of years.

Sandra said that "resilience" is a term that we have heard bandied about a lot recently and that this disaster has certainly tested their ability to bounce back.

A thought that is often in Olle's mind is, "You start at one end and finish at the other, one day at a time".

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## Australian food personality Magdalena Roze shares her macadamia farm experience

**Jacqui Price**, Market Development Manager

Like so many Australians, Magdalena Roze is taken back to her childhood when she thinks about the first time she tried a macadamia. "It was on holidays when I was seven or eight," she recalls. "My dad got a macadamia nut ice cream, so I did too. And I'll never forget the flavour."

A popular journalist, food writer and cookbook author, Magdalena worked as a TV presenter on major Australian television networks for many years before relocating to Byron Bay with her husband, chef Darren Robertson. We recently hosted Magdalena for an on-farm macadamia experience to help amplify key macadamia messaging among Australian consumers.

By partnering with Magdalena, we were able to communicate the macadamia story to her audience of food lovers to help deepen their understanding of macadamias, how they grow and their versatility as an ingredient in home cooking. Boasting an Instagram following of more than 46,000, she posted a host of engaging content after this immersive experience, including a macadamia chicken satay recipe.

Magdalena was the ideal partner for this collaboration, and not only because of her passion for delicious, wholesome food. As a Byron Bay local, she witnessed first-hand the devastation that unfolded throughout the region during the floods and is sensitive to the ongoing challenges that many people are facing.



*Magdalena Roze tries her hand at using a manual harvester.*

The macadamia experience was hosted at "Malua", the macadamia farm of grower Ross Arnett, which thankfully did not sustain any flood damage. The 10 ha property, which has been in Ross's family since 1872, is home to 2,000 macadamias trees that range in age from 7 to 17 years.

Magdalena was treated to a harvest experience, with Ross showing her macadamia flowers, macadamias growing on the tree and introducing her to the first stage of harvest, when the nuts fall to the ground. After trying her hand at operating a manual harvester, Magdalena moved on to the dehusking shed where she sorted some freshly harvested and dehusked macadamias.

Ross also explained the farming practices he adopts as a regenerative farmer, including soil protection and promotion of biodiversity within the orchard.

A delicious macadamia morning tea was where the taste of macadamias could really shine, with Magdalena enjoying macadamia cake, macadamia butter and vegetarian frittatas with macadamia pesto.


Magdalena says she loves cooking with macadamias at home. "Macadamias are beautiful and delicious and versatile. We make everything from crusts for our

fish, to pesto, to baking, to cookies. We use it for so many different things, and the kids have crackers with macadamia butter and honey in their lunchbox every single day."

We extend our thanks to Ross Arnett for so generously welcoming us to his farm for the collaboration and for sharing his knowledge to help inform Magdalena's fabulous macadamia content.



Magdalena loves cooking with macadamias, which she says are versatile and delicious.




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# Macadamias flip the script on fat as consumers seek satiety and heart healthy ingredients

Jacqui Price, Market Development Manager

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As a delicious source of plant-based protein, macadamias tick a lot of boxes for the modern consumer. Our industry's research has revealed that what has traditionally been one of the biggest barriers to the consumption of macadamia nuts – their fat content – may in fact be one of their greatest strengths.

This was the focus of our most recent trade PR campaign that encouraged brands to rethink how macadamias stack up when it comes to health. The campaign reached a potential audience of more than 920 million and generated 865 pieces of media coverage.

## Changing consumer expectations

Australian macadamia industry research involving more than 6,000 consumers globally revealed that consumers expect a wide range of benefits from food and ingredients. Key findings revealed that:

- more than 70% of consumers are seeking food and ingredients that deliver healthy fats to support heart health
- 60% are seeking healthy fats for satiety.

These insights show how far the consumer mindset has evolved when it comes to the role of good fats in their diets. It wasn't that long ago that consumers were advised to avoid fat at all costs, but it's now known that healthy fats offer some very compelling health benefits. This research revealed how clearly consumers understand this and that it's become something they seek out when making food purchase decisions.

The trade PR campaign targeted media in China, Taiwan, South Korea, Japan, Australia and the USA, with a local health spokesperson quoted in each market, including Australia's accredited practicing dietitian and Nuts for Life Program Manager, Belinda Neville.

"Macadamias have the highest 'good' monounsaturated fat content of all tree nuts," said Belinda. "These fats are beneficial for heart health and reducing the risk of heart disease. In fact, more than 80 per cent of the total fat in macadamia nuts is the heart-healthy monounsaturated type."

## Healthy fat benefits recognised

Our research revealed that many people already recognise the link between macadamias and their healthy fat benefits, with 62% associating macadamias with feeling fuller for longer and 59% seeing macadamias as helping to promote heart health and reduce heart disease risk thanks to their high healthy fat content.

Uptake of macadamias as an ingredient has been strong across several categories, but with consumers embracing their health and wellbeing more than ever and so many recognising the health benefits of macadamias, there is still untapped potential. As an industry, we are excited to see which brands will push the envelope in terms of what's possible with macadamias to meet rising consumer demand for health-enhancing, satisfying and great-tasting products.

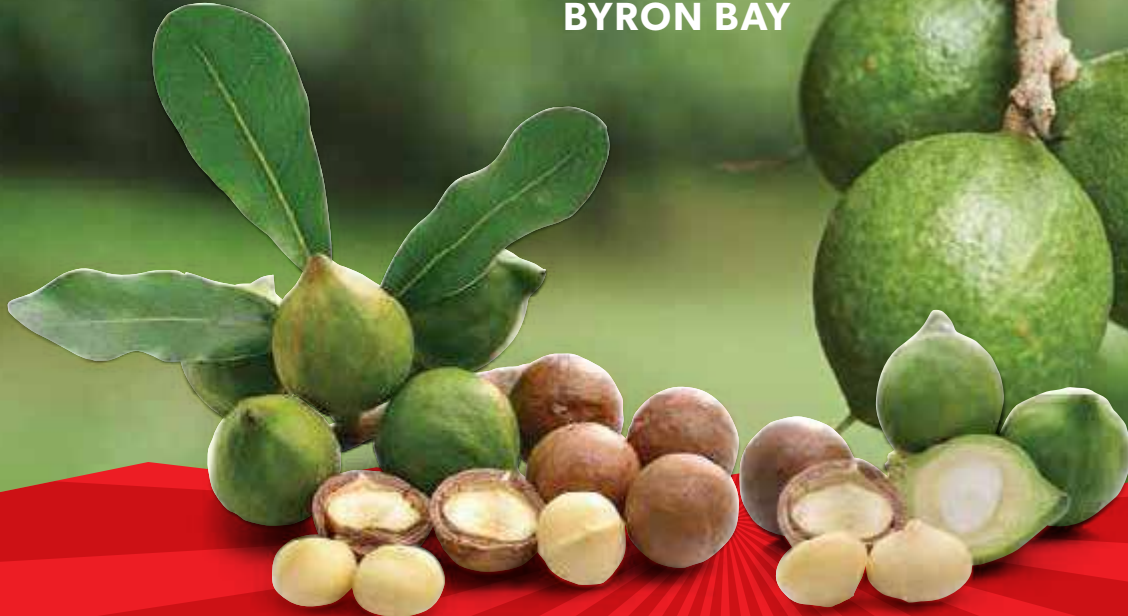


## About the Australian Macadamias research

In late 2020, Australian Macadamias commissioned research based on 6014 individual surveys with consumers in Australia, China, South Korea, Japan, Taiwan and the USA. Conducted by the Singapore regional office of independent research agency Kantar, the research was conducted between August and October 2020 and findings delivered in December 2020.



BYRON BAY





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# Australian macadamia minor use and emergency permits

Current at February 2022

Chemical	Permit no.	Pest/Disease use	Application rate	Withholding period (no. days)	Minor use permits
<b>Minor use permits</b>					
<b>Abamectin</b>	PER87510	Thrips and flat or broad mites	<ul style="list-style-type: none"> <li>Product containing 18 g/L abamectin: 750 mL/ha plus 5 L summer spray oil/ha</li> <li>Product containing 36 g/L abamectin: 375 mL/ha plus 5 L summer spray oil/ha</li> </ul>	28	All states and territories except VIC
<b>Chlorpyrifos &amp; maldison</b>	PER13642	Australian plague locust	<ul style="list-style-type: none"> <li>Product containing 500 g/L chlorpyrifos: 350 mL/ha</li> <li>Product containing 440 g/L maldison: 1.4 or 1.9 L/ha</li> <li>Product containing 500 g/L maldison: 1.2 or 1.7 L/ha</li> <li>Product containing 1000 g/L maldison: 600 or 850 mL/ha</li> <li>Product containing 1150 g/L maldison: 520 or 750 mL/ha</li> <li>Ground application</li> </ul>	Chlorpyrifos: 30 Maldison: Not required when used as directed	All states and territories except VIC
<b>Diazinon</b>	PER14276	Macadamia lace bug	<ul style="list-style-type: none"> <li>Product containing 800 g/L diazinon: 120 mL product/100 L</li> </ul>	14	NSW, QLD & WA only
<b>Ethephon</b>	PER11462	Promote nut fall after maturity reached	<ul style="list-style-type: none"> <li>Product containing 480 g/L ethephon: 65–250 mL/100 L water</li> <li>Product containing 720 g/L ethephon: 55–165 mL/100 L water</li> <li>Product containing 900 g/L ethephon: 44–132 mL/100 L water</li> <li>Do not spray stressed trees</li> <li>Refer to critical comments for varietal rate adjustments</li> </ul>	7	NSW, QLD, WA & NT only
<b>Indoxacarb</b>	PER86827	Macadamia seed weevil	<ul style="list-style-type: none"> <li>Product containing 150 g/L indoxacarb: 50 mL product/100 L</li> <li>Product containing 300 g/kg indoxacarb: 25 g product/100 L</li> </ul>	42	NSW & QLD only
<b>Methomyl</b>	PER90592	Banana fruit caterpillar	<ul style="list-style-type: none"> <li>Product containing 225 g/L methomyl: 1.5–2 L/ha</li> <li>Spraying ground mulch/soil surface up to treelines only</li> <li>Do not spray tree foliage, flowers or developing nutlets</li> </ul>	Not required when used as directed	QLD only
<b>Petroleum oil</b>	PER11635	Macadamia felted coccid	<ul style="list-style-type: none"> <li>Product containing between 763 and 861 g/L petroleum oil: 1 L/100 L water</li> </ul>	Not required when used as directed	NSW & QLD only
<b>Trichlorfon</b>	PER13689	Macadamia lace bug, fruit spotting bug, banana spotting bug and green vegetable bug	<ul style="list-style-type: none"> <li>Product containing 500 g/L trichlorfon: 200 mL/100 L</li> <li>Do not apply a spray volume exceeding 1500 L/ha</li> <li>Do not apply by aircraft or to plants in flower</li> <li>Not compatible with integrated pest management</li> </ul>	2	NSW & QLD only
<b>Emergency permits</b>					
<b>Chlorantraniliprole</b>	PER89353	Fall armyworm	<ul style="list-style-type: none"> <li>Product containing 350 g/kg chlorantraniliprole: 18 g product/100 L + 15 g active/100 L non-ionic surfactant/wetting agent</li> <li>Product containing 200 g/L chlorantraniliprole: 30 mL product/100 L + 5 g active/100 L non-ionic surfactant/wetting agent</li> </ul>	10	All states and territories except VIC
<b>Indoxacarb</b>	PER89278	Fall armyworm	<ul style="list-style-type: none"> <li>Product containing 300 g/kg indoxacarb: 25 g/100L</li> </ul>	42	All states and territories except VIC
<b>Methomyl</b>	PER89293	Fall armyworm	<ul style="list-style-type: none"> <li>Product containing 225 g/L methomyl: 1.5–2 L/ha</li> <li>Product containing 400 g/kg methomyl: 0.84–1.13 kg/ha</li> <li>Spray ground mulch/soil surface only</li> </ul>	Not required when used as directed	All states and territories
<b>Spinetoram</b>	PER89241	Fall armyworm	<ul style="list-style-type: none"> <li>Product containing 120 g/L spinetoram: 40 mL product/100 L</li> </ul>	7	All states and territories except VIC

All efforts have been made to provide the most current, complete and accurate information on these permits, however, AMS and NSW DPI recommend that you confirm the details at the APVMA website portal: <https://portal.apvma.gov.au/permits>.

Growers wishing to use a chemical in the manner approved under a permit should obtain a copy of the relevant permit from the APVMA and must read and comply with all the details, conditions and limitations relevant to that permit.

AUSTRALIAN  MACADAMIA SOCIETY



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