

AUSTRALIAN MACADAMIA SOCIETY

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NEWS BULLETIN

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Front cover. CEO Jolyon Burnett (right) with well-known grower and industry consultant, Kim Wilson. During his time as AMS Chair, Kim worked closely with Jolyon, who is stepping down after 14 years of successfully steering the AMS through the industry's ups and downs. Photo: Mazzer Photographics.

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
1 July	Norm Greber and grower awards close		AMS office email office@macadamias.org
12 to 15 July	MacGroups	Queensland	AMS office email office@macadamias.org
19 to 21 July	MacGroups	NSW	AMS office email office@macadamias.org
9 August	AMS Board meeting		AMS office email office@macadamias.org

CEO's report



In August this year, after guiding the AMS through the ups and downs of the last 14 years, CEO Jolyon Burnett will hand the reins on to his replacement. In his last column for the News Bulletin, Jolyon reflects on the past and what the future might have in store for the industry.

According to the old Chinese saying, we are blessed to live in challenging times. This is really another way of acknowledging that we are faced with problems that are testing us all, and by this measure in the last few years we certainly have been "blessed".

The drought, fires and recent floods have shown that climate change is with us. IPPC predictions indicate that all growing regions are likely to see greater climatic variation in future with more intense conditions more often.

COVID is still with us although, fortunately, some of the most visible impacts are lessening. This said, it is still proving a challenge and causing major disruption to aspects of production and trade.

With exquisite timing, the long-awaited surge in global macadamia production is now arriving and has coincided with a COVID-driven downturn in demand, which is working its way through the supply chain. This is causing increased competition in the global market shifting the delicate balance between seller and buyer and ending the long period of demand outstripping supply. This has all had an impact on farm-gate price and has probably amplified a correction that was coming in any case.

The rapid expansion of the Australian industry, again long expected, is now kicking in. While very welcome and much needed, it brings with it its own set of challenges: lack of equipment, skilled staff and trees and, in the not-too-distant future, lack of processing capacity. A challenge will be finding the resources and the capital to service these new productive hectares.

The larger the industry becomes, the more attention we attract both from the community and from government. This increased scrutiny will mean we have to live up to our best-practice claims and be able to defend our growing practices. Government attention is, of course, a two-edged sword bringing greater support and assistance but also greater regulation and intervention.

On a positive note, the industry's fundamentals remain sound, and we have one of the best products in agriculture - healthy, versatile, shippable, and with a taste profile to die for. Nuts for Life and the Australian Macadamias' marketing programs are two of the most professional and effective market development initiatives in Australian agriculture.

We represent under 2% of global tree nut trade. Indonesia, Malaysia and India, among the most populous and nut-obsessed countries on earth, are

yet to be converted to the joys of macadamias, as are the significant markets of Europe and the Middle East. If the Australian industry can continue its leadership of collaborative demand stimulation and market development through the World Macadamia Organisation and meet its funding obligations through continued strong support for the Voluntary Marketing Fund, the softening of the farm-gate price can be a speed bump and not a car crash.

This will all take strong and visionary leadership. The AMS Board has developed a new industry strategic plan and a companion AMS business plan. These documents provide a road map to navigate the challenges we face, including greater cooperation between all parts of the industry, a more effective levy investment landscape and a new AMS membership and service structure.

It is a time for new leadership at the AMS, a CEO with new skills that are better aligned to these challenges. A CEO with a boldness not constrained by too much history and a little frustration, and perhaps a few less miles on the clock. I wish the new CEO all the best and encourage you all to give them all the support you can.

I would like to thank all those who have not only helped me over the last 14 years but have also made that time a pleasurable and, hopefully, productive one.

Board members have come and gone but almost without exception have been dedicated, professional and passionate about the AMS and its members. They have given their time generously and freely (literally). The five chairs I have worked with have all provided leadership and wise counsel and have given board meetings and other activities their own character.

Many members have been helpful, supportive and generous. It has truly been an honour to serve the membership and I hope that you feel you were well served.

Finally, I want to pay tribute to the staff of the AMS. From the day I walked into Dawson Street and was asked if I could walk on water "because that's what we need", I have been supported by the most professional, capable and dedicated team I have ever worked with. The success and achievements of the last 14 years are theirs; the disappointments and mistakes have been mine. I, and all members, owe them a great debt of gratitude.

I hope and believe the best times and greatest successes of the AMS and the Australian macadamia industry are still to come. I hope you all enjoy them.

Jolyon Burnett, CEO

Macadamia kernel imports continue to improve

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Supply

The 2022 global crop is forecast to be up 6.4% on the 2021 season, despite challenging weather conditions in the two largest producing origins. The initial crop forecast published for the Australian 2022 season predicted a crop of 54,930 t in-shell @ 3.5% moisture (58,900 t in-shell @ 10% moisture). In May this forecast was reduced by 10%, as a direct result of the recent severe weather and flooding in NSW and South East Queensland. The revised forecast is now 49,340 t in-shell @ 3.5% moisture (52,900 t in-shell @ 10% moisture). NSW growers

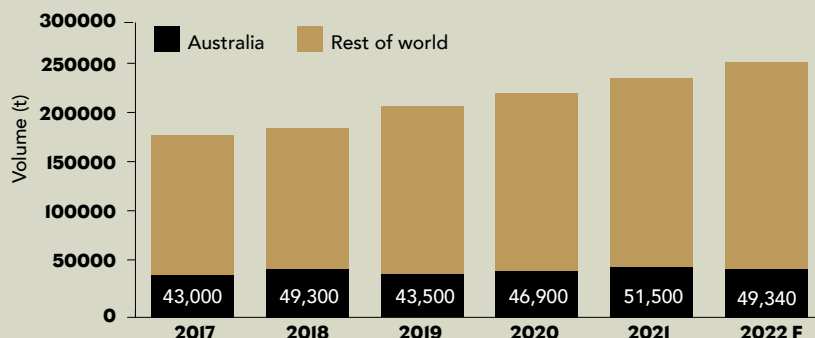


Figure 1. Global macadamia crop volumes 2017-2022 (tonnes)
Source: INC, AMS, SAMAC. All volumes are at 3.5% MC.

have been worst affected, and the prolonged rainfall which followed the two flooding events has made harvest more difficult. In contrast and despite

being affected by severe flooding, South Africa has recently increased its forecast from 57,723 t in-shell @ 3.5% moisture to 61,288 t.



Demand

Macadamia kernel imports continue to improve, albeit slowly, with the top markets combined up 5% on the previous MAT period. As the Europe market opens post COVID-19, we are seeing stronger growth (+15%). Imports to China/HK remain positive (+10%), however, the rate of growth is slowing from the highs of the last 12 months and is likely to be impacted by the current extended lockdowns in the China market. The domestic market has been stable over the last MAT period. Demand is expected to improve as Australian consumers transition through the removal of restrictions and border openings, resulting in increased travel. Demand in the US market remains at levels well below the last five years. As the largest global market for macadamia kernel, the

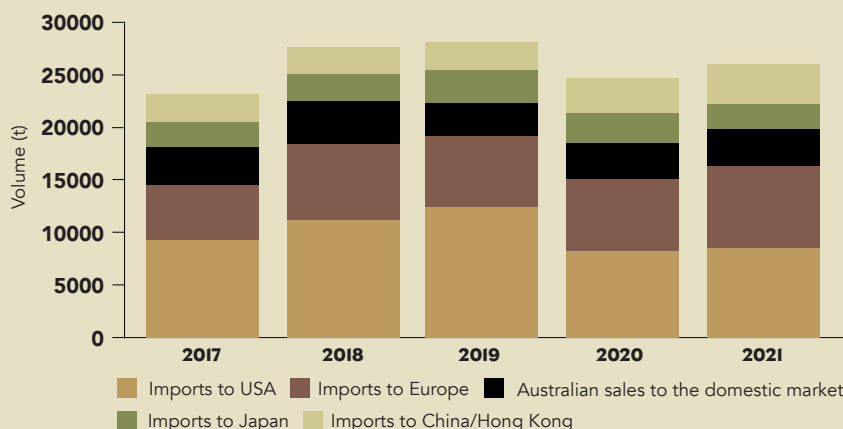


Figure 2. Macadamia kernel imports to top five markets (tonnes) MAT March to February
Sources: USDA, Eurostat, Japan Customs, China Customs, Hong Kong Census & Statistics Department via HIS Markit Inc, AMHA

slow return to previous demand is driving increased price competition, particularly in the ingredient styles. In-shell imports to China continue to increase year on year and were up 27% for 2021 compared to 2020

(MAT April to March). Australian imports increased 9% for the period, resulting in a reduced market share of 28%. South Africa recorded its highest ever imports, capturing market share of 40%.



Australian sales

The Australian industry recorded a strong 12 months for the MAT period (April to March), assisted by a good start to new season sales in March. Sales were up 15% for the 12 months, driven by strong sales in Germany and most Asian markets, particularly China (+122%).

Key challenges for the Australian industry continue to be global price competition in ingredient style kernel and increasing costs and complexity in the supply chain. Indications are these conditions will continue into 2023.

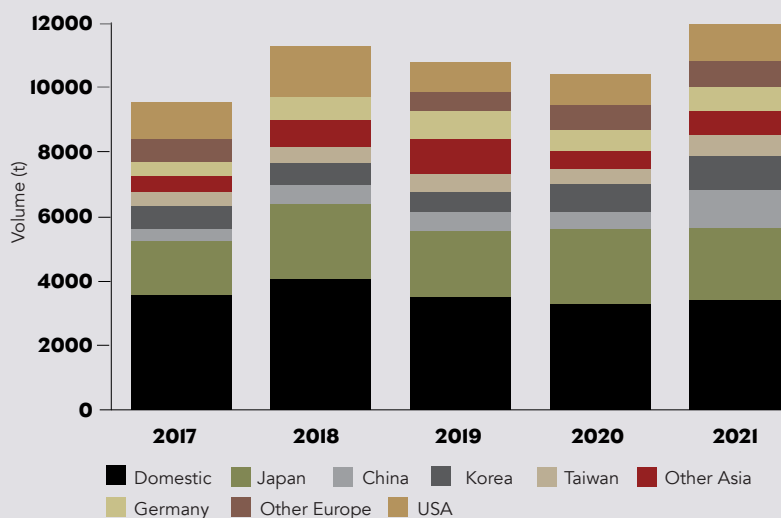


Figure 3. Australian macadamia sales (tonnes) MAT (April to March)

Source: AMHA. AMHA represents 90% production, sales are adjusted to represent non AMHA members.

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Leoni's orchard rounds

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Many growing regions have been on a roller-coaster ride in the 2022 season. With favourable spring and early summer conditions in 2021, we had the makings of an excellent season with the largest crop on record forecast. Unfortunately, La Niña conditions brought more rain than anyone could have imagined was possible to most regions other than central and north Queensland, which in large part missed the worst of the rain and flooding and are looking at a good season

As of May, the 2022 crop forecast is 52,900 t (@10%). Quality reports from Queensland, have been good although the incidence of both husk rot and husk spot has increased and this could be contributing to higher immaturity levels at the start of the season. There has also been an increase in late season insect stings, which are noticeably higher in factory reports. Kernel recoveries are higher than average, but a national trend is uncertain with so little of the NSW crop harvested. The AMS estimated that less than a quarter of the NSW crop had been harvested by the end of May.

Rising costs require greater prioritisation

The rising price of basic inputs like fuel, fertilisers and other farm expenditure like labour costs, along with the effects of storms and floods, have many growers prioritising their management strategies for the rest of the year. Compounding the situation is a farm-gate price drop, due in large part to the softening market price for nuts including the largest traded tree nut – almonds – and slower demand for ingredient kernel styles consumed out of home.

Growers who have seen price corrections in the past speak passionately of holding firmly to crop inputs and orchard investment to maintain orchard profitability, however, this strategy is being tested by the cost of inputs and contractor services and supply shortages. Three key figures highlight this:

	Diesel per litre	
	January 2021	\$1.20
	April 2022	\$2.10
	Urea per tonne	
	January 2021	\$350
	April 2022	\$1200
	Inflation rate	
	January 2021	0.9%
	April 2022	5.1%

While many other factors are not within our control, a focus on maximising orchard productivity and efficiency of operations is. Prioritising honestly what on-farm activities and costs bring in the best return on investment will be essential to maintain profitability.

Industry resources available

The industry has a substantial bank of resources available to help growers assess orchard performance and profitability. The Benchmarking project and individual farm reports they produce, industry consultants, processor grower liaison officers and government/research agency staff can all help growers to answer fundamental questions:

- What is my farm's true cost of production?
- What are my most profitable and least profitable blocks and, importantly, why?
- What are the opportunities to improve productivity and sustainability?

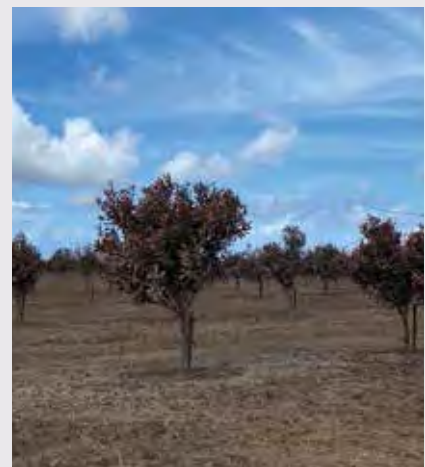
When you analyse consistently top performing growers, they aren't from a single region, nor do they have a particular management structure or an ideal tree age. They are represented in all parts of industry, and what sets them apart is that they really know where production is coming from and what the cost of achieving that is. I have found these growers to be incredibly gracious with their learnings and I encourage you to take advantage of the sharing culture we still maintain in the industry.

The regions worst affected by severe weather

It is difficult to convey the impact the recent weather has had on so many. Some orchards in the Glass House Mountains region suffered major hail and wind damage with significant tree loss. Trees look like they have been put through a mulcher or just pulled out the ground. In Gympie and Maryborough, severe flooding in February caused orchard floor washouts and pushed small trees over. Similarly, parts of Childers, Bundaberg, Gin Gin and Bucca experienced severe storms resulting in flash flooding, wind impacts and orchard infrastructure damage. Despite this rocky start, events have been generally favourable to harvest and much of the



From left to right: Hail-damaged trees in Beerwah, trees knocked over by flooding in Goomboorian (near Gympie) and an inundated orchard in Childers



Post-flood orchard devastation at Dungarubba, near Woodburn

Queensland crop is steadily heading to processing facilities.

The NSW harvest is, unfortunately, not as on course. Harvest has been severely hampered by the wet conditions and flooding, with many orchard areas simply impassable while long grass is swamping nuts. In late February and March, the NSW north and central coasts had record rainfall. In the Northern Rivers, macadamia growing towns like Dunoon and Rosebank recorded more than 750 mm of rain in 24 hours (the second highest 24-hour rainfall ever recorded in the State). On the undulating plateau orchards this meant torrents of water scouring orchard floors, washing away soil, organic matter, roadways and early crop. Orchard clean-up was impossible for many growers, who have had to wait for drier days to attempt harvesting.

With rivers peaking higher than anything experienced in recorded history, metres of water completely covered new orchards in the low-lying floodplains. Water was slow to drain and consistent rainfall in the following weeks kept orchards impassable and caused widespread tree death. In addition, the destruction of towns such as Lismore, Coraki, Woodburn and Broadwater where growers, farm staff and industry members were living has made the situation more

difficult. For those who had started to recover and restore orchards, the second flood four weeks later was a big blow. You can read about some of the devastation and the different cultivar responses from the inundation in the article on page 42.

With rain moving south, NSW Mid North coast orchards, some of which have been flooded two seasons in a row, were also impacted. A small mercy was the delay in nut drop. Being the last region to start harvest, less crop was washed away but orchard damage is severe, harvest is delayed and, as with the Northern Rivers, there is uncertainty about the long-term impact of wet conditions and the potential for increased disease.

With all these pressures, there is no better time to find out how growers are managing their orchards and challenges. Growers listen to other growers, so take the opportunity to get off the farm and visit a neighbour, or to take advantage of organised events. We will be holding MacGroup meetings in most growing regions in July 2022 and this will be another chance for you to hear how others have managed the roller-coaster season.

I look forward to seeing you there.

Leoni

AMS Chief Executive Officer to step down after 14 years

After 14 years at the helm of the AMS, Jolyon Burnett has announced his intention to step down from the role of CEO when his contract expires in August this year.

AMS Chair Craig Mills paid tribute to Jolyon on behalf of the Board following the announcement.

"When Jolyon joined the AMS in 2008, the industry was facing significant challenges. Farm-gate prices were low, our membership was dwindling, and various industry reviews had highlighted issues with the performance of the society.

"Jolyon was appointed to rebuild and strengthen our organisation, which he has done with outstanding commitment and professionalism," said Craig. "He is a passionate advocate for our industry at all levels of government – local, state and federal – as well as the global stage."

Craig said Jolyon brought an abundance of energy and expertise to the role and worked tirelessly to grow the AMS and the services and support it provides to members, so that it is regarded as one of Australia's strongest horticultural organisations. It now has a robust membership of more than 1000 members, representing more than 85% of Australia's macadamia production.

"Importantly, Jolyon leaves the AMS in a much stronger and financially secure position, and with a team of nine professional staff who are servicing all major macadamia growing regions," he said.

During his tenure, Jolyon drove many important achievements. These included revitalising MacGroups, whose participation grew from tens to hundreds, and partnering with NSW DPI to develop and launch the

successful *Integrated Orchard Management Guide*. The *News Bulletin* and AMS conference have evolved into some of the most professional and profitable communications vehicles in horticulture.

"Jolyon played a pivotal role in the AMS taking ownership of the levy-funded marketing program, which resulted in a more professional, targeted and commercially focused program with tangible outcomes. The development and growth of the Australian Macadamias brand remains one of the key achievements. As well, he helped establish the collection of critical industry data with the assistance of the Australian Macadamia Handlers Association (AMHA)."

"Jolyon also took a particular interest in the Macadamia Conservation Trust, ensuring the AMS maintained its support until it could become self-sufficient," he added.

More recently, Jolyon worked with the global industry to establish the World Macadamia Organisation (WMO) and led the establishment of the Voluntary Marketing Fund to finance it.

"Jolyon's drive and commitment to the role, our industry and to Australian horticulture has been exceptional. The Board thank him for his leadership and the significant contribution he has made to the Society and global macadamia industry. We wish him all the best in his future endeavours."

The AMS Board has begun recruiting a new CEO, which will allow time for a smooth transition and handover of responsibilities.

The new CEO will be charged with overseeing the implementation of the AMS's recently completed Industry Strategic Plan and the proposed membership restructure that supports the goals of the new plan.



AMS CEO Jolyon Burnett at the International Nut Conference held in May 2022 in Dubai. Jolyon, who is stepping down as CEO, has been committed to growing the AMS and expanding the role of the Australian industry on the global scene. Photo (l to r): Larry McHugh (Marquis Macadamias), Jolyon Burnett, Jillian Lang (WMO), Jacqui Price (AMS) and Michael Russo (grower and AMS Board member).

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Pollen sources for stingless bees in the orchard

Rachele Wilson and **Professor Helen Wallace**,
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Centre for Planetary Health and Food Security,
Griffith University

Rachele Wilson and Professor Helen Wallace recently completed a handy guide - *Supporting stingless bees for pollination of macadamia* - that macadamia growers can use to manage stingless bees in the orchard and to identify plant species that support them when macadamias are not flowering. During their research for the guide, Rachele and Helen identified major plant sources in the pollen pots of 57 *Tetragonula carbonaria* colonies over two years in orchards and forests in South East Queensland. This article is a snapshot of the guide.

Stingless bees are excellent pollinators of macadamia and will forage heavily on macadamia when it is in flower, but what do they do for the rest of the year?

Stingless bees need a range of flowers to maintain their strength and to grow, which means that bees in hives left on farm year-round may starve if they do not have access to other food sources when macadamia is not flowering.

This is even though stingless bee colonies store and ration macadamia pollens between crop flowering, possibly to compensate for seasonal lack of food. Macadamia pollens make up between 50 and 75% of stingless bee pollen pots in spring, decrease in summer (29 to 31 %) and autumn (8 to 19 %) and increase again in winter (31 to 42 %). Table 1 shows sources of pollen based on season and identifies the different plant species stingless bees forage on.

Spring is when flowering in macadamia peaks and stingless bees in orchards focus most of their foraging. Colonies are stronger if they can mix macadamia with other pollen sources. Keeping flowering strips of herbaceous plants between rows helps colonies to optimise mixing while staying close to the target crop.

Summer is when pollen stores still include mostly macadamia, but are topped up with turpentine, *Persoonia virgata*, *Glochidion* spp., *Corymbia* spp., wild radish, billy goat weed and *Cannabaceae* spp.

Autumn is when pollen diets become most diverse and bees fly further to find forage. Eucalyptus and *Melaleuca* spp. are targeted in orchards (year-round in forests) as well as picabeen palm, *Araliaceae* spp. and weeds such as the invasive groundsel bush.

Winter is often the driest season, particularly the month of August. Bee pollen diets remain diverse with foragers even collecting pollen from grasses, sedges and parasitic mistletoes (*Amyema* spp.) as well as wattles and she-oaks. Pollen stores include a lot of golden penda, picabeen palm and early blooming macadamia, and the weeds wild radish and billy goat weed.

Table 1. Seasonal sources of pollen for stingless bees.



Stingless bees are important pollinators in macadamia orchards that need a variety of plants to provide a year-round source of pollen. Photo: Helen Wallace.

Using the guide

Plants featured in the guide are listed in four categories - trees, shrubs, ground covers and riparian vegetation - from most abundant to least and selected due to their availability as seed or tube stock (unless existing as weeds of agriculture). Using this information, growers can increase plant diversity on farm (and, if possible, nearby forests) to ensure that flowers are available year-round for hives of stingless bees kept on farm.

Flowering trees are the most important source of food and nest materials for stingless bees, particularly if they exude resin, as colonies need plant resins to make structures within the hive.

In the short term, growers and other land managers could consider conserving existing riparian zones, windbreaks and other trees and retaining fast-growing annual herbs, including some weeds, between crop rows until just before seed development. Long-term strategies could include planting flowering trees and shrubs in unproductive areas such as along creeks and beside dams or as windbreaks.

Examples of species in each category included in the guide is shown in tables 2 to 5. For a full list, download the guide from the AMS website. Note that images of plants in tables 2 to 5 are copyright free and obtained from the public domain.



Cross-section of an opened stingless bee hive showing brood spiral, protective involucrum, pollen pots, honey pots and bees. All these structures in the hive are made using propolis, a mixture of beeswax and plant resins. Photo: Rachele Wilson.

Trees

Trees are important pollen sources for stingless bees (and other native bees) and comprised almost 40% of the top pollen source plants in our study. Trees are like vertical gardens for bees; however, some species are hard to keep alive during droughts, and eucalypts tend not to flower if it is too dry. Table 2 below is a sample of trees that we found were very common in hive pollen pots. Download the guide for a full list.

Table 2. Sample of trees that are important pollen sources for stingless bees.

 Tony Rodd	Celery wood (<i>Polyscias elegans</i>) • Fast growing	Tree 10 to 30 m with panicles of purple-black flowers. Fruit also purple-black when ripe. Grows in a range of habitats, often in rainforests and vine thickets. Fast-growing pioneer, especially in moist soil. Prefers full sun, adaptable to most well-drained soils.	● ● ● ●
 Maureguanandi	Umbrella tree (<i>Schefflera actinophylla</i>) • Fast growing	Tree 6 to 10 m tall (occasionally to 20 m). Large umbrella-like compound leaves, small red flowers in branched clusters and small fruits (6 to 12 mm) that turn dark red or dark purple as they mature. Native to northern and central Queensland. Environmental weed in southern places.	● ● ● ●
 Kim Starr	Picabeen palm (<i>Archontophoenix cunninghamiana</i>) • Fast growing	Palm to 30 m. Small lilac flowers and red fruits. Found naturally in wet areas, planted widely in public spaces. Grows in a range of soil types, partial shade or full sun. Seeds germinate in high humidity and temperature (1 to 3 months).	● ● ● ●
 Greg Tasney	Green bolly gum (<i>Neolitsea australiensis</i>)	Under-storey tree, usually between 6 and 15 m tall. Cream flowers in clusters. Black fruits to 10 mm diameter attractive to birds. Found in subtropical rainforest in lowland and coastal ranges on fertile soil. Prefers sheltered, moist, free-draining soil in light shade.	● ● ● ●
 Summerdrought	Swamp bloodwood (<i>Corymbia ptychocarpa</i>)	Small to medium tree to 15 m. Native to northern WA, NT; planted as a street tree in Queensland. Prefers a protected sunny position. Ideal as waterside tree, due to open weeping form and tolerance of waterlogged soils. Seeds germinate easily.	● ● ● ●

Key

● spring ● summer ● autumn ● winter

Coloured circles in the column next to plant descriptions indicate the season in which pollens were detected in stingless bee pollen pots.

Shrubs

Table 3 describes a sample of shrubs suitable for edging, in gardens close to buildings or as under-canopy plants in revegetation areas.

Table 3. Shrubs that can be used for edging and in gardens as pollen sources for stingless bees.

 Joao Augusto Bagatini	Muttonwood <i>(Myrsine umbellata)</i> • Ornamental	Evergreen tree, 5 to 15 m. Found in woodland and open habitats. Tolerant of a range of soil conditions and moisture. Prefers sunny position. Seeds germinate best after scarification with boiling water. Sow in partial shade.	• • • • •
 Arthur Chapman	Lilly pilly, scrub cherry <i>(Syzygium spp.)</i> • Edible • Ornamental	Shrubs to trees; 52 species in Australia. Many cultivated as ornamentals, some with edible fruits. Can be used as hedging.	• • • • •
 Tatters	Small leaved geebung <i>(Persoonia virgata)</i> • Edible	Shrub to 5 m. Found in dry eucalypt forest, heath and wallum woodland. Prefers full sun and moist, sandy soil. Small yellow flowers. Fruits drop when green, soft, edible when purple (similar taste to watermelon).	• • • • •
 Fritzflorreyolds	Partridge pea <i>(Chamaecrista fasciculata, syn. Cassia fasciculata)</i> • Hardy • Introduced	Annual to 0.9 m. Bright yellow flowers. Leaves collapse when touched. Drought and dry soil tolerant. Spreads invasively in dry, open areas by self-seeding. Seedpods split open in heat and dispel a great distance. Cut down as pods form and before maturation.	• • • • •

Key

• spring • summer • autumn • winter

Coloured circles in the column next to plant descriptions indicate the season in which pollens were detected in stingless bee pollen pots.

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Ground cover

Most of the ground covers identified in stingless bee pollen pots were introduced plants. Introduced annual plants may fill gaps when there are no flowers available, since they are fast-growing, early or late blooming, and often nutritious species. Growers may consider retaining introduced annual herbs, including some weeds, between crop rows and away from remnant vegetation until just before seed development.

Table 4. Sample of ground covers that can be used in orchards as pollen sources for stingless bees.

 <i>Harry Rose</i>	Grass trigger-plant (<i>Stylidium graminifolium</i>)	Native perennial herb with erect grass-like leaves basally tufted. Raceme up to half the length of the scape. Flowers 5 to 10 mm long, pale to bright pink. Grows in dry sclerophyll forest; widespread and common.	● ○ ○ ○ ○
 <i>Reiner</i>	Water primrose (<i>Ludwigia peploides</i>)	Perennial prostrate herb to 2 m. Yellow, solitary flowers. Grows in low areas subject to flooding, on margins of water bodies. Cuttings strike readily. Similar aquatic subspecies <i>Ludwigia peploides</i> subsp. <i>montevidensis</i> is highly invasive.	● ○ ○ ○ ○
 <i>Harry Rose</i>	Amaranth (<i>Amaranthus</i> spp.)	Annual broadleaf, 30 cm to 1 m. Drought-hardy when established. Some species with edible leaves. twenty species in Australia, five of them native including <i>A. macrocarpus</i> and <i>A. grandifloras</i> in Queensland.	○ ○ ● ○ ○
 <i>Kolforn</i>	Nasturtium (<i>Tropaeolum majus</i>)	Edible herb with creeping or sprawling stems. Showy orange, yellow or red flowers. A weed of watercourses and disturbed areas. Reproduces by seed and vegetatively.	○ ○ ○ ○ ●

Key

● spring ● summer ● autumn ● winter

Coloured circles in the column next to plant descriptions indicate the season in which pollens were detected in stingless bee pollen pots.



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Riparian vegetation

We detected pollens from wind-pollinated sedges, grasses, cat-tails and trees in stingless bee colonies, mostly in autumn and winter. This adds to growing evidence that bees and other insects visit many wind-pollinated species, possibly because they provide critical nutrients for bees during periods when there are few other flowers available.

Table 5. Riparian vegetation used as pollen sources by stingless bees

 Bernard Dupont	Cumbungi/Bullrush (<i>Typha domingensis</i> or <i>Typha orientalis</i>)	Robust, emergent monoecious aquatic perennial to 4 m high.	● ● ● ●
 Harry Rose	Slender bamboo grass (<i>Austrostipa verticillata</i>)	Caespitose perennial to 2 m high, shortly rhizomatous, with numerous branches at each node, without a basal tuft of leaves. Widespread.	● ● ● ●
 John Robert McPherson	Guinea grass (<i>Megathyrsus maximus</i>) • Introduced	Densely tufted perennial to 3 m high with a short stout rhizome covered with the hairy remainders of cataphylls.	● ● ● ●
 John Tann	Pale Pigeon Grass (<i>Setaria pumila</i>)	Loosely or densely tufted annuals to 1.3 m high.	● ● ● ●

Key

● spring ● summer ● autumn ● winter

Coloured circles in the column next to plant descriptions indicate the season in which pollens were detected in stingless bee pollen pots.

Sources

Wilson et al (2021) Many small rather than few large sources identified in long-term bee pollen diets in agroecosystems. *Agriculture, Ecosystems and Environment*, Vol. 310, 107296. <https://doi.org/10.1016/j.agee.2020.107296>.

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Acknowledgments

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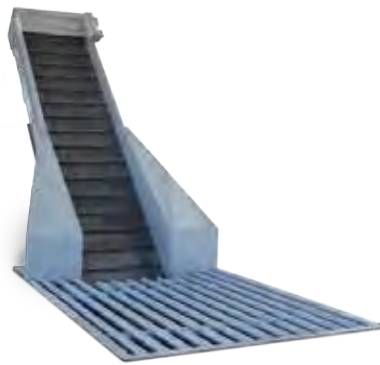
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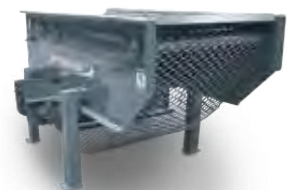
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Pollen parentage of nuts during premature nut drop: do self-pollinated nuts drop and cross-pollinated nuts remain?

Prof. Stephen Trueman, Anushika De Silva, Dr Wiebke Kämper, Joel Nichols, Dr Shahla Hosseini Bai, Prof. Helen Wallace, Griffith University, **Dr Jack Royle, Trent Peters,** Australian Genome Research Facility, and **Assoc. Prof. Steven Ogbourne,** University of the Sunshine Coast

While macadamia flowers can be self-pollinated by the same cultivar or cross-pollinated by a different cultivar, most nuts at maturity result from cross-pollination rather than self-pollination. Stephen Trueman and his team were curious to see if this is because self-pollinated nuts fall to the orchard floor during the premature nut drop in October and November, leaving cross-pollinated nuts on the tree. To find out, they analysed the DNA of macadamia embryos to determine whether the premature nut drop consists mainly of self-pollinated nuts.

Macadamia flowers are covered with self-pollen when they open. Much of this self-pollen may be removed by bees and replaced with cross-pollen before the female part of the flower is receptive to pollen. Self-pollen is also less effective than cross-pollen in growing down the flower and fertilising the ovule. However, macadamia flowers are only partly self-incompatible not completely so, which means that self-pollination can provide some initial nut set, though not as much as cross-pollination.

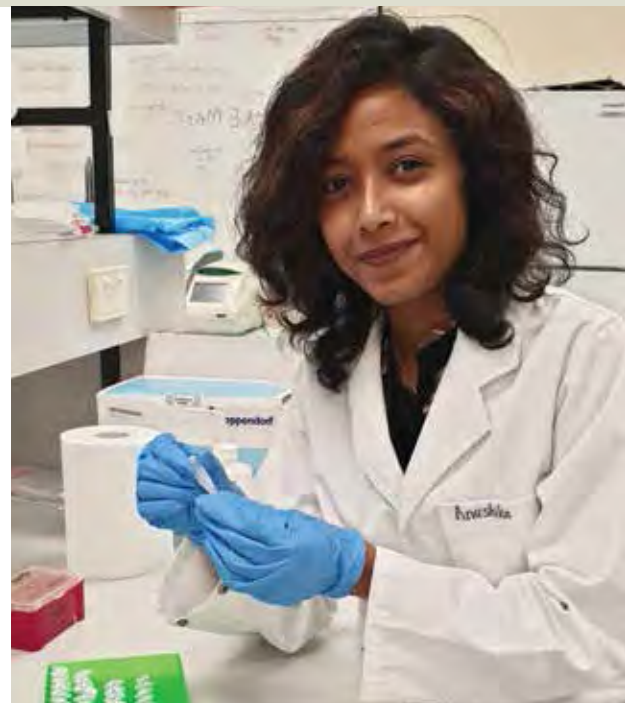
Macadamia growers are very aware that much of the initial nut set falls off the tree during premature nut drop in October and November. This typically happens between six and ten weeks after peak flowering. Almost all the mature nuts of several cultivars are cross-pollinated. Perhaps this is because the self-pollinated nuts had dropped off the tree during the premature nut drop.

Father DNA identifies pollen parent

In this study we used a sample of 30 trees in the middle row of a five-row-wide block of cultivar 816 trees at Alloway, near Bundaberg. At six weeks and 10 weeks after peak flowering, we sampled ten freshly dropped fruitlets under each tree and ten fruitlets remaining in the canopy of each tree, as well as 20 mature nuts randomly from the final harvests of each tree. We dissected the embryos from fruitlets that had fallen off the tree during premature nut drop and from fruitlets and mature nuts that remained on the tree and analysed their father DNA. We also confirmed the pollen parent of each fruitlet collected at six weeks after peak flowering.

Embryo development and nut paternity

Most fruitlets on the orchard floor and in the tree in late October (six weeks after peak flowering) either had undeveloped embryos or were self-pollinated (see figure). Almost all the freshly dropped fruitlets on the orchard floor in late November (10 weeks after peak



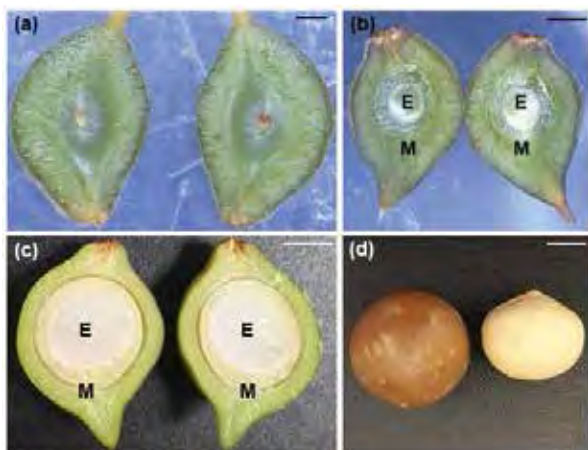
Anushika De Silva from Griffith University prepares macadamia embryos for DNA analysis.

flowering) and the remaining fruitlets in the tree were cross-pollinated. Almost all (97%) the mature nuts in the following March to June harvest period were also cross-pollinated.

Results highlight importance of cross-pollination

The results show that the early premature nut drop in October consists almost entirely of undeveloped nuts and self-pollinated nuts. The nuts remaining in the tree by late November are almost all cross-pollinated. This highlights the critical importance of cross-pollination between different macadamia cultivars to ensure the production of mature nuts.

We have shown previously that nut-in-shell yields can be increased by between 0.62 and 1.22 t/ha with better



Dissected fruitlet at 6 weeks after peak flowering with an undeveloped brown embryo sac (a), dissected fruitlet at 6 weeks after peak flowering with a developing embryo (b), embryo dissected fruitlet at 10 weeks after peak flowering with a developing embryo (c), and mature nut-in-shell and kernel (d). E = embryo, M = mother tissue. Scale bars = (a) 0.5 mm, (b) 2.0 mm, (c) 4.0 mm and (d) 8.0 mm.

cross-pollination (AMS News Bulletin, Spring 2019, pp. 68-70). We have also found that kernel recovery is often between 3 and 5% higher in cross-pollinated nuts than self-pollinated nuts (AMS News Bulletin, Spring 2021, pp. 44-45). High macadamia yields depend on bees moving pollen effectively from one cultivar to another. This is important to ensure good initial set of cross-pollinated fruitlets in September and good retention of cross-pollinated fruitlets through the early premature fruit drop in October.

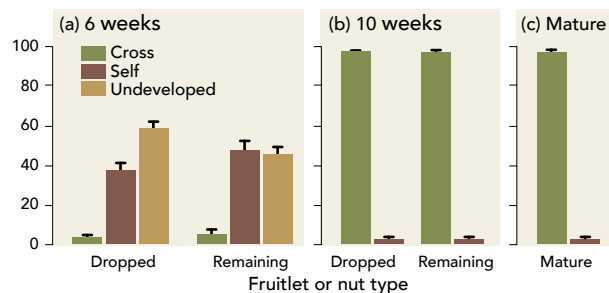


Figure. Percentages of undeveloped, self-pollinated and cross-pollinated embryos among dropped and remaining fruitlets and mature nuts of macadamia cultivar '816' trees at 6 weeks after peak flowering (a), 10 weeks after peak flowering (b), and maturity (c). Means are provided with standard errors (30 trees).

Holding on to most of these cross-pollinated fruitlets through November may then depend on other factors such as tree carbohydrate status, mineral nutrition, irrigation, pests and diseases. These physiological and pathological factors are likely to play important roles, in addition to cross-pollination, in determining macadamia yields.

Information

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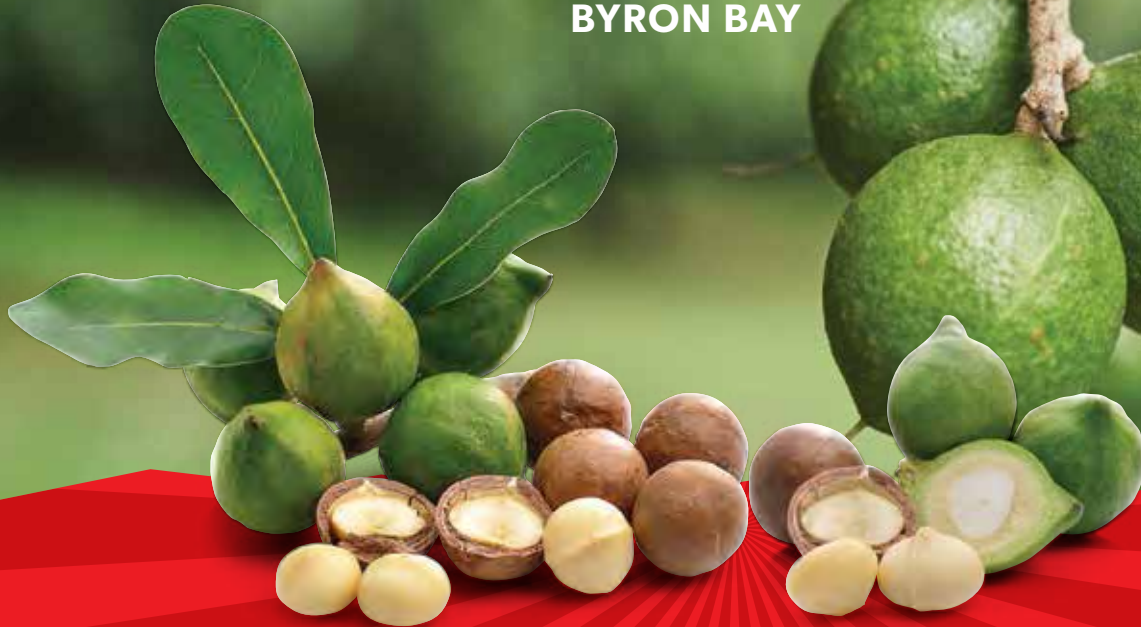
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Healthy bees crucial to maximise macadamia production

Healthy bees are crucial to Australia's macadamia industry with cross-pollination a valuable contributor to bumper macadamia yields. Most macadamia growers in Australia rely heavily on pollination services offered by honey bees and native bees.

Australia has one of the healthiest bee populations in the world, thanks to the country's geographic location, a world-class biosecurity system and programs such as the National Bee Pest Surveillance Program (NBPSP). The NBPSP is an early warning system that uses a range of surveillance methods at seaports and airports throughout Australia, since these are the most likely entry points for honey bee pests and pest bees.

New program announced

A new three-year NBPSP was announced in December 2021. The program is coordinated by Plant Health Australia (PHA) and funded by Hort Innovation through 14 pollinator-reliant industries, with co-investment from the Australian Honey Bee Industry Council (AHBIC), and Grain Producers Australia (GPA).

"The program ensures Australia has the best early warning system in place to protect our valuable honey bee health status," said Dr Sharyn Taylor, PHA's National Manager Surveillance.

The new program will continue to focus on safeguarding honey bees from high impact pests to provide the best chance of maintaining the supply of healthy pollinators for plant industries.

Over the next three years it will also focus on identifying and securing long-term sustainability funding opportunities, which will ensure the continued delivery of an industry-government partnership program.

Some of the surveillance tactics employed in the program include monitoring live (sentinel) hives for pests and diseases, catchboxes to capture swarms, rainbow bee-eater pellet analysis and aerial pheromone ballooning to pick up new species of bees, and using nets to sweep flowering plants to capture any foraging bees near ports.

Keeping an eye on top bee pests

Top honey bee pests of concern include varroa mites, tropilaelaps mites and tracheal mites.



Stingless bee on a macadamia flower. Photo: Dr Jenny Shanks

In the past, the macadamia industry contributed to the successful eradication of varroa mite in Queensland. The mites had the potential to devastate the honey bee industry and those industries relying on pollination services if they became established. Fortunately, Australia was declared free of varroa mite in August 2021.

Because of considerable growth in the native bee industry over the past few years, PHA is also undertaking a project to identify the types of biosecurity risks (exotic and those present in Australia) and ways to mitigate the impacts of these risks. The project is funded by the Department of Agriculture Water and Environment (through the Office of the Chief Environmental Biosecurity Officer).

"The native bee risk mitigation project has looked at the biosecurity challenges for the emerging native bee industry," said Dr Shanks.

Despite the rapid increase in the number of people keeping native bees, little is known about the pests that affect them. Most Australian native bee species are unique to Australia and this makes it hard to determine exotic threats, since there has been little research on the effects of exotic pests and diseases on the species of native bees present here.

Some pests and diseases of honey bees have been found to affect Australian native bees, including small hive beetle (*Aethina tumida*), and nosemosis, (caused by *Nosema ceranae*).

Macadamia growers can be instrumental in detecting threats by reporting any unusual plant or bee pests and diseases through the Exotic Plant Pest Hotline (1800 084 881). Early reporting increases the chance of effective control and eradication.

"Reporting unusual symptoms or unexplained colony deaths, by working closely with beekeepers pollinating your crops will also assist in building knowledge and may provide vital clues needed to identify a new pest and stop it spreading to surrounding bee populations," said Dr Shanks.

Information

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Native bees and macadamias - a way forward

Jeremy Higgins with solitary stingless bee nesting boxes.

Jeremy Higgins, Sting-Less, **W:** www.sting-less.com.au
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With 30,000+ ha of macadamias, we currently don't have enough stingless bee colonies to cover them all. This deficit of colonies leaves every fruit crop that relies on honey bees, another important pollinator, vulnerable to the ever-present threat of a varroa mite incursion. A strong native bee industry that can deliver farmers' needs will protect our pollination security as well as increase prosperity for Australia's horticultural industries.

Not enough stingless bees

Every newly developed macadamia orchard places further demand on stingless bee suppliers to produce more colonies. This is at a time when many, if not all, suppliers are already struggling to meet demands on them from other crops and hobbyist beekeepers as well. Compounding this, is the fact that stingless bees grow slowly so colony numbers can be doubled only once a year at best. While this is an issue with newly established colonies, they grow exponentially, so over time and with appropriate management, numbers can increase quickly.

Knowing this, are there strategies for accelerating colony growth to help meet demand? And what role can solitary bees play in farms that don't have access to stingless bees yet? It is important that we invest in a committed effort develop these strategies. One pay-off will be increased yields for growers as a result of more effective pollination. Growers aren't the only winners here either, as using bees underpins a more sustainable, ecological approach to growing food.

Native bees and macadamias have shared many thousands of years of evolutionary history over which time an effective relationship has developed between them both. By developing orchards, the macadamia industry has become part of the process of maintaining this relationship between bee and tree, however, this is not without limitations.

Solitary bees as a managed pollinator

Australia has over 1600 species of native bee. Most growers know about *Tetragonula carbonaria* and *Tetragonula hockingsi*, stingless bees that live in colonies used on farms, but many species of solitary bee (solitaries) are likely to be present around your orchard already, especially if you have established native vegetation around the trees.

A benefit of many solitaries is that they have lots of fur on their bodies, allowing them to carry more loosely attached pollen granules, which facilitates more pollen exchange from flower to flower. This makes them very effective on a per visit basis.

Research needed

An issue is that, unlike stingless bees, solitaries do not live in colonies, which makes them hard, but not impossible, to manage. Research into their breeding and nesting habits could produce some rewarding outcomes.

The priority in any research program would be to investigate how to manipulate their breeding to manage the production and movement of their eggs as a way of controlling their presence on farm. We also need to understand how to make better artificial nesting sites. For commercial purposes, valuable properties of artificial nesting modules that need to be investigated include:

- How to encourage the densest population possible.
- How to accommodate a diverse range of bee species, not just one or two.

- How to entice and attract high numbers of bees. Would an attraction agent like a pheromone be an option? This is perhaps the biggest challenge, it but could also be the most rewarding.

A strong and healthy solitary bee population will help make up for a lack of stingless bee colonies in farms where there are currently none. A diversity of pollinators does increase yields, so arguably, the best yields could be from a combination of stingless bees and solitaires.

Habitat zones and inter-row plantings increase populations

Native bee populations will increase on farms, as will their diversity, if there is more forage for them outside of macadamia flowering (see article on page 12). This can be achieved by permanent habitat zones and inter-row plantings. Having enough bee forage will also help colonies increase weight, improving the probability of a successful splitting each year.

Habitat zones should contain small patches of flowering bushes, shrubs, ground covers and small trees planted around the farm in areas that don't interfere with orchard operations. These plants will serve as year-round nesting sites for solitaires and food for all bees. Importantly, these forage plants should not flower at the same time as macadamias so there is no competition, which can affect pollination. The best approach is to



Demand for stingless bee colonies from horticulture is high.

have a lot of small habitat zones no bigger than the floorspace of an average bedroom.

You can establish inter-row plantings by not mowing the centre of rows outside flowering. And you can improve on them by sowing seed blends.

Colony breeding

People who already own colonies hold the key to meeting the demand. Colonies can't just be made out of thin air, rather it's a matter of patience and splitting existing colonies. Once farms meet their stocking rate, colony production can continue and surplus colonies sold as to supply other farms.

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Lace bug predators invited to scientific 'fight club'

Kirsten Ellis, PhD candidate – entomology, Centre for Organics, Southern Cross University
M: 0434 786 920 **E:** k.ellis.28@student.scu.edu.au

“OMG there are aphids EVERYWHERE!”

This was literally my first reaction when I walked into a macadamia crop to check bugs a couple of years ago. It still amazes me that while every other horticulture crop grapples with aphids as a severe pest with serious chemical resistance issues, macadamia growers walk past them as if their orchard is just a nightclub where they can hang out and party!

My name is Kirsten Ellis, and I get called the “bug lady”. The name was given to me because when I was living in Stanthorpe I became good at monitoring the “bug wars”, which occurred after a lot of chemical options were deregistered beginning in 2010 for safety reasons. This has created problems with how to manage insect pests in many crops. In this context, I found I loved getting to know all the competitors in each crop in those bug wars, with the aim of tipping the balance in favour of the good guys and help farmers get better crop yields.

I’m currently studying for my PhD at Southern Cross University, a position I took up because I was getting frustrated with the lack of research into solutions for dealing with pest problems. My PhD project is looking at macadamia lace bugs and better options for their control, particularly focusing on supporting beneficial predators.

Learning from experiences in other crops

One of the many crops I’ve played bug wars in is strawberry, where the major pest that can cause 100% loss is two-spotted mites. They have become resistant to all chemical options over time. In Stanthorpe, the strawberry season lasts nine months and during periods of high pest pressure growers were out spraying weekly to stay on top of the pest. Nine months multiplied by weekly efforts equals a lot of money for no real result, not to mention the environmental impacts of using that much chemical.

It became obvious that chemicals alone weren’t a long-term option, and these days using biological control is common. Mass releases of predatory *Persimilis* mites to eat two-spotted mites are very effective. The mites are fierce attack insects, which seek out and hunt down every two-spotted mite when the conditions are just right for them. It’s awesome to watch them through my hand lens!

To get predatory mites and other biological controls working, we must be smart and know our enemy. The bug wars are a balancing act of predator vs prey, and if there are not enough predators to stop pest numbers exploding, it’s game over and the chemicals need to come out. In strawberries, if the pest got away and started multiplying rapidly, a chemical that had



Kirsten Ellis is passionate about finding solutions to pest problems in macadamias. Currently she is studying for her PhD and is focusing on control options for lace bug.

resistance issues but still was 70% effective could at least get growers back to an even playing field and give the predators a chance to catch up again. In organic systems, strawberry growers have even fewer options.

It’s the same story with just about every crop, often with the same pests making a repeat performance across many different plant species.

The cunning lace bug

Many factors affect the bug wars – some insects like it wet, others love the dry weather; some like it hot and can explode in numbers while it is unseasonably warm, whereas some like it cold, which seems to be the case with macadamia lace bugs. They breed up in numbers quickly while I’m still wearing my beanie and while a lot of the predators are still in their winter slumber.

I’ve watched the behaviour of some of the predatory insects found in macadamias. Green lacewing larvae are often present with lace bugs and like to eat them, but they are also lazy and just roam around racemes like a Roomba vacuum cleaner. No hunt and fight at all, just opportunistic munching!

Lady beetles, a worthy bug wars contender, are also there but I wonder if they aren’t sidetracked by all those fat, juicy aphids?

Macadamia lace bugs are cunning. Under a microscope they are hard to catch because they have lightning



Could Orius bugs be a worthy contender in the fight against lace bugs? This is just one aspect of Kirsten's investigations.

reflexes and move under a raceme to escape. I have to sneak up on them and get my paint brush under their chest to catch them. Adults also like to play dead if they think they are caught. Last year I learnt the hard way that you don't pronounce an adult lace bug dead until after they've been left quietly for a minute, otherwise they just get up and fly away.

My research aims to find out all about macadamia lace bugs, so we know our enemy in the bug wars. With future chemical options under a cloud, we need this information. Plus, I hope that if we can find ways to reduce or even eliminate that first spray of the season, the meat-eating good guys will have a chance to really build in numbers and help tip the balance in the fight against the next pest that shows up in the next stage of the crop.

There are three parts to my thesis. Firstly, I'll be in the lab working out the effect temperature has on lace bug lifecycle and if there's any difference between the two species in northern NSW, *Cercotising decoris* and *Proteatingis howardi*. Then, I'm looking at their distribution and movement, and comparing the differences between the two species.

I'm doing intensive field observations at six farm sites, as well as sampling from 15 locations for genetic analysis. I'll be comparing seven of those back to the genetic work Ryan Shofner from UNSW did on samples from five years ago – differences in the genetics over time should give us an idea of how they move around and breed with each other.

So far, it's looking like the two species behave very differently, and *C. decoris* are possibly retreating to the rainforest during summer for an aestivation period, (when they become dormant). If that is the case, it may mean future opportunities for area-wide management

of lace bug by targeting them in the off-season before they get a chance to breed up rapidly on flowers and spread throughout the region. I'm looking forward to the data coming in!

Then, lastly, I'll be creating bug wars in the lab using commercially available predatory insects to see which ones have any potential as a lace bug predator. It happens in a petri dish, which I call the Colosseum, my version of a scientific fight club!

With all this information, we will know a lot more about lace bugs, and will be able to come up with ways to augment or perhaps even replace chemical control of macadamia lace bug.



Kirsten has noticed the eyes of macadamia lace bugs change colour from red to black as they age.



Kirsten Ellis calls the petri dish "the Colosseum", where she will be testing commercially available predatory insects to see which ones have potential against lace bugs.

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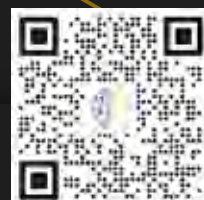
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Drone proves itself in orchard trial

Last year, Kim Wilson from Eureka Macadamia Management was involved in a trial using a drone to apply insecticide at a farm near Dorroughby in the Northern Rivers. The owner of the orchard has two areas of macadamias totalling about 50 ha. One of the areas has trees that are around 20 years old; the other has trees that are 30 years and older.

According to Kim, the owner is interested in innovation and the application of new technology as a way of improving productivity and was keen to test drone technology in his orchard. We spoke with Kim to get his thoughts about the potential of using drones.

He explained that because this was a trial, the first step was to test the application technology in January 2021 by getting Scott Fisher from Skytech Solutions from Lismore to bring a drone out to the farm. After loading up the drone with water, Scott launched it and sprayed trees which had water sensitive paper distributed in the canopy so coverage could be checked.

"I must admit that I was sceptical about how it would go but was pleasantly surprised at the coverage, which was very similar to what can be achieved using an air blast sprayer," Kim said.

Trial application

With that success under the belt, a plan was made for Scott to return to the orchard in August to do the first test application of an insecticide to control lace bugs. Two areas totalling 4.5 ha were identified – one containing the younger trees and the other containing the older ones - to check the effectiveness of the technology on trees of different ages and heights. The rest of the orchard was sprayed conventionally using an air blast sprayer.

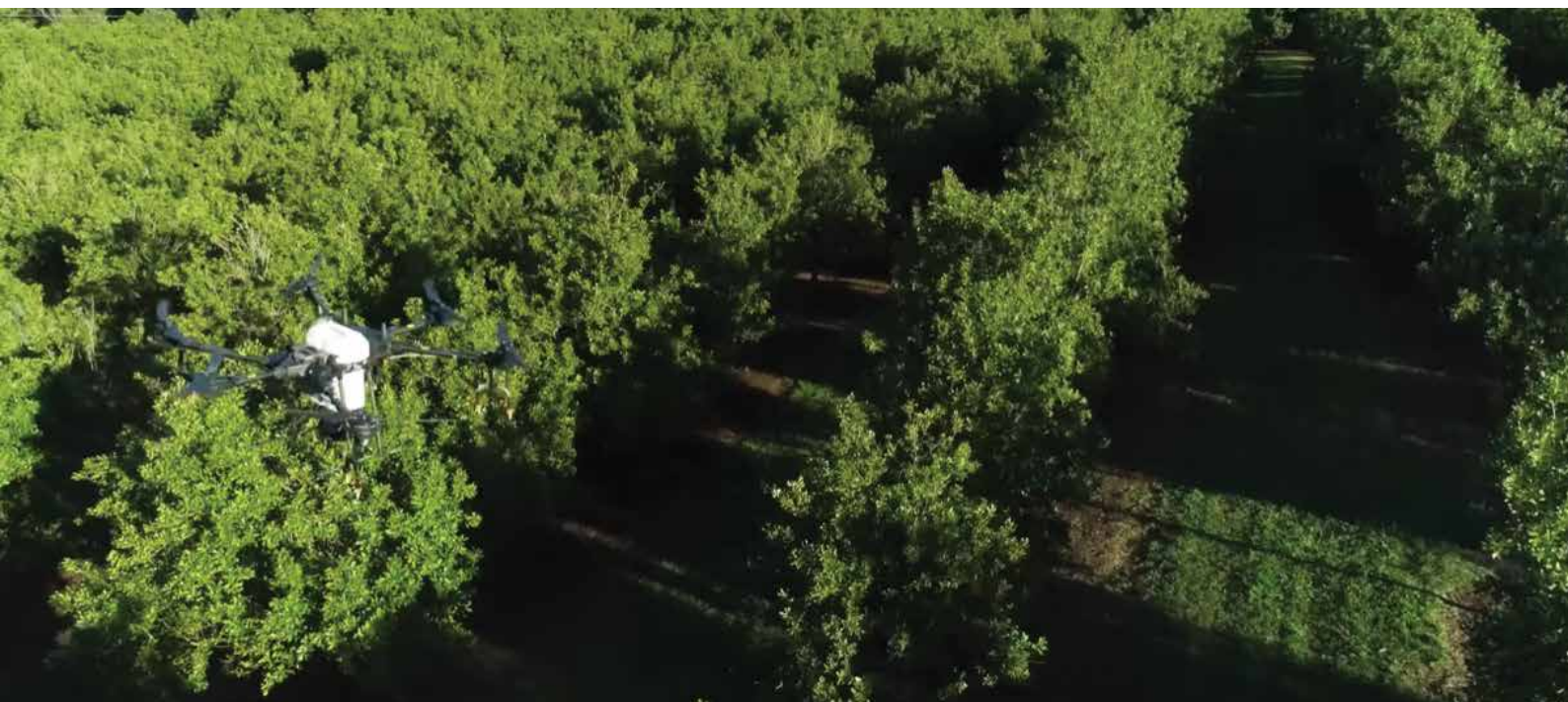
Scott used a smaller drone to map the area, an essential initial step when using this technology in an orchard, and this map was used to develop a flight path for the application drone. Kim also organised for the bug checker to be on hand. After application he checked the two test blocks as well as the rest of the orchard so the results could be compared.

One of the things that surprised Kim was how often the drone's tank had to be reloaded with the insecticide, which was mixed with water. Despite this, he explained that after the area had been mapped, which was a once-off exercise, the drone was quicker than a ground-based rig.

"The results for both technologies were almost the same as far as coverage and effectiveness were concerned," said Kim.

Cost is an important factor, and according to Kim, at about \$165/ha for the drone, there was almost no difference between this and using a contract sprayer. Of course, the economics would be very different for growers who own a spray rig.

Something that became obvious as a result of the trial was that the range of pesticides registered to apply to macadamia crops aerially, which includes with a drone, is a significant limiting factor.



This meant that while the drone could be used to apply the first and last rounds of insecticide, rounds 2 and 3 could only be applied using ground-based sprayers because of their registration status. While this is an issue that might be overcome in the future, it is important to factor it into any plans for using drones for this purpose.

One of the biggest advantages for Kim was that using a drone would allow a grower to get into an orchard much more quickly after rain compared with a heavy sprayer. And they are quiet and more discreet compared to using a tractor, which could be useful in mitigating issues with neighbours in areas like the Northern Rivers, where many orchards are smaller than those in Queensland and neighbours are closer.

A useful tool

The owner was happy with the results of this trial using a drone as it showed that the technology does have potential for use in orchard management.

For Kim, a significant issue is that not a lot of pesticides are registered for aerial application in macadamia orchards, and this will limit the use of drones at least in the short term.

Despite this, he does see them as another option that growers can consider, not only for tasks like applying chemistry, but also for things like checking ground covers and the state of the orchard floor.

"The advantage is that using a drone is not super expensive so it could be a useful tool for orchard management," Kim said.

The lowdown on using drones

The development of drone technology in the last few years has opened a new front in orchard management, particularly for applying chemistry and for mapping orchards to check things such as ground cover and orchard floor condition. To find out more about how drones are being used in macadamia orchards and their advantages and limitations, we spoke with Scott Fisher from Skytech Solutions, which has been operating in the Northern Rivers since 2018. Skytech Solutions uses DJI drones, with the latest addition to their fleet being large capacity model that holds 30 L per flight.

Scott explained that when the company first started working with macadamia growers the focus was field trials using fluorescent dye and UV light to understand chemistry spray pattern and canopy penetration. Based on the results from these trials, they developed a successful method to efficiently spray macadamia trees and are now mainly contracted to apply insecticides, some systemic fungicides and foliar fertilisers.

AMS. When you go on to a macadamia farm to apply pesticides, what procedure do you follow?

Scott. Our workflow starts with digitally mapping the orchard. We use a survey grade mapping drone (a DJI Phantom 4 RTK), which can generate precise digital orthomosaic images. Once the photos are reconstructed and stitched together, our software then generates a 3D image that the drone uses as a guide so it can fly above the canopy safely and efficiently at a pre-set height, usually 2.5 m

One of the elements that is crucial is that we must only use chemistry that is registered for aerial application, which can be a bit restrictive. We constantly check the weather, especially wind speed and direction, to ensure we adhere to our drift management policies. Fortunately, the large amount of downforce the drone produces enables us to manage drift effectively while pushing the spray down through the canopy.

Work health and safety is also an important consideration and we pay attention to personal protective equipment, which includes long-sleeved shirts, trousers, washable hats, half-face respirators and safety glasses.

AMS. What advice would you give to a grower considering using drone services?

Scott. The biggest problem we face is the proximity of non-target trees around the perimeter of a lot of orchards. The drone uses state-of-the-art obstacle avoidance for safety, which means that if the orchard is right up against boundary trees it does restrict us getting to the edges of the orchard. Overhanging branches from non-target trees are also a problem.

AMS. How do you ensure droplet size is the same as is often specified on the registration label for each pesticide?

Scott. We usually use an air-inducted nozzle that produces a coarse droplet which conforms to most label recommendations. We also carry a range of nozzles to suit different applications.

AMS. What is the payload and how effective is spray coverage in trees from a drone?

Scott. Our drones carry 30 L which equates to an application rate of 150 L/ha.

Drones are ideally suited to applying systemic products in orchards. They are not suitable for pesticides, including some fungicides, that need to be applied to the point of runoff.

An advantage with drones is that the down force as they pass over the tops of the trees is significant and this allows spray to be pushed through the canopy, especially where trees are tall, targeting areas that may not be being reached with an air blast sprayer.

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Drone supports decision making in Lindendale orchard

Grower: Ross Arnett

Location: Alphadale, near Lismore

Orchard size: 10 ha, 2000 trees (6 ha, 17 years old and 4 ha, 7 years old)

Spacing and cultivars: 10 x 5 m spacings, 816, 246, 849, 344

Soil type: Red ferrosols

Slope: Less than 4%

Ground cover: 100% coverage

In mid-December last year Ross Arnett, a macadamia grower in the Lindendale area in the Northern Rivers, received a heads up from his crop consultant Jarrah Coates that fruit spotting bug was at a level that, for most growers, would trigger a spray treatment.

Ross manages his orchard based on regenerative agriculture techniques, features of which are promoting a biodiverse environment and minimising the application of chemistry, and this influenced his decision not to spray at that stage.

Another bug check in early January showed a small increase but Ross was still reluctant to spray.

After doing his sums and estimating the cost of doing this, Ross thought there had to be better option, particularly given his management philosophy.

"Because my farm is based on regenerative agriculture, I have a lot more diversity in the orchard so work on the theory that my thresholds are higher than for a conventional orchard and I don't want to lose all these good guys," he explained.

Drop sheet trial

Ross and Jarrah discussed the pros and cons and decided to check bug numbers in the orchard by conducting a trial using a drone to apply knock down chemistry and drop sheets to count what fell out of the trees.

With the help of entomologist with BioResEd and SCU, Christopher Carr, they designed a trial to estimate the population of FSB in the orchard. To get a reliable estimate, it was determined that at least eight trees would be sprayed and that this be a mixture of known hotspots and a representative spread across the orchard. Once these were carefully selected on the farm map, the drop sheets were laid out in the orchard. Scott Fisher from Skytech Solutions used a drone with a 30 L payload to apply a pyrethrum spray to the trees.



Drop sheets were used to count the numbers of insects that fell out of target trees after the drone applied a pyrethrum spray.

Ross explained that the aim was to count and identify insects on the drop sheets after the spray application to determine whether spotting bugs were present in numbers that were likely to be a threat.

"One of the surprising elements was the coverage that the drone achieved. Even though trees were sprayed from above, the coverage went right through the canopy, something that was helped by the fact that I have fairly open canopies following limb removal."

"We checked the drop sheets six hours after spraying and there were no fruit spotting bugs but we did find there were eight macadamia seed weevils in total, but I still decided not to spray as seed weevils won't be a problem at this stage in the season," he said.

Christopher examined the insects that fell on the drop sheets to determine how the chemical acted on knocking out different insects. In this trial, several hemipterans (true bugs) were found but not FSB. There were some katydids, grasshoppers, spiders, thrips, beetles, and some flies. Interestingly, there were a lot fewer wasps in this spray treatment than they expected from previous drop sheets. Perhaps all the wet weather had suppressed them. Christopher did find a rich diversity of spiders, which are important bug predators.

"Because Ross is aiming to maintain beneficial insects all year round, another fundamental question is, if I spray am I going to lose the beneficial insects that take a while to breed up that provide natural pest control for several minor pests like thrips, feltid coccid and aphids?" said Christopher. "And how will this impact the next season's build-up of beneficial insects that are important for control of lace bug?"

Ross decided not to spray and, so far, his decision has been vindicated, based on his consignment reports from his processor – insect damage so far has been 2.1% for the first or clean-up round then zero, 0.9 and 0.6 for the second, third and fourth rounds respectively. A great



A drone with a 30 L payload was used by Scott Fisher from Skytech Solutions to apply chemistry.

result considering he has only sprayed once this season and that was for macadamia seed weevil.

Christopher sees great promise in this approach: "I can't see any reason why farms can't use these methods. Wouldn't it be great?" he said.

Farm management the key

Ross acknowledges that the way he manages his farm expresses concern about the farm environment generally for both the benefit of his family and his passion for developing significant biodiversity. These factors are important in decisions to spray or not. And he is confident that this farm approach gives him a buffer against taking action when it might not be needed.

"There are all sorts of insects in my orchard that are preying on spotting bug and other pests, such as spiders and assassin bugs, and I have also been releasing *Anastatus* wasps through the season. All this reduces the likelihood of spotting bug from being a big enough problem to warrant spraying," he said.

The key is to monitor closely so that he can quickly identify when issues with insects are likely to get out of hand.

Potential of drones

Ross believes that the drone was useful in providing more information for decision making. It also saved him money and will be an element in his strategy in the future.

"The drone comes into its element from November to February when spotting bug are feeding in the orchard, but that nut doesn't necessarily drop. We could use the drone, which only costs around \$300 for my size orchard, to spray selected trees and compare numbers of insects that fall on a drop sheet with results from assessments on the ground by Jarrah," he said.

He is also interested in seeing the results from larger scale orchard spraying trials with drones to assess whether that could be used on his farm.

For Ross, drone technology has potential as a tool in the orchard that is economical and can be used to provide useful management information that is not presently easily accessible.

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Guarding against farm accidents

Agriculture has long had a reputation as being one of the most dangerous industries in Australia to work in. This is because of its combination of hazards, including:

				
operating machinery such as tractors, motorbikes and quad bikes	using pesticides and fertilisers	working in environments that can be noisy and dusty	working outdoors leading to exposure to sun and varying weather conditions	working with animals

A recent summary of safety in the NSW agricultural sector found that it had a higher percentage of major accident claims than any other industry, that the average cost for each workers compensation claim is higher than for any other industry (\$24,000 compared to \$17,000) and that workers in the sector have more time away from work as a result of a workers compensation claim (8.3 weeks compared to 7 weeks for all industries).

One cause of accidents on farm is workers being injured because of inadequate or non-existent guarding. According to WorkSafe Queensland, a guard is “any shield cover, casing or physical barrier that prevents contact by a person or their clothing with a moving part”. Guards should be included on any part of equipment or plant that is within reach and could become dangerous when operated or being maintained or adjusted. Guards must also comply with the relevant Australian standards.

Hazardous parts likely to cause injury

When doing a risk assessment on the farm it is worthwhile knowing the hazardous parts of machinery that are likely to injure an operator and that need guarding.

WorkSafe identifies the following areas:

- Rotating shafts (including joints, coupling, shaft ends and crank shafts), gears (including friction roller mechanism), cables, sprockets, chains, clutches, coupling, cams or fan blades.
- The run-on point of any belt, chain or cable. Belts themselves are not considered hazardous, provided that their joints are smooth and without hazardous projections.
- Keyways, keys, grease nipples, set-screws, bolts or any other projections on rotating parts.
- Pulleys or flywheels that incorporate any openings, spokes or protrusions that render them anything other than totally smooth.
- Any crushing or shearing points, e.g. augers and slide blocks, roller feeds, conveyor feeds.
- Ground wheels and track gear that incorporates any openings, spokes or protrusions that are next to an operator's position (standing platform, seat, footrest) or passenger's seat.
- Rotating knives, blades, tines or similar parts of power-driven machines which operate in or near the ground or engage crops.

- Any machine component which cuts, grinds, pulps, crushes, breaks or pulverises.
- Hot parts of any machine where the surface temperature exceeds 120°C in normal operation.

Reducing the risks

As a rule, guards on any machinery or plant should:

- be designed in a practical way to protect the user but allowing easy access.
- be in place on dangerous parts of machinery unless they are, by any reasonable definition, located out of reach of users, operators or bystanders.
- be conveniently placed so that users, operators and service and maintenance people are less likely to remove them permanently.
- be strong and durable enough to suit the machine and its intended use.
- protect users, operators and bystanders against dangers caused by ejected material and burns caused by hot parts.
- be ventilated where applicable to avoid the machine overheating.
- not be removed before the machine is stopped, isolated and all sources neutralised, e.g. pressure in the hydraulic, LP gas lines.

Guards must stay in place when the danger exists. There are four ways to ensure that a guard remains effective.

1. Fix it permanently so it cannot be removed.
2. If the machine or machine part needs to be accessed, e.g. for cleaning or maintenance, fit an interlock (e.g. automated kill switch) to make sure that the machine cannot run if the guard or barrier is not in place.
3. If the guard needs to be removed from time to time and an interlock is not practicable, make sure a tool or key is needed to remove it. It must also be attached to the machine somehow, e.g. a hinge so it isn't misplaced. This means that workers need to be trained to not run the machine when the guard is not in place.
4. If none of these are practical, you must install a presence sensor to ensure that the machine does not run if people are in the area.



PTO shafts are extremely dangerous and must be fitted with guards.

Tractors and PTOs in particular are a significant hazard risk to farm workers and farmers and have been the cause of fatal and serious injuries. WorkSafe NSW advises the following when working with tractors and related implements and attachments:

- all hazardous parts must be maintained and guarded in line with industry standards and manufacturers' requirements
- ensure all guards are in place, especially PTO guards, and check them regularly for signs of wear and tear
- if you remove a guard during servicing, ensure it is re-fitted before the tractor is used.

The safety of children around machinery must be a priority. It is important to make sure guarding is on machines, especially when children are in the vicinity. Remember that little fingers can reach into places you may not realise possible.



An example of a guard for a PTO shaft.

Safety and PTOs

Many farm machines, especially older equipment, often don't have PTO shaft guarding because it has been removed or has worn out and not been replaced. Not having guarding is a serious health and safety issue and cannot be justified in any circumstances. PTO guarding is a legal requirement of operation whether you employ staff or are an owner operator.

Getting caught in a PTO assembly is an accident that is all too common on farm. This often results in horrific injuries, or worse, death, unless someone is there to turn off the tractor and get the victim quickly to medical care. Importantly, there don't need to be any parts protruding from the PTO assembly for someone's clothing to get entangled. It only needs to wrap around onto itself once, then the friction of the contact makes it stick, and this force increases as the PTO turns or you try to pull away.

Have you checked that your PTO guarding is up to standard and fitted to all machines? The Australian Standard for PTO guards gives the required specifications for the plastic housing around the power transfer shafts, as well as the 'masterguard' housing that covers the PTO shaft and the power input connection that pokes out of the implement.

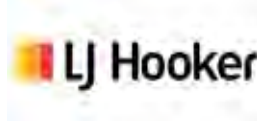
It is important to ensure that your PTO shaft is protected by a standard PTO shaft sleeve and universal joint cover that meet the requirements of Australian Standard AS 1121-1983 or better. These items wear out so must be regularly checked and replaced when required.



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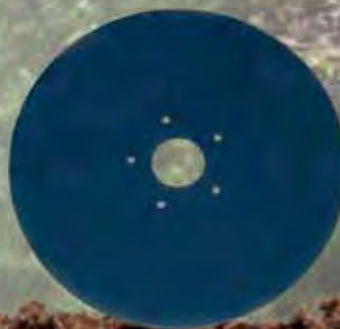


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Slow road to recovery

Floods and storms from South-East Queensland down to the Nambucca region have had a devastating impact on the industry. Initial crop forecasts have now been downgraded to around 52,900 t (@ 10% MC) and the effects on farm income will be felt for some time. Many growers, particularly in the Northern Rivers, have not been able to get back into their orchards to harvest nuts, which is further cause for frustration.

Some growers will find it easier to recover than others, depending on many factors like age of trees, resources, the extent of damage to trees and infrastructure and whether they can access timely funding support.

In this article we talk to three growers about how they are coping on the road to recovery.

Losses less than expected

In the Northern Rivers, two months after the floods, Robbie Commens is feeling more hopeful after initially expecting the worst when the flood waters went down and he could get onto his two floodplain orchards near Wardell to assess the damage.

From the extent and height of the floodwater on the Salt Spray Farms, he wouldn't have been surprised to find half the trees beyond saving, but now the picture isn't quite as bleak, and Robbie thinks that he has probably suffered losses of up to 10%. While this is bad enough, especially as this year was to be when he would harvest his first big crop from the four- and five-year-old trees, he is trying to see the upside, considering how much worse things could have been.

According to Robbie, the uncertainty after having had two floods and ongoing wet weather is a big issue.

"The trees were starting to recover from being under water for fifteen days during the first flood at the end of February, but the second flood in March, when they were under water for another two weeks, pushed many of the young trees that were starting to recover over the edge and they have died," he said. "Since then, we have had continual wet weather so that we still can't get back on the orchard and harvest. And the worst thing is we don't know when this will end."

Robbie said that he has decided to leave the nuts that have dropped on the ground because this the "safest place for them", and he is hoping that it will dry out enough soon to allow him to get a harvester in to pick them up. "Flood waters on our orchards are slow moving and don't wash nuts off the farm like they can up on the hills, so leaving them on the orchard floor is the safest thing to do at the moment," he said.

One decision that has been vindicated was to plant 85% of the orchard to 344 cultivars, which he said are

recovering much better than the other cultivars. As well, he has noticed that age has a big impact on a tree's ability to recover: "The risk of tree death seems to be related to age, with trees older than two years less at risk of dying than younger trees, which have suffered much more," he said.

In the short term, Robbie is relieved that his losses aren't as high as he originally thought they might be, but the long-term impact of the floods is yet to be assessed. As with almost all floodplain orchards, Robbie's trees were under water for a total time of almost a month, something that no orchard has previously experienced, and only time will tell how well the orchard will recover.

For now, he is gearing up to tackle the NSW Government bureaucracy and apply for support to assist with recovery.



Robbie Commens has noted that the older the tree, the more likely it is to recover from being inundated.

Replacing trees a top priority

Om and Savita Jhorar have a different story to tell about the impact of the floods, and are now working out what happens next with their young, 20 ha orchard near Woodburn.

As well as losing their trees and equipment, they were rescued by boat when their home was submerged and severely damaged by floodwaters. After having to deal with being displaced and living in emergency accommodation, they are now adjusting to living in a campervan that has been lent to them by one of the new



Om and Savita Jhorar are faced with the task of replanting 6000 trees, most of which were killed by floodwater. Photo: Kim Honan, ABC.

friends that the couple say they have met as a result of the floods.

"The fact that we now know more people who have become our friends and who have helped us is one of the blessings to have come from our experience," said Om.

The couple planted their first trees in 2016 and had 1500 in the ground that were between one and five years old, and 3000 trees in the nursery almost ready to plant. According to Om, while about 500 trees have put out new growth, he doesn't know whether they will survive the next few months, so they are looking to replace the lot. Add to this 100 custard apple tree seedlings that were to be planted, along with machinery, irrigation pumps and fences, and they face a significant task of rebuilding. According to the Jhorars, replacing the trees, two tractors and equipment will probably cost around \$400,000, a huge sum, especially as the orchard wasn't producing a significant income because it was still very young. Fortunately, they have received some government funding to assist with this.

"Our top priority now is to replace the trees and get them in the ground as soon as we can," he said. "Unfortunately, this won't happen overnight as we will have to wait for up to two years for new trees to be supplied."

Om said that if he were 35 or 40 years old, it would be easier, but he is not that young and it is a struggle to find the energy to start out again, especially as the floods have put their plans back at least three years.

"This means it will take us eight years to recover and get to full production, where previously we were looking at five years," he said.

He emphasised that in the face of this task, the fact that the local community has been so supportive is very important both at a personal level and as they start to rebuild their macadamia business.

Volunteers support recovery

The Cheal family orchard, near Beerwah in Queensland, will take some time to recover from significant damage caused by an intense hailstorm and violent winds in early March. Kolora Farm, which is run by Graeme Cheal and his daughter Diane, has 4500 trees most of which are between a year and 20 years old although a few are 50 years old. The older cultivars are Daddo, 842s and 741s with a young planting of MCT1s.

According to Diane, the storm and winds hit at around 3 o'clock in the morning with a devastating impact.

"Most of the house block trees were peppered with hail, and all the nuts were knocked off the trees. The younger trees, some of which we had planted three days earlier, were stripped bare of foliage and ringbarked with hail. More than 400 older trees (5 to 20 years old) were blown over, some with their root balls exposed, some imploding, some losing two or three larger boughs, and some screwed out of the ground by intense wind gusts," said Diane.

The damage didn't stop there, however, with huge 200-year-old eucalypt trees collapsing. Some fell on



A severe hailstorm and violent winds that struck the Beerwah area in March caused substantial damage on the Cheal farm, blowing trees over and snapping limbs off many trees.

macadamia trees and others flattened a large shed which holds the spray machinery.

Diane, her father and their worker started working on recovery within hours, after a quick assessment of the damage. The first task, after consulting their agronomist, was to have a copper fungicide mix sprayed on the trunks and branches of the younger hail-damaged trees to guard against disease. Then, with the help of family and friends and even a few strangers, they completed an initial clean up.

Diane said that they are still removing dead trees and replanting replacements. "We lost about 100 of the younger ringbarked trees and we are in the process of replanting them by hand, and there are around 200 empty spaces in the mature rows which need to be replanted," she said.

When they can get onto the land with an excavator, they will pull out the broken stumps.

Recovery is a way off, as they have been told that it will take three to four years for the trees to fully recover and to produce a crop similar to what they were doing before the storm.

Diane said that among all the devastation, there was some good to emerge: "I was touched by the community spirit and the willingness of people to give their time and skills to help us. By the Sunday after the storm, in just four days, we had 80-man days of volunteers come and help us with recovery. Five other macadamia farmers and their families downed tools on their own farms, grabbed their chainsaws and came to help us out," she said.

Recovery support

Many growers are looking for information about financial support to help them recover from the floods, as indicated by the 150+ growers who attended flood recovery events held during May and organised by the AMS and NSW DPI.

To apply for disaster relief: in Queensland go to website www.qrida.qld.gov.au and in NSW go to website www.raa.nsw.gov.au.

Note. In May, orchards in Queensland were hit by severe weather resulting flooding and damage. We will include an update in the Spring edition of the *News Bulletin*.

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Signs of recovery – northern NSW floodplain macadamias

Dr Karina Griffin, Project Support Officer, AMS **M:** 0483 084 297 **E:** karina.griffin@macadamias.org

Farm: Stibbards Creek Macadamias

Location: Dungarubba NSW (northern NSW floodplains)

Size: 250 ha

Cultivars: 344, 849, A203, A38, MCT1 and G

Soil type: Mostly sandy loams

Many macadamia growers in NSW and Queensland have seen significant rainfall, severe weather events and flooding this year. Hailstorms have pulverised trees in parts of the Glass House Mountains, and almost nonstop rainfall along with two flood events in the NSW Northern Rivers region have significantly delayed harvest.

I caught up with Johan Jacobs and Robbie Walton from Stibbards Creek Macadamias in Dungarubba NSW, the largest plantation in the area, to talk about how young trees and different cultivars are recovering from the floods.

Past flooding events in both Queensland and NSW have shown that macadamias tolerate being flooded, even for many days. According to Robbie and Johan, it is difficult to comment on which cultivar has done the best after the floods at this early stage, but they are seeing some interesting differences in death rate, leaf loss, leaf retention and regrowth.

"Other growers on these floodplains are seeing different cultivar responses to those we have experienced, and I think that soil type, the level of inundation and the time under water are key factors affecting tree response. We are even seeing this across our property with trees on soils with higher clay content not doing as well," Robbie said.

The 250 ha orchard is being planted in stages, and the aim is that there will be 75,000 trees when it is fully developed. There are currently about 70,000 in the ground, and of these Johan and Robbie estimate up to 60% or 35,000 to 40,000 are lost completely.

"For what remains, time will tell as to how they recover, but my gut feeling is that this has set back nut production by at least two years," said Robbie.



The main shed housing all the farm machinery was built higher than development requirements but still was flooded. In front of the shed are two-year-old trees under the water.

Learning from others

Johan and Robbie have been talking to growers and industry representatives in Bundaberg who experienced significant flooding in 2013 when ex-tropical cyclone Oswald hit the region.

"From consultations with others we've decided to apply a foliar fertiliser to trees now that orchard access is improving. As long as the trees have green tissue in the stem, we are treating them with a mixture of NPK and trace elements, even if the foliage is looking pretty dead.

"Trees were budding within a few weeks of the flood and the recent foliar fertiliser seems to be further promoting budding on dead looking trees. The biggest concern is whether this flush will survive in the longer term to regenerate the trees. Climatic conditions have not been favourable due to persistent rainfall and low light levels. We are also coming into winter with shorter day length," said Robbie.

One of the first priorities after the first flood in February was to stand up some of the first trees planted in the orchard, which are now between two and three years old: "We chose not to stake our trees and overall they have done very well even after the floods, with only a small proportion of our largest trees having fallen over. These were pulled up, staked and pruned heavily as soon as we could get in, about a week after the flood. Now, six weeks later, we are seeing good vegetative growth, although it is expected to take some time to get back to where they should be in terms of production for their age," said Robbie.



Some dead looking trees were budding within a few weeks of the flood.

Yield and other losses

This year Johan and Robbie were looking at the first reasonable harvest from their 2½- to 3-year-old A203s and A38s. It was the first time since establishment that they were going to bring in a commercial crop but they cannot get onto the orchard with machinery to pick nuts up. As well, a second flood event in March, though not as high, has set them back even further, and continual rain since is keeping the orchards very wet.

"The nut on the tree has been tested and is mature, but we don't know that it will actually drop given what the trees look like and what's on the ground is difficult to salvage," said Robbie.

In addition to nut losses, a lot of fertiliser stored in a shed has been destroyed, and there has been flood damage to machinery, including to five 100+ HP New Holland tractors and several ATVs, as well as other equipment.

"When boats rescuing people from local houses crossed the orchard during the flood, boat propellers cut our irrigation lines, which had floated. Hundreds of kilometres of irrigation line were damaged and we now need to replace it. This clean up and the removal of debris, which included hay bales, tree stumps and dead cattle from neighbouring farms, was a massive task," said Johan.



Only a small proportion of the oldest trees that were not staked were pushed over by flood waters. Recovery has started but Johan and Robbie don't know how long it will be until they see good nut production.

Looking to the future

Johan said they will continue to develop the site and replace losses but admits it is going to take some time to get back to where they were before the floods. They also sustained significant damage to one of their tree nurseries on the Alstonville plateau. While this will affect the availability of trees, even if they did have them, currently it is impossible to enter the orchard with tree planting machinery.

For now, it's about waiting and seeing how the budding and returning flush develop. The 16- to 18-month old MCT1s have performed the best of all the young trees, pushing buds within weeks of the first high flood. Unfortunately, the second, smaller, flood has knocked those trees around again with leaf burn occurring on this newly formed flush, and this is a concern for Johan and Robbie.

For older trees the hope is that the floods haven't affected bud initiation and that they will flower later this year so the farm can start bringing in an income.

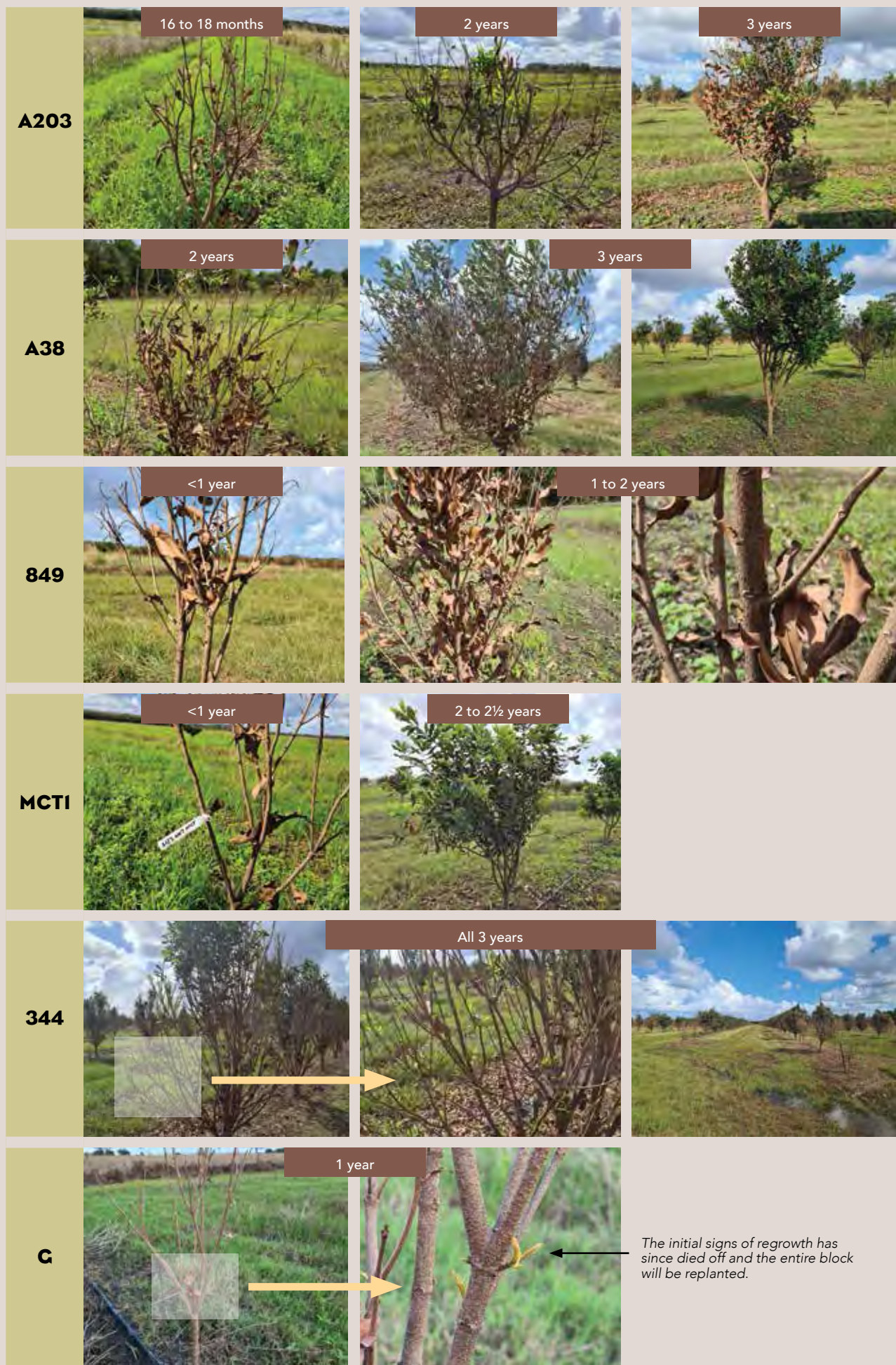
"The orchard was in such a good position before this event. The trees were looking so healthy, and we had excellent early yield on many of the varieties. This has set us back significantly at a time of maximum investment in the farm. We believe that the orchard was established based on good principles and management to ensure high productivity and we will see that return in the future," said Johan.

The photos over page show flood responses between different cultivars and tree ages. "Of all the cultivars we have on farm, the 849 have been the hardest hit, and they have been really slow to recover. Interestingly, we also see this with grafting 849 trees in the nursery, as they are the slowest to take," said Robbie.

A38, 344 and MCT1 have proven to be resilient, particularly at two to three years old. The A203s initially only dropped leaf from the outside leaving a green leaf pocket in the middle but they have since dropped most of that green leaf too, however, there is a large flush on these now.



The A38s (shown) and A203s had their first real crop this year but machinery access to harvest is almost impossible.





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TV chef celebrates macadamias in new season of food tourism show

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When Ben Milbourne entered the MasterChef kitchen as a contestant in 2012, he thought good food depended on the cook. Fast forward a decade, and Ben's outlook has changed, with the passionate chef, foodie and TV host saying it's the grower who is the real hero.

Ben has once again been a regular fixture on Australian TV screens recently, with a new season of his acclaimed food tourism show, *Left Off the Map*. Celebrating the exceptional food, people and scenery of Tasmania, the program is now in its third season, and this time, macadamias have a starring role.

Ben's inspiration for creating *Left Off the Map* is similar to what inspires him when he's creating a menu for Peacock and Jones, the Tasmanian restaurant where he is culinary curator.

"I enjoy showcasing ingredients that are less well known, and that's what I aim to do both on the show and in the restaurant," he says. "I have relationships with a lot of smaller growers, and I love getting my hands on whatever they have coming out of the ground and then building my ideas around that produce. *Left Off the Map* encourages people to think differently about where their food comes from, cooking with ingredients they may previously have overlooked and shining a light on places in Tasmania that even the locals may not have heard of."

Ben is a huge fan of Australian-grown macadamias but feels they are an under-leveraged ingredient.

"A lot of people know about macadamias but not that many people include them in their diet regularly. There's a misunderstanding that they're expensive when, really,

I think many people just lack an understanding of all the different ways you can use them," he says. "We featured five recipes with macadamias in this season of *Left Off the Map* and I'm really excited to help our audience think differently about macadamias and discover some unique ways of using them."

Unrivalled versatility

Get Ben talking about why he loves macadamias and you're transported into a world where seemingly anything is possible.

"They are just so incredibly versatile," he enthuses. "Macadamias work equally well in sweet and savoury dishes. They can be used raw for a delicate flavour and a soft crunch or roasted to achieve a more intense noisette flavour with a cleaner break. They coat your mouth differently depending on whether they're raw or roasted."

Ben is also a huge fan of the macadamia's oil content. "I love that buttery quality you get from their oil content and that's what enables them to transfer flavour so well; their healthy fats carry other flavours, and they can be used as a seasoning to drive the flavour that's already in a dish. They really lend themselves to being adventurous as a chef."

In the latest season of *Left Off the Map*, Ben demonstrates a range of applications for macadamias including a blueberry crumble cake, dukkha and avocado toast, and charred cos lettuce with anchovy and macadamia. He also shows how to make macadamia crumble with greens and salmon – a dish that's become a hit in his restaurant.



"We make the macadamia crumble by toasting macadamias with sourdough and corn chips until they're golden and then blitzing them in a food processor. We serve that with steamed greens as a side with fish. It's amazing and everyone who tastes it tries to guess what's in it, but hardly anyone gets it right!"

When at home with his family, Ben uses macadamias to make his own granola by roasting them with pepitas, rolled oats, almonds, brown sugar, and milk powder that's been caramelised with butter. But the twist is in how he uses it. "I don't eat it for breakfast – I serve it over ice cream for dessert," he reveals.

So, what's Ben's favourite way to use macadamias? "Microplaning," he says emphatically. "I'm doing that a lot right now. When you grate macadamias finely, they kind of melt and impart that beautiful nutty flavour to the rest of the dish. It's great on both sweet and savoury dishes."

Ben says a key learning from his time on *MasterChef* is that smart chefs work with good food producers.

"If you have good produce, you don't need to do a lot to the food to make it sing. You're far better to plate up three great ingredients cooked and seasoned to perfection than six or seven inferior ones. Most good food is quite simple. It's clean and fresh and you know what's in it, but it features an innovative way of using or plating a certain ingredient," he says.



His connection with indigenous Australian ingredients – including macadamias – has deepened significantly in recent years.

"I did a Connection to Country tour with an Aboriginal elder on the east coast of Tasmania and it opened my eyes to all the food that's growing around me and how indigenous people harvested that sustainably. As chefs, I believe we need to start using more of our native ingredients. If we start to tap into the knowledge of indigenous elders, there's so much we can do with the food that's in our own backyard," he says.

"Macadamias are probably the most widely known and eaten native ingredient that Australia has. If we can drive awareness of the fact that macadamias are indigenous to Australia, it will change the way we look at other native ingredients too."

A macadamia evolution

Ben says the way he uses macadamias has evolved significantly.

"When I was growing up, I didn't have macadamias often and they were usually coated in chocolate. Even when I started on *MasterChef*, I didn't know a lot about them, and while some contestants were using them, it was in quite simple ways, usually just to add some texture to a dish," he recalls.

Since that time, Ben says his understanding and appreciation for the nut has completely changed.

"Once I experienced fresh, raw, premium quality macadamias, it changed how I thought about them, and I fell in love. How I use them now largely reflects the time I've spent working in the restaurant. Being forced to think of restaurant-style ways to use ingredients has driven that evolution and made me think more laterally about macadamias. Through that and *Left Off the Map*, I love the fact I can show people how much is possible with this amazing whole food."

To learn more about *Left Off the Map* visit leftoffthemap.com.au, and to watch recent episodes head to 10play.com.au/left-off-the-map

All images courtesy of Ben Milbourne and Cultivate Productions

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Colour sorting technology builds capacity at Natara Macadamias

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Growers: Duane and Jamie Joyce, Natara Macadamias

Location: Gooburrum, north Bundaberg

Orchard size: 200 ha, with another 70 ha to be planted

Spacing and cultivars: 9 x 4 m (16-year-old 816 and Daddow; 10-year-old 741 and A203 replants; 2- to 4-year-old A203, 741 and MCT1)

Soil type: Sandy to clay loam

Colour sorting technology, which has been used by processors for years to increase the speed of sorting and improve efficiencies, is now being used on farm. Duane Joyce, his wife Veronika, and Jamie Joyce and wife Caren are amongst a handful of growers who have revolutionised their shed capacity by adding colour sorting technology as they expand their operation.

Two paths to macadamia growing

Brothers Duane and Jamie grew up working their family's small crop farm near Cudgen, in northern NSW. Almost 30 years ago, Duane moved to Gooburrum, fertile small-crop country north of Bundaberg, where he grew sweet potatoes. After two decades of growing sweet potatoes, in 2006 he started to diversify into a promising new tree crop – macadamias – a move that at the time was a big gamble as there were only a few macadamia growers in the region.

Duane began by planting 60 ha of Daddow and 816 in large mono-cultivar blocks. He found that growing macadamias was very different to small cropping, with one of the biggest differences being the smaller labour force. With 60 ha of sweet potatoes, around 30 staff were needed; with more than 200 ha of macadamias at Natara Macadamias, they only employ five full-time staff.

Jamie took a different path, working in various roles with Qantas customer service and training at Brisbane domestic and international airports. When COVID hit and the Qantas fleet was grounded in 2020, he decided to come back to farming and help Duane plant new macadamia blocks on the last of the old sweet potato farms he had been converting. With Duane expanding Natara on both the home farm, and an additional 70 ha in Sharon in the works, it was a natural fit to have Jamie, Caren and their family move from Brisbane to the farm in Gooburrum.



Jamie and Duane Joyce in the newly planted orchard

Cyclone impact and cultivar changes

One of the fears when converting to tree crops in Queensland has always been the risk of severe weather damage, as occurred in 2011 with tropical cyclone Anthony and again in 2013 with ex-tropical cyclone Oswald, when at least 500 trees were lost in each event. Then in 2017 a windstorm ripped through North Bundaberg and 1000 more trees were lost.

Replacing storm-damaged trees was an opportunity to improve cross-pollination, which Duane thought was a limiting factor for a large single cultivar block. In the Daddow blocks, A203 was replanted, and 741 in the 816 blocks.

The newest more than 140 ha of trees, all A203 and 741, are now between two and four years old. Asked what he would do differently with cultivars, Duane would be less sure about planting so many 741s because its lower kernel recovery markedly brings down the average in blocks. If he did it all again, he would be more likely to choose more Daddow, which has consistently performed well and is a manageable tree in their situation. His other pick would be A203 for its good early and ongoing yield. Duane has also planted some MCT1s and he thinks they look promising.

Quality is made in the orchard

With the young orchards close to bearing there was a clear need to upgrade shed capacity. The main objectives were reducing bottlenecks in the post-harvest system and maximising the hard work done in the orchard by quickly getting nuts into the shed and out again to the processor. Duane's experience from sweet potatoes instilled in him that quality is made in the paddock and no amount of technology or expense can fix a poor product.

On face value you would think that upgrading shed sorting and buying a colour sorter would be about lowering the farm's unsound kernel, but the levels at Natara were already low - below 1.5% USK. Duane and Jamie understand that chasing zero defects is an expensive goal with diminishing returns. What the colour sorter provides for them is shed processing speed and efficiency.

Expansion calls for upgrades

In their previous post-harvest system, nuts dehusked on the harvester (with around 85% husk removed) arrived at the shed receival hopper in Nally bins. From there it was on to an air leg to take off leaf, grass and loose husk, then on to a stick and rock belt, through a sizing trommel, and then into four 10 t receival silos. Warm air from the shed roof space was used to dry nuts in these bins.

One of the simple storage techniques used in the shed still has its place for smaller or incidental loads. Nally bins with an extractor fan mounted on plyboard lids are very effective for ventilating smaller nut quantities.

Nuts were then sent to Bundy Sort for dehusking if required and for sorting. This external service was very welcome and allowed Natara the time needed to design and finance the shed upgrades.

The old shed system was processing about 20 t NIS a week, but with a farm producing 300 t NIS a year and significantly more on the way, upgrades were essential. Smaller upgrades were made to the initial cleaning processes. The stick and rock belt, with a prototype steeper double belt, has increased capacity from 1 to 2 t/hour to 6 to 8 t/ha. The sizing trommel was upgraded and its length doubled, and a new sorting table longer than 5 m was installed with capacity to insert another process in line in the future.

The new colour sorter is next in the system. Natara bought a custom AMD precision-colour sorter manufactured in China. All nuts move along a belt through a series of optical colour scans where hundreds of images are taken every second. When a nut outside the programmed colour range is detected, a jet of air instantly ejects the nut onto a second belt. Further scans on this belt separate nuts into black/damaged nuts and still husked nuts which empty into separate bins. The



The smaller of Natara's harvesters where nuts are dehusked on board and emptied into Nally bins.

husked nuts can then be sent through the dehusser, which is now only dehussing nuts that require this. Dehusked nuts are run back through the colour sorter which has a capacity to sort roughly 5 t NIS an hour.

Colour-sorted nuts move along into 10 t storage silos with easy letdowns. Large fans beneath the perforated silo floors draw air down through the nutbeds. The fans are controlled by humidity sensors that automatically switch them on and off at pre-set levels. In these silos, nuts are dried down to roughly 10% moisture before being consigned to the processor.

Shed capacity has more than quadrupled, with Duane and Jamie's goal of being able to process at least 80 t in a week, within reasonable working hours.

Colour sorter cost

While the colour sorter cost about \$135,000, with feed-in rollers and conveyor belts, there were other associated costs. The large compressor operating in the colour sorter cost another \$40,000 and, because it required 35 kW power to the shed, this had to be upgraded, which was an extra \$30,000. While this certainly has been a large investment, shed efficiencies have improved significantly in the two seasons that Natara has been running the upgraded system.

Duane and Jamie believe that they previously were at the mercy of many external factors and bottlenecks, including relying on good weather to keep being able to pick up nuts consistently and matching the shed throughput. Now if rain delays harvest by a week and they have much larger harvested loads, field moisture nuts don't sit around waiting for shed processing. They also don't have to rely on using external services, where you often cannot control processing timeframes. The upgrades have given them far greater control over operations and nut quality.

Future improvements

Duane and Jamie have more plans to improve shed operational efficiency. Natara bought a batch weigher so they are able to accurately weigh loads and maximise storage and transport as well as accurately quantify the yield from each orchard block. While they have on-board harvester scales, this weight can be very different from



The double "waterfall" stick, rock and debris belt has significantly increased capacity.

the final cleaned, sorted and dried nut weight, with huge cultivar and seasonal variability. The batch weigher will take the estimation out of how much nut is really in a 10 t capacity storage silo or in a 40 t truck to the processor.

Duane hasn't lost sight of years of sweet potato growing lessons, insisting that although the shed upgrades were important, the best investment with the biggest return is money spent in the orchard. After a grower trip to South Africa with the AMS in 2019, Duane completely rethought the orchard's irrigation systems, which has resulted in better yields, less disease and greater resilience to weather conditions.

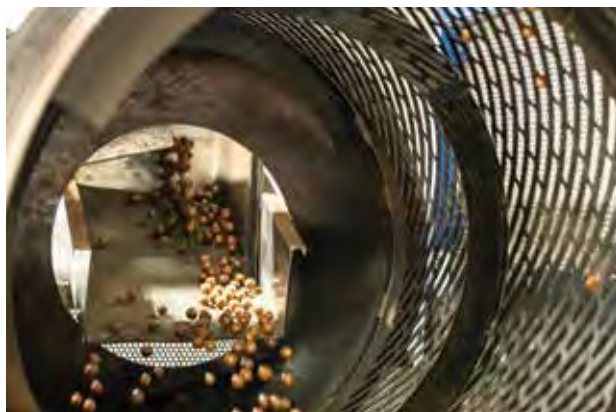
Duane and Jamie are also considering a harvester-based yield monitoring system that will complement the upgrades in the shed.



Natara's new AMD precision colour sorter has provided more control over operations and nut quality.



New 10 t storage silos where nuts are dried down to about 10% moisture before being consigned to the processor.



The custom length sizing trommel has been installed.

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Planning and sound advice keys to success

Gavin Lerch, Nutworks, Bundaberg

The Anderson Family has a long history in the Childers area, having been farming there since 1899. Norm, a fourth-generation farmer, and wife Donna are reaching retirement age and, while handing over day-to-day management to their two sons Graeme and Justin and Graeme's son, Mitchell, they are still very involved in developing plans for the future.



Three generations are involved in running the Anderson family farm at Childers (l to r) Mitchell, Norm, Donna, Justin and Graeme Anderson. Photo: Chris Sweetapple

In 2016 the family decided to diversify their business growing soybeans in rotation with sugar cane and started planting macadamia trees. There are now more than 55,000 trees on 10 x 3.5 m spacings, with plans to plant another 10,000. The farm has mostly fertile red soils, which are typical of most of the Childers area.

Gavin Lerch from Nutworks caught up with Graeme and Justin to find out about the orchard and plans for the future.

The first harvest, a small one, was in 2019, but in 2020 they harvested more than 5 t. Justin said that so far, they are happy with production from their A203s, which yielded 6 kg per tree at year 5, and their small MCT1 trees are looking very promising as they have produced a very high yield. In 2020, kernel recovery from the A203s was 36% and from the 741s, 38%.

While they started developing the orchard in 2016, Justin is the first to admit that the "L-plates" are still on: "We are always learning and innovating new and improved farming practices," he added.

One lesson they earned early on was with irrigation. When they planted the trees they used trickle tape,

which brought with it the issue of all sorts of pests chewing through it, so they soon adapted their irrigation to include poly pipe.

Justin explained that drainage is critical: "During the recent wet weather, we discovered some other wet and soakage areas, and have installed more subsurface drainage to remove the excess water," he said.

Along with these wet areas, Justin said that they have found it is important to manage side slope and drainage in their overall block design, while at the same time trying to maximise row length (for farming efficiency purposes).

Soils and orchard floor have also been considerations. The red fertile soils and likely large growth of the trees meant going out to 10 m row spacing would ensure light was optimised for many years to come.

"The selection of varieties on our red soils are crucial to avoid AVG, and we have found that certain grass species make harvesting difficult," said Justin. "We need to continue to improve management of this."

As far as this season is concerned, it has differed from the last few dry seasons in that the leadup was wet, with the result that they are "constantly" mowing.

"We realise the importance of keeping the orchard floor clean for harvesting, so mowing is a high priority," he said.

Keys to success

According to Justin and Graeme the keys to success so far have been investing in irrigation, paying attention to orchard design and establishment and canopy and nutrition management of the young trees.

They use MAIT irrigation scheduling and have automated fertigation control on most blocks. Having an automated system ensures that trees are watered and fertilised based on their requirements rather than on whether Justin and Graeme can fit these tasks into their busy farm management schedule.

When they decided to develop the orchard, one of the first things they did was to put a lot of work into planning the layout and getting the drainage correct before the trees were planted. And now that the trees are developing, they prune all varieties to promote a stronger trunk and root system for a stronger tree.

Justin said that they haven't been shy about getting advice when they need it: "We have developed a good relationship with our agronomist and that has been a key to our success, and we did get lots of advice from Chris Searle when we were establishing trees," he said.

In the pipeline

Investing in machinery has been a priority for the family recently. In 2021 they bought a Yannie Creek finger wheel harvester and they said that it is working very well this season. They have ordered a wider slasher to reduce the mowing time.

And with more trees to plant in the future, they also have their own nursery, which, considering their operation size, is an important investment in their view.



The irrigation system is controlled automatically and incorporates weather data. This allows for schedules to be checked and managed remotely.



With plans to plant more macadamias, the Andersons have invested in developing their own nursery so they have a reliable supply of trees.











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TREE REMOVAL

Inaugural Women in Macadamias events a success

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

It goes without saying that the Australian macadamia industry's greatest asset is its people. From growers and agronomists to processors and marketers, it's their skills and drive that has taken the industry from strength to strength and put our product on a global stage. Many of these roles are carried out by women. Whether one half of a husband-and-wife farm or a valued team member in a larger operation, women are heavily involved in vital functions across the supply chain.

While the enormous contribution of women to our industry is undisputed, recent consultation revealed an opportunity to do more to help women network and learn together and address confidence gaps. These insights led to the development of a new initiative called Women in Macadamias and it recently launched with a series of events in Bundaberg, Glass House Mountains and the Northern Rivers.

Landmark events

The inaugural Women in Macadamias events were generously hosted by growers Suzanne Fleming (Bundaberg), Dianne Vere (South East Queensland) and Cath Ford (Northern Rivers). It was the first time women from Australia's macadamia industry had come together in this way and the events were enthusiastically embraced by everyone who attended.

The initiative is part of a commitment to creating an environment that encourages women's participation in industry and decision making at all levels. For every man in the industry, there are usually two or three women who are equally invested in that operation. There are several issues, however, that women find more challenging than their male counterparts, including a reluctance to ask questions, loneliness on farm, and a lack of confidence when it comes to safely operating and maintaining larger pieces of machinery.

Many women also want to have more of a voice within the industry, so the initiative sought to uncover how we can best support women and open opportunities for them to be more involved in industry decision making and participation.



The women who attended the Northern Rivers event with Mark Goltz from TAFENSW.



Julia Macdonald-Buchanan, Dianne Vere and Michelle Smith at the South East Queensland event.

Nothing off limits

The events were open forums which saw an array of topics raised that included everything from cultural patterns in agriculture, cost of inputs, production practices, farm safety and what sustainability means to global demand dynamics.

Bundaberg host Suzanne Fleming said that while Australia's macadamia industry is very inclusive, she often finds when she attends industry forums and events there are not many women there - an experience that many of the women could relate to.

"Our farms are quite young, so I always have a lot of questions," she said. "But I tend to hold back from asking questions as I feel like I should already know the answers. Having other women there would really boost my morale and make me feel more confident."

Many women agreed that they lacked confidence in their knowledge, and the theme of 'imposter syndrome' was raised repeatedly. Imposter syndrome - feelings of self-doubt that persist despite one's education, experience and accomplishments - is ironically a common feeling among high-achieving women.

An agronomist at the Bundaberg event noted that her interactions with male and female growers tend to be quite different: "When I'm consulting to women, they will usually ask more questions and they're keen to understand at a deep level, whereas men prefer a quicker answer and tend to be more black and white in their thinking," she said.

A practical focus

Consultations with women in the industry before the events found that machinery operation and maintenance was a significant skills gap for many, so

this became the centrepiece of the events. Expert machinery operators and mechanics were recruited for each event to go through operator safety, pre-start checks, attachments, basic maintenance considerations and to answer any questions from participants.

The Bundaberg demonstration was delivered by Di and John Vaughan from Macadamias Australia. John says while care needs to be taken around larger machinery, it's not something to be feared.

"Confidence will keep you safe. It's hesitation that's more dangerous," he said. "Correct any issues before you take a machine out, and if you don't know something about the machine you're operating, ask someone who does. It's important to have safety and standard operating procedures available, and if you're creating these yourself and feeling overwhelmed about where to begin, I'd recommend starting with your most dangerous piece of machinery and working from there."

Many of the women in attendance shared their machinery fails with the group. John was quick to point out that these mishaps are par for the course, for both male and female operators. "Running into your first tree, running your first tap over - that's like an initiation," he said.

Di Vaughan has a reputation of being one of the best machinery operators Macadamias Australia has ever had. "Di knows how to operate and maintain every piece of machinery."

"I was uncomfortable at the start," shares Di. "But now I know how to confidently operate even the biggest machinery over the 1,000-hectare operation."

Putting women in the driver's seat

Mark Goltz from TAFENSW led the Northern Rivers machinery demonstration and said women are sought-after machinery operators because they look after their equipment so well, and there's enormous upside to this in terms of operational efficiency.

"Women take great care and pride in their jobs," he said. "They don't treat it like a race to get a job done. Well-maintained equipment breaks down far less and it's the best way of preparing for smooth and uninterrupted operation."

At the Glass House Mountains event, Steve Morrison from Tractor Implement Supply Company of Australia (TISCA) led the machinery demonstration and he advised that the only silly question is the one not asked.

"If you're feeling unsafe in a situation when operating, stop. It's a warning sign something is not right. Trust your gut," he said.

"Continuing to operate when there are odd noises, or when something feels wrong or different, that's when you are likely to cause damage that costs a lot to repair."

Steve also stressed the importance of not feeling pressured to fix everything yourself. "Do what you're skilled at or enjoy and contract the other jobs to

someone who does it well and is set up with all the tools to get the job done efficiently."

John Vaughan revealed that while he would love to see more female machinery operators in the industry, he has had trouble finding applicants to join his team.

"We can advertise a position which includes training and get 70 applicants, but only one of them will be female," he says. "I'd really like to have a better male to female ratio in our team, but it's difficult to attract more women. I believe workplace culture is better when a good gender balance is achieved."

According to some of the participants, the answer may lie at a grassroots level. Many believe greater female industry participation requires a focus on encouraging young women to study agriculture or consider a career in agriculture when finishing school.

"It's not only agriculture graduates that end up in the horticultural industry, I see many different science and business graduates making the transition because there is such a wide variety of positions available. I majored in biochemistry and have many friends in the industry from environmental science backgrounds," said Karina Griffin from the AMS.

"If you haven't grown up exposed to the idea of working in agriculture, it's hard to throw yourself into something like this," said another. "If as a young girl you've never seen women in jobs on the land, then it's hard to know it's an option for you."

Just the beginning

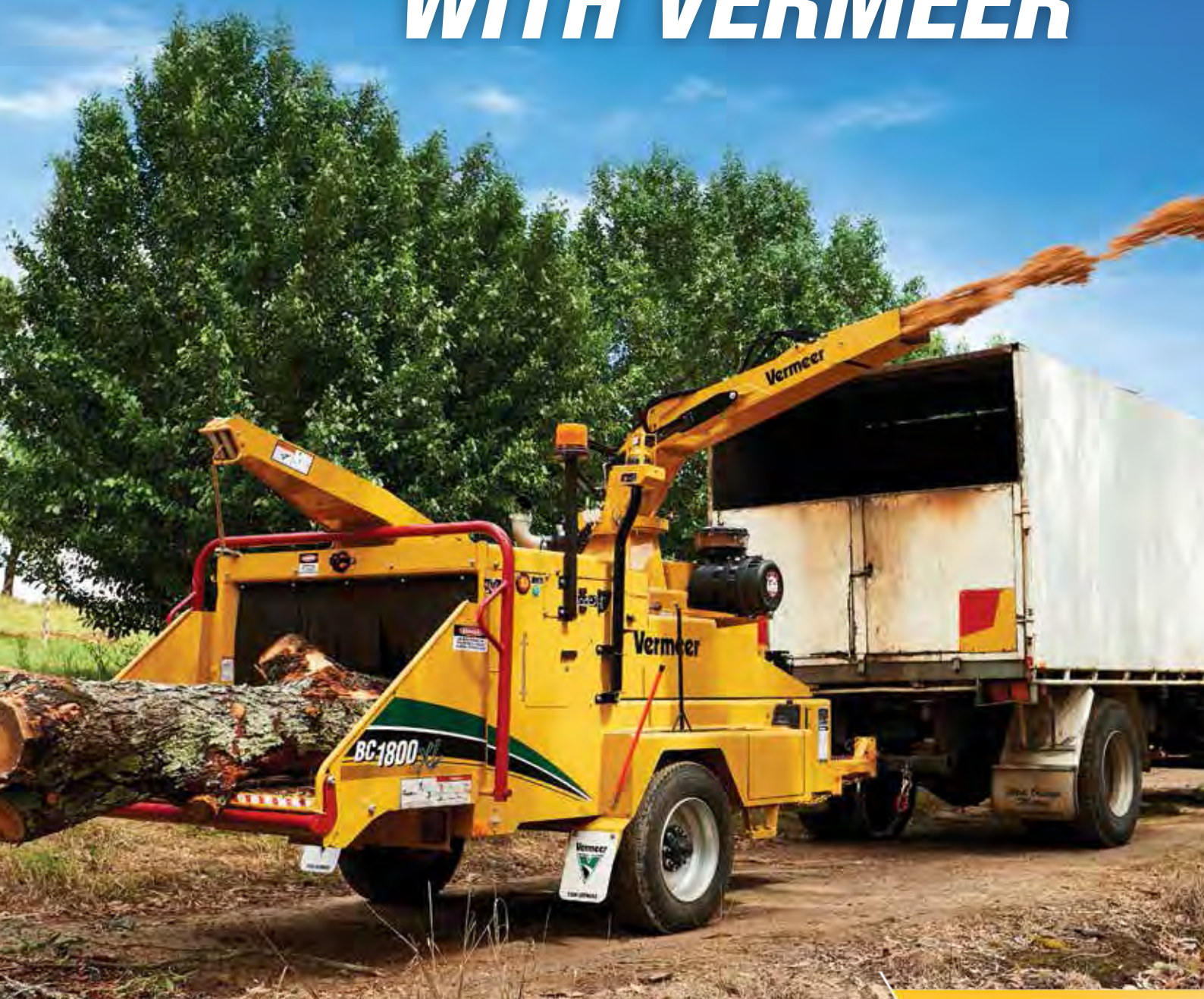
It's hoped the events will mark the start of a new chapter for the industry, in which women are more visible, vocal and accessible to one another.

To see more of what happened at these landmark events, watch the event video on the Australian Macadamia Society's YouTube channel – the link is: <https://youtu.be/r4AWjWQ1Nko>



John Vaughan gives a machinery demonstration at the Bundaberg event.

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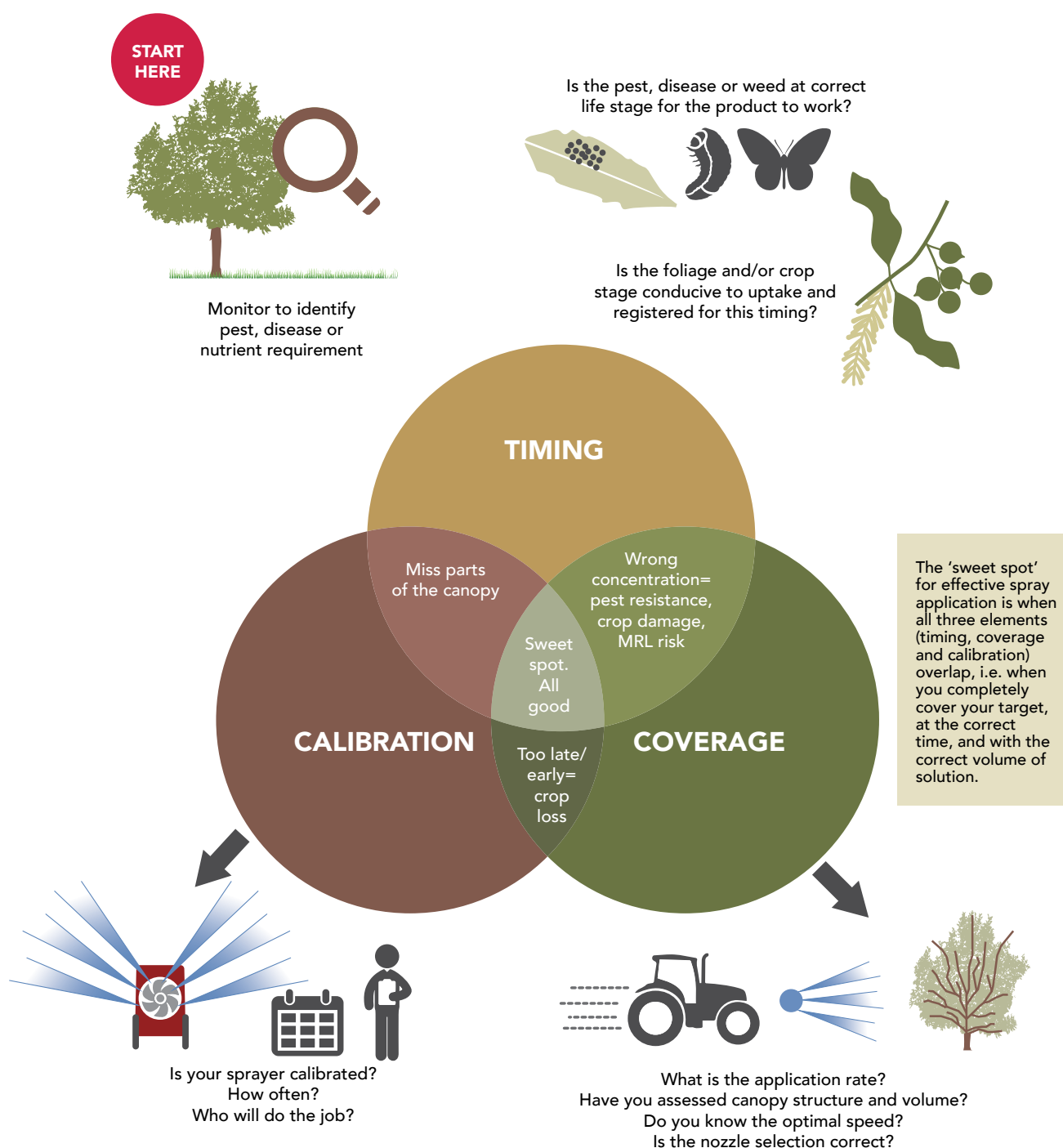
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Optimising spray coverage for the best returns

Dr Karina Griffin, Project Support Officer, AMS M: 0483 084 297 E: karina.griffin@macadamias.org

The AMS Macadamia Grower Toolkit describes the critical factors for spray application on orchard trees, which are timing, calibration and coverage. This article expands on these three fundamental elements by exploring the cornerstones to achieving effective spray coverage - calibration, speed, nozzles and canopy management – to help growers and orchard staff maximise the effectiveness of any spray application.

Spray coverage doesn't just relate to pest and disease control with insecticide or fungicides; it also includes foliar sprays such as trace element inputs. Whatever the solution being applied, effective coverage is essential to get the best value for money.



Timing

Understanding the life cycles of pests and diseases and the phenological stage of the tree is critical to getting the timing right for spray application. This requires effective monitoring, to track changes in the orchard.

Is the pest, disease or weed at correct life stage for the product to work?

Many pests, diseases and weeds only are susceptible to a product when it is used at certain life cycle stages. This means if you use a product outside of the susceptible period, you will not achieve the desired control.

For example, if a product disrupts larvae from feeding by coming into direct contact with the larvae, then spraying when only eggs are present is not going to control them. Similarly, a pre-emergent herbicide is not going to affect a weed that is already growing.

You must not only know the life stage you target, but also how the product being used works.

Is the foliage or crop stage conducive to uptake and is the pesticide registered for this timing?

Mature macadamia leaves have a thick waxy layer that can limit the uptake of the active ingredients in foliar sprays such as nutritional elements or biological products. The toolkit also notes that there are several elements that are not effectively taken up by the leaves, rather are more available to the tree through soil applications.

This means that some products should only be applied to immature flush, otherwise you will be wasting time and money. Some products also target a particular crop stage like flowering or early nut development so it is important to check the label.



If you are advised to use a certain product, make sure you understand why and when.

Ask how the product works and the pest life stage or crop stage it is most effective on so you can be sure you are making the best management decision and getting the timing right.

Calibration

After determining the appropriate timing for a spray application, it is critical to ensure your equipment is properly calibrated.

Is your setup calibrated?

Calibration involves matching your tractor with your sprayer, at the correct speed, and with the correct nozzle selection and setup to apply specific active ingredient rates. Optimal spray coverage is critical to orchard productivity, so it is not worth leaving calibration up to chance. It is also a legal requirement to have your sprayer calibrated before applying any agricultural chemicals. This ensures you are meeting your legal obligation to comply with label or permit requirements and are doing everything within your control to apply the correct rate and minimise any off-target spraying.

How often?

Most macadamia growers complete a formal calibration each year and then monitor each spray round for water

use. Correct calibration should allow you to calculate exactly how much product to mix in your spray tank for the area you need to cover. If you run out before reaching the end, something is wrong; if you have a lot of product left over when you have finished, again, something is wrong.

Who can help?

It is highly recommended that you consult with a local service provider about calibration and spray gear selection. All businesses that sell and service sprayers should be able to either provide a calibration service or give you contact information for a private provider. When buying a new sprayer, an initial on-farm calibration normally comes as part of the deal. If you are buying a second-hand sprayer, get professional advice if you don't have the skills or experience about its suitability for your farm.

Coverage

A critical consideration in ensuring effective coverage is water application rate. To determine this, you must know the registered dosage and concentration rate of the product you are applying, as well as machinery speed, canopy volume and structure and nozzle selection and positioning.

You also need to understand the orchard system and be familiar with the equipment being used. Because this requires technical expertise, it is recommended you seek professional assistance.

To determine correct application and good coverage you need to know:

1. Product dosage rate and allowable dilution/concentration (e.g. 50 mL/100 L and can be used up to 3 x concentrate)
2. Average tree volume and spacing (e.g. 168 m³/tree on 8 x 4 m) - this will be different for single or double-sided spraying
3. Calculated rate/tree and rate/ha (e.g. 10 L/tree and 3120 L/ha)
4. Pump maximum capacity (e.g. 120 L/minute)
5. Nozzle output capacity (e.g. 10 L/minute)
6. Calculated travel speed (e.g. 2.5 km/hour)



Keeping all parts, pipes and pumps clean, clear and working is key to effective sprayer operation, good coverage and equipment longevity.

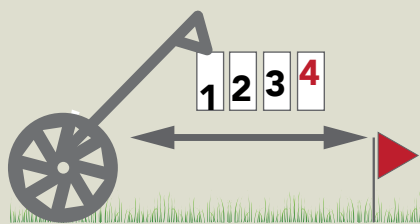
Use specially formulated tank cleaner regularly.

Optimal speed

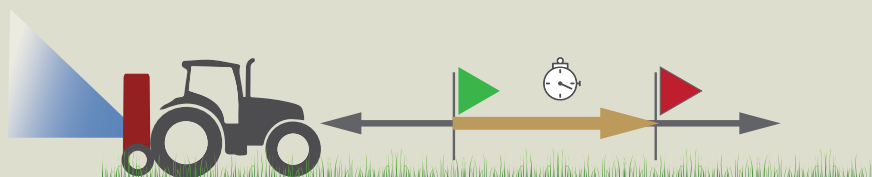
Consider machinery specifications and operation limits, including pump water output capacity. Spray application rates should be below 75% of the pump's maximum capacity.

The actual speed of a machine can be different to the speedometer reading if the tyre type and size have changed since it was manufactured and calibrated. If in doubt, check it at a set gear and RPM (even if you haven't changed anything it is good practice to do this every few years as part of your calibration process).

How to measure speed



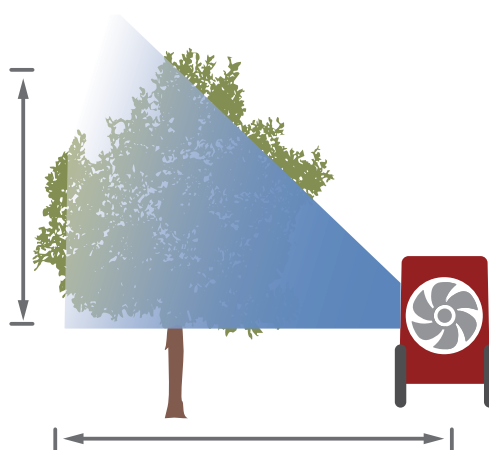
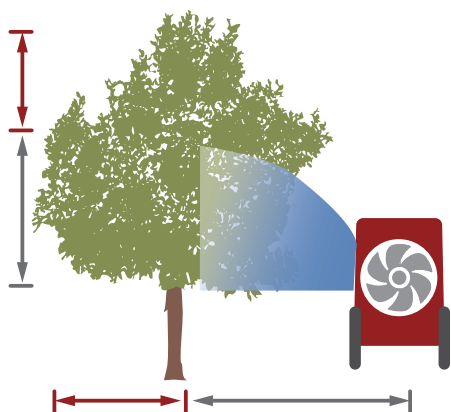
Measure an area with a trundle wheel or similar, e.g. 100 m.



Drive the length and time how long it takes to travel from one end to the other. Start outside the area so you reach a constant RPM by the time you pass start the marker.

Calculate your speed, for example:
 $100 \text{ m in } 1.5 \text{ min} = 1000 \text{ m/15 min}$
 $= 1 \text{ km/15 min}$
 So you are travelling at 4 km/hr

Faster is not always better



No matter how good your machine and water output, driving too fast can reduce water penetration into the tree canopy resulting in coverage that is not effective.

Nozzles

Nozzle selection. There are many factors involved in nozzle selection and placement for sprayers. Some things to consider in your selection include the following:

Output and operating pressure

Ensure your nozzle selection and combined output does not exceed 75% of pump pressure.

Nozzle capacity	Bar	Nozzle L/min
01	1	0.23
	2	0.32
	3	0.39
	4	0.45
	5	0.50
	6	0.55
	7	0.60
	8	0.64
02	1	0.34
	2	0.48
	3	0.59
	4	0.68
	5	0.76
	6	0.83
	7	0.90
	8	0.96

Pump water output capacity and pressure

If you fit multiple high output nozzles but your pump can't physically put out that much water, you won't achieve your target application rate.

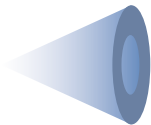


Nozzle type. The most common nozzles and housings you see on sprayers used in macadamias are:



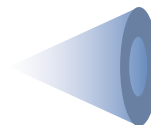
Cannons

- Solid stream, like a firehose. Droplets shatter on impact with foliage and stems (reach high up in canopy)
- Cone-shaped spray pattern. Covers a wider area with smaller droplets.



Ceramic hollow cone nozzles

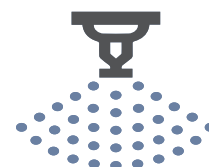
- Cone-shaped spray pattern is the standard configuration but removing the 'swirl plate' produces a solid stream.



Boom sprayers

With ground-application boom sprayers, nozzles are normally air-induced flat fans. Air induction pulls air into the water to increase droplet size. This reduces spray drift and droplets tend to shatter more when hitting leaves compared to a standard flat fan nozzle.

Boom sprayer nozzles also have different spray angles that determine how far above the ground they should operate and what distance apart nozzles should be.



Positioning

Even with the correct nozzles, pump capacity and pressure, coverage will not be effective if the nozzles are not correctly positioned. You must consider:

- spray angle
- air direction (in airblast sprayers)
- distance between nozzles
- distance to the tree.



It is critical to understand droplet size and spray pattern when choosing nozzles. Along with operating pressure, they determine spray drift potential, and legal obligations in this regard are increasing.

Some products specify they can only be used with medium or coarse droplets. You must read and follow the product label.

Canopy volume and structure

Determining canopy volume is an important part of applying the correct amount of product and getting good coverage (see formula below). You are calculating the "green area" which does not include the skirted section. Every tree isn't the same, so determine a representative volume for the block or orchard.

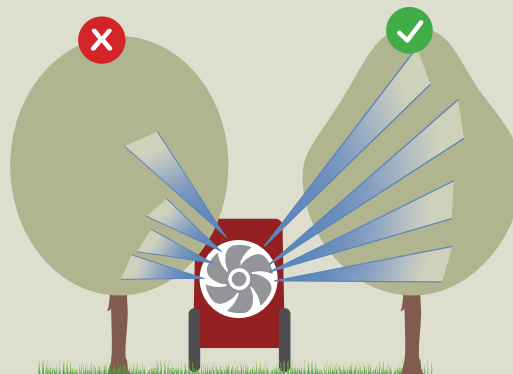
In the Canopy Management chapter of the *Macadamia Grower Toolkit*, light penetration and its link to crop production potential are discussed in depth. Canopy structure is a key factor in achieving successful spray coverage and, ultimately, pest and disease control or productive potential.

Canopy volume = canopy height x width x depth

A rule of thumb for effective spraying is to displace all air in the canopy with the applied spray.

Closed canopy, top of tree blocked by lower limbs, crowded alley: **BAD COVERAGE**

Open canopy, top of tree not blocked by lower limbs, good alley clearance: **GOOD COVERAGE**



High density canopies create hundreds of barriers to spray getting into the canopy. Consider these photos:



This flower is inside a dense canopy with upright branching. The branches have been pulled back to show the flower.



This is the same tree with the branches back in their normal position. Notice the flower is hidden. Even if you spray at all angles while you are driving down the inter row, coverage on this flower in a dense canopy will be poor.



In this tree, these unopened flowers are covered in aphids. If your spray product only has 'contact activity', e.g. horticultural oil, your ability to control these aphids with that spray are limited.

By aiming for optimal light penetration into the canopy, you are by default creating a canopy conducive to good spray coverage. This means thinking about:

- tree height
- alley width i.e. space between canopy of trees on neighbouring rows
- selective pruning or in combination with strategic hedging (see caution on hedging in Canopy Management chapter).

Determining each of these requires technical knowledge of the orchard system and the equipment being used. It is recommended to seek professional assistance.

References and acknowledgments

Jim Patch 'Macadamia Orchard Spraying' presentation given at MacGroups 2018 and "Coverage is King Article" 2018.

Chris Fuller Spray coverage considerations slides presented at MacGroups 2021

AMS factsheet by Jeremy Bright "Coverage, Calibration, Timing: get them right for effective pest and disease management"

Website: sprayers101.com

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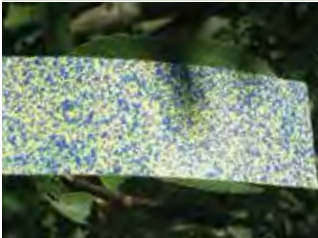
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Testing for coverage

Dr Karina Griffin, Project Support Officer, AMS **M:** 0483 084 297 **E:** karina.griffin@macadamias.org

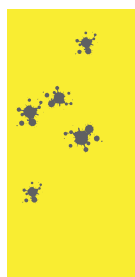
Testing for coverage is also a core part of any calibration and it will help you check the four core factors of coverage i.e. speed, nozzles, canopy structure and application rate.

Water-sensitive paper	Kaolin clay	Florescent dyes
		
Specialised paper cards placed in the tree in different locations	Kaolin clay mixed in water sprayed onto trees	Water-based fluorescent, food-grade dye sprayed on trees After sunset, shine UV light onto leaves

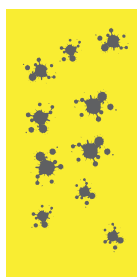
In large trees, place a pole along a tree stem reaching to the top. If using water sensitive paper place these intermittently up the pole. If using kaolin clay or fluorescent dyes make sure your pole is a suitable colour to see the droplets e.g. black. Once you have sprayed you simply take down the pole down to assess droplet distribution along the entire pole.

Effective coverage is around

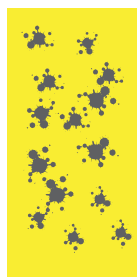
85 fine to medium droplets/cm² and 10-15% of surface area.



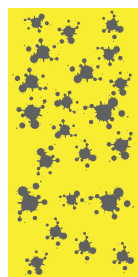
20 drops/cm²



60 drops/cm²



85 drops/cm²



100 drops/cm²

Check coverage



Yes, I have achieved effective coverage



No, my coverage is inadequate

Modify/recalculate

1. Output
2. Speed
3. Pressure
4. Nozzle type and position

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Ancestry.com for macadamias

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

In 2019, Hort Innovation funded a new research project, MC18004 *Genetic diversity and population structure of wild and domesticated Macadamia*, dubbed "Ancestry.com for macadamias".

The project, managed by Dr Cathy Nock from Southern Cross University, has advanced our understanding of population structure and genetic diversity in macadamias. It involved sampling, genotyping and analysing more than 1000 accessions, including wild and planted trees, predominant cultivars, new levy-funded cultivars and germplasm from the Australian and Hawaiian breeding programs (see table).

The results can now inform the long-term conservation of genetic and morphological diversity for the benefit of the macadamia industry and retention of natural biodiversity.

Genotyping

Southern Cross University has developed 15 macadamia-specific short sequence repeat (SSR) markers. SSR genotyping is a robust method used in human forensics and agriculture that requires minimal DNA, and a small amount of tissue from young or older macadamia leaves is usually all that is needed. Macadamia SSR markers have contributed to the Australian industry by being used to identify cultivars to ensure that nursery propagation of newly released selections only uses true-to-type scion wood. Without a reliable genotyping method, the supply of MCT1 scion wood would have been delayed and current demand unable to be met.

Subsets of the SSR genetic markers can distinguish between macadamia cultivars, individuals, hybrids and species and are being used for DNA paternity analysis in orchards and gene flow studies in wild populations. A major benefit of SSR genotyping is that the primers and methods are published, non-proprietary and transferrable between labs.

Results

Macadamia integrifolia

The most valuable result from a conservation perspective is the identification of accessions that capture much of the genetic diversity found in macadamia. Five genetic clusters were found in *M. integrifolia*. Figure 1 shows the distribution of genetic diversity (on the left) for each of five areas of habitat (on the right). Trees that represent each of the main genetic clusters (>80%) are being selected by MCT for inclusion in the Wild Macadamia Arboretum.

The lost Brisbane clade

Genetic Cluster 4 has been a mystery. It was first detected in 2019 using chloroplast sequencing and was represented by only three planted trees: the Walter Hill tree (planted 1858), a tree in California (planted 1879) and an old tree in a Brisbane backyard (Nock et al. 2019). In this project, nine more trees belonging to the lost clade were found. The most exciting thing is that some of these were collected from remnant wild populations in the Brisbane region suggesting that macadamia historically grew along rainforested creeks between the Brisbane River and Beenleigh. MCT is now working with the Brisbane City Council and local conservation groups to repopulate this area with cuttings from the original wild trees – something that would not have been possible without this project.

The next edition of *Wild 4 Macadamias*, the Wild Macadamia Champions newsletter, will feature the full story. Sign up for your copy at wildmacadamias.org.au

Species	Accessions	Notes
<i>M. integrifolia</i>	427	Wild trees and cultivated varieties
<i>M. tetraphylla</i>	314	Wild trees
<i>M. ternifolia</i>	40	Wild trees
<i>M. jansonii</i>	182	Wild trees, some from seedlings not included in the population census for this species.
Hybrids	68	Sixteen of these are cultivars, many others are planted trees – from this sample, natural hybridisation appears to be limited.
Not genotyped	36	Insufficient sample material or quality for genotyping.
Total	1067	
Cultivars	79	Seventy-nine of the 1067 accessions are cultivars bred for the macadamia industry, 35 from Australia, 33 from Hawaii and 11 from other growing regions around the world.

Table. Accessions analysed for the genetic diversity project MC18004

Macadamia tetraphylla

The *M. tetraphylla* accessions show the highest genetic diversity of the four species, but compared with *M. integrifolia*, there was more gene flow between geographic regions. This is consistent with previous reports by O'Connor et al (2015) and Mai et al (2020). Trees with the highest percentage assignment to each of five main genetic clusters in *M. tetraphylla* will also be targeted for the arboretum.

Macadamia ternifolia

M. ternifolia is a small tree, of interest for future breeding or as a rootstock but little studied to date. While this project sourced enough accessions to confirm that it is a distinct species, more trees need to be sampled from across its geographic range to understand the distribution of genetic diversity. The Wild Macadamia Arboretum will house the largest ex situ collection of *M. ternifolia* genetic diversity.

Macadamia jansenii

Collaboration with Professor Alison Shapcott, University of Sunshine Coast, provided the opportunity to genotype leaf samples from all known *M. jansenii* trees

(182, including seedlings). Because of its extreme rarity, *M. jansenii* genetic diversity is the lowest of the four species. The Trust is working to establish ex situ conservation collections and will strive to include as much of the identified genetic diversity as possible.

Collaboration between industry, research and conservation

This project is the result of more than two decades of dedicated research and field work. The collection of leaf samples from wild and planted macadamia trees involved a large group of scientists, conservationists, landholders, volunteers and the industry. The greatest accolade must go to Dr Cathy Nock for her vision and dedication, but thanks are also due to Paul O'Hare who encouraged me to submit a concept development proposal to Hort Innovation over the 2018 Christmas break and was then able to champion its merits, leading to the allocation of Macadamia Levy Funds to the project. For more information, see: <https://www.horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/mc18004/>

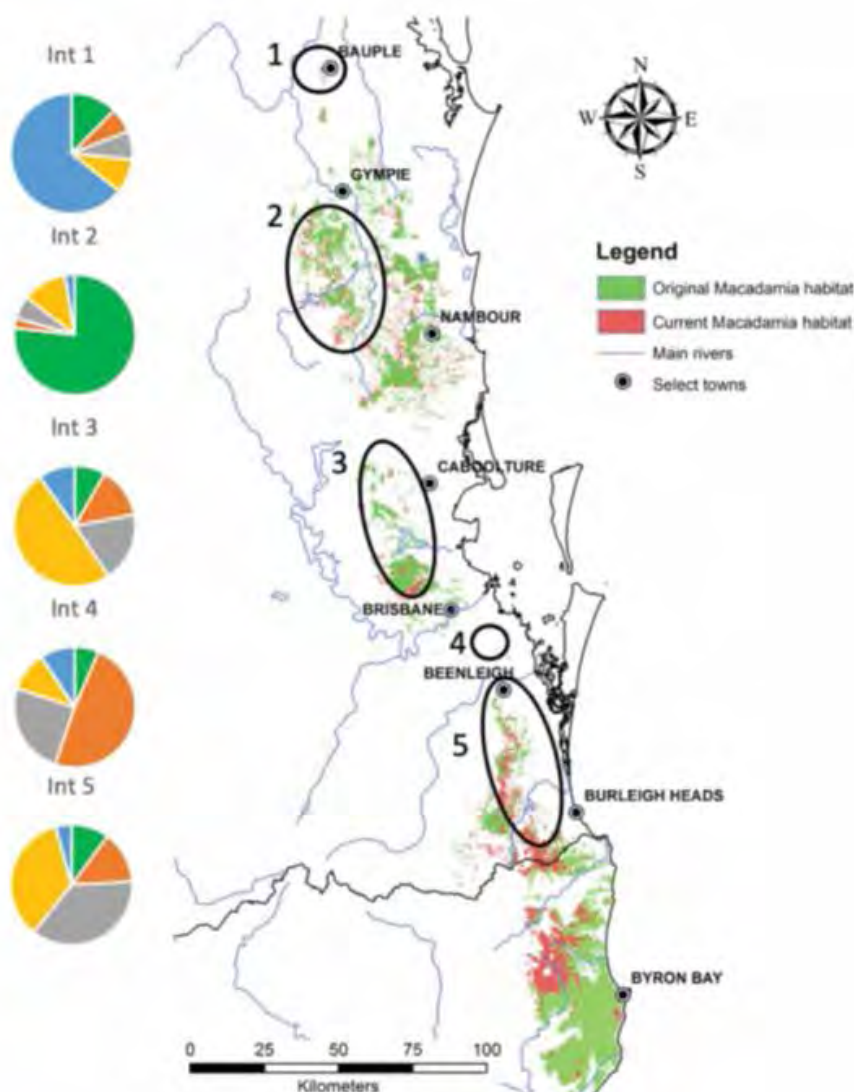


Figure 1. Geographic distribution of genetic diversity in *Macadamia integrifolia*. Regions of habitat are circled on the map. Pie charts show the proportion of trees from each region belonging to each of five genetic clusters identified in *M. integrifolia* (Hort Innovation, 2021).

References

- Hort Innovation, 2021. Genetic diversity and population structure of wild and domesticated Macadamia. Final Report: MC18004.
- Langdon, K.S., King, G.J. and Nock, C.J., 2019. DNA paternity testing indicates unexpectedly high levels of self-fertilisation in macadamia. *Tree Genetics and Genomes* 15:29.
- Mai, T., Alam, M., Hardner, C., Henry, R. and Topp, B., 2020. Genetic Structure of Wild Germplasm of Macadamia: Species Assignment, Diversity and Phylogeographic Relationships. *Plants*, 9(6), p.714.
- Nock, C.J., Elphinstone, M.S., Ablett, G., Kawamata, A., Hancock, W., Hardner, C.M. and King, G.J., 2014. Whole genome shotgun sequences for microsatellite discovery and application in cultivated and wild Macadamia (Proteaceae). *Applications in Plant Sciences* 2(4): 1300089.
- Nock, C.J., Hardner, C.M., Montenegro, J.D., Ahmad Termizi, A.A., Hayashi, S., Playford, J., Edwards, D., Batley, J. (2019) Wild origins of macadamia domestication identified through intraspecific chloroplast genome sequencing. *Frontiers in Plant Science* 10:334
- O'Connor, K., Powell, M., Nock, C., and Shapcott, A. (2015). Crop to wild gene flow and genetic diversity in a vulnerable Macadamia (Proteaceae) species in New South Wales, Australia. *Biological Conservation* 191, 504–511.

Leptocoris bugs, are there more or are we looking more closely for them?

Jeremy Bright, Industry Development Officer, NSW DPI P: 02 6626 1346 E: jeremy.bright@dpi.nsw.gov.au

Snapshot

- *Leptocoris* spp are widely distributed and found in all macadamia growing regions. There are two species: NSW, *L. rufomarginatus* and Queensland, *L. tagalicus*.
- Use indicators such as seasonal conditions and *Leptocoris* populations on host plants to determine whether it is likely to be a problem in your orchard.
- *Leptocoris* spp damage is similar to that of FSB and green vegetable bug (GVB) but which insect is the cause can be identified in dried kernel samples.
- *Leptocoris* spp are not controlled through beta-cyfluthrin (Bulldock) sprays.
- *Leptocoris* congregate so their presence is easy to detect.
- To date no known effective biological controls have been found and no chemical is registered for use against the pest.
- Control of *Leptocoris* spp relies on sound monitoring and effective general pest management.
- Identify what a low, medium and high population of *Leptocoris* looks like if you are using drop sheet monitoring.
- Use a skilled pest consultant to determine *Leptocoris* pressure and provide recommendations for management.

Leptocoris species (commonly called soapberry bugs, family Rhopalidae), which are widely distributed throughout NSW and Queensland, have recently been seen more often over a wider area than was previously the case. This wider distribution is likely due to drier weather conditions such as those experienced in 2019–2020. In dry seasons, FSB pressure is low and *Leptocoris* spp pressure is high; when it rains, FSB pressure increases and *Leptocoris* spp pressure is reduced. In Queensland, especially in the Gympie region, *Leptocoris* spp are a continuous threat year-round, especially during the drier late summer months.

What the insect looks like and the damage it causes

Adult *Leptocoris* spp. are reddish brown, have narrow bodies, are winged and are about 12 mm long. The underbody is dull red with a dark green area in the middle of the abdomen, and its legs and antennae

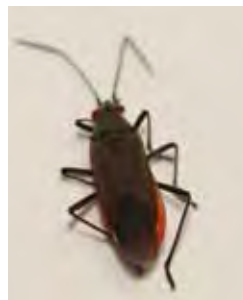
are black. *Leptocoris* spp. nymphs have a bright red abdomen with a brown-black head. There are two known species of *Leptocoris*; *L. rufomarginatus*, found in Northern NSW and *L. tagalicus*, found in the Amamoor region, Gympie. Both species will feed on macadamia.

Foam bark (*Jagera pseudorhus*) and golden rain trees (*Koelreuteria elegans*) are known hosts for *Leptocoris* so monitoring them is a good way to determine insect pressure and life stages.

A characteristic of *Leptocoris* spp. is that they congregate so are often found initially in localised areas in macadamia orchards from where they spread outwards.

While the damage they cause is like that of FSB and green vegetable bug, it is distinguished by more defined margins and shallower depth of damage. As all kernel damage by insects is categorised as "insect damage", if you would like to know which insect or insects are causing damage, ask your processor representative to examine samples for you.

NSW DPI research suggests that during dry weather such as experienced in 2019–2020, FSB pressure is low and *Leptocoris* spp. pressure is high. Once it rains again, FSB pressure increases and *Leptocoris* spp. pressure goes down.



An adult *Leptocoris*, which is about 12 mm long, winged and is a reddish brown in colour. Photo: NSW DPI.

Monitoring the key to management

Monitoring is the key to controlling this pest. Growers can identify potential sources of pressure by monitoring surrounding host plants such as golden rain or foam bark trees. When there are high numbers on these trees during a high-risk period or a susceptible stage of production, get advice on the best management strategy.

Risk period

Pre-flowering	Early flowering	Peak flowering	Nut set	Pea size nut and spring flush	Shell hardening to harvest	Harvest to pre-flower

Table 1. The highest risk period for *Leptocoris* spp is from nut set to harvest

Seasonal conditions are also a guide; in a dry year, *Leptocoris* spp. pressure most likely will be high. Pest scouts and consultants who routinely check for FSB will also be able to identify *Leptocoris* spp. in the orchard, and they will be able to alert growers to population pressures in particular areas and to recommend control strategies.

Leptocoris congregate so are often found initially in restricted areas in macadamia orchards from where they spread outwards.

Control strategies

To date there is no known effective biological control for *Leptocoris*. A parasitic fly isolated in the field by NSW DPI entomology staff was not found in significant numbers and currently little is known about it and its potential as a biological control.

No product is registered currently for control of *Leptocoris* spp in macadamia, but as it can coincide with FSB, it could be an off-target control. NSW DPI entomology staff have identified that Beta Cyfluthrin (Bulldock), used for spotting bug, will not control *Leptocoris* spp.

Higher populations or are we looking more closely?

With many growers now using drop sheeting for monitoring, especially late in the season, a more comprehensive picture of pest and beneficial insect population dynamics in orchards is being revealed.



Leptocoris adults and nymphs on a nut. Photo: Leoni Kojetin.



Examples of damage caused by *Leptocoris* spp (left) and by fruit spotting bug. *Leptocoris* damage has more defined margins and is not as deep as that caused by fruit spotting bug. Photos: Marquis Macadamias.

We don't know whether the wide range of pests (and often beneficials) being found using this relatively new practice is due to increased pressure or whether they were always there, but we didn't have the tools previously to find them. Until we have several years of data it will remain unknown.

Information

For more information on *Leptocoris* identification and damage, control go to the NSW DPI Macadamia Plant Protection Guide 2021-22.



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Views from the orchard

The AMS spoke with industry members at Bundaberg and Gympie to get their on-ground experiences of *Leptocoris* in the last two seasons.



Earl Yandall, grower, Childers and Bundaberg

"From our monitoring, we have seen a significant increase in *Leptocoris* damage in orchards, specifically our Childers farms in late 2021 and 2022. To quantify what we were seeing in the trees and nut damage we put out a series of drop sheets and the results were very high numbers of *Leptocoris*. This is usual but we haven't had the issue and drop sheets for enough years to have a definitive benchmark for damage."



Eddy Dunn, consultant, Bundaberg

"In Bundaberg *Leptocoris* pressure seems to be similar to the previous season, but we are not certain of the full impact in macadamia. They congregate in hotspots, which are often in more stressed or sick trees. They are prevalent in lychees during and just after flowering so this could be another way to monitor regional levels. Interestingly, they don't seem to be causing much damage on lychees."

This is a relatively new pest in the region in macadamia and we're hoping drop sheet and other monitoring tools over the next seasons will help inform control. There are anecdotal views about control from some of the products sprayed for other pests, but nothing is currently registered."



Megan Boote, grower services officer, Gympie

"In the Gympie region some farms consistently have *Leptocoris* in the orchard, while it is absent in others. Places where there are many alternative hosts definitely have more *Leptocoris* present. We see them coming in from neighbouring unsprayed avocado orchards."

The 2020 season saw very high levels when we had dry conditions. We weren't really expecting this in 2021 but late in the season this changed. With the very wet start to summer we found *Leptocoris* numbers increasing, but not high enough levels or possibly even late enough not to cause significant crop damage. The thinking that it is only a 'dry season' pest seems disproven."

In 2021 our processor lab did see what we suspect was *Leptocoris* damage and often at levels greater than 10% insect reject which was correlated by grower reports of their sightings. In other cases, lab report damage doesn't seem to match grower observations and possibly we are confusing kernel damage with other very similar markings from green veggie bug damage."

Leptocoris don't seem to scare like FSB do and are very easy to find if they're in the orchard. They tend to be in hotspots and on boundaries and are a bit like nut borer in that they can fly in so the tops of hills can also be hotspots. But then they can also just disappear from the orchard without any intervention, and we are still trying to understand that."

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Softer insecticide option for lace bug management

Minimising harm to pollinators over flowering is a critical consideration when spraying for macadamia lace bug. According to Bayer Australia, the macadamia industry is set to benefit from a new generation insecticide, SIVANTO prime, that will do just this. The insecticide is available for use against lace bug this year.



Growers are prioritising insecticides that have a minimal impact on pollinators such as native Australian stingless bees (left) and European honey bees (right).

SIVANTO prime was inspired by a natural plant compound from the plant *Stemona janonica*. When used as directed it has low toxicity to Australian native stingless bees and European honey bees. This provides growers and beekeepers with greater flexibility during flowering, as accidental overspray does not cause bee disorientation or affect colony survival and strength.

It has also been tested against a range of beneficial species like predatory mites, hoverflies lacewings, parasitoids and lady bird beetles, with results showing that this product has minimal to no impact on these species.

Recommended rate

The insecticide has both contact and systemic activity. The contact activity rapidly prevents sap feeding by adult and juvenile lace bugs. Its systemic properties allow further protection in the raceme against later re-infestation. The industry recommendation is to monitor green, unopened racemes, and spray no later than 5% open flowers. Field trials using this spray regime in the Northern Rivers showed it outperformed standard organophosphate insecticides for control of lace bug (see figure).

This season, SIVANTO prime should only be used at 50 mL/100 L against macadamia lace bug, with a maximum of one application per 12-month period. Wider recommendations are expected in 2023, after establishment of export tolerances for higher application rates for the control of spotting bugs.

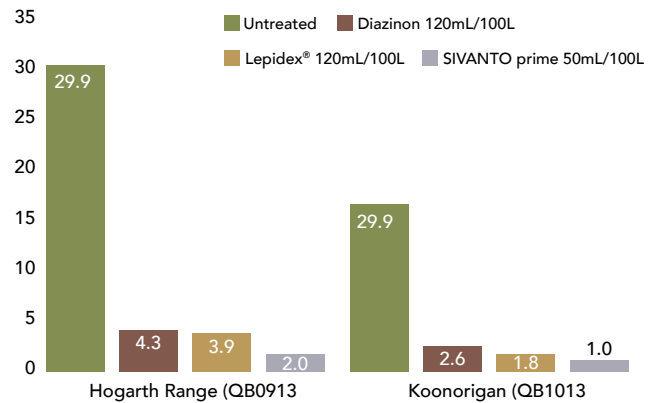


Figure. Comparison of mean number of lace bugs per 10 racemes for SIVANTO and organophosphate insecticides



Lace bug damage on untreated flowers.

Information

For more information, visit sivantoprime.com.au for the pest management guide or contact Bayer Australia on 1800 804 479.

Note. This article was supplied by Bayer Australia Ltd.

Australian macadamia minor use and emergency permits

Current at June 2022

Chemical	Permit no.	Pest/Disease use	Application rate	Withholding period (no. days)	Minor use permits
Minor use permits					
Abamectin	PER87510	Thrips and flat or broad mites	- Product containing 18 g/L abamectin: 750 mL /ha plus 5 L summer spray oil/ha - Product containing 36 g/L abamectin: 375 mL /ha plus 5 L summer spray oil/ha	28	All states and territories except VIC
Chlorpyrifos & maldison	PER13642	Australian plague locust	- Product containing 500 g/L chlorpyrifos: 350 mL/ha - Product containing 440 g/L maldison: 1.4 or 1.9 L/ha - Product containing 500 g/L maldison: 1.2 or 1.7 L/ha - Product containing 1000 g/L maldison: 600 or 850 mL/ha - Product containing 1150 g/L maldison: 520 or 750 mL/ha - Ground application	Chlorpyrifos: 30 Maldison: Not required when used as directed	All states and territories except VIC
Diazinon	PER14276	Macadamia lace bug	Product containing 800 g/L diazinon: 120 mL product/100 L	14	NSW, QLD & WA only
Ethephon	PER11462	Promote nut fall after maturity reached	- Product containing 480 g/L ethephon: 65–250 mL/100 L water - Product containing 720 g/L ethephon: 55–165 mL/100 L water - Product containing 900 g/L ethephon: 44–132 mL/100 L water - Do not spray stressed trees - Refer to critical comments for varietal rate adjustments	7	NSW, QLD, WA & NT only
Indoxacarb	PER86827	Macadamia seed weevil	- Product containing 150 g/L indoxacarb: 50 mL product/100 L - Product containing 300 g/kg indoxacarb: 25 g product/100 L	42	NSW & QLD only
Methomyl	PER90592	Banana fruit caterpillar	- Product containing 225 g/L methomyl: 1.5–2 L/ha - Spraying ground mulch/soil surface up to treelines only - Do not spray tree foliage, flowers or developing nutlets	Not required when used as directed	QLD only
Petroleum oil	PER11635	Macadamia felted coccid	Product containing between 763 and 861 g/L petroleum oil: 1 L/100 L water	Not required when used as directed	NSW & QLD only
Trichlorfon	PER13689	Macadamia lace bug, fruit spotting bug, banana spotting bug and green vegetable bug	- Product containing 500 g/L trichlorfon: 200 mL/100 L - Do not apply a spray volume exceeding 1500 L/ha - Do not apply by aircraft or to plants in flower - Not compatible with integrated pest management	2	NSW & QLD only
Emergency permits					
Chlorantraniliprole	PER89353	Fall armyworm	- Product containing 350 g/kg chlorantraniliprole: 18 g product/100 L + 15 g active/100 L non-ionic surfactant/wetting agent - Product containing 200 g/L chlorantraniliprole: 30 mL product/100 L + 15 g active/100 L non-ionic surfactant/wetting agent	10	All states and territories except VIC
Indoxacarb	PER89278	Fall armyworm	Product containing 300 g/kg indoxacarb: 25 g/100L	42	All states and territories except VIC
Methomyl	PER89293	Fall armyworm	- Product containing 225 g/L methomyl: 1.5–2 L/ha - Product containing 400 g/kg methomyl: 0.84–1.13 kg/ha - Spray ground mulch/soil surface only	Not required when used as directed	All states and territories
Spinetoram	PER89241	Fall armyworm	Product containing 120 g/L spinetoram: 40 mL product/100 L	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.

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