

Appendix 3. Recommendations – options and management strategies for inter row insectaries

MOW OPTION	DESCRIPTION
MOHAWK	<p><i>Reduced mowing leaves a central mohawk strip down the row, with more regular mowing under the drip-line of the trees.</i></p> <p>A mohawk allows for an area of greatly reduced mowing for an insectary down the centre of the inter row in conjunction with more intensive ground-cover management under trees.</p> <p>A mohawk can be retained year-round, including throughout harvest.</p> <ul style="list-style-type: none"> • This helps to keep beneficial arthropods active in the orchard year-round, and especially leading into flowering when pest pressure will start to increase. • It also keeps insectary vegetation viable in the inter row throughout drier winter months. It can take many months for this vegetation to recover during long dry periods if it is mowed out. <p>Row width of minimum 9-10m.</p> <p>Mohawk strip width to be calibrated against width of harvester, slasher and mower.</p> <p>Mohawk strip to be monitored:</p> <ul style="list-style-type: none"> • Is nut getting caught in the mohawk? Take action to reduce mohawk width or remove mohawk altogether for harvest period. • Is mohawk vegetation getting “ropey” or “thatchy” and likely to cause problems for
ALTERNATE ROW MOW	<p><i>Mow every second row on a rotating schedule, allowing all rows to “grow out” somewhat across the year and all rows to be mowed alternately, outside of harvest.</i></p> <p>This reduces the overall disturbance of beneficial arthropods that conventional mowing creates. At any one time, only half of the orchard is disturbed by mowing. Inter row vegetation has an opportunity to grow out and flower, providing food and habitat for beneficial arthropods. A refuge remains in place at all times somewhere in the orchard.</p> <p>This approach provides opportunities to more regularly manage:</p> <ul style="list-style-type: none"> • Heavy, clumping grasses and woody weeds and dominating species. • Rejuvenation of vegetation for new growth and flowering. • Any areas where rats are observed to be active. <p>Alternate row mow is only suitable outside of harvest.</p>
MOWHAWK OR ALTERNATE ROW MOW?	<p><i>Ultimately this is a decision to be taken on a farm-by-farm, season-by-season and also site-by-site basis, given the following considerations:</i></p> <p>Mohawk can be a better fit where:</p>

- Width is available. 9-10m row minimum.
- Machinery is compatible.
- Retaining insectary vegetation throughout harvest and winter is a priority.
- Time, resources and/or capacity for basic monitoring and management of the mohawk during harvest is available.

Alternate row mow can be a better fit where:

- Width is a constraint. In this trial, mohawk worked best in 9-10m rows.
- In relation to width, machinery operation is a constraint. Configuration of existing machinery may not be optimal in conjunction with a mohawk.
- Time, resources and/or capacity for basic monitoring and management is limited.
- Dominating, clumping plant species, and/or woody weeds are present (eg., setaria, rhodes grass, kikuyu, cobblers’ pegs, noogoora bur and so on) and require regular mechanical mangment.
- New blocks and orchards with young trees where the more intensive management of the mohawk is not necessary. The entire inter row can be dedicated to ecosystem services including insectary and soil health until trees begin to set nut.

“Mohawk” and “alternate row mow” described here provide basic templates, which you can trial and innovate for your own farm

Table 15: Options for inter row insectaries

Reduced mowing must be conducted with clear objectives, planning, and management strategies, which should be considered on a farm-by-farm basis (see **Table 16**, for recommendations below).

The strategies presented below are listed in order of increasing management commitment and increasing insectary value.

MOW STRATEGY	DESCRIPTION
CURRENT INDUSTRY STANDARD	<p><i><u>Action:</u> Complete close mow of the entire inter row, under the drip-line and down the centre of the inter row.</i></p> <p><i><u>Objective:</u> The entire inter row is managed for ground cover to harvest standards and requirements.</i></p> <p>The inter row is managed with heavy regular mowing, slashing and/or herbicide year-round with ground cover principally for erosion management and orchard floor suitable for harvest requirements.</p> <p>A monoculture of densely-packed, carpet-forming grass (eg., smother grass, broad-leafed carpet grass, or couch) is maintained.</p> <p>Monitor and manage rats in the inter row, as appropriate.</p>
REDUCED MOW - CALENDAR	<p><i><u>Action:</u> Mowing is reduced in the inter row using either a mohawk or alternate row mow and scheduled against major orchard activities including pre-harvest clean-up and harvest.</i></p> <p><i><u>Objective:</u> Reduce frequency of mowing to allow for growth of diverse species in inter row vegetation, which will flower and provide habitat for beneficial insects.</i></p>

Reduce mowing to approximately 1-2 month intervals outside of harvest.

Suitable for any orchard (most row widths, and moderate available light).

Existing machinery for current industry standard will be suitable.

Monitor and manage rats in the inter row, as appropriate.

**REDUCED MOW -
MONITORING**

Action: Mowing is reduced in the inter row using either a mohawk or alternate row mow and scheduled on the basis of monitoring and major orchard activities including pre-harvest clean-up and harvest.

Objective: Reduce frequency of mowing based on simple monitoring of vegetation to allow for growth of diverse species in inter row vegetation, which will flower and provide habitat for beneficial insects.

Some farms have good existing mixes of naturalised weeds, grasses and natives, which perform well in low mow insectaries. Observe and monitor for desirable characteristics.

Base decisions to mow on basic monitoring of inter row vegetation during the growing season and seasonal extremes. For example:

- Reduce mowing during prolonged dry periods.
- Reduce mowing to allow flowering of grasses.
- Increase mowing - during wetter periods if growth rates produce large volumes of vegetation that can tangle harvester mechanisms; if one grass species or naturalised weed becomes too dominant; if you observe an increase in rat activity.

Suitable for most orchards (row width, available light).

Existing machinery for current industry standard will be suitable. Consider configuration and settings for stream-lined operation of reduced mowing operations for future machinery purchasing decisions.

Monitor and manage rats in the inter row, as appropriate.

INTERMITTENT SEEDING

Action: Mowing is reduced in the inter row using either a mohawk or alternate row mow and scheduled on the basis of monitoring and major orchard activities including pre-harvest clean-up and harvest. There will be seeding of the inter row with seed-mixes prepared specifically for macadamia orchards (annually or biannually, as required).

Objective: Seed to improve plant species diversity in the inter row, selecting species with characteristics attractive to beneficial arthropods including flowers and habitat.

Some farms do not have good existing mixes of naturalised weeds, grasses and natives. Observe and monitor for dominance, weediness, low value plants. Seeding may be necessary to improve the overall mix.

Some farmers will be interested in simple but targeted and selective improvements of the inter row with seeding.

It is strongly recommended that seed mixes are specifically selected for suitability in the macadamia orchard:

- A number of seed suppliers can provide advice and pre-mixed selections suitable for your orchard and local area.
- Do not use “good bug mixes” that are often recommended for gardeners and temperate climate horticulture. They do not represent value for money in this application and in our trials did not establish or perform well in the field.

Target specific areas of the inter row. For example:

- Shade tolerant, carpet forming species mixes can be selected for under the drip-line, and these will be especially compatible longer-term with harvest.
- Annual species that flower heavily, grow vertically and vigorously and are easily mowed out can be seeded into the mohawk.

Most suitable for orchards with row width of 9-10m and/or good available light.

Existing machinery for current industry standard will be suitable to get started. Consider configuration and settings for stream-lined operation of reduced mowing operations for future machinery purchasing decisions. You can hand broadcast seed but eventually access to a seeder will be preferable.

Monitor and manage rats in the inter row, as appropriate.

COVER CROPPING

Action: Multiple annual and/or seasonal re-seedings of the inter row with cover crops selected specifically for macadamia orchards, with mowing to support and improve cover crops and major orchard activities including pre-harvest clean-up and harvest.

Objective: Intensive management of the inter row with cover crops that improve multiple ecosystem services including insect pest suppression and crop pollination, nutrient cycling and soil health, carbon sequestration, and water and erosion control.

Major opportunities for cover cropping exist during the development of new orchard blocks, in blocks with young trees, and following the removal of macadamia tree rows. Cover cropping can also be incorporated into the inter row of orchards with sufficient row width (9-10m minimum) and good available light on the orchard floor year-round; and where growers will invest in managing and maintaining a dedicated cover-cropping system to realise the potential of high-value returns for multiple ecosystem services.

This project has collected data from one farm with cover cropping (See **Methods** and **Appendix X**). The results are very impressive and warrant industry-wide consideration.

These results come with careful long-term farm planning, prudent investment in appropriate machinery, education and training, and commitment to evidence-based decision-support (various crop consultants).

Provision of further advice on this very promising management strategy is beyond the scope of this project.

Table 16: Management strategies for inter row insectaries