

Improving soil health, pollination and pest regulation in lychee orchards with managed vegetative diversity – what to do and how to do it

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Managed vegetative diversity

“Managed vegetative diversity” is an orchard management practice centred on ecological intensification, which carefully directs¹ and selects² non-crop vegetation for the purposes of overall productivity and sustainability. It has been rapidly adopted in recent years by a number of Australian agricultural industries including viticulture³ and macadamias⁴. The objective is to restore and conserve key ecosystem services including soil health, pollination security and insect pest regulation.⁵ It can also play a valuable role in regulating hydrological processes, microclimates, and soil moisture, while protecting native flora and fauna.⁴

For growers implementing managed vegetative diversity, the decision as to what to plant is inter-linked with where to plant it. Furthermore, it is associated with the cultivation of plants with specific traits, which have been characterised by functional ecology⁸ and are well understood in agronomy⁹. Wherever there is a “problem” on-farm, there are plants adapted to providing valuable services in the mitigation of that problem. And diversity is key. This diversity can be found in annual cover crop mixes, perennial ground cover mixes and/or native vegetation areas.

In 2021-22 BioResEd has been talking with the lychee industry with a view to supporting growers who are looking to incorporate managed vegetative diversity into their farms.

Here are just a few of the potential opportunities available for managed vegetative diversity on lychee farms:

- In the inter row. It is well understood that ground cover is very important in the orchard inter row. These benefits can be amplified with more targeted and selective vegetation decisions, especially in relation to the inclusion and care of cover crop strips or a more diverse mix of perennial ground covers.
- Orchard inter rows are subject to compaction. The roots of inter row vegetation can be used as a powerful tool for mitigating this problem.¹⁰ Inter row plant species can support soil improvements with their physical and chemical properties.¹¹ Improved vegetation in the inter row can keep beneficial insects active in the orchard year-round, which in turn helps to suppress pest insects and keep pollinators close to trees.¹²

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Wynn cassia, left, tillage radish, right, can be selected for their tap roots, which can help break up compaction. Legumes like wynn cassia also fix N, as evident with nodulation.

- Around the orchard perimeter.** These areas can serve as growing zones for the more robust cover crop species that can be difficult to include in the inter row, including sunn hemp and sorghum. This is also a good area to consider shelter belts with native vegetation, including shrubs and grasses. Unlike ground covers and the inter row itself, perimeter vegetation strips can offer a more stable and less disturbed habitat for beneficial insects.
- These insectary areas can be especially valuable in supporting generalist predators such as spiders and a greater diversity of pollinator species.¹³ We call the resources provided by these areas SNAP - Shelter Nectar Alternate prey Pollen.¹⁴ Furthermore, these strips can provide the orchard with a buffer against a range of weather extremes, including wind, heat waves, flash flooding and so on.



A perimeter strip around an orchard includes more robust and longer lived and/or self-seeding annuals and biennials – sunn hemp, chicory, sunflowers, brassicas, forage sorghum.

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- In fallow or functional areas not currently in the production system. Machinery pads, drainage channels, undeveloped future orchard blocks, and so on, can serve multiple functions. For example, they can also serve as seasonal pollinator insectaries if seeded with fast-maturing cover crop annuals. These areas can increase the abundance and diversity of pollinators. This in turn is likely to improve pollination and fruit set.¹⁵
- Having diverse vegetation in these areas can support active, diverse and abundant pollinators across time and space on-farm. The idea is to have bulk

flowering and also sequenced flowering particularly in the lead up to tree flowering.¹⁶ This is likely to make better use of M2 male flowers.

- Insectaries will also sure-up pollination security, year-on-year, especially when climatic extremes such as heat waves or floods – which severely impact insects in the absence of SNAP - are taken into consideration. The bottom line is that with a greater diversity of pollinator species sustained in the orchard by a greater diversity of plant provisions and habitats year-round, we can reduce the exposure of valuable pollinators to environmental shocks and risk



Provisions for honey bees year-round with various species of clovers and brassica in the inter row; along with honey bees, more potential pollinators including hover flies and native bees with highly attractive species including buckwheat.

How to do it

Trials of these and similar changes to vegetative diversity on-farm are within the reach of most growers.

Step 1 - conduct a simple practical assessment of your site:

- Available light to the orchard floor, or other selected area.
- Seasonal demands, especially around harvest.
- Current soil health, including soil moisture and especially compaction.

- Available machinery.

Step 2 - get advice and do some research on what is likely to work on your farm. Every farm is unique.

Step 3 - approach changes to vegetative diversity as an initial three-year program and plan and prepare accordingly.

- Year 1 usually involves working through a lot of practical issues. Is irrigation necessary? If your trees are irrigated,

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you will need to think carefully about what can be achieved and how in terms of inter row soil moisture. Should you work on the soil health of the inter row before seeding? How do these changes sit alongside the timing and operations of harvest? What is achievable with current machinery? What kind of ground preparation suits your orchard?

- In year 2 there will be some big successes with plantings and some failures, with lessons to learn. What changes should be made in year 2? Was soil health in the planting area a major limiting factor?
- By year 3 things are much clearer in terms of what will work for you with soil moisture, schedules, machinery and seed mix options. The benefits of vegetative diversity are cumulative, they compound through time and they are active across multiple inter-related areas – soil health, pollination, pest regulation.

Final recommendations

Set realistic expectations. Many orchards, though not all, will have less than optimal soil health in the inter row. Compaction will often limit the success of cover crops there. If irrigation and/or amendments are not options for your trial, you will need to get creative in order to guarantee soil moisture and nutrition for your cover crops.

Trialling seed mixes. Newcomers to cover cropping often want to go straight to “the seed mix”. Before making any decisions on seed mixes, it’s a good idea to put some time into working through the practicalities for your farm and crop.

Planting out native vegetation. Many plant species, particularly grasses and shrubs, provide beneficial insects with SNAP. Avoid plants in [this list](#) – they may host spotting bug species, which are a pest of your crop.

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