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SA DROUGHT HUB

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Enhancing orchard soils

LEAD ORGANISATION: University of Adelaide

PARTNER ORGANISATIONS INVOLVED: Duxton Apples

Outcomes

Short term

- Increased collaboration and partnerships among organisations working in research, development, extension, adoption and commercialisation (RDEA&C).
- Efficient and effective activities to support RDEA&C and uptake by end users.

Medium term

- Increased availability and accessibility of, and capacity to use and adopt, knowledge that can be applied to improve drought resilience.
- Technologies and practices adopted are effective in improving drought resilience.

Introduction

Many current practices in agriculture – including the apple and pear industries – degrade soils and rely heavily on inputs from the farmer to ensure nutrient and water availability meets crop requirements.

Recognising the critical role of soil health in the productivity and sustainability of orchards, this project explored and developed ecologically intensive orchard floor management practices. It aimed to provide viable alternatives to traditional methods, focusing on enhancing soil quality, promoting biodiversity, and aligning with the global shift towards environmentally responsible agriculture.

At field trials in South Australian Riverland apple orchards, the research team implemented and compared five orchard floor management practices:

1. Herbicide (tree-row) – the 'business as usual' control treatment
2. Volunteer sward (whole floor)
3. Pollinator mix (whole floor)
4. Medic and ryegrass (whole floor)
5. Tall fescue, *Festuca arundinacea* (tree-row).

Soil samples were collected and analysed periodically to measure changes in nitrogen levels and organic carbon content.

Benefits for growers

1. **Increased soil health:** The treatments planted with living cover experienced an increase in soil nitrogen and organic carbon concentrations, indicative of improved soil health.
2. **Best-practice cover crop establishment:** To establish, cover crop seed needs winter rain, especially in a hot, dry climate such as the SA Riverland. Attempting to establish cover crops too late in the season runs the risk of poor germination and emergence.



3. **Optimal cover crop selection:** Vigorous cover crops, such as fescue, may harm soil–water dynamics, while a combination cover crop such as medic and ryegrass may enhance nutrient cycling, especially soil nitrogen and soil organic carbon concentrations.
4. **Grower education:** Workshops and interactive sessions with growers and consultants played a crucial role in disseminating knowledge and encouraging adoption.
5. **Reduced herbicide use:** Soils may undergo ecological intensification, with living covers providing ecosystem services to the orchard, enhancing nutrient cycling and improving soil structure and porosity, enhancing infiltration and water holding capacity in the medium to long term.

Alex Mason

Sustainable Agriculture Analyst, Duxton Capital Australia



Alex implements and monitors sustainable agricultural practices and emissions reduction activities. With support from Duxton, he is also undertaking a PhD at the University of Adelaide, investigating the potential of microbial inoculums to capture and store soil carbon and improve soil productivity.

We see floor management as one area where there's a real opportunity to improve performance. Achieving more consistent floor management and better soil function improves overall productivity of your orchard or vineyard.

The 'Enhancing orchard soils' project focused on ways to reduce herbicide use and get more regenerative systems working. In this sense, working with the hub created a novel collaboration that has ultimately helped us make more sustainable management decisions.

Just having the soil data is valuable in itself, as is the mapping data that has quantified above-ground carbon. This information allows for a more precise management approach.

This project has helped shape a new soil carbon project that we're establishing at the same site at Loxton, with a view to making the orchard more sustainable, which is central to the way Duxton operates. The results will help inform species selection, and that data will flow on to a project we're looking to roll out over the whole orchard.

Before getting involved in this project, I was letting as many good grasses grow as possible. In winter, for example, we had a good stand of clover and I'd let grasses grow naturally.

'Enhancing orchard soils' has not only confirmed that those earlier decisions were in the right direction, but also made this approach appear even more promising.

It's too early to form a full opinion yet, but I have no doubt that further down the track, the benefits to the orchard could be huge.

I was talking someone I know who plays cricket. I asked him, in the middle of summer, when it's 38°C, do you want to stand on the bare ground or the grass? Well, it's the same for the apple trees.

In areas without netting, the trees suffer radiant sunburn. If that ground had cover on it, you wouldn't get that. It will lead to more water efficiency as well.

The potential benefits of this sort of permanent groundcover include reduced water usage, suppression of unwanted weeds, and less slashing because the cover is low – which means less use of diesel. So I have no doubt there are dollars to be saved.

We also expect improvements in tree and fruit health. A better-quality product offers improved financial returns, too.

Rob Robertson
– Loxton Orchard Manager, Duxton Orchards

MORE INFORMATION

For further information on this and other weed management trials in The Riverland and across SA, contact Dr Thomas Lines at thomas.lines@adelaide.edu.au.

Adelaide University

DUXTON

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