

REDUCING TILLAGE
AND IMPROVING
SOIL HEALTH WITH
MULGOWIE FARMING
COMPANY

MAFFRA, VICTORIA

February 2023

Soil Wealth
NURTURING CROPS



**Integrated
Crop Protection**
PROTECTING CROPS

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BUSINESS OVERVIEW

- Mulgowie Farming Company is an Australian owned and operated vegetable grower and packer
- Crops: Conventional and organic sweet corn, green beans and broccoli
- Locations: East Gippsland Vic, North Queensland, Lockyer Valley Qld and Northern NSW.

A BRIEF HISTORY

The founder of Mulgowie Farming Company, Rodney Emerick, started his team on a path to improving soil health through the adoption of controlled traffic farming. Andrew Johanson, Mulgowie's sustainable agriculture manager saw a successful Soil Wealth ICP strip tillage demonstration in 2018, which piqued his interest. Andrew and his team to investigate expanding practices like strip tillage and cover cropping to more of their growing regions.

In 2019 and 2020, Mulgowie in collaboration with Soil Wealth ICP decided to trial strip tillage combined with their existing cover cropping practices at their Maffra farm, 220 km East of Melbourne. Their primary goal was to use strip tillage to improve soil health characteristics like water infiltration and water holding capacity, to increase crop health and yield, reduce costs and ultimately improve profitability.

KEY BENEFITS OBSERVED FROM STRIP TILLAGE FOR MULGOWIE FARMING COMPANY

- Improved soil structure – more friable, less compacted, less dispersion of soil particles (Figure 1)
- Improved soil water infiltration and water holding capacity
- Improved resilience of soil and crops to extreme weather events
- Improved crop uniformity
- Increased soil carbon by 0.5% over three years, following adoption of strip tillage
- Reduced labour costs
- Reduced fuel costs
- Reduced weed pressure and subsequently the cost of in-crop herbicides
- Reduced nutrient use – nitrogen and phosphorus
- Longer term savings – smaller tractors
- Increase in bean yields of 26%, and maintained corn yields between conventional and strip tillage

“For me, seeing was believing. Despite my original scepticism, after half an hour of trying strip tillage in different cover crop scenarios [at the Maffra site], we were quite blown away by how it could convert the cover crop to an area ready for planting vegetables,” said Michael Evans, the former farm manager of the site. “We purchased the machine on the spot, and the trial went from a few hectares to being adopted across the 200 hectares destined for growing corn.”

“After using strip tillage, the corn crop was the most even I’ve ever seen it in my 17 years of farming, despite the gullies through the paddock and uneven beds.”

“We saved costs on in-crop herbicides, fuel and labour hours,” Michael said.



Figure 1. Soil structure under strip tilled area, showing air pockets, and plant residue.

ADJUSTING PRACTICES TO SUIT THE FARMING SYSTEM

Soil type, climate, resources and equipment, and farming operations in each of the Mulgowie growing regions vary significantly, so the use of cover crops and strip tillage could not be implemented using a copy and paste approach across the farms.

During the preparation and execution of the demonstration at Maffra, collaboration between Andrew Johanson, Michael Evans, Elders Agronomist Noel Jansz, and Kelvin Montagu from the Soil Wealth ICP project, enabled the approach of cover cropping and strip tillage to be tailored to the site conditions and operations.

The cold temperatures experienced over winter in Maffra were a strong factor for consideration by the team when choosing the cover crop and the timing of its sowing. Cool season species were chosen to ensure they could establish before winter. “Other important considerations included the cover crop chosen for greatest efficacy with strip till, as well as the timing of strip tillage with respect to the soil moisture levels. Not too wet or too dry,” Michael said.

WHAT ACTIVITIES TOOK PLACE AT THE MAFFRA SITE?

- A cover crop containing wheat, oats, annual ryegrass and clover was planted in April of 2019, although the clover did not establish
- The cover crop grew for five months over winter and spring
- Four different termination scenarios were trialed, including:
 1. Herbicide application, mulching, then strip tillage (Figure 2)
 2. Herbicide application, then strip tillage (Figure 3)
 3. Rolling, then strip tillage (Figure 4)
 4. Strip tillage straight into the cover crop (Figure 5)
- The areas prepared using strip tillage were sown with sweet corn and beans between September 2019 to December 2019, with some areas prepared through conventional cultivation to allow for comparison with normal practice.



Figure 2. Herbicide application, mulching, then strip tillage

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Figure 3. Herbicide application, then strip tillage



Figure 4. Rolling (left), then strip tillage (right)



Figure 5. Strip tillage directly into the cover crop

OBSERVATIONS

The successful use of strip tillage under all four cover crop scenarios demonstrated the flexibility of the strip tillage machine in various settings. "Best results were observed following herbicide application, mulching then strip tillage," said Andrew. "We also noticed that soil moisture levels were more favourable for planting

the vegetable crop, when strip tillage was completed just prior to planting, rather than strip tilling days or weeks in advance of planting."

The corn crop, sown into the strip tilled area, germinated and grew uniformly (Figure 6), despite variations in the slope of the paddock and uneven beds. As Mulgowie machine harvest their corn, crop

uniformity enabled yield to be maximized as the cobs were more consistent in size. Comparatively, the area sown to conventional cultivation experienced some soil dispersion and erosion (Figure 7).



Figure 6. Corn grown in area prepared using strip tillage



Figure 7. Corn grown in area prepared using conventional cultivation

KEY LEARNINGS FOR BEST RESULTS

While the demonstration was largely successful and was adopted rapidly across the property, there have been some challenges.

- An increase in earwigs, cutworms and snails were observed predominantly in green bean crops and to a lesser extent in corn. While the increased pest pressure could have been driven by localised seasonal conditions, the strip of plant residue left uncultivated on the soil surface may have also created a refuge for these pests.

The team is still investigating a long-term, robust solution to the issue, but Andrew says the benefits observed from strip tillage outweigh the impact of increased pest pressure.

- Issues with cover crop residue getting caught in the vegetable planter were observed in paddocks with cover crop mixes containing a high ratio of annual ryegrass. The issues were resolved with a shift to a cover crop mix with less ryegrass and a greater ratio of cereal species and the use of a crumble roller.
- In some paddocks with a greater level of soil compaction, the strip till machine was unable to effectively prepare the soil for planting. Despite this, the team has continued to strive towards their soil health goals through the continued use of cover cropping and other forms of reduced tillage.

THREE PRINCIPLES TO STRIVE TOWARDS

"I've brought back what I've learnt from the Soil Wealth and precision ag tours and together with our farm managers and agronomists we have implemented a soil health strategy on our farms. The strategy is based on three key principles, which are giving us great results in most cases," said Andrew. These include:

1. Keep living roots in the soil
2. Maximise soil cover
3. Reduce soil disturbance

Each of these principles helps to build soil carbon and soil organic matter, important characteristics for almost all soil properties – chemical, biological and physical – playing a key role in soil health and soil quality (Weil & Magdoff, 2003; Magdoff & Van Es, 2021).

Mulgowie has since progressed its minimum till goals. The Bowen and Home Hill farms, which were the first to adopt our soil health strategy, are now direct seeding large-seeded crops like sweet corn and green beans. See more details in a [recent AUSVEG webinar](#) with Andrew Johanson.



UNDERSTANDING SOIL BIOLOGY

Mulgowie continues to look for new ways to improve its practice, with the next area of focus on soil biology to help build resilient healthy soils, able to recover and adapt to the stresses of a changing climate.

The Soil Wealth ICP team has been investigating how to create an environment for soil biology to thrive by understanding what farming practices promote or hinder soil biology. Some of the benefits of promoting soil biology include nutrient cycling, pest and pathogen protection, water availability and the formation of stable soil aggregates (Lehman, et al., 2015), all services that are important for the environmental and financial health of a farming business.

Mulgowie has sought to adopt practices like cover cropping and reduced tillage to encourage healthy populations of soil biology. They have also trialled different biological products to promote these beneficial populations, to optimise uptake of nutrients and reduce the use and costs of fertilisers and other chemical inputs.

ADDITIONAL RESOURCES

[Soil Wealth Panel Session: East Gippsland Vegetable Innovation Days – Cover crops and strip-tillage](#)

[Soil Wealth Panel Session: Soil Wealth ICP demo site growers share innovations at Annual Vegetable Industry Seminar 2022](#)

[AUSVEG Webinar: Alternative Farming Techniques: Annual Vegetable Industry Seminar 2022](#)

[Soil Wealth Webinar: Rediscovering cover crops with Kelvin Montagu](#)

[Soil Wealth Factsheet: What is a cover crop worth? Cover crops in Australian vegetable systems](#)

[Soil Wealth Factsheet: Managing cover crop residues in vegetable production](#)

[Poster: Cover crops for Australian vegetable growers](#)

[Poster: Cover crop termination guide](#)

[Poster: Cover crop herbicide guide](#)

[Video: Strip-till for corn production – Reducing erosion, building robust soils](#)

[Factsheet: Reduced till in vegetable production](#)

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