

MAKING SURE
CHANGE WORKS
FOR YOUR
BUSINESS AT
COWRA NSW

February 2023

Soil Wealth
NURTURING CROPS



**Integrated
Crop Protection**
PROTECTING CROPS

MAKING SURE CHANGE WORKS FOR YOUR BUSINESS, PRACTICE CHANGE AT **COWRA, NSW**

It can be a big decision to make changes on farm, and knowing what others experience helps evaluate the costs, resources and potential outcomes when thinking about adopting Soil Wealth strategies. For one farming duo, economic factors were key to their decisions on short- and long-term approaches, results and expectations.

A LONG HISTORY

Brothers Ed and James Fagan run their 1,400-hectare farm on the banks of the Lachlan River near Cowra, NSW. Mulyan Farms started growing broadacre crops in the 1880s, adding vegetables in 1943 after the opening of a local cannery. The Fagans have diversified further since, producing a range of crops, both broadacre and horticultural, and also running livestock in a truly diversified operation.

The Fagans have been involved with the Soil Wealth project since 2014. They have embraced considerable change, with benefits as well as some difficulties along

the way. Their experience highlights the importance of finding systems and practices that suit a farm's specific circumstances, including its business priorities.

In the 1950s, 60s and 70s vegetable soil management practices were hard on the soil, although it wasn't obvious what was happening. Over time, light soils along the river lost their organic matter and structure. More cultivation was required, and nutrients were easily leached below the shallow crop root zones, adding cost and acidifying the soil.

"When we looked at our vegetable ground it had been severely worked for 70 years. A lot of the soil was



Figure 1. July 2018 - state of the soil at the farm

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starting to become degraded. There wasn't a lot of structure at all left in the soil. Mostly it was just plain dirt with high bulk density, and very low infiltration rates of water – so you'd get run off very quickly. We were down to 2mm/hr infiltration," Ed Fagan says.

"Because of the high bulk density, we were having to do a lot of tillage. A lot was deep tillage to work the soil up to get the roots going."

More recently Ed has taken a whole-farm approach to rebuild the soils on Mulyan Farms after more than 70 years of intensive cultivation and vegetable cropping. Carefully planned crop rotations, reduced tillage and cover crops have all been adopted to revitalise the soil and enhance its productivity.

WHAT THEY DID

The Fagans recognised that changing practices to rebuild their soil health was necessary, and contacted the Soil Wealth Integrated Crop Protection team, agreeing to trial a range of different practices.

Practice change at Mulyan Farms has been a slow, methodical process considering many aspects:

- Overall paddock soil health
- Sprinkler vs flood irrigation methods
- Different soil types

- Winter and summer crops
- Rotations
- Cost of equipment
- Economics
- Short and long-term benefits

Initially, a bed reformer was bought in 2010 to pull up beds with soft spade and vertical tillage action. Permanent beds were then used for multiple years, with minimal rotary hoe tillage at shallow depths. In 2014 single species cover crops were trialled and today Mulyan has adopted single and multi-species cover crops for many paddock rotations.

Early cover crops were sown as single species and the Soil Wealth team monitored biomass, water infiltration, soil nutrients and weed suppression. Soil health and the reduction of plastic use were important parts of these initial cover crops. Baby leaf spinach sowing dates were postponed allowing more stubble breakdown of the ryegrass cover crop. Field peas and annual clovers were the standout cover crops for the Fagans as they added nitrogen and broke down quickly.

Brassica biofumigants were trialled but required aggressive tillage. The lack of soil disease and



Figure 2. 18 March 2019 fallow vs strip till and cover crop

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nematodes did not justify their continued use. Instead, there has been less intensive use of beds, with horticultural rotations to lower disease and nematode pressure.

Cover crops and reduced tillage created “stubble trouble” for sowing some crops. Baby leaf crops required increased tillage before sowing if planted immediately after cover crops. The timing needed for cover crop termination and delayed sowing had to be carefully factored into yearly farm plans for the best outcomes. Strip tillage was trialled with great success in baby cucumbers in 2018-2019 (Figure 2).

It was not always successful; as the farm increased baby beet production, sowing density did not allow strip tillage.

Additionally, for success with cover crops, they need to be as inexpensive as possible, while creating good ground cover, suppressing weeds, and cycling nutrients back to subsequent crops. These demands come with big challenges, considering all the seasons and harvest planning for the year.

Compost trials were conducted on Mulyan farm, and while these led to good returns in both yield and soil carbon, the logistics and cost of acquiring, transporting, and applying the compost outweighed the yield benefit for the Fagans.

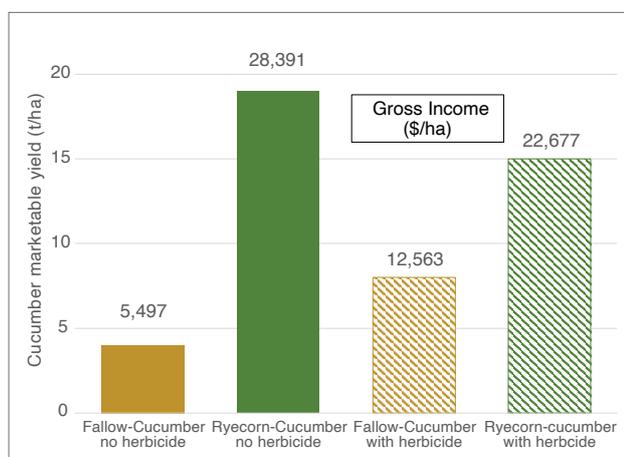


Figure 3. Cucumber yield and gross income following either a fallow or rolled ryecorn cover crop, with and without the herbicide clomazone.

Decision-making processes were driven by risk and long-term economic factors. Cover crops were viewed as a short-term period of low risk, low income for poor performing paddocks, but with the expectation of a higher return longer term on investment. Today, both single-species and multi-species cover crops are used to deliver the intended benefits.

OUTCOMES

Although strip tillage worked well for the Fagans in the trial crops, it was not adopted as an ongoing practice because of their specific crop selection factors and irrigation methods. If wide row spacing crops like cucumbers, or sprinkler irrigation using pivots or laterals on corn, then strip tillage will become a high priority for Ed at Mulyan.

Sourcing large quantities of both nitrogen-rich and carbon-rich materials for making compost on Mulyan Farms has proved challenging. Local dairies now compost and return their nitrogen-rich manures back onto their own paddocks. Ed invested in a compost turner and experimented with making his own compost, but the economic case was not strong. The cost/benefit of compost made on farm in recent years has been either break-even or negative, partly due to a lack of quality inputs.

“We can clearly see better infiltration with reduced tillage and ground cover crops. The economics are difficult to accurately capture, but with legume cover crops and the N fixation benefit, we straight away



Figure 4. Compost Application at Mulyan farm

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reduce our commercial nitrogen input. For example, last year we followed lupins with beets and saved over \$150/ha. Sunflowers are deep scavengers of nutrients and quick to break down so gives us a high chance of getting the next cash crop in on time," Ed says.

A 2018-2019 cover crop trial in their cucumber crop stunned Ed with its success. "You never recover 100% of the plastic mulch and it becomes a major pollutant for years. We had fantastic results from a "grow your own mulch" for cucumbers."

The combination of higher overall yields and higher marketable yields in the ryecorn cover crop areas underpinned this success, where 80% of the subsequent cucumber crop was marketable, compared to 62% in the fallow area (Figure 3).

By using less intensive and non-powered implements the result is fewer passes, saving time, fuel and compaction.

LEARNINGS AND REFLECTIONS

For Ed the learnings are clear: "We won't bother with compost anymore. We will focus on cover crops, reduced tillage and softer tillage (including vertical tillage) in the future. We understand now that good soil health can be undone quickly with excessive tillage."

After experimenting with many different practices on their farm, the Fagan's have found systems that achieve their natural resource management goals while limiting the impact on their wallet.

"There's no point having the best dirt in the district if you go broke. So you have to make sure that its financially viable. You have to make sure you're making money out of it," Ed says.

"The soil health benefit that we see is that you improve structure, and improve water infiltration and nutrient uptake. It took a few years; the first year we were looking at it going 'it looks much the same as it did last year' and then the second year it looked a little bit better and now you dig in and dig worms up whereas before you were struggling to find a worm anywhere."



Figure 5. A field pea and rye grass cover crop used by the Fagans in 2022

"A lot of the tillage we've had to do in the past to break up compaction layers and bulk density is now being done by the worms and microbes in the soil. Our infiltration rate went from 2mm/hr to 10mm/hr now. The more activity you've got in the soil the quicker the residue from the previous crop breaks down. So, a lot of the breakdown of the crops has been mechanical in the past, whereas now, the soil is doing it for us."

FURTHER INFORMATION

Reduced till in vegetable production - <https://www.soilwealth.com.au/resources/fact-sheets/reduced-till-in-vegetable-production/>

Cowra cover crop and strip-till a winning combination for soil health - <https://www.soilwealth.com.au/resources/case-studies/cowra-cover-crop-and-striptill-a-winning-combination-for-soil-health/>

Podcast: Cover crop trial at Cowra, NSW, with Marc Hinderager - <https://www.soilwealth.com.au/resources/podcasts/podcast-cover-crop-trial-at-cowra-nsw-with-marc-hinderager-6-minutes/>

Acknowledgements

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