

CASE STUDY
SEPTEMBER
2020

Soil Wealth
NURTURING CROPS



Integrated
Crop Protection
PROTECTING CROPS

Cover crop + strip till combination

THREE RYANS FARM, MANJIMUP, WA

AT A GLANCE

OWNERS: Gary, Tracey and Jake Ryan

LOCATION: Manjimup, Western Australia

PROPERTY SIZE: 500 acres

CROPS: Broccoli, cauliflower, red and green cabbage, red and green kale

SOIL TYPE: Loam

KEY BENEFITS

- Strip till makes cover crops more manageable and helps lock in the benefits of cover crops.
- Reduction in costs:
 - Less paddock preparation required
 - Can use smaller tractors – less compaction, less capital, less weight and cheaper maintenance
 - 50% less time required for watering the ground prior to transplanting
- Broccoli yields similar to conventional cultivation
- Weed suppression
- Soil holds more water
- Improved soil structure
- A 3-fold increase in earthworms.

BACKGROUND

Three Ryans farm is located at Manjimup, about 280 km south of Perth. With assistance from the Soil Wealth project team, the Three Ryans decided to try the cover crop + strip till combo to see what benefits there are for their vegetable farm. In November 2019, an on-farm strip till demonstration plot was established in a broccoli crop. This has seen cost savings and soil benefits, compared to their conventionally grown broccoli crop.



Figure 1: Broccoli six weeks after transplanting in the strip till area

-Jake Ryan, Three Ryans

WHY TRY STRIP TILL?

"I was interested in improving soil health on the farm and got the idea of trying cover cropping and strip till from a variety of sources," said Jake.

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WHAT WAS DONE?

Broccoli was grown in either cover crop + strip till or conventional till following a short fallow. This allowed a direct comparison of the two soil prep approaches. Fallow + conventional cultivation used by the Three Ryans use 6-7 passes to establish their broccoli crop. By contrast, even with the addition of a cover crop, strip till reduced the number of passes to 5 (Table 1). Importantly, the transition from cover crop to broccoli is rapid involving just two passes.

The cover crop was a mix of sorghum, lablab, cowpea, vetch and linseed sown in late spring (November 2019) at 30 kg/ha with 20 kg/ha MAP fertiliser. The cowpea and lablab had a Rhizobium inoculate coating to improve nitrogen fixation by the legumes. The cover crop was irrigated to get it going as it was sown after the winter rains.

The sorghum reached 2 m with an understory of lablab and cowpea about 10 cm high, which helped to keep weeds, such as fat hen, under control. The cover crop was sprayed off using Basta®, and flattened with an old bracken fern roller.

Broccoli seedlings were transplanted in January 2020, a week after strip tilling. In the strip tilled area there were some initial problems using the seedling transplanting machinery. Root material from the cover crop was wrapping around the boot of the machine, resulting in the broccoli seedlings not being properly transplanted and slowing early growth.



Figure 2: Strip till of the cover crop prior to transplanting the broccoli crop
-Jake Ryan, Three Ryans

This may have been due to the transplanter boot not always following the middle of the strip tilled area as tractors were not fitted with GPS. Other growers with GPS steering have not had this problem.

Gary and Jake sorted this problem with a straight disc in front of the boot and increasing the speed of two small rotary hoes, used for fertiliser incorporation, prior to placement of the seedlings. "After seven further plantings this is proving to be working with transplants establishing well," said Jake.

Three Ryans farm applies basal fertiliser at transplanting using an incorporation method. This places the fertiliser in a strip about 20 cm wide, which is then mixed into the soil using a small rotary hoe. "The strip till method was compatible with the fertiliser incorporation method as a similar size strip is formed through the cover crop, allowing the regular planting machinery to be used with minimal modification," said Jake.

The time to harvest was 12 weeks for the conventionally grown broccoli and 13 weeks for the stripped tilled broccoli due to the impact of initial planting problems on plant growth. At the start of harvest, most of the cover crop had rotted away, leaving about a 2 cm depth of residue covering the soil. The crop quality and yield were similar between the two growing methods. "If it weren't for the initial problems we had transplanting the broccoli into the strip tillage area, I believe that we would have seen a greater difference in the final crop yield," said Jake.

IMPROVING SOIL QUALITY

The cover crop + strip till combo visibly improved soil quality. At 21 worms per shovel, the cover crop + strip till combo had three times as many earthworms as the conventional cultivation area.

"The soil in the strip till area was more friable and appeared to have a better structure compared to the soil in the conventionally grown area. The strip till area was also noticeably wetter during the broccoli growing season compared to the conventional area. We may



Figure 4: Soil from the strip till area had good structure and more earthworms compared to the conventional area. -Rachel Lancaster, EATS

be able to irrigate less when growing crops using the strip tillage method," said Jake, adding, "and we were warned by the Soil Wealth team to keep an eye out for slugs and snails, but these weren't a problem in this crop."

Despite being on some steep land, no soil movement in the alleyways of the strip till area occurred, even after 50 mm of rainfall. Over the winter, the soil under subsequent strip tilled crops has held together really well with no obvious erosion.

Thinking of trying a cover crop + strip till combination?

- Carefully select your cover crop and decide how you are going to manage it. It's important to manage the amount of cover crop biomass and how quickly you want it to break down to work in with the row cleaners on the strip till equipment and planting of the following crop.
- Try the strip till machinery on a small scale first to work out modifications that may be required to manage the cover crop residues still present at transplanting.

- Cover crop + strip till may not be suitable for all vegetables. The Soil Wealth team has supported growers successfully in the following crops – corn, cucumber and pumpkins, brassicas and lettuce.
- The configuration and use of the strip till equipment (depth culture, row cleaner width and height, shank depth, width and depth of wavy coulters and tractor speed) will require getting it right for your soil type and cover crop biomass.
- You should look at how the strip till will fit in with your planting configurations, bed sizes, rows per bed and the transplanting equipment spacing. This may need to be adjusted to get the best result.
- Look for a potential increase in pests, particularly snails and slugs. The increased moisture retention under the cover crop provides an ideal environment for pests to hide. Conduct regular crop observations for quick action to control them.

Cost comparison between conventional and strip till production methods

Cost savings were made at the Three Ryans when using the cover crop + strip till combo. The main saving was the reduced tractor passes to prepare the ground for transplanting of the broccoli crop (Table 1).

About 50% less irrigation was required to prepare the ground for transplanting in the strip till area, i.e., the strip tilled area retained moisture better leading to savings in irrigation costs.

"Savings were made not only in a reduction in the number of passes required across the paddock, saving fuel and man-hours, but also in equipment as a smaller tractor is required for the cover crop and strip till machinery, compared to when we prepare the ground using conventional methods. Being able to use smaller



tractors that cost less to purchase and cost less to maintain and run is an additional benefit of using strip till in our farming system,” said Jake.

“Broccoli yield was about the same in the strip tilled and conventional areas, which is a good start for a first go at strip till. In a further six plantings, yields have improved compared to our expected broccoli yield as we fine tune everything.”

A FINAL THOUGHT

The Three Ryans’ growers were impressed with the substantial time and cost savings of the strip till method, combined with observable improvements in soil health. The cover crop + strip till combination makes the transition from cover crop to broccoli much more manageable and helps lock in the benefits from cover crops.

The demo trial allowed the Three Ryans to work through the practical challenges of replacing their

usual fallow and conventional cultivation, with a cover crop + strip till combo. After the demonstration trial, they have transitioned to growing all their vegetables using cover cropping + strip till.

“The benefits of cover cropping and strip till, after we solved the initial transplanting problems, will be great for our farm. We intend to keep using the method in the future and will experiment with different types of cover crops, when they are sown and the timing between stopping cover crop growth and the transplanting of the vegetable crop using the strip till method,” said Jake.

ACKNOWLEDGEMENTS

Thanks to Gary, Tracey and Jake Ryan from Three Ryans farm for their time and experience in trying strip till, supplying photographs and information, and allowing this case study to be produced.

COVER CROP + STRIP TILL COMBO	TRACTOR PASSES	FALLOW + CONVENTIONAL CULTIVATION	TRACTOR PASSES
Planting of cover crop	1	Spray weeds	1
Spray cover crop to end growth	1		
Crimp and roll cover crop	1		
<i>Broccoli crop</i>		<i>Broccoli crop</i>	
		Soil tillage prior to planting	2
		Deep rip paddock	1
Strip tillage	1	Levelling of soil for planting	1-2
Transplanting	1	Transplanting	1
Total Passes	5	Total Passes	6-7

Table 1. Number of tractor passes required for the cover cropping + strip till combination compared to conventional cultivation after a fallow.