



Mixed Cover Cropping Case Study

Bruce Morgan, Coulta, Eyre Peninsula

Project: Warm and cool season mixed cover cropping for sustainable farming systems in south eastern Australia

Farm size: 2075 ha arable, plus 260 ha grazing and 550 ha native vegetation

Farming system: Continuous cropping with a rotation of wheat, barley, canola and lupins/beans. Also running a self-replacing flock of 2500 Dohne merinos.

Soil type: Loam

Average annual rainfall: 551 mm

Summer rainfall mm (Nov-Mar)		Winter rainfall mm (Apr-Oct)	
<i>Average</i>	88	<i>Average</i>	463
2018/19	49		
2019/20	53	2019	362
2020/21	87	2020	393
2021/22	123	2021	395



Introduction

The ‘mixed cover cropping for sustainable farming’ project aimed to deliver strategies to promote the use of multi-species cover crops – diverse crops grown often outside the main growing season to build fertile and resilient soils, and sustainable and profitable farming systems. Suitable cover crops were investigated and tested in a range of environments across south-eastern Australia. The impacts of cover cropping on soil health, nutrient cycling and stratification, organic carbon and fractions, and soil moisture have been measured.

On Bruce Morgan’s property, a farm paddock demonstration site was established looking at three treatments over the life of the project, from summer 2018 to autumn 2022. These treatments were:

1. a multi-species planting in both winter and summer,
2. a single species cover crop,
3. an area of no soil disturbance which was treated as a fallow.

In the final winter growing season (2021) a cash crop of barley was sown across all three treatments, to determine if there were any impacts on crop performance.

Bruce also hosted a species evaluation small plot trial on his property.

Bruce focused on species including barley, Italian ryegrass, tillage radish, canola and lentils in the winter phase and tillage radish, winter canola, millet and sunflowers in the summer phase.

Why try mixed species cover cropping?

Bruce has been playing around with mixed-species cover cropping in both winter and summer since the summer of 2015.

"I was getting a bit frustrated with some of our paddocks not being as productive as they once were since moving from a pasture wheat rotation to continuous cropping in 1994."

Bruce believes they haven't had soil health benefits from moving to a continuous cropping system, but he has noticed increasing compaction in their paddocks.

"In the continuous cropping systems, we have been putting higher and higher inputs in and getting the same results, occasionally getting a better result in a good season, but on average I think it was performing poorer than it had been historically."

Bruce was a board member of South Australian No Till Farmers Association (SANTFA) and with mixed cover cropping a new concept being spoken about in the South Australian ag community, he was given the opportunity to travel to America and attend a No-till conference as well as meet growers that had been using mixed cover crops for some time.

"I came home and I wasn't quite sure how or where to start."

The common theme that he observed in America was most mixed cover croppers were using almost zero tillage and a single-disc seeding system.

"The first thing we bought was a small 15-foot single-disc John Deere. The first year with the single-disc system was a summer cover crop which wasn't hugely successful, but it encouraged us enough to think maybe we can keep playing around."

The first try

Bruce's first attempt at summer mixed cover cropping resulted in wireweed being the most successful species grown.

"We had the odd very attractive sunflower, and then a bit of sorghum and a little bit of millet. But the plants we got established came up on the better bits of soil in the paddock with clay and a good water holding capacity, seemed to thrive".

He believes that if you can get summer crops established, they are pretty hard to kill.

The first time the Morgan's planted a summer mixed cover crop it was sown with a tine seeder.

"The next year we had a single disc, I think in summer the tine disturbs the soil too much and dries the soil out. It doesn't allow plants to establish, whereas the disc retains enough moisture to get it growing."



Figure 1 Bruce in the species evaluation trial, March 2021.

What led you to become involved with the mixed species cover crop project?

“We had some success with three years of trialling in one of our paddocks and I was impressed with what we’d achieved in that time. I happened to be on the then LEADA board and got talking to the people on there and Mark Stanley in particular, showed interest in mixed species cover crops and Ag Excellence Alliance developed the project. I was quite interested in getting some results and data around the systems change that I had begun to implement”.

Challenges and what worked best

Bruce would encourage starting with a winter mixture as your risk of nil establishment is lowered.

“If you’ve got a paddock that you’re able to grow a winter mixed cover crop on and then in early spring spray it out then sow a summer mix into it.”

Bruce notes that the couple of times he has been able to achieve consistent cover on the paddock he has had good results with getting his summer mixed species cover crop established.

“We found this to work but you’ve got to leave a paddock dedicated for almost two years of mixed cropping to make the system work. By the time we harvest our winter crops, every time we’ve tried it was too late to get summer cover crops to germinate unless we got a freak thunderstorm come through to wet up the profile.

“Although tillage radish is popular with other farmers, I would never put it in a summer mix again as it goes to seed too fast in our environment, making it hard to manage everything else growing, and you’ve got to put stock in there too soon to make use of the feed potential.”

However, Bruce still believes it tillage radish is a good option in winter mixes and will utilise it in paddocks where compaction is a real issue.

Livestock & mixed species cover cropping

The Morgan’s run a mixed farming enterprise with the livestock component 2500 Dohne ewes.

“If you can get the summer species established this is pretty handy because we normally mate one mob of ewes earlier in the year to white Suffolks. It allows us to lamb them into some pretty good feed without having to feed them grain and hay.”



Figure 2 Species evaluation trial hosted by Bruce Morgan.

A good early establishment with the addition of summer rain has given the Morgan's feed security during lambing.

"We've had success with that management option twice, lambing about 400 ewes into a small 30-hectare paddock. Those ewes have been able to stay in there right through the lambing process which is five weeks."

This high-intensity grazing has allowed them to manage the growth of the mixed species and get the most grazing value out of their paddock.

Do you think you will continue using both summer and winter plantings?

Bruce is hoping to use mixed-species plantings as an accompaniment to his livestock production system rather than a harvestable cash crop. For 2022 he plans on using a couple of winter mixed species pastures.

"It depends on the season, we may be able to spray one or two of the planned mixed-species paddocks out if we have a really good spring and have excess feed and then sow a summer mix into each, if there's moisture there."

Moving forward, Bruce is hoping to be able to have summer species seed on hand so if the opportunity arises he can get the seed into the ground promptly.

"If you haven't already got seed stored on-farm ready for the time that opportunity comes up, you've missed the chance to sow it. I think you need to have it stored in the shed somewhere and do your best to keep the rats and mice out of it."

What would be your go-to winter mix?

The mixed cover cropping project has given Bruce the opportunity to trial different mixes and species in both the summer and winter seasons.

"I'm hoping to use beans in my next mix because of their root structure, long-season wheat and long-season brassica, maybe canola or Subzero forage brassica. We've had the success with peas in the mix and have also used lentils successfully. I guess whatever you've got available on the farm is always going to be the cheapest. If you're not buying in the seed you lessen the risk of buying in weeds as well."

"If you're going to try mixed cover crops, start with the species that are the hardiest things you can find. We've had an experience with cereal rye - the sheep would not eat it - it must have been due to the furry leaf, so it was really hard to manage grazing."



Figure 1 Joel Williams in the soil pit on Bruce Morgan's property in July 2019.

Benefits to soil health and structure

The Morgan's have used tillage radish followed by sunflowers which have a substantial taproot and are quite hardy plants, and believe they have improved their water infiltration in some of their more compacted areas.

The Morgan's have been able to see the benefit since they adopted the use of a John Deere single disc sowing system.

"We're thinking that if we stick with the disc system long enough, we may create more opportunities to grow summer cover crops. If we've improved our soil structure without smashing it up and we can keep ground cover and retain moisture, we might increase our opportunities to grow summer mixed cover crops."

Bruce believes they may gain more soil benefits from using the disc system than what they are gaining from cover crops alone, but it will also help increase the opportunities to use mixed cover cropping.

If you were to do this again what would you do differently?

"I don't know that we'd do a lot differently, maybe be a bit more active in the timing of spraying out - there were a couple of times we let it go too far - to work properly it needs to be terminated before it starts going into its reproductive phase otherwise you start losing the grazing benefits."

Do you think from your perspective mixed cover cropping has a place in medium rainfall lower EP farming systems?

Bruce believes that mixed cover cropping has the potential to fit into systems on the Eyre Peninsula especially those that run stock.

"I think you can make it work and get some money back out of it that way. If you haven't got stock in the system it's still probably going to benefit you, but I think it stops an integral part of the system working."

Bruce acknowledges that there are not many years that they haven't received enough rainfall to fill the soil moisture profile at some stage during winter and this has contributed to the success of their mixed cover cropping to date.

Acknowledgements

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Figure 4 Bruce Morgan and Jamie Phillis in field at the Soil Knowledge Tour event held on Bruce Morgan's property in July 2019.

More information

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Project Proponents



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