



Mixed Cover Crops Case Study

Jamie Phillis, Ungarra, Eyre Peninsula

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

Farm size: 1750 ha

Farming system: Controlled traffic zero till strip and disc continuous cropping

Soil type: Red-brown loam over clay

Average annual rainfall: 407 mm

Summer rainfall mm (Nov-Mar)		Winter rainfall mm (Apr-Oct)	
<i>Average</i>	85	<i>Average</i>	317
2018/19	50		
2019/20	61	2019	213
2020/21	63	2020	238
2021/22	198	2021	224



Introduction

The 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 Jamie Phillis' 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 Scepter wheat was sown across all three treatments, to determine if there were any impacts on crop performance.

Can you tell me about your farming system and rotations?

Jamie has been farming his property with continuous cropping since 1983. They have transitioned from minimum till into zero till and more recently adopted a strip and disc system. Livestock are only a small part of Jamie’s farming business.

His three-year rotation generally consists of legumes followed by two cereal crops.

“I haven’t grown a lot of canola aside from where it stacks up with the start to the season, but generally we have a reasonable portion of legumes in the rotation.”

Jamie uses a John Deere single disc 1890 in conjunction with a Shelbourne stripper front. They made the change from a knifepoint machine to a single disc in 2015 and a stripper front in 2018. They have now also adopted a controlled traffic 12 metre system.

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

Jamie has been actively trying to eliminate the need for fungicides and promote soil health for the last five to six years.

“There’s always been something different happening - each year I’ve normally got about 15 different trials around the farm for different products or treatments or something like that.”

Soil health can mean a lot of different things to people, Jamie’s focus has been investigating the principle of having a continually living root system all year round.

“I mucked around with companion crops and I guess with this project it was more to investigate this thought about having a continuous green living root system year-round, as well as increasing diversity rather than the monocultures we have generally grown.”

Summer crops

Jamie had played around with the use of summer covers, but with livestock being only a small part of his operation, it wasn’t necessarily giving a very good return and benefit.

“My experience with summer crops is that I still have a yield deficit the following year because of moisture used. If you are grazing that summer growth and making money out of that, then that can maybe offset the loss. As a continuous cropper, when do we start to see any potential benefits from a soil health perspective that outweigh the yield loss?”

2020/21 SUMMER		
36 MT HEADLAND	12 MT	BEAN STUBBLE
	12 MT	sown 12.12.2020, millet at 10 kg/ha, sunflowers at 4 kg/ha, 12 mts wide, 300 mts long
	12 MT	BEAN STUBBLE
	12 MT	
	12 MT	SUMMER MIX consisting of millet x 2, forage sorghum, sunflowers, buckwheat, tillage radish, purple top turnip, mung beans, & clover x 3
	12 MT	35mt wide, 300 mts long
	12 MT	Sown 12.12.2020 at 15 kg/ha
	12 MT	
	12 MT	BEAN STUBBLE
	12 MT	sown 12.12.2020, millet at 10 kg/ha, sunflowers at 4 kg/ha, 12 mts wide, 300 mts long
36 MT HEADLAND	12 MT	BEAN STUBBLE
	12 MT	

Figure 1 An example of the site layout repeated each season, with treatments sown by Jamie Phillis using broadacre machinery in 12-metre-wide strips.

"I've got yield maps where I've done summer crops for three or so years on different sites around different soil types and every year you terminate your summer growth at flowering time and every year you get a yield penalty in that wheat or barley or whatever it might be in the following year, often up to half a tonne."

Winter mixed cover crops and companion cropping

In a livestock system, winter mixed cover crops make sense for diversity for sheep feed. The stock will do well and the soil will do well.



Figure 2 Jamie's winter mixed cover crop in spring 2019.

"In a cropping aspect we've tried companion crops, the benefits are hard to quantify and any benefits are going to be offset by logistical issues or hardships when you're growing a companion crop and trying to segregate them."

For example, in 2021 Jamie had beans and lentils sown together to minimise frost risk. In the end he had good quality beans and lentils mixed with frosted beans and lentils, which posed a logistical cleaning nightmare.

Future work

Jamie is very keen to continue sowing a diverse mix into the same demonstration site for the next three or four years as he sees strength in trying things over the longer term in the same location.

"The question I am also seeking an answer for is - is it enough to have a diverse rotation, or do we need to be mixing it up within the same season?"

Challenges

- Loss of yield following summer cover crops
- Getting summer crops established (early is best in September/October)
- Yield is not necessarily an indicator of things improving in the short term
- Measuring and quantifying benefits is difficult without soil testing
- A poor year may set back any gains
- Lack of chemical options in mixed cover crops – need to plan based on weed profile and crop rotation
- Harvesting and segregating seed in companion crops
- Getting diversity in a cropping system (much easier in a purely grazing system).

"The biggest challenge going forward is to try and get a two or three-way mix with diversity without too many complications with chemical options or more cleaning options."

Situations where summer and winter mixed cover crops might work best:

- Livestock systems
- Waterlogged environments
- Early establishment opportunities for summer crops.

Jamie's preferred winter mix is vetch, oat or barley, tillage radish and a winter canola. Preferred summer mix is sunflowers, millet, sorghum, tillage radish and maybe winter canola.



Figure 3 Jamie on the left at the Exploring Soil Health workshop at Ungarra in June 2019.

What are your future goals in terms of soil health?

Jamie intends to continue on the path of reducing his reliance on synthetic products, this year alone he has decided to use an all-liquid fertiliser option.

"We are doing great things by maintaining all this stubble above the ground, but we haven't built soil organic matter."

Jamie wants to focus on increasing and nurturing his root exudates and learning more about what is happening beneath the soil.

Acknowledgements

This project is supported by Ag Excellence Alliance through funding from the Australian Government's National Landcare Program, Grains Research and Development Corporation and the South Australian Department for Environment and Water.

More information

Email: eo@airep.com.au

Phone: 0428 540 670

www.research.csiro.au/mixedcovercrops/

www.airep.com.au

Project Proponents



Project Funders



Government of South Australia
Department for Environment
and Water

