



SOIL CARBON CASE STUDY

with Peter Campbell

Submitted by:
Lynn Macaulay & Kate Coffey

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Introduction

Riverine Plains conducted a Soil Carbon project from 2012-2015. It was developed in response to knowledge gaps around how to increase soil organic carbon and the general complexity of understanding soil function. The project was funded from the Australian Government's Department of Agriculture Action on the Ground program. Riverine Plains partnered with Murray Local Land Services, Northeast Catchment Management Authority and the Victorian Irrigated Cropping Council to deliver the project.

Thanks to the Foundation for Rural and Regional Renewal (FRRR), and the William Buckland Foundation, we were able to produce the Soil carbon in cropping systems booklet at the completion of the project. Now in 2022 we can investigate the progress of farming systems since the completion of the soil carbon project. We also have the opportunity to better understand individual key drivers in managing carbon within the farming system. Sharing knowledge and outcomes from the soil carbon research project as well as providing farmer case studies on their changes in practice and the challenges they're facing helps us to demonstrate where the knowledge opportunities and gaps are in understanding the complex system of soil health including carbon.

Summary of 'Soil Carbon in Cropping Systems' Project

- The inclusion of a pasture phase and/or pulses/legumes in the cropping rotation is important to maintain and potentially build soil organic matter and build nitrogen. Keeping good soil cover all year round promotes high microbial activity which has many soil health benefits.
- To assess if applying fertiliser after harvest will increase soil carbon levels, a 5-10 year project is needed. If all other soil nutrients are balanced and this practice does increase soil carbon, it may not provide return on investment.
- Soil type and rainfall have a great impact on soil carbon levels, with some soil types having a very limited ability to increase soil carbon.

Background

With the help of funding through FRRR we are updating the outcomes from the Soil Carbon project. In 2018 we did a case study with Peter Campbell, who farms at Henty on a mixture of red brown earths and yellow podzolic soil types. In this case study we reviewed how Peter's soil carbon management practices have changed in his farming system over the past 5 years.

Farmer

Peter Campbell

Location

Henty



Q. Describe your farming enterprise?

We run a mixed farm with sheep and cropping over 1200ha. We currently have around 2800 breeding merino ewes and 2000 lambs.

Q. Describe your cropping sequence /rotation?

Our cropping rotation is flexible. Generally, we start with a pasture phase, followed by canola followed by wheat, then barley, oats, triticale, narrow leaf lupins or arrowleaf clover. We rarely have two consecutive wheat crops and try to put a pulse in the middle of the 5-year cropping rotation.

Q. How do you manage your stubbles?

We try to retain our stubbles 100% across the farm. This year was the first year in 20 years that we had to burn paddocks because of the large stubble load and high moisture in the soil. If we didn't burn, then we would have had yield penalties and possibly would not have been able to sow in some paddocks due to how wet they were. Although we try to keep our stubbles and sow through them you must be flexible in your approach.

If there are any pulses, what are they and what are your perceived and real benefits from including a pulse?

I have sown faba beans and albus lupins but found the grain yield to be unreliable to now we stick to narrow leaf lupins. The benefits of growing a pulse include providing a disease break and lower costs through not having to apply nitrogen and sometimes phosphorous.

We use an aerial seeded clover such as arrowleaf in the middle of the cropping phase for a disease break and nitrogen input.

Q. If there are any pastures used, what is the composition of the pasture, and how long does your pasture phase go for?

We have a pasture phase of 7-10 years in paddocks. Generally, the paddocks with poor draining soil types stay in pasture longer than those that drain more freely.

We use a lucerne sub-clover mix on the free draining soils and either phalaris or tall fescue and sub-clover on the poorly drained soils.

Q. What range in soil carbon values do you have across your property (0-10cm) and how have these changed in recent years?

Our aim is to have 2 to 2.5% carbon in our soils. Some paddocks have over 3% carbon.

There seems to be variation again based on soil types. The poorly drained soil average around 2.2% carbon in the top 10cm, possibly due to a longer pasture phase, with the better soil types struggling to reach 2%, again possibly because of more intensive cropping regime.

When testing it is important to sample at the same GPS point each time and at the same time of year to allow a fair comparison.

Q. What value do you place on maintaining/ improving soil carbon in your cropping system? And how do you do this?

Maintaining and improving our soil carbon levels is very valuable to us. It is important as high carbon levels are linked with good soil fertility and allows us to reduce our nitrogen fertiliser use.

We preserve and increase our soil carbon through stubble retention, through having a zero-tillage system and using pastures in our rotation.

Healthy pastures need healthy soils and lime is a critical component to correct acidity.

Are you likely to change your management practices to attempt to improve soil carbon (if not unprofitable?)

We could currently put fertiliser on cereal stubbles to prevent the tie-up of nitrogen while the stubbles are being broken down, however for us I don't feel like it is a financially viable option.



Q. What benefit do you see the CSI project having to your enterprise?

It was a bit disappointed with our soil test results as we were only around the mid-range of values.

It will be interesting to see if they are different when we test again as there are some anomalies compared to our regular soil testing programme.

From the project, I would like to see a methodology developed for Australian farmers around how we can market and sell our carbon.

Q. Have you trialed any new ideas or approaches regarding plant systems, rotations, novel species, cover* or companion crops*?

We have tried companion cropping forage radish with winter cereals for grazing. We didn't identify any real benefit for soil health however radish provides good nutritional value for the sheep when combined with a cereal.

I am interested in cover crops however skeptical about the benefits to the soil compared to simply retaining stubbles, which provides biota habitat and protection from erosion.

Q. Have you changed any practices to try to reduce your GHG emissions?

No, not specifically. We have planted thousands of trees on our farm which I believe helps reduce the GHG emissions.

Not burning stubbles will help too. It is hard to reduce livestock emissions especially when they are out in a paddock and not in a feedlot as you can't control their diet.

Q. Do you change your carbon management practices based on the weather conditions?

Yes, we are flexible in our approach depending on how the season is going. 2022 is the first year over a 20-year period we have had to burn a number of stubbles.

To prevent nitrogen volatilization, we avoid spreading urea onto waterlogged soils and we don't apply it in the summer months. Like most growers we tend to wait until there is a strong forecast for rain before we apply any fertilizer.

Knowledge Opportunities

Research into soil carbon has progressed in the last 10 years, what effects it, how it behaves in cropping systems and how it interacts with other nutrients for overall soil health. However there is a need to put all this into practical on farm terms for growers for them to be able to implement changes.

Some extension opportunities and practical knowledge gaps for farmers in the region are:

- How do soil types affect soil carbon levels?
- Is there a limit to how high soil carbon levels can go in a continuous cropping system – is a target of 3% carbon realistic?
- Is there a significant connection between soil organic carbon and soil nitrogen levels?
- The effect of cover crops on soil carbon.
- Companion cropping in Australian farming systems.
- What does carbon neutral in an Australian farming system look like.
- Impact of carbon markets for Australian farmers.

*Companion cropping is planting and growing two or more crops together in the same paddock, at the same time.

*Cover cropping is any non-cash crop grown in addition to the primary cash crop, but not at the same time.

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