SOIL CARBON CASE STUDY - ANDREW DICKIE

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. As a result of this investment we have investigated the progress of farming systems since the completion of the soil carbon project.

We also can now 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 are facing helps demonstrate where the knowledge gaps and opportunities 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 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 five-to-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

Andrew Dickie farms at Youanmite, Victoria, managing a mixed farming system. In 2018 Riverine Plains completed a case study as part of the Soil carbon project. In 2022 thanks to Foundation for Rural and Regional Renewal (FRRR) and *Cool Soil Initiative* (CSI) we have reviewed Andrew's soil carbon management practices and can see the changes in his farming system over the past five years. Andrew's farm has soil types of mostly clay loams with some granite loam.

Farmer: Andrew Dickie

Location: Youanmite, Victoria

Describe your farming entrerprise

In the past five years we have increased our cropping area from 1300ha to 2000ha and removed the sheep enterprise from our business.

Describe your cropping sequence/rotation?

Our continuous cropping runs on a four-year rotation. Wheat, canola, wheat, and then either vetch or faba beans. Generally, we crop 50% of our area in wheat, 25% in canola and 25% in vetch/faba beans.

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

Nitrogen fixation is the main benefit for us, you can't beat natural nitrogen, especially with the high costs of fertiliser the past couple of years. We had a deep nitrogen soil test last year show us that after brown manure vetch we would have enough nitrogen in the soil to grow a 6.5t/ha wheat crop with 11.5% protein.

In my opinion, a wheat-canola-wheat rotation that relies on urea as the only source of nitrogen may not be sustainable in the longer term. Legumes/pulses also offer us different weed control options and there is the opportunity to bale vetch for another source of income if the faba bean market is poor.

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

We don't currently have any pastures. In the future I have thought of the possibility of tightening the rotation to wheat-vetch or wheat-canola-vetch and if the costs of inputs keep rising this may be something that we consider. However, the wheat-vetch rotation would only be financially viable for a business with low levels of debt, and we would have to run some sheep on the vetch for an extra income source. Having said that, it may significantly reduce chemical and fertiliser input costs.

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

Our soil carbon is sitting at around 0.9 - 1.3%. These values have remained stable over the last 15 years.

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

We place a high value on maintaining our soil carbon. Soil carbon and fertility is the engine room of our farming system. I was hoping our values would have been above 2% across the farm, in the recent soil tests completed. I am not sure what more we can do to try and increase our carbon levels but 2- 3% soil carbon in a r harvest.

Are you likely to change your management practices to attempt to improve soil carbon (if profitable)?

Not at this stage. I believe that what we are doing currently is as good as we can do without completely changing our farming system. For now, we are going to continue what we are doing, and we are happy that our soil carbon levels are being maintained.

What benefit do you see the Cool Soils Initiative project has on your enterprise?

It will be a valuable benchmarking tool for us to have soil samples taken and analysed from the same spot over a period of time.

Hopefully having evidence of our soil carbon levels and understanding how on-farm practices affect these levels, will build a sustainable farming system will give us a bit of insurance in the future if the government decide to bring in policies for carbon in farming systems.

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

We haven't tried anything in the past five years. Companion cropping is an interesting avenue, and we are watching some other farmers in the area closely to see how successful their on-farm trials are. One farmer has sown 15kg of wheat with 40kg of vetch and sprayed the vetch out in late August to allow the wheat to finish for harvest. I don't think we get enough reliable summer rainfall in a normal year to grow cover crops.

Have you changed any practices to try to reduce your greenhouse gas emissions?

No. It is too hard for us to measure. I am more concerned about building a sustainable system overall than specifically reducing our emissions. We don't burn stubbles which would help us have lower emissions overall as well as placing a high value on soil carbon in our system.

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

The only issue that we get is on the retained stubbles where we are planting faba beans, if we have a wet autumn then trafficability becomes difficult.

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?
- What is 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.

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

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

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