



## Project Snapshot

|                                     |  |
|-------------------------------------|--|
| <b>Land Manager Names:</b>          | <b>Ian and Dianne Haggerty</b>   |
| <b>Property Size:</b>               | <b>2000 acres</b>  |
| <b>Location:</b>                    | <b>Wyalkatchem</b>   |
| <b>Annual Rainfall (mm):</b>        | <b>200 mm (5 year average)</b>   |
| <b>Enterprise Mix:</b>              | <b>60% cropping, 40% sheep</b>   |
| <b>Soil Types/Vegetation Types:</b> | <b>Light-Acidic (Wodjil) sands; Morrel clay/loam; conglomerate gravels</b> |

*Above: Dr Andrew Wherrett  
(Consultant Agronomist, Living Farm).*

## Key Messages

- Preliminary findings suggest that the adoption of a biological farming system may have positive benefits for soil organic carbon storage when compared to a conventional farming system. However, further research is required to verify these findings.
- Improving soil structure can improve plant growth through enhanced water-holding capacity and water-use efficiency.
- To remain productive, soil fertility must be maintained. Farmers can enhance the fertility of their soil by adopting practices that stimulate biological activity thereby releasing nutrients that are important for plant growth and vigour.
- The C:N ratio of the soil can provide you with an insight into the nitrogen requirements of your crop.

## Their story

Since 1994, Ian and Dianne Haggerty have been implementing a holistic and integrated program of broadacre, dryland cropping of cereal grains; cereal hay crops; and grazing with specially bred sheep for wool and premium grade fat lambs. Their program is underpinned by their shared commitment to the regeneration of their property's soil fertility. To achieve this they practice zero tillage, use biological fertilisers, such as worm juice and compost and have not used man-made phosphorus fertiliser for the last 10 years. The Haggerty's do not rely heavily on chemicals, instead adopting practices such as slashing paddocks with heavy weed infestations, maintaining good levels of groundcover at all times and they have adopted alternative grazing options (e.g. perennial fodder shrubs and sub-tropical grasses) to maximise soil moisture.

The Haggerty's original property, Prospect Pastoral Co., lies on undulating semi-arid country in the north of Wyalkatchem, bordering on the Wallambin Salt Lake. When they first took over farming the land they were told by farm advisors to 'get out' before they got started, however, this only challenged them to make a go of things. Initially they implemented conventional best practice farming techniques around at the time but after a couple of dry seasons and declining production they realised the vulnerabilities of this farming system. "We observed cereal crops with shallow root systems, which contributed to poor growth particularly in short seasons", Di mentioned. "This made Ian and I want to know more about the limiting factors within the soil".

Their ongoing pursuit of knowledge regarding soil health and productivity has led the Haggerty's to be involved with many Wheatbelt NRM projects over the years. The recent Soil Conservation Incentives Program gave them an opportunity to critically examine whether or not the practices they had adopted were having a demonstrable affect on soil quality. With the help of consultant agronomist, Andrew Wherrett of Living Farm, the Haggertys compared soil organic carbon and soil nitrogen within 'biological farming', 'continuous cropping' and 'permanent pasture' farming systems.

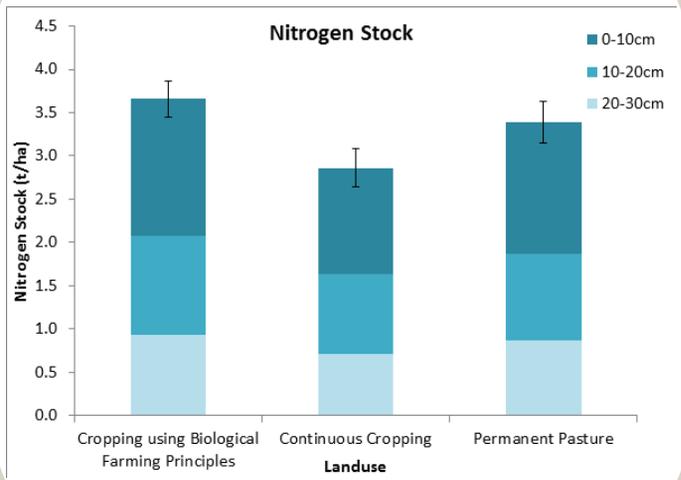
*Right: Dr Andrew Wherrett, Living Farm.*

## The importance of the carbon: nitrogen ratio

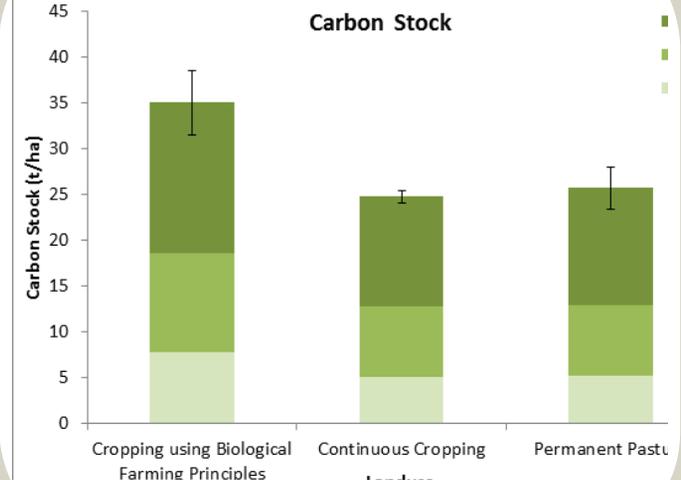
Regardless of where you are in the world, the soil microbial community is always searching for a C:N:P:S ratio of about 100:10:1.5:1.5. This is important for a couple of reasons:

1. It allows you to determine requirements for the breakdown of crop residues. Cereal crops have a high C:N ratio (60-90:1), therefore nitrogen is limiting when soil fauna and microbes try to break it down. Soil microbes as a community are much more competitive than a crop root at accessing that nitrogen and will take it before the plant has a chance to. This also explains why legumes provide nitrogen, they have a much lower C:N ratio.
2. In the period that you are increasing soil carbon storage, you will need more nitrogen inputs to maintain crop requirements. Once the upper limit has been reached, however, you will receive a larger N supply from the soil organic matter pool than previous. This is because you can assume a ball park figure of receiving 1 – 2 % of the total soil nitrogen pool in any given year (e.g. if there is 20 t/ha of soil nitrogen then you should get between 20 and 40 kg/ha of N released from the organic matter).





**NB. There is no statistically significant difference between nitrogen stock for biological farming and permanent pasture farming systems.**



**NB: There is no statistically significant difference between carbon stock levels for the continuous cropping and the permanent pasture farming systems.**

## The Findings

The graphs above show the difference between the farming systems for soil carbon storage and soil nitrogen storage at depth increments of 0-10 cm, 10-20 cm and 20-30 cm.

## Lessons Learnt

Over the years the Haggerty's have come to recognise the value of many practices such as using biological fertiliser and zero tillage to improve soil health and capture of soil organic carbon. They have also benefited from revegetation, using fodder shrubs to limit the spread of salinity and stabilise soils, whilst increasing productivity for grazing.

## Legacy

Ian and Dianne will continue to implement biological farming practices on their family farm as they believe their crops are healthy despite meagre growing season rainfall, which can be as little as 100 mm. The Haggerty's believe that the increased microbial activity and associated improvement in soil structure that have resulted from Biological Farming principles are maximising the retention of soil moisture. (Dianne Haggerty, personal communication).

The Haggerty's believe that "Farmer's must be prepared to try things that might not necessarily work – we are having success now, but we also have had many failures along the way", Dianne explained. There are many other aspects of their biological farming system the Haggerty's would like to understand further.

It is only through continually testing and refining the biological farming system to suit local conditions that real improvements can be made towards reducing fertiliser usage and increasing soil carbon.

## Acknowledgements

Dr Andrew Wherrett

(Consultant Agronomist, Living Farm)





*Above: Dr Andrew Wherrett, Living Farm and Dianne Haggerty*

**Published: August 2013**



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