Taking a fresh look at the soil

By Chelsea Ashmeade

With an aim to produce nutritious and healthy food for humans and animals while regenerating their farm and providing a biodiverse farm ecology, Ian and Fiona Koch, Barossa Valley, are learning each and every day.

They're sixth generation farmers in the Barossa Valley and are working towards a more sustainable future by listening to and working with the land around them.

Farmed in traditional European methods - with cereal crops planted and livestock farmed - since the 1840s, when the couple took over the management of land they decided to make change.

Today, Ian and Fiona have continued in agriculture and the current generation of the family farm. Focusing on cropping and sheep production and sheep breeding with the Bunyara Merino and Poll Merino Stud.

The main purpose of cropping on the farm had been to provide food for sheep and extra to the local silo. Cropping a little over 120ha for oats, barley, wheat or hay. Legumes were not used.

When Ian and Fiona took over management of the farm, they cropped almost 730ha in 500mm rainfall areas using herbicides, fungicides, insecticides, urea, DAP and MAP.

They adopted no till practices to keep as much organic matter and cover on our ground, build up topsoil and reduce erosion from traditional cultivation and fallow technique used by previous generations to control weeds.

Ian and Fiona Koch, with their working dogs Ollie and Phoebe, at their home in the Barossa Valley where they have been experimenting, and finding success, with increasing their plant species.

They also introduced planned crop rotations with beans, peas and canola.

"Over a period of time we noticed that something was not quite right..." Fiona Koch.

"Over time the soil ph. decreased with acidity increasing to 5.4 (ph. CaCl) due to artificial fertilisers. They added lime to cropping paddocks to try to increase the pH of the soil and this had a short-lived effect," Fiona said.

They were also finding nutrients were becoming locked up which was leading to health problems in livestock.

"Sheep were showing calcium and magnesium deficiency even though the soil had adequate calcium the plants were not able to provide it for the livestock," she said.

Above ground, their crops looked fantastic and they had excellent yields but it was a different story below.

"Over a period of time we noticed that something was not quite right. We were spending more and more money on chemicals and artificial fertilisers and products to remedy increasingly acid soils and sheep health problems, the cropping yields reached a plateau and started to decline even though we were trying to do the correct things using agricul-

Experimenting after researching

tural science," Fiona said.

They knew there must be something else that could be done, considering they had been no till continuous cropping since about 2000.

Ian and Fiona could no longer grow peas on the property as they continued to fail and snails had become an issue, even clogging up the harvester elevators.

Stubble was also not breaking down.

"At harvest the stalks of wheat and barley would often pull out the ground because the root system on the crops was so small and weak, although the crops looked good above the ground."

Rye grass had also become somewhat of a super weed and was able to survive chemical applications.

Farming 'by the book' they grew frustrated with their technique.

It was a trip to St Louis, USA, in 2012 at a No Till conference where they listened to Gabe Brown.

"We were impressed with his holistic and sustainable approach he and his family have to their farm," Fiona said.

Gabe's family's farm was operating in a 450mm rainfall zone managing about 1800ha. So, his methods worked on a commercial scale and were economically viable - he had been managing his farm this way since 1991.

At the conference Gabe spoke about the importance of using multi species pastures to create biodiversity in the soil and encouraging biodiversity in the farm ecosystems by using animals such as cattle and chickens to control pests and diseases.

On return to South Australia, Ian and Fiona thought they would experiment with his ideas and allocated 36ha of the cropping system to a polyculture.

Pea and canola mix trialled together.

The paddock selected had a ryegrass herbicide resistance problem, however ryegrass is good sheep feed.

"We decided to turn the ryegrass into an advantage by allowing it to be in the polyculture and accept it as one of the species. (we didn't sow ryegrass because it was already there)."

Doing a lot of their own research, they looked at particular plant species they could grow in the area and if those species could help fix problems.

"For example, the herb chicory is used to help calcium absorption in humans and animals. Therefore, chicory was used in the mix. We also tried some other plants such as beetroot, kale, sunflowers, turnips, mung beans, and others," Fiona said.

While obtaining different plant species can be expensive and difficult to source, they were able to find many of these at their own farm to make it more economically viable.

With a significant drought in 2012 but a successful lamb weaning program (on the polyculture paddock) they've continued to increase the number of paddocks in play.

"We have continued to increase the number of polyculture paddocks noticing the improvement in the health of the livestock," Fiona said.

Not only has the health of their livestock improved but they've noticed more insects, birds and bees living in the multispecies pastures.

"We also began to look below the soil surface instead of just above and we noticed lots of earthworms.

"We knew there was something going on below the surface in the ground but it was so small they couldn't see it and knew we had to measure it."

In 2015 they were introduced to a soil testing company (SWEP) who could meet their needs to measure soil microorganisms.

Delving below the soil surface

They sent the soil away from one of the no till full use chemical paddocks and then found they had just about killed all their soil microbes. "This was a real wake up call, we had to change before no plants would grow," Fiona said.

In 2015 they received the AW Howard award to do a study trip to Bismarck in North Dakota to visit Gabe Brown's farm and learn some more about his practices.

"One of the main points was he improved soil health to reduce his dependence on artificial fertilisers by using diversification of plants, plant root systems for organic carbon and mineralisation. Using a mix of plants including legumes, brassicas and cereals to achieve soil balance," Fiona said.

Each has its own unique purpose to bring balance to the soil system and environment.

By having monocultures, we are continuously using one of few species which serve a limited purpose in the ecology.

Ian and Fiona also went to Menoken farm, a farmer funded research site, where they were trialling growing two cash crops together and at the same time such as corn and peas.

They were also trialling composing manures and compost teas.

"We also learnt the importance of large root systems to provide carbohydrates in the soil for food for microorganisms. Menoken farm experiments included using compost teas to protect crops from fungal attack."

With further knowledge now behind them, soil testing in 2015 set the benchmarks for their much-needed change.

"The first paddock comprehensively tested was sampled in 2015,

Left: Worms are happy in the soils that Ian and Fiona Koch have worked to improve, right: Roots on a young bean seedling.

the soil in this paddock was retested at about the same time in 2020," Fiona said.

This particular paddock had a summer poly species crop planted in it during this time.

The ph. has increased from 5.4 to 6.4 ph. (water). The organic matter percent had increased from 2.26% to 3.21% in five years compared to

"We also began to look below the soil surface instead of just above..."

achieving only 1% increase in organic matter over 10 years with no till alone.

"Calcium and zinc have increase to desirable levels and Magnesium is also increasing. The active soil biology has increased to now be in a desirable level but needs to increase more," Fiona said.

Their next step is to properly understand the purpose of each of the main groups of indicator soil organism groups and what they do and how to grow the desirable ones.

Lambing; In the past they had weaned lambs on pasture sown to vetch and oats.

Often lambs scoured and lost weight initially.

In 2012 they had the worst drought since 1982 with only 275mm of rainfall. They weaned 400 lambs on the 36ha poly culture.

The lambs were on the polyculture for four months from the end of August. The lambs didn't scour.

They selected to eat different plants at different plant growth stages depending on palatability. Therefore, there was more cover on the ground for longer.

Take-away message:

"One main message came out that we as farmers in general have very little understanding about soil mi-

Beneficial insects join the improved soil

crobiology and how it aids mineralisation," Fiona said.

Moving forward and the family is continuing to change their farming practices.

They no longer use insecticides, chemical seed treatments, fungicides and urea. They try to limit herbicides to one knock down at seeding and no longer use glyphosate. "Each paddock is treated as an individual and we no longer use a blanket "same" management approach over our whole property.

"We have reduced the number of continuous cropping paddocks and grow more poly culture paddocks," they said.

Both Ian and Fiona agree the change to regenerative agriculture was long term.

"There will be yield reductions for the first years until soil organisms build up in the soil. Small steps first.

"Try a small paddock first. Experiment with different crops," Fiona said.

They now grow a cash crop of peas and canola together. "Predator insects get confused with growing the two species together so we don't need to use insecticides. Not using insecticides promotes beneficial insects," Fiona said.

"Each paddock is treated as an individual and we no longer use a blanket "same" management approach..." Fiona Koch.

Not only is there a number of beneficial insects, native bird life is also strong - something Ian and Fiona encourage on their property and suggest it for others.

"...especially small birds and quails. This will reduce moth and caterpillar populations.

"But also give them somewhere to live like a pollinator patch with small native shrubs."

They're learning daily; making change, adapting to their environment and witnessing positive outcomes along the way.

Ian and Fiona are now working on using compost teas on the crops and understanding how they may increase microbial action to encourage nitrogen availability.

"Since the industrial revolution and the reliance of the "artificial" in our farming operations we have lost our connection with understanding nature. "We need to observe the interaction of living organisms on the land we are stewards of," Fiona said.

Together they will continue on their journey into understanding the intelligence of nature and how they can work with the environment.

"The world and climate are changing and we want our farm to have an adaptable and resilient ecology to survive for future generations."

Radish bulb poking through the soil after a summer crop.

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