

Fertiliser decisions and choice of fertilisers and Soil physical characteristics

Over the last 15+ years that we have used zero till farming techniques, we have observed troubling changes in our soil. We originally thought that applying urea and other chemicals were improving soil health and structure however in more recent years we have seen a decline in this, while our chemical outlays have increased. What we are doing is not sustainable. Every year we are having more trouble with weeds, pests, and diseases, then having to put on more chemicals at higher rates to attempt to fix the problems. We are now seeing around the world more fungicides being used in wheat and a variety of crops. Once you start spraying, you take out the 'good guys' with the 'bad guys' and have to keep on spraying because nature's balance has been upset.

There is no doubt that all this chemical use is negatively affecting our soil life and the soil food web. I asked Chris Dowling in Biloela not long ago whether he was aware that roundup was tying up our minerals like manganese zinc and copper in our soils and he said he was, but no one wants to talk about it.

We took some biology tests in our cultivation and in some old cultivation that had been put back to pasture for only four years. In the zero tilled cultivation there was absolutely no protozoa compared to the pasture country beside it which had some. The main difference was spraying with roundup for four years, we use very little residual chemicals.

The protozoa are important in recycling nutrients in the soil, they eat the bacteria and fungi and because they have a higher carbon to nitrogen ratio, the nitrogen in the bacteria and fungi becomes available to the plants. We used to have some earthworms in earlier years of zero till, but they have seemed to disappear with the higher rates of chemical being used. Earthworms love to eat protozoa, which are not simply there anymore. No wonder we have trouble recycling nutrients in the soil and have to use more and more inputs like urea etc.

Also, for the last few years we have seen major crop damage on the headlands where we have triple strayed overlaps. This is also in paddocks where we have used no residual chemicals only round up and 2 4D. Other famers have reported similar observations. We have been farming in this valley for nearly 40 years and have cleared virgin country, grown crops in conventionally worked county, minimum till and zero till, then zero till with matched wheel tracks for the last 10yrs. We have also practiced monocultures, crop rotations, and crop rotations with legumes, in both irrigation and dryland situations, have seen the droughts and floods come and go, and witnessed the slow decline in soil health over these years. You learn from your mistakes and that process will continue.

I am concerned about the very low levels of mycorrhizal fungi in our soils (documented in our biology tests) that have been destroyed slowly with our farming practices. They seek out the phosphorous and zinc and other elements in the soil and make it available to the plants in exchange for sugars. They are also responsible for building soil carbon so if they have been destroyed they need to be repopulated. With new technology this can now be done cost effectively. Liquid injection set up on planting tynes or discs can apply products like mycorrhizal fungi and other microbial amendments. It is also the best method of putting on legume innoculants with the seed at planting time (in the wet soil with the seed). Putting on major and trace elements in the seed slot or beside it

if needed is another option. Using liquid injection can also allow the application of products like micronized lime or gypsum (if you have good agitation) or you can apply anything that dissolves in water.

The yield of a crop is limited to the nutrients that are deficient in the soil, so liquid injection is a great way to put on what you need in the water. We also have the traditional dry blend air seeder set up as well, if that is what is needed.

Soil tests are one of the tools used to monitor soil health. We also use plant tissue tests while the plant is growing, which gives another prospective indicating what the plant is lacking in , or if there is any excesses of nutrient which can affect other nutrients.

We also use hand held metres (eg nitrogen potassium, ph, brix etc.) which gives you an instant result which can be fixed straight away by either foliar spraying with a boom spray or side dressing with a liquid or a dry blend if possible.

Foliar fertilising has proven to be effective at fixing a crop deficiency quickly and maybe fixing the problem with a soil amendment when time allows (next crop). Hand held meters are handy for checking afterwards to see if you improve your results. They have saved us money, especially with nitrogen, as you don't apply where you don't need it. I think foliar applied nitrogen either urea, or uan, is a good tool to have available. If you need it you can apply 20kgs or 20L to the hectare to give your crop that extra boost if needed, but extra equipment and tanks are needed.

It has been proven that up to 50% of nitrogen can be lost if pre applied to your crop. The losses can be higher if there is a lot of wet weather. It is ridiculous to think that a tiny little plant needs to have so much fertiliser around it, I am sure it is only for convenience that all nitrogen is applied pre or at planting, and not very good for the environment.

There were urea trials done where a single application of 100kgs/ha was applied pre plant and on another 4x25kg/ha were applied in crop when the plant needed it. The 4x25kg trial doubled the yield increase of the other trial.

Nitrogen sulphur and boron are easily leached, as they don't stick to the clay particles. They will stick to the organic carbon in the soil, but soil organic carbon levels are so low in most soils that a lot of the nutrients are finding their way out to the ocean along with soil and whatever chemicals are in it.

We have to build the organic carbon levels in the soil as it is the store house for our nutrients, which are held in a plant available form that won't leach. We need all the microbes and the whole soil food web to recycle all the nutrients to build up the organic carbon in the soil, to produce the glomalin that binds the soil together to stop it washing away.

Zero till is good in that it helps a lot with soil erosion and water infiltration and conserves our water as it is our most limiting resource. But with the high costs of inputs and the declining soil health, we have to get back to a more natural system where we look after all the soil life and start improving our soil health because our present farming systems are not sustainable with all this chemical use.

With the grains bmp I am disappointed that the soil microbes and the soil life are not acknowledged. Even a simple question about whether or not there are earthworms present would give a farmer an indication of how healthy his soil is. I am sure the grazing bmp would acknowledge soil biology.

Regarding soil physical characteristics, where we have surface crusting, the soil will not breathe and not let the water in although the soil tests seem to always come back okay. I think the problem is more than the chemistry of what the soil tests show, it is the physical and biological makeup of the soil itself. The soil structure was improved by growing butterfly pea for three years. The soil changed immensely with no spraying and having a green crop in the ground continually. We put it back into zero till cropping and spraying for a couple of years and the soil is starting to go hard again.

I think we all need to have a good long hard look at our cropping systems in order to produce healthy soils so we can grow pest and disease free crops with as little chemical use as possible. Farming and grazing need to be sustainable and has the least negative environmental impact possible. You have to build resilience in your soil so it can withstand droughts and floods. This is achieved best by building organic carbon levels and glomalin in the soil using a diversity of above ground crops (plenty of rotations) and a biodiversity of below ground soil life. You must refrain from practices that destroy soil like eg excessive tillage and harsh chemicals. This enables the soil to hold more water in the dry times and means plants have healthy vibrant roots which can hold the soil together in the floods. With a healthy soil life and a well balance nutritious soil, we should have less pest and diseases, and therefore less chemical use. Less chemical use, and less erosion means less expenses for the business as well. If we can keep a green crop or plenty of cows all year round we will have less runoff therefore less nutrients, soil erosion, and chemicals downstream.

Prioritisation & Planning Tool

Name: Tony Bongers

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1. Please list your top 3 actions that you have identified in the workshop today that is of greatest priority to your business going forward.

- 1.
- 2.
- 3.

2. Choose the action that you consider most important from Q 1 and answer the following question:

If you had to explain to a potential funder what the benefit might be to your enterprise upon implementing your action, what might you say?

Farming and grazing need to be sustainable and has the least negative environmental impact possible. You have to build resilience in your soil so it can withstand droughts and floods. This is achieved best by building organic carbon levels and glomalin in the soil using a diversity of above ground crops (plenty of rotations) and a biodiversity of below ground soil life. You must refrain from practices that destroy soil like eg excessive tillage and harsh chemicals. This enables the soil to hold more water in the dry times and means plants have healthy vibrant roots which can hold the soil together in the floods. With a healthy soil life and a well balance nutritious soil, we should have less pest and diseases, and therefore less chemical use. Less chemical use, and less erosion means less expenses for the business as well. If we can keep a green crop or plenty of cows all year round we will have less runoff therefore less nutrients, soil erosion, and chemicals downstream.

