

## Interview with Andrew Smith

### Why did you decide to mostly stop using chemical treatments?

I have major concerns about chemicals in agriculture. We've been depleting soils for 50 years. The research you read worldwide about all the different chemicals is pretty scary. There's glyphosate in the Antarctic and there's Chlorpyrifos, which is a terrible insecticide, in America. It's actually been found in some children – it's a pandemic in chemicals. A lot of the chemicals the Australians are still using have been banned overseas. If someone else banned them, I think we should be looking more seriously at them. But I think it goes back to the health factor – what are our children eating? A lot of the wheat or barley we harvest goes through the system and ends up in a two-year-old's bowl of cereal. There's a responsibility there to make our produce a hundred percent clean.

I also grew up on the land. We had a lot of trouble with soil erosion and that's always been stuck in my brain since I was a child. It was usually from overworking of farm machinery. It has changed a little bit now, but going back 20 years, soil might be worked up three times and by that point it could be like powder that just blows away. A lot of the big players have far better equipment now and they have a lot less soil disturbance.

But to be fair to the chemical industry, we actually do need a little bit of chemical to get maximum yield. All of my methods have not given me superior yields yet, but I'm bringing more life back to the soil, and microbe populations are benefiting. I use smoky wood vinegar now to kill unwanted insects on cereal crops. A couple of days later, the insects I don't want are all gone, but I've still got butterflies and bees in the crop. If you use those other normal chemicals, everything is dead. It's a barren landscape. Nothing lives, nothing survives, except for one plant.

### How long have you been exploring alternative methods to chemicals?

I've probably been reading about it for five years and been actually using these treatments for about three years now.

### Who do you recommend to read or learn from in this area?

Graeme Sait has produced many podcasts and that's really the first place if anyone wants to look at turning things around a little bit and rejuvenating their soil. Nicole Masters, she has a brilliant book out *For the Love of Soil: Strategies to Regenerate our Food Production Systems*. She has spent a lot of time in the US and around the world. She's probably the number one in that space now. There's also Gabe Brown, an American. His book is called *Dirt to Soil*. In 2021 he was invited to present farming alternatives to the US Congress about soil regeneration. There are good shows on Netflix to get a basic understanding too: *Kiss the Ground* and another called *Ice on Fire*.

### Are a lot of others doing this in Australia too?

My wife and I go off and speak to other growers around Australia as well and learn from them. There are a lot of people doing this, but I don't think anyone's really doing what I'm doing. It's more of a formula.

### How would you describe that formula?

It's all about enhancing microbes in the soil; you've got to bring that soil back to life. There should be a billion microbes in a teaspoon of dirt. You really have to look after these. You need to feed them and you need to stop using certain chemicals. The insecticides and fungicides are very aggressive for the soil – they're the first ones I've stopped. That's a bit of a risk. Sometimes fungicides can be devastating on your wheat crops and it will cost you in grain loss to not do this. Aphids attack our cereals, but I simply use a smoky wood vinegar for that. To get it on your hands, you smell like you've been fighting a bushfire. I discovered that in one of Graeme Sait's podcasts. He introduced an organic distributor here in Virginia, South Australia Biotech Organics. I'm learning a whole lot from them now as well.

Tell us about the main treatments you use.

There are about 15 different things now that we've changed. Some are minor, some are major.

**1. Vermicast liquid**

I make our own Vermicast which is a liquid fertiliser made from worm castings. I have about six shuttles with thousands of worms in there now, and compost. There's also a whole line of bacillus microbes that you get out of cow manure that's all in there. I feed the worms a range of different things, even carbon products such as paper. We have a little sprinkler system and that just runs over that twice a day, drains into a drum, and then it gets pumped via a little solar pump into a thousand litre shuttles. I've probably sprayed out 20,000 litres of that. It's really good for microbes, and there are some trace elements in there as well. You can also buy Vermicast for AU\$2.50 a litre and this is often better than what I use, mine is more or less a leachate. Nutril Soil and Vermicast Australia make superior products.

**2. Protozoa**

Protozoa is a type of single-celled organism that earthworms love, and is found in organic lucerne hay. I put protozoa in a shuttle, put an air bubbler in it for a couple of days, and let the protozoa breed. That will create a thousand litres which will cost me a dollar a hectare. These first two treatments I spray under the soil and on crops (wheat, barley and lucerne).

**3. Beneficial anaerobic microbes**

We can't breed fungi, but I can breed microbes. I can simply put a hundred litres in a thousand litre shuttle, put in some molasses and then seal it up tight and that sits there for 30 days. When it starts pushing carbon dioxide out the little hose, I know it's ready. The cost of that is only about AU\$2.50 a hectare. It's also actually a great seed treatment. Seed treatment is paramount; we do not put any nasty chemicals on our seed. I buy the concentrate from NTS in Queensland and now from Biotech Organics.

**4. Fulvic acid**

We use a lot of fulvic acid, derived from coal, which is basically an organic fertiliser. That's like adding direct carbon back in the ground and it's very good for flushing out chemical residue as well. That's a little bit more expensive, but we are still only talking dollars, and we only put out a small amount.

**5. Humates**

We use humates as well, another fantastic fertiliser. We put out about 5 percent, or five kilograms a hectare, of that. That has great water holding capacity.

**6. Guano**

We put out guano (the accumulated excrement of seabirds or bats), instead of using MAP or DAP fertilisers. Guano will release phosphorus for 13 years, whereas MAP or DAP will only release it for about eight weeks.

But the MAP/DAP is a much higher hit, so you're giving this big synthetic overdose which will yield better than the guano I'm using, unfortunately. But we're going to keep putting that guano out for quite a number of years to build up the phosphorus.

**7. Molasses**

We use molasses to feed microbes. That's a great product, and I'll put as much out of that as possible.

## **8. Underplanting**

We have been undersowing lucerne under our wheat for three years. For the first two years, the cereal with the lucerne underneath it was the highest yielding paddock. It was a bit less this year. That may have been because it was very wet – the lucerne really got going and might have dominated too much.

## **9. Disk Seeder**

To do all these things, I bought a disk seeder so that we can very carefully place seed without disturbing the ground. The ground is a whole network, it's like a whole bunch of freeways and cities under the ground where all these microbes live and communicate with each other. So rather than digging all that soil up and getting soil erosion, we have a little cut in the ground and the disk seeder runs through, pops seed in and a press wheel presses the soil back down on it. The disk seeder has dropped my fuel use by 40 percent so that's good for our carbon footprint too.

## **10. Broadstrike**

If I do have to use a chemical on a crop, I use Broadstrike as a post-emergent treatment for broadleaf weeds. With normal chemical approaches to cropping, you would do a knockdown spray to kill everything, then put a pre-emergent in with your seed, and then a post-emergent. I use my other treatments instead, and then use broadstrike as a post-emergent treatment.

Broadstrike doesn't kill legumes – so all of your clovers and lucernes for example can remain living under your crop, meaning you can get more roots in the ground, more breakdown, more cover, more foliage. They're only little things, but they all add up.

## **11. Microbes in place of using urea for nitrogen**

While it works, urea can be pretty devastating on the soil and the microbes. I've been trialling Azotobacter microbes instead – they will attach themselves to cereal crops and produce nitrogen, just the same way a rhizobia inoculant does for legumes. I haven't seen any results from that one yet, but I've done the whole place and I'll do it again this year.

## **12. Trichoderma**

I use Trichoderma, a fungus used for disease control, for adding to lucerne. An inoculant can be used as a seed treatment on a legume to ensure it produces nitrogen. While this is expensive to buy, you can make it for minimal costs. You can put the fungus in a few bags and grow it out – then layercake it with manure, straw and molasses and it will grow and spread. If you don't have inoculants the plant won't produce any nitrogen so you have to get that right.

## **13. Liquid seeding application**

The most effective way to go with your brew of microbes and nutrients is to put them under the soil. I have a liquid kit on my air seeder which puts the treatments under the ground when I'm seeding. I'll put usually about 50 litres a hectare under the ground. Don't forget, we've got billions of microbes in a teaspoon. When I'm testing the number of microbes I've got, it's coming up with very good numbers. But when your plants are in full leaf, folia sprays (on top of the crop) are very effective also.

## **14. Seed treatment**

Instead of using chemicals, I use beneficial microbes, such as those already discussed – vermicast (1), protozoa (2), beneficial anaerobic microbes (3), and fulvic acid. I also use Azotobacter (11).

## 15. Smoky wood vinegar

This is a by-product of biochar, and the product is called PyroAg. It has a number of uses. It's really good for plant vigour and it increases the cell wall strength of plants. Cell wall strength is basically their barrier to pests, so it's like putting the stonewall up around the castle. It gives them more immunity. You've just got to be careful not to put too much on. I do about one in 500, but if you don't have any microbes in your brew, you can actually put it on at one in 200 and it'll give it more protection. But if you put it on too heavy, it may kill some of your good microbes.

### Do you still use any other chemicals other than broadstrike?

I still use a small amount of glyphosate but I've been able to reduce the glyphosate rate by 30 percent because of the smoky wood vinegar, so that's a saving. We're not organic. I would like to be, but we do have a range of weeds that come through that can be poisonous to livestock. I have noticed though that those nasty weeds are not coming through in the lucerne paddock, as once the lucerne is established it is harder for other plants to. I'll double my lucerne exposure this year. Those paddocks are clean and they've got beautiful sheep feed in them.

### How successful are these treatments overall? Is this a long-term game?

It's a long-term game. It's probably going to take three to five years to have full benefit. My yields were down on my neighbours this year, but my soil has more life in it. If you're throwing out hundreds of kilograms of urea out there, you'll be doing damage, but you will yield. And it's a tricky one to convince farmers – that we need to look after the soil, when they're making reasonable returns with their urea and synthetic fertiliser. But they may not build carbon.

### How long do you think people can keep using chemicals though before the soil is barren or lesser quality?

Some people are talking 60 years. Farmers will stop growing cereals and things because the inputs will be too great. To grow the same amount of wheat or barley now, the amount of urea you need is like double what it was 20 years ago. Those application rates are going to keep skyrocketing and of course costs will get to a point where the farmers are going to think 'now it's too big a risk'. If they have one bad year, it can take two years to recover fully.

### How do the costs and benefits of your treatments and chemical alternatives compare?

Overall, my costs are minimal, but it does cost you a bit of yield to get it going. My inputs are a lot lower compared to chemical input outlays which have gone through the roof. Urea is about a thousand dollars a ton at the moment, so that's a hundred dollars a hectare. If you have a drought year, it doesn't matter how much urea you put out or how the fertilisers and chemicals work, you'll lose money. And if you lose too much one year, you are going to take two years to pay that back and that's simply because of the chemical outlay.

Out of all my treatments, my most expensive is guano, the bird fertiliser phosphorus, which is about AU\$40 a hectare, and the disk seeder. Capital purchases like disk seeders can be anywhere from AU\$50,000 to AU\$250,000. Undersowing lucerne costs about AU\$60 a hectare but that cost can be written off given I graze that lucerne for 10 years – we make more money out of sheep than we do cropping. Microbes are between 50 cents and AU\$2.50 a hectare. Humates were AU\$6 a hectare. The smoky wood vinegar is between about AU\$2.50 to AU\$5 for a heavy spray.

All of these things will help you build carbon as well. So there's two things here – we are trying to revive, regenerate the soil for better yields and carrying capacity, which as we said will take time, but we're also building carbon.

**And why do you need to build carbon?**

Carbon is a number one thing you need for water holding capacity. You can end up making your paddock spongy again. If you get a hundred millimetres of rain, it'll soak in and not run off and erode. How much your soils can absorb at once is really important. The more unhealthy the soils are, the more erosion and the more runoff you'll get, and that run off will take chemical with it and end up in the creeks and the rivers.

**And how long ago were carbon levels 10 times higher? What sort of period have we lost those carbon levels over?**

About 50 years.

**Do you think there'll eventually be a point where health and climate concerns converge? Perhaps that will force a tipping point for change – where farmers have to move to non-chemical treatments?**

The regenerative agricultural movement is always pushing to rejuvenate our soils, improve quality and yield. Farmers can be paid for adding carbon, adding another income stream. With costs rising more and more, farmers (who are always innovative) are looking at better methods.

**What next? Are you sharing this knowledge with others?**

I'll share this knowledge with anyone. My formula is not about giving them outstanding yields yet. My formula is about repairing soil – we've got to do that. Yields will come over time and listening to Gabe Brown, he says he has improved his yields. There are a number of things we can all do and people know about some of them, but it's how you put it all together. There's a lot more to it than what people think.

We're currently seeking grant money to do a range of trials to see whether we can put some numbers on the data and get some more soil testing and plant tissue testing done. I do a range of soil testing and plant tissue testing, and that's given us good indication of where we're going. It would be good to do more so we can quantify and share that information and some numbers with others.