

CASE STUDY SIX

PA used to improve soils

On-the-go pH mapping has formed an integral part of Kym and Katie I'Anson's Mid North business while also playing a critical role in improving soils.



Farm profile

Farming personnel: Kym, Katie, Murray and Ann I'Anson

Farm location: Marrabel, South Australia

Annual rainfall: 350-500 millimetres

Soil types: Red clay loam, dark self-mulching clay, grey shale, silty sand

Farm area: 2000 hectares

Topography: Undulating

Enterprises: Canola, export oaten hay, bread wheat, biscuit wheat, faba beans

Average wheat yield: 4 tonnes per hectare

SPAA member: Yes

PA consultant: All done in-house, ideas sourced from other Farmers

PA timeline

Variable rate –	2000
Yield mapping –	2002
Guidance –	2004
Autosteer –	2004
Inter-row seeding –	2004
On-farm trials –	2007
Biomass sensors –	2009
On-the-go pH mapping –	2011
Controlled-traffic farming –	2013
Direct injection spraying –	2013

farming is affecting water infiltration, the rate and volume of water a soil can hold and how different crops are now accessing larger amounts of water to a deeper depth as we can see water use at many different levels along the length of the probe.

Our main soil type started as an acidic soil ranging from pH 4 to 7, so lime has been a major input over 15 years raising the average pH to 6. The soils are sodic ranging from five to nine percent exchangeable sodium in the top 10 centimetres and increasing with depth up to 17 per cent, so the soils set very hard and limit root growth. We also experience short-term waterlogging over the winter period which affects plant emergence and crop growth. A gypsum program over this time has fixed this to a large degree down to a depth of 30cm through heavy targeted rates and movement through the profile.

Top PA tips

- Use PA to improve the soil resource.
- Undertake a cost-benefit analysis to aid in decision to adopt PA technology.
- Yield maps help to identify how different practices are affecting end result.

Which technology tools or components have you adopted and (which do you) continue to adopt?

We have adopted and improved soil mapping technology as well as the systems of analysing the data and the map analysis programs over time.

We started with Farm Works' Field Rover program to grid our paddock on a one-hectare basis and provide a geolocated point. We then manually sampled that point and sent it to a lab for a full soil analysis of the first 300ha to explore different soil characteristics, which showed us that soil pH was our most critical issue.

We could then variably apply lime and gypsum on a manual basis by turning the spreader on and off using the maps. It went from marking zones with drums to background maps on our John Deere 2600 and then 2630, then using Google Earth and iPads to identify zones. From 2016 we have gone full variable rate with a Bredal spreader controlled by a Topcon X30.

Why did you choose to adopt precision farming technology?

We see precision agriculture as a way of improving our soil resource. You can't manage what you don't know. Yield maps highlighted the large yield differences amongst soil types and have been a tool to show improvements in yields in zones over time.

For us, PA works in two ways. It allows us to produce maps of different soil characteristics, biomass and yield. It also allows us to measure a relative change. For example, a moisture probe has shown us how the new system of

Manual sampling continued for 10 years but it was time consuming, not accurate enough and not sustainable. We realised how critical pH was and so acquired an automated soil sampling system, the Veris MSP.

The machine takes nine cores per hectare. Every 30 metres a horizontal corer drops into the soil for a metre and collects a new sample to a depth of 10 centimetres. A GPS location is logged and then raised to be tested by two individual antimony electrodes. The corer then drops back in for another sample and two high pressure water jets wash the electrodes and provide some solution for the next sample.

We worked for four years on getting the machine to operate in Australian conditions and validate it to see if it would correlate well to lab results. Andrew Harding from Primary Industries and Regions SA was a key part of validating the machine and assisting with soil acidity work.

From 2015 we have been able to map soil pH for other farmers and we still continue to map our own property. We now have soil pH change maps in which we can see the effects of liming and the response to different lime products.

In 2013 we moved to partial three-metre controlled traffic, purchasing a John Deere 8335RT tracked tractor for this and a John Deere 4940 sprayer with two direct injection modules. This system continues to work well for us.

We use our soil pH maps as ryegrass maps, as ryegrass is more dominant on acid soils. The crop does not grow as well on acid soils making it less competitive against ryegrass, which can take over. Liming is the first task to combat this and then we can target chemicals on these zones. We might spray a whole paddock with glyphosate and then we will turn on the direct injection and go over these zones with a specific chemical to target the ryegrass.

To help us with variable rate nitrogen, we have biomass sensors linked to the spreader. This enables the spreader to automatically adjust the rate of urea going out in real-time according to the health or biomass of the crop.

What are the factors that motivate you to adopt and use each of the different tools or PA components?

We enjoy technology and that motivates us. Now that more people are using

these technologies, the issues associated with them are being addressed. Four years ago there were only a handful of variable rate spreaders. Now they are nearly standard and the ISOBUS systems on them are allowing them to work effectively.

What types of data and information are you collecting to guide your decision-making to adopt or not adopt each PA component?

We do a back-of-the-envelope cost benefit analysis but more importantly we visit and talk to farmers around Australia. In the end, most new PA decisions we make are a leap of faith. You can apply the theory and the economics but how each one works out in practice all comes down to your farm, your specific issues, your understanding of the specific issue you want to address, the end result you want to achieve and your drive to make it work.

Has the adoption of PA increased profitability on your farm? How?

Our profitability is directly related to PA. Without it, we wouldn't be profitable given our soils. That's where you make your money from farming – your farm works on profit and loss and if you break even, you break even but if you have the PA there it's all extra profit. PA is particularly helpful in the dry years as you can manage the amount of inputs you use and target them to specific areas so that yields are only limited by water. There are always areas in a paddock affected by a lack of nutrients and/or weeds and in a dry year this stands out as it affects a plant's water use and yield. PA is a very good investment, it would be between 50-100 per cent payback in the first year.

How are you using the data generated by PA? Is it leading to further practice change? If so, what kind of practice change?

The biggest tool in assessing change is yield maps. Even though you might not be able to use them for much except for altering phosphorous rates, they are a pictorial display of what occurred over the year and you can identify how different farming practices are affecting yield.

Our investment in the Veris machine is an example of practice change and as a result we have been able to better target lime applications. We can get a very accurate soil type map and once you have that you can do more manual sampling and assess any other issues.

Who is influencing or assisting you with the adoption of PA?

Other leading farmers around Australia influence me. My wife Katie supports and assists me — it's almost a full-time job in the office doing the administrative side of PA. Industry groups such as SPAA are great for sourcing information, as are publications such as the Grains Research and Development Corporation's Ground Cover magazine.

Are you planning to adopt more or less of these various precision farming technology components in the future?

We will only adopt any new tools if they are going to simplify the business. One thing we would like to see in the future is a system of sensors connected back to the office. This would enable us to see soil temperature, air temperature at canopy height and real-time NDVI sensors just to have that timely information feeding back to the office on crop growing conditions. If I've got all of that information on my phone then I can make decisions on the go or remotely.

Contact details

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**- Conversations with Farmers:
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