Mike Smith farms at Gurley, in north-western New South Wales

In collaboration with SPAA, The Australian Cottongrower presents a series of articles on a wide range of precision agriculture technologies and how best to put PA to Work on your farm.

Data king in defining undulating country

Written for SPAA by Ann Rawlings

NEW South Wales grower Mike Smith has harvested yield data since 1996, using the data to better define the area's black self-mulching clay soils as well as experimenting with variable rate fertiliser application. Despite many successes, he admits there is always more to learn when it comes to precision agriculture.

Cattle once dominated the state of play at Tarnee Pastoral Company, in north-western New South Wales, but crops are now the mainstay of its owners, Mike and Bev Smith. It was not that they hated livestock; they just found crops more interesting.

Their farm, just south of Moree, has been in Mike's family since 1913, with the couple taking over its management in 1992.

Now, alongside their son, Nick, and his wife, Sophie, they crop about 2300 hectares annually and contract farm an additional 1000 hectares for a neighbour.

Following a four-year rotation of wheat, cotton or sorghum, chickpeas and linseed, the system is tailored to suit their undulating country and, importantly, the properties of their soil – a black self-mulching clay. It is good soil, but fragile and prone to erosion, an important management consideration when operating within a traditionally summer-dominant rainfall system.

"We rely on a lot of stored moisture to finish our crops, because from August to September – the money months – it doesn't rain much," Mike said.

"The black clay varies in depth [to bedrock], and so that is our bucket of water. We have different size buckets in different parts of the paddocks, and that's primarily what drove my interest in yield monitors when I heard about them in 1996. I thought they might be the perfect tool to try and quantify what goes on here with that variation." While Mike has experienced a few "hiccups" along the way with wet seasons, frost and droughts, he has over the years collected a considerable amount of yield data. His first task in determining the link between soil depth and yield involved GPS referencing sample points across the property.

"I had a push probe marked off in increments, so I could push the probe in and measure in 15cm increments how deep the soil was. I then attached that to GPS coordinates to make soil depth maps," he said.

"There is better technology out there now, such as EM38, that can give you a far greater data density, but it gave us a good idea of what we were doing." Since 1996, the family has collected "layer upon layer" of data each harvest, with the analysis of this information also prompting a move into variable rate (VR) nutrient application.

"In some ways, it was a bit of a surprise to see how much variation there was," Mike said. "We were thinking, why are we throwing nutrients at that area, at the same rate as other areas, and it's making no difference? "We weren't seeing better protein in our wheat, even though we

Farm details…

Location: Gurley, New South Wales.

Owners: Mike and Bev Smith.

Farm size: Family crops about 3300 hectares each year.

Enterprises: Wheat, cotton, sorghum, chickpeas and linseed.

Annual rainfall: About 600mm.

Soil: Black self-mulching clay.

Top PA Tips…

- Be realistic about what you can achieve. "You can be as precise as you like, but can you tell me how much rain I'm going to get in any one month?," Mike said.
- Being involved in local research initiatives is beneficial, in terms of knowledge gained and support received, and especially during difficult seasons. Mike works with local agribusiness Agricultural Marketing and Production Systems, heading up its Moree grower research committee. "It has a very proactive and reactive research wing and that adds a lot of value for clients," he said.

were putting more nitrogen on that area, and it was yielding half of what the other area was; some of our shallow soils don't hold onto nutrients." Mike said the aim had been to better target projected average yields.

"Our average rate stays the same, but we're getting more on our better areas.

So we're pushing our yields better, achieving our targets better, on our better areas," he said.

"We've also started to use potassium and phosphorus, but put it in deeper into our soil if we can. We go through after harvest and put in a good lick, we might only do it every second year, and then at sowing we plant back over the top of that band." An important factor in a system such as this is to continually monitor, Mike said.

"We were getting pretty cute with fertiliser and I was trimming it back, saying we were fine and we could keep the average up," he said.

"Our crops were going well but I think our soil and system was just too finely tuned. Then we had a really wet year and it was too wet for us to get in and top up with nitrogen, and we suffered.

Nick and Sophie Smith in November 2020 with new addition to the family, Milly.
(PHOTO: Mike Smith)

"We had high-yielding crop with poor protein, which cost us a lot of money. So we had to do a bit of a reset and go back to our old system, where you make sure you have enough in the bucket."

Assessing performance

Mike said it was still basic farming, but they were able to be a bit more precise with the nutrients they applied, rather than having a blanket approach.

"We are shifting our target as we go but we probably need to look more critically at some of the more poorer performing areas and say, are we doing it for aesthetics or just efficiency, because there is a good bit of dirt on the other side of it? We're on controlled traffic, we want to go through it, so there is no point in just letting it go," he said.

They use Farm Works as the main software program for layering and mapping analysis.

"We've used it from the start," Mike said. "It was the cheapest program that we could get hold of that was able to yield map and make VR maps.

"Then, as we started to use the John Deere system, we needed to use Apex, but we've since moved away from that to its online platform. But we still use Farm Works for a lot of the visual stuff."

JMP, a computer program for statistical analysis, is used for the "actual number crunching side of it". "It takes a fair bit of rigmarole to get the data into the right format; it's a stats program and not designed for yield mapping," Mike said.

But using JMP has allowed Mike greater flexibility when comparing relationships at yield "data points", or grid cells in the map layer.

"If you set your data up on a common grid, so you have a grid point for predicted yield or predicted nutrient applied, or whatever you have done to the paddock, you can have layer after layer of data in JMP," Mike said.

"You can then look at all the relationships at those data points. For example, if you have fertiliser strips through the paddock, you can see what the relationships are, or the responses from, the different rates of fertiliser.

"But it's still not a walk in the park; it takes a fair bit of imagination sometimes to work out what is going on."

Capturing data

"If you don't capture data, and measure it, you don't know what's going on," Mike said. "It might turn out to be no use, but if you've got it, at least you can put it into the program and see if there is a relationship between, say, yield and sowing rate." Mike uses Satamap, a web-based platform for viewing and analysing satellite imagery, as a supplementary layer of information.

"My personal feeling [with Satamap] is, don't get too carried away – you still need yield maps," he said. "You can use it to develop VR maps but you need to be confident about what your predicted yields may be, based on that data." Recently, the family looked to Satamap to determine the best time to defoliate cotton, using the platform to create a VR map for chemical application.

"There's a cost saving but it also meant we were far more effective in terms of how much leaf we removed," Mike said.

"If we had just used an average rate, we would have got a good result in the poor areas, an acceptable result in the average areas and, where we have the best cotton, we wouldn't have taken off enough leaf. We would have suffered a downgrade in the best cotton."

Another project, held back by drought, includes incorporating into the system a WeedIt for selective spraying, while this harvest was the first that involved a protein monitor by Cropscan, as part of a Grains Research and Development Corporation-funded initiative.

"Now my son is home, I have a bit of opportunity to look at the science stuff more. Then, hopefully, I can teach him some of what I know," Mike said.

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