Variable Rate Application – the basis of an agtech adoption journey

- Type of farm – mixed cropping and livestock
- Area – 385 ha
- Crops – cereals, oil seeds, potatoes, corn, peas and onions
- Livestock – beef cattle
- Soils – mostly red Ferrosol
- Irrigation – traveller, pivot, linear move

Michael & Rochelle Nichols, 'Redbank Farms', Sisters Creek

photograph: Simon Stuzaker; source: Landcare Tasmania.

Ag tech background

Interest in vari-rate application (VRA) technologies was sparked by UK farming magazine articles about real time sensing for vari-rate N application. The impression was given that the technology was simple to use, and apart from the real time sensing component, all that was required was to enter some data about variability into 'your farm management software' to generate a map for the spreader to do the job.

Michael describes his VRA journey as 'horrendous', primarily because of the two common bugbears of most PA ventures – software and hardware communications incompatibilities. A Bogballe M2W VR capable spreader (bought 2010), could automatically adjust application rate to accommodate variable operating speeds, such as going up or down hill. This was his first venture into VRA, based only on ground speed.

Satellite guidance (2013) allowed straight driving and avoided overlap and improved field operations efficiency by 15%, which easily justified the purchase. Brand (Trimble) and model decisions were determined by what the dealer had available.

Although EM38 mapping (2016) was one of the first mapping layers obtained for his farm, it was not particularly useful on the uniform red ferrosol soils. He also had one paddock mapped using the SIS system of sampling based on zones of difference.

At this stage, Michael had guidance and a VR capable spreader, but no software or communications system to link them together. Purchase of a Claas grain harvester (2017) with yield mapping capability and proprietary software for data analysis and map generation was a defining move. Grain yield mapping confirmed his observations of paddock variability, but also identified areas of variability that weren't immediately apparent to the human eye. It also allowed robust financial analysis of the costs of poorer yielding areas and calculation of the benefits of VRA.

Following yield mapping he had grid mapping done (one sample/ha) for pH, Ca, Mg, K and P. The blanket recommendation for potash based on standard random sampling and one aggregated sample per paddock was 800 kg/ha. Grid sampling showed he could use rates ranging from 0-800 kg/ha. Savings from VRA easily covered the mapping costs and future mapping was done at two samples/ha to 20 cm depth for greater resolution, particularly in small paddocks.

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Challenges

Michael's journey has faced numerous challenges and costs, such as having to purchase additional cables and unlock codes on the guidance console in order to get all the communications working.

A new tractor (Valtra), with its own built-in guidance system, was bought in 2021. The existing spreader was supposed to be compatible with the ISOBUS system on the tractor but wasn't, so a new ISOBUS compatible Amazone spreader was purchased.

Outcomes

Fertiliser savings were not the only benefit of VRA. Saving fertiliser on parts of the paddock that didn't need it reduced luxuriant crop growth leading to reductions in disease, lodging and post-harvest stubble management, while allowing production on poorer areas to increase. Small areas that had never performed well were identified, allowing them to be fenced off and sown to pasture.

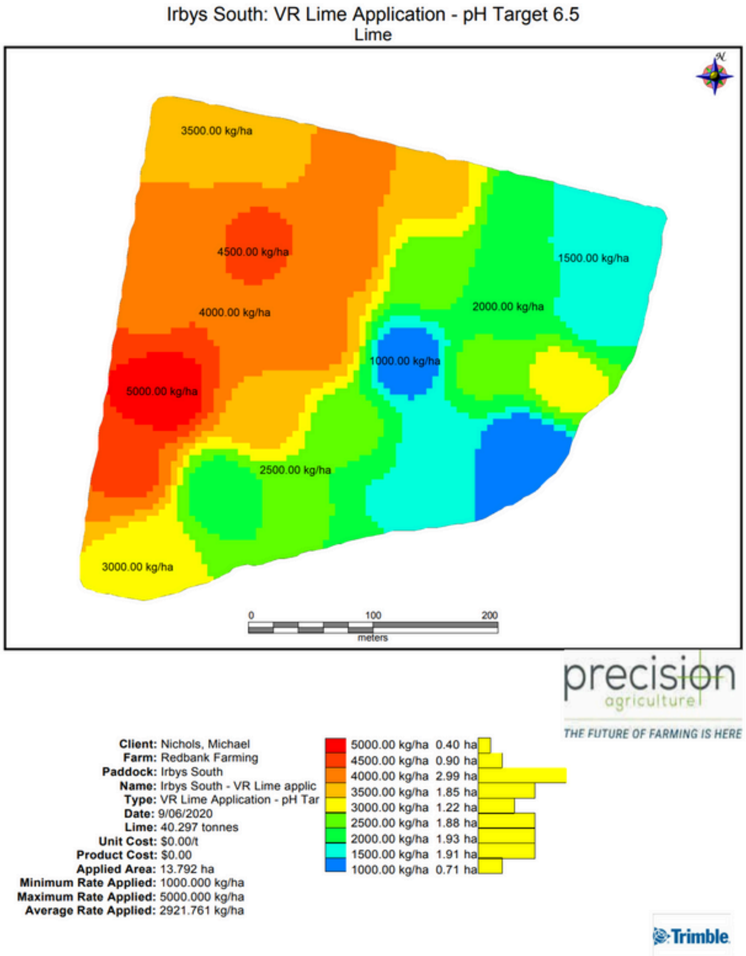
Michael is saving approximately $20,000 per year on fertiliser without taking into account improved yield from previously underperforming areas.

What would you do/not do next time?

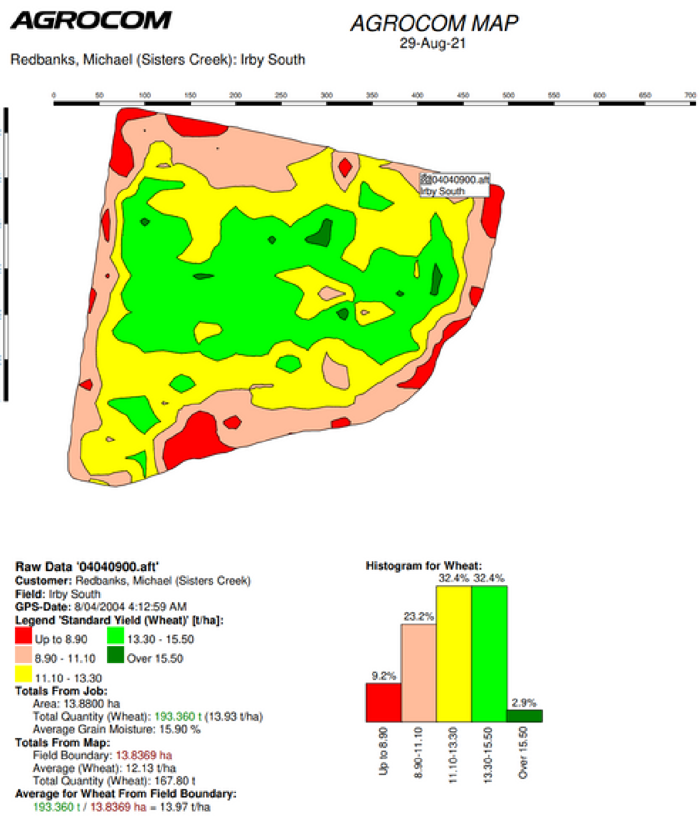
Avoid trying so many farm management platforms. Go straight to an integrated system – which wasn't available at the time that Michael started his VR journey.

Positives

The VR journey has absolutely paid its way through reduced inputs and improved yield for the inputs provided. The initial guidance purchase and speed-based VR fertiliser application paid for themselves very quickly.



Variable rate lime application map showing zones for nine different rates



Wheat yield map from 4 years after the VR lime map showing most of the paddock yielding 11.1-15.0 t/ha

Negatives

EM38 and SIS zonal mapping were not very useful on red ferrosol soils. Michael doesn't use soil moisture monitoring widely as he sees limitations in basing irrigation decisions on one monitored point chosen to represent the 'average' of the paddock - then deciding how to manage the parts that are not 'average'. He sees some benefit in monitoring to prevent over-watering (below 50 cm) and when to start after a rain event. Michael has used Enviroscans from Sentek for 10 years and currently runs an Outpost unit and Green Brain. He doesn't see any value in VR irrigation for his operation.

Michael is a collector of farm management software accounts as his needs have never been completely met by one product. Either discarded or still in use are Farmworks, Ag World, PAM Ultracrop, PCT and Trimble. Different platforms have their strengths, but it seems very difficult to find one that does it all. If starting with a clean slate, he would adopt an integrated system, such as John Deere Operations Center.

One of the biggest surprises has been the time investment required to learn software for managing data and turning data into useful decision information like maps, and getting it out again in a format that is useful for VR controllers on machines.

Conclusions

The focus on VR input application has definitely paid its way, even if the data management journey has been long and at times frustrating.

In terms of advice for someone starting out - chose a technology that is going to give operational advantages at the outset. In Michael's case this was guidance, although in most cropping machinery and operations this is now a given.

If adopting ag tech applications that require data for decision making, a key decision is – are you going to manage your data yourself or get a consultant to do it?

- **If yourself – be prepared to spend a lot of time learning farm management software and dealing with communications incompatibilities. Probably go for an integrated platform.**
- **If a consultant – they are not easy to find. You need someone who knows data management and conversion, but who can also respond in close to real time when issues arise at key times of the season. It takes time to get data to the person doing the analysis and back again to ensure that key operations are not delayed waiting for input maps.**

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