

Case study: variable rate farming

Boosting production through understanding soil variability and applying fertiliser/seed more efficiently



Background

Variable rate technology (VRT) farming is about understanding the variability of soil in a cropping paddock so that fertiliser and seed can be applied more efficiently, boosting production. In the Mallee, VRT has great potential to increase agricultural production due to the often highly variable soil types within paddocks and across farms.

Soil types vary greatly in their capacity to hold water and nutrients, which impacts upon crop production. Understanding soil types on farm and applying inputs that best suit the production zone can save a lot of money while still ensuring the crop gets the nutrition it needs.

The main aim of this project was to develop and refine VRT techniques best suited to the Mallee, and work with farmers to remove barriers to adoption. Many farmers have the capacity to use VRT but may need help to understand and develop confidence to apply the technology. Testing VRT to a small scale on farm will inform them of the advantages of the technology.

The method

The Land and Water Management Team from Natural Resources SA Murray-Darling Basin worked with Wisdom Data and Mapping, and Insight Extension for Agriculture to support 28 farmers from 15 farm businesses who took part in the project. Each business had a different level of experience with precision agriculture and VRT farming, as well as different cropping systems and VRT machinery.

However, each went through a similar process to establish production zones and determine the inputs that would be trialled to measure the best returns.

Paddocks were surveyed using EM38 mapping and soil zones were identified. Each zone was analysed for texture, fertility, moisture and growing constraints. This information was used to calculate yield potential using the 'Your Soils Potential' and 'Mallee Calculator' tools.

Farmers were supported to use this information to make decisions about the best seeding and fertiliser rates in each zone based on the estimated potential, risks and resources.

Paddocks were established with test strips for high rate, low rate, VRT, and farmer standard practice inputs, and crop growth was monitored over time including assessment for post emergent nitrogen application if required.

Crop yield maps were developed and analysed against soil zones, EM38 ranges, trial strips and input costs to determine economic benefits. The results were used to make adjustments to VRT plans for future seasons.

The results

The equipment and VRT capability of each farm business was different but results showed there was always economic advantage by targeting different rates into different soil zones.

Land and Water Management Team Coordinator, Tony Randall said 'the advantage of VRT over applying a flat rate of fertilizer was often \$10-\$30/ha but in some situations was \$100/ha better off'.

'Each farmer's circumstances were different and decisions on paddock inputs were impacted by factors including the farming system in operation, attitude to risk, equipment capabilities and budget.

'The EM38 has generally worked well as a basis for mapping soils, however there can be problems where stony soils can give readings like deep sand or heavy flats.

'Ground truthing was really important to help identify the production zones. A farmer's knowledge of their paddock was as important as the use of EM38 mapping and soil testing.

'VRT was more beneficial in systems with intensive cereal rotations. Benefits were less obvious in paddocks following a legume crop due to the increased soil nitrogen'.



Farmer experience with VRT - Paul Rudiger

Paul and his wife Briony farm 2,500ha near Loxton in South Australia. In the year of the project, 2015, their enterprise was 94% cropping, running Murray grey cows and operating a cattle feedlot with hay and grain produced on farm.



Above - Paul with sowing monitor controlled by tractor GPS

As a sole operator, with help from son Brycen, Paul focuses on efficiency in order to get everything completed on time.

Paul has owned a no-till seeder with VRT capability for 12 years. He operates with 3.8cm accuracy to sow between stubble rows, but had not been using the VRT function. This was primarily because of issues with the tractor GPS not connecting with the air seeder GPS. Paul was keen to join the project right from the start to get access to technical support to work through his system issues.

Paul acknowledges that people can struggle with the move to VRT farming because equipment systems don't always 'talk' to each other. In Paul's case the project team were able to resolve the problem very simply for him. Paul commented that, 'Before the VRT project came along I did not understand the process involved in getting VRT working. It sounds simple to purchase a cable but the technical support to create zones and rates for paddocks, and assistance to draw the zones and provide the correct file to load into the tractor's console, is also very important'.

Paul's experience is common and highlights the real benefits of the project. Adoption is rapid when the barriers are removed.



Above - Inter-row sowing on 3.8cm accuracy

Paul has upgraded his harvester to the latest IntelliView IV monitor; this system records yield mapping and data. The IntelliView IV monitor operates auto section control and records paddock data in the sprayer. Yield maps were used in conjunction with EM38 maps to determine the three main production zones on Paul's property. A consultant helped to determine fertiliser rates in each zone based on soil test results, however, Paul's knowledge of how his paddocks perform was just as valuable and helped to fine-tune input rates.

During seeding time Paul commented that it was great to finally see the unit working. 'It's exciting to see the rates changing and knowing that the system works. I can see the benefits of putting fertiliser where it's needed most'. Fertiliser applied during seeding is going on the more productive sections of the paddock, generally the mid-slopes, with less applied on the flats and sand hills that either don't need it or don't perform as well.

Now that Paul has the system running he will work on using VRT across the entire farm, whilst seeking technical assistance to interpret the mapping and results.

Paul reflects on his experience and makes the point that when buying equipment it's important to ask the right questions. He adds, 'Usually the decision to buy a machine is based on other features and the technology is secondary. If you want to start VRT farming, the technology needs to be a primary consideration'. The back-up technical support can be hard to find when buying second hand equipment.

Paul has made a conscious decision to stay with New Holland machinery to ensure everything is compatible, but he admits the technology is improving all the time and compatibility between different makes is also improving.

Paul can highly recommend the project to other farmers wanting to get into VRT, and urges others not to be put off if they don't have all the machinery. The project team provided excellent support to make VRT work in each situation, even if manually varying rates.

'It's exciting what the technology can do', Paul adds. 'It really keeps farming interesting and motivates me to see where it could all go'.

Results

Of Paul's three trial paddocks, the most significant gains from VRT management were \$40-\$50/ha in savings compared to flat rate application. This was achieved by targeting higher inputs into the midslope sands and lower inputs into the heavy constrained flats in a consecutive cereal rotation. There was far less impact from varying rates in the wheat following a vetch crop.



Above - Spraying monitor with auto section in operation

Location: Mallee region within the SA Murray-Darling Basin

Project: VRT farming can be applied successfully when the soil zones with a paddock or farm are different enough to warrant treating separately. VRT can result in significant cost savings on crop production inputs. Application of test strips to the different zones is important to determine the best input rates for each soil type.

Project partners: Technical data management support provided by Scott Gillett, Wisdom Data and Mapping, while Chris McDonough, Insight Extension for Agriculture, assisted with soils, agronomy and analysis.

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