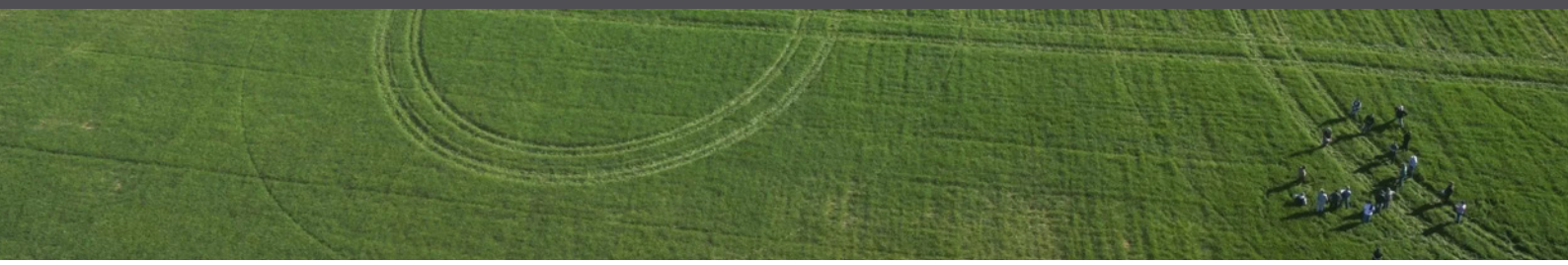
Australian Government
Department of Agriculture, Fisheries and Forestry

Future Drought Fund

SA DROUGHT HUB

This program received funding from the Australian Government's Future Drought Fund



Demonstrating soil zone mapping for variable rate nutrition management

LEAD ORGANISATION: Mallee Sustainable Farming (MSF)

PARTNER ORGANISATIONS INVOLVED (3 year project from 2022-2024): Agronomy Solutions, Precision Ag Services, Murray Plains Farmers, Insight Extension for Agriculture, South Australian Research and Development Institute (SARDI), Lowbank Agricultural Bureau, Southern Mallee MSF Group

SA DROUGHT HUB NODE: Loxton

Outcomes

Short term

- Co-design and participatory approaches embedded in the design and delivery of Hub activities
- Hubs seen and utilised as key regionally focused institutions for defining and delivering research, development, extension, adoption and commercialisation (RDEA&C) services (relating to drought resilience)
- Efficient and effective activities to support RDEA&C and uptake by end users

Medium term

- Increased adoption and commercialisation of drought-resilience technologies and practices
- Technologies and practices adopted are effective in improving drought resilience
- Design and delivery of hub activities is responsive to end-user needs.

Project activities

Farmers in the low-rainfall Mallee region can manage their input costs and risk by zoning their soil types, determining what inputs are required in different zones, and fertilising accordingly.

This is beneficial following both challenging and good years: in dry or drought years, nutrients may be left behind, meaning a reduced need for replacement; in years with good soil moisture and rainfall, zoning can boost opportunities for higher yields.

MSF is working with growers, Murray Plains Farmers, and local Agricultural Bureaus to implement variable rate nutrition on-farm.

Grower interest in zoning and variable rate technology (VRT) has seen the project grow from small plot trials in three Mallee regions in 2022.

In 2023, six focus farms – two each in the Murray Plains, Pinnaroo and Lowbank areas – sowed paddock-scale fertiliser strips across different soil types.

These demonstration sites show other growers how to manage their own investigation of nutrition requirements when setting up variable rate technology for soil zones and fertiliser recommendations.

Several other growers have zoned their paddocks, with the MSF led project supporting basic strip trials and soil sampling to help determine optimal fertiliser application rates across different zones.

In 2024, the project is building on farmer activities over the last two seasons and is developing and implementing online VRT decision-support tools, delivered as decision trees, for soil nutrient management:

- **Easy VRT** covers simple zoning techniques using generic rules and widely available data.
- **Expert VRT** will provide more in-depth testing and analysis to enable development of a more detailed plan.

Once piloted and refined, the tools will be available and applicable to farmers across all regions.

The project has rapidly expanded beyond the initial trials, demonstrating a growing interest among farmers in the use of VRT and soil zoning. Many growers are noting that by optimising fertiliser use, they are starting to see improved yields, better economic returns, and increased resilience in their farming operations.

Kylie Matthewson

Project Officer, MSF

After emerging more than 15 years ago, take-up of VRT across the region is varied. Most growers have dabbled in it, but full adoption has been challenged by technology hurdles. The core purpose of this project is to help remove the barriers to adoption and support farmers wherever they are in their journey.

The project has brought like-minded farmers together and given them access to people who can help them through the process. A lot of users have been constrained by the technological side of things more than anything else, which is where Peter Treloar's work to help farmers set up their systems has been key.

We've seen clear evidence of upskilling – farmers are becoming more adept at reading maps and understanding zones and the implications for fertiliser rates. Some of the farmers involved have expanded from strip trials to full paddocks.



Kylie Matthewson (MSF), Sean Mason (Agronomy Solutions) and Kym Walton (SA Drought Hub) at one of the project sites in Pinnaroo.

The project's regular meetings have strengthened peer networks and opened up communication among the farmers. Seeing the benefits of zoning has given them confidence and instilled more resilience in their operations.

Dr Sean Mason

Research Agronomist and Director, Agronomy Solutions

Earlier work by Trengove Consulting, through a South Australian Grain Industry Trust investment, identified significant potential benefits of VRT based on soil properties in the Yorke Peninsula and mid-North regions. Working with MSF, Michael Moodie and I were keen to expand this work into the Mallee, with the addition of varying nitrogen inputs.

In 2024, the workshops Peter Treloar and I have run have been well attended. We've ensured that communication and tools are practical and applicable for growers, and they're getting excited.

In the past, we looked at overall yields and the strategy was to feed the productive areas and ignore the poor areas. But looking at data maps, normalised difference vegetation index – and marrying that data with Google Earth – this tells us not to ignore the poor areas, they can still be productive. The Easy VRT and Expert VRT decision-support tools will help growers do this.



Sean Mason talks to growers at one of the VRT field trials.

Peter Treloar

Consultant, Precision Ag Services

Initially, I ran project workshops with farmers to discuss the challenges of implementing VRT. Often farmers set things up, but when the stress of seeding hits, it can go out the window.

It was clear that one of the major pitfalls for growers was getting the tech to work, so my role expanded to helping farmers clear that hurdle. I'm working directly with farmers to pinpoint their requirements – this is the equipment you need; these are the buttons you need to press; these are the steps. Once people get past that, they think it's easy. VRT doesn't need to be as complicated as people think.

One reason for the project's success is that we haven't tried to solve all the problems in one go. Most people are farming for the long term, so there's no need to get everything perfect immediately.

Ultimately, farmers want to maximise income. I see too much advice about lifting poor production by spending more – but if the soil type is already at peak yield, that's a waste of money. On the flipside, high-yielding areas might do even better with additional inputs.

We're seeing results – despite a low rainfall year at some of the sites, we were still able to get an economic response. VRT helps you increase inputs where you'll get yield benefits and reduce inputs where it won't offer an advantage. Knowing where it's not worth fertilising or growing reduces risks.



Peter Treloar presents to Pinnaroo growers at one of the project workshops.

Zoe Starkey

Mixed enterprise farmer, Sanderston SA



Zoe Starkey crops 2,225 hectares with her husband Scott on their 2,800-ha sheep and cropping property near Sanderston. On soils that range from grey calcareous to red loams, they typically run a three-year grass break rotation that includes vetch or lentils, canola, wheat-on-wheat, followed by barley with a little bit of oaten hay.

We're set up in terms of machinery to manage variable soil types across the one paddock, but we hadn't implemented it until this project.

Soil testing and the demonstration sites have shown that variable rate application of phosphorus (P) at seeding is beneficial, with higher rates of P zoned on our more calcareous ground.

We're still learning about setting our rates – how do we calculate rates for different types of seasons (wetter, dryer etc)?

There is so much data out there, farmers are sometimes overwhelmed by it, which is a barrier to adoption. This project has demonstrated that you can keep things simple – you don't need to overthink it by creating a map with 40 data layers; soil type is sufficient. Too much data, too many map layers, too many zones can paralyse you.

The one-on-one support with consultants, like Peter Treloar and Sean Mason, was something we hadn't had before and was extremely valuable.

It's a been a very practical, interactive project to be part of, with opportunity for growers to compare each other's data and results. It's been driven by farmers and therefore activities in the different regions are tailored to what those regions need.

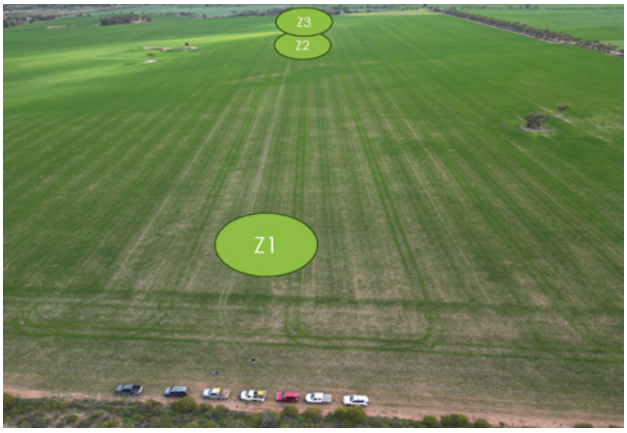


Photo: MSF



Photo: MSF

Drone images showing soil sampling zoning (top) and fertiliser trial rates (kg/ha) for mono-ammonium phosphate (MAP) in the 2023 Starkey field trial.

Luke Nuske

Mixed enterprise farmer, Panitya, VIC

Luke Nuske and his father Robert farm 1,500 hectares on their property that straddles the SA/VIC border near Pinnaroo. Along with wheat and barley, he grows canola, lupins, lentils and vetch and cereal mix for feed for his 300 breeding ewes and 250 hoggets.

I began doing VRT with both N and P in 2021 but decided to drop VRT N after the 2022 season.

After joining a training day being run for this project, I looked at some data indicating that higher P rates give better results than nitrogen (N) in the Mallee. From there, I created fertiliser maps with Peter Treloar's help. I have been making prescription fertiliser maps based on yield maps for a few years, but never a free-form map for trials.

We had to abort the original trial I planned with Peter after we had some issues applying the planned rates. With the knowledge I gained from the project and working with Peter, though, I was able to set up a trial in a different paddock. At the moment we're trialling VRT for P on our wheat, barley and lentils. To keep it simple, I blanket rate N at 40kg /Ha.



Now we're seeing higher top-end yields, along with similar low-end yields, so our overall average is up, particularly in wetter years. This is possibly because the zones with the highest potential weren't getting enough P in a blanket rate fertiliser regime.

I'd like to start playing with VRT N at top dressing, but in furrow I see little benefit.

Danny Steer

Mixed enterprise farmer, Lameroo SA



Danny Steer farms 2,600 hectares with his partner Cori and parents John and Bridget on their property near Lameroo. They crop wheat, barley, lentils, oaten hay, lupins and some vetch.

I've been doing VRT for both N and P at seeding for the past six years. Now I'm planning some in-crop variable rate N. I wanted to go down that path but didn't have the equipment for it. Being involved with this project has given us the confidence to purchase the spreader.

When our group of farmers involved in the project in this region first got together, half weren't using VRT, even though everyone had equipment that was capable of it – this has been huge in getting people started.

We're not using less starter fertiliser under VRT, but we're targeting our application and using it in the areas that need it. And during years when P is expensive – 2022 was one – we made some big savings. VRT allowed us to access and mine our P back without any loss.

Our shallow clay, sodic areas are a big challenge for us. We've been able to use zoning and VRT to determine what we can apply to catch these areas up to the rest of the paddock.

The biggest takeaway has been having the advice of Peter Treloar and Sean Mason, who can walk us through developing and interpreting maps. Sean's guidance in ground truthing has helped us make sure we're doing things right.

Photos: MSF



Drone images showing soil zones identified by EM38, Google Earth and NDVI mapping (left) and VRT rates (kg/ha) for di-ammonium phosphate (left number) and urea (right number) in the 2023 Steer field trial.

RESOURCES

MSF PROJECT PAGE

PODCAST
Know your zones for VRT

FACT SHEET
How to set up a fertiliser test strip

BLOG POST
Unlocking the potential of VRT

GET INVOLVED

Producers wanting more information can contact Kylie Matthewson, MSF, at kylie@msfp.org.au.

Mallee Sustainable Farming

AGRONOMY SOLUTIONS

PETER TRELOAR PRECISION AG SERVICES

Insight Extension for Agriculture

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