Precision Ag Trials

Using PA to improve efficiency of soil amelioration

Edillilie

Although PA tools have been available to Australian grain growers for many years, and the benefits have been well documented, it is estimated that less than 1-% of grain growers utilise PA 'beyond guidance' in any form.

The objective of this GRDC / SPAA funded project is to increase the level of adoption of PA 'beyond guidance' by broadacre farmers. The project specifically aims to increase the level of adoption of variable rate (VR) by growers in the project to 30% by 2013. This goal will be achieved by demonstrating how to use PA tools to growers at a regional level and by increasing the skills of growers and industry in PA to a level where they can then use PA tools in their farming systems to achieve economic, environmental and social benefits.

Trials and demonstrations are conducted on growers' properties and are visited throughout the season using farm walks and workshops to discuss the advantages and disadvantages of PA techniques with the involvement of other regional growers.

This information sheet presents the outcomes of the SPAA trial run in conjunction with the Lower Eyre Agricultural Development Association (LEADA) from season 2011.

Aims:

- To determine if precision ag tools can improve the efficiency of soil amelioration as well as assess the effectiveness of amelioration techniques
- To compare delving, spading and gypsum to improve sodic and bleached soils

Background:

It is estimated that the lower Eyre Peninsula has around 200K hectares of soil that could respond to amelioration in the form of spading, delving and/or gypsum application. This type of work, while having the potential to bring great returns, is a very costly exercise and therefore needs to be done as efficiently as possible.

About the trial:

The trial was established on Peter and Brett Mickans Edillilie property with soil amelioration treatments occurring through January to March with the paddock being sown on the 10th of March. The paddock was sown with Mickan's Flexicoil bar with 100kg/ha of wheat and 140kg/ha of 28:13. Urea was applied three times totalling 140kg/ha.

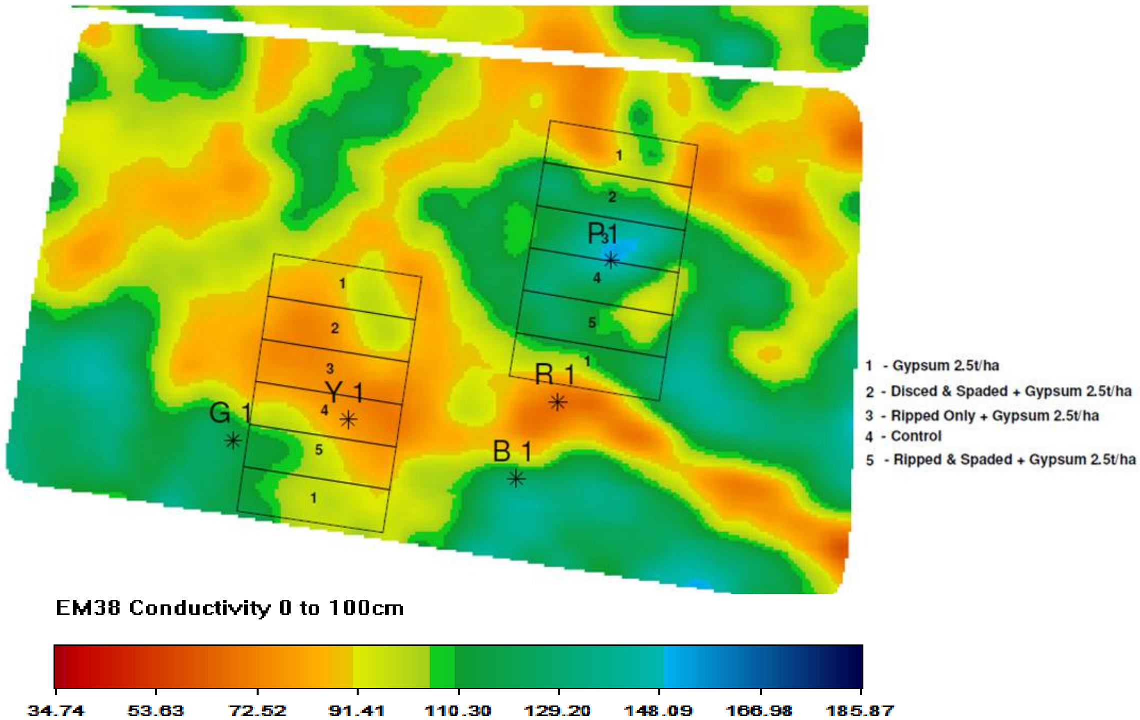


Figure 1 EM38 (0-100cm) of southern section of Mickans paddock with demonstration plan (east and west plots) and soil sampling positions overlayed

Peter Treloar, Precision Ag Services, EM38 surveyed the trial paddock in January and soil sampling was completed before treatments were decided. Five treatments were then chosen to address the constraints, these treatments include gypsum at 2.5t/ha, disced and spading with gypsum at 2.5t/ha, ripping plus gypsum at 2.5t/ha, a control and ripping plus spading with gypsum at 2.5t/ha.

Assessments:

- EM38 mapping
- Soil tests
- Observations on plants numbers and health
- Yield

Results:

Results from three of the ten sampling sites are presented in table 1. This data, along with the observations made during sampling, further supported the level of variability shown in the EM38 map. The topsoil on all sites was similar with no major constraints evident. However, soil P1 became highly sodic at 10cm and was moderately sodic below 30cm. This varied greatly from G1 which was slightly sodic at the 15-30cm and only became highly sodic at 30+cm. Y1 had a bleached A2 horizon with no clay or organic matter present. This horizon sat above very highly sodic subsoil from 40 to 90cms.

SAMPLE #	DEPTH	Texture	EC1:5 (sampled)	CONVERSION FACTOR 1:5	ECe (estimated)	Dispersion
Purple South P1	0-10	Loamy Sand	0.12	14	1.68	-
	10-30	Clay	0.04	6.5	0.26	High
	30-70	Clay	0.32	6.5	2.08	Moderate
	70-90	Clay	0.48	6.5	3.12	Moderate
Yellow South Y1	0-10	Loamy Sand	0.08	14	1.12	-
	10-40	Sand	0.04	14	0.56	-
	40-70	Clay	0.05	6.5	0.33	Very High
	70-90	Clay	0.05	6.5	0.33	Very High
Green South G1	0-15	Loamy Sand	0.05	14	0.70	-
	15-30	Sandy clay loam	0.04	9	0.36	Slight
	30-70	Clay	0.16	6.5	1.04	High
	70-90	Clay	0.28	6.5	1.82	High

Table 1 Soil test results from selected zones at Mickans

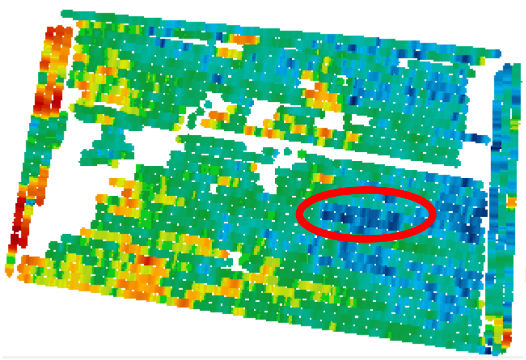


Figure 2 Raw yield data

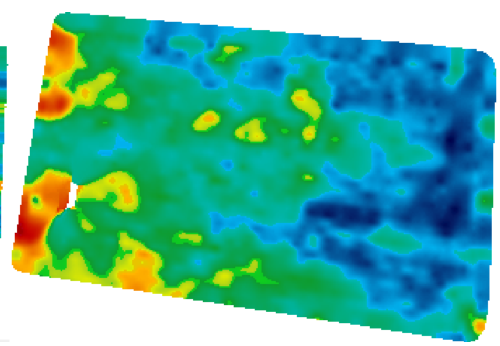
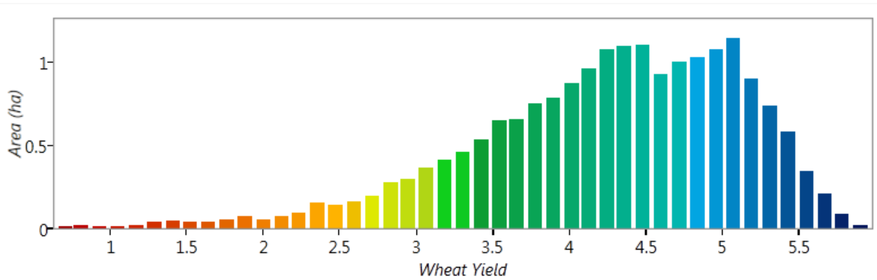
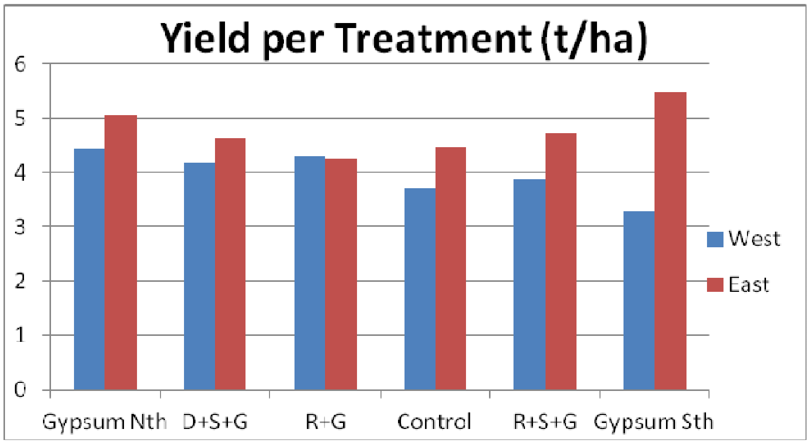


Figure 3 Smoothed yield map





Graph 1. Yield per trial plot (D=Disced, S=Spaded, G=Gypsum, R=Ripped)

A yield increase is apparent in figures 2 (circled) and 3 at the ripped only treatment in the eastern plot, however this is not seen in the western plots and does not stand out in graph 1. Results presented in Graph 1 generally show only slight differences with the greatest response observed in the gypsum only treatment on the eastern plots. This soil was highly sodic at 10cm and as could be expected the gypsum would make a quicker impact on sodicity, thus allowing for improved drainage that may have improved crop production. Gypsum would take longer to impact on subsoil sodicity and may show a response after several years of data are collected.

Comments

Due to the high levels of variation in the paddock, it proved difficult to position the trial to have all treatments on a similar soil type for each of the blocks. This has meant each plot not only has different treatments but is also covering a range of soil types.

Rainfall for the season was slightly above average and yields were well above what the paddock has produced recently with similar rainfall amounts. Treatments where such aggressive modification has occurred may improve over the following years when the soil settles out, this will be monitored with Mickan's yield monitor.

One large issue regarding precision ag and soil amelioration is the ability of contractors to respond to variation within a paddock when undertaking such work, and few have the technology on their equipment to have this done automatically.

Before undertaking such dramatic changes to your soil it is imperative to understand the issues that you're trying to address. EM38 mapping can assist with putting paddocks into varying zones and soil tests are crucial to understand what these zones represent. Once this is understood the correct amelioration technique can be selected for the different zones. Working closely with technical experts and contractors to ensure everyone involved understands the specific issues will also help ensure you get the outcomes you are after.

While the technology for 'on the go' changes are not commonly available for soil amelioration work, using tools such as EM38 and Gamma Radiometrics soil surveying, farmers can better target areas to undertake this work. Equally important, they can also isolate areas where soil amelioration is not required or even potentially detrimental, thereby reducing the overall cost.

Farmers looking to use yield data to assess benefits of soil amelioration or other management changes should be aware of several issues. The first is plot size, this should be big enough to cover multiple passes of the header and ideally located to one soil type. This work is all about matching management to soil type and so when a trial strip covers multiple soil types it is effectively a different treatment each time. Increasing the size of plots will increase the amount of data points collected and the accuracy of the results.

Who was involved?

Peter and Brett Mickan
Rural Solutions SA, Cummins Ag Services, LEADA and Precision Ag Services
Kieran Wauchope, Marty Chandler, Peter Treloar and Michael Wells
Kieran Wauchope, RSSA and LEADA

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GRDC Grains Research & Development Corporation

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