Precision Ag Trials

Variable Phosphorus

Tumby Bay

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 2010.

Aims:

- To evaluate the benefit of variable rate P across a paddock with various NDVI zones
- To illustrate how farmer trials can be easily be established to monitor the effects of variable rate
- To compare the effects on crop yield to various P rates

Background:

Phosphorus (P) is one of the most commonly considered nutrients when it comes to variable rate applications in a cropping enterprise. SPAA and LEADA established a trial with Peter and Mark Swaffer to evaluate the potential of using NDVI maps, soil tests and variable rate to improve efficiencies and profitability through variable rate P.

About the trial:

The trial was established at Peter and Mark Swaffers property south of Tumby Bay on the lower Eyre Peninsula. No previous yield maps existed for the paddock and therefore historical NDVI maps (Figure 1) were used to understand the variability across the paddock.

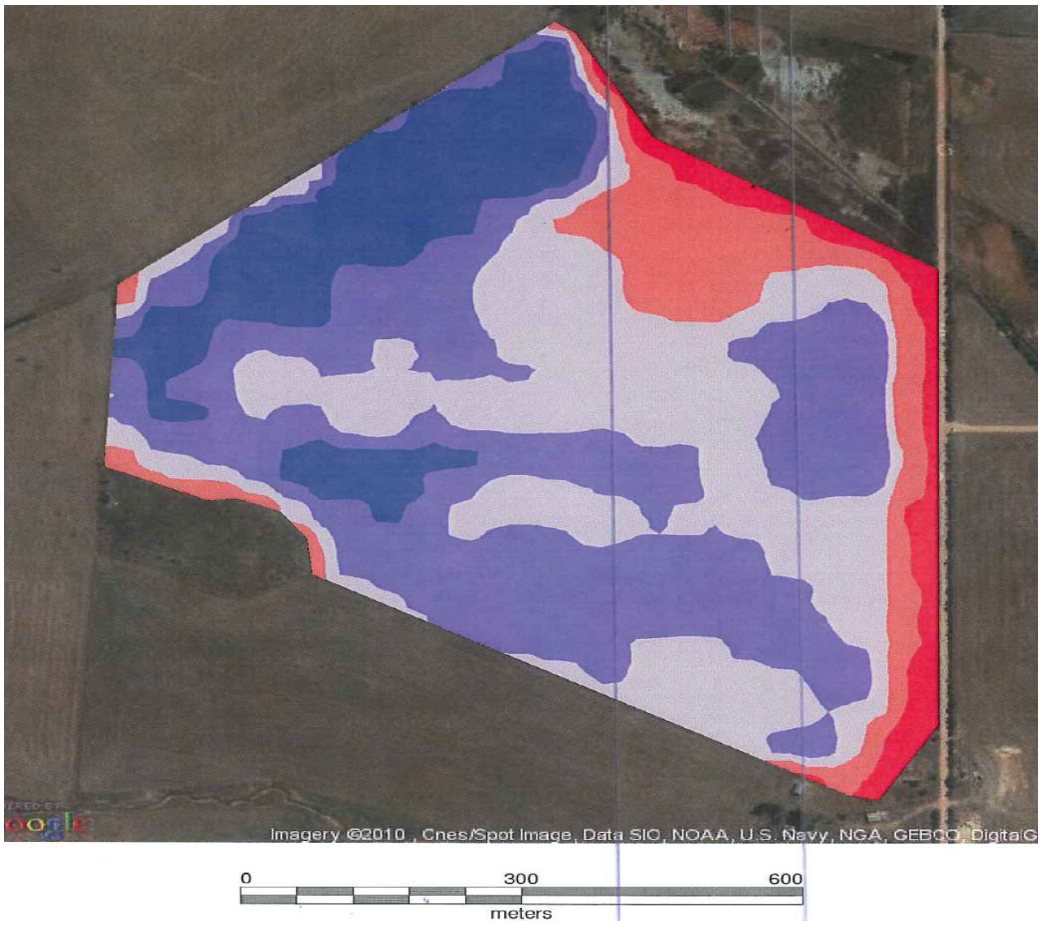

Figure 1 Historical NDVI map from Swaffers, blue high, red low

Soil tests were then undertaken to understand the constraints in the different zones and a trial plan was created, figure 2.

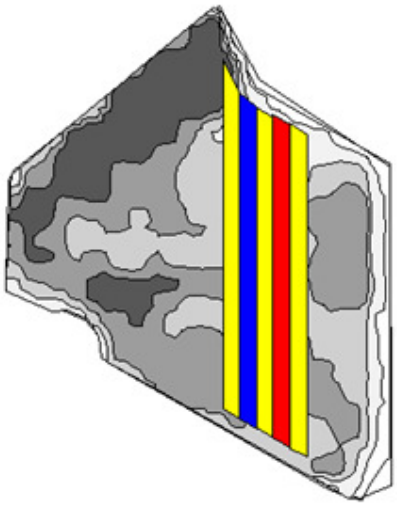

Figure 2 Variable rate fertiliser trial plan, Blue 0P, Yellow 8P and red 16P

The remainder of the paddock was fertilised with 8.8kg/ha liguid P and 35kg/ha of N (sowing) with a follow up of 21kg/ha of N broadcast mid July. The paddock was sown on the 1/6/2010 with 85kg/ha of wheat using their Simplicity seeder and liquid P cart. Paddock yield was averaged at 4.07t/ha with protein averaged at 9.7%

Assessments:

Soil tests, tissue test and final yield data was collected for the trial

Results:

Soil and Tissue Test Results

Zones: High = high yield 2009 and high September NDVI, Low = low yield 2009 and low September NDVI

Soil Test Results, April 2010

Site	Zone	Colwell P (mg/Kg)	PBI	Colwell K (mg/Kg)	Organic Carbon (%)	Conductivity (dS/m)	pH (CaCl2) (pH)	pH (H2O) (pH)
1	High	35	124	858	2.33	0.398	7.9	8.3
2	High	36	55.3	785	1.73	0.21	7.9	8.4
3	Low	53	41.1	604	1.64	0.234	7.9	8.4
4	High	29	44.9	549	1.61	0.279	7.7	8.3
5	High	32	89.9	924	2.05	0.294	7.9	8.5
6	Low	27	99.2	369	1.63	0.294	8	8.6
7	Low	40	41	318	1.18	0.252	5.6	6.6
8	Low	50	28.1	359	1.39	0.287	5.2	6.3
Average	**High**	**33**	**79**	**779**	**1.9**	**0.30**	**7.9**	**8.4**
	Low	**43**	**52**	**413**	**1.5**	**0.27**	**6.7**	**7.5**

Tissue Test Results, August 2010

Zone	DAP rate kg/ha	Fe mg/kg	Mn mg/kg	B mg/kg	Cu mg/kg	Zn mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	K mg/kg	P mg/kg	S mg/kg
Low	0	72	35	5.2	5.4	26	1120	1110	460	31000	4200	2400
Low	40	74	41	6.7	5.0	25	1130	1130	420	30000	4600	2700
Low	80	87	31	5.2	6.2	24	1630	1210	330	31000	4900	3000
High	0	103	29	4.4	6.3	29	2600	1230	540	36000	4400	3500
High	40	96	23	5.2	5.4	22	2200	1250	270	37000	4600	3000
High	80	72	22	4.5	5.7	20	1840	1240	320	36000	4700	2600
Average	Low	78	36	6	6	25	1293	1150	400	30667	4567	2700
	High	90	25	5	6	24	2213	1240	377	36333	4567	3033

Table 1 Soil and tissue test analysis from Swaffers P trial

The soil samples taken from the different paddock zones at the beginning of the year showed varying levels of P across the different zones. Where the NDVI was high in 2009, the levels of P were generally lower than in the low NDVI zones of the same year. Anecdotally this can be attributed to the higher NDVI zones using more of the P for the higher production levels than the lower NDVI zones.

Assessments:

Tissue tests that were taken from the different zones and different fertiliser rates produced results that were expected. Where the higher levels of fertiliser were applied, regardless of the zone, the higher the levels of P were in the plant tissue.

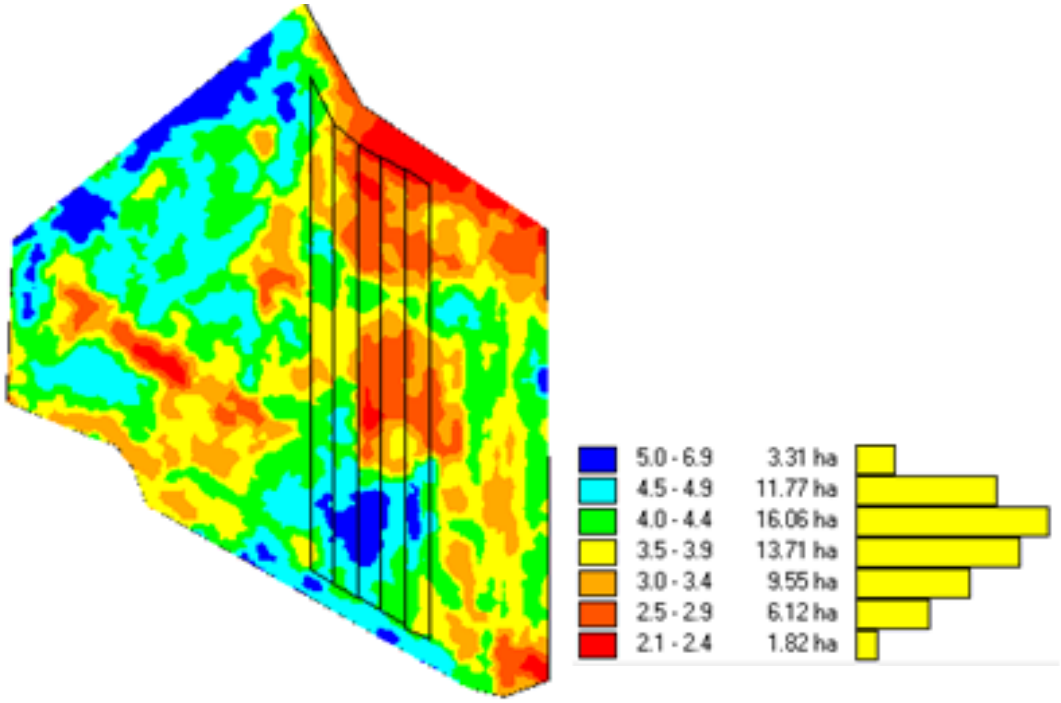

Figure 4 Yield map with trial boundaries at Swaffers

The above yield map displays little difference from the NDVI zones shown in figure 1, these zones remained relatively consistent regardless of the changes in fertiliser rates. The tissue test results indicated there was some P response, however no yield response was observed. The assumption can therefore be made that the fertiliser rates are not necessarily the biggest contributor to yield variability in this paddock; factors such as pH, organic carbon and even salt levels also need to be considered. This suggests that fertiliser P rates could be reduced, especially in the poorer performing zone where P levels are higher.

Discussion:

Achieving a greater understanding of the potential constraints from the different zones would allow a more targeted approach to paddock management. Spending money on the low NDVI zones through blanket paddock fertiliser strategies is an inefficient use of finances. These funds are more likely to provide greater returns by directing more fertiliser to the higher NDVI zones or by addressing the constraints in the low NDVI zones.

Who was involved?

Peter and Mark Swaffer
Rural Solutions SA and LEADA
Sam Trengove and Kieran Wauchope
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Topcon provided the Crop Spec sensor for our field day

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For more information

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