Precision Ag Trials

Nitrogen application and NDVI

Lameroo, South Australia

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 Precision Ag, Lameroo from season 2010.

Aims:

- To encourage Bruce and Robert Pocock, to test a the applicability for NDVI mapping for making Nitrogen application decisions on their paddock.
- To use precision yield mapping to provide an accurate analysis of the trial.
- Te demonstrate NDVI technologies to demonstrate reduced risk and maximised return for Nitrogen application in the Mallee.
- Show the benefits of using EM38 and 'Your Soils Potential' soil testing service to map subsoil constraints.
- To demonstrate and extend the benefits of precision agriculture technology to SA Mallee growers.

Background:

Bruce and Robert Pocock are father and son cereal growers from Lameroo SA, who were interested in 2010 to apply Nitrogen to lighter textured, lower nutrient areas in paddock D6 to assess the risk and impact on grain production. Bruce are keen to maximise their Nitrogen investments in each crop and are wanting to know those areas which will be Nitrogen responsive. Under this SPAA project Bruce and Robert have been experimenting on this paddock in order to help understand what is driving the yield responses in their paddocks.

D6 is a typical undulating Mallee paddock with light rises running approximately West - East and heavy flats. The paddock is dune-swale with light textured soils (loamy sand) on the dune through to much heavier textured soils (light clay) in the swale. The paddock was EM38 mapped in 2009 under a Caring for Our Country project and the resultant map appears as Figure 3 below.

From 2009 we had the following information about the paddock:

- EM38 soil data
- Soil physical and chemical tests from six areas in paddock (0-10, 20-40, 40-60 and 60-80 cm fractions)
- Paddock zone map developed from "Your Soils Potential" model.

In 2010 we tested the 0-10 cm soil horizon for basic chemical nutrients and this shown in Table 1. We also have

- NDVI map of D6
- Wheat yield map of D6
- Yield analysis of treatments by paddock zone

About the trial:

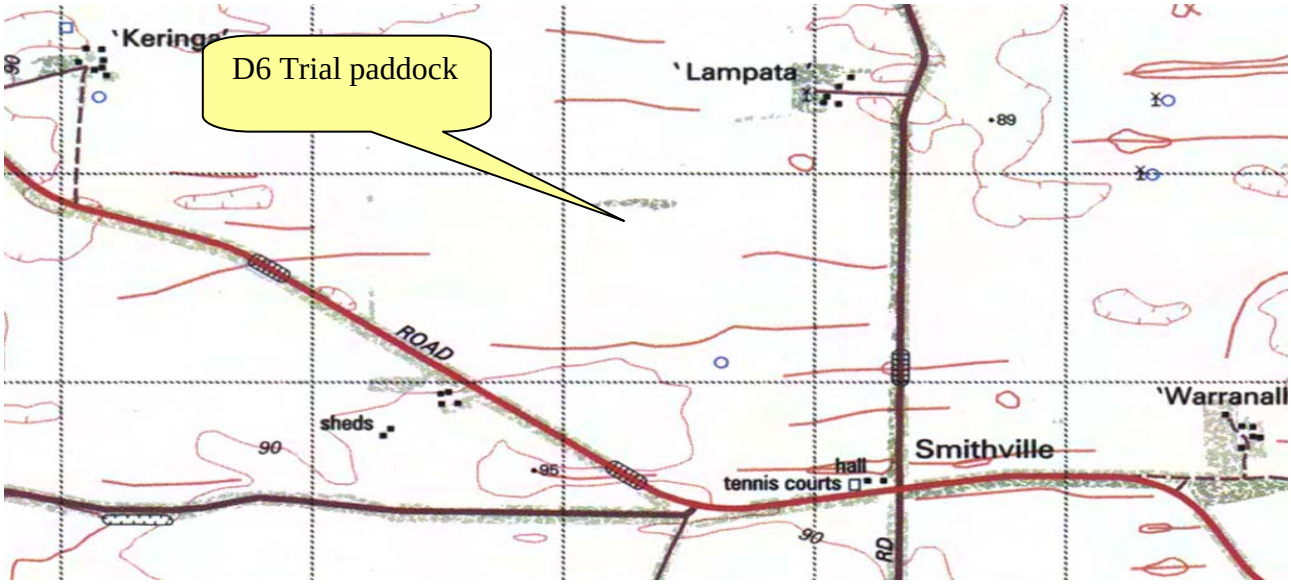

Figure 1. Location map of Paddock D6 in Pocock homestead property, 20 km North West of Lameroo.

In 2010 Robert was interested to investigate the practicality of Normalised Difference Vegetative Index (NDVI). At its most basic NDVI is a simple numerical indicator that can be used to analyse remote sensing measurements and assess whether the target being observed contains live green vegetation or not. More useful is that NDVI has been in use for many years to measure and monitor plant growth (vigour), vegetation cover, and biomass production from multispectral data. The ability to monitor plant vigour gives an indication of the health of the each portion of the paddock at that point in time and one can make assumptions as to the nutrient status of that portion of the paddock.

The broad assumption is that if there are areas of the paddock growing better then it is possibly better nutrition (Nitrogen?) driving the growth and low levels of nutrients reducing the maximum potential growth.

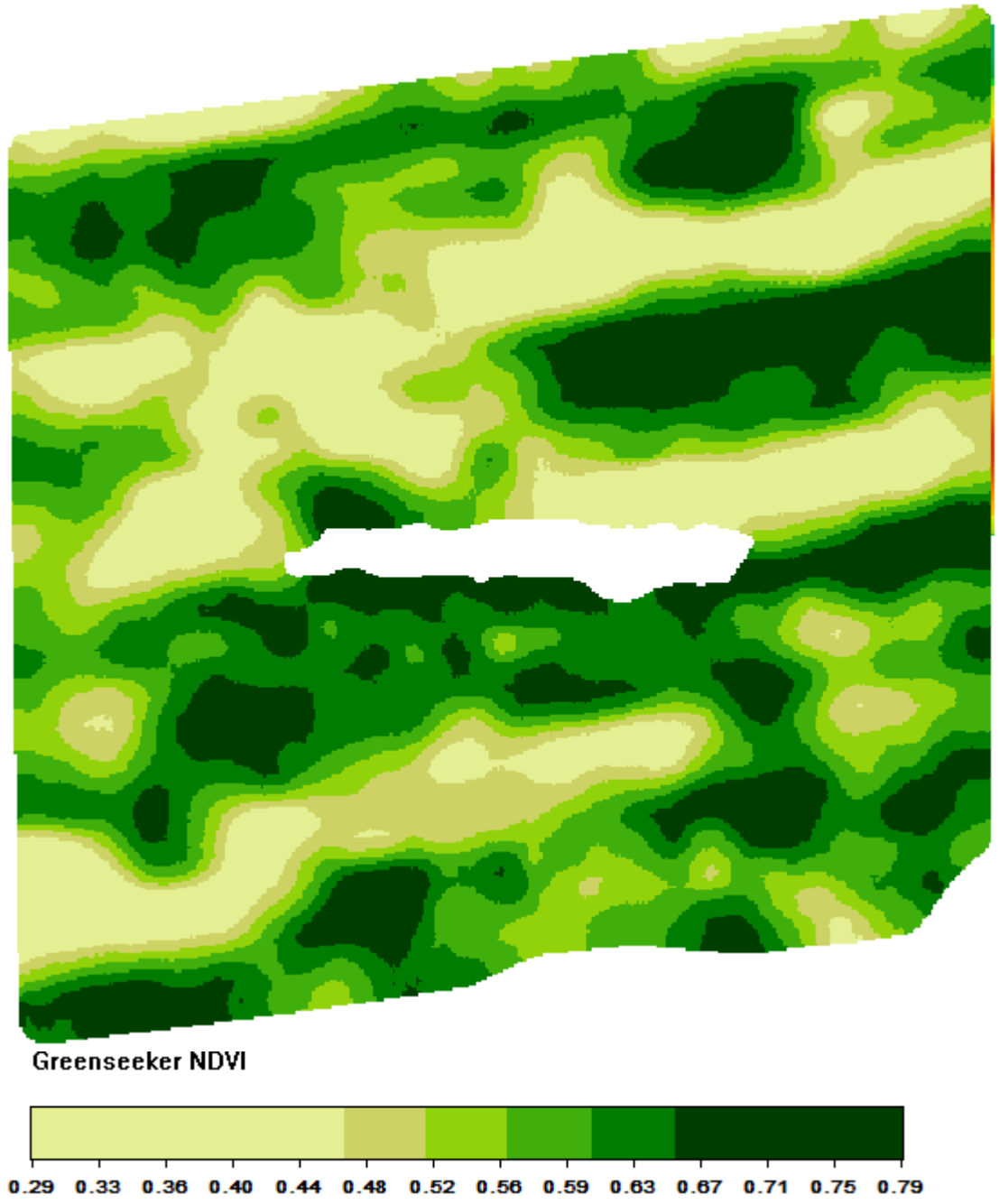

Figure 2. Green Seeker NDVI map of paddock D6. Mapping was performed on 20th August 2010 by Grant Yates. Data was analysed by Michael Wells and Peter Treloar to produce this map.

I contracted Grant Yates, Southern Precision - Sprayers and Precision Ag, to conducte on ground NDVI readings with a Greenseeker unit mounted on and ATV. Grant was able to produce two maps – one the NDVI readings and the

second the target N application rates. These pdf files are included with this report.

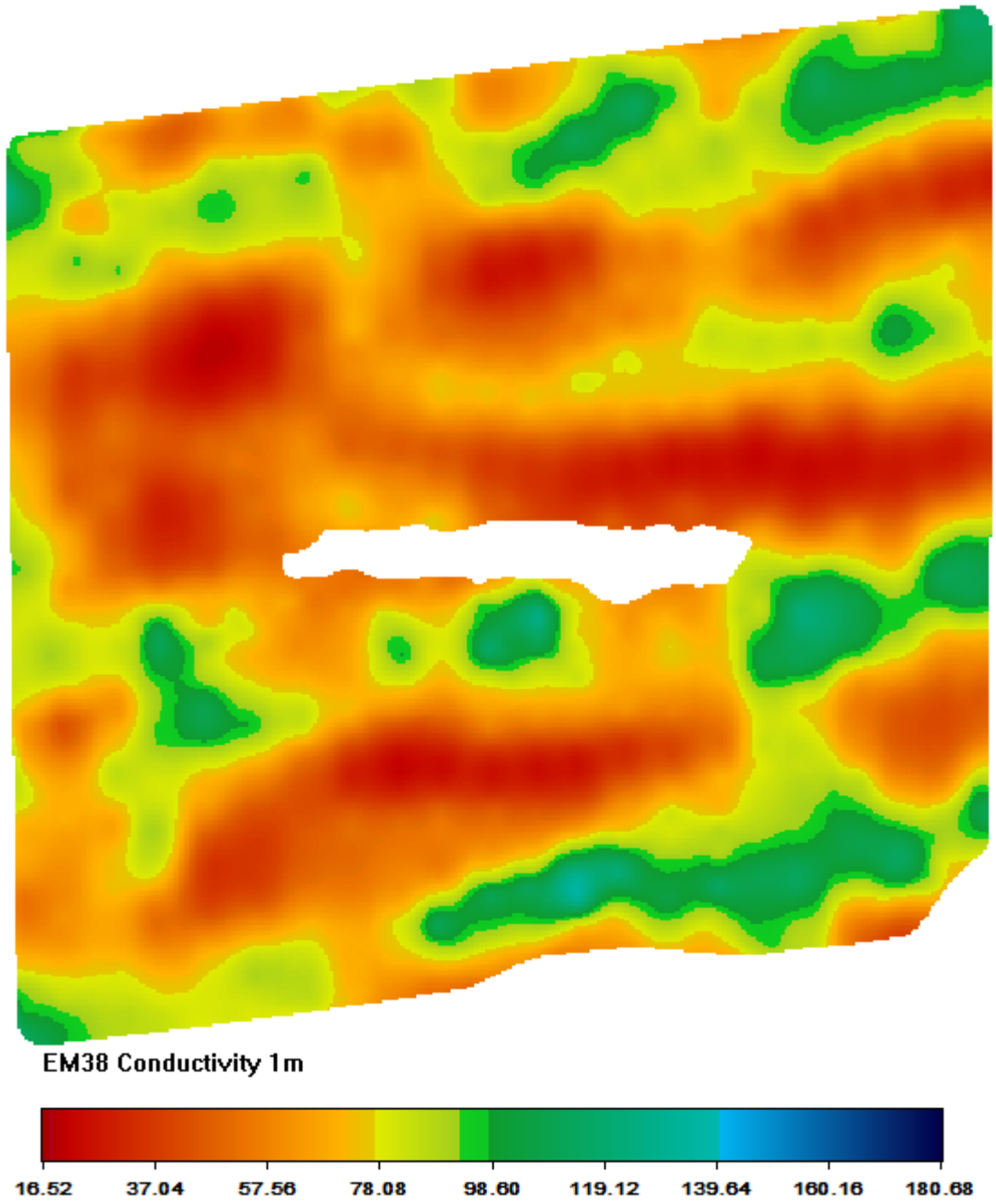

Figure 3. EM38 map of D6. Light textured soils as dunes roughly match the low EM red colour, and highlight the approximate West-East dune swale system. Paddock was zoned up using 'Your Soils Potential' into 5 zones – zone 1 corresponding to the light sand dunes grading down to zone 6 as the constrained flats or swales.

Robert set up a prescription map on his seder to apply three rates of DAP fertiliser at seeding, and these were 38, 47 and 55 kg/ha of DAP. Robert also set up a prescription map for their variable rate sprayer to apply Nitrogen as UAN. Figure 4 below shows the map of the liquid N application which was applied 21 August 2010.

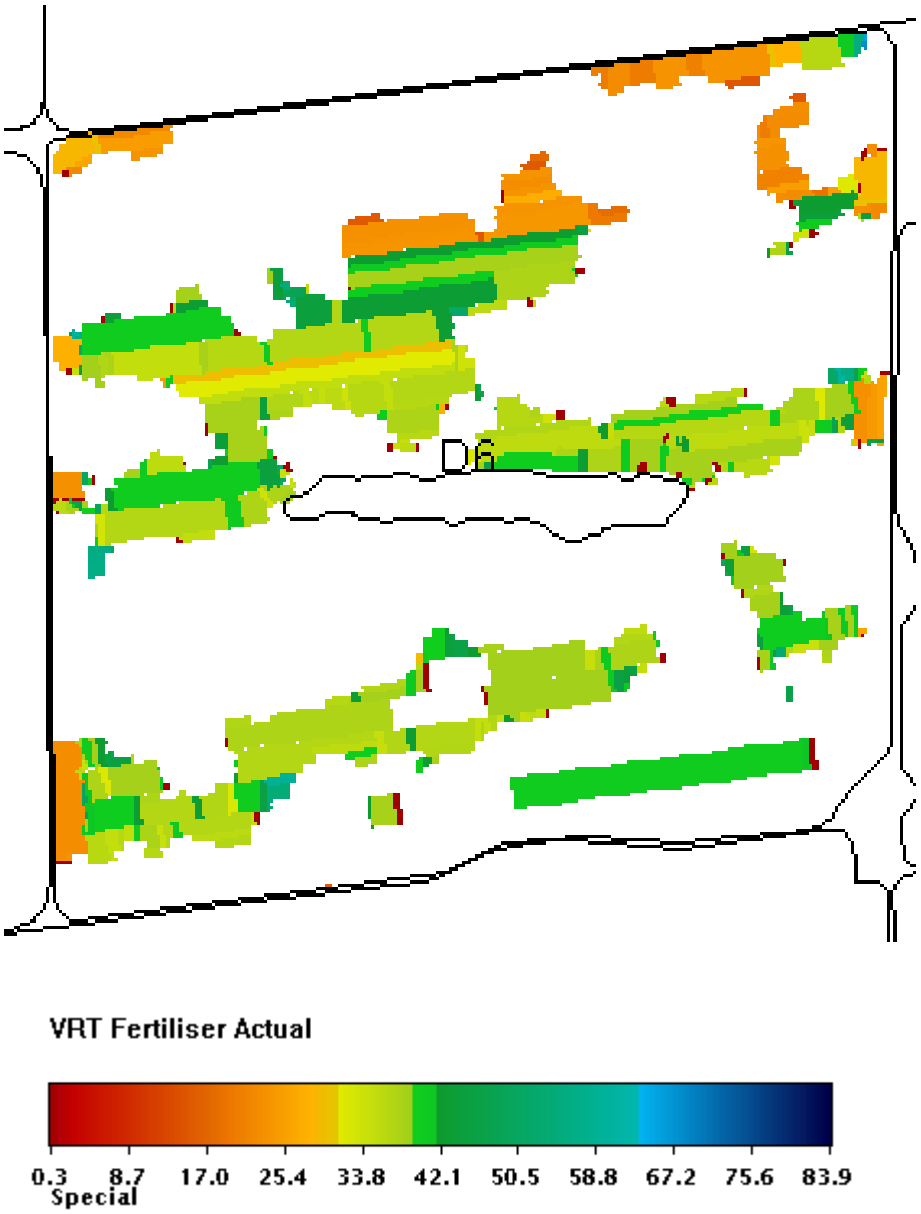

Figure 4. Application map for UAN on Bruce and Roberts Pocock's paddock D6. Rates are in kg N per ha.

Assessments: Grain Yield

Results:

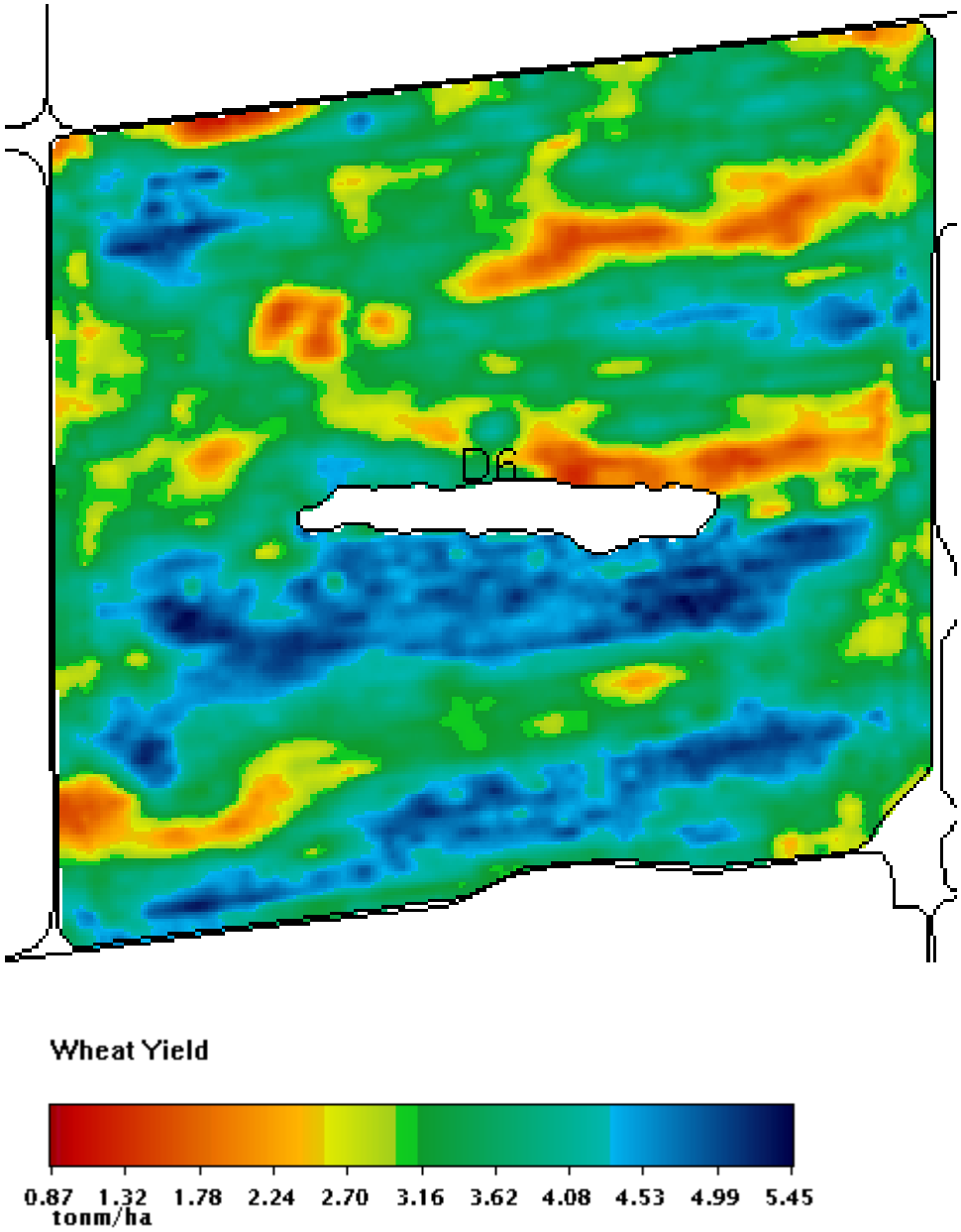

Figure 5. Grain yield for paddock D6.

Table 1. Paddock yields for where UAN was applied and area with no added UAN.

	yield (t/ha)
VR UAN	3.09
No UAN	3.08

Table 2. Grain yield figures for ±UAN by paddock zone

Grain yield (t/ha)

Zone	No UAN	Post UAN
1	2.97	2.92
2	3.27	2.92
3	3.93	3.27
4	4.12	3.88
5	4.43	4.55

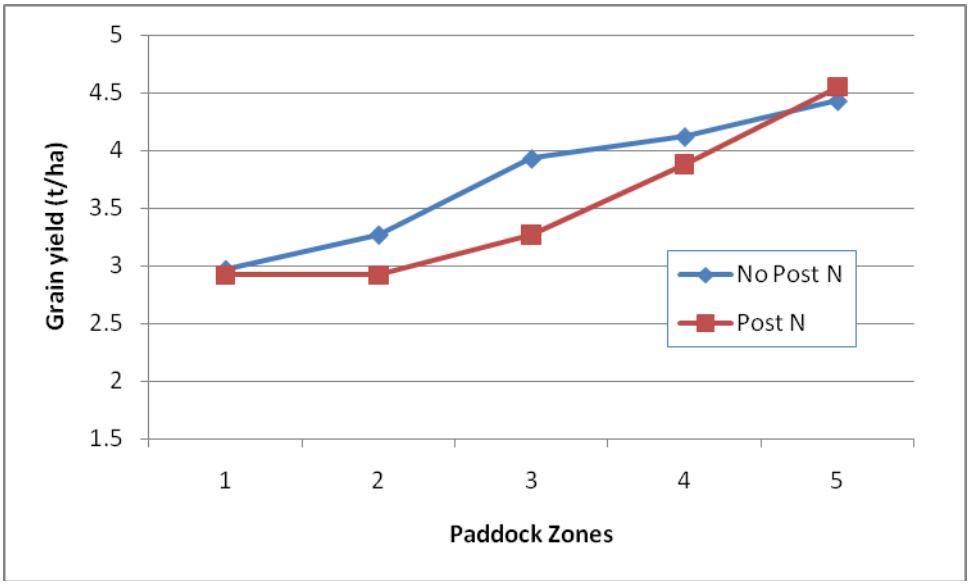

Figure 6. Grain yield by paddock zone ±N application

Table 3. Grain yield for paddock zone by seeding fertiliser (DAP) rate without and with Post seeding N application.

Grain yield (t/ha) Zone by Fert Rate

No Post N

Zone	38kg	47kg	55kg
1	-	3.12	2.78
2	-	3.39	3.03
3	4.05	3.91	3.47
4	4.12	4.23	-
5	4.46	-	-

Grain yield (t/ha) Zone by Fert Rate

Post N

Zone	38kg	47kg	55kg
1	-	3.1	2.71
2	-	3.03	2.7
3	3.3	3.29	3.19
4	3.95	-	-
5	4.58	-	-

Grain yield was recorded continuously during harvest and logged against GPS position. The grain yield map appears as Figure 5 above.

From the yield and fertiliser application maps Peter Treloar was able to determine the yields of the various paddocks zones by ± Post N application and also by seeding fertiliser application rate and these are Tables 1-3.

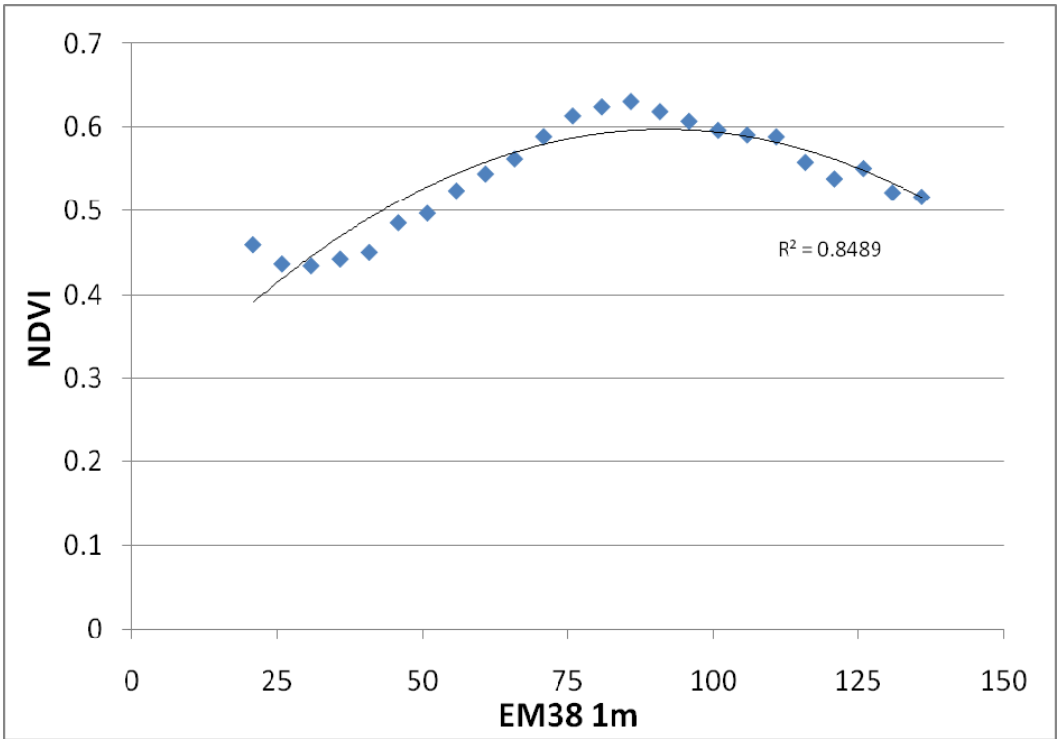

Figure 7. Correlation curves for NDVI and EM38 readings on paddock D6 (Michael Wells and Peter Treloar)

Discussion

- Average Yields for 2010 in D6 were considered high
- Increasing rates of DAP at seeding appear to have depressed grain yield across most paddock zones. This phenomenon was irrespective of N added post seeding (Table 3). Phosphorus levels were good across the paddock - The dunes and flats returned 31 and 42 mg/kg (Colwell) in March 2010.
- The application of post seeding N also depressed yield across every zone. Across the whole paddock the addition of N post seeding increased yield by 0.01 t/ha.
- There appears to be a significant yield response to paddock zones - increasing yield with increasing zone - from 2.92 t/ha in zones 1 and 2 to 4.55 t/ha in zone 5. This demonstrates the success of the Rural Solutions SA model to delineate paddock zones using EM38 and 'Your soils potential' model.
- Figure 7 shows the high level of correlation between NDVI and EM38.

Who was involved?

Bruce, Gaye and Robert Pocock, Lampata, Lameroo
Peter Treloar, Precision Ag services and Vision Ag.
Richard Saunders, Rural Solutions SA, Trials Coordinator
Michael Moodie, Agronomist, Mallee Sustainable Farming Inc.
Mike Mooney, Manager, Mallee Sustainable Farming Inc.
Grant Yates, Southern Precision-sprayers and Precision Ag. Naracoorte.

Grower/Regional feedback:

Bruce and Robert were happy with the yields but are still questioning the drop in yields with application of Post seeding N.

This project was funded by the Grains Research and Development Corporation (GRDC) and run in conjunction with Caring for our Country and Dept. Environment and Natural Resources.

For more information

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