Precision Ag Trials

Variable Rate Nitrogen

Nyngan, Central West NSW

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 **Variable Rate Nitrogen** from season 2010 in the Central West.

Aims:

- To compare the variability of nitrogen needs across a paddock of Canola
- To try and develop a method of assessing when and how much Nitrogen to apply.

Background:

Nitrogen applications are regarded as a hit and miss thing in the Central West region due to the highly variable climate. Farmers put out urea or Easy N @ rarely and on a hunch that there is enough moisture for the plants to use the nitrogen and there is a need for nitrogen.

About the trial:

The trial was conducted on Wass's Brothers property "The Plains" which is approximately 30kms south on Nyngan. The trial was sown to Canola (Hyola 50) sown at a rate of 1.55kg/ha.

A Greenseeker® was used to determine the variability of vegetation (NDVI) across the paddock and a spray boom with a Raven 440 controller that was capable of applying variable rate Easy N® across a paddock.

From satellite images (Spot 5 images 2005) and a yield map created in 2007, the project team generated a grey haired yield map, where we determined there were three distinct zones. Identified as zones 1, 2 and 3 we did not give zones a typical terminology of low, medium and low simply because yielding areas “flip flop” from year to year due to weather conditions and crop type.

From this map, we set up nine sampling areas which N rich strips and soil sampling was collected.

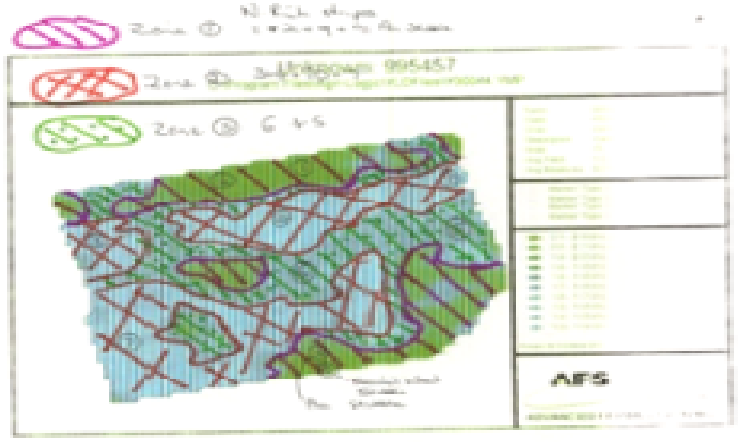

Figure 1: Trial design

N rich strips applied at 200kg/ ha on the18th April, the same date soil sampling was completed.

Greenseeker measurement were collected on the 7th June, and the paddock was harvested on 8th November, 2010.

Assessments:

Soil nutrient analysis
N-rich strips
NDVI – vegetation biomass

Results:

We found little or no response with excess Nitrogen during the season and within each zone. This was measured with the Greenseeker®. However, we did find lot of difference in biomass (NDVI) between the different zones.

Table 1: Soil test results

Sample Name	**N Rich strip =200kg /HA**	Untreated with N	Zone	pH (1:5 Water)	pH (1:5 CaCl2)	Elect. Conductivity	Nitrate Nitrogen (NO3)	Phosphorus (Colwell)	Phosphorus Buffer Index (PBI-Col)	Available Potassium	Calcium/Magnesium Ratio	Organic Carbon (OC)
						dS/m	mg/kg	mg/kg		mg/kg		%
9	0.758	0.767	Medium zone3	5.8	5	0.07	3.8	36	67	600	3.3	0.68
6	0.77	0.752		6.5	5.5	0.06	5.6	33	54	650	5.5	0.95
5	0.76	0.752		6.1	5.1	0.05	8.5	31	64	580	4.1	0.69
4	0.794	0.763	High zone2	6.2	5.1	0.04	2.1	16	60	470	4.4	0.57
3	0.711	0.662		6.6	5.4	0.03	1.8	14	57	410	5.7	0.58
7	0.733	0.657		6.6	5.6	0.05	1.9	13	44	420	4.8	0.58
1	0.695	0.656	Low zone 1	6.1	5	0.05	2.8	43	68	520	2.8	0.64
2	0.694	0.692		6.6	5.8	0.07	3	16	69	510	4.2	0.59
8	0.745	0.694		6	5	0.05	4.4	20	51	470	4.5	0.57

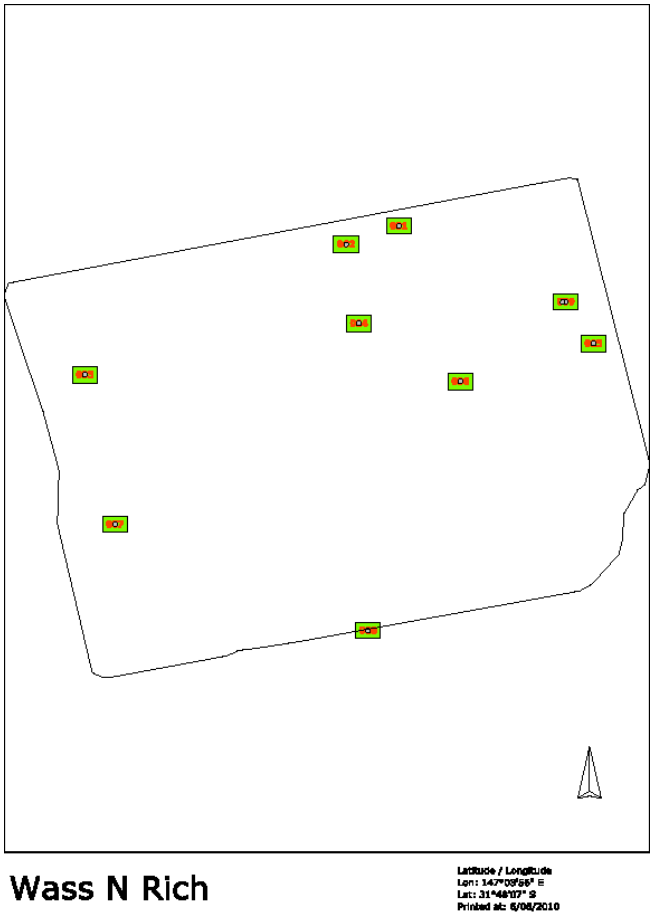

Figure 2: N-rich application points

From this we were able to determine that there was little response with an application of Nitrogen and there are other factors driving the differences in NDVI.

The Haydon's still put out Easy N® strips across the paddock with the aim to confirm whether there was a yield response and to see if there was a subsequent increase in oil content.

Figure 3: Haydon Wass collecting Greenseeker data

Figure 4: Harvesting

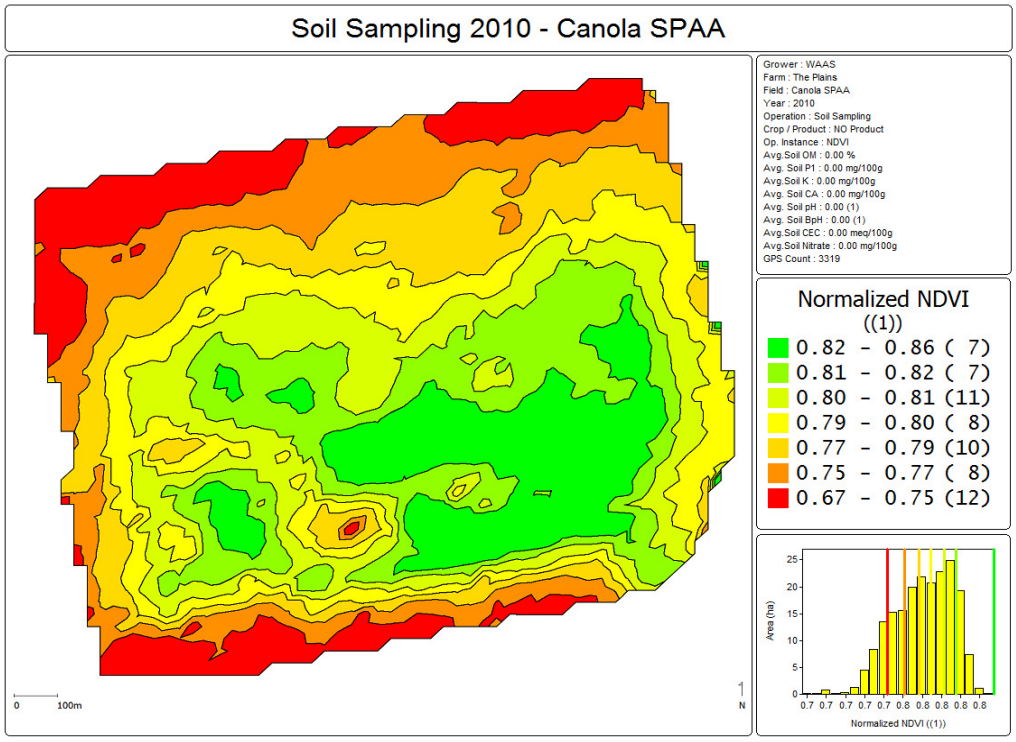

Figure 5: NDVI map

Harvest

Wass's suffered ***Compatibility problems*** and as a result they were not able to collect any yield and oil content data apart from visual assessments while harvesting. They observed the paddock averaged 2.5 t/ha and there was little difference between the zones. A possible reason for this is that it was a very wet season where exceptional yields resulted.

As a result, the normally poor performing areas performed just as well as the good areas in this paddock regardless of additional nitrogen application. In other paddocks across the farm, there were significant yield differences across each paddock. Haydon intends to try and understand what is driving these differences, and yield maps are a way if spatially determining different zones.

Figure 6: Crop inspection

Post Harvest Soil Pits

Figure 7a and b: Soil collection, note the mottled clay layer in the B horizon.

Soil pits approximately 2 meters deep were dug in each of the three zones in an effort to explain the differences in the crop performance and answer why there was so much “flip flop” from year to year.

We found in all soil pits a heavy mottled clay layer in the B horizon and in wet years such as that experienced this season became water logged and the plant roots were not able to access this soil. In the areas with low NDVI and less biomass this layer was about 80- 100cm down, in the areas with higher biomass this layer was 150cm to 170cm down. As a result, the Canola plants

had more soil to draw nutrients and moisture and visually the plants looked a lot better this wet year.

In dryer years, this heavy clay layer does not get water logged and as a result plants can put their roots into this layer which has good stored moisture from previous wet years. Where this layer is closer to the surface plants will access more water in drier years. This may explain the "flip flop" from year to year between the zones.

Who was involved?

Neil McMillan - CWFS
Leighton Wilksch - SPAA
James Austin – gps-Ag
Ian Packer – Lachlan CMA.

Grower feedback:

Haydon is enthusiastic with the SPAA project but see's there are more questions than answers at the moment. He can see the value in VR technology just working out how best to use it. Next year the Wass's brothers intend to purchase their own Greenseeker and do two to three N rich strips across all paddocks on their property. Haydon can see the value of targeted N applications even in unreliable rainfall areas such as Nyngan.

This project was funded by the Grains Research and Development Corporation (GRDC).

For more information

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