Precision Ag Trials

Variable Rate Nitrogen Management

Wongan, Victoria
Inverleigh, Victoria

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 2011.

Aims:
To use a combination of N-rich strip and satellite imagery in Canola to determine a variable rate nitrogen plan.

Background:
Nitrogen is the major fertiliser cost for farmers in south-west Victoria who are pushing canola yields up to 4t/ha. The PA discussion group wanted to see how the N-rich strip approach could be used to assist nitrogen management in canola.

About the trial:
We placed the trial in a canola paddock central to the discussion group, at Wongan, plus a second trial near Inverleigh (Murnong).

Assessments: yield maps, satellite imagery & crop sensor maps

Results:

We obtained a 2010 satellite image of the focus paddock and selected 5 strategic soil sampling points using a combination of the imagery and the farmer's knowledge.

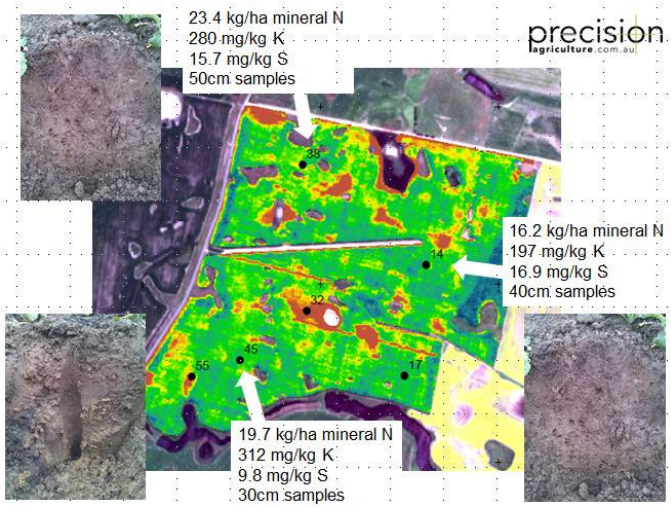
It is clear to see the waterlogging effects in the 2010 satellite image, which highlights the practical challenge of crop management in a paddock like this.

The paddock was also soil tested for soil pH on a 2ha grid using PrecisionAgriculture.com.au's rapid soil pH mapping unit.

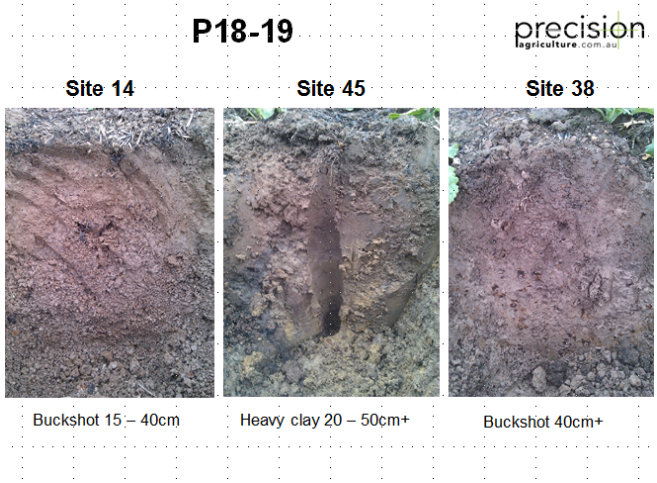
Image of soil pH Detector and Deep N soil testing in the focus paddock

Paddock	Depth (cm)	Bulk Density	NO3-N (kg/ha)	NH4-N (kg/ha)	Total Mineral N (kg/ha)	Potassium (mg/kg)	Sulphur (mg/kg)	RootzoneMoisture (mm)
P18-19 - 14	40	1.028	13.5	2.7	**16.2**	279.1	15.7	81.7
P18-19 - 38	50	1.054	19.7	3.7	**23.4**	197.5	16.9	114.2
P18-19 - 45	30	1.086	16.4	3.3	**19.7**	312.1	9.8	64.7

Soil test results from the three Deep N soil tests



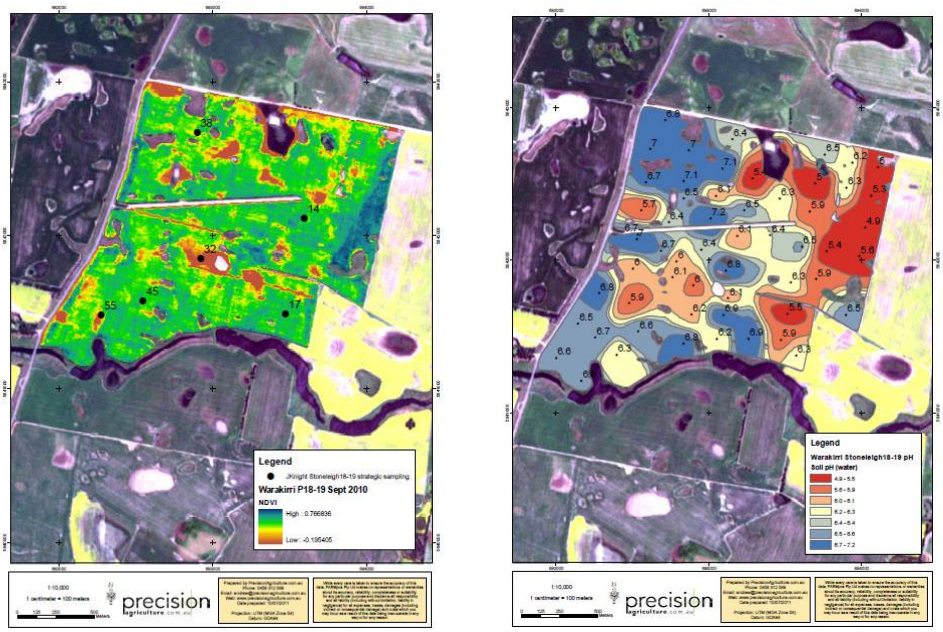
Locations of the three strategic soil tests across the focus paddock



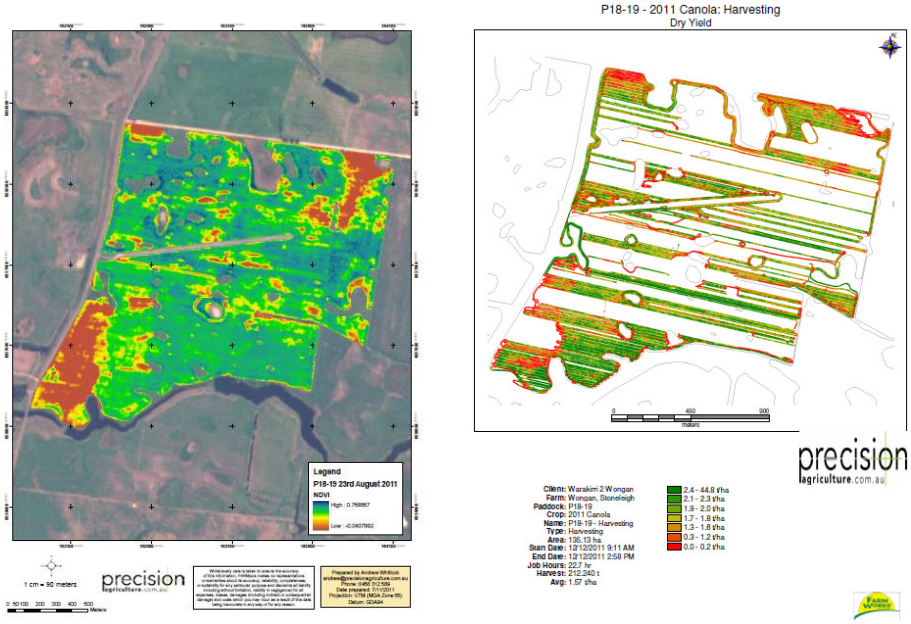
Images of soil profiles at the three locations of the strategic soil tests

As seen in the above images the sub-soil varies significantly across the paddock which highlights the issue of managing waterlogging. Depth of topsoil varies greatly as does the quality of sub soil, clearly indicating that the key to managing paddock variability is underpinned by knowledge of the soil profile.

We also collected soil pH readings across the focus paddock on a 2ha grid and found significant variability in soil pH with a range of 4.9 to 7.2 in water. This was a major finding for the Wongan property and has lead to further investigations into variable rate lime.



(Left) September 2010 Satellite Image, 5m pixel NDVI & (Right) Soil pH Map



(Left) August 2011 Satellite Image, 5m pixel NDVI & (Right) 2011 Canola Yield map

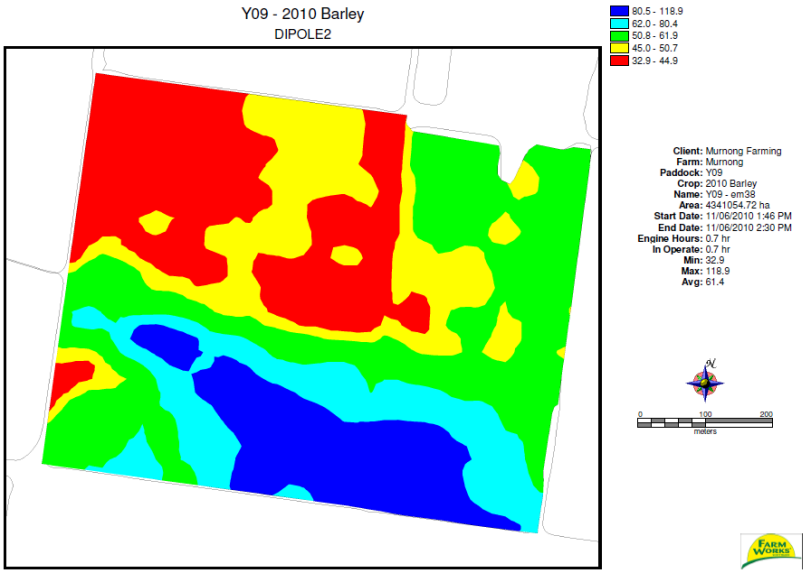
Unfortunately the N rich trial strip location was not accurately recorded and therefore it has not been overlayed on the satellite imagery. There was also a significant amount of yield data missing making it impossible to analyse the results of the trial.

Murnong Farming Trial

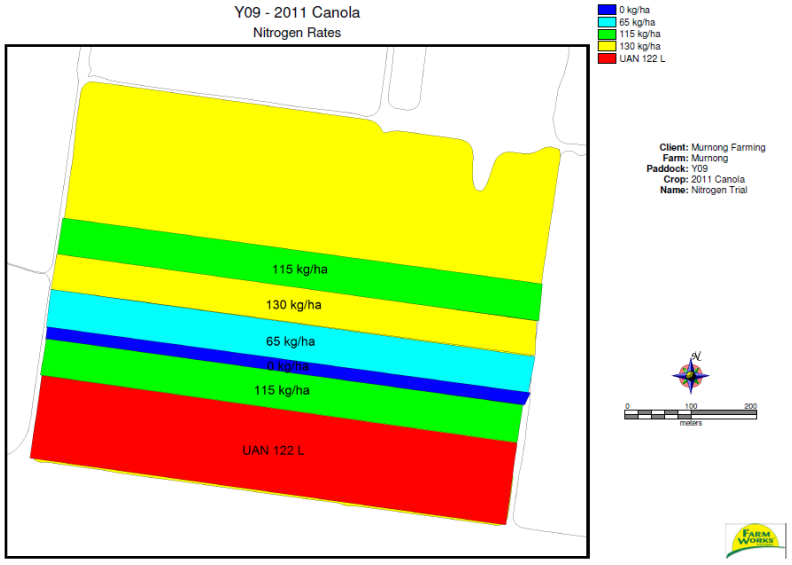
About the trial:

The 46ha canola paddock used for the project on Murnong Farming had a mixture of sand and clay soils. EM38 mapping was completed on the paddock in 2010 to assist in determining the range and area of the different soil types. This information combined with historic paddock yield maps was used to determine the location of the N treatment strip trials.

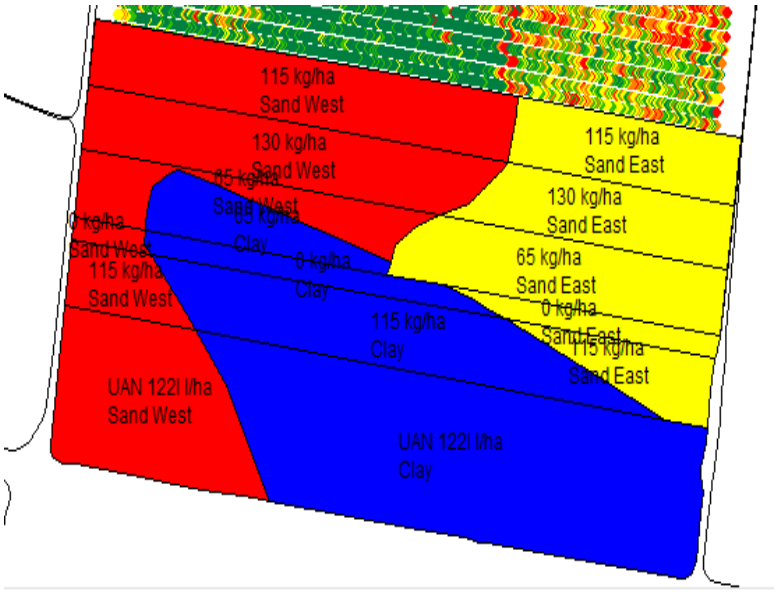
Five N treatments were applied in the trial (0, 65, 115 and 130 kg urea/ha and 122 L UAN/ha). These treatment strips passed through the paddock soil/management zones.



2010 EM38 map from Murnong trial paddock

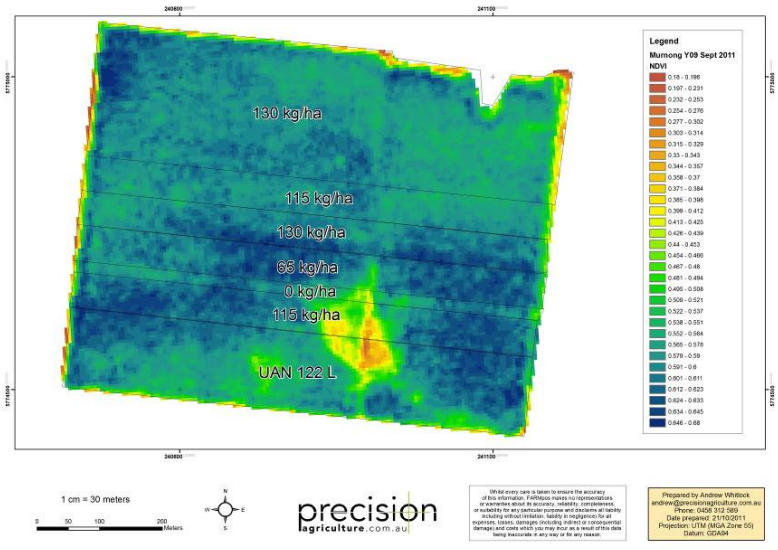


N trial layout



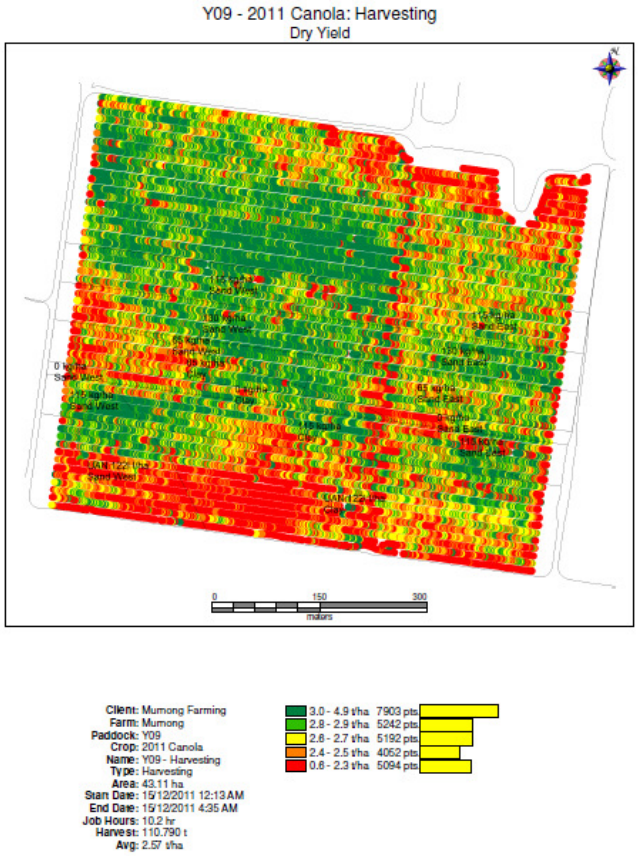
Paddock soil zones with trial layout overlay. Red = sand west, yellow = sand east, blue = clay

Results:

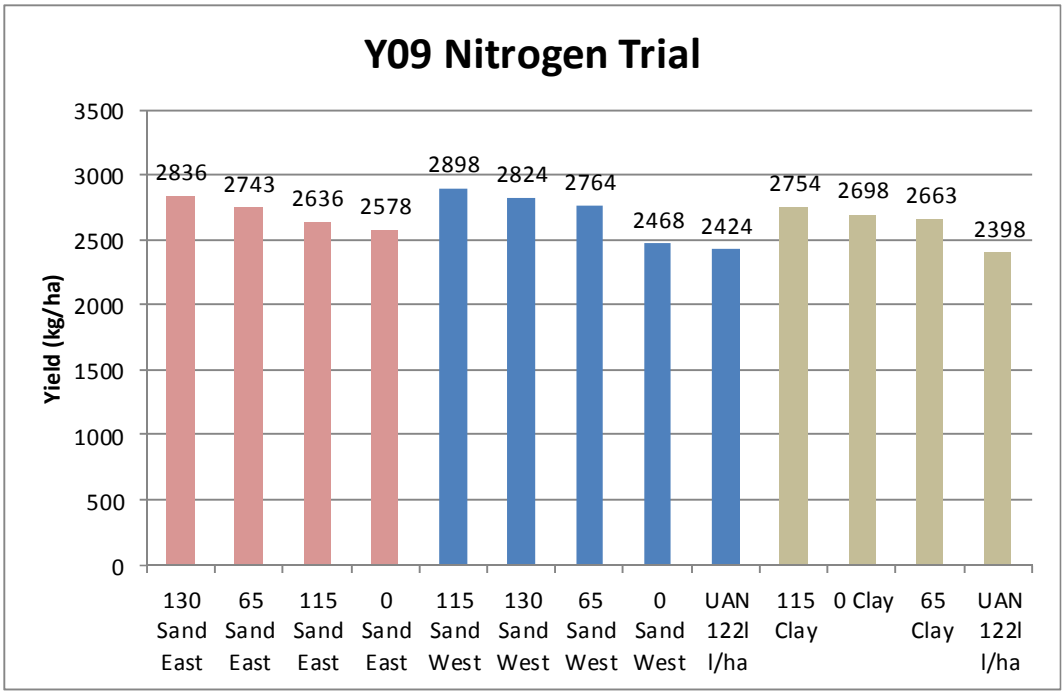


September 2011 Satellite Image, 5m pixel NDVI

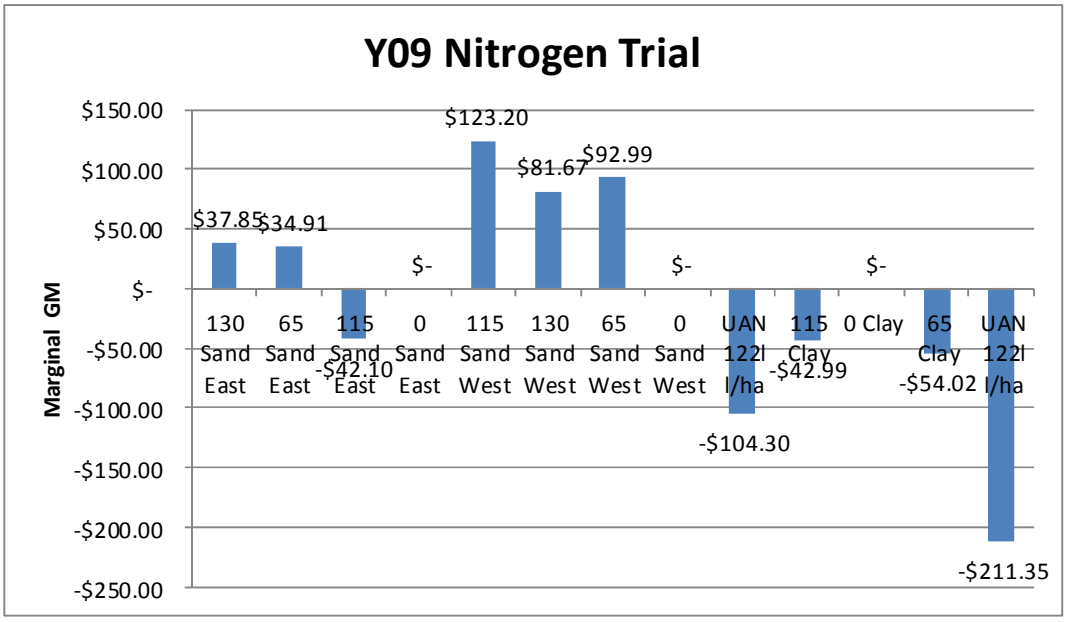
We obtained a 2011 satellite image of the focus paddock. The satellite image highlighted the differences in crop biomass across the paddock soil zones. The satellite image has a strong correlation to the yield map (higher biomass = higher yield).



2011 Canola Yield Map with trial layout overlay



Average canola yield (t/ha) of N treatment strips within sand east, sand west and clay soil zones



Marginal return on investment ($ return per $1 spent on N above base rate of 0 kg urea/ha) for N treatments in the three paddock soil zones

Applying nitrogen on the sand soil zones has consistently delivered sound economic returns. The highest ROI achieved in the sand west zone ($123.20) and sand east zone ($37.85) was in the 115kg urea/ha and 130kg urea/ha treatments respectively.

Applying nitrogen in the clay zone however failed to deliver an economic return and this has been realised in this paddock before. This trial highlighted that variable rate nitrogen is highly applicable to paddocks with high degrees of spatial variability in order to maximise yield and/or return on investment in individual paddock zones.

Who was involved?

James Knight, Warakirri, Wongan, cooperating farmer, Wongan, Victoria
Josh Walter, Murnong Farming, cooperating farmer, Inverleigh, Victoria
Andrew Whitlock, PrecisionAgriculture.com.au
Karen Haigh, SFS

Grower/Regional feedback:

George is certainly keen to further progress ryegrass patch management by more accurately defining these ryegrass zones.

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For more information

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