Precision Ag Trials

pH mapping & Potash Trial

Glenthompson, 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 **pH mapping and potash trial** from season 2010.

Aims:

- To investigate the benefits of a range of spatial datasets including soil pH mapping, satellite imagery, yield maps
- To compare different potash rates in areas of paddocks which are believed to be potash deficient

Background:

Agronomists and farmers throughout the Glenthompson region appreciate the presence of potassium deficiency, however little has been done to understand the spatial distribution across the landscape. This demonstration trial has utilised a range of spatial technologies, strategic soil sampling and local knowledge to determine opportunities for variable rate potash.

About the trial:

The trial paddocks are located approximately 20km south west of Lake Bolac, Victoria.

Toms Paddock: Wheat (Kellalac) sown 26th May 2010 at 90kg/ha with 80kg/ha MAP, top dressed with 80kg/ha urea 10th September 2010, potash trials applied 20th June 2010.

Cattle Yards Paddock: Barley (Westminster) sown 22nd May 2010 at 75kg/ha with 80kg/ha MAP, top dressed with 60kg/ha urea 8th September 2010, potash trials applied 20th June 2010.

Noels Paddock: Lupins (Mandelup) sown 29th April 2010 at 100kg/ha with 70kg/ha MAP.

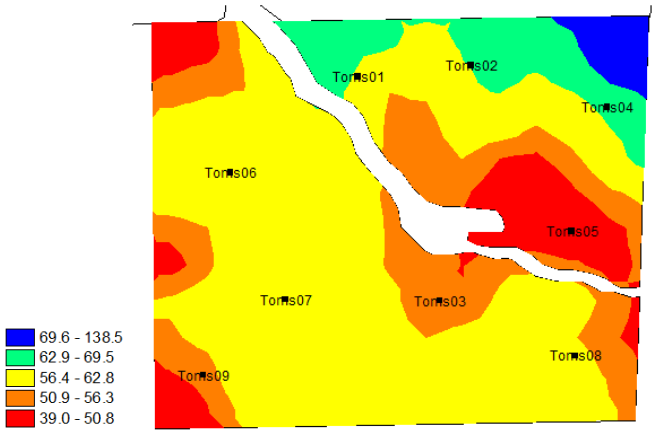
Spatial data included:

- Yield map (2009)
- EM38 (dual dipole) – data collected 3rd May 2010
- Digital Elevation Models and Contour Maps - data collected 3rd May 2010
- Satellite imagery (Sept 2009 & Oct 2010)

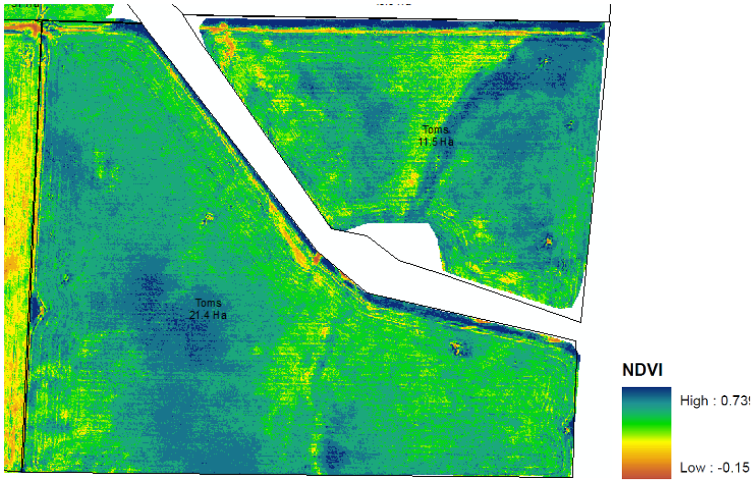
All soil samples were collected 3rd May 2010

Toms Paddock

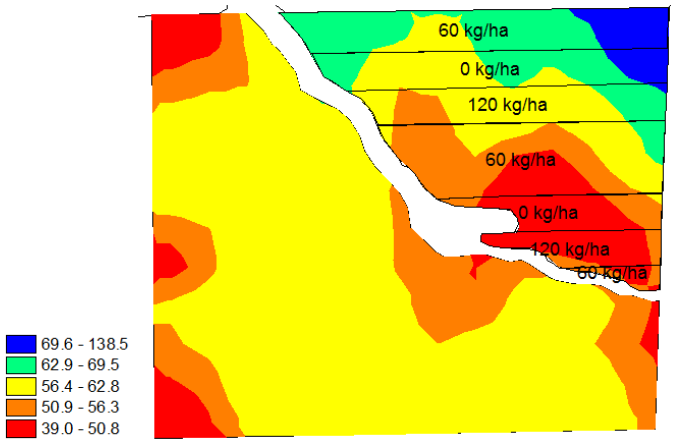
Soil sampling locations over EM-38 map



High resolution satellite image from September 2009 illustrates variability in crop vigour (NDVI), the lighter green colour represents lower crop vigour at that particular point in time

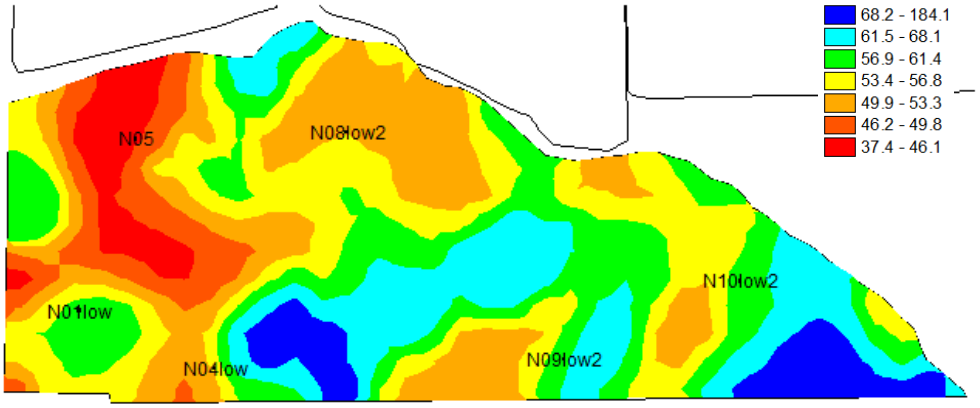


Potash trial design over an EM-38 map, each treatment is 48m (2 passes with spreader), although the middle 60kg treatment is actually 4 passes with the spreader

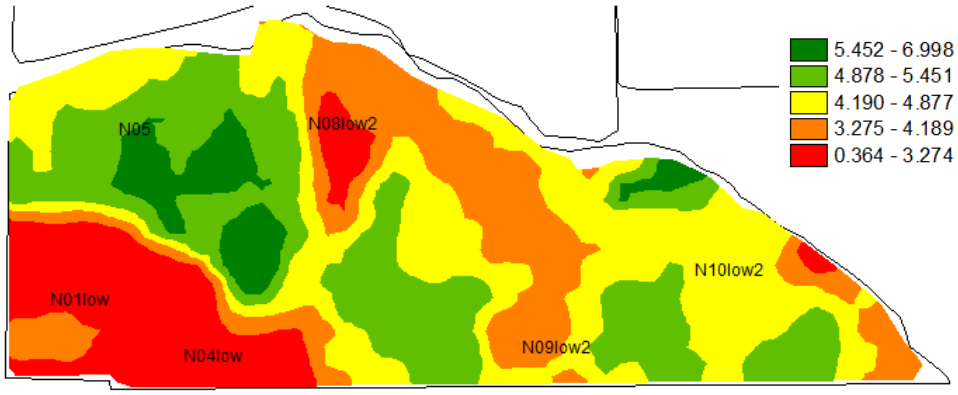


Noels Paddock

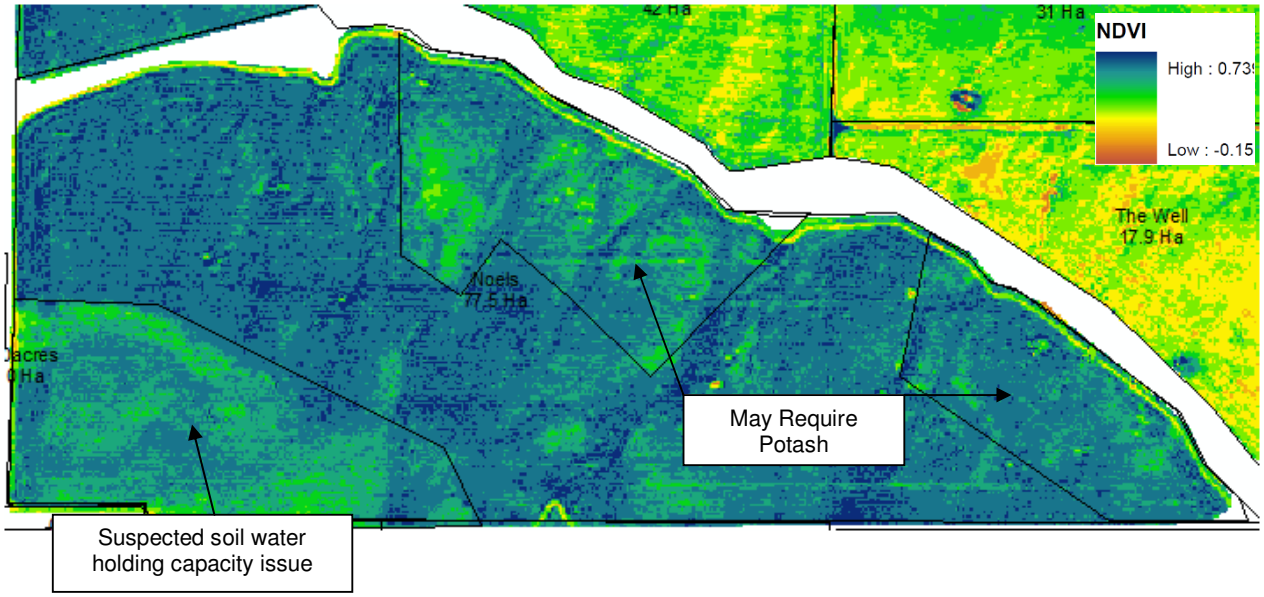
Soil sampling locations over EM-38 map



Soil sampling points over 2009 Yield map (t/ha)

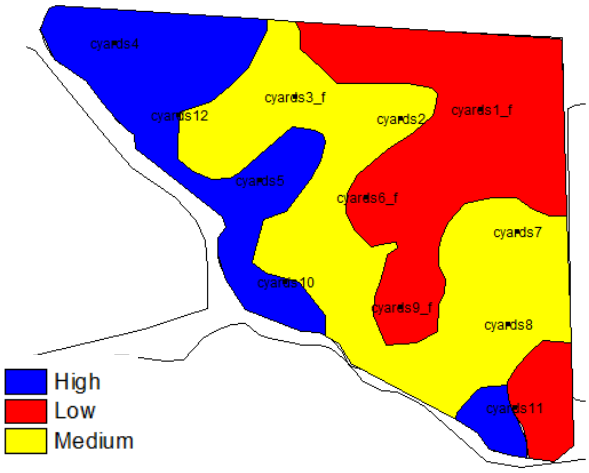


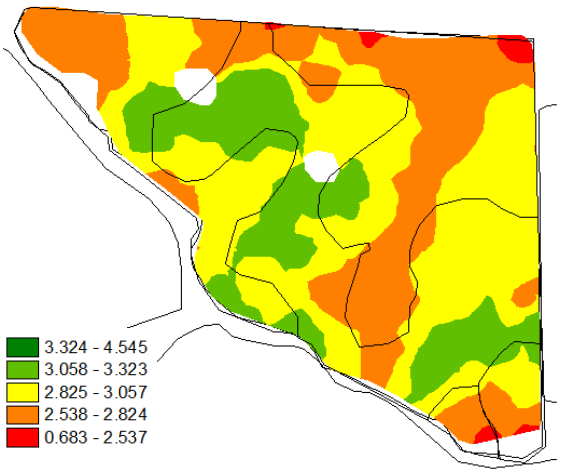
High resolution satellite image September 2009 (NDVI) also illustrates the areas with lower crop vigour.



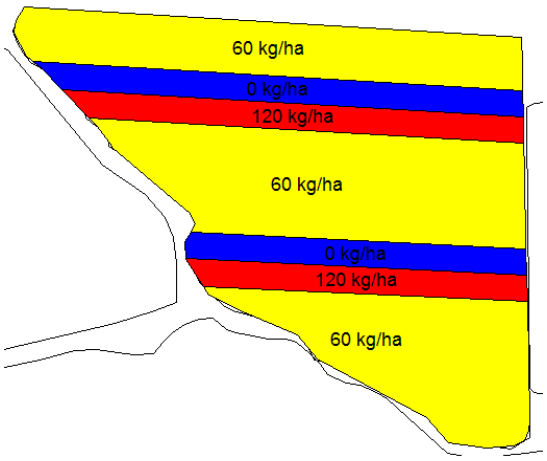
Cattle Yards Paddock

Below (left) are the locations of the 0-10cm soil sample locations over an EM-38 map (3 zones). Interesting to note that the 2009 yield map (t/ha) did offer some correlation to the EM-38 map which we collected prior to 2010 sowing.





2010 Potash trial design



Assessments:

Soil sampling (collected 3rd May 2010) included:

- Soil nutrients (0-10cm), strategic samples based on proposed management zones
- Soil pH & EC (0-10cm), based on 4ha grid

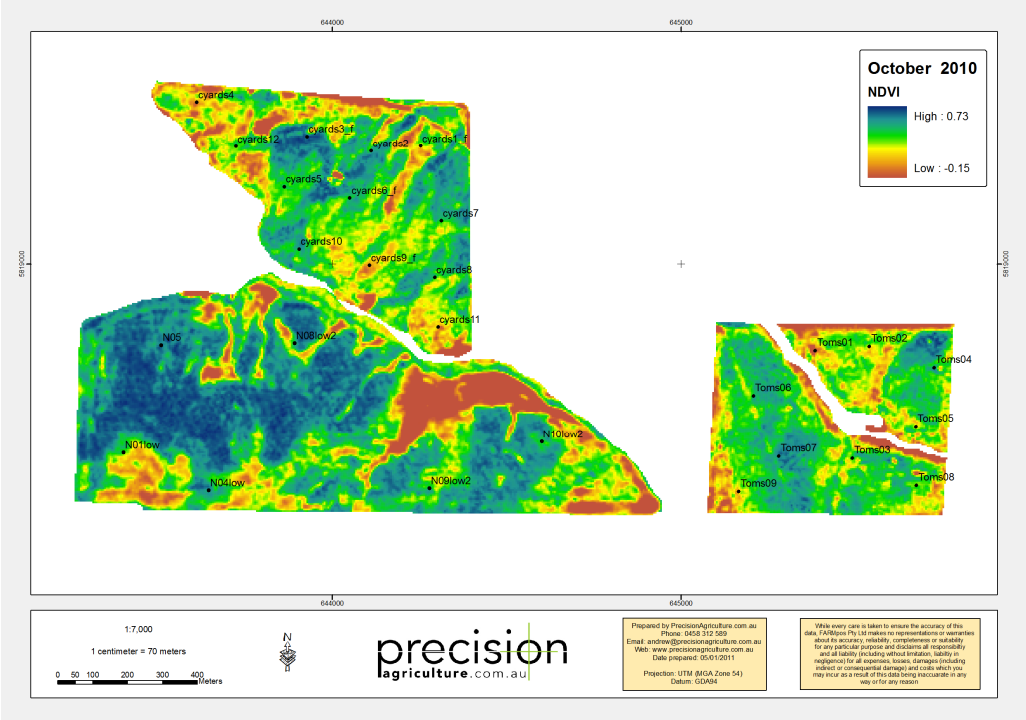
Satellite imagery October 2010

Unfortunately yield data was not collected on any of the focus paddocks

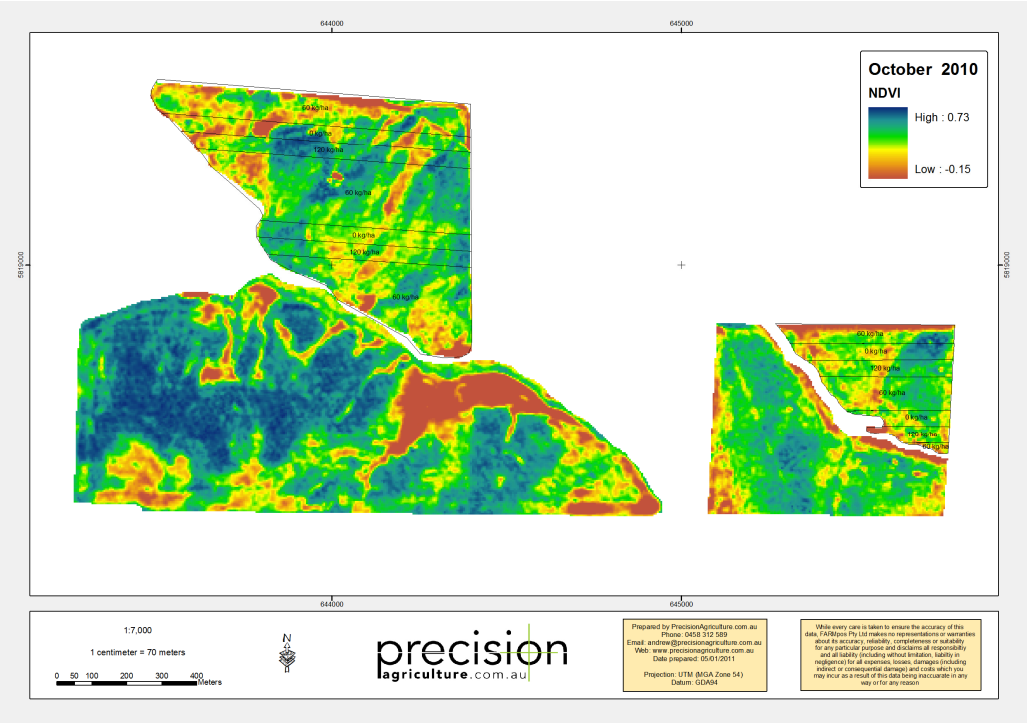
Results:

We were unfortunate not to capture any yield data over any of the trial paddocks, however satellite imagery and strategic soil tests have delivered some valuable learnings.

Satellite imagery (Oct 2010) NDVI and Soil Sampling Locations



Satellite imagery (Oct 2010) NDVI and Trial Layouts

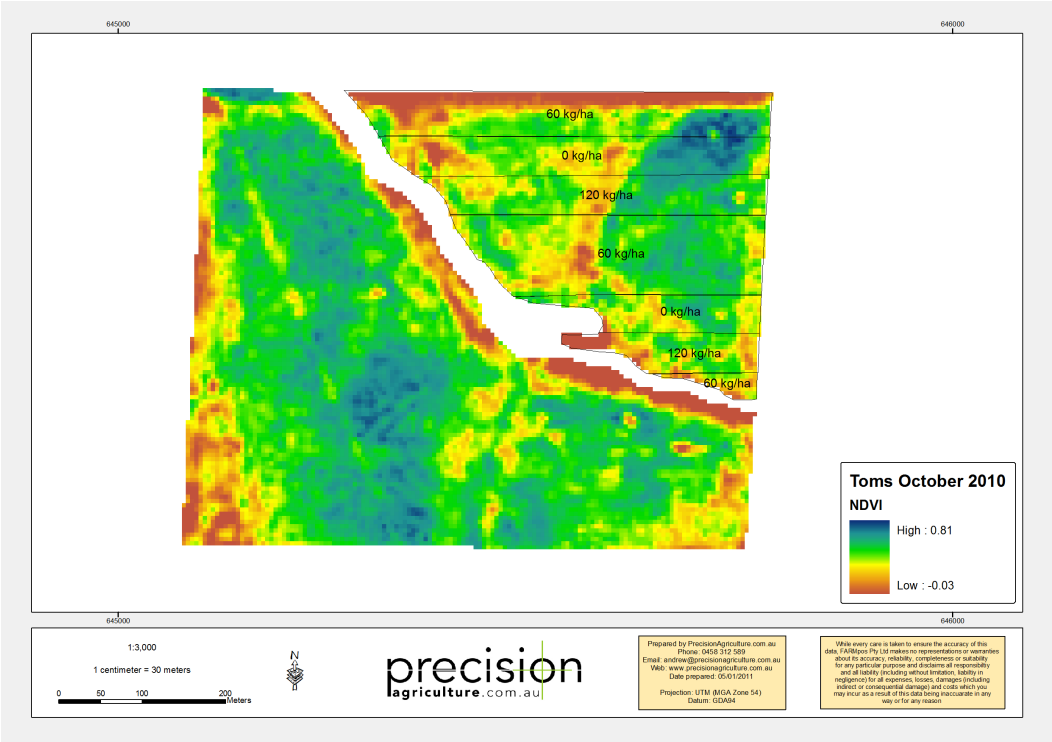


Toms paddock - Wheat

Name	Depth	Colour	Gravel	Texture	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity	pH Level (CaCl2)	pH Level (H2O)
			%		mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	dS/m	pH	pH
TOMS01	0-10	GR	0	1.5	20	123	56	190	75.10	2.50	0.484	5.60	6.00
TOMS02	0-10	GR	0	1.5	27	78	56	212	59.00	2.60	0.361	5.10	5.60
TOMS03	0-10	GRBR	0	1.5	12	145	36	204	68.40	2.24	0.497	5.70	6.00
TOMS04	0-10	GRBR	0	1.5	11	93	47	195	48.10	3.15	0.425	5.60	6.00
TOMS05	0-10	GRBR	0	1.5	21	95	54	142	36.40	3.29	0.297	5.80	6.00
TOMS06	0-10	GR	0	1.5	17	127	75	292	61.90	3.14	0.444	6.10	6.40
TOMS07	0-10	GR	0	2.0	6	82	55	322	39.40	3.49	0.393	6.80	7.10
TOMS07-20-30	20-30	GRBR	0	3.0	3	8	2	202	9.70	1.09	0.181	6.30	7.10
TOMS08	0-10	GR	0	2.0	17	122	49	184	59.30	2.63	0.376	5.30	5.70
TOMS09	0-10	GR	0	1.5	22	146	59	208	75.90	2.62	0.473	5.70	6.00

The majority of soil conductivity results seem to be relatively high – possible an issue for pulse crops. Significant variability in potassium levels, however the values are not too bad.

We trialled the responsiveness of potash on part of the paddock but did not measure a positive response in crop growth. Water logging is clearly the dominant driver of paddock variability – it will be interesting to test the response of potash in a dry season.

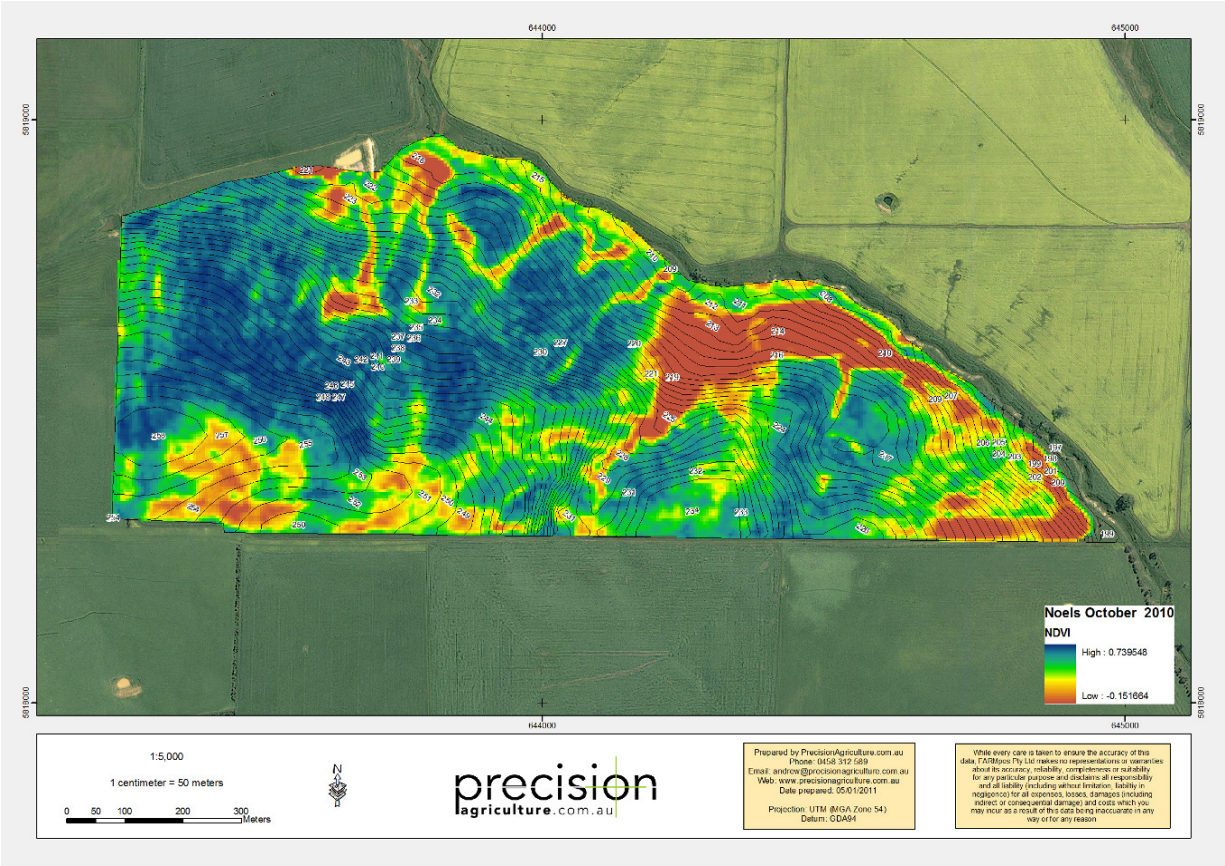


Noels paddock - Lupins

Name	Depth	Colour	Gravel	Texture	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity	pH Level (CaCl2)	pH Level (H2O)
			%		mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	dS/m	pH	pH
NO1Low	0-10	GR	0	1.5	4	58	34	215	9.46	2.62	0.177	6.40	6.90
NO4	0-10	BRGR	0	1.5	18	51	35	283	8.42	2.69	0.191	6.60	7.20
NO5	0-10	BRGR	0	3.0	5	39	26	219	10.60	3.94	0.212	6.80	7.20
NO 8 LOW2	0-10	GR	0	1.5	4	29	25	72	8.43	2.10	0.129	5.90	6.50
NO9 LOW2	0-10	BRGR	0	1.5	5	34	38	266	7.90	2.34	0.128	6.30	6.80
N10 LOW2	0-10	GR	0	1.5	6	41	40	154	12.90	2.80	0.135	6.40	6.90

Half the samples are at the point of being responsive to sulphur. Again we had identified potassium deficiencies and subtle differences in phosphorus levels.

The lupin crop was not harvested due to wet weather damage, the satellite image has clearly identified water logging effects. We can also see poor crop growth in the south-west corner of the paddock where there is believed to be a sub-soil constraint.

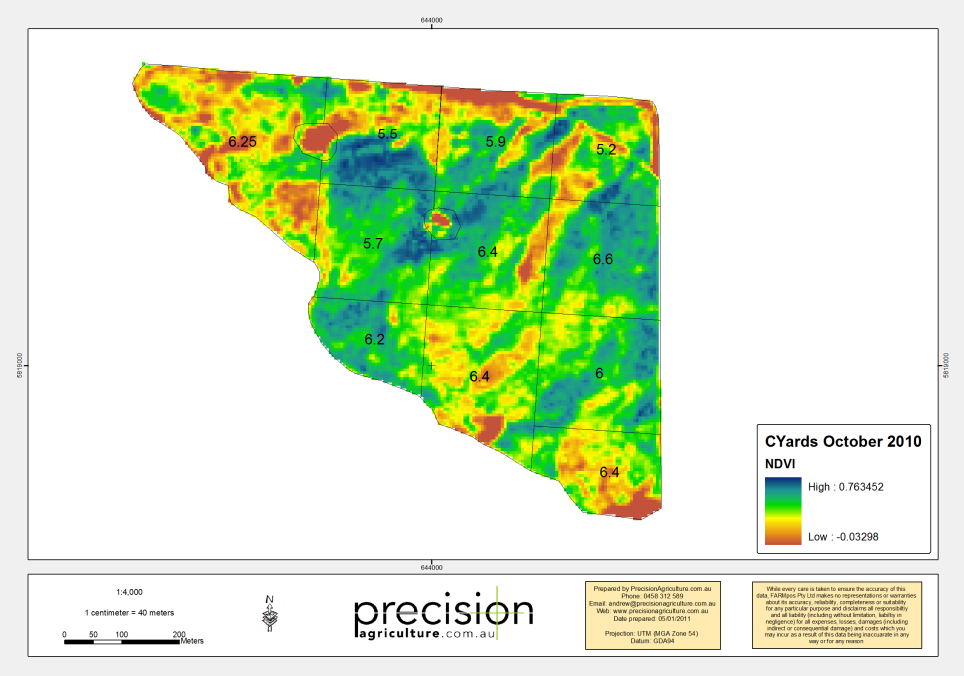


Cattle Yards paddock - Barley

Name	Depth	Colour	Gravel	Texture	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus Colwell	Potassium Colwell	Sulphur	Organic Carbon	Conductivity	pH Level (CaCl2)	pH Level (H2O)
			%		mg/Kg	mg/Kg	mg/Kg	mg/Kg	mg/Kg	%	dS/m	pH	pH
CYards1F	0-10	DKGR	0	2.0	11	68	33	215	23.00	2.52	0.213	5.20	5.90
CYards3F	0-10	DKGR	0	3.0	6	123	29	153	49.10	6.21	0.310	5.50	6.10
CYards6F	0-10	BRGR	0	2.0	14	68	24	215	30.20	3.28	0.260	6.40	6.80
CYards9F	0-10	BRGR	0	2.0	6	59	23	149	29.20	2.80	0.271	6.40	6.80
CYards2	0-10										0.383	5.90	6.40
CYards4	0-10										0.565	6.30	6.80
CYards5	0-10										0.287	5.70	6.10
CYards7	0-10										0.283	6.60	7.00
CYards8	0-10										0.336	6.00	6.40
CYards10	0-10										0.341	6.20	6.50
CYards11	0-10										0.396	6.40	6.80
CYards12	0-10										0.356	6.20	6.40

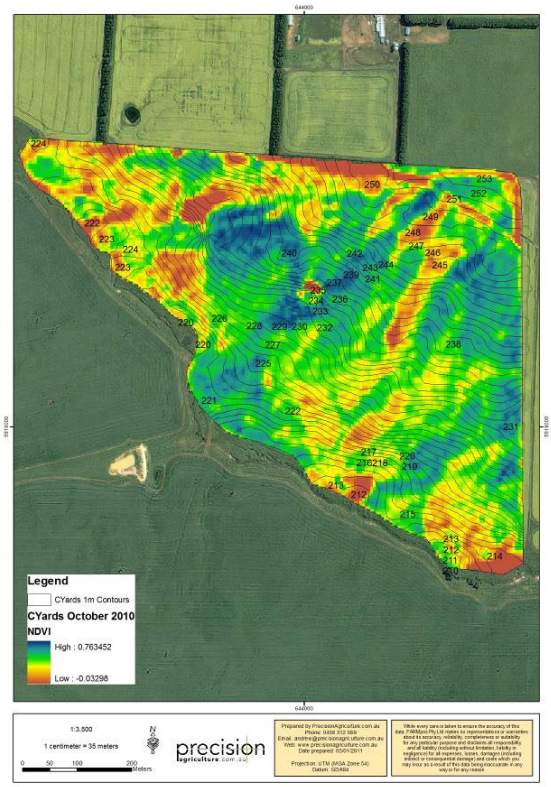
Once again we found potassium levels bordering on being deficient and some textural differences.

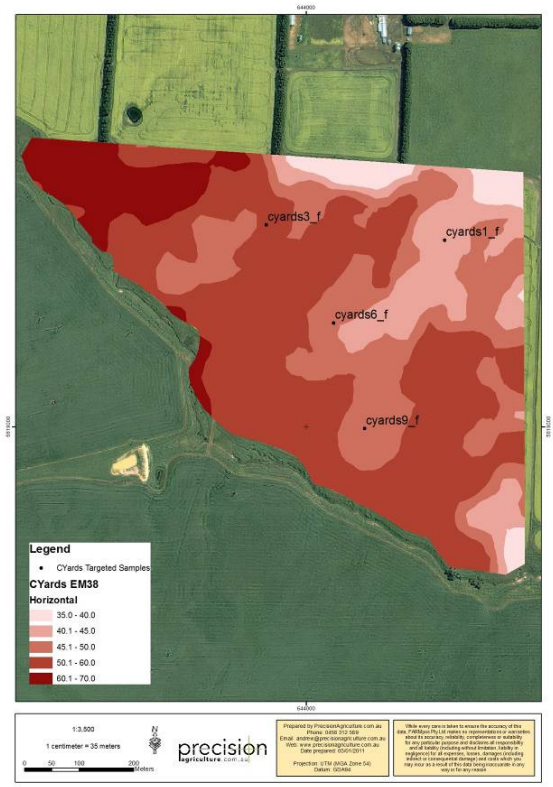
We were particularly interested to understand variability in soil pH across Cattle Yards paddock – the results did find variability but the actual values were all quite high limiting the potential for variable rate lime.



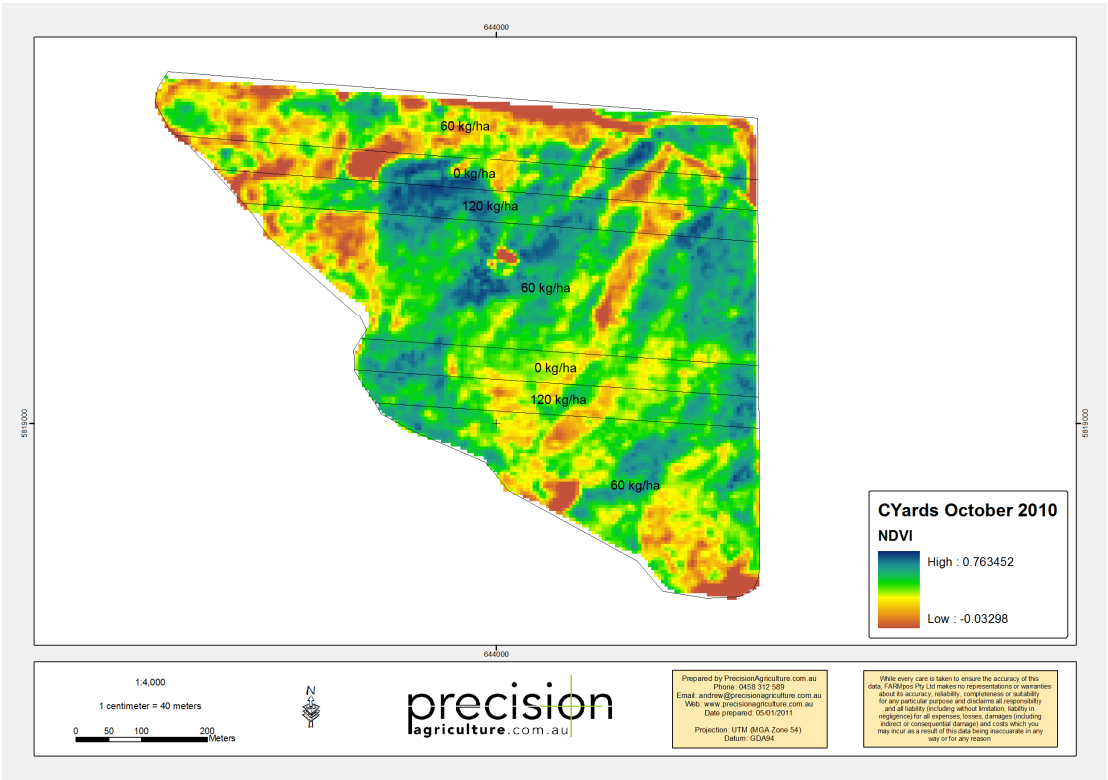
Satellite imagery (October 2010) and 1m contours offered good insight into the effect of surface water. The spatial trends across this image are consistent with the 2009 yield map. The impacts on crop growth relate to both soil type and concentrations of surface water.

The EM-38 map has detected high salt readings in the north-west corner of the paddock which was confirmed by elevated EC readings. Further investigations are required to understand if and how this can be managed.





We could not detect an improvement in crop growth with applications of potash



Who was involved?

Cooperating farmer: Dave McInnes
Trials coordinator: Andrew Whitlock (PrecisionAgriculture.com.au)
FSG contact: Karen Haigh (Southern Farming Systems)

Martin Peters (FarmingIT) assisted with EM-38 & elevation mapping, and collection of strategic soil cores (0-10cm) & pH samples (0-10cm)

CSBP soil laboratory for pH and nutrient testing

Andrew Whitlock (PrecisionAgriculture.com.au) managed all spatial data

Grower/Regional feedback:

The McInnes appreciate that there are significant crop and pasture nutrition issues derived by natural variability through their undulating landscape. They will continue to measure paddock variability and conduct further trials and sampling in an attempt to understand the key drivers of constraints to crop and pasture production.

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

For more information

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