Wheat response to P and N at Dandaragan 2013

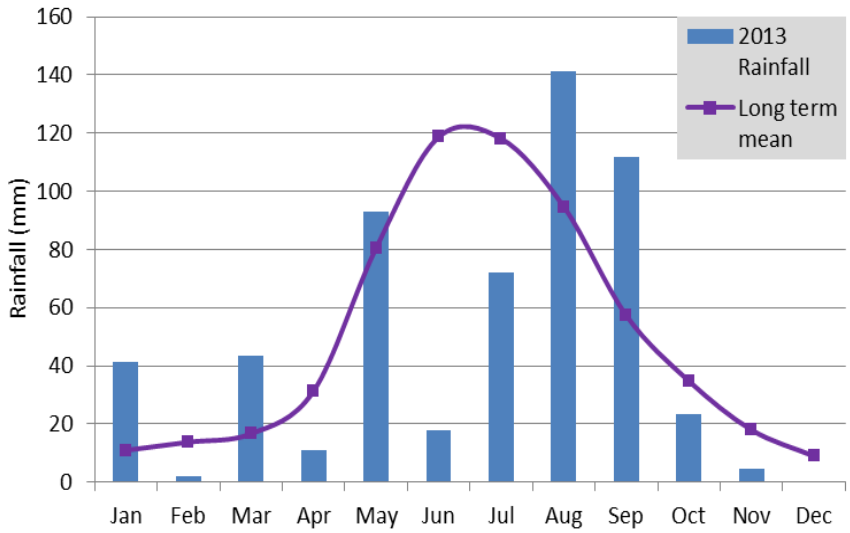
Brett Beard, Area Manager, Summit Fertilisers, Moora

Purpose:	To investigate the response of wheat to different rates of applied P and N
Location:	WMG Main Trial Site, Negus's farm, Dandaragan RD, Dandaragan
Soil Type:	Sand
Rotation:	2012 Pasture

Soil Test Results:

Depth (cm)	Topsoil	Subsoil
pH Level (CaCl2) (pH)	5.4	3.9
Aluminium CaCl2 (mg/Kg)	0.5	8.2
PBI	27	
Organic Carbon %	1.3	
Conductivity (dS/m)	0.08	0.02
Ammonium Nitrogen (mg/kg)	1	
Nitrate Nitrogen (mg/kg)	23	
Phosphorus Colwell (mg/kg)	21	13
Potassium Colwell (mg/kg)	79	36
Sulphur (mg/kg)	6	3
Copper (mg/kg)	0.2	
Zinc (mg/kg)	0.7	
Exch Calcium (mg/kg)	3.4	
Exch Magnesium (mg/kg)	0.4	
Exch Sodium (mg/kg)	0.1	
Exch Potassium (mg/kg)	0.2	

Growing Season Rainfall (April-October 2013): 471mm compared to the long-term average of 536mm. Mid-May to mid-July was particularly dry. June saw 18mm fall compared with the long-term June average of 119mm.



BACKGROUND SUMMARY

A trial with a goal to investigate how combining Phosphorus and Nitrogen applications influences wheat growth and yield under 2013 conditions and provide growers with value-based fertilizer recommendations.

TRIAL DESIGN

Plot size: Length 12 m, Width 2 m, Row spacing 25.4 cm (10")

Machinery use: Small plot seeder, knife points and press wheels

Crop type and varieties used: Cobra wheat

Seeding rates and dates: 70 kg/ha on 10th May 2013

Fertilizer prep: SOP 100 kg/ha IBS

Stratasol Zinc 300 mL/ha Big Red Copper 300 mL/ha

Herbicide rates and dates: Pre-emergent 118 g/ha Sakura

2 L/ha Avadex

400 mL/ha Diuron

3 g/ha Ally

2 L/ha SpraySeed

Post-emergent 30 g/ha Monza (2/06/13)

350 mL/ha Axial (15/06/13)

670 mL/ha Velocity (25/06/13)

Insecticides applied: Pre-emergent 200 mL/ha Bifenthrin

1 L/ha Chlorpyriphos

Post-emergent 300 mL/ha Chlorpyrifos (26/05/13)

Treatments:

Trt	P (kg/ha) Banded (kg/ha)	N (kg/ha)	Seeding[a] Fertiliser		N banded at seeding (kg/ha)		N top up 25th June (L/ha)		N top up 22nd July (L/ha)	
1	0	0	0							
2	0	40		0	Urea	55	UAN	36		
3	0	80		0	Urea	55	UAN	65	UAN	65
4	0	120		0	Urea	55	UAN	112.5	UAN	112.5
5	8	0	TSP	39						
6	8	40	TSP	39	Urea	55	UAN	36		
7	8	80	TSP	39	Urea	55	UAN	65	UAN	65
8	8	120	TSP	39	Urea	55	UAN	112.5	UAN	112.5
9	16	0	TSP	78						
10	16	40	TSP	78	Urea	55	UAN	36		
11	16	80	TSP	78	Urea	55	UAN	65	UAN	65
12	16	120	TSP	78	Urea	55	UAN	112.5	UAN	112.5
13	24	0	TSP	117						
14	24	40	TSP	117	Urea	55	UAN	36		
15	24	80	TSP	117	Urea	55	UAN	65	UAN	65
16	24	120	TSP	117	Urea	55	UAN	112.5	UAN	112.5

[a] Triple Superphosphate

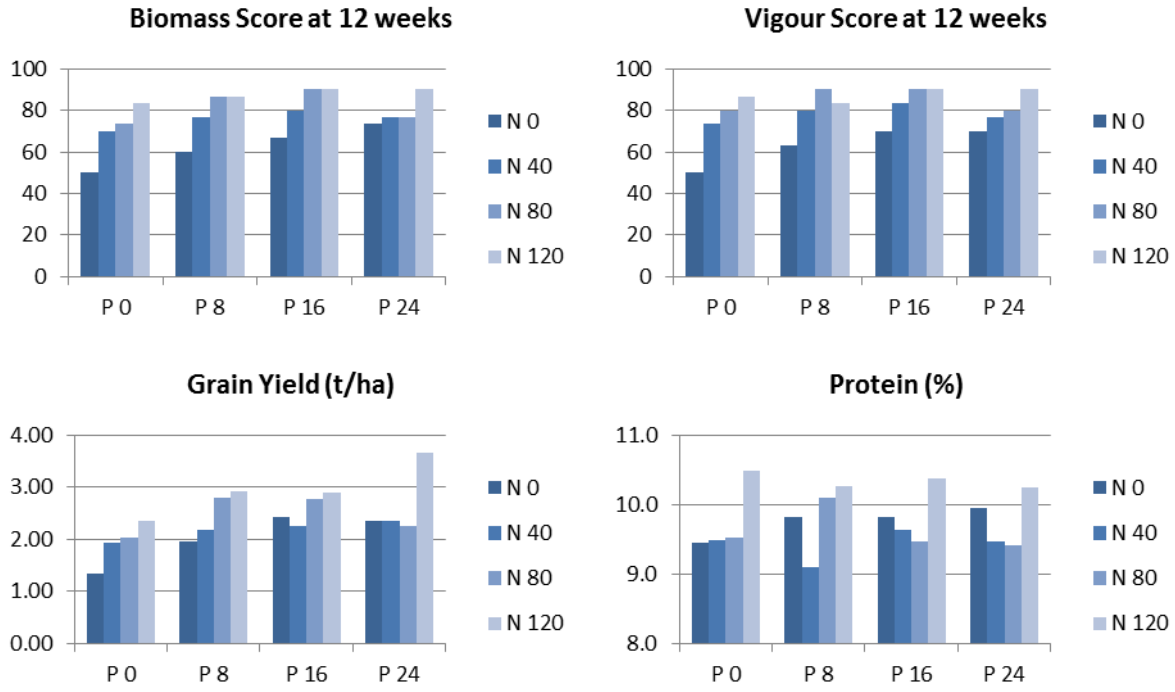
TRIAL LAYOUT

→N

Rep/plot No													
	301 2	302 12	303 4	304 15	305 3	306 8	307 13	308 6	309 10	310 14	311 7	312 16	313 9	314 1
Treatment No.	201 1	202 2	203 3	204 4	205 5	206 6	207 7	208 8	209 9	210 10	211 11	212 12	213 13	214 14
	101 16	102 6	103 11	104 2	105 3	106 15	107 7	108 9	109 13	110 10	111 4	112 8	113 14	114 1

RESULTS/STATISTICS

- Emergence was slow but uniform across the site. Average emergence was 79% per plot.
- Crop vigour and biomass improved with increasing fertilizer application. Plant growth responded significantly to both P and N.
- Grain production showed strong increases with the application of P and N.
- Yield increases up to 1.3 t/ha were seen in response to increased P application independent of N.
- Yield increases up to 1.4 t/ha were seen in response to increased N application independent of P.
- Combined P and N application increased yield up to 2.3 t/ha more than the untreated control plots. However, this interaction was not statistically significant.
- Protein was generally in the 9 to 10 % range, averaging 9.8 %. Increased yields at high fertilizer rates may have diluted protein at rates less than 120 N. However, total protein yield per hectare increased strongly with increased P and N applied.
- There was no relationship between fertilizer applied and hectolitre weight or screenings. All hectolitre weights were above 78 kg/hl and all screenings were less than 2.2%. These are well within delivery standards.



FINANCIAL ANALYSIS OF RESULTS

- Delivery grades improved with applied P and N. Grades ranged from ASW with no P or N applied to APW at P24 for all N treatments.

- With all other costs being equal between treatments we can use income from grain minus cost of P fertilizer applied as a crude gross margin
- Optimum return was seen at P 8 to 16 kg/ha applied and N at 40 kg/ha applied.
- Gross margins are indicative only and are strongly influenced by the constraints outlined below, especially the weed burden. Improved weed control should result in improved margins at higher fertilizer application rates.

Wheat delivery grades and indicative value return represented by different P x N treatments

Fert kg/ha	P 0	P 8	P 16	P 24
		Delivery Grade		
N 0	ASW1	ASW1	ASW1	APW1
N 40	ASW1	ASW1	APW2	APW2
N 80	ASW1	ASW1	ASW1	APW2
N 120	ASW1	ASW1	ASW1	APW2
		Gross Grain value per ha		
N 0	$ 351	$ 505	$ 532	$ 645
N 40	$ 510	$ 566	$ 766	$ 795
N 80	$ 635	$ 586	$ 722	$ 792
N 120	$ 614	$ 614	$ 586	$ 996
		Gross margin*		
N 0	$ 351	$ 381	$ 267	$ 236
N 40	$ 377	$ 309	$ 367	$ 253
N 80	$ 369	$ 195	$ 190	$ 116
N 120	$ 215	$ 91	-$ 79	$ 187

***** Gross margin calculated using yield, grain values at Jan 2014 APW1 $273/T with grade spreads, minus cost of treatment fertilizer applied, UAN $1.51 and Urea $1.27 per kg of N , TSP $3.41 per kg P.

OBSERVATION/ DISCUSSION/ MEASUREMENTS

- Poor performance of pre-emergent herbicides led to poor weed control. Ryegrass was a significant problem. Ryegrass also appeared to respond to P and N treatments resulting in increased competitive effect and would have limited wheat responses to the applied treatments.
- 2013 growing season rainfall limited production and the value of increasing fertilizer rates. Rainfall during mid-May to mid-July – when important tillering and growth response to applied N is expected – was about 10% of long-term average.
- Non wetting soils had an impact on early emergence of wheat in this trial.
- The combination of low rainfall and non-wetting soils decreased the herbicide effectiveness.
- Sub soil pH and aluminium levels may well have limited deep root growth and exacerbated the impact of the dry conditions and, therefore, limited the total plant response to applied fertilizer.
- Considering the final weed load on the site, a direct and accurate measure of biomass may have provided a more meaningful basis for assessing responses to fertilizer treatments and calculating grower returns.

CONCLUSION

Despite weed competition, less-than-ideal winter weather and soil conditions, wheat responded to both P and N application at this site. Grower returns on fertilizer investment were best with P applied at 8 to 16 kg/ha and N applied at 40 kg/ha. Greater response and returns from increased fertilizer application may be expected with improved early-to-mid season moisture conditions and less weed competition.

PEER REVIEW/REVIEW

ACKNOWLEDGEMENTS/ THANKS
Living Farm for establishment and management of the trial for Summit Fertilizers and Peter Negus for allowing the trial on his property.