

Precision agriculture demonstrations on sowing and fertiliser rates at *Bogandillan, Rand*

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Key points

- Reducing sowing rates to 50kg/ha did not impact on yield, which is consistent with 2009 trial results.
- Yield at the site did not respond to applied phosphorus or nitrogen fertiliser even following early plant growth responses.

Location: *Bogandillan, Rand, NSW*

Rainfall:

Annual: 667mm (avg 490mm)

GSR: 194mm (avg 290mm)

Soil:

Type: Grey clay to red chromosol

pH (H₂O): 5.9

pH (CaCl₂): 5.4

Sowing information:

Variety: Lincoln, wheat

Sowing date: 12 May 2011

Sowing rate: 35, 50 and 70kg/ha

Fertiliser: Phosphorus (0, 30, 50, 75 and 100kg/ha as MAP)

Nitrogen (50kg/ha plus 40kg/ha as nitrogen-rich strips)

Herbicides: Glyphosate and trifluralin applied to all plots.

Sowing equipment: Janke 14.6m tine airseeder (300mm rows) equipped with Janke press wheels. Goldacre 29.2m boomspray. Lely spreader with actuator spreading on 29.2m centres. AutoFarm 2cm guidance in the sowing, spraying and spreading.

Row spacing: 30cm

Paddock history:

2009 — wheat

2010 — canola

2011 — wheat

Plot size: 800m x 29.2m

Replicates: nil



Aims

- To compare the effects of variable phosphorus and sowing rates on the wheat yield.
- To assess if remote sensing, using Crop Circle normalised difference vegetation index (NDVI), could determine yield differences between the treatments.
- To assess if nitrogen-rich strips and NDVI could be used to better assess in-crop nitrogen requirements.

Background

During 2010 a demonstration was established on *Bogandillan* to examine the effect of variable sowing and phosphorus rates on the yield of wheat grown in high-phosphorus situations.

The site was used as a major demonstration site for precision agriculture (PA) with more than 70 growers attending the main field day. The demonstration was repeated during 2011 to further demonstrate the benefits of PA and to assess the effect of varying phosphorus and sowing rates and nitrogen-rich strips on wheat yield.

Nitrogen-rich strips were used to assess the nitrogen requirements of the crop by highlighting any yield differences. Plots were assessed using a Crop Circle biomass sensor to determine NDVI and highlight any nitrogen differences (see Table 1).

TABLE 1 NDVI results, Rand July 2011

Treatment	NDVI*
Sowing rate 35kg/ha, MAP 50kg/ha	0.3
Sowing rate 35kg/ha, MAP 50kg/ha, plus 40kg/ha of nitrogen as a nitrogen-rich strip	0.4
Sowing rate 70kg/ha, MAP 50kg/ha	0.7
Sowing rate 70kg/ha MAP 50kg/ha, plus 40kg/ha of nitrogen as a nitrogen-rich strip	0.7+

* NDVI calculated as an average of 10 individual measurements taken from each plot from the nitrogen-rich strip and the treatment area to the south of the nitrogen-rich strip.



TABLE 2 Grain yields and results of the visual assessments

Seed and fertiliser treatment	Phosphorus rate (kg/ha)	Plants (plants/m ²)	Tillers (tiller/m ²)	Grains/head	Yield (t/ha)
Sowing rate 70kg/ha, MAP 50kg/ha	11	124	447	38	3.1
Sowing rate 35kg/ha, MAP 50 kg/ha	11	65	321	56	3.2
Sowing rate 50kg/ha, MAP 50kg/ha	11	74	422	44	3.1
Sowing rate 70kg/ha, no fertiliser	0	117	265	66	2.9
Sowing rate 70kg/ha, MAP 30kg/ha	6.5	131	463	42	2.9
Sowing rate 70kg/ha, MAP 50kg/ha	11	128	455	40	2.9
Sowing rate 70kg/ha, MAP 75kg/ha	17.5	119	466	36	2.9
Sowing rate 70kg/ha, MAP 100kg/ha	22	133	421	42	2.9

TABLE 3 Grain quality results

Treatment	Moisture (%)	Protein (%)	C/W (kg/hL)	Screening (% , 2mm)
Sowing rate 70kg/ha, MAP 50kg/ha	9.1	10.4	80	1.2
Sowing rate 35kg/ha, MAP 50kg/ha	8.9	11.2	80	1.5
Sowing rate 50kg/ha, MAP 50kg/ha	9.0	11.1	81	1.5
Sowing rate 70kg/ha, no fertiliser	8.9	10.9	80	2.9
Sowing rate 70kg/ha, MAP 30kg/ha	8.9	11.1	80	3.0
Sowing rate 70kg/ha, MAP 50kg/ha	9.0	11.1	80	2.6
Sowing rate 70kg/ha, MAP 75kg/ha	9.0	11.1	80	2.8
Sowing rate 70kg/ha, MAP100kg/ha	9.0	11.4	81	2.6

Method

Yield maps from 2010 were used to develop two management zones for 2011.

Sowing rates were varied across each zone — 35, 50 and 70 kg/ha.

Phosphorus was applied at rates of 0, 30, 50, 70 and 100kg/ha as MAP.

An 80m nitrogen-rich test strip of 40kg/ha was applied across both zones at GS15. Deep soil nitrogen results and yield targets, assessed using weather predictions and the French and Schultz model, were used to determine a single rate of nitrogen (50kg/ha) for all plots, across both zones, applied at GS31.

Results

While there was a visual response to phosphorus, applied at sowing through to after GS31, this did not translate into yield differences at harvest. There was an initial response to varying sowing rate, but this was not obvious at GS31 and did not translate into a yield response (see Table 2). The results may have been a reflection of the dry spring and the time of application. The addition of phosphorus increased input costs and reduced profits.

There was no visual response from applying nitrogen in the nitrogen-rich strip in either zone. The harvest results showed no yield response in the nitrogen-rich strip, but as these were only 80-metres wide and had additional nitrogen at GS31, the result may not be indicative of whether there was a response at the site.

Overall the yield was disappointing and well below the target. Grain quality was also below target (see Table 3).

SPONSORS

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