Risk management trial - Curyo

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Aim

To determine the most cost effective approach to managing inputs for wheat production in a low rainfall cropping environment.

Take home messages

- *BCG risk management work between 2005 and 2008 has shown a low to moderate input approach to be the most profitable*
- *Adopting a low input approach to managing variable inputs was the most economic at Curyo in 2008*
- *No economic yield or grain quality response was achieved by adopting a high input strategy*
- *Tools such as soil sampling and Yield Prophet® can support fertiliser and in-crop input decisions.*

Method

This replicated experiment evaluated three different approaches to managing inputs at the main site at Curyo. These treatments were based on low, best bet and high input approaches, perceived to have different attitudes to risk – high input being high risk, low input being low risk and best bet somewhere in between (Table 1).

All treatments were sown to wheat (cv. Young) on 19 May 2008 at 300mm row spacing and all treatments were sprayed with 0.8L/ha trifluralin (Triflur X™) incorporated by sowing.

Table 1. The treatments/strategies implemented in this trial.

Treatment	Treatment title	Treatment description
1.	High input	- High sowing rate 74kg/ha targeting 190 plants/m² - High P rate 14kg P/ha (67kg/ha Supreme Z) - Split N rate 12kg N/ha at sowing (top-dress if required in season – determined by fortnightly Yield Prophet™ runs at 20% probability of yield response) - Flutriafol (Impact®) on fertiliser 400ml/ha - Foliar fungicide (determine in-season if required) - Foliar micronutrients (use tissue test in-season to determine if required)
2.	Best bet	- Average sowing rate 59kg/ha targeting 150 plants/m² - Moderate P rate 7kg P/ha (33kg/ha MAP) - Split N rate 12kg N/ha at sowing (top-dress if required in season – determined by fortnightly Yield Prophet™ runs at 50% probability of yield response) - No upfront fungicide - Foliar fungicide in-crop option (determine in-season if required) - Foliar zinc if required (use tissue test in-season to determine if required).
3.	Low input	- Low sowing rate 39kg/ha targetting100 plants/m² - Low P rate 4kg P/ha (19kg/ha MAP) - Top dress N if required in-season – determine by fortnightly Yield Prophet™ runs at 80% probability of yield response - No upfront fungicide - Low cost foliar fungicide in crop if required

Segmented soil samples were taken at 0-10, 10-40, 40-70 and 70-100cm on 22 May to measure starting nitrogen and moisture. Phosphorus was measured as Colwell P (0-10cm).

In-crop nutrient and fungicide treatments were applied as required, determined by tissue testing and visual assessments. The crop model Yield Prophet™ was used to support nitrogen input decisions.

Emergence density of each treatment was estimated by counting plants in 3m (1m x 3) of crop row in each replicate on 17 June (Table 2). Dry matter at GS30 (17 July) and GS65 (16 October) was estimated for all treatments.

All treatments were harvested on 27 November 2008 and grain yield and quality recorded.

Location: Curyo

Replicates: 4

Sowing date: 19 May

Seeding density: 190, 150, 100pl/m² depending on treatment

Crop type: Wheat cv. Young

Seeding equipment: Smale bar (knife point press wheel), Trimble (Case IH) auto-steer (2cm accuracy) GPS, 300mm row spacing

Agronomy

A simple gross margin was calculated after harvest to determine the economics of adopting each approach.

Results

Starting nitrogen at the site was 69kg/ha to a depth 0-100cm and Colwell P of 35 with a Phosphorus Buffering Index (PBI) of 57.

The high input, best bet and low input treatments achieved plant densities of 122, 143 and 112 plants/m^2 respectively.

As the crop approached the end of tillering (GS30), Yield Prophet® showed that nitrogen availability was limiting yield in all treatments at their specified probability level (Figure 1, 2 and 3). On 16 July, 40kg N/ha, 30kg N/ha and 20kg N/ha were applied to the high input, best bet and low input treatments respectively. These nitrogen rates were based on the amount of nitrogen required to achieve potential yield at each treatments specified probability level.

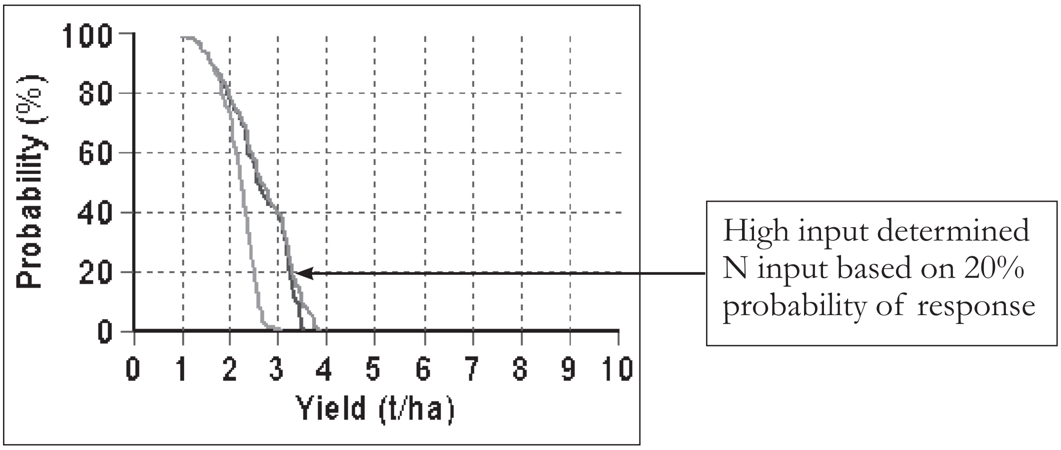

Figure 1. Nitrogen comparison report for high input treatment at 16 July 2008.

— No additional N — 40 kg N/ha — N unlimited

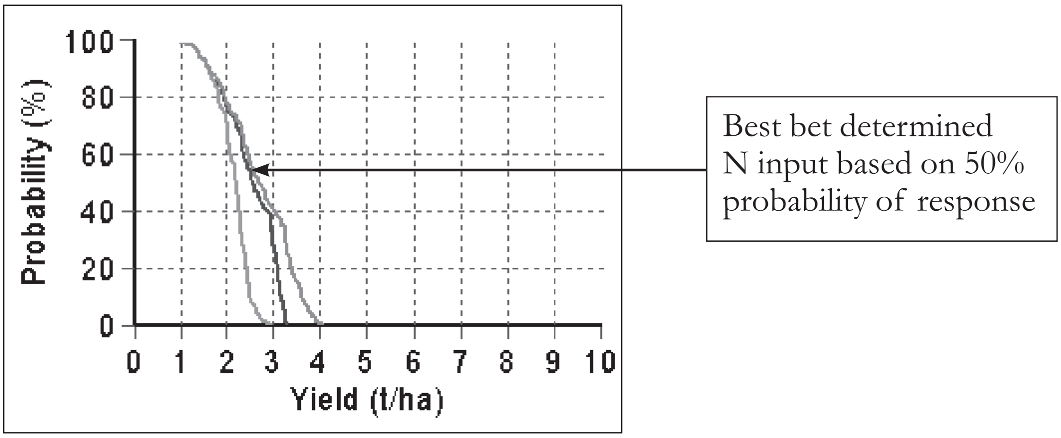

Figure 2. Nitrogen comparison report for best bet treatment at 16 July 2008.

— No additional N — 30 kg N/ha additional — N unlimited

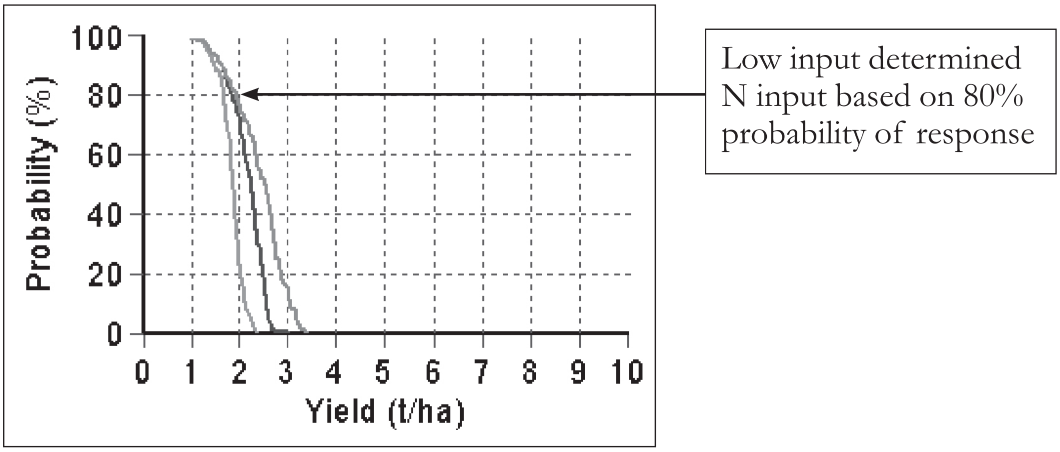

Figure 3. Nitrogen comparison report for low input treatment at 16 July 2008.

— No additional N — 20 kg N/ha additional — N unlimited

Tissue tests indicated that no foliar micronutrients were required for either the high input or best bet treatments.

There was no significant difference in dry matter production between the treatments with an average across all treatments of 364kg DM/ha at GS30 and 3.9t/ha at GS65.

There were no significant differences between the grain yield, protein or screenings of any treatments. The average yield and protein across all treatments was 1.9t/ha and 9.9 percent respectively. Screenings across treatments averaged 5 percent.

This site received 140.4mm growing season rainfall (April – October).

Interpretation

Lower seeding establishment than targeted in the high input treatment may have resulted from increased competition or occurrence of nitrogen toxicity in the seed row at 300mm row spacing. Near perfect establishment in other treatments indicates that there were some negative interactions occurring in the high input treatment.

The fact that there was no difference in dry matter at flowering between treatments highlights that even if targeting hay production, the low input strategy was sufficient to reach potential in 2008 at Curyo.

This work showed that there were no benefits in yield or grain quality from adopting a high input approach in 2008. Simple economic analysis shows that for the 2008 season, adopting a low input strategy achieved the greatest gross margin of $317/ha (Table 2). There was a difference of $115/ha between the low input strategy and the high input strategy.

Table 2. Simple economic analysis of three approaches to managing inputs. Analysis used a harvest grain price of $250t/ha. Variable costs were calculated including all input and associated operational costs eg. $4/ha for each spray application as well as the herbicide cost.

Treatment	Gross income ($/ha)	Total variable costs ($/ha)	Gross margin ($/ha)
High input	475	273	202
Best bet	475	210	265
Low input	475	158	317

Agronomy

Application

The results from this experiment and similar work carried out by BCG over the last four seasons has highlighted that in commercial practice, a low input to best bet approach is the most economical in a low rainfall environment.

Decision support tools such as soil sampling and Yield Prophet® provide valuable guidance when making input decisions, particularly regarding nitrogen application during the season.

Acknowledgements

This research was funded by the GRDC project BWD00012 'Yielding benefits through partnerships'. The authors gratefully acknowledge the contributions made to this project by Claire Browne, Karen Chapman, Liam Coffey, James Jess, Peter and Brenda Doran and James Scambler, Tim McClelland and Case IH O'Connors.