In-crop risk management

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Take Home Messages

Climate variability or climate change? Whatever the situation we face we need to be prepared to respond quickly to temperature and rainfall extremes with better in-crop management decisions.

Background

It has been headline news - 2006 was officially the 6th driest year globally and several capital cities in Australia experienced their driest year on record. Almost all of the Wimmera and Mallee experienced a decile 1 season. That is now eight out of the last ten years in which below average growing season rainfall has been recorded in Birchip and surrounding districts.

The year started off with a very dry summer and autumn resulting in very little stored soil water, which varied from 20-30mm of available moisture on fallows, to only 0-10mm on some stubble paddocks in the Birchip area. Soil nitrogen levels varied from 30kg/ha N to 70kg/ha N at sowing. In early July, the seasonal forecast provided by the SOI phase system, which is generally accurate at that time of the year, was negative, indicating that a well below average finish to the season was likely.

So how do we, as farmers, manage for this? We know that you can generally make money in an average year even if most inputs and hence costs are upfront, however this is certainly not the case if the season turns out to be below average or a drought. Traditionally most decisions are made at sowing, however we need to know if there are opportunities to be more responsive in managing the crop inputs during the season.

Aim

Can we manage inputs in-crop that will yield well in a good season whilst also maintaining yields and keeping costs down in poorer seasons?

Method

At the three BCG sites, Hopetoun, Birchip and Rupanyup, a series of in-crop risk management plots, similar to previous years, where high, medium and low risk management strategies were demonstrated in plots. The model Yield Prophet® was used to model likely yield responses to various management strategies throughout the year based on current seasonal conditions.

Trial design: Demonstration only at each site.

Sites: Birchip (not harvested), Rupanyup and Hopetoun

Crop: Yitpi wheat at Birchip; Yitpi wheat at Rupanyup; Wyalkatchem wheat at Hopetoun

Sowing date: 21 May Birchip, 17 May Rupanyup, 12 May Hopetoun

Treatments: See Table 1.

Table 1: Treatment description and cost for each treatment. Costs are worked out on inputs and machinery costs (machinery is costed at local contract rates).

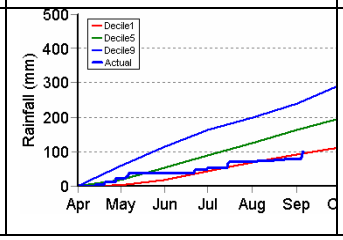
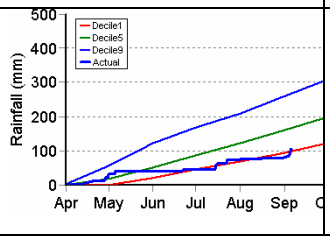
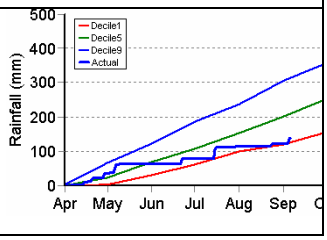
Treatment	Description	Cost/treatment $/ha
High Input	Go for maximum yield! 100kg/ha Yitpi; predrilled urea 60kg/ha; 55kg Supreme10Z; Triad on the fertiliser	189
Moderate Input	Best Bet – spread your risk 80kg/ha Yitpi; 40kg/ha Supreme10Z	120
Low Input	Cut your costs 50kg/ha Yitpi; 30kg/ha MAP	103
In-crop canopy manipulation	Dry since sowing - drought finish 80kg/ha Yitpi; 40kg/ha Supreme10Z; remove every 3rd row	138
In-crop nitrogen topdress	Good outlook 80kg/ha Yitpi, 40kg/ha Supreme10Z, 60kg/ha top-dress Urea (only applied if outlook is for a decile 8 finish)	155

At Hopetoun a small area was irrigated (at two timings x 60mm water at each) to investigate the yield difference if it had rained for 2 more events during the season (therefore it was assumed rain water). This irrigation water was not included in the gross margin calculation at Hopetoun.

Forecasts and conditions during the year

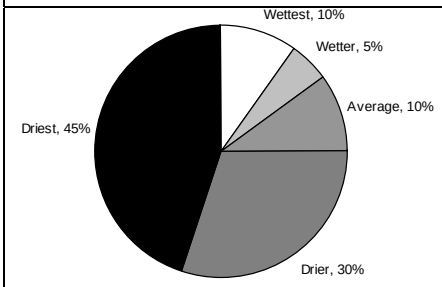
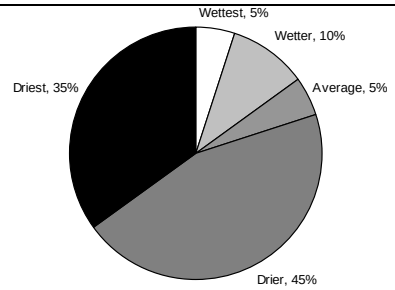
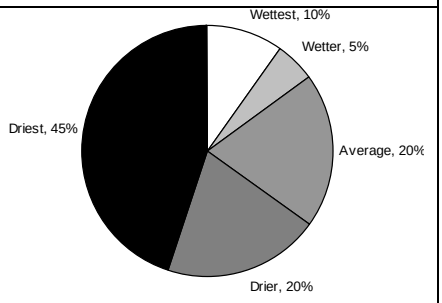
Decile: At the start of September when decisions regarding further inputs for treatments were made, all sites were at decile 1 (based on rainfall from April 1 to 1 September) i.e. growing season rainfall to date had been in the driest 10% on record. At this stage of the year it is highly likely that the current decile range will continue for the rest of the season. Hence the most likely outcome for the 2006 season was that we would finish in a decile 1 to 2 growing season.

Table 2: Growing season rainfall and decile finish for Hopetoun, Rupanyup and Birchip

	Hopetoun	Birchip	Rupanyup
GSR up to 7/9	99 mm	100 mm	139 mm
Decile up to 7/9	1	1	1
			

SOI: The July-August phase of the Southern Oscillation Index (SOI) was negative. The July-August phase has a relatively high level of skill in our region at that time of year (Table 3) and was predicting a drier than average September-November as the most likely outcome.

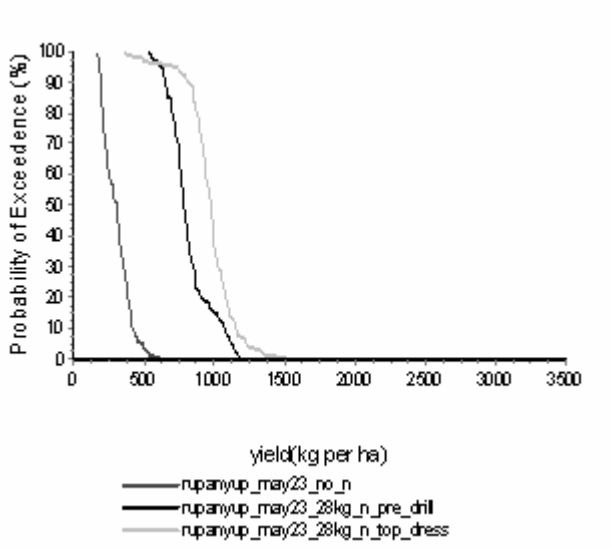
Table 3: The probabilities of getting a driest (1 in 5 dry), drier, average, wetter or wettest (1 in 5 wet) season finish at Hopetoun, Birchip and Rupanyup.

Hopetoun	Birchip	Rupanyup
75% chance of a drier than average season finish	**80% chance of a drier than average season finish**	**65% chance of a drier than average season finish**
		

BOM: In early September the Bureau of Meteorology forecast was favouring neither drier nor wetter than average conditions across Victoria. The chances of accumulating at least median rain during September-November were close to 50% for most of the Wimmera Mallee. This should not be mistaken as a forecast for 'average' conditions, rather an indication that all outcomes are equally likely.

Yield Prophet®: At sowing in mid-May, Yield Prophet® indicated that whilst there was likely to be a response to nitrogen at all sites (Figure 1), it made little difference to the final yield if the nitrogen was predrilled or top-dressed. Therefore there was going to be no yield penalty if topdressing was held off until September when we were more confident with how the season was tracking.

Rupanyup yield probabilities at sowing



Hopetoun yield probabilities at sowing

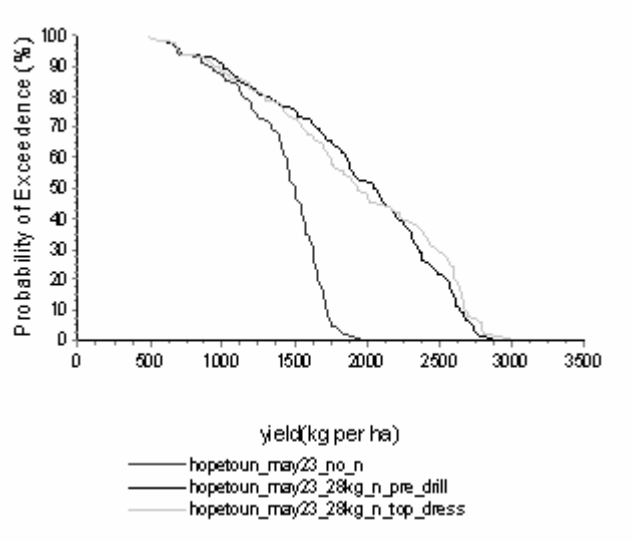
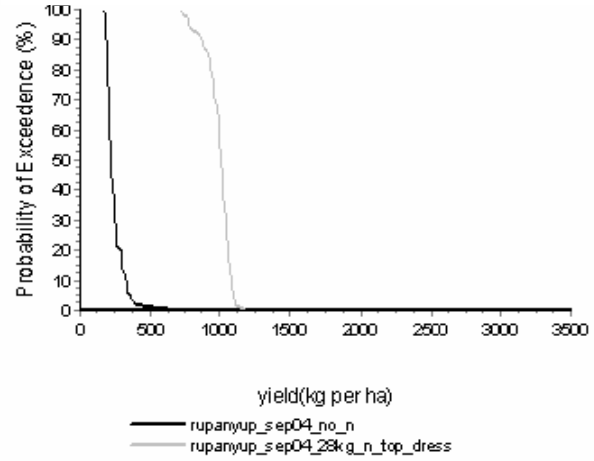


Figure 1: Yield (kg/ha) probabilities at sowing for Rupanyup and Hopetoun and response to nitrogen

When the decision to top-dress was made ahead of the rain in early September, Yield Prophet indicated that a profitable nitrogen response at Hopetoun was out of the question, whilst considerable yield increase was still likely at Rupanyup (Figure 2). At Hopetoun in-crop

management would suggest low input decisions would be best for gross margins, where as at Rupanyup, topdressing would be the better option with less risk compared to pre-drilling at sowing.

Rupanyup yield probabilities in September



Hopetoun yield probabilities in September

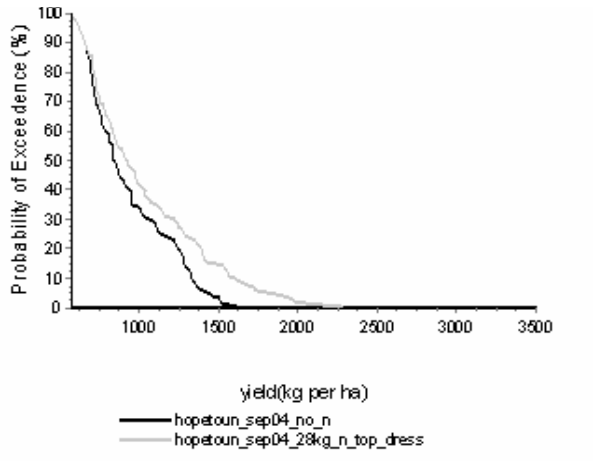


Figure 2:. Yield (kg/ha) probabilities in September for Rupanyup and Hopetoun and response to nitrogen.

Results

Yield Prophet® and the decile and SOI phase system forecasts were accurate in predicting the below average finish to the season as the most likely outcome. The rain that most of our region received at the beginning of September was not followed up during the critical late Sept-Oct period. The warm, dry and windy conditions that prevailed meant that many cereal crops approached grain-fill 2-3 weeks early and with very little available water. The frost in the last week of September, and multiple frosts during October, also damaged cereal crops, particularly in the Wimmera with many farmers cutting canola and cereal crops for hay.

Despite the dry conditions, Yield Prophet® was accurate in its yield simulations, doing better at Rupanyup (Table 4) in comparison to Hopetoun (Table 5). Yield Prophet® does not take into account the effects of frost and disease, or rhizoctonia at the Hopetoun site which resulted from the trial being planted into wheat stubble which contributed significantly to Yield Prophet's® over prediction of yield at Hopetoun. The final simulation for the Birchip site was for 0.3 t/ha, however this site was un-harvestable. Yield Prophet® under predicted the protein% at Rupanyup compared to the actuals however protein predictions at Hopetoun were reasonably accurate.

Table 4. In-crop risk management trial at Rupanyup yield (t/ha) and protein (%) of actual results compared to the Yield Prophet predictions.

Treatment	Actual Yield (t/ha)	Yield Prophet Yield (t/ha)	Actual Protein (%)	Yield Prophet Protein (%)	Income* ($/ha)	Cost# ($/ha)	GM ($/ha)
Max Yld	1.14	1.3	11.8	9.3	331	189	142
Best Bet	0.74	0.6	9.4	5.6	215	120	95
Low Input	0.72	0.5	10.2	6.0	209	103	106
Best Bet + 3rd row removed	0.58	-	8.6	-	168	138	30
Best Bet + Topdressed	0.92	1.2	11.5	9.6	267	155	112

Income calculated using a rate price through the domestic market

Costs calculated from input costs and operations (based on local contract rates)

The Yield Prophet model was predicting a yield response to nitrogen at the Rupanyup site all year (Figure 2) due to the low levels of available nitrogen in the soil profile at sowing (65kg/ha). The actual yields reflected this and the Maximum Yield treatment and the Best Bet + Top-dressed treatment (the only 2 treatments with added nitrogen), produced the highest yields. Due to the high domestic grain prices in 2006 the Maximum Yield and the Best Bet + Top-dressed treatments also produced the highest gross margins at Rupanyup.

Table 5: In-crop risk management trial at Hopetoun yield (t/ha) and protein (%) of actual results compared to the Yield Prophet predictions.

Treatment	Actual Yield	Yield Prophet	Actual Protein (%)	Yield Prophet	Income* ($/ha)	Cost# ($/ha)	GM ($/ha)
Max Yld	0.42	0.8	15.2	16	116	189	-73
Best Bet	0.46	0.8	15.5	15.7	127	120	7
Low Input	0.46	0.8	15.5	13.8	127	103	24
Best Bet + 3rd row removed	0.5	-	15.6	-	138	138	0
Best Bet + Topdressed	0.49	0.8	16.8	16	135	154	-20
Max Yld + irrigation	0.89	1.7	14.6	14.4	245	120	125

Income calculated using a rate price through the domestic market

Costs calculated from input costs and operations (based on local contract rates)

At Hopetoun the yields were similar across all treatments except for the irrigation plot, where yields were almost double all other treatments. Note: The irrigation application was not calculated as a cost as we were only simulating the yield increase in this paddock had it rained another 120mm (4.8inches). For Hopetoun, given that the yields were low and there was no response to nitrogen, the gross margin for the Low Input plot worked out to be the best. Both plots with urea applied produced a negative gross margin.

At Birchip all input costs were the same. In this case, with no harvest at Birchip, all treatments produced a negative gross margin with the Low Input plot being the least expensive.

To calculate gross income, a domestic price of $290/t on farm was used for Rupanyup and $275/t on farm for Hopetoun. Very few growers delivered to the silos this year therefore it was decided to use a flat price rather than a price based on the AWB classification payment scheme. Costs were based on input costs plus the cost of the operation. The gross margin is the difference between the gross income and costs.

Interpretation

BCG's risk management trials and Nick Poole's canopy management experiments have repeatedly shown that delaying nitrogen inputs until later in the season when forecasts are more certain is a very effective risk management strategy, and can be done without compromising yield in good seasons. The Best Bet treatment top-dressed in September resulted in a slightly lower gross margin than the High Risk plot but better than any of the Low and Marginal input plots, keeping in mind that this was not a replicated trial and the ranking order may have been different if it was replicated.

At the Hopetoun site, where yields were significantly less than what was observed at Rupanyup and soil nitrogen levels were adequate for the target yield, the Low Input plot came out in front. This highlights the importance of soil testing prior to sowing and delaying expenditure on nitrogen fertiliser to match seasonal conditions and revised target yields. At Rupanyup, where there wasn't enough available N to meet the target yield, the 2 plots with added N produced the best gross margins. At Hopetoun soil available N was adequate for the target yield therefore the Low Input crop was the best strategy to employ.

At the Rupanyup site, where the soil was low in available nitrogen, those treatments that had nitrogen applied (Trt 1 High Input and Trt 2 Moderate Input + topdressing) had the highest actual and predicted yields. At the Hopetoun site, where disease was an issue due to cereal on cereal, there were no treatment differences between crop management strategies except for a plot, which was irrigated twice with 60mm of water, producing the highest yield.

Commercial Practice

To manage your inputs in-crop there are several tactics to employ:

- Know the potential of your soils (subsoil limitations)
- Measure available moisture and nitrogen at sowing
- Check forecasting tools regularly (SOI, BOM, YP, Deciles etc)
- Tailor crop choice and upfront inputs according to stored soil moisture and time of the break as well as seasonal forecasting models.
- Delay inputs of nitrogen until more certain of seasonal forecasts
- Watch your costs – question all inputs and advice
- Delaying inputs does not mean limited yields – see Canopy Management paper.
- Monitor crops regularly (disease, nutrient deficiencies, insects, weeds etc) and apply inputs to match realistic yield expectations