Yield Prophet® 2007

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Take home messages

- *2007 was an unusual year and one in which playing the odds as they looked at the start and middle of the growing season did not pay off.*
- *When making decisions based on probability, be aware of the likelihood and consequences of downside risk.*
- *Our climate is changing; climate science is moving away from forecast systems that rely on the past to predict the future and investing its efforts in improving general circulation models.*
- *Yield Prophet in 2008 will be capable of simulating paddock-specific yields under climate change scenarios for 2030.*

2007 probability post-mortem

2007 was the fifth season that Yield Prophet has been run commercially by BCG, and it certainly saw its heaviest use to-date, with over 9,000 reports generated by users from all over Australia. In many ways, it was also the most challenging season to date. Whereas years such as 2004 and 2006 were tough years, they were predictably tough in that Yield Prophet could give an early indication that the chances of exceeding average yields during the growing seasons of those years were low. In 2007, the ideal autumn break that occurred in most of the Wimmera and Mallee gave crops enormous yield potential (Figure 1). Had we experienced average rainfall from then on, cereal yields would have been well above average. Unfortunately, this is not what occurred. Far from receiving average rainfall, most of the Wimmera-Mallee experienced decile 1 rainfall during winter and spring. This meant that actual yields at the end of the season were in the range that the Yield Prophet probability curve generated at sowing suggested would be exceeded in 90-100% of seasons.

This gives an indication of how unlikely the actual seasonal outcome of 2007 was. With around an 80% chance of exceeding average yield as crops neared the end of tillering (Figure 2), it is little wonder that significant forward sales of grain were made as prices rose. The painful lesson to absorb is the importance of looking closely at down-side risk when the consequences of that risk are severe. During the growing season, although the probability that we would achieve the yields we did was low, Yield Prophet tells us that such yields were always possible. This is what Yield Prophet does – it provides the odds on yield outcomes occurring. It is up to managers to assess what these outcomes will mean for them and their business individually.

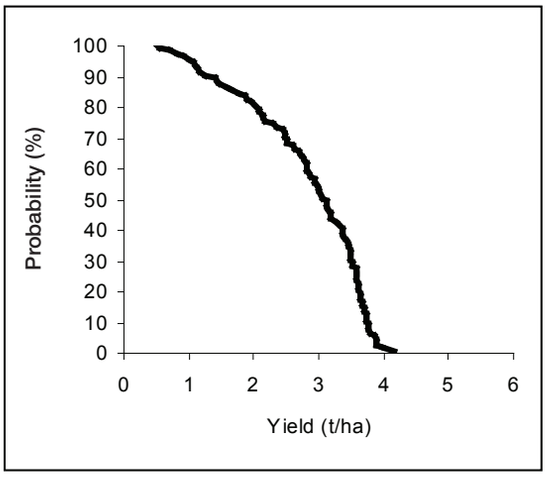

Figure 1. Yield Prophet yield probabilities at sowing (24 May 2007) for the 'best bet' treatment of the BCG 'Risk management' trial at Birchip.

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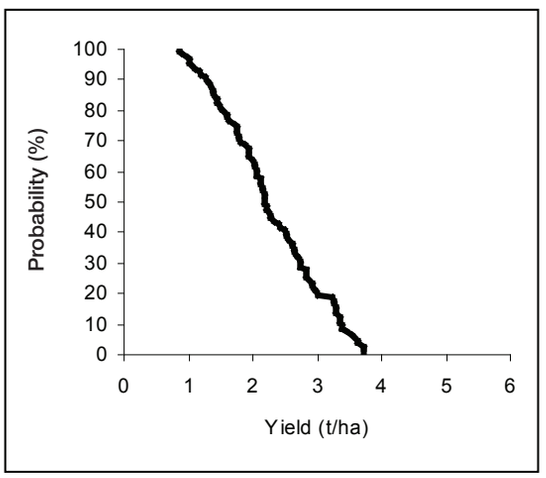

Figure 2. Yield Prophet yield probabilities for the 'best bet' treatment of the BCG 'Risk management' trial at Birchip as the crop approached the end of tillering (23 August 2007).

For instance, Yield Prophet indicated in August that there was an 80% chance of exceeding 1.5t/ha at the BCG main site (Figure 2). Whilst the odds of achieving this yield were favourable, if this yield were contracted to be forward sold, the chances of **not** being able to fulfil the contract were 20% (or 1 in 5). These odds are not inconsiderable, but it is up to managers to decide whether they and their business can bear this risk given the consequences of outcomes.

Where Yield Prophet was able to come into its own in 2007 was toward the end of the growing season. Because the year was so unusual and beyond collective farming experience, Yield Prophet was able to provide reassurance that crops could still produce significant yields on April and May rainfall, without much significant rain falling during winter and spring. Even if crops experienced one of the driest finishes on record, which it turns out they did, yields at the 100% mark should still hold. This information was particularly valuable when decisions regarding cutting crops for hay were being made.

Yield Prophet in 2008 and beyond

There is no denying that 2007 was climatically unusual - a La Niña in the Pacific Ocean has never before occurred simultaneously with a positive Indian Ocean dipole. For Birchip and many other places, it was also the eleventh consecutive year of growing season rainfall at or below the 1900-1996 average. This combined with recent media focus on climate change has fuelled speculation that reduced rainfall in south-eastern Australia in recent years may be the result of global warming due to increased greenhouse gas emissions. However, no scientific study has yet attributed a cause to the rainfall decrease in south eastern Australia (Nicholls 2006). Regardless, the fact that our climate is changing does have implications for climate and yield forecasting systems that rely on events of the past to predict the future. This includes the forecasting systems currently used by Yield Prophet. If, in the future, we experience a distribution of seasons that are not represented by the variability of our historic climate record, the probability outcomes of Yield Prophet will not fully capture the new distribution. To address this possibility, several new tools are being developed and evaluated for inclusion in Yield Prophet.

The first of these is an effort to evaluate the likely benefits from integrating forecasts from general circulation models (GCMs) into Yield Prophet. The future of seasonal climate forecasting lies with GCMs, and the Bureau of Meteorology's POAMA model, and the UK Met Office's GloSea are examples of GCMs for which output is currently available to the general public (http://www.bom.gov.au/climate/ahead/ENSO-summary.shtml). As opposed to statistical forecast systems such as the SOI Phase System and DAFWA's Experimental Analogue Years which use past relationships between ENSO phenomena and Australian rainfall to predict the future, GCMs model the circulation of our atmosphere and ocean into the future using current observations as a starting point. Until now, GCMs have only provided forecasts of climate indices such as sea surface temperatures in the eastern Pacific Ocean. The next generation of GCMs will be capable of providing temperature and rainfall forecasts at specific locations, which can be used by Yield Prophet to generate a yield forecast that is independent of historic climate records. Evaluating GCM output with an eye to including it in Yield Prophet will be a priority in 2008 and beyond.

To ascertain how forecast global warming is likely to affect yields, a new climate change report will be added during 2008 that will allow users to assess how climate change forecasts developed by CSIRO and the BoM, based on climate change scenarios for 2030 that were published by the Intergovernmental Panel on Climate Change (IPCC), will impact on likely yields for their farm. Yield Prophet will make these reports specific to paddock location, soil type and sowing times, and will be an invaluable tool for managing climate change into the future.

Commercial practice

Yield Prophet is an invaluable tool for managing climate variability and its impact on many aspects of management. From 2008, it will also be capable of assessing forecast impacts of climate change. Accuracy results from Yield Prophet in 2007 will be posted on the Yield Prophet website in February and registrations for 2008 will open in early March – www.yieldprophet.com.au.

References

Nicholls N (2006) Detecting and attributing Australian climate change: a review. *Australian Meteorology Magazine* **55**, 199-211. http://www.bom.gov.au/amm/200603/nicholls.pdf