Maximising profit when growing Mace

August 2015

This update reports the interim results of MaceMax; a multi-year, multi-environment trial designed to determine the most economic method of growing Mace, and has been produced in response to the large number of enquiries we have received from growers regarding the trial. These results are from the first year of the trial and, as such, should be used as a guide only. As additional data is generated each year, a more reliable picture will emerge.

Why do the trial?

Cost of production is an important consideration in all grain growing operations. Aiming for maximum yield and grade to maximise income is intuitive, but how does that affect the bottom line? Aiming for high yield and protein is logical but what is the most profitable method to grow wheat? As Mace is currently the most widely grown wheat variety in South Australia, we decided to test different levels of inputs in order to gain an idea of the most profitable method to grow this variety.

What did we do?

Four sites in South Australia and one in western Victoria were chosen to cover a wide range of environments. In all, 24 combinations of seed rate, nitrogen, fungicide, trace elements and plant growth regulators were tested in three replicates at each site. Three seed rates were used: a high rate of 300 seeds/m^2 (110kg/ha), a moderate 150 seeds/m^2 (55kg/ha) and a low rate of 75 seeds/m^2 (30kg/ha). All plots were sown with 80kg/ha DAP, giving a base nitrogen application of 14.4kg/ha. Where extra nitrogen was required, liquid nitrogen was applied soon after seeding (1 – 2 weeks) and again at GS31. Fungicide was applied at GS31 and GS39 (250g/L Propiconazole at 500mL/ha). Trace elements and plant growth regulators were applied at GS31.

The data generated was analysed both within individual sites and across sites, in a multi environment trial (MET). The MET analysis indicates which treatment effects are consistent across environments.

Treatment costs were calculated using current retail prices. Application costs were adapted from the GRDC Gross Margin Guide. The value of seed used at each seed rate was also included in the analysis.

Results at a glance

- Although no rust was present in any of the trials, applying fungicide increased yield (150kg/ha) and test weight (0.4kg/hl), but had no significant effect on protein content, screenings or thousand grain weight.
- Plant growth regulators and trace element application had no significant effect on yield, protein content or grain size.
- Seed rate was the biggest driver of yield in this trial. Increasing seed rate from 75 seeds/m^2 to 300 seeds/m^2 increased yield 380kg/ha. (Figure 1). Although the magnitude of the effect on yield varied across the sites, they followed the same trend, suggesting there is scope to alter seeding rate to maximise yield at most sites. Thousand grain weight was reduced with increasing seed rate, but screenings were still less than 2% at all locations.
- Adding nitrogen increased protein percent approximately 0.5% for every 50kg/ha of nitrogen applied (Figure 2). Grain protein response to nitrogen varied across sites corresponding to soil nitrogen levels prior to seeding (Figure 3), where Angas Valley and Kaniva had lower top-soil nitrogen levels (15 – 17mg/kg) than the other sites (24 – 32mg/kg). The extra nitrogen decreased test weight and thousand grain weight. However, all test weights were well above the minimum required. Increasing nitrogen did not have a significant effect on yield or screenings.
- Increasing seed rate and nitrogen improved the yield and quality grade of Mace (Figure 4). However, the high input, high yield system is not necessarily the most economical (Tables 1 and 2, Figure 4).

Figure 1: Average effect of seed rate on yield across all MaceMax trial sites, 2014.

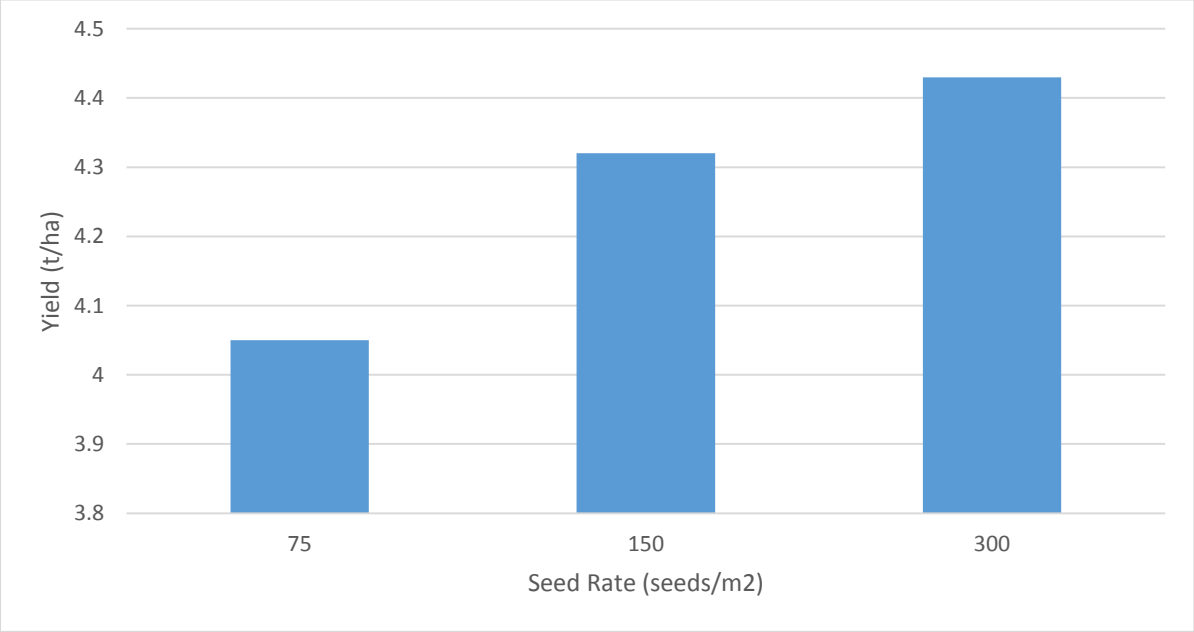


Figure 2: Average grain protein response to nitrogen application across all MaceMax trial sites, 2014.

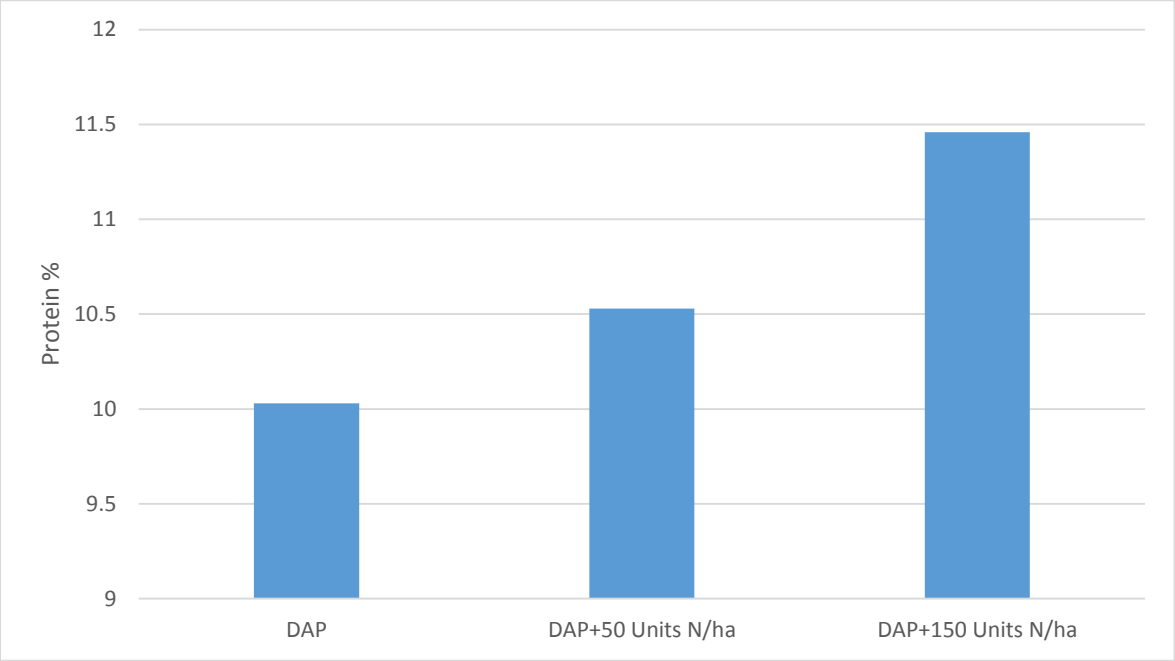


Figure 3: Grain protein response to nitrogen application at each MaceMax site, 2014. Soil nitrogen levels (mg/kg) at each site prior to seeding are noted in brackets.

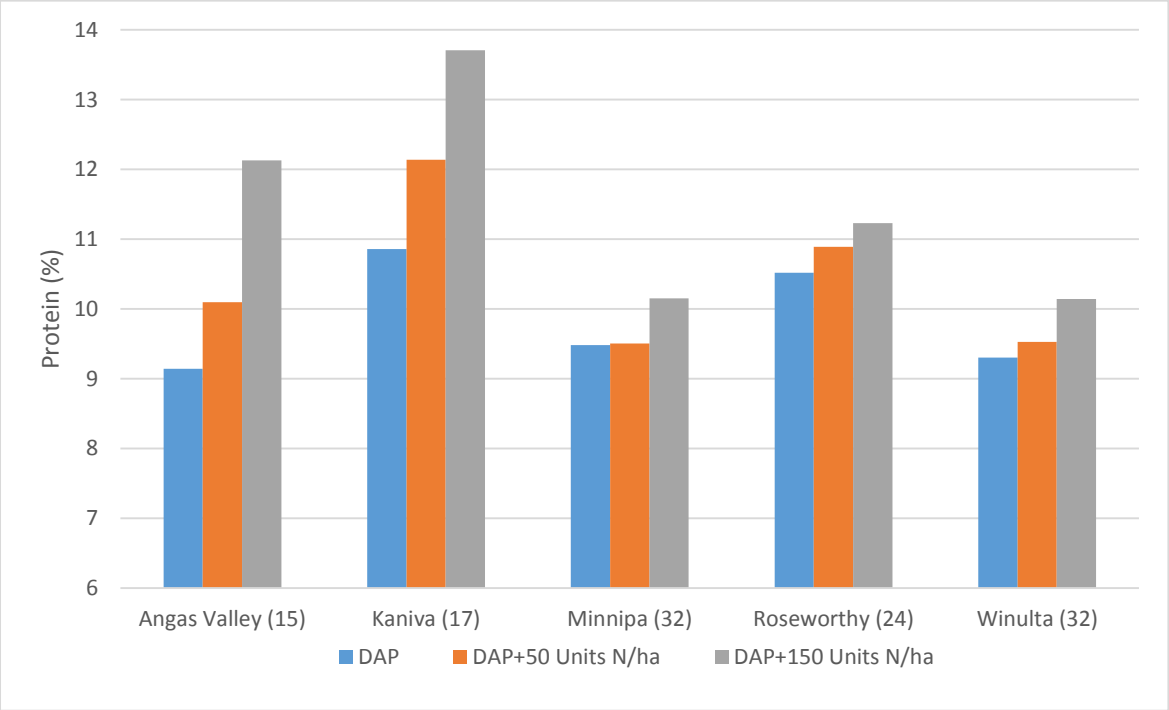


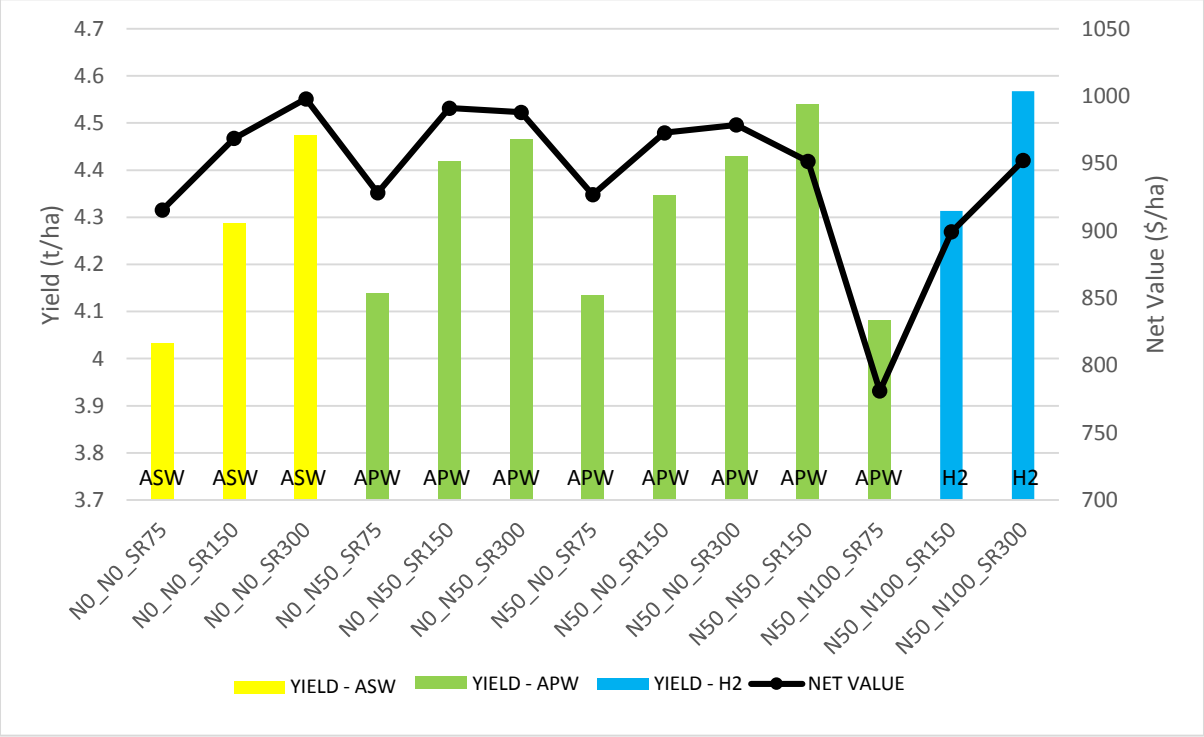
Table 1: Comparison of yield, protein and financial return of different inputs in the multi-site 2014 MaceMax trial. Nitrogen at sowing refers to nitrogen applied in addition to DAP.

Seed rate (seeds/m^2)	Nitrogen (sowing)	Nitrogen (GS31)	YIELD (t/ha)	PROTEIN (%)	NET VALUE ($/ha)
150	0	0	4.29	9.9	969
300	0	0	4.47	9.8	998
150	0	50	4.42	10.5	991
300	0	50	4.47	10.6	988
150	50	100	4.31	11.6	899
300	50	100	4.57	11.5	952

Table 2: Treatments providing the best return at each MaceMax trial site, 2014.

Trial site	Seed rate (seeds/m^2)	Nitrogen (sowing)	Nitrogen (GS31)	YIELD (t/ha)	PROTEIN (%)	NET VALUE ($/ha)
Angas Valley	150	0	50	4.41	10.05	989
Kaniva	300	0	0	2.99	10.35	685
Minnipa	300	0	0	3.8	9.68	838
Roseworthy	300	0	50	5.53	11.73	1344
Winulta	150	0	0	6.05	8.94	1390

Figure 4: Yield and return after seed and nitrogen costs across all MaceMax trial sites, 2014. N refers to nitrogen added in addition to DAP at two time points; sowing and GS31.



Conclusion

The cost of extra inputs must be less than the return resulting from those inputs. Currently the price increase from APW to AH2 is approximately $16 (10 year average) and the cost of adding 50kg of nitrogen as urea is approximately $70/ha. Therefore, adding 50kg of nitrogen per hectare to improve the crop value from APW to AH2 will only be worthwhile in a crop that yields more than 4.4t/ha, and only if 50kg/ha of nitrogen is enough to improve the quality grade. None of the best returns in this trial included high nitrogen application, and none of the highest yields had the highest financial returns. The lower input systems were the most cost effective at all sites. The conclusion that can be drawn from this is that in 2014, chasing higher protein and higher yields was counterproductive to the objective of high profits.

These results should be considered with the following additional notes:

- This is the first year of the trial. It will be repeated to validate these results.
- Each year is different, in 2014 the tight finish to the season probably reduced the profitability of most inputs, particularly nitrogen.
- The results were calculated using a 10 year average price for all grades. These will change from year-to-year, but based on the 2014 results, and due to the cost of applying nitrogen, there needs to be a much larger price differential to warrant chasing high protein.
- This trial used liquid nitrogen due to logistical limitations associated with trial management. The treatment costs were calculated using the price of urea for the equivalent total nitrogen application (given that this is normal practice). The effects of urea may vary slightly to those of liquid nitrogen.
- The costs were calculated based on individual applications. Some treatments may be combined which would reduce the overall cost, but qualified advice should be sought on this.
- Application costs were taken from the GRDC Gross Margin Guide and may vary between operations.

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