Groundwater Nitrates Economics: 2019 Case Study

Burdekin BRIA grower: Brendan Swindley

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries to identify costs and benefits of the trials. In this study, Brendan Swindley and Farmacist trialled the application of a reduced Nitrogen (N) rate to account for the nitrates supplied through irrigation water.

The objective was to assess whether applied N rates for high groundwater nitrate areas could be reduced without reducing yield or profitability. If the trial yields positive results, Brendan would like to adopt lower N application rates in late ratoons to compensate for nitrates supplied by irrigation water.

Trial Design

The replicated and randomised strip trial was established during 2018 in a first ratoon crop of Q183 harvested in 2019. The trial compared the yield and profitability of applying a reduced rate of 130 kg N/ha against 170 kg N/ha. Each treatment had four replicates with a randomised complete block design. Yields and profitability were measured to compare the treatments. The trial followed a similar methodology to the trial Brendan conducted during 2017-18 on a different block.

Costs

Applying 130kg N/ha reduced fertiliser costs by $98/ha. Harvesting costs and levies also varied as these were dependent on yield. All other costs were the same for both treatments. Figure 1 shows a breakdown of the average variable cost for each treatment.

Key findings

- A higher average yield and CCS for the higher N rate (170kg N/ha) resulted in a higher average gross margin, although not statistically different (at 5% significance level).
- Results suggest there is a need to further investigate the contribution of ground-water nitrates to crop N uptake in early ratoons.

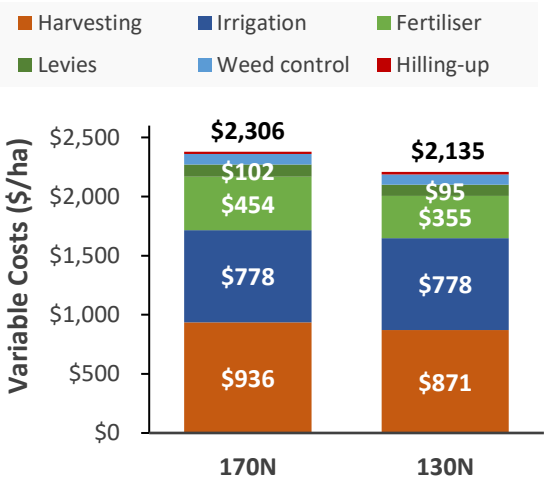

Figure 1: Variable cost breakdown

Results

Table 1 shows the higher N rate treatment (170 kg N/ha) had a higher average cane yield and CCS. The differences in both yield and CCS were not statistically significant and therefore could not confidently be attributed to the different N rates.

Table 1: Average cane yield and CCS.

	170N	130N	p-value
Cane yield, tch	126.5	117.7	0.397
CCS, units	15.46	15.28	0.616

Gross margins (revenue less variable costs) were determined to compare the profitability between treatments. Figure 2 shows that the average gross margin for 170N was $293/ha higher than for the 130N treatment, although a statistical analysis of the economic results indicated that the differences in gross margins were not statistically significant.

It is also important to note that there was a wide variation in production results within treatments, particularly for the 170N treatment whose yields ranged from 108 to 139 t/ha. This suggests that other factors may be influencing production.

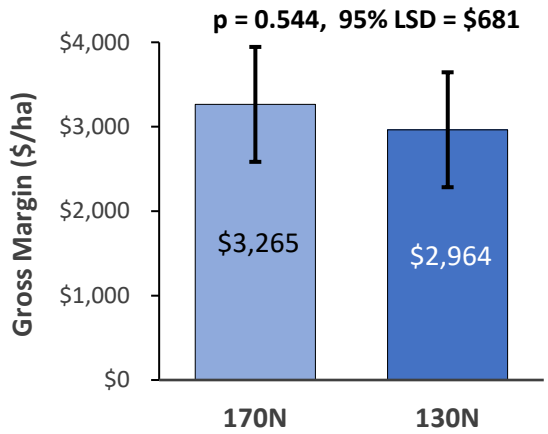

Figure 2: Average gross margin – *error bars indicate the 95% least significant difference (overlapping bars indicate no significant difference).*

In contrast, Brendan's 2017-18 trial showed the lower rate of N (107kg N/ha) obtain a higher average yield and CCS. This resulted in a higher average gross margin (+$306/ha), although this difference was also not statistically significant.

Conclusion

The ground water used for irrigation at the trial site was identified as being high in nitrates. The trial sought to determine if applied N could be reduced, while maintaining yield and profitability in the first ratoon.

The higher gross margin for the 170 kg N/ha treatment was driven by a higher average cane yield and slight improvement in CCS. However, the difference was not statistically significant and further investigation is necessary to validate the results. This would include measuring nitrate levels in irrigation water, introducing additional treatments (including a zero N treatment) and further trials.

With a better understanding of the nitrates being supplied to the crop through irrigation water, adjusted nutrient rates may help improve farm profitability in ratoon crops and water quality outcomes.

Note: The trial results are specific to this grower, paddock and prevailing conditions.

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