Variable N Economics: 2019-20 Case Study (trial D)

Mackay grower: Tony Bugeja

Growers participating in Project Catalyst trials worked with economists from the Department of Agriculture and Fisheries (DAF) to identify costs and benefits of the trials. In this study, grower Tony Bugeja and Farmacist trialled varied N (nitrogen) rates.

The trial objective was to examine both the sugar yield and profitability of varying nutrient rates from three treatments in a high yielding block. Treatments included a "Six-Easy-Steps" (6ES) rate, a 6ES + ~15% N rate and a 6ES + ~25% N rate. The average agronomic and economic results are presented for data collected in 2019 and 2020 for 2nd and 3rd ratoons respectively.

Figure 1: Tony Bugeja on his farm (Mackay region)

Trial Design

The trial was conducted by Farmacist and Tony Bugeja on his farm located 15km south-west of Mackay. The trial was harvested during the 2019 and 2020 seasons from a paddock planted with variety Q240.

The trial included a base application of N (6ES rate) with an additional application of N using urea to meet trial specifications. It was both a replicated and randomised strip trial. Table 1 presents the average N application rates for each treatment as applied to each ratoon.

Key findings

- There was no economic advantage from applying a higher rate of N (above the Six-Easy-Steps rate).
- Despite a significantly higher average yield at both higher N rates, gross margins were not significantly different due to the CCS impact.

Table 1: Average N applied (kg/ha, 2nd & 3rd ratoon)

Product (+ N %)	6ES	6ES +15%	6ES +25%
Econo LOS	150	150	150
Urea	0	20	40
Total N	150	170	190

Agronomics

Figures 2 and 3 present average yield and CCS results for each treatment from the 2019 and 2020 seasons. Both 6ES+15% and 6ES+25% resulted in higher yields compared to the base 6ES rate of N. However, both also resulted in significantly lower CCS translating to no statistical difference in sugar yields (Figure 4). This follows results from previous studies (e.g. the RP20 project taken over 5-years for 23 replicated/randomised trials) where higher N rates also resulted in lower CCS.

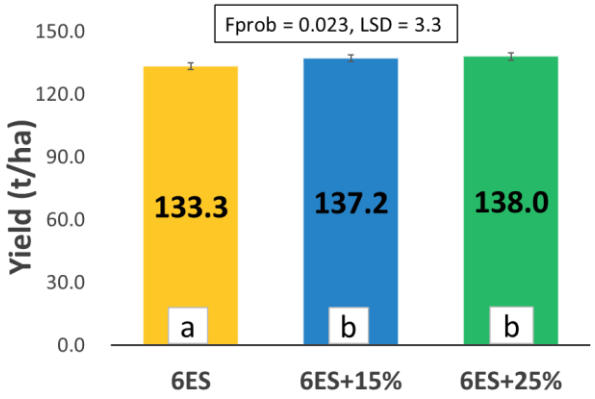

Figure 2: Average yield (t/ha) 2019-2020
Source: Farmacist. Error bars indicate 95% least significant difference and different letters indicate statistically significant differences. Note: same applies to figure 3.

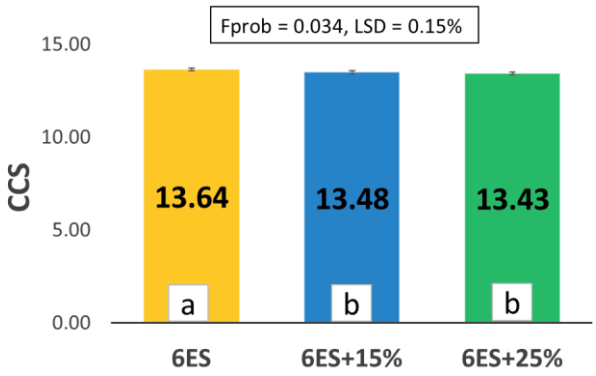

Figure 3: Average CCS (units) 2019-2020
Source: Farmacist.

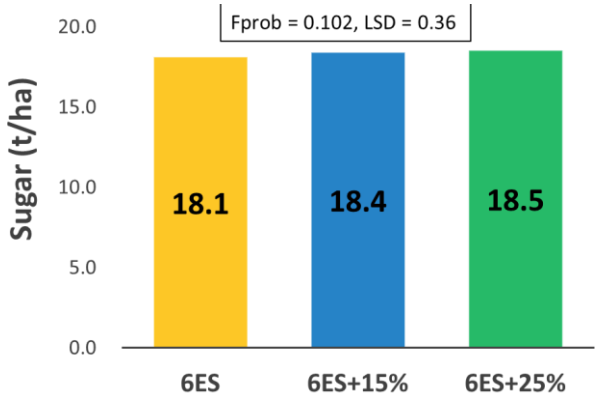

Figure 4: Average sugar yield (t/ha) 2019-2020
Source: Farmacist.

Costs

Differences in average variable costs were largely attributed to fertiliser cost variations. Fertiliser costs were calculated as a single application to reflect commercial practice (product pricing included application costs). Figure 5 shows that an additional 40 kg of N cost an average of $89/ha more for the 6ES +25% treatment. Other cost differences were linked to changes in harvesting costs and levies due to variations in yield.

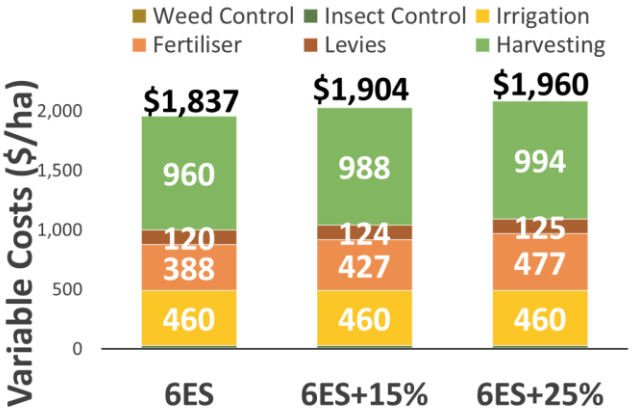

Figure 5: Average variable costs 2019-2020

Gross Margins

Gross margins (revenue less variable costs) were not significantly different between N treatments (figure 6, based on a 5-year average sugar price of $417/t). With the lowest average gross margin found at the highest N rate ($56/ha less compared to the 6ES treatment), there is likely no benefit in applying an N rate above the 6ES rate.

A sensitivity analysis shows that for the 6ES+15% treatment gross margin to break-even

with the 6ES treatment, a sugar price of $531/t is required. This is higher for the 6ES+25% treatment at $796/t.

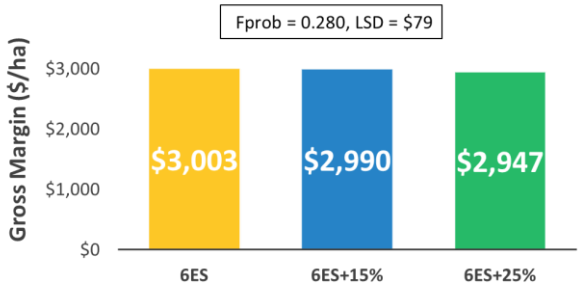

Figure 6: Average gross margins 2019-2020

Conclusion

Although higher N rates gave statistically significant improvements in yield, they also showed significantly lower CCS results when compared to the 6ES treatment. Overall, sugar yields were not significantly different.

Given similar sugar yields, the marginally higher variable costs to apply more N gave a slightly higher mean gross margin for the 6ES treatment. This was also due to lower costs related to lower yields (e.g. harvesting and levies), and the higher marginal grower revenue benefit of a CCS improvement relative to yield. However, the difference in gross margins were not statistically significant.

To-date, results from the trial follow previous research outcomes where N rates above industry recommendations produced higher yields offset by lower CCS values. Incorporating results from the 4th ratoon would confirm whether the full crop cycle follows this trend but unfortunately due to grub and pig infestation the block sustained severe damage and requires replant.

Results from the second crop cycle is required to determine longer-term effects as Tony anticipates mineralisation to play a role in later crops.

"It's going to be interesting to see how 6ES compares over a longer-term trial given the effect mineralisation and farming practice has on yields. This will be important when considering vertical expansion and the impact on our industry."

- Tony Bugeja.

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

We acknowledge the significant contribution made by Farmacist to this publication and to David Reid (DAF) for the statistical analysis and guidance.

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Publication date: February 2021

Project Catalyst is funded by the partnership between the Australian Government's Reef Trust and the Great Barrier Reef Foundation, and the Coca-Cola Foundation with support from WWF-Australia and Catchment Solutions Pty Ltd.