Reduced N on late ratoons – economic case study, Tully region

Grower: Chris Condon

Chris Condon farms 1430 hectares of sugarcane in the Tully region. He is trialling reduced fertiliser rates on late ratoon blocks to see if he can improve profitability and lower his impact on the environment. As late ratoon sugarcane crops generally have a lower yield potential (and therefore take up less nutrients) compared to early ratoons,[1] lower fertiliser rates might be able to be applied to these crops without adversely affecting yield.

Key findings

- In both trials, the reduced fertiliser treatments recorded higher gross margins than the standard rate treatments.
- However, statistical analysis found that there was no significant difference between any of the treatment gross margins.

Trial description

Chris has established two separate trials in 2015 and 2016. The 2015 trial is in the Murray Upper district, and consists of three replicates of three treatments laid out on a seven-hectare block. Treatment 1 is a standard fertiliser blend at 500 kg/ha, Treatment 2 is a reduced phosphorus blend at 350 kg/ha and Treatment 3 is the same product as the control applied at 250 kg/ha.

Image 1: Murray Upper trial site

The 2016 trial was established on a 16 hectare block in the Riversdale district. Three treatments of three replicates were compared: a standard rate, a reduced rate and a low rate of the same fertiliser blend.

Table 1 and Table 2 outline the products, application rates and product costs of the treatments at the Murray Upper and Riversdale sites respectively.

Table 1: Trial products, application rates and product costs – Murray Upper

	Product	Application rate	Product cost ($/ha)
T1	Impact 301	500 kg/ha	$327
T2	Impact Ratooner 3	350 kg/ha	$222
T3	Impact 301	250 kg/ha	$163

Table 2: Trial products, application rates and product costs – Riversdale

	Product	Application rate	Product cost ($/ha)
T1	CK 51/51 S	600 kg/ha	$382
T2	CK 51/51 S	500 kg/ha	$319
T3	CK 51/51 S	400 kg/ha	$255

[1] Chapman, L. S., Ferraris, R., Ludlow, M. M. (1992) Ratooning ability of cane varieties: variation in yield and yield components. Proceedings of the Australian Society of Sugar Cane Technologists, 14: 130-138

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The amount of nitrogen, phosphorus, potassium and sulphur applied in the two trials are shown in Table 3 and Table 4.

Table 3: Treatment nutrition analysis (kg/ha) – Murray Upper

Treatment	N	P	K	S
T1	150.5	14.0	65	1.0
T2	102.5	0.0	63.7	0.0
T3	75.3	7.0	32.5	0.5

Table 4: Treatment nutrition analysis (kg/ha) - Riversdale

Treatment	N	P	K	S
T1	129.6	0.0	129.0	25.8
T2	108.0	0.0	107.5	21.5
T3	86.4	0.0	86.0	17.2

Methodology

The following economic analysis examines the impact of each treatment on ratoon gross margins for each of the trial sites.[2] The Farm Economic Analysis Tool (FEAT) was used to model Chris Condon's typical ratoon growing expenses such as fertiliser application costs, pest control costs and other machinery operational costs.

The analysis assumes a sugar price of $430 per tonne[3]; a labour rate of $30 per hour; and a fuel price of $1 per litre (net of the diesel rebate and GST). Fertiliser and pesticide prices were sourced from local suppliers.

Results – Murray Upper

Table 5 shows the production results from the Murray Upper site. While the medium and low rates actually recorded higher tonnes of cane than the standard rate, the difference was not statistically significant. Similarly, there was no significant difference between the treatments in terms of both tonnes of sugar and CCS.

Table 5: Average yield and CCS results – Murray Upper

	Treatment	TCH	CCS	TSH
T1	Standard rate	68.1	13.7	9.3
T2	Medium rate	70.7	13.2	9.3
T3	Low rate	75.7	13.3	10.1
P-value		*0.08*	*0.14*	*0.23*

TCH: tonnes of cane per hectare; CCS: commercial cane sugar; TSH: tonnes of sugar per hectare. P-values less than 0.05 indicate a statistical difference between two or more treatments.

The economic results from the Murray Upper trial site are shown in Table 6. The highest revenue was generated by the low rate treatment (Impact 301 at 250 kg/ha), driven by the higher yield recorded for that treatment. The variation in variable costs largely reflects the different fertiliser rates, with the lowest cost associated with the low rate of Impact 301.

Table 6: Murray Upper economic results

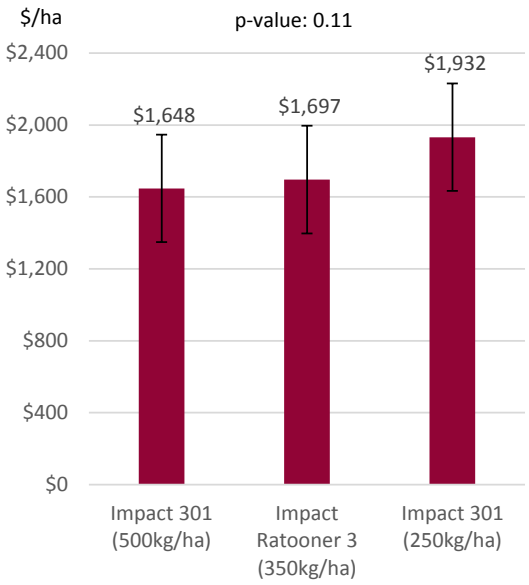
	Standard rate ($/ha)	Medium rate (diff. to T1, $/ha)	Low rate (diff. to T1, $/ha)
Gross revenue	$2,574	-$37	$176
Variable costs	$926	-$85	-$108
Gross margin	$1,648	$49	$285

Figure 1 presents the treatment gross margins along with error bars indicating the 95% confidence interval. The medium and low rate treatments had higher gross margins ($1697/ha and $1932/ha respectively) compared to the standard rate ($1648/ha), however the differences were found to be not statistically significant.

[2] Gross margin equals revenue minus variable costs, which include chemical, fertiliser, machinery and harvesting costs.

[3] $430 per tonne is the 5 year average (2010-14) of QSL's seasonal and harvest pools.

Figure 1: Average gross margin – Murray Upper



Results – Riversdale

Trial results from the Riversdale site are shown in Table 6. The average results were very similar for the three treatments, and statistical analysis showed that there was no significant difference between tonnes of cane, tonnes of sugar and CCS for each treatment.

Table 7: Average yield and CCS results – Riversdale

	Treatment	TCH	CCS	TSH
T1	Standard rate	81.5	11.5	9.4
T2	Medium rate	84.1	11.4	9.6
T3	Low rate	81.3	11.4	9.3
P-value		*0.70*	*0.81*	*0.86*

TCH: tonnes of cane per hectare; CCS: commercial cane sugar; TSH: tonnes of sugar per hectare. P-values less than 0.05 indicate a statistical difference between two or more treatments.

Economic results for the Riversdale trial are presented in Table 8. The yield and CCS figures resulted in little difference between the revenues for the three treatments.

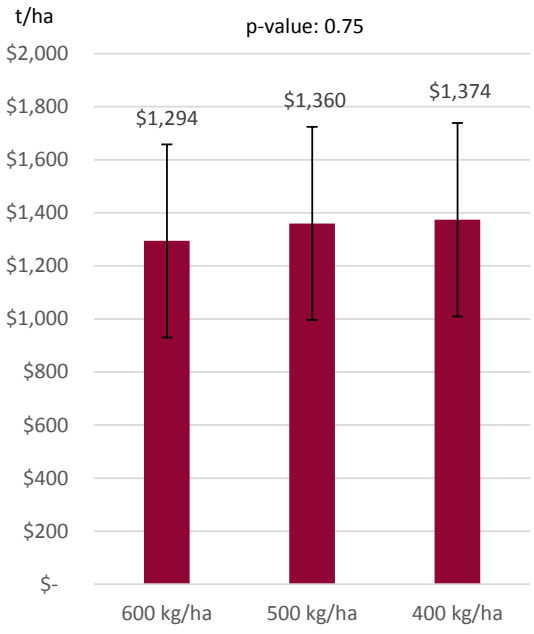
Table 8: Riversdale economic results

	Standard rate ($/ha)	Medium rate (diff. to T1, $/ha)	Low rate (diff. to T1, $/ha)
Gross revenue	$2,374	$22	-$49
Variable costs	$1,079	-$44	-$129
Gross margin	$1,294	$66	$80

Similar to the variable costs at Murray Upper, Riversdale variable costs largely reflected the differences in fertiliser rates, with the low rate treatment having the lowest cost of $951 per hectare, $129 per hectare lower than the standard rate.

As treatment revenues were quite similar, the variable costs largely drove the differences in gross margins (Figure 2), with the low rate treatment having the highest gross margin of $1374, followed by the medium rate treatment at $1360. However, statistical analysis again revealed that there was no significant difference between the three treatment gross margins.

Figure 2: Average gross margin – Riversdale

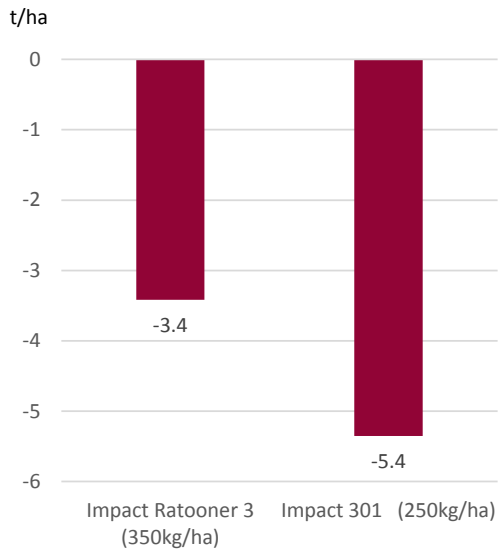


Break-even analysis

Due to their lower fertiliser cost, the medium and low rate treatments in both trials could potentially have achieved lower cane yield than the control before becoming less profitable. The following break-even analysis shows how much cane yield would need to have decreased by in these treatments to result in the same gross margin as the standard fertiliser rate. The break-even analysis assumes a constant CCS.

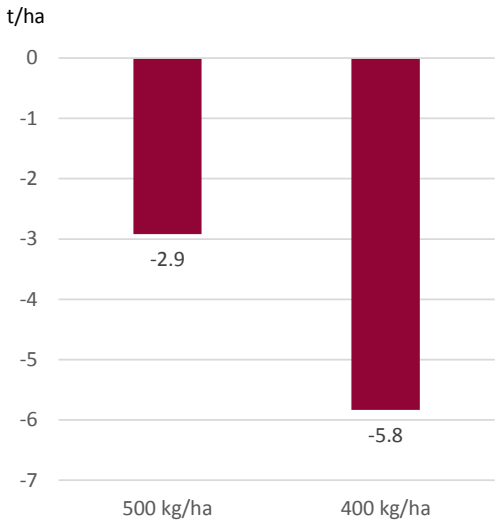
At Upper Murray, the medium rate treatment could have yielded 3.9 TCH less before it became less profitable than the standard rate treatment, while the low rate treatment could have yielded 6.2 TCH less (see Figure 3).

Figure 3: Break-even analysis - Murray Upper



Similarly, the medium rate treatment at Riversdale could have yielded 2.9 TCH less and the low rate treatment, 5.8 TCH less before each treatment was less profitable than the standard rate (see Figure 4).

Figure 4: Break-even analysis - Riversdale



Sensitivity analysis

As the price of sugar is highly variable, understanding the sensitivity of the results to changes in the price of sugar is useful.

Figure 5 and Figure 6 extend the break-even analysis, showing the break-even yield for the medium and low rate treatments at different sugar prices. The graphs show that at lower sugar prices, the reduced fertiliser treatments could sustain greater decreases in yield before becoming less profitable than the standard treatments.

Figure 5: Sensitivity of break-even yield to sugar price – Murray Upper

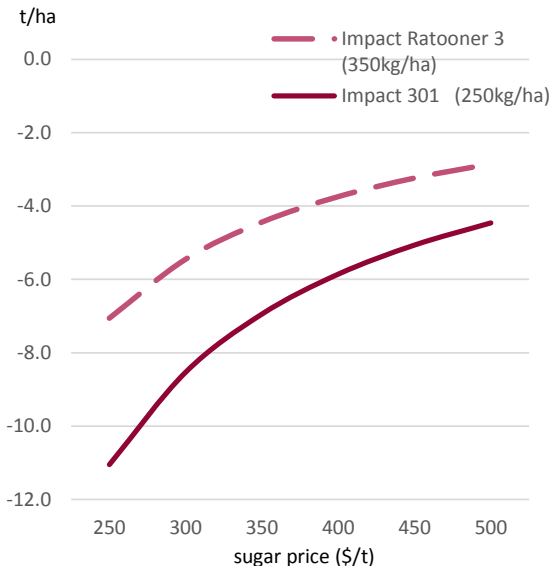
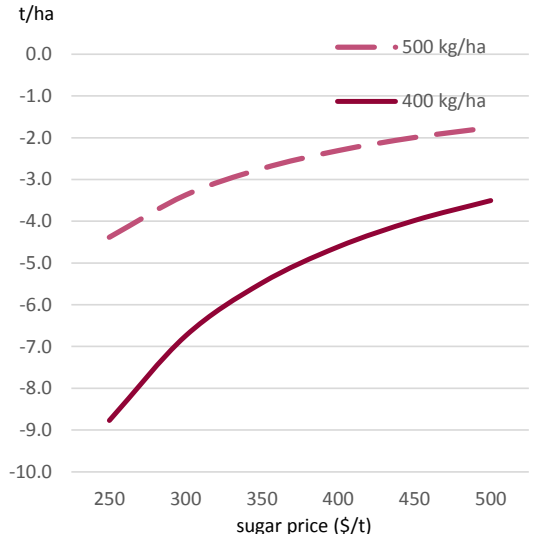


Figure 6: Sensitivity of break-even yield to sugar price - Riversdale



Conclusion

This study examined the economic impact of applying lower rates of fertiliser in late ratoon blocks.

The results did not find evidence that reducing rates had a negative impact on production levels. However a lack of significant difference in the production results may also mean that any potential treatment effect was masked by variation caused by other factors.

Despite the lower costs of the reduced rate treatments, leading to higher gross margins, variation in the production results meant that there was no significant difference in profitability between the three treatments.

While the results do not contradict the hypothesis that improved profitability can be achieved by lowering fertiliser rates in late ratoons, further research trials would help to confirm these results. In addition, Chris noted that they experienced ideal growing conditions over the course of the trial, and he would be interested in finding out if different weather conditions would affect the results.

Acknowledgments

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Citation

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