ENTEC fertiliser trial – economic case study, Tully region

Grower: Tully Sugar

Tully Sugar Limited operates the Tully sugar mill, as well as farming 1650 hectares of cane land spread across the region. Tully Sugar is investigating the use of the nitrification inhibitor ENTEC to evaluate if lower application rates of nitrogen over time can produce equivalent cane yields due to improved nitrogen use efficiency. Four treatments were investigated: a high rate of standard fertiliser, a high rate of ENTEC-treated fertiliser, a low rate of standard fertiliser, and a low rate of ENTEC-treated fertiliser

ENTEC fertilisers are designed to inhibit the conversion of ammonium nitrogen to nitrate for several weeks after application. In ammonium form, nitrogen is less prone to being lost to leaching and denitrification under wet conditions, potentially leaving more nitrogen available to the plant following a significant rain event compared to conventional fertiliser.

Key findings

- No significant difference in production between the standard fertiliser blend and the ENTEC treated product at the same rate, suggesting that ENTEC did not result in any additional production benefit.
- No significant difference between the higher and lower rates, indicating that a cost saving could potentially be achieved by reducing fertiliser rates.
- At the same application rate, the ENTEC treatment would need to result in an increase in yield of 1.4 tonnes per hectare to break even with the standard treatment.

Trial description

A trial consisting of three replicates of four different nutrient treatments was established in 2014 in a second ratoon block on the Tully Sugar Syndicate farm, near the township of Tully. The trial was harvested in late 2015, and is continuing into third ratoon in 2016.

Figure 1: Trial site

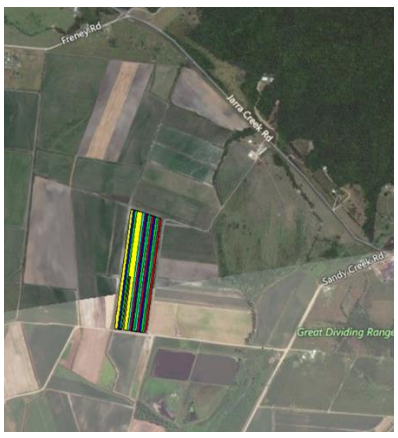


Table 1 outlines the products, application rates and product costs of each treatment. T1 is a standard nutrient treatment used as a control, and T2 is a standard nutrient treatment with the addition of ENTEC. T3 is a reduced nitrogen rate and T4 is a reduced nitrogen rate with the addition of ENTEC. The treatments are balanced so that the rates of phosphorus, potassium and sulphur are the same across all treatments.

Table 1: Trial products, application rates and product costs

	Product	Application rate	Product cost ($/ha)
T1	Standard fertiliser	459 kg/ha	$326
T2	ENTEC	459 kg/ha	$363
T3	Standard fertiliser	414 kg/ha	$299
T4	ENTEC	414 kg/ha	$324

Table 2 shows the percentages of nitrogen, phosphorus, potassium and sulphur for the four treatments.

Table 2: Treatment nutrition rates

	Treatment	N	P	K	S
T1	Standard (high)	25.0%	2.7%	14.8%	3.6%
T2	ENTEC (high)	25.0%	2.7%	14.8%	3.6%
T3	Standard (low)	22.4%	3.0%	16.6%	4.0%
T4	ENTEC (low)	22.4%	3.0%	16.6%	4.0%

Methodology

The following economic analysis examines the impact of each treatment on the second ratoon gross margin.[1] The Farm Economic Analysis Tool (FEAT) was used to model Tully Sugar's typical ratoon growing expenses such as fertiliser application costs, pesticides and other machinery operations.

The analysis assumes a sugar price of $430 per tonne[2]; 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

Table 3 shows the production results from the trial block for 2015. Statistical analysis of the results revealed that there was no significant difference between any of the treatments in terms of tonnes of cane per hectare, tonnes of sugar per hectare and CCS.

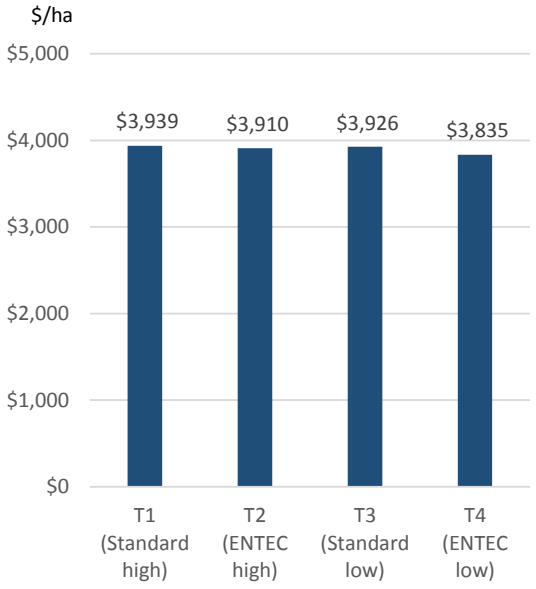
Table 3: Yield and CCS results

	Treatment	TCH	CCS	TSH
T1	Standard (high)	111.9	13.0	14.5
T2	ENTEC (high)	117.3	12.5	14.6
T3	Standard (low)	109.7	13.1	14.4
T4	ENTEC (low)	110.8	12.8	14.1

TCH: tonnes of cane per hectare; CCS: commercial cane sugar; TSH: tonnes of sugar per hectare.

Revenue per hectare for each treatment is shown in figure 2. Comparing the ENTEC treatments with the standard fertiliser blend at the same rate, higher yields in the ENTEC treatments were more than offset by lower CCS, resulting in slightly lower revenue.

Figure 2: Revenue



The variable costs associated with each treatment are presented in figure 3. Harvesting accounted for the majority of variable costs, followed by the cost of fertiliser. "Other" costs includes weed control and the cost of applying fertiliser.

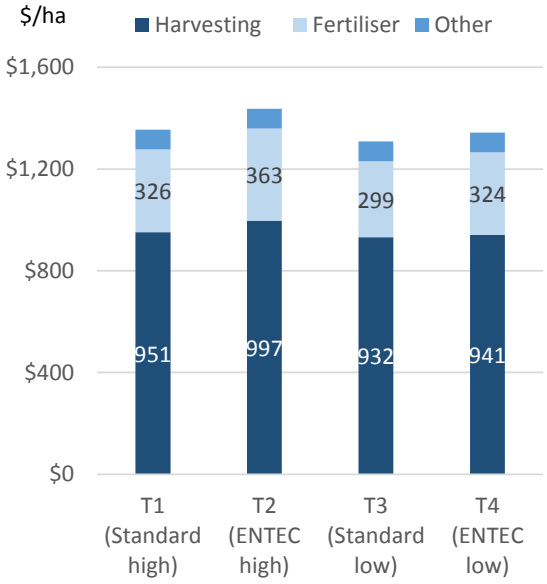
The most expensive treatment was T2 (ENTEC high), driven by a higher product cost,

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

[2] $430 per tonne is the 5 year average (2010-14) of QSL's seasonal and harvest pools.

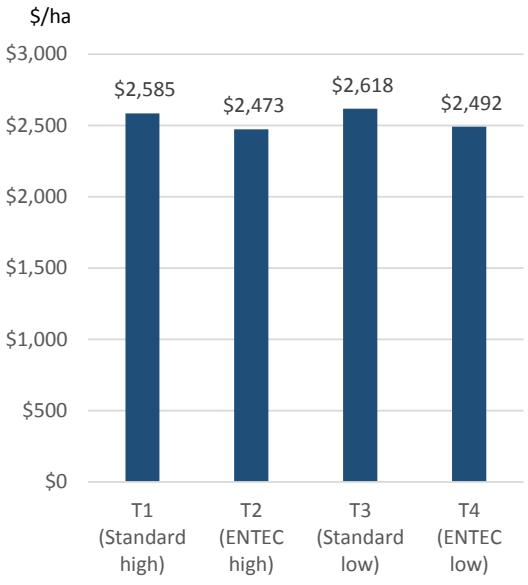
and a higher harvesting cost due to the larger yield recorded for the treatment.

Figure 3: Variable costs



Treatment gross margins per hectare are shown in figure 4. Both of the ENTEC treatments had lower gross margins than the equivalent rate of standard fertiliser, driven by both lower revenue and higher growing costs. The highest gross margin was associated with the standard fertiliser treatment at the lower rate. However, statistical analysis revealed there was no significant difference between the gross margin results of each treatment.

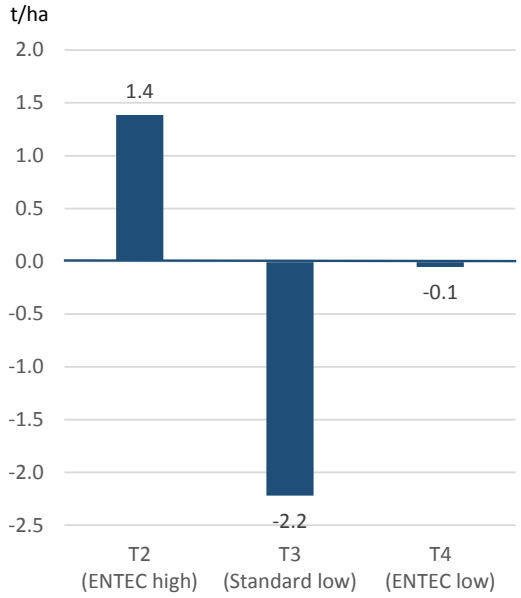
Figure 4: Gross margin



To extend the gross margin analysis further, a break-even analysis was conducted to determine the yield response required for each treatment to result in the same gross margin as the standard fertiliser blend at the high rate. The break-even analysis assumes a constant CCS.

Figure 5 shows that the high rate of ENTEC would need to result in a yield increase of 1.4 t/ha in order to be worthwhile. The lower rate of the standard blend could result in a yield decrease of 2.2 t/ha before it became less profitable than the higher rate, while the lower rate of ENTEC could result in a slight yield decrease.

Figure 5: Yield increase/decrease to break even with T1 (standard high)



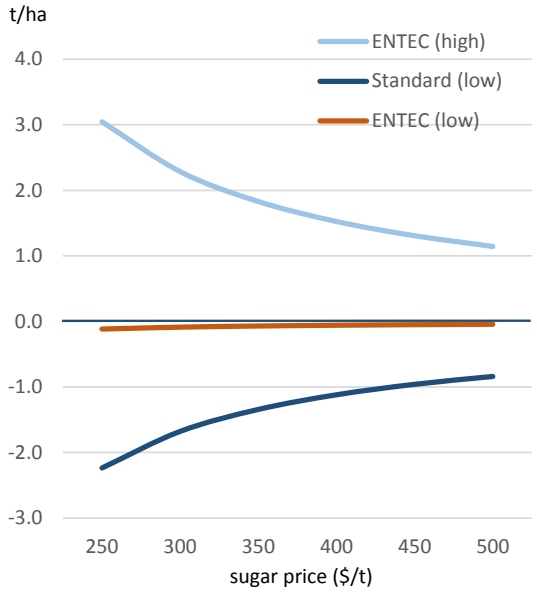
Sensitivity analysis

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

Figure 6 builds on the previous analysis, showing the break-even yields for treatments 2 to 4 at different sugar prices. The graph shows that at higher sugar prices, the high rate of ENTEC requires a smaller yield increase to break even, while the low rate of standard

fertiliser can result in a smaller yield decrease before becoming unprofitable.

Figure 6: Sensitivity of break-even yields to sugar price



Conclusion

This study examined the economic impact of using ENTEC treated fertilisers on second ratoon cane in Tully.

Production results did not show any significant difference between the four treatments, indicating that the ENTEC treated fertilisers did not result in any additional production benefit. However the lack of significance also suggests that a cost saving could potentially be achieved by reducing fertiliser rates without sacrificing production. The results should be interpreted with caution, however, as lack of significance may also mean that an underlying treatment effect was masked by variation caused by other factors.

Furthermore, nitrogen based trials often do not generate significant results in the first year. As this is an ongoing trial, third ratoon production data will be available after the 2016 harvest, which will provide more robust results.

Break-even analysis indicates that at the same rate of nitrogen application and a sugar price of $430/t, the ENTEC treatment would need to result in an increase in yield of 1.4 tonnes per hectare to break even with the standard treatment.

As the sugar price increases, a smaller yield increase in the ENTEC treatment is required to break even with the standard treatment.

Acknowledgments

This publication was prepared by Alison Collier and Eamon Holligan from the Department of Agriculture and Fisheries (DAF). Terrain, TRAP Services and Tully Sugar Limited contributed research data and technical expertise to this report. DAF provides economic support to Project Catalyst, which is funded by Terrain through the Project Catalyst program. For further information please contact the Townsville DAF Office on 3330 4506.

Citation

Holligan, E. (2016), ENTEC fertiliser trial – economic case study, Tully region. Department of Agriculture and Fisheries (DAF), Queensland.