Compost tea and bio-fert in sugarcane – economic case study, Tully region

Growers: Michael and Peter Ottone

Michael and Peter Ottone run a 160 hectare sugarcane and pineapple farm at Bilyana south of Tully. As part of Project Catalyst, the Ottones are investigating the ability of compost tea and Bio-Fert to improve soil health in sugarcane. They are comparing four treatments in this trial – a standard fertiliser rate with and without compost tea and Bio-Fert, and a reduced fertiliser rate with and without compost tea and Bio-Fert. The Ottones would like to reduce their use of synthetic fertilisers in sugarcane to achieve both environmental and economic benefits.

Key findings

- Results did not show any significant production or economic benefits from compost tea and Bio-Fert, however there may be longer term benefits to soil health that have not been captured in this trial .
- The reduced fertiliser rates resulted in a yield decrease in ratoon cane, however this was largely offset by cost savings.

Trial description

Three randomized replicated strips of four different nutrient treatments were evaluated over three years in plant and first and second ratoons (table 1).

Table 1: Trial treatments

	No.	Description
Plant	T1	370kg/ha CK66s + 270kg/ha GM030 High K
	T2	370kg/ha CK66s + 270kg/ha GM030 High K + 100L/ha Compost Tea + molasses
	T3	370kg/ha CK66s + 100L/ha Compost Tea + molasses
	T4	370kg/ha CK66s
1st and 2nd ratoon	T1	650kg/ha GM030 High K
	T2	650kg/ha GM030 High K + 100L/ha Compost Tea + 100L/ha Bio-Fert
	T3	270kg/ha CK66s + 100L/ha Compost Tea + 100L/ha Bio-Fert
	T4	270kg/ha CK66s

T1 is a standard granular fertiliser program and T2 is a standard program with the addition of compost tea and Bio-Fert. T3 is a reduced rate of granular fertiliser plus compost tea and Bio-Fert while T4 is purely a reduced rate of granular fertiliser.

Table 2 compares total nutrients applied in each treatment.

Table 2: Total nutrients applied (kg/ha)

	No.	N	P	K
Plant	T1	128	39	102
	T2	128	39	102
	T3	48	39	55
	T4	48	39	55
1st and 2nd ratoons	T1	170	20	100
	T2	170	20	100
	T3	35	28	40
	T4	35	28	40

Table 3 compares fertiliser costs ($/ha) in plant cane and first and second ratoons for each treatment.

Table 3: Fertiliser costs: plant, 1st and 2nd ratoon ($/ha)

	T1	T2	T3	T4
Plant	$498	$536	$340	$303
1st & 2nd Ratoons	$430	$482	$302	$250

Fertiliser costs include application costs (tractor/implement fuel, oil, repairs and maintenance and labour), the cost of synthetic fertiliser, compost tea and Bio-Fert costs. T2 (standard granular fertiliser plus compost tea and Bio-Fert) had the highest fertiliser costs in both plant cane and first and second ratoons.

Methodology

The Farm Economic Analysis Tool (FEAT) was used to calculate the gross margin[1] for each treatment. In this analysis fixed costs were assumed to remain constant.

Fallow management, and therefore gross margin in fallow, was the same for all treatments. The cost of preparing ground immediately prior to planting was included in the cost of plant cane.

Other parameters used in the analysis include: a sugar price of $430 per tonne;[2] a labour price 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

Plant, first and second ratoon harvest results and gross margins are shown in table 4.

Table 4: Plant, first and second ratoon production results and gross margin

		Yield (t/ha)	CCS	Ts/ha	Gross margin ($/ha)
Plant	T1	126[a]	11.68[a]	14.76[a]	$1166[cb]
	T2	123[a]	11.66[a]	14.35[a]	$1048[c]
	T3	124[a]	11.79[a]	14.67[a]	$1335[ba]
	T4	126[a]	11.74[a]	14.81[a]	$1381[a]
1st ratoon	T1	126[a]	13.52[a]	17.01[a]	$3224[a]
	T2	134[a]	13.19[a]	17.67[a]	$3277[a]
	T3	112[b]	13.52[a]	15.12[b]	$2936[a]
	T4	102[b]	13.65[a]	13.89[b]	$2740[a]
2nd ratoon	T1	108[a]	13.24[b]	14.31[a]	$2469[a]
	T2	115[a]	13.20[b]	15.19[a]	$2703[a]
	T3	83[b]	14.67[a]	12.12[b]	$2439[a]
	T4	84[b]	14.43[a]	12.08[b]	$2330[a]

Averages followed by a different letter are significantly different at the 5% level.

There was no statistical difference in yield (tonnes per hectare), CCS, tonnes of sugar per hectare (ts/ha) or revenue in plant cane. However gross margins for both of the reduced fertiliser treatments were significantly higher than the standard fertiliser plus compost tea treatment. Additionally, the gross margins for the reduced fertiliser treatment without compost tea was significantly higher than both standard fertiliser treatments.

Harvest results from first ratoon, indicate that yield (t/ha) and ts/ha in T3 (reduced fertiliser plus tea) and T4 (reduced fertiliser) were significantly less than in T1 (standard fertiliser) and T2 (standard fertiliser plus tea). Second ratoon results also showed significantly lower yield in T3 and T4 compared to T1 and T2, however CCS was significantly higher in T3 and T4 compared to T1 and T2. There was no

[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.

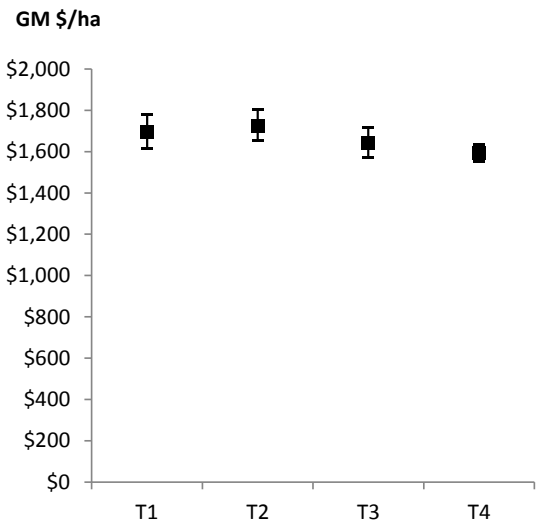
statistical difference between the gross margins for all treatments in first and second ratoons. While this means there is no evidence that compost tea and bio-fert had a positive impact on profitability in ratoons, it does suggest the significant reduction in fertiliser rates was achieved without affecting profitability.

Average farm gross margin, inclusive of fallow, plant cane and first and second ratoons is shown in figure 1. As the chart shows, there was very little difference between the average gross margins, however to date, the gross margin for T2 (standard fertiliser plus compost tea) was the highest of the treatments.

Figure 1 also highlights the minimal effect that the significant drop in fertiliser rates in T3 and T4 had on overall gross margin, with the decrease in yield largely offset by savings in fertiliser costs.

The results should be interpreted with caution, however, as the variation between replicates caused by other factors may have masked an underlying treatment effect.

Figure 1: Average farm gross margin ($/ha) to date



Investment analysis

An investment analysis was conducted to determine whether the cost savings of moving from T1 (standard fertiliser) to T3 (reduced fertiliser plus tea) outweigh the initial capital outlay. The analysis initially assumed no change in yield between treatments, then the break-even point was determined to work out the yield decrease that could result from moving to T3 before the investment was no longer worthwhile.

Table 5 presents the parameters that were used in the investment analysis.

Table 5: Investment analysis parameters

Initial capital cost ($)	$10,000
Initial capital cost ($/ha)	$63
Sugar price ($/ts)	$430
Whole-farm average CCS	13.5
Variable cost saving ($/ha)	$92
Discount rate	7%
Investment Horizon	10 years

The cost of equipment ($63/ha) accounts for the compost tea brewer tank and air blower.

Variable cost savings ($/ha) account for the reduction in fertiliser in plant and ratoon cane assuming fertiliser savings realised in first and second ratoon cane are also applicable to third and fourth ratoons.

Table 6: Investment analysis, T1 to T3

AEB ($/ha)	$83
Discounted payback period	1 year
Break-even yield decrease (t/ha)	2.8

When yield remains constant, moving from T1 to T3 is estimated to result in a positive economic return, with an annualised

equivalent benefit[3] (AEB) of $83 per hectare per year. Furthermore the initial capital cost for this project will be returned in less than 1 year. Alternatively, the change from T1 to T3 could result in a yield decrease of 2.8 t/ha below the farm average before the investment was no longer worthwhile. It should be noted that, as yield was held constant in the analysis, the economic benefit of moving from T1 to T3 is solely the result of the savings made by reducing the fertiliser rate.

However the compost tea and Bio-Fert treatments would also need to perform better than the straight fertiliser treatments at the same rate in order to justify the additional cost. Therefore a further investment analysis was conducted comparing T3 (reduced fertiliser plus tea) with T4 (reduced fertiliser), to determine the yield increase that would be needed to offset the investment cost.

The analysis found that an average yield increase of 1.45 t/ha would be required over the crop cycle to offset the capital cost of setting up the compost tea and Bio-Fert system.

Conclusion

This case study has evaluated the economic impact of compost tea and Bio-Fert application in sugarcane. Production results did not show any significant benefit as a result of adding compost tea and Bio-Fert, however there may be longer term benefits to soil health that have not been captured in this trial that may make the treatment worthwhile.

Overall there was a large decrease in yield in ratoon cane resulting from the reduced fertiliser rates, however this was largely offset by cost savings, so that there was little impact on average gross margins for the reduced rate treatments.

Each farming business is unique in its circumstances and therefore the parameters and assumptions used in this economic analysis reflect this individual's situation only. Consideration of individual circumstances must be made before applying this case study to another situation.

Acknowledgments

This publication was compiled by Alison Collier and Eamon Holligan from the Department of Agriculture and Fisheries (DAF). Michael Ottone 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 4507.

Citation

Collier, A., Holligan, E. (2016), Compost tea and bio-fert in sugarcane – economic case study, Tully region. Department of Agriculture and Fisheries (DAF), Queensland.

[3] Annualised Equivalent Benefit (AEB) is a way of evaluating whether an investment is worthwhile from an economic perspective. The AEB is a transformation of the investment amount and the economic benefits it generates into a single annual cash flow. If the AEB is positive, the investment is performing better than the specified rate of return (the discount rate) and is thus considered worthwhile.