Mill mud trial – economic case study, Ingham region

Grower: David Morselli

David Morselli is trialling different rates of banded mill mud on his 320 hectare farm near Ingham. David is interested in finding out whether applying mill mud will result in a yield benefit sufficient to offset the additional cost. Mill mud is a by-product of the process of milling sugarcane, and provides numerous soil benefits, including the supply of nutrients such as nitrogen, phosphorus and calcium, as well as improving soil texture, structure and biology. Banding can improve the cost-effectiveness of mill mud by applying a smaller amount of mud per hectare directly on top of the cane row. This can help offset the cost of delivery, particularly for growers at relatively large distances from the mill who are subject to higher haulage costs.

Key findings

- Average yields would need to increase by 3.9 to 11.6 tonnes per hectare in order to offset the cost of the mill mud treatments.
- If fertiliser reductions were made in plant and ratoons to compensate for the nutrients supplied by the mill mud, the break-even yield increases are between 2.1 to 9 tonnes per hectare.
- Production results are not available as the trial has not been harvested.

Trial description

The trial is being conducted on a 3.9 hectare block, with two replicates of four treatments: a control treatment of no mill mud, and banded treatments at 30 t/ha, 60 t/ha and 90 t/ha. The mill mud was applied by a contractor before planting in August 2015. David reported that the plant cane had a poor strike rate due to heavy rains three days after planting, which will ultimately have a significant negative impact on cane yields. Production results from the trial block will not be known until after harvest in 2016.

The costs associated with the mill mud application are shown in table 1. These consist of the price David normally pays for mill mud (including delivery) of $5.10/t, plus the cost of the contract application.

The higher rates of application result in both higher product cost and delivery cost, the latter due to the fact that the rate is controlled by varying the speed of application, with higher rates taking longer to apply.

Table 1: Mill mud delivery and application costs

Treatment	Discounted cost ($/ha)	Normal cost ($/ha)
No mill mud	$0	$0
Banded 30t/ha	$529	$570
Banded 60t/ha	$1,058	$1,139
Banded 90t/ha	$1,588	$1,709

Methodology

The following economic analysis examines the impact of the mill mud application treatments on David's farm gross margin.[1] The Farm

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

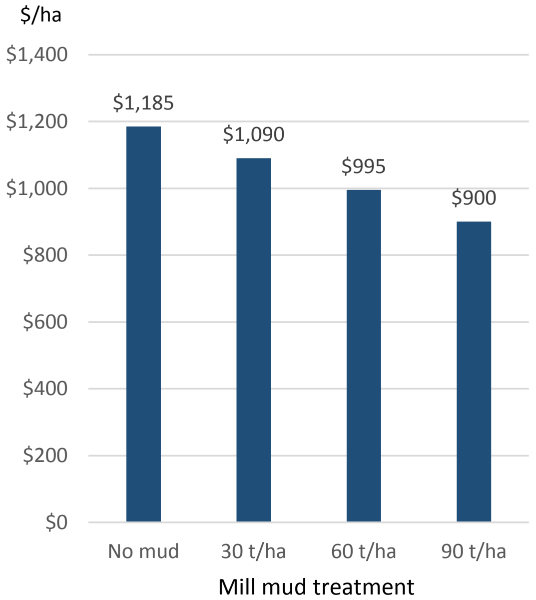
Economic Analysis Tool (FEAT) was used to model David's typical growing expenses such as fertiliser, pesticides and machinery operations over plant and four ratoons. Yield and CCS are based on David's 2015 harvest results, and were held constant for each treatment so that a break-even analysis could be conducted. The mill mud delivery cost of $5.10/t was used in the analysis, to reflect the cost David would face under normal circumstances.

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

The following chart compares the farm gross margin per hectare of each treatment, assuming the trial treatments were applied on all fallow blocks prior to planting.

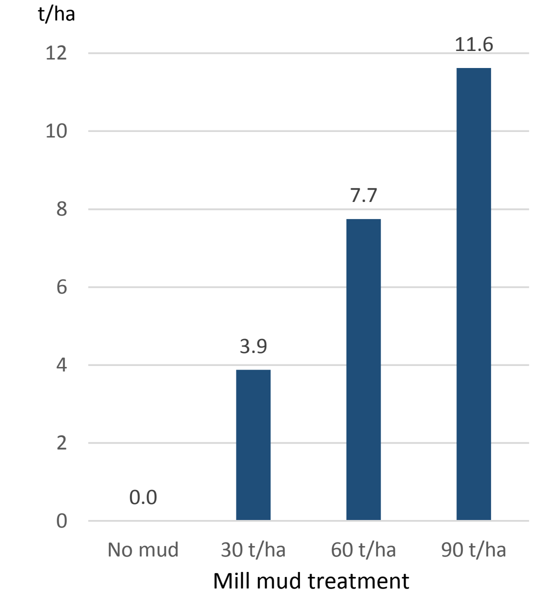
Figure 1: Farm gross margin per hectare by treatment



In order for the mill mud application to be worthwhile, an increase in cane yield or a decrease in costs would be required in the following plant and ratoons crops. Fertiliser cost savings can be realised by reducing fertiliser rates to allow for the nutrients supplied by the mill mud. Longer term yield benefits can also result from the soil conditioning effect that mill mud can provide.

Figure 2 shows the average increase in yield per hectare of the following plant and ratoon crops that would be needed to break even with the control treatment of no mill mud.

Figure 2: Average yield increase over the crop cycle required to offset the cost of mill mud treatments



Due to the nutrients supplied to the soil by the mill mud, reductions in fertiliser application can be made in the subsequent plant and ratoon crops. While not part of this trial, the supervising agronomist outlined nutrient reductions that would be appropriate to the different rates of mill mud that were applied. The recommended reductions for plant cane are presented in table 2. For the following ratoons, nutrient application is unchanged, except that no phosphorus is applied for the whole crop cycle for all treatments.

[2] $430/t is the 5 year average (2010-14) of QSL's seasonal and harvest pools.

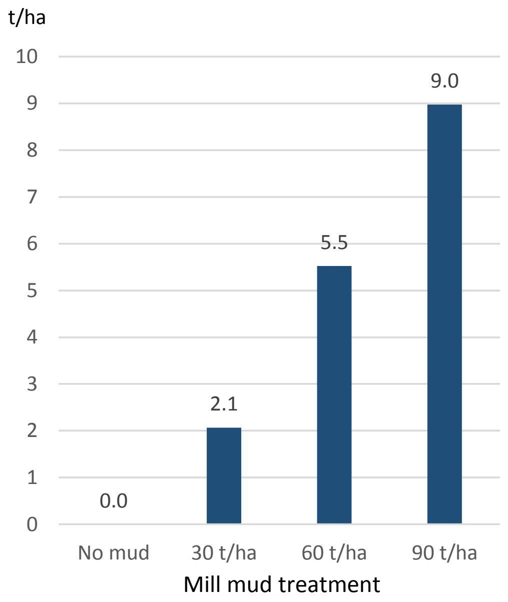
Table 2: Recommended nutrient reductions in plant cane

Treatment	N	P	K	S
30t/ha	Reduce by 20kg	No P	No change	No change
60t/ha	Reduce by 30kg	No P	Reduce by 25kg	Reduce by half
90t/ha	Reduce by 40kg	No P	Reduce by 50kg	No S

N: nitrogen, P: phosphorus, K: potassium, S: sulphur

If fertiliser reductions were made in line with the above recommendations, the savings would result in higher gross margins, and thus smaller yield increases in plant and ratoons would be required for each treatment to break even. These are shown in figure 3.

Figure 3: Average yield increase required to offset the cost of mill mud treatments, net of recommended fertiliser reductions



Investment analysis

While the mill mud was applied by a contractor in the trial, David has also purchased his own mill mud applicator for $50,000, which he will use in future in place of the contractor. An analysis was done to determine the cost of applying the different trial rates using David's applicator. Table 3 shows the per hectare application cost at the three trial rates, net of the recommended fertiliser reductions for subsequent plant and ratoon crops. For treatment 2 (30 t/ha of mill mud) the fertiliser savings more than offset the application cost, resulting in an overall net saving of $9 per hectare of fallow.

Table 3: Net saving/cost of applying mill with own equipment on fallow, $/ha

T2 30 t/ha	T3 60 t/ha	T4 90 t/ha
$9	-$188	-$382

An investment analysis was also conducted to determine the annualised equivalent benefit (AEB)[3] of the investment under the three treatment scenarios, assuming they were applied to all fallow blocks. The parameters used in the investment analysis are shown in table 4, and the results in table 5. The analysis assumes a constant yield and CCS between treatments.

Table 4: Investment analysis parameters

Number of hectares	320
Initial capital cost	$50,000
Discount rate	7%
Investment life	10 years
Sugar price ($/t)	$430

[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.

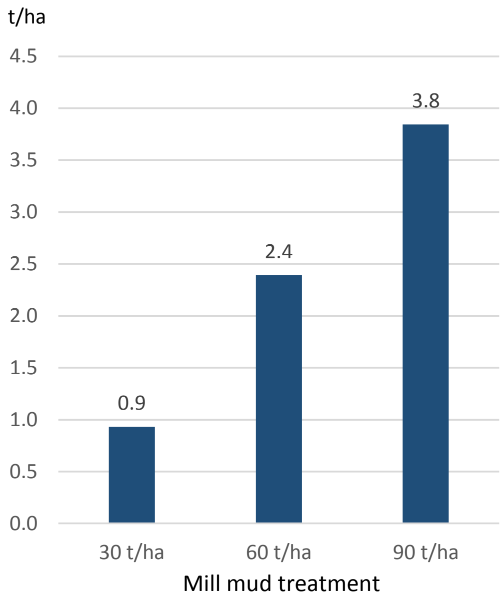
Table 5: AEB of applicator under each treatment scenario, assuming no change in yield ($/ha/yr)

T2 30 t/ha	T3 60 t/ha	T4 90 t/ha
-$20.83	-$53.50	-$85.97

As can be seen in the table, the AEB for each treatment was negative. In the case of T2 (30 t/ha), the net saving that resulted from the mill mud treatment was not enough to compensate the investment cost.

Similar to the previous analysis, potential yield benefits from applying mill mud may compensate for the investment cost. Figure 4 presents the break-even yield increases for each treatment. These represent the average yield increases across the farm that would be required to make the discounted future benefits of each treatment equal to the investment cost. Any yield increases greater than these would mean the investment is making more than the required rate of return of 7% per annum.

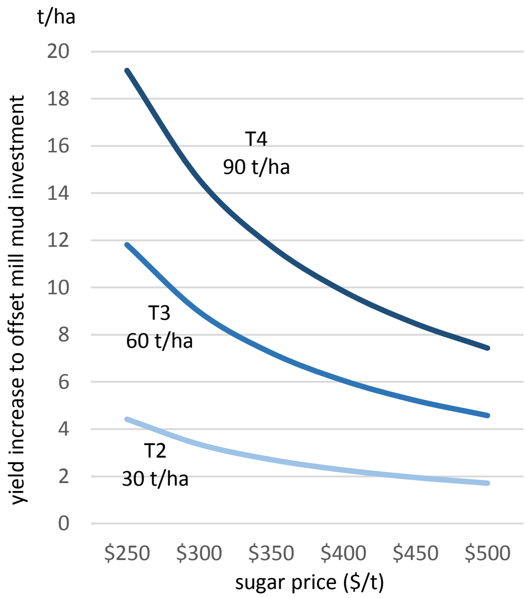
Figure 4: Increase in yield required for the investment to break even



Sensitivity analysis

The preceding break-even analysis assumed a sugar price of $430 per tonne. The following chart (figure 5) examines the sensitivity of the break-even yield increases to changes in the price of sugar. The chart shows that as the price of sugar rises, a smaller average yield increase is required for each treatment to break even. For example, at a sugar price of $250 per tonne, T2 would need to generate 4.4 tonnes per hectare of extra cane, whereas at $500 per tonnes, T2 would only need an additional 1.7 tonnes per hectare. The changing slope of the line indicates that as the sugar price decreases, increasingly higher yields are required to break even.

Figure 5: Sensitivity of required yield increase to changes in sugar price



Conclusion

This study examined the economic impact of applying mill mud on a 320 hectare farm near Ingham.

Results indicate that average yields would need to increase by 3.9 to 11.6 tonnes per hectare in order to offset the cost of the mill mud treatments. If fertiliser reductions were made in plant and ratoons to compensate for the nutrients supplied by the mill mud, the range of break-even yield increases is lower, from 2.1 to 9 tonnes per hectare.

Acknowledgments

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Citation

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