Subsurface Mud Economics: 2019-20 Case Study

Sarina growers: Grant and Allan Matsen

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, Grant and Allan Matsen trialled the subsurface application of Mill Mud (mud).

The trial objective was to compare the crop response and economic outcome from subsurface versus surface mud application methods. It is expected that longer-term benefits in ratoons would outweigh the added application costs of sub-surface mud prior to planting soybeans and cane. The analysis presents soybean, plant cane and first ratoon gross margins.

Trial design

Farmacist conducted the trial with the Matsens on their farm located north-west of Sarina (Mackay region) between 2017 and 2020. The trial was a randomised strip trial with three replications for three treatments. The treatments included a control (no mud) and both a surface (surf) and subsurface (sub) application of mud prior to planting soybeans. The Matsens applied 100t/ha of mud in both mud treatments (banded). Prior to the subsurface application of mill mud, a 'two legged ripper' was utilised to open the furrow which was later closed with a bedformer. Harvesting of the plant and ratoon crops (KQ228 on a sodic soil) took place during 2019 and 2020 respectively.

Key findings

- Mill mud (mud) treatments gave higher yields while the control (no mud) had improved CCS with lower variable costs.
- There was no statistically significant difference in sugar yield or gross margin between surface and subsurface application methods for the combined results.
- Initial gross margins were highest for the control in the plant and first ratoon crops. These gains are anticipated to be offset by longer-term gains in the ratoon for the mud treatments.

Figure 1: Grant Matsen on his farm north-west of Sarina (Mackay region)

Agronomics

Trial results (Figure 2) show a statistically significant improvement in yield for both mud application methods when compared to the control. However, there was no significant difference in yield between mud application

methods from the combined plant and ratoon cane results.

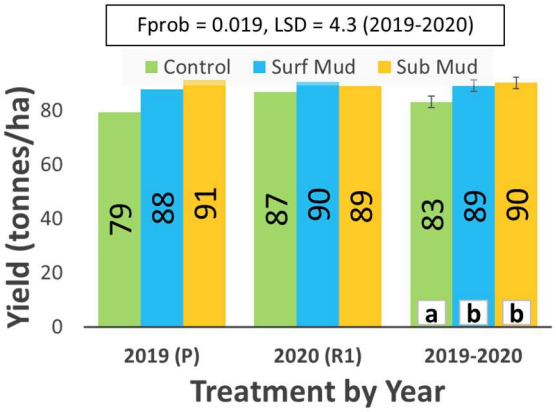

Figure 2: Average cane yields (t/ha, 2018-2019)

Source: Farmacist. Error bars indicate 95% least significant difference and different letters indicate statistically significant differences. Note: same applies to figure 3.

Both surface and subsurface applications of mud resulted in lower CCS when compared to the control (Figure 3). There was however, no overall statistically significant difference in sugar (t/ha) between any of the treatments despite the overall trend showing a marginal increase from the control through to the mud treatments (Figure 4).

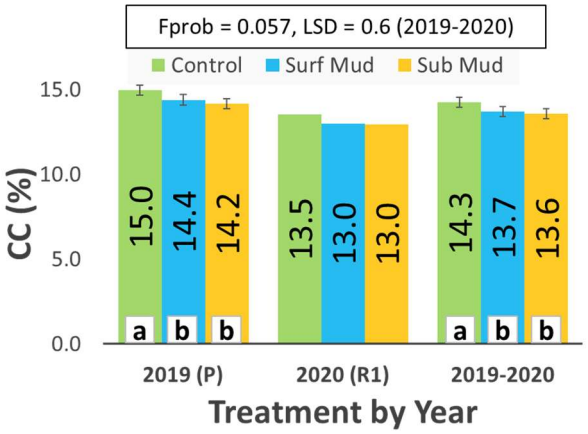

Figure 3: Average CCS (2018-2019)

Source: Farmacist.

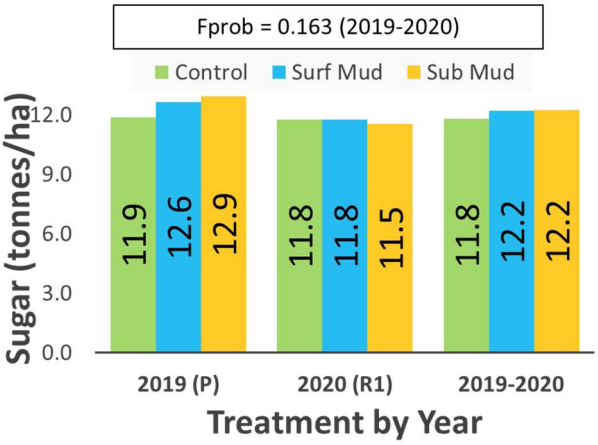

Figure 4: Average sugar yield (t/ha, 2018-2019)

Source: Farmacist.

It is understood that mill mud requires time to work into the soil and it is anticipated that nutrients will be made available in later ratoons. The level of availability is however, difficult to ascertain [1] Longer-term benefits of the subsurface treatment will also need to be monitored.

Note: Soybean yields were included at a constant 2.5 t/ha (payment yield) for all treatments in the preceding year.

Costs

Figure 5 presents the total variable costs per treatment for the soybean and plant crops. Both mud treatments had $599/ha and $645/ha respectively higher variable costs when compared to the control.

When comparing mud application costs, the subsurface treatment included an additional $18/ha against the surface treatment (i.e. more narrow width of pass and slower working speed for the 'two legged ripper'). This contributed to

[1] *Reference: Final Report: Reef Water Quality Science Program Project 12C. Mill mud and mill mud products: efficacy as soil amendments and assessment of environmental risk. April 2014.*

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.

a $46/ha higher total variable costs in applying mud subsurface. The total difference in cost also accounted for plant cane costs associated with yield differences (i.e. harvesting costs and levies).

Capital costs were a further $15/ha more for the 'two legged ripper' used to apply mud subsurface. This included depreciation over 15 years for both applicators at 3% interest on capital.

Figure 5: Plant cane and Soybean treatment variable costs (2018/19)

The difference between ratoon costs (Figure 6) were limited to those arising from yield changes (i.e. harvesting and levies) and were similar between all treatments. The biggest difference being a $34 higher cost for the surface mud treatment compared to the control.

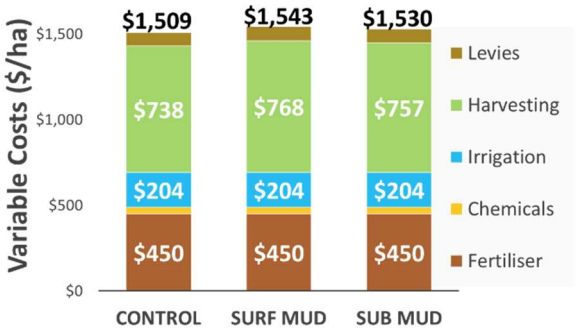

Figure 6: Ratoon cane treatment variable costs (2019/20)

Gross margins

The average treatment total gross margins (revenue less variable costs) generated by the soybean, plant cane and ratoon crop are presented in Table 1. These are based on a 5-year average sugar price ($417/t). It is expected that the applied mud will improve cane yields in further ratoons despite the control producing a significantly higher average gross margin of $3,796/ha (due to later nutrient availability). This was $527/ha and $573/ha respectively higher than the surface and subsurface mud treatments.

There was no statistically significant difference in average gross margins between the surface and subsurface mud treatments.

Table 1: Gross margins ($/ha)

Crop	Treatment		
	Control	Surf Mud	Sub Mud
Fallow/Soybeans	$950	$412	$394
Plant Cane (2019)	$1,122	$1,242	$1,268
1st Ratoon (2020)	$1,697	$1,616	$1,562
Total	**$3,796[a]**	**$3,269[b]**	**$3,223[b]**

Different superscript letters indicate statistically significant differences for gross margin results.

Conclusion

The economic results remain inconclusive from the plant and first ratoon crops, when comparing the subsurface against surface application method (including capital cost differences). However, Grant expects the benefits of mud in the follow-up ratoon crops to show an improvement in sugar yield and profitability over the longer-term. He also anticipates that subsurface application of mud would further improve these results.

Other economic benefits from an improved crop yield are difficult to ascertain and are not included in the overall economic results. These include a thicker trash blanket that would help suppress weeds and improve water retention while maintaining stool structure.

Lastly, while soybean yields were not measured between treatments, this could also have an impact on overall economic results and may prove important to measure in future trials.

"We intend to continue the practice of subsurface application of mill mud and mill ash. Consistency of supply is a significant factor limiting our ability to treat the areas we would like to treat" **– Grant Matsen.**

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

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