Soil Health & Nutrition Economics: 2018-20 Case Study

Tully grower: Chris Condon

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, Chris Condon and TRAP Services trialled the regenerative agriculture practices of RegenAG including a multi-species fallow on his farm.

The objective of the trial was to determine the impact of a multi-species fallow, together with the application of the RegenAG program and reduced nitrogen (N), on both sugar yield and resultant economics. Variable costs and mill data were used to undertake an economic analysis and compare profitability between the treatments from the fallow to first ratoon. Trial results, including yields, production costs and revenues, were analysed for each treatment.

Trial design

The trial was established on Chris's farm in the Tully region in 2017. The sugarcane crop was planted in 2018 and harvested in 2019 and 2020. The two treatments included in the trial are described in Table 1. These are the grower's Standard practice (Std) and a RegenAG program (RegenAG). The trial design was a randomized complete block. There were three replicate blocks with treatments randomly allocated for the two treatments within each block (see Figure 1).

Key findings

- Average cane and sugar yields were significantly higher for the Standard treatment ($p<0.05$).
- There were no significant differences in CCS between treatments in either the plant cane or first ratoon.
- Gross margins for the Standard practice were higher compared to the RegenAG in both plant cane and first ratoon, but these were not statistically significant.
- The combined average gross margin was significantly higher for the Standard treatment ($p<0.05$).

Table 1: Treatment description and N rates

Treatment	Description/N application rates		
	Fallow (2018)	**Plant Cane (2019)**	**First Ratoon (2020)**
(Std)	Growers Standard Fallow (cow peas)	100% Six Easy Steps N-rate	100% Six Easy Steps N-rate
(RegenAG)	Mixed species fallow + RegenAG Pgm	70% Six Easy Steps N-rate + RegenAG Pgm	100% Six Easy Steps N-rate

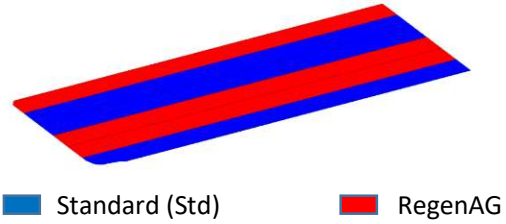

Figure 1: Illustration of Trial Layout – (source: TRAP Services)

Agronomics

Figure 2 presents the 2019, 2020 and average cane yield data. In the plant cane, the yield for the Standard practice was 15.1t/ha higher compared to RegenAG and this was significant ($p<0.05$). In the first ratoon, the Standard practice also attained a higher yield compared to RegenAG but this was not significant. Overall, the Standard treatment obtained an 11.7t/ha higher average yield and this was statistically significant ($p< 0.05$).

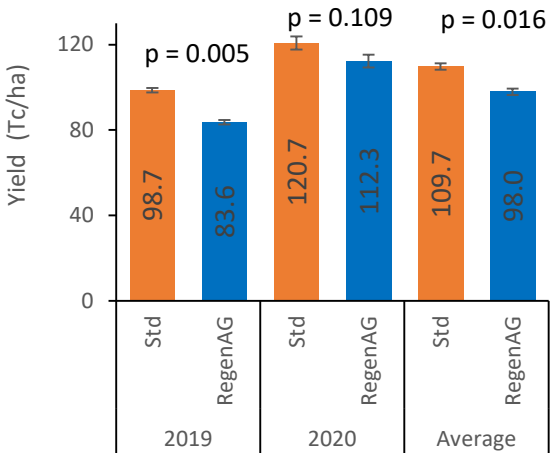

Figure 2: Sugarcane yield results (t/ha)

Figures 3 and 4 present the mean CCS and sugar results from each treatment for the plant cane (2019), first ratoon (2020), and combined average for both years. Results from both individual and combined crop classes showed no statistically significant treatment differences in CCS.

In the both the plant cane and first ratoon, the Standard treatment yielded more sugar (t/ha) when compared to RegenAG. This was largely driven by the higher sugarcane yields. Although individual year differences were not statistically significant ($p>0.05$), it should be noted that the plant cane (2019) sugar yield treatment difference had a significance level of 0.051. Overall, average sugar yield from both years was 1.7ts/ha significantly higher for the Standard treatment when compared to RegenAG ($p<0.05$).

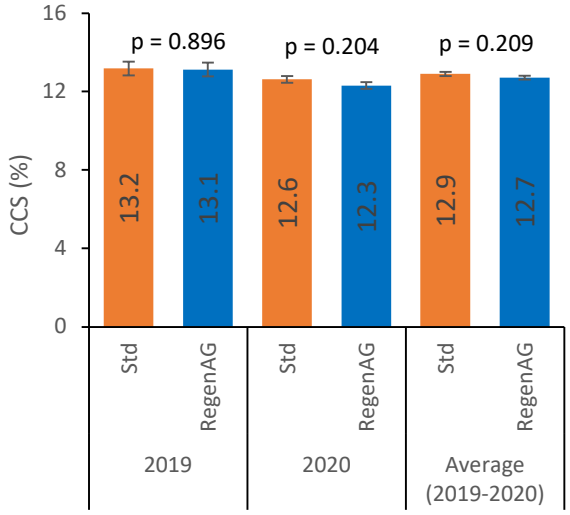

Figure 3: Average mill CCS results (%)

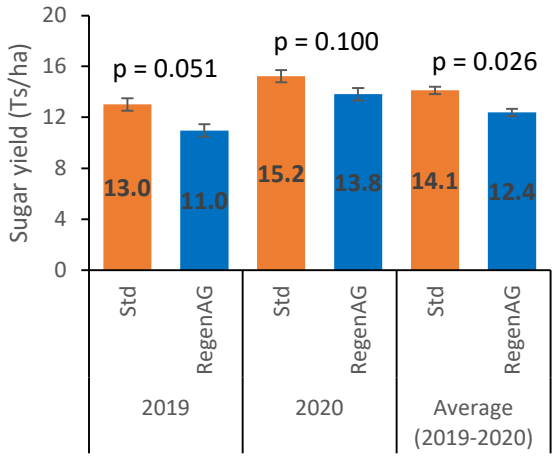

Figure 4: Sugar yield (ts/ha)

Costs

Variable fallow costs (2018) are presented in Figure 5. The RegenAG treatment had higher fallow costs (+$362/ha) against the Standard treatment. This was mainly due to the higher legume seed costs at $333/ha more per hectare when compared to the cow pea fallow. The RegenAG program also included additional biofert product and application costs (+$30/ha).

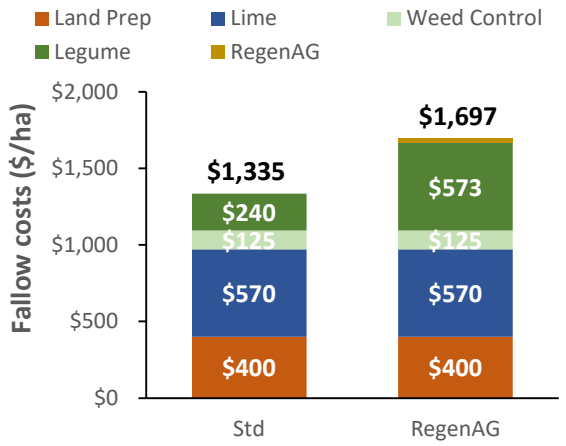

Figure 5: Variable fallow costs per treatment, 2018 ($/ha)

The variable costs for the plant cane (2019) and first ratoon (2020) are presented in Figure 6. The Standard treatment had slightly higher costs (+$192/ha) due to higher fertiliser costs as well as harvesting costs and levies in the plant cane. In the first ratoon, costs were fairly similar with only a slight difference (+$77/ha) attributable to higher harvesting costs and levies for the Standard treatment (due to the higher yield).

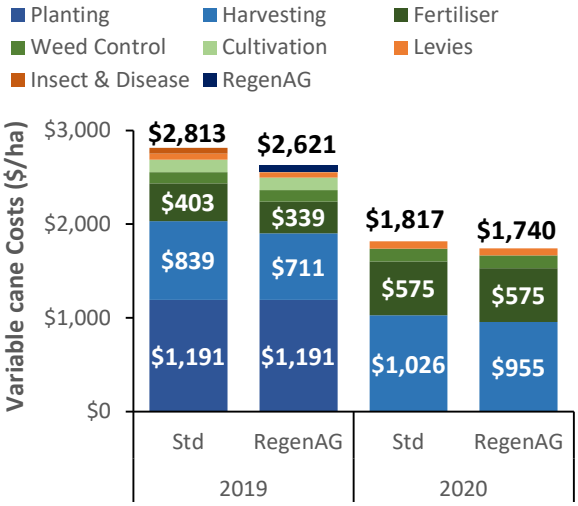

Figure 6: Variable cane costs per treatment, 2019 - 2020 ($/ha)

Gross Margins

Gross margin results (revenue less variable costs) are presented in Table 2 from the fallow, plant cane, first ratoon, and the combined average for each treatment. In both the plant cane and first ratoon, the gross margin for the Standard treatment was higher when compared to the RegenAg treatment. However, these differences, were not statistically significant due to the high variability of the data. Observed differences could therefore not confidently be attributed to the treatment effect. The three-year average showed a $355/ha significantly higher gross margin for the Standard treatment ($p<0.05$).

Table 2: Gross margins (GM) ($/ha)

Crop Class	Treatment GM			
	Std	RegenAG	s.e.d*	p-value
Fallow	-$1,335	-$1,697		
Plant cane	$707[a]	$343[a]	157.9	0.147
1st Ratoon	$2,231[a]	$1,895[a]	119.9	0.107
Average	**$535[a]**	**$180[b]**	**48.4**	**0.018**

[ab] Different superscripts indicate statistically significant differences.
**s.e.d – Standard error of the differences of the mean .*

Conclusion

Chris trialled a mixed species fallow with RegenAG practices to see if it would improve sugarcane production and profitability by using less inorganic fertiliser and potentially achieving higher yields and CCS.

In the fallow, the RegenAG treatment had higher costs mainly due to the cost of the multi-species legume seeds.

In the plant cane there were statistically significant differences ($p<0.05$) between treatments for cane yield (t/ha) and sugar yield (ts/ha) in favour of the Standard treatment. In the first ratoon, however, these differences were not statistically significant. There was no statistically significant difference in

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CCS between treatments from either the plant cane or first ratoon results.

Driven largely by cane yield differences, the gross margin for the RegenAG treatment was lower than the standard treatment in both the plant cane and first ratoon, but these differences were not statistically significant. However, the average gross margin from the Standard treatment across all the years combined was significantly higher when compared to RegenAG ($p<0.05$).

Although standard practices were more economically beneficial, results from the trial only present early stages of the crop cycle (up to first ratoon). It will be important to monitor a full crop cycle where RegenAG practices are expected to benefit the soil over the longer-term.

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

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