Department of Agriculture and Fisheries

Project Catalyst

Economic Summary Report
2020/2021 DAF Case Studies

Project Catalyst fosters the adoption of innovative sugarcane farming management practices and technologies that aim to improve the quality of water leaving farms in Great Barrier Reef Catchments. 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 the Worldwide Fund for Nature (WWF)-Australia and Catchment Solutions Pty Ltd. Other service providers include Natural Resource Management (NRM) groups, agronomic service providers (Farmacist, Herbert Cane Productivity Services Ltd (HCPSL), T.R.A.P. Services and Mossman Agricultural Services (MAS)) and agricultural economists from the Department of Agriculture and Fisheries Queensland (DAF). Importantly, the project draws on the innovative ideas, time and resources of grower participants from across the sugarcane industry.

The four key focus areas of the project include trials to better manage nutrients, chemicals, water and soil. Understanding the production, economic and environmental impacts of farm management practices enable farmers to make informed decisions regarding the adoption of these practices. Consequently, measuring these impacts by undertaking field trials and farm demonstrations with participating growers is an important component of the project.

This report contains a summary of the economic results for selected Project Catalyst trials in 2019/20 and 2020/21 (Tables 1-4). Tables categorised by key focus area include details on the trial's location, duration, crop class, variety, soil type, trial design (treatments/reps), key gross margin results and statistical analysis outcomes. There are also interesting points of note on each trial and a final summary of the overall results relating to each table category. Hyperlinks are included for individual case studies should further information be required (click on the practice name for direct access).

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Table 1: Nutrients (varying rates and delivery methods)

Practice	Location/ Sub-district	Trial period/ crop class	Variety/soil type	Treatments/ Reps	Gross Margin (GM) impact	Statistics	Notes
Staggered N rates	Mackay-Whitsundays: Mackay	2018-2020 (Ratoons 2-4)	Q242 on a Brown Chromosol.	Treatments - 5 Reps - 4	The alternating rate (110/150N*) had a $149/ha higher average GM compared to applying 180N.	GM differences were not statistically significant.	Applying 0 Nitrogen had consistently lower yields & sugar (t/ha).
Variable N rates	Mackay-Whitsundays: Eton	2019-2020 (Ratoons 2-3)	Q240 on a Sandiford.	Treatments - 3 Reps - 5	The Six-Easy-Steps® (6ES) average GM was $56/ha higher than the highest N rate (6ES+25%).	GM differences were not statistically significant.	There was no economic advantage from applying a rate of N above the 6ES rate.
Solid vs liquid fertiliser	Burdekin: BRIA	2020 (Ratoon 2)	Q252 on a loam.	Treatments - 3 Reps - 4	Results showed a $581-$660/ha higher GM for Granular side dressed fertiliser compared to the other two treatments (Granular stool-split and Liquid fertiliser stool-split).	The difference in GM was statistically significant.	Further investigation is required to validate this result given there is only one year of data.
DunderUnder (subsurface liquid fertiliser)	Mackay-Whitsundays: Eton	2019 (Ratoon 2)	Q240 on a Victoria Plains (Black Earth).	Treatments - 2 Reps - 3	Results showed a $147/ha reduced GM for the subsurface treatment.	GM differences were not statistically significant.	Further investigation is required where previous trials gave yield improvements for the subsurface treatment.

**110/150N denotes alternating between 110kg and 150kg of nitrogen (N) per ha.*

There was no economic benefit from nitrogen rates exceeding Six Easy Steps® (6ES) guidelines. The longest-term trial (Staggered N Rate trial) did show some promise in alternating between 6ES and a lower rate. However, an overall lack of statistical significance highlighted the variability of results from most nutrient trials. The only trial result showing a significant difference in gross margin included the Solid versus Liquid fertiliser trial where the granular side dressed application had a higher gross margin compared to both granular stool-split and liquid fertiliser application methods.

Table 2: Nutrients & Water (reducing rates with ground water N)

Practice	Location/ Sub-district	Trial period/ crop class	Variety/soil type	Treatments/ Reps	Gross Margin (GM) impact	Statistics	Notes

Ground water N (1)	Burdekin: Delta	2019-2020 (Ratoons 3-4)	KQ228 on a medium clay.	Treatments - 3 Reps - 4	The 155N treatment had the highest average GM for both years. This was followed by the 185N ($140/ha less) and 125N treatment with the lowest GM ($236/ha less).	GM differences were not statistically significant.	Further investigation is required to validate the effect of accounting for Nitrates from groundwater.
Ground water N (2)	Burdekin: BRIA	2019 (Ratoon 3)	Q183 on various soil types.	Treatments - 2 Reps - 4	The 170N treatment had a $301/ha higher GM than the 130N treatment.	GM differences were not statistically significant.	Further investigation is required to validate the effect of accounting for nitrates from groundwater.

There were mixed results from the ground water nitrate case studies. Given the previous trials have shown the potential to reduce N rates, further investigation is required. Under conditions where ground water contributions of nitrates are significant, it is recommended that future trials include ground water nitrate tests that can be linked to alternate application rates of N.

Table 3: Soils (biofert, fallows & ameliorants)

Practice	Location/ Sub-district	Trial period/ crop class	Variety/soil type	Treatments/ Reps	Gross Margin (GM) impact	Statistics	Notes
Soil ameliorants	Wet Tropics: Herbert	2018-2020 (Plant-Ratoon 2)	Q231 on a clay/terrace loam.	Treatments - 3 Reps - 3	Ag Lime had a $12-$117/ha higher average GM compared to the kiln dust/ag lime mix and prilled lime.	There were no statically significant differences between treatment GM's.	Over the full trial period, there was no statistical difference in GM's between soil ameliorants.
Subsurface mud and ash	Mackay-Whitsundays: Eton	2018-2020 (Fallow-Ratoon 1)	SP80 on a Victoria Plains (clay) & Calen (Brown Chromosol)	Treatments - 3 Reps - 1	For the mill mud and ash combination, the subsurface treatment had a $182/ha higher GM than surface applied treatment.	Not available (demonstration).	There were different yield responses between the mud and mud/ash plots. Results remain inconclusive where treatments lack replication.
				Treatments - 3 Reps - 1	For mud alone, the surface application had a $27/ha higher GM compared to subsurface application.		

Subsurface mill mud (1)	Wet Tropics: Mossman	2018-2020 (Plant-Ratoon 2)	Q208 on a Clifton.	Treatments - 4 Reps - 3	The subsurface with reduced N application had the highest GM in R1 and R2 as well as the overall average GM (but only $4/ha higher than the standard 6ES rate).	Not available (trial replicated but not randomised).	GM differences between treatments could not be validated due to non-randomised trial design.
Subsurface mud (2)	Mackay-Whitsundays: Sarina	2018-2020 (Fallow-Ratoon 1)	KQ228 on a Sodic soil.	Treatments - 3 Reps - 3	The surface application had a $46/ha higher average GM than sub-surface treatment for mill mud.	GM differences between sub-surface and surface treatments were not statistically significant.	It will be important to monitor the implications over a full crop cycle.
Biofert and mixed species fallow (soil health/ nutrition)	Wet Tropics: Tully	2018-2020 (Fallow-Ratoon 1)	No details.	Treatments - 2 Reps - 3	The average GM for the standard practice (this included a legume fallow) was $355/ha higher than the RegenAG treatment.	Statistically significant differences in the combined gross margin from plant and first ratoon results.	It will be important to monitor the implications over a full crop cycle.
Multi species fallow	Wet Tropics: Herbert	2019-2020 (Fallow-Plant)	Q253 on an Alluvial soil.	Treatments - 21 Reps - 3	A number of fallow crop options had a higher plant cane GM compared to the bare fallow ($150/ha). The Tropical Mustard fallow resulted in the highest plant cane GM ($487/ha).	GM differences were not statistically significant.	It will be important to monitor the implications over a full crop cycle.
Legume fallow	Mackay-Whitsundays: Proserpine	2020 (Fallow)	Q208 on a Wagoora soil.	Treatments - 2 Reps - 3	The Soybean fallow had a $234/ha GM (at $900/t) when compared to the cost (-$136/ha) of a bare fallow. At long-term pricing the low-cost soybean strategy would need a minimum 1.2t/ha yield to remain viable.	Not available.	Due to an error in the fertiliser application on the plant cane, a break-even investment analysis was completed.

In both lime and multi species fallow trials there was no significant difference between the treatments. For the Biofert trial there was a significantly higher gross margin from the standard practice against the RegenAg practice. This was largely due to the higher yield and lower costs relating to the standard practice. Longer-term impacts of RegenAg

would need to be investigated. Sub-surface trials showed mixed results and, in some cases, contradicted previous Project Catalyst trials. More research is thus required in this area.

Table 4: Water (alternate row irrigation)

Practice	Location/ Sub-district	Trial period/ crop class	Variety/soil type	Treatments/ Reps	Net Revenue impact	Statistics	Notes
Alternate row irrigation	Burdekin: Delta	2018-2019 (Ratoons 3-4)	Q240 on a mixture of Black Sandy to Clay Loams.	Treatments - 2 Reps - 1	Alternate row irrigation had an $812/ha higher average net revenue for the two years when compared to conventional practice.	Not available (trial not randomised).	Alternate row irrigation showed promising results. Further investigation with a randomised trial would help with validation.

The significant savings from the alternate row irrigation system may be a viable option for growers. It remains difficult to properly test the production outcomes in the absence of replicated and randomised trials. Going forward this may continue to be a challenge given the nature of irrigation infrastructure.

Please refer to the DAF Publications Portal for a full report on the trial results, including individual trial case studies here:
Project Catalyst - 2021 Economic Analysis Report - Sugarcane economics | Publications | Queensland Government

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