

Profitability of shifting to minimal tillage, legume crop rotation and double disc planting – economic case study, Ingham region

Grower: Gino Zatta

Key findings:

- The economic evaluation indicated an annual improvement in farm gross margin of \$74 per hectare.
- Tillage costs were reduced as a result of decreased tractor operations and labour hours.
- Fallow costs increased due to growing a legume cover crop, however these were offset by fertiliser cost savings in plant cane.
- The case study results suggest that the changes in management practices provided sufficient benefit to make grower's investment in a legume planter worthwhile.

The aim of this case study is to evaluate the economic impact of practice change in the sugarcane industry supported through the Australian Government Reef Programme and Reef Trust. The Reef Programme was delivered between 2008 and 2015 by Terrain and industry partners in the Wet Tropics region. The programme provided grants and specialist expertise to assist farmers with the adoption of improved management practices that lead to a reduction in pollutants entering the Great Barrier Reef lagoon, in particular nutrients, sediments and pesticides. The Reef Trust is an ongoing programme that provides investment funds to cane farmers through a tender process. The programme is aimed at assisting farmers in introducing practices that increase nitrogen use efficiency, leading to improved water quality outcomes.

Along with the expected environmental benefits from improved management practices, developing a greater understanding of the implications to farm profitability is crucial for the future sustainability of the sugarcane industry.

Farm characteristics

The following case study is based on information provided by Gino Zatta, a sugarcane farmer for 29 years in the Ingham region. The Zatta farm is approximately 330 hectares and located 25 km south of Ingham. This study focuses on the adoption of several management practices over the last five years that were supported by the Reef Programme and Reef Trust. The changes in management practices aim to improve both farm productivity and water quality run-off.

The economic analysis compares the old and new farming systems. The old farming system is based on the conventional farming practices previously used in 2010 compared to the 2015 farming system

which involves a reduction in tillage, a legume crop rotation and use of a double disc billet planter. A farm gross margin analysis is used to estimate the productivity benefits and costs of applying such practices. Furthermore the Annualised Equivalent Benefit is calculated to determine if the new farming system provided sufficient benefit to make the investment costs worthwhile.

Management practice changes

A number of management practice changes (table 1) were implemented over several years including: minimal tillage, growing a legume (cowpea) crop in the fallow, and double disc billet planting:

Minimal tillage: The grower aims to minimise soil tillage in order to improve soil health and reduce machinery operation costs. The grower believes that excessive ripping, discing and other cultivation methods are detrimental to soils health and can contribute to yield decline. Land preparation is a major cost for sugar cane growers and reducing cultivation can decrease tractor hours and labour hours, lowering the overall production costs.

Legume crop: The grower believes that incorporating legume crops in a bare fallow improves the soil's physical, chemical and biological health. Growing the legume crop provides a source of nitrogen and a break in monoculture which can lead to improved production; however additional costs are incurred, including seed, machinery operations and labour hours.

Double disc billet planter: The double disc billet planter forms a narrow slot in the soil where the billets are planted, resulting in less soil disturbance. The planter also forms a finished mound profile, reducing the potential for waterlogging, which can occur with conventional planting.

Table 1: Changes to the farming system

	Old System	New System
Tillage operations pre and post-planting	2 pass with offset disc 2 pass with ripper 2 passes with rotary hoe 2 passes with weeder 1 pass with hill-up grubber	2 passes with wavy disc 1 pass with moulder
Fallow management	Bare fallow	Cowpea Legume crop
Nutrient management	Grower determined nutrient rate	Six-Easy-Steps nutrient rate
Planting method	Conventional billet planter	Double disc billet planter

Methodology

The economic evaluation was undertaken using the Farm Economic Analysis Tool (FEAT). The FEAT model was developed by Queensland Department of Agriculture and Fisheries and was designed for planning and decision making to assist cane farming enterprises. The objective of this case study is to determine if the change in farming system is profitable and adding value to the farming business.

The economic measures used include Farm Gross Margin¹ and Annualised Equivalent Benefit².

A break-even analysis was also completed to assess the break-even points of cane price and yield movements; this provides a better understanding of the financial risk involved if things don't turn out as planned.

The legume planter was the only capital expenditure included in the AEB calculations. The capital cost of the billet planter is not included since it is a separate business and cash flows are generated off-farm. Instead, the billet planter contract rate charged to local growers is used in the analysis.

Results

The data for the analysis was obtained from farm records, discussions with Gino, and information sourced from local rural suppliers. The management practice change improved the farm gross margin by \$74 per hectare, due to a reduction in tillage costs as a result of the decreased machinery operations and labour hours. Fallow costs increased due to growing a legume cover crop, however these were offset by a reduction in fertiliser costs applied to plant cane, due to accounting for the nitrogen provided by the legumes.

It is important to note that there can be considerable variability in the size of the legume crop, driven by a range of factors including weather and soil conditions. This impacts on the amount of nitrogen that the legumes supply, and therefore the cost savings in fertiliser.

As part of the change in management practices, a new legume planter was purchased for a cost of \$32,000. When taking the initial capital investment into account, the investment analysis shows that the adoption of the new farming system was worthwhile³ (Table 2). Over a ten year investment horizon, the investment adds \$54/ha/yr to the bottom line of the farming business. This analysis assumes that yield is maintained in the new farming system, and is based on a sugar price of \$430 per tonne.

In terms of assessing the financial risk, the payback period calculation indicates that it would take two years to repay the \$32,000 capital invested, and that a maximum of \$116,000 (investment capacity) could have been invested before it becomes economically unviable. The break-even cane yield analysis reveals that the average farm yield would need to decrease by over 1.97% (as a result of the new farming system) before investing in the practices becomes unprofitable.

¹ The gross margin is the total income derived from an enterprise less the variable costs incurred in the enterprise. Gross Margin does not include fixed costs.

² 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.

³ Using a discount rate of 7%.

Table 2: Investment and risk analysis

Economic indicators	
Costing of implementation (\$)	\$32,000
Discounted Payback Period	2 years
Annualised Equivalent Benefit (\$/ha/yr)	\$54
Investment capacity (\$)	\$116,000
Break-even cane yield (% reduction)	1.97%

Conclusion

Over the past five years Gino Zatta has introduced minimal tillage, a legume crop, and the use of double disc billet planter, with the objective of increasing the farm's productivity and improving the water quality of run-off. The management practice changes improved farm gross margin by \$74 per hectare. The increased costs associated with growing a legume fallow crop were offset by a reduction in plant cane fertiliser costs to account for the nitrogen supplied by the legumes.

When taking into account the capital investment, the AEB of \$54/ha/yr indicated that the adoption of the new practices was worthwhile for the farming business. The discounted payback period calculation indicated that it would take two years to repay the \$32,000 capital invested, and that a maximum of \$116,000 could be invested before the practice changes become unviable. The break-even cane yield analysis reveals that the average farm yield would need to decrease by over 1.97% (as a result of the new farming system) before investing in the practices becomes unprofitable. The grower expects that a reduction in yield is unlikely and hopes that long-term production will improve through better soil health.

This case study is specific to an individual grower's situation and is not representative of all situations. When evaluating a farming system change, it is important to have a detailed plan and an accurate assessment of benefits and costs involved for your own situation.

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