

# Economic case study of ABCD cane management practices in the Burdekin Delta region





## 1. Introduction

A case study was undertaken to determine the economic impact of a change in management class as detailed in the A, B, C and D management class framework. This document focuses on the implications of changing from D to C, C to B and B to A class management in the Burdekin Delta region and if the change is worthwhile from an economic perspective. This report provides a guide to the economic impact that may be expected when undertaking a particular change in farming practices and will ultimately lead to more informed decisions being made by key industry stakeholders. It is recognised that these management classes have certain limitations and in many cases the grouping of practices may not be reflective of the real situation.

The economic case study is based on the A, B, C and D management class framework for water quality improvement developed in 2007/2008 for the Burdekin natural resource management region. The framework for the Burdekin is currently being updated to clarify some issues and incorporate new knowledge since the earlier version of the framework. However, this updated version is not yet complete and so the Paddock to Reef project has used the most current available version of the framework for the modelling and economics.

As part of the project specification, sugarcane crop production data for the Burdekin Delta region was provided by the APSIM model. The information obtained from the APSIM crop modelling programme included sugarcane yields and legume grain yield (legume grain yield only applies to A class management practice).

Because of the complexity involved in the economic calculations, a combination of the FEAT, PiRisk and a custom made spreadsheet was used for the economic analysis. Figures calculated in the FEAT program were transferred to the custom made spreadsheet to develop a discounted cash flow analysis. The marginal cash flow differences for each farming system were simulated over a 5-year and 10-year planning horizon to determine the Net Present Value of changing across different management practices. PiRisk was used to test uncertain parameters in the economic analysis and the potential risk associated with a change in value.

## 2. Economic analysis parameters

Each farming business is unique in its circumstances and therefore the parameters and assumptions used in this economic analysis do not reflect each individual situation. Consideration of individual circumstances must be made in order to make an informed investment decision. The parameters listed below are based on historical data and information provided by growers and technical experts to develop a representative farm. The major economic parameters used include:

- 120 hectare representative farm.
- Net sugar price: \$349.30. This is the 5 year average price from 2005 to 2009.
- CCS: 14.94. This is the 5 year average CCS for the Burdekin Sugar Mills.
- Contractors used for harvesting, planting and some spraying operations.

- Contract harvest cost: \$6.50/tonne for D and C class management, \$6.80 for B class management with GPS guidance and \$7.80/t with GPS guidance and green cane harvesting for A class management.
- Contract planting cost: \$400/ha without GPS guidance for D and C class management, \$425/ha with GPS guidance for B and A class management.
- Contract spraying cost: \$30/ha.
- Fuel price without GST and after rebate: \$0.85/L.
- Labour cost: \$30/hour.
- Soil tests are \$130 each and leaf test are \$50 each.
- All chemical and fertiliser prices are based on April 2010 figures.
- Crop cycle consists of fallow, plant and three ratoon cane crops. Each part of the crop cycle has an equal proportion of land area.
- Bare/weedy fallow used in D and C class management.
- Soybean fallow crop grown for green manure in B class management and soybean crop grown for grain harvest in A class management.
- Maintenance lasering is carried out on half of the fallow area in all management classes.
- Gypsum is applied in the fallow area of A and B class management.
- Grower changes from narrow rows (1.5m) to wider rows (1.8m) in implementing controlled traffic as the move is made from C class to B class management.
- Irrigation water applied is held constant across all management classes.
- Detailed machinery operations, fertiliser application rates and chemical application rates are contained in a publication produced by Van Grieken, Webster, Coggan, Poggio, Thorburn and Biggs (2010).
- The information presented on A class management is based on practices under research and not thoroughly tested on a commercial scale. Caution must be taken with the interpretation of the actual numbers presented in this management class.
- Transaction costs are not included in this analysis. Examples of transaction costs include the time spent purchasing and learning about the new equipment purchased.
- The economic analysis is a steady state analysis for a representative property operating exclusively in each management class. In reality, most farms would operate across a few management classes, and there may be varying periods of transition. This analysis assumes that the transition to a new management practice occurs in the first year.
- Figures are exclusive of GST where applicable.

## 3. Gross margins

The main objective of this section is to identify the gross margin of fallow, plant and ratoon cane crops (table 1) in a sugarcane farming business. The economic analysis focuses on two types of fallow management, bare/weedy fallow and soybean fallow crop. Legume crops can either be grown as a green manure or harvested grain crop in the Burdekin region due to the availability of water for irrigation and suitable environmental conditions. The ABCD framework specifies a bare fallow

Table 1: Gross margins

Scenario name	Plant cane GM/ha	Ratoon 1 GM/ha	Ratoon 2 GM/ha	Ratoon 3 GM/ha	Bare fallow GM/ha	Soybean fallow GM/ha	Soybean grain crop fallow GM/ha	Farm GM/ha
A class	\$2,886	\$3,841	\$4,023	\$3,977	NA	NA	\$399	\$3,025
B class	\$3,616	\$3,990	\$4,056	\$4,022	NA	-\$889	NA	\$2,959
C class	\$2,434	\$3,614	\$3,592	\$3,551	-\$565	NA	NA	\$2,525
D class	\$1,831	\$3,311	\$3,279	\$3,240	-\$676	NA	NA	\$2,197

in C and D class management, soybean green manure crop in B class management and soybean harvested grain crop in A class management. Labour has been treated as a variable cost (\$30/hr) in the gross margin analysis to allow for a more accurate comparison between management classes.

Table 1 shows a trend of increasing farm gross margin per hectare with a change from D class through to A class management. This trend is largely associated with savings in tillage, fertiliser, weed control and labour costs in the plant and ratoon cane crops. A substantial increase in farm gross margin is indicated in the change from C through to B class management. The fallow gross margin is negative for B, C and D class management due no revenue being generated. A positive fallow gross margin is displayed in A class management due to the soybean crop being harvested for the sale of grain.

Table 2 shows the potential practice changes that a business may undertake in the transition from one management class to another management class. The changes listed will vary for each farming business and largely depend on soil type, farm size, machinery, access to contractors and individual circumstances.

## 4. Capital costs

The capital costs incurred by a business transitioning from one management class to another will vary substantially and largely depend on individual circumstances. The capital costs that have been included in this economic analysis are shown in table 3, although for each business this list would be different.

In addition to the capital costs, there are some annual costs associated with changing management class. These annual costs are associated with a more detailed nutrient management plan used in B class and A class management. For B class management, 2 soil tests per annum, while for A class management 4 soil tests and 2 leaf tests per annum.

## 5. Investment analysis

An investment analysis was undertaken using the net present value (NPV) technique to determine if the investment in capital is worthwhile and creating value for the farming business. The investment analysis framework implicitly accounts for the opportunity cost of the extra capital investment involved. Given the economic parameters used in the analysis, an investment should be accepted if the net present value is positive and rejected if it is negative. A discount rate of 7% has been used to convert the future cash flows of the cane business to their present values (value in today's dollar terms). Table 4 displays the net present values

Table 2: Potential practice changes

D class to C class
Reduction in the number of soil preparation passes pre cane planting
Reduction in the number of cultivations post cane planting
Reduction in cultivation in ratoon cane
Reduction in fertiliser application rates
Fertiliser applied sub-surface for all crop classes
More flexible chemical strategy across the farm (e.g. use of spray out in fallow and herbicides in plant cane)
Basic record keeping
Decrease in farm labour requirements
C class to B class
GPS used for cane planting equipment
Controlled traffic at 1.8m row spacing
Further reduction in tillage passes pre and post cane planting
No tillage in ratoon cane
Soil tests undertaken in each fallow block before planting
Fertiliser application rates based on soil tests
Use of soybean legume crop in fallow, legumes grown on raised beds
Increased chemical use, but targeted to each blocks requirements
Development of a soil management plan
Paper based records of block activities
Use of climate and weather forecasts
Decrease in farm labour requirements
B class to A class
All major machinery controlled by GPS guidance
Green cane trash blanketing (GCTB)
Controlled traffic at 1.8m row spacing
Zero tillage post cane planting
Trash splitter used in ratoons for GCTB
Permanent beds kept on half of the fallow area
EM mapping of farm
Soil test taken in each fallow block and selected leaf tests undertaken
Use of soybean legume crop in fallow, legumes grown on raised beds and harvested for grain
Knockdown chemicals used more and residual chemicals used less
Zonal spraying with a hooded sprayer
Detailed electronic based farm records
Decrease in farm labour requirements

Table 3: Capital costs

Capital item	Cost (\$)
D class to C class	
No capital investment	0
C class to B class	
Stool splitter fertiliser box	40 000
Sprayer modifications	5 000
Bed former	10 000
Harvester modifications	12 500
Farm tractor modifications	1 500
<b>Total</b>	<b>69 000</b>
B class to A class	
GPS on farm tractor	40 000
Shielded sprayer	28 000
Trash splitter	15 000
<b>Total</b>	<b>83 000</b>

Note: The information presented on A class management is based on practices under research and not thoroughly tested on a commercial scale. Caution must be taken with the interpretation of the actual numbers presented in this management class.



**Table 4: Net present values**

Change in mgmt class	Net capital investment	NPV (10 yr analysis)	NPV (5 yr analysis)
D to C	\$0	\$276,107	\$161,185
C to B	\$69,000	\$296,727	\$144,502
B to A	\$83,000	-\$27,197	-\$50,424

associated with changing from one class to another class over both a 5 year and 10 year investment period.

Changing from D to C class management requires no additional capital outlays and earns a positive NPV (5years) of \$161,185 and \$276,107 (10 years). The results indicate that a change management class from D to C is clearly a worthwhile proposition.

Changing from C to B class management requires an additional capital outlay of \$69,000 and earns a positive NPV of \$144,502 over a 5 year investment horizon. The 10 year investment horizon also revealed a positive NPV of \$296,727. The results indicate that the investment required to change from C to B class management is worthwhile from an economic perspective.

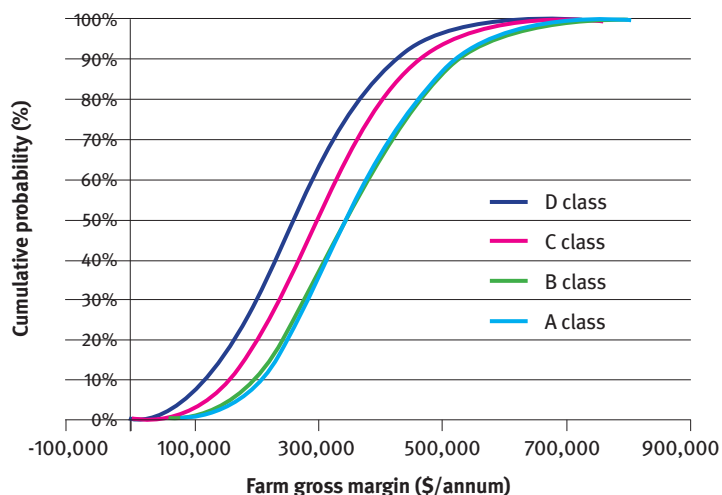
Changing from B to A class management requires an additional capital outlay of \$83,000 and is likely to produce a negative NPV of -\$50,424 over a five year investment horizon. The 10 year investment horizon displayed a marginally positive NPV of -\$27,197. The negative NPV indicates that the investment is not worthwhile from an economic perspective.

## 6. Risk analysis

Risk analysis has been undertaken due to the uncertainty that surrounds future cash flows. These future cash flows can vary due to the variability in prices received and yields obtained from both the sugarcane and fallow crops. PiRisk was used to conduct simulations of the farm gross margin with random values being chosen from the probability distributions for sugarcane price, sugarcane yield, soybean price and soybean yield. The gross margin associated with each management class is shown in figure 1.

The PiRisk analysis indicates that D and C class management have a higher probability of making a lower farm gross margin compared with A and B

**Figure 1: Distribution of farm gross margins**



class management. This suggests that A and B class management will have a higher farm gross margin than those persevering D and C class management, all else being equal, in any given year. The close relationship between A and B class management at the higher levels of income is due to the potential negative impact of poor soybean crop performance in the A class management. The graph emphasises the superiority of A and B class management over the other options, however this does not take into account fixed costs or capital investment required to make the transition. Therefore, the interpretation of this graph should be carried out in conjunction with the NPV figures outlined in section 5 of this report.

## 7. Conclusion

Using a variety of economic parameters detailed in this case study report, the NPV results indicate that the transition from D to C and C to B class management is worthwhile proposition from an economic perspective for both the 5 year and 10 year investment period. The changing from B to A class management provided a negative net present value over a 10 year and 5 year investment horizon and was not a worthwhile investment using the specified economic parameters.

The risk analysis showed that in any given year, the business will receive a higher farm gross margin when operating with an improved class of management, although the difference is small between B and A class management. This indicates that A and B class management will be stronger financially than those persevering D and C class management.

Overall, this economic case study has displayed potential financial benefits when moving from D to C and C to B class management. The benefits will vary for each individual business and will depend on their starting point and individual circumstance. A business currently operating with B class management may not be better off by moving towards A class management. The outcome of this transition will strongly depend on factors such as capital investment, length of the investment period and the ability to successfully implement these commercially unproven practices. As previously noted, the costs and benefits associated with a transition in management class will be different for each business and therefore each individual circumstance needs to be carefully considered before making a change.

For a copy of the full project report, please refer to the publication produced by Van Grieken, Poggio, East, Page and Star (2010).

Key contacts: Mark Poggio, Jim Page or Martijn Van Grieken.

## List of references

Van Grieken, M.E., Poggio, M.J., East, M., Page, J. and Star, M., 2010. Economic Analysis of Sugarcane Farming Systems for Water Quality Improvement in the Great Barrier Reef Catchments. Reef Rescue Integrated Paddock to Reef Monitoring, Modelling and Reporting Program. A report to Reef Catchments. CSIRO: Water for a healthy Country National Research Flagship.

Van Grieken, M. E., A. J. Webster, A. Coggan, M. Poggio, P. Thorburn and J. Biggs (2010). Agricultural Management Practices for Water Quality Improvement in the Great Barrier Reef Catchments. CSIRO: Water for a Healthy Country National Research Flagship.