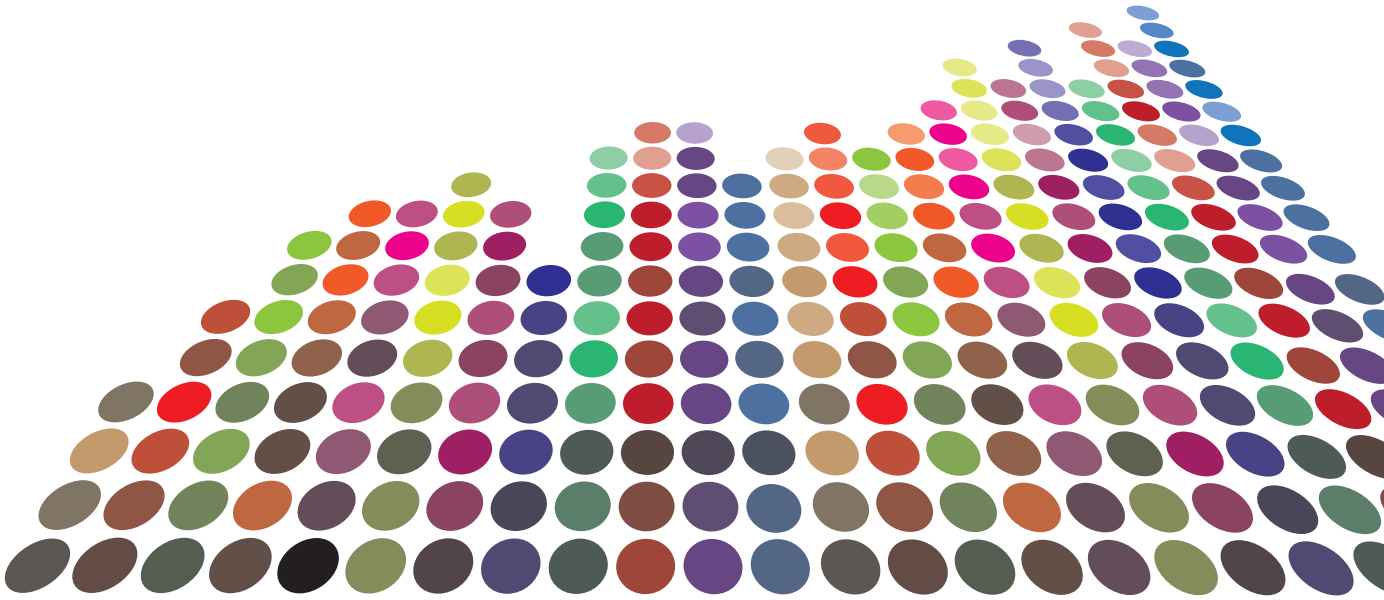
Department of **Employment, Economic Development and Innovation**



Economic case study of ABCD cane management practices in the Tully region

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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 Tully 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 by the wet tropics natural resource management region. The framework for wet tropics 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 Tully region was provided by the APSIM model.

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: 12.86. This is the 5 year average CCS for the Tully Sugar Mill.
- Sugarcane yields provided by APSIM.
- Contractors used for harvesting, planting and some spraying operations.
- Contract harvest cost: $7.50/tonne without GPS guidance for D, C and B class management, and $7.80/t with GPS guidance for A class management.
- Contract planting cost: $360/ha without GPS guidance for D and C class management, $370/ha with GPS guidance for B class management and $400/ha with GPS guidance for 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.
- Crop cycle consists of fallow, plant and four ratoon cane crops. Each part of the crop cycle has an equal proportion of land area.
- Green cane trash blanketing is used across all management classes.
- Bare/weedy fallow used in D and C class management.
- Cowpea fallow crop grown for green manure in A and B class management.
- Lime is applied in the fallow area of all management classes.
- All chemical and fertiliser prices are based on April 2010 figures.
- Grower changes from narrow rows (1.5m) to wider rows (1.8m) in the process of implementing controlled traffic as the move is made from C class to B class management.
- 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 and potential practice changes

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. It is assumed that no revenue is received from the legume green manure crops grown in fallow and that the legume crop is grown for green in half of the total fallow area for A and B management class, with the remainder of area in bare fallow. A bare fallow is used in C and D management class. Labour has been treated as a variable cost ($30/hr) in the gross margin analysis to allow for a more accurate comparison between management practices.

Table 1: Gross margins

Scenario name	Plant cane GM/ha	Ratoon 1 GM/ha	Ratoon 2 GM/ha	Ratoon 3 GM/ha	Ratoon 4 GM/ha	Bare fallow GM/ha	Cowpea fallow GM/ha	Farm GM/ha
A class	$843	$1,419	$1,487	$1,546	$1,774	–$245	–$405	$1,124
B class	$717	$1,402	$1,510	$1,544	$1,815	–$330	–$490	$1,096
C class	$484	$1,226	$1,334	$1,413	$1,677	–$477	NA	$943
D class	$243	$1,148	$1,260	$1,321	$1,589	–$425	NA	$856

Table 1 shows a trend of increasing farm gross margin per hectare as practices 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. The fallow gross margin is negative for A,B,C&D management class due to no revenue generated from a cowpea or bare fallow. As anticipated, the gross margin for plant cane crops is lower than ratoon cane crops because of the higher input costs associated with plant cane operations (e.g. tillage and planting).

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. Therefore, the capital costs used in the analysis represent just one possible scenario.

In addition to the capital costs, there are annual costs associated with changing management classes. These annual costs are associated with a more detailed nutrient management plan used in B class and A class management practices. 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 associated with changing from one class to another class over both a 5 year and 10 year investment period.

Changing from D to C management class requires no additional capital outlays and earns a positive NPV

Table 2: Potential practice changes

D class to C class
Slight reduction in the number of soil preparation passes before cane planting
Reduction in cultivation in ratoon cane
Reduction in fertiliser application rates
More flexible chemical strategy across the farm (e.g. use of spray out in fallow)
Basic record keeping
Limited soil tests taken
Decrease in farm labour requirements
C class to B class
GPS used for planting
Controlled traffic at 1.8m row spacing
Further reduction in tillage passes before 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 cowpea legume crop in half of the fallow area for green manure
Spray-out of fallow area
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
Increase in contract harvesting cost to accommodate for the GPS on harvester and haul-outs
Further reduction in tillage passes before cane planting, zero tillage after planting.
EM mapping of farm
Soil test taken in each fallow block and selected leaf tests undertaken
Fertiliser & soil ameliorant rates application rates based on soil and leaf tests and EM mapping
Use of cowpea legume crop in half of the fallow area for green manure
Spray-out of fallow area
Variable chemical application using maps and GPS
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
Harvester modifications	12 500
Farm tractor modifications	1 500
Total	**59 000**
B class to A class	
GPS on farm tractor	40 000
Shielded sprayer	28 000
Ripper/rotary hoe mods	20 000
Total	**88 000**

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	$73 020	$42 627
C to B	$59 000	$70 538	$16 621
B to A	$88 000	–$64 748	–$74 426

(5years) of $42,627 and $73,020 (10 years). The results indicate that a change in management class from D to C is clearly a worthwhile proposition.

Changing from C to B management class requires an additional capital outlay of $59,000 and earns a positive NPV of $16,621 over a 5 year investment horizon. The 10 year investment horizon revealed a positive NPV of $70,538. Both scenarios indicate that the investment required to change management class (C – B) is worthwhile from an economic perspective.

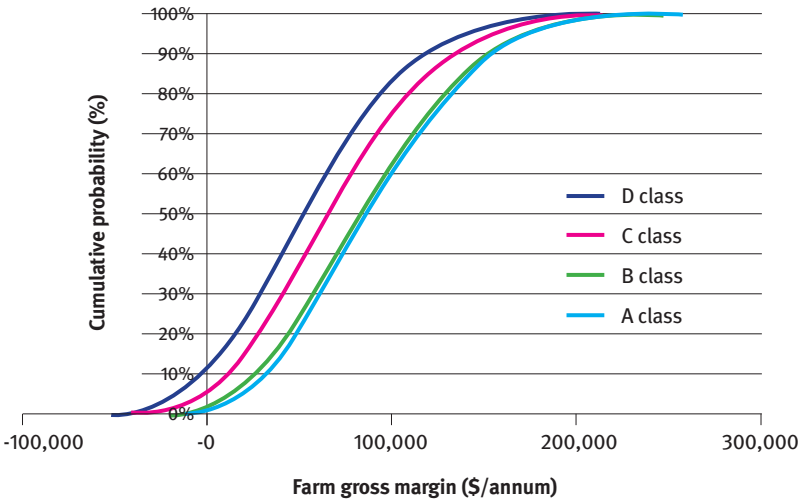
Changing from B to A management class requires an additional capital outlay of $88 000 and is likely to produce a negative NPV of -$64,748 (5years) and -$74,426 (10 years). The negative NPV indicates that the transition from B to A class management is not a worthwhile investment.

6. Risk analysis

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

The key observations from the PiRisk analysis is that the D and C class management have a higher probability of making a negative farm gross margin compared with A and B class management. This suggests that A and B class management will be stronger financially than those persevering with D and C class management, all else being equal, in any given year. The results also indicate that the maximum negative gross margin is substantially higher for D and C class management practices. The graph emphasises the superiority of A and B class management over the other options, however this does not take into account fixed costs and 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.

Figure 1: Distribution of farm gross margins



7. Conclusion

Using the variety of economic parameters detailed in this case study report, the net present value results indicate that the transition from D to C and C to B class management is a worthwhile proposition from an economic perspective. In contrast to this, the transition from B to A class management was not worthwhile and displayed a negative net present value. Changing from C to B class management displayed the greatest benefit with a more resilient farm gross margin and a positive net present value with either a five year or ten year investment period.

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 the likelihood of A and B class management making a negative farm gross margin is lower compared to C and D class management.

The results of this economic case study have shown that there are expected financial benefits when moving from D to C and C to B class management. The benefits will vary for each individual business depending on their starting point and their 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 will be different for each individual business and therefore each circumstance needs to be carefully considered before making a change in management practice.

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

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