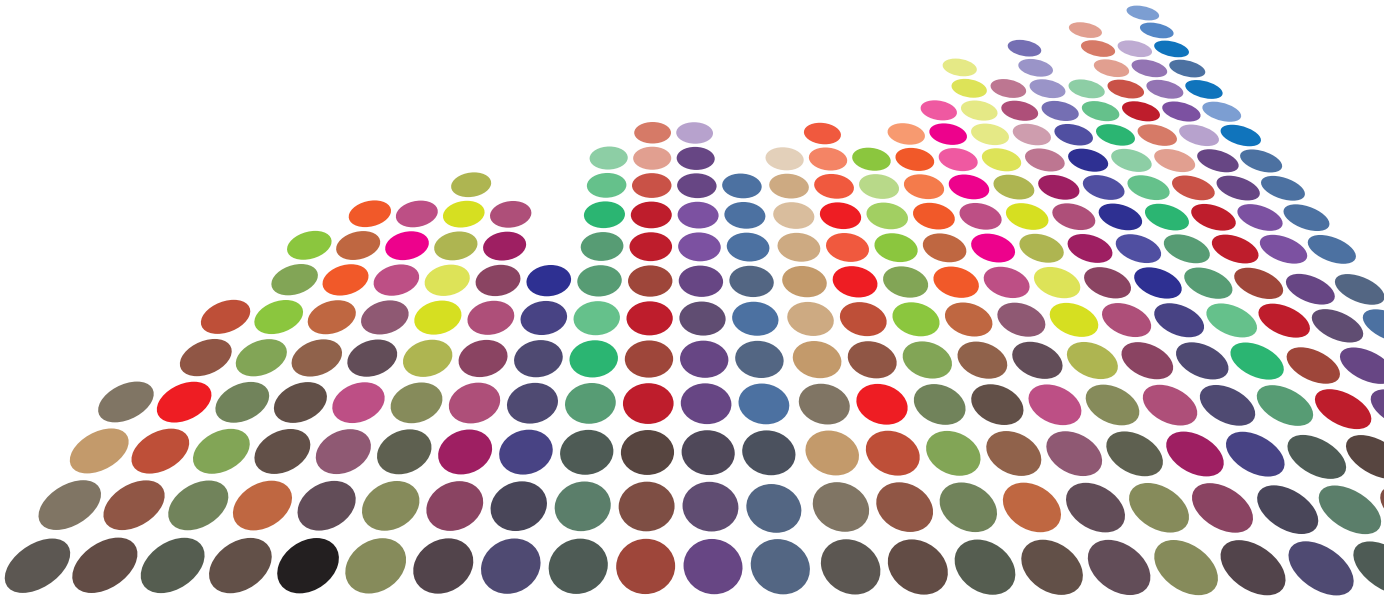
Department of **Employment, Economic Development and Innovation**



Economic case study of ABCD cane management practices in the Burdekin River irrigation area

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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 Burdekin River irrigation area (BRIA) 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 BRIA 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.

Note: Fertiliser application rates are subject to further validation for the A and B class management categories in this region. The rate of nitrogen to apply following a legume crop in fallow is also subject to further research and may be influenced by various biophysical, environmental and management factors. A sensitivity analysis was undertaken for plant cane nitrogen rates in A and B class management practices to determine the overall influence on net present value (NPV) results. The sensitivity analysis indicated that there is no impact on the overall NPV decision rule results when applying nitrogen (≤150kg/ha) to plant cane following a legume fallow.

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:

- 240 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.
- Sugarcane yields and soybean grain yields determined by APSIM
- Contractors used for harvesting, planting and some spraying operations.
- Contract harvest cost: $6.50/tonne for D and C class management, $6.80/tonne for B class management with GPS guidance and $7.80/tonne 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.
- Burnt cane harvesting is used in all D, C and B class management. Green cane trash blanketing is used in A class management.
- 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 in all management classes.
- 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 would 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). The economic analysis focuses on two types of fallow management, bare/weedy fallow and soybean fallow crop. Legume crops (e.g. soybeans) 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

Table 1: Gross margins

Scenario name	Plant cane GM/ha	Ratoon 1 GM/ha	Ratoon 2 GM/ha	Ratoon 3 GM/ha	Cane GM/ha	Bare fallow GM/ha	Soybean fallow GM/ha	Soybean grain crop fallow GM/ha	Farm GM/ha
A class	$1,103	$2,005	$2,226	$2,154	$1,872	NA	NA	$208	$1,539
B class	$1,632	$2,041	$2,261	$2,189	$2,031	NA	–$929	NA	$1,439
C class	$1,237	$1,748	$1,985	$1,951	$1,730	–$767	NA	NA	$1,231
D class	$620	$1,357	$1,594	$1,563	$1,284	–$761	NA	NA	$875

specifies a bare fallow 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. Fallow management practices also influences farm gross margin per hectare, particularly in the A class management. The financial benefit of a soybean grain crop in A class management assists in offsetting the reduction in cane gross margin per hectare. The fallow gross margin is negative for B, C and D class management due no revenue being generated. A substantial increase in farm gross margin is indicated in the change from D through to C class management.

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 every individual business depending on their 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 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

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
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 1.8 m 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
Use of more accurate spray nozzels – matched the job
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 1.8 m row spacing
Zero tillage post cane planting
Trash rake used in ratoons for GCTB
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	
Bed former	35 000
C class to B class	
Stool splitter fertiliser box	50 000
Sprayer modifications	10 000
Harvester modifications	12 500
Farm tractor modifications	1 500
Total	**74 000**
B class to A class	
GPS on farm tractor	40 000
Shielded sprayer	28 000
Trash rake (GCTB)	18 000
Total	**86 000**

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	$35,000	$594,196	$332,309
C to B	$74,000	$276,907	$130,851
B to A	$86,000	$83,535	$12,970

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 class management requires $35,000 additional capital outlay and earns a positive NPV of $332,345 (5 years) and $594,258 (10 years). The results indicate that a change in management class from D to C is worthwhile from an economic perspective.

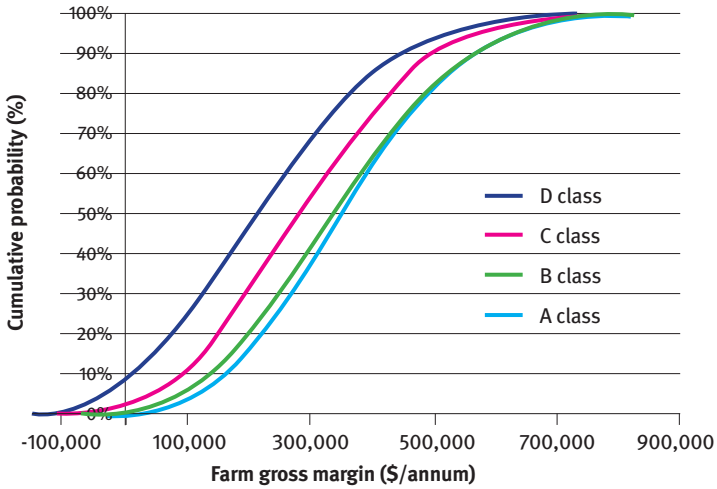
Changing from C to B class management requires an additional capital outlay of $74,000 and displays a positive NPV of $130,851 over a 5 year investment horizon. The 10 year investment horizon revealed a positive NPV of $276,907. The results indicate that changing from C to B class management is a worthwhile investment for the farming business.

Changing from B to A class management requires an increase in capital investment of $86,000 and is likely to produce a positive NPV of $12,970 (5 years) and $83,535 (10 years). The results indicate that a change from B to A class management may be a worthwhile proposition from an economic perspective if the practices can be successfully implemented on a commercial basis. The transition from B to A class management is largely influenced by the size of the farming business and the financial impact of growing a legume crop for grain.

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.

Figure 1: Distribution of farm gross margins



The PiRisk analysis indicates that the progression towards A class management will improve the probability of achieving a higher farm gross margin. This suggests that improved management practices will have a higher farm gross margin, 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 results indicate that the transition from D to C, C to B and B to A class management is a worthwhile proposition from an economic perspective for both the 5 year and 10 year investment period. The change from D to C class management provided the highest NPV result, followed by the transition from C to B. Although the results indicate a positive NPV when moving from B to A class management, the outcome of this transition will strongly depend on the ability to successfully implement these commercially unproven practices. Factors such as farm size, capital investment and impact of a legume fallow will also influence the viability of this transition.

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 practices. The results indicated an increase in farm gross margin when progressing through the management practice classes from D to A. This suggests that A, B and C class management will be stronger financially than those persevering with D class management.

Overall, this economic case study has displayed potential economic benefits when moving to improved management classes. The benefits will vary for each individual grower and will depend on their starting point and individual circumstances. As previously noted, each grower will need to carefully consider their own individual circumstances before making a change in management class 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

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