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Burdekin Grazing BMP and extension support project – a cost benefit analysis

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Background

This paper reports on a cost-benefit analysis (CBA) completed for the Queensland Government's Reef Plan Grazing Best Management Practice (BMP) extension project in the Burdekin catchment, covering the period from June 2011 to June 2014.

The Grazing BMP and extension support project aims to encourage beef producers to adopt practices that result in productive and profitable grazing systems that also have improved water quality outcomes for the Great Barrier Reef. This work is part of a concentrated response with industry aimed at reversing the decline in water quality entering the Great Barrier Reef (GBR) that has occurred as a result of land management practices in adjacent catchments over the past 150 years. The project delivers extension services to producers across four major themes – grazing land management, animal production, economic services and enhanced extension products.

The scope of the CBA was limited to private benefits accrued to beef producers and the beef industry through adopting BMP. However, the project is expected to provide public benefits in the form of sediment load reductions running off from grazing lands into the Great Barrier Reef Lagoon. These benefits were not calculated at the time of analysis. Benefits for agency staff and non-government staff such as Natural Resource Management groups, similarly were excluded from the CBA.

The project was required to achieve a number of targets, based around engagement, improved capacity, intention to change and on-ground practice change. Evaluation surveys, confidential case studies and narratives were undertaken to evaluate project impact against these targets. Over three years, the project has engaged with 272 businesses managing 859,026 cattle covering 6.2 million hectares on 42% of commercial beef properties, representing 44% of the catchment area and 54% of beef cattle within the catchment.

Methodology and assumptions

The CBA focused on quantifiable practice change and expected benefits to industry. Evaluation surveys (n=64) showed that 76.1% of producers who participated in one or more of the projects activities had made a practice change. The internal rate of return from practice change evaluated in case studies (n=7), done at the gross margin level or through an investment analysis framework where appropriate, ranged from 3.6% to 20.3% with a mean of 12.5%. The Northern Beef Situation Analysis (McLean, et al. 2014) suggests that for the geographical area which best approximates the productivity of the larger Burdekin Catchment (Central North) the average gross margin is $97.72. Assuming that profitability and the internal rate of returns (IRR's) are fully derived from gross margins, the impact of the extension project on gross margins via a change in management practices was an increase of $12.25/head/annum. An explicit assumption was that this benefit was applied across all cattle. Project costs totalled $900,000, $960,000 and $985,000 in years one, two and three, respectively.

"With" and "without" scenarios (i.e. with or without the project) were developed, relative benefits parsed through a discounted cashflow analysis to ascertain net present value (NPV) and benefit-cost ratio (BCR) calculated. The "with" scenario used the costs, adoption levels and benefits mentioned

above over a 10-year time frame. The "without" scenario assumed that adoption and benefits were the same as the "with" scenario, however, were delayed by 5 years. This, in effect, meant that benefits of the project were neutral after 5 years. Specifications for the cost benefit analysis can be seen in Table **1**. See "Introduction to cost benefit analysis and Alternative Evaluation Methodologies" (Department of Finance and Administration 2006) for further detail on CBA methodology.

Table 1: Specifications of the cost benefit analysis

Factor	**Specification**
Number of affected cattle	859,026 over 3 years (286,342 / annum was used)
"With" scenario Net benefits Adoption rates	 A net improvement of $12.25 per head accruing over 10 years. Sensitivity analysis was conducted at $5.00 increments, from a range of $2.25 to $22.25. 76.06%, as per M & E, over 10 years. Lower and upper confidence levels at 95% confidence were 65.27% and 86.73% respectively. Sensitivity testing was performed at these levels.
"Without" scenario Net benefits Adoption rates	 A net improvement of $12.25 per head, delayed by 5 years, occurring over 10 years. Sensitivity analysis was conducted at $5.00 increments, from a range of $2.25 to $22.25. 76.06% delayed by 5 years. For lower and upper scenarios, 65.27% and 86.7% were used. Sensitivity testing was performed at these levels.
Discount rate	6%

Results

The CBA showed that for every $1 spent, $3.65 was received in private industry benefits. Net present value was also positive at the default gross margin improvement of $12.25/head (Table 2). At the lower and higher confidence levels of adoption, BCR ranged between 3.14 and 4.17 (Table 3 & Table 4).

Table 2: Results of the CBA

Results (average)	
Adoption rate	76.1%
Present value of benefits	$9,244,797
Present value of costs	$2,530,478
Net present value	$6,714,319
Benefit-cost-ratio	3.65

Table 3: Results at lower adoption

Results (lower adoption)	
Adoption rate	65.3%
Present value of benefits	$7,933,252
Present value of costs	$2,530,478
Net present value	$5,402,774
Benefit-cost-ratio	3.14

Table 4: Results at higher adoption

Results (upper adoption level)	
Adoption rate	86.7%
Present value of benefits	$10,541,610.49
Present value of costs	$2,530,478.18
Net present value	$8,011,132.31
Benefit-cost-ratio	4.17

Sensitivity analysis

Sensitivity analysis was performed on a number of assumptions and variables. A summarisation of these is outlined in Table **1**. The results suggest benefits could fall to $3.36/head gross margin improvement before project benefits failed to cover costs at the default adoption rate of 76.1%. Tables 5 to Table 7 show the sensitivity on gross margin improvement at the lower and upper confidence levels of adoption. The sensitivity testing showed that both adoption rates would need to be at the lower confidence interval level and gross margin improvement fall to very low levels relative to the default level before the project failed to achieve a break-even BCR.

Table 5: Sensitivity analysis at default adoption

$/head net benefit (Average Adoption)	Benefit-Cost-Ratio
$22.25	6.50
$17.25	5.04
$7.25	2.12
$2.25	0.66
(Break-even) $3.36	1.00

Table 6: Sensitivity analysis at lower adoption

$/head net benefit (Lower Adoption)	Benefit-Cost-Ratio
$22.25	5.69
$17.25	4.41
$7.25	1.86
$2.25	0.58

Table 7: Sensitivity analysis at higher adoption

$/head net benefit (Upper Adoption)	Benefit-Cost-Ratio
$22.25	7.57
$17.25	5.87
$7.25	2.47
$2.25	0.77

Conclusion

The CBA showed that the project is worth $9.2 million of present value benefits, utilising $2.5 million in present value funds, or a net present value benefit of $6.7 million. For every dollar spent, $3.65 would be expected to be generated in industry benefit. Sensitivity analysis showed that benefits

would need to fall 72% to $3.36/head before the project benefits would not provide a return on current investment, which is not considered likely. There are further significant public benefits through the reduction of sediment draining into the GBR Lagoon as well as training and awareness provided to other government and non-government staff. These benefits are not included in the dollar amount reported, but would significantly increase the benefit-cost ratio if they were to be included.

Acknowledgements

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References

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