Quantifying the effectiveness of extension delivery methods on practice change – the experience of the Grazing BMP Extension Support Project

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Abstract. The effectiveness of extension delivery methods used by the Department of Agriculture and Fisheries (DAF) beef extension team in enabling producer practice change was investigated within the Grazing Best Management Practice Extension Support project. The aim of this paper is to quantify the effectiveness of extension delivery mechanisms. Over the period 2013 to 2015, the project conducted 93 surveys of randomly selected producers who had engaged with the project from 2011 to 2015. The surveys collected information such as improved confidence, practice change and narratives. The evaluation of survey data found that the project greatly exceeded project targets for practice change (≥40 per cent), achieving 78 per cent (95% confidence interval: 69% - 87%). As well, producers who had engaged with DAF in Grazing Land Management (GLM) extension were more likely to adopt GLM practices than producers who did not (p = 0.01), though the extension delivery method was not influential (p = 0.53). This analysis has shown the value in conducting a robust evaluation program both for demonstrating practice change and informing future extension programs.

Keywords: Reef Plan, adoption, Grazing BMP extension, practice change

Introduction

Decline in the quality of water entering the Great Barrier Reef (GBR) lagoon is attributed primarily to run-off from agricultural lands in the adjacent catchment (Thorburn, Wilkinson & Silburn 2013). The Scientific Consensus Statement 2013 (Brodie et al. 2013) conducted an assessment of the relative risk of current land management practices and identified improved grazing practices in the Burdekin and Fitzroy catchments as the highest priority for achieving sediment reduction. The baseline sediment loads attributed to Burdekin grazing lands are estimated at 4.1 million tonnes with a further 2.9 million tonnes from the Fitzroy (Queensland Government 2009).

To improve water quality run-off, the Reef Water Quality Improvement Plan (Reef Plan) (Queensland Government 2013), a joint initiative between the Australian and Queensland governments, has set a target of reducing sediment run-off from grazing land by 20 per cent. To achieve this, the Reef Plan has set a target of 90 per cent best management practice (BMP) adoption in the grazing industry. The Grazing BMP Extension Support project is one project which has been funded by the Queensland Government to improve adoption of management practices which improve water quality outcomes. The project is funded by the Department of Environment and Heritage Protection (DEHP) and delivered by the Department of Agriculture and Fisheries (DAF) in the Burdekin catchment. While significant investment has been made in extension, information on the effectiveness of these extension activities and quantifiable data on practice change are limited (Wegsheidl, Trendell & Coutts 2015).

To address this issue, the Grazing BMP Extension Support project set up a robust monitoring and evaluation (M&E) program. The M&E was conducted at critical events run throughout the project and annually through a survey conducted by independent consultants. The aim of this process was to provide data to demonstrate effectiveness of extension to funders, industry and the public. This paper reports on these results and the insights gained through the M&E process.

The aim of this paper is to quantify the effectiveness of extension and the effectiveness of delivery mechanisms in enabling practice change.

Project background and delivery methods

The Burdekin Grazing BMP Extension Support project began in July 2011 and is on-going at the time of publication. It conducts extension activities in the Burdekin catchment where there are approximately 660 grazing businesses (Australian Bureau of Statistics 2010) that manage greater than 12 million hectares of land (Queensland Government 2012). The aim of the project was to support beef producers to adopt grazing systems that are productive and profitable with improved water quality outcomes for the Great Barrier Reef. The project had the following annual targets:

- ≥300 beef business engagements
- ≥80 per cent improved capacity (knowledge, attitudes, skills and aspirations) of producers
- ≥50 per cent intention to change management practices
- ≥25 per cent quantifiable practice change (pre 2015)
- ≥40 per cent quantifiable practice change (post 2015).

Extension activities were delivered by eight full time equivalents with support from an agricultural economist, scientists and project managers. Activities were primarily focused on management practices identified by the Paddock to Reef Water Quality Risk Practices Framework (Queensland Government 2014) but also assisted producers through whole-of-business focus using a range of extension approaches. The management practices included:

- Grazing land management, particularly:
  - stocking rate and spelling management
  - rehabilitation of degraded lands
  - rehabilitation of gullied areas
- Animal productivity and husbandry
- Business management and economics.

Extension activities and events, included:

- workshops
- one-on-one extension
- producer demonstration sites
- field days
- e-extension.

Table 1 shows number of engagements the projects achieved.

Table 1. Number of beef business engagements

Year	Beef business engagements
2013	468
2014	428
2015	459
Total	1054

Methods

M&E framework - Design and implementation

The M&E framework was based on Bennetts framework (Bennett 1975), adapted for this project as described in the M&E design for DAF's Sugarcane adoption program (Wegsheidl, Trendell, & Coutts 2015). The framework is a sequence of processes which monitoring and evaluation can follow to determine both practice change made by producers and steps taken towards practice change. The framework used was:

Extension Activities -> Participation & Reactions -> Capacity Gains -> Practice Change –> Water Quality Improvement

To collect data for this framework, a custom database was created by DAF with Coutts J&R in their "YourDATA" platform. In "YourDATA" information collected fell into the following categories:

- Extension activities: At each activity, the date, location, type of activity (e.g. one-on-one, workshop), participant numbers and type (producer, private advisor etc.), participant location within the catchment, topics covered, purpose of activity, and observed and expected impacts are recorded.
- Participation & reactions: Participants were asked to provide feedback on how to improve delivery and content for future workshops.
- Capacity gains: Feedback sheets were used at the end of key events, workshops and field days to assess participants change in knowledge, attitude, skills and aspirations (KASA) and the intention of producers to make a practice change.
- Practice change: An annual survey was conducted with producers, either face to face or over the phone, to determine whether a practice change occurred as a result of producer participation in the project (later referred to as 'producer survey'). Narratives and case studies were also used to provide examples of practice change and to further quantify the

impacts on productivity, profitability and water quality improvements arising from the change. As the changes in these metrics were not the focus of this paper, these metrics have not been reported or used.

Producer survey - Design, implementation and data analysis

At the end of each financial year, from 2013 through to 2015, a survey was conducted by independent consultants to determine practice change resulting from producer engagement with the project. The aim of the survey was to quantify practice change, improved confidence (KASA) and intention to change. Each year, producers who had engaged with the project were randomly selected to be surveyed (using the rand function in excel). The survey sample was without replacement. This meant that producers who were surveyed in one year were not eligible to be re-surveyed. This was to ensure that practice change was not double counted over time. In 2013, 2014 and 2015, the number of producers surveyed was 33, 30 and 30, respectively. Over the three years, 93 surveys were done in total.

Data for the three survey years were combined to determine practice change, improved confidence (KASA) and intention to change outcomes. Practice change and intention to change was collected as a binary outcome (yes/no) with a narrative on change undertaken. The narrative was collected during the producer survey and was a description of the practice change (e.g. wet season spelling implemented). Improved confidence was assessed on a scale of 1 (low) to 7 (high). This reflected the change in confidence to make a decision after an extension interaction. It should be noted that in 2015, improved confidence was changed from asking producers to rate change in overall confidence to asking producers about confidence in the specific management practice categories (Grazing Land Management (GLM), Animal management and Business management). Confidence data were categorised into low confidence (1, 2, 3, and 4) and high confidence (5, 6, and 7). The results of practice change, improved confidence and intention to change were determined using counts of responses. Practice change activities reported by producers were then categorised into grazing land management (GLM), animal management or business management.

This data were then analysed using the Genstat software, to determine the following relationships:

- relationship between level of confidence and overall practice change;
- effectiveness of DAF GLM extension in enacting GLM practice change
- relationship between GLM practice change and delivery method.

A chi-squared test for association between level of confidence and overall practice change was performed on data from 2013 to 2014. Due to the format of the question changing in 2015, these data were not used.

A binomial test of proportions was used to determine if there was a difference in the likelihood of achieving GLM practice change between those producers who had GLM interactions with DAF (n=30) and those who did not have GLM interactions with DAF (n = 10). Producers who did not engage with the department in a GLM course or in a one-on-one capacity may have received advice from other providers of extension services, or through other information sources.

Logistic regression was used to determine whether surveyed producers (n = 62) who had made a GLM practice change were more likely to have engaged with one on one extension (n = 31), workshops (n = 14) or a combination of both workshops and one on one extension (n = 17).

Results

Overall KASA, intention to change and practice change results

Over the three years of survey data, the project exceeded all engagement, practice change and intention to change targets (Table 2). Practice change targets, in particular, were considerably exceeded with overall practice change being 78 per cent (95% confidence interval: 69% - 87%) against a target of 40 per cent. Table 3 shows the proportion of respondents who had attended an event or received extension in either GLM, animal management or business management categories. Table 4 shows the likelihood of participants adopting a change as a result of attending events or receiving extension. These likelihoods were not tested for significance. Finally, Figure 1 shows the confidence levels of producers in making changes. The majority of producers reported confidence levels above four in their ability to make decisions due to interaction with the project.

Table 2. Overall intention to change and practice change results

Year	Beef business engagements	Intention to change (%)	Practice change (%)
2013	468	81	79
2014	428	78	73
2015	459	80	83
Total	1054	80	78

Table 3. Percentage of respondents categorised by management category participation

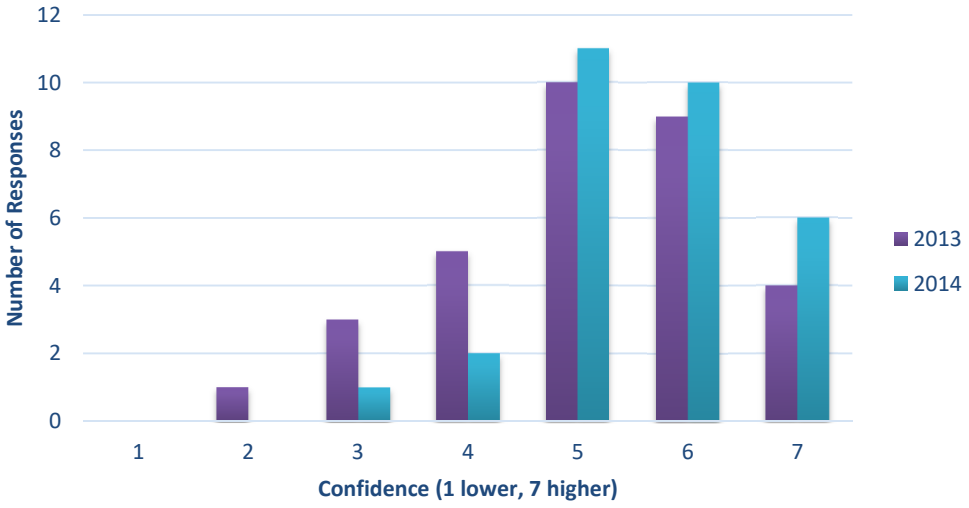
Year	GLM (%)	Animal management (%)	Business management (%)
2013	73	48	3
2014	57	67	13
2015	47	90	33
Total	59	68	17

Note: respondents may have attended more than one category

Table 4. Percentage of respondents, by management category, who indicated practice change

Year	GLM (%)	Animal management (%)	Business management (%)
2013	50	68	-
2014	47	60	50
2015	57	44	50
Total	51	38	50

Figure 1. Confidence levels of producers in making a practice change



Relationship between level of confidence and practice change

Despite some observed difference in practice change outcomes between producers in higher and lower confidence groups (Table 5), the percentage of producers enacting practice change was not significantly different between the groups (p = 0.116). However, due to a low sample size in the low confidence category, this result may be unreliable.

Table 5: Percentage of producers making practice change based on level of confidence*

Level of confidence	Practice change	
	Yes (%)	No (%)
Low Confidence	58 (7)	42 (5)
High Confidence	80 (40)	20 (10)

*number of producers in brackets

Effectiveness of DAF extension in delivering GLM practice change

Of producers who made a GLM practice change over the combined survey data (n = 30) (Table 6), practice change was significantly better (p = 0.01) for producers engaging with DAF on GLM interactions (67 per cent), compared with those who had not (33 per cent). However, in some individual years there was no significant difference (Table 6). Interestingly, the final year differed, suggesting there might be lag in extension and adoption.

Table 6: Percentage of producers that made a GLM practice change (number of producers in brackets)

Extension Interaction	2013	2014	2015	Total
None	0.5 (6)	0.444 (4)	0 (0)	0.333 (10)
WS and/or 1on1	0.5 (6)	0.556 (5)	1 (9)	0.667 (20)
p for difference in proportions	1.0	0.637	<0.001	0.010

Relationship between practice change and delivery method

Despite some observed differences in the percentage of producers making practice change (Table 7), the differences were not significant (p = 0.53) suggesting that the method of interaction between the producer and the department did not influence the likelihood of practice change. These results also show that of producers who attended a workshop (n = 12), seven continued to engage in one-on-one extension. This suggests that there is a moderate to high level of producers who engaged multiple times with the project.

Table 7: Summary of GLM extension interaction and practice change outcome*

Extension Interaction	Producers making a GLM change	Percentage of total GLM practice change
One on one only	8	40%
GLM workshop only	5	25%
GLM workshop and one on one	7	35%
Total	20	100%

number of producers in brackets

Discussion, recommendations and conclusions

The analysis performed here on the M&E data collected by the Grazing BMP Extension Support project has identified a number of findings, insights and gaps for future research.

Results as they pertain to the Grazing BMP Extension Support project were:

- Targets for engagements, KASA and practice change were exceeded, demonstrating the success of the project.
- Producers who interacted with DAF officers on GLM topics were significantly more likely to make a GLM practice change than those who did not engage in GLM extension activities.
- The type of interaction or delivery mechanism between producers and the department did not influence resulting practice change. Either one on one extension and workshops, or a combination of these, were just as likely to result in practice change.
- There was no significant difference in the percentage of producers undertaking practice change based on their level of confidence, however, a larger sample size may contradict this result.

Insights from the data are also useful for either future projects or the M&E of those projects. Some of these insights were:

- There is invariably a lag between interaction and practice change. Four years after the inception of the project, all producers who had engaged with the department reported making a practice change. It would be interesting to determine whether this trend continues and to quantify both the lag and factors affecting lag (i.e. drought, finances, markets).
- The M&E also identified GLM practice change which occurred outside of the project GLM extension activities. This might be explained by the focused effort to incorporate GLM themes into animal extension throughout the project. It is also possible that these practice changes are due to other extension sources such as producer-to-producer networks. In this case, it is necessary that M&E programs ensure that practice change external to project activities is separated from project practice change. However, the collection of these data would allow quantitative analysis to determine trends of adoption of producers who do not engage on specific management practice topics.
- Despite there being similar effectiveness of one on one extension and workshops, the effectiveness does not allude to the cost-effectiveness of delivery mechanisms. Certain complications, such as possible interaction effects between delivery mechanisms on resulting practice change, would need to be quantified before cost-effectiveness work can be performed.

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References

Australian Bureau of Statistics 2010, *Land Management in the Great Barrier Reef Catchments*, Final, 2008-2009 (Cat. No. 4619.0.55.001), Australian Government, ACT.

Bennett, C 1975, Up the hierarchy, *Journal of Extension*, vol. 12, no. 2, pp. 7-12.

Brodie, J, Waterhouse, J, Schaffelke, B, Kroon, F, Thurburn, P, Rolfe, J, Johnson, J, Fabricrus, K, Lewis, S, Devlin, M, Warne, M, McKenzie, L 2013, *Scientific consensus statement: Land use impacts on Great Barrier Reef water quality and ecosystem condition*, Reef Water Quality Protection Secretariat, Brisbane, QLD.

Queensland Government 2009, *Water quality improvement plan - technical baseline repor*t, Queensland Government, Brisbane, QLD.

Queensland Government, 2012, *Land use summary 1999-2009 for the Burdekin NRM region*, Queensland Government, Brisbane, QLD.

Queensland Government 2013, *Reef Water Quality Protection Plan 2013*, Reef Water Quality Protection Plan Secretariat, Brisbane, QLD.

Queensland Government 2014, Management practice results - Great Barrier Reef - Report Card 2014, Queensland Government, Brisbane, QLD

Thorburn, PJ, Wilkinson, SN, & Silburn, DM 2013, 'Water quality in agricultural lands draining to the Great Barrier Reef: A review of causes, management and priorities', *Agriculture, Ecosystems & Environment*, vol. 180, pp. 4-20.

Wegsheidl, C, Trendell, P, & Coutts, J 2015, 'Evaluating the role of extension in helping to improve water quality in the Great Barrier Reef', *Rural Extension & Innovation Systems Journal*, vol. 11, pp. 1-10.