Grains Best Management Practices: delivering productivity and sustainability outcomes for the central Queensland grains industry

Hayley Eames & Rod Collins

[1]Queensland Department of Agriculture and Fisheries, 98-102 State Farm Road, Biloela, QLD 4715
Email: hayley.eames@daf.qld.gov.au

Abstract. The Grains Best Management Practices (BMP) program was designed to assist grain growers in identifying and implementing improved management practices that lead to long term productivity and sustainability for their business. Facilitated self-assessment workshops, field days, targeted one-on-one and group based training events and ongoing follow up re-assessment workshops are part of the intensive delivery model and are fundamental in fostering informed decision making and enabling enduring practice change. Since commencement of the program in June 2008, 295 businesses within the Fitzroy catchment have completed the program, 60 per cent of which have completed the program more than once allowing a real measure of change in on-farm practices over time. Long term delivery of the program has highlighted the importance of delivering technical productivity based content, promoting readily adoptable practices and providing multiple avenues in which to implement change as a means in which to effectively re-engage growers overtime and drive practice change adoption.

Keywords: Practice change, extension, adoption, best management practices

Introduction

The Grains Best Management Practices (BMP) program is an industry driven extension program aimed at facilitating the adoption of improved land management practices that result in increased productivity and reductions in off-farm movement of water-borne pollutants (sediment, nutrients and pesticides). Since inception in 2008, program delivery and provision of incentive funding for on-ground works has been supported through the Australian Government Reef Programme. Grains BMP has also contributed to targets in the Queensland Government Reef Water Quality Protection plan which aims to achieve 90 per cent of cropping lands in priority areas managed using best management practices by 2018 (Queensland Department of Premier and Cabinet 2013). As such, much of the delivery of the Grains BMP program to date has been focussed in the catchments adjacent to the Great Barrier Reef (GBR), namely the southern portion of the Burdekin catchment and the Fitzroy catchment of central Queensland.

This paper will focus on the outcomes of delivery within the Fitzroy catchment, the largest of the broad acre grain growing regions within the broader GBR catchment. The Fitzroy catchment is estimated to have approximately 600 grain growers with a combined production area of 914,000 hectares (Queensland Department of Premier and Cabinet, 2016). Of these growers, the Grains BMP program has engaged 295 businesses (managing 316,544 hectares), 60 per cent of which have completed the program more than once allowing a real measure of practice change on farm.

Benchmark data on industry practices is collected from growers upon completion of their first Grains BMP self-assessment and whilst this data set is important in providing a snapshot of industry practices at any one point, the real power of the BMP program is its ability to measure change in practice over time. Long term delivery of the Grains BMP program in the Fitzroy and a commitment to maintaining grower engagement in the program has resulted in implementation of 274 on-ground projects (on-farm management practice changes that demonstrate improved productivity and water quality) and a dataset of practice change reflective of a large proportion of total BMP participants. This is one of the key successes of the Grains BMP program and one which makes it unique from other industry BMP programs.

This paper will aim to quantify the level of practice change that has occurred within the Fitzroy catchment as a result of delivery of the Grains BMP program and subsequent implementation of on-ground projects as well as outline some critical success factors for achieving ongoing practice change in a long-term extension program.

Program objectives

The Grains BMP program was developed with the following objectives:

- Assist grain growers in identifying pathways to best practice adoption that are practical, profitable and sustainable.
- Develop the skills and knowledge of grain growers to enable long term change within their business.

- Demonstrate alignment with and contribution to regional NRM water quality targets.
- Provide a capacity for the grains industry to report good environmental stewardship to the broader community.
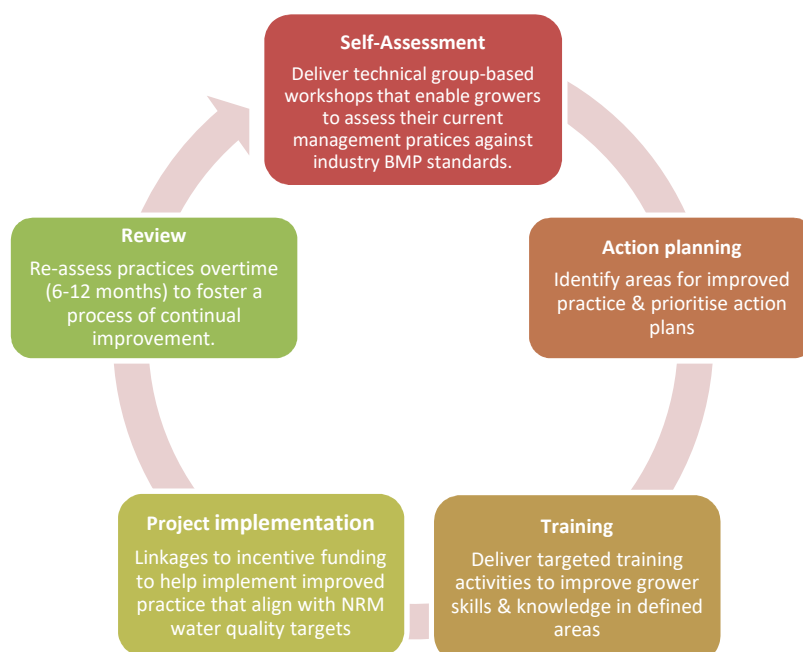
Delivery model

Delivery of the Grains BMP program is through an intensive action learning model adapted from the Kolb (1984) experiential learning cycle. The model is designed to facilitate individual understanding of grain production issues, improve the capacity of participants to plan and make informed decisions about changes within their business and foster continual improvement.

There are five core modules (and two optional modules) which make up the Grains BMP program, each covering a specific subject area which has been determined by the grains industry to be a component of best practice. The core modules include:

- Pesticide application
- Property design and layout
- Making best use of rainfall
- Integrated pest management
- Crop nutrition and fertility management

The modules are delivered by technically trained facilitators in group based workshops across a six-month period. Targeted one-on-one and group based training is delivered as required based on grower-identified training needs to equip participants with the skills to apply best practice to their own situation. Completion of an 'assessment' constitutes growers assessing their business against all five modules (i.e. the entire farming system). This ensures that monies invested in training and/or on-ground projects are prioritised based on associated productivity and water quality impacts which inevitably result in better outcomes for growers and industry.
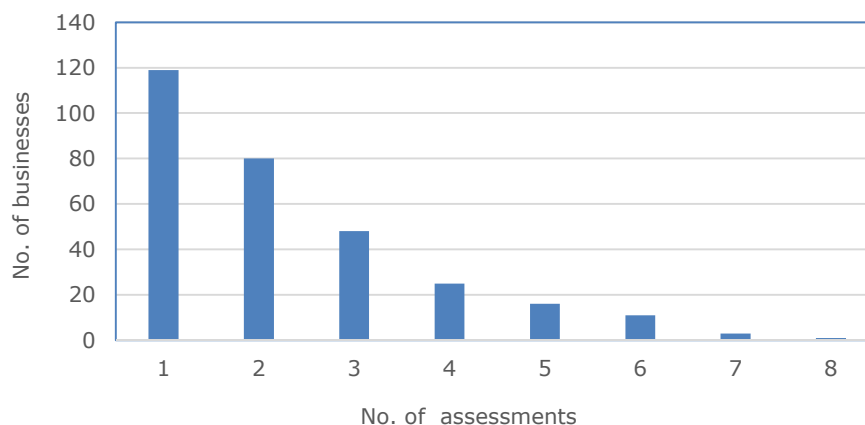
Figure 1. Grains BMP delivery process

Each assessment completed by an individual business is considered to remain current for the following twelve months, during which time training activities and/or on-ground projects are completed. Training activities are designed to lead to improvements in knowledge and skills, with projects leading to change in farming practices. After twelve months, businesses are encouraged to complete another self-assessment of the five core modules, where new actions are developed and the learning process continues with further training and project opportunities. In recording the practices used at each assessment, the Grains BMP database is able to provide a measure of change in practice over time which can been reported at a range of spatial scales.

Figure 2 illustrates the number of times individual businesses have completed the review step in the action learning cycle. This step forms the basis of all practice change measurements and also demonstrates the capacity of the program in continuing to provide value to participants.

Figure 2. No. of assessments completed by individual grain businesses in the Fitzroy catchment between June 2008 to June 2017

Practice change

To date, a total of 274 on-ground projects have been implemented by 184 grain growers within the Fitzroy catchment. The total investment is approximately $10.3 million, 69 per cent of which is grower in-kind contribution (B McKechnie 2013, pers. comm., 19 Nov). For projects to be eligible for funding, they must be identified as a priority through the BMP self-assessment process and then must demonstrate a recognised link to reducing off-target movement of sediment, nutrients and/or pesticides to waterways. Whilst the incentive funding is linked to improved environmental outcomes, the real driver for growers is increased productivity.

Pannell et al. (2006) describes the two main factors that drive adoption of practice changes within a business are: perceived relative advantage and trialability. For many growers, the relative advantage that determines adoption is heavily geared towards increased productivity and profitability. So, whilst the reef program incentive funding is contingent upon an ability to demonstrate improved environmental outcomes, this requirement alone may not be the driver for successful broad scale adoption of improved practices. The close linkages between productivity and environmental outcomes in the grains industry are well defined (Ridley 2005), so by focussing delivery of the Grains BMP program on productivity based outcomes, the program delivers parallel positive environmental outcomes.

The practices commonly implemented by growers as a result of participating in the Grains BMP program (Table 1) are those that deliver productivity gains soon after implementation, can be adapted across a significant proportion of the total farming area (excluding contour bank projects) and demonstrate significant environmental outcomes. Uptake of zero till and controlled traffic farming practices for example have a high level of trialability, whereby the benefits of adoption are well documented and ground-proofed, the risk associated with implementation is relatively low and the productivity gains are fairly immediate following adoption.

Adoption of practices such as zero till and controlled traffic farming are both significant system levels changes within a business. The cost benefit comparison of adopting these systems is summarised in Table 2. There is a profit margin increase when the practice change is from an unsustainable conventional farming system to a zero till system, however the profit margin increases even further when a zero till system is coupled with a controlled traffic farming system. Continuing to engage growers in the BMP program overtime is important in helping growers understand the cumulative benefits of adopting additional system-level changes.

Critical success factors

The quantity of practice change data collected from the Fitzroy catchment and the ability to accelerate adoption of on-ground change is one of the key outcomes of the Grains BMP program to date. We know that long term practice change is contingent on re-engaging growers in the Grains BMP program, so how can a program continue to create value for growers; and what have been the key factors in driving practice change?

Table 1. Area of practice change adoption and the associated productivity outcomes for commonly implemented on-ground projects in the Fitzroy catchment (2008-2016)

Practice change	Productivity outcomes	WQ Outcomes*		
		S	N	P
82,299 hectares converted from conventional cultivation to a minimum/zero tillage system	• Improved ability to maintain stubble cover, which reduces potential for runoff and erosion of topsoil, leading to improved water infiltration & storage, increased cropping frequency and increased yield potential	✔		
46,190 hectares converted from random wheel traffic (RWT) to a controlled traffic farming system	• Reduced compaction leading to improved water infiltration & storage, increased cropping frequency and increased yield potential • Improved input efficiencies in regard to fuel, seed, chemical, fertilisers through reduced overlap of applications.	✔	✔	✔
138,643 hectares now implementing a GPS guidance system	• Reduced paddock overlap means reduced application of seed, chemical, fertiliser • Improved placement accuracy of inputs – inputs better utilised by crops means less available for loss		✔	✔
9,831 hectares of non-contoured sloping country converted to well designed and constructed contour banks (2013-2016 only)	• Reduced erosion potential by minimising velocity of runoff water • Improved drainage – more even water distribution across paddock	✔		
189,546 hectares upgraded from unsuitable pesticide application technology to technology that improves efficacy and reduces off-target movement.	• More precise application of pesticides reduces potential for over application and total amount of pesticide applied • Improved application technology results in reduced potential for off target movement and impact on non-target areas			✔

*Water Quality (WQ) outcomes include reductions in off-target movement of Sediment (S), Nutrients (N) and/or Pesticides (P)

Table 2. Change in per hectare profit for management practice changes in the Dawson/Callide sub catchment

Management Level	Per ha profit	Change in per ha profit
Conventional farming system	-$74.44	
Zero till (RWT) farming system	$64.43	$138.87
Controlled traffic farming system	$115.23	$50.80
Controlled traffic farming system (12 crops in 10 years)	$182.78	$67.55

Source: Strahan & Hoffman (2009).

Readily adoptable practices

To expedite the rate of practice change adoption, the Grains BMP program focuses on promoting practices that have proven tangible productivity and environmental outcomes and thus are readily adoptable (i.e. high relative advantage and trialability). The self-assessment process helps growers to identify gaps in their knowledge; targeted training is then delivered to support growers in developing the skills required to make changes in their business and adopt improved practices.

One of the barriers to adoption is the perceived complexity of the change. Delivering business specific one-one-one training with industry experts aims to break down the practice change into manageable tasks. For example, upon completion of the pesticide application module, growers who identify the need to improve their spraying efficacy are offered an on-farm consultation with a spray management expert whose task is to provide tailored recommendations to the grower on how improved practice might best be incorporated into their business. This approach works well, in that the recommendations better align with the individual grower's values and overarching business objectives. This process of taking readily adoptable practices and tailoring them to individual businesses through targeted training, improves grower decision making and inevitably enables the Grains BMP program to rapidly generate on-ground change.
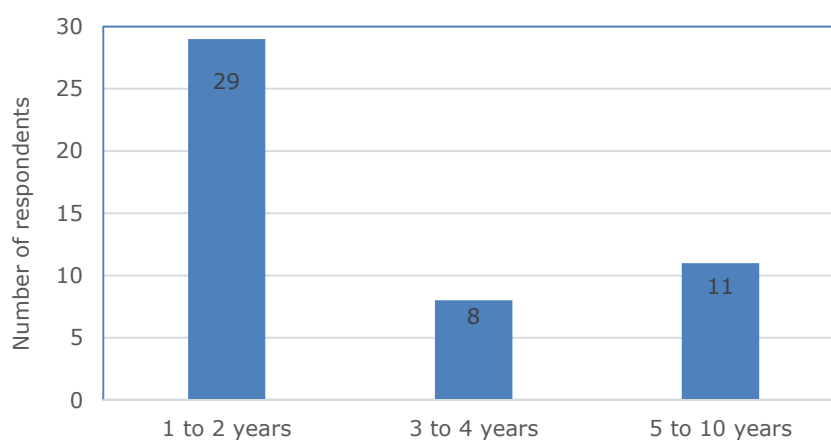
Delivery model

Whole of business assessment: The Grains BMP delivery model requires growers to assess their practices against all five core farming system modules. This approach, as opposed to delivering

modules as distinct entities, ensures that action plans are prioritised based on most significant impact across the entire farming system. Often, the change that growers perceive to be highest priority for their business on entry to the Grains BMP program is different to that realised upon completion of the five modules. Accurately prioritising improved practices through a whole of business assessment process means that training can be better targeted to grower needs and investment in on-ground projects result in the largest productivity and environmental gains.

Multiple avenues to change: Of the 295 businesses having completed the Grains BMP program, not all (184) have accessed incentive funding to implement improved practice. The Grains BMP database however captures change data from all growers completing more than one assessment which we know is approximately 60 per cent of the total number of businesses in the program. This indicates that whilst the offer of incentive funding may have been the driver for change for some growers, for others the change in on-farm practices has been the result of improved knowledge and skill development following participation in the Grains BMP program. This view is supported by the results of a grains industry survey completed by Coutts (2013) which highlighted the impact of the Grains BMP process in accelerating the adoption of practice changes (Figure 3).

Figure 3. Number of years sooner changes made as a result of the Grains BMP process

Source: Coutts (2013).

Technically trained facilitators: The questions in the Grains BMP modules are written at a higher systems level in order for the program to be applicable to grain growers across a large geographical area. However, to ensure the program is relevant and useful on-ground, it is critical that facilitators are technically trained and can provide locally relevant practical examples on how best practice applies to an individual business. Furthermore, in order to effectively prioritise action plans and target training for growers, facilitators need to understand the associated impacts of implementing systems level changes. If growers perceive the facilitator to be credible in the information they deliver, growers are more likely to see value in the program.

Review process for continual improvement: The review process, which also requires growers to complete a whole of business assessment (five modules), is a critical component of the Grains BMP action learning delivery model. Often the first self-assessment process identifies multiple areas for improvement. In the first cycle of the program training and incentive funding is focussed on helping growers implement their number one priority. The review process builds on the success of their first assessment and encourages growers to tackle their next priorities (for which additional training and support is provided) in order to foster a process of continual improvement. In some cases, unexpected outcomes from implementing the first change in their business leads growers to make significant changes to their prioritised actions in subsequent assessments. This realisation that external input can provide much greater benefit to their business has been a key outcome for many growers.

Conclusion

The process used to deliver the Grains BMP program has been focussed on maximising grower engagement, learning and on-farm practice change. Long term investment in the Grains BMP program in the Fitzroy catchment has delivered substantial productivity outcomes for growers as well as improved water quality outcomes that contribute to the Reef Plan's best management practice targets. Delivering technically relevant productivity based content, providing targeted business-specific training opportunities, and fostering a process of continual improvement;

which are fundamental components of the Grains BMP delivery model; are critical in upskilling and empowering growers to better identify and manage change within their business in the long-term. The key learning from delivery of the Grains BMP program is that extension programs that aim to achieve widespread engagement and practice change need to ensure the delivery model is well-planned, targeted and focuses on promoting readily adoptable practices.

References

Coutts, J 2013, *'Grains BMP grower feedback phone survey report',* Coutts J&R. Toowoomba, Australia.

Kolb DA 1984, 'Experiential Learning – Experience as a source of learning and development,' Prentice Hall, New Jersey.

Pannell, DJ, Marshall, GR, Barr, N, Curtis, A, Vanclay, F, Wilkinson, R 2006, 'Understanding and promoting adoption of conservation practices by rural landholders', *Australian Journal of Experimental Agriculture,* vol 46, no. 11, pp. 1407-1424.

Queensland Department of Premier and Cabinet 2013, *Reef water quality protection plan 2013*, Available from: <http://www.reefplan.qld.gov.au>.

Queensland Department of Premier and Cabinet 2016, *Great Barrier Reef report card 2015,* Available from: <http://www.reefplan.qld.gov.au>.

Ridley, AM, 2005, 'The role of farming systems group approaches in achieving sustainability in Australian Agriculture', *Australian Journal of Experimental Agriculture,* vol. 45, pp. 603-615

Strahan, R, Hoffman, A, 2009, '*Estimating the economic implications for broad acre cropping farms in the Fitzroy basin catchments of adoption of best management practices*', Department of Employment, Economic Development and Innovation, Toowoomba, Australia.