



Improved extensions through a whole of business approach.

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The authors also acknowledge contribution from Peter Long from the Fitzroy Basin Association.

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Introduction

The declining health of the Great Barrier Reef is attributed to pollutant run-off from the grazing and sugarcane industries (Queensland Government 2009; Waterhouse *et al.* 2011). The Australian and Queensland Governments determined that action was required to address water quality issues in the GBR and its catchments, resulting in the development of the *Reef Water Quality Protection Plan (Reef Plan)* in 2003 (Queensland Department of the Premier and Cabinet 2003). The goal of *Reef Plan* was to halt and reverse the decline of water quality entering the GBR within 10 years (i.e. by 2013) through reducing sediment, nutrient and pesticide loads.

Grazing is listed as the prime determinant of changes in water quality regarding sediment, with beef production accounting for the largest single industry by land use, covering 90 per cent of the relevant land area (Karfs *et al.* 2009). Across Australia extensive beef production contributes over \$1 billion dollars to the national economy annually and employs over 9,000 people in rural communities (Gordon 2007).

The agricultural sector is a contributor to the declining water quality. However, the size and economic importance of the industry means it may be costly to reduce impacts. The focus of this report is on sediment reductions from rangelands grazing in the two largest catchments (Burdekin and Fitzroy) adjacent to the GBR.

The *Reef Plan* targets a 20 per cent reduction in sediment to be achieved from the grazing and sugarcane industries. Changes to management practices in both industries have been identified to achieve reductions in the pollutants (Queensland Department of the Premier and Cabinet 2013).

Following the land condition classification of A,B,C, D, a management practice framework classifying A as above industry standard and highly likely to maintain land in good condition through to D which is dated or practices that are highly likely to degrade land to poor condition was developed. Practices that achieve water quality improvements include improved management of ground cover, riparian areas and soil condition. A key focus of past and current funding has been to provide extension and incentives to shift graziers to A or B management practices, through funding fencing to land type, riparian fencing, voluntary land management agreements and mechanical earthworks.

Although the grazing management practice framework has been developed and targets set, achieving the pollutant reduction targets remains difficult when attempting to bring about practice changes by private land managers (Table1). The 2010 Reef Plan report cards highlighted that approximately half the industry were at the considered level of B practice however the majority of the remaining half were considered C or D (Table 1). The experience in grazing is that there is no one approach to fostering on-ground practice change to improve water quality, it needs to be a tailored multi-faceted approach (Rolfe and Gregg, 2013).

Table 1: Summary of grazing adoption under Reef Plan

Practice categories	Reef Plan 2008-2009	Reef Plan 2009-2010
	Baseline (1 st report card)	(2 nd report card)
	% of landholders using	% of landholders using
A practice	6.04%	7.61%
B practice	49.78%	51.79%
C practice	36.99%	33.60%
D practice	7.19%	7.00%

Source: www.reefplan.qld.gov.au


Private benefits of adoption and ability to be financially sustainable long term are critical to a long term grazing industry however the adoption of improved management practices is crucial to ensure environmental sustainability both for improved land condition, subsequent production outcomes and water quality outcomes.

There have been a number of Reef Plan extension strategies considering extension in the perspective of animal health and nutrition extension, grazing land management extension and integration with private extension providers (Coutts, 2014, Wegscheidl . 2012). However few studies have considered extension across the whole of business.

The report aims to integrate the findings from the Grazing Economics project RP70G funded through the Department of Environment and Heritage Protection science program. It aims to provide linkages and insights to improve extension mechanisms and increase overall adoption of management practices whilst improving business viability.

Aims and objectives

This report aims to provide recommendations to improve business viability and to increase the rate of adoption for best management practices. It aims to provide an understanding of the importance of a mix of policy mechanisms and key factors in



increasing adoption.

Specifically the objectives are:

- Improve the content and knowledge base on adoption and how to determine a strategy based on integrating improved land management practices to enhance business performance and sustainability.
- Improve the understanding of how business performance affects adoption of various practices.
- Provide insights into a range of policy mechanism that could achieve water quality improvements in the grazing industry.

This report will firstly, discuss key business indicators and describe areas where graziers seek to improve their overall viability. Secondly, it will describe the current financial performance of the beef industry. It will then describe the natural resource management frameworks and current programs and policies which support adoption. Discussion on consideration of factors that affect adoption and the impact of climate on overall profitability will then occur. Finally, recommendations for improved extension and policy mechanism integration will be given.

Natural resource management frameworks

Landholders will adopt land management practices with positive private net benefits, provided that they are able to learn about those practices, have the skills to implement them and have sufficient resources to invest in necessary infrastructure or technologies. Positive incentives refer to land use change being encouraged through the use of financial instruments. Negative incentives refers to regulation or financial incentives been used to inhibit change. Extension refers to the technology transfer, participatory learning, consultant mentoring, education, communication, demonstrations, and community network support.

Given these assumptions Pannell (2009b) articulates the following rules for selecting policy mechanisms and programs (Figure 4):

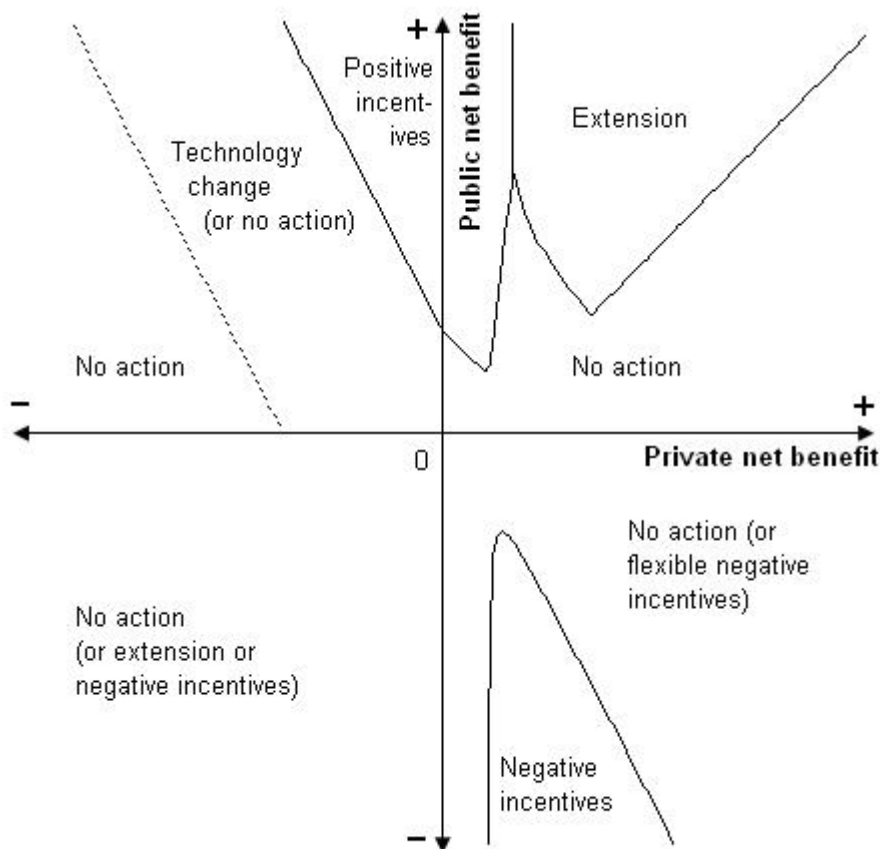



Figure 4. Natural Resource management investment framework

1. Do not use positive incentives for land-use change unless the net public benefits of change are positive (Top right quadrant).
2. Do not use positive incentives if landholders would adopt land-use changes without those incentives (Bottom right quadrant).
3. Do not use positive incentives if private net costs outweigh public net benefits (Bottom left quadrant).
4. If private net benefits outweigh public net costs, the land use changes should be accepted if they occur, implying no action (Top left quadrant).

Alternatively, if it is not known whether private net benefits are sufficient to outweigh public net costs, a relatively flexible negative incentive instrument may be used to communicate the public net costs to landholders. Inflexible negative incentives such as a regulation should not be



used. If public net costs outweigh private net benefits from a set of land-use changes, the most effective mechanism is the use of negative incentives to discourage uptake of land.

If public net benefits and private net benefits from a set of land-use change are both negative and landholders accurately perceive this, then no action is required. Adverse practices are unlikely to be adopted. If there is concern that landholders have misperceptions about relevant land uses, adoption of environmentally adverse practices could be discouraged by extension, or more strongly by negative incentives.

The framework (Figure 4.) illustrates that where there are private and public benefits extension represents the most effective policy mechanism to achieve the environmental outcome and when there is a negative to low private benefit, positive incentives are required to be used. Conversely, where there is a negative public benefit and a positive private benefit, negative incentives are required. Similarly, changes in use of technology or innovation require no level of public investment.

The key limitations of the framework however are it assumes that the public and private trade-offs are understood, and are homogenous across different enterprises, locations and management practices. It also does not account for time required to shift to a new overall environmental position. It provides a static state analysis for policymakers however does not fully consider the land holder perspective which is key in improving adoption. The subsequent sections outline an improved adoption framework considering the individuality of landholders, diversity in achieving private benefits, production systems and risk. It then highlights how different policy mechanisms can be integrated and where further integration and

For some improved land management practices, which have a public benefit (sediment reductions), there is substantial risk and uncertainty for the grazier regarding its adoption. A key aspect is that only capital that is focused on achieving a positive public outcome is invested in to avoid creating perverse outcomes such as inflating the price of the capital and crowding out other graziers.

For different management practices there will be different perceived risks and subsequent costs and benefits depending on how the practice fits within the production system, time taken to see the benefits, and the underpinning science. This therefore creates a challenge to effectively target funds to where the opportunity for public and private benefits to be achieved within the supply the chain. For example if there is a management practice that had a small marginal private benefit but is in an area of the production system that can be easily modified or contracted out the net private benefit will be realised much faster.

The level of risk and uncertainty will vary between practices depending on the grazier's production system, prior knowledge, and trial ability. This presents a problem for determining which type of policy instrument to use to encourage adoption. An adoption framework is required to allow the practice to be trialled by graziers to determine the private benefits and costs, and also giving more time for the public benefits to be measured. Figure 5. presents this framework.

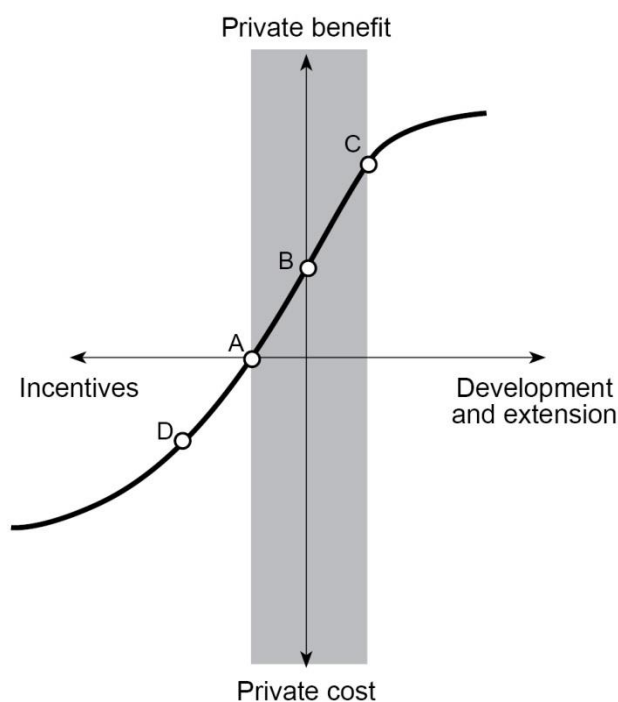



Figure 5: Framework for adoption of management practices

The horizontal axis provides the scale of policy mechanisms to implement and the vertical axis represents the private costs and benefits of the management practice. Due to the unknown private benefits and costs, an NRM group may initially provide a financial incentive to graziers. This is point A, where positive incentives are required for the grazier to cover their level of risk. At point A there are still key aspects of the practice that must be understood such as the impact on efficiency and productivity of the business, the impact of scale, production system, the long term sustainability of the practice.

As time passes, the grazier receives financial, and economic support to fully implement the management practice and understand the management and production trade-offs. If private



benefits are realised then the practice shifts to point B where other early adopters trial the practice and similarly realise the private benefits. If the private benefits are negative, the practice shifts to point D where graziers dis-adopt this practice. At point B, low or no incentives are required as early adopters are willing to take the risk of investing in the practice understanding a private benefit may be achieved although still not definite. If the early adopters continue to realise further benefits, extension and development may still be required to further adapt the practice to the production system. Once this has occurred the practice shifts to point C where private net benefits are expected for most graziers. The development and extension may include varieties better suited to the region, modifications or further education in the production management of the particular practice.

The subsequent sections address components of this framework. Initially, existing incentives and extension programs will be discussed, followed by the linkages between grazing BMP and improved profitability. The implications of risk and tools to improve decision making will then be considered.

This is a result of scale at which the small benefit accumulates much faster for larger properties or contractors (Figure 5. Management practice 2). If however there is a large perceived private benefit then potentially only one or two graziers will have to demonstrate the larger benefits to achieve much faster and wide spread adoption (Figure 6. Management practice 1).

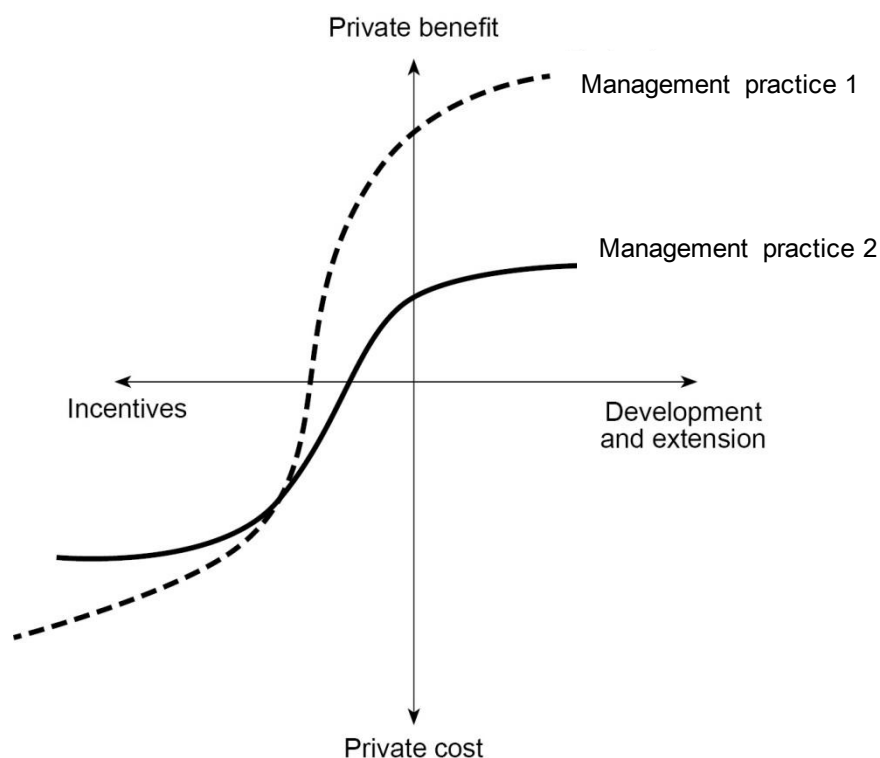


Figure 6: Variance in associated risks and benefits and costs for different management practices

Existing programs and projects

The ability for graziers to have access to extension and incentives is a key component to increase the adoption of management practices. A key aspect of this is understanding the links to overall business profitability. Within Queensland's reef catchments there are currently a range of policy mechanisms, which are employed to support graziers to improve water quality. This section will explain the current mechanisms used in the Burdekin and Fitzroy catchments for improved adoption of practices.

Reef Programme

Implemented across the Burdekin and Fitzroy through the NRM bodies and funded through federal funding. Funding grants co-contributed by landholders were implemented providing infrastructure such as fencing to land type, improved watering points, riparian fencing and land regeneration techniques were funded to improve ground cover, reduce gully erosion and limited stream bank erosion. Although many were one off payments, others were in the form of part payments over time or voluntary land management agreements. This enables the capital cost of infrastructure to be offset and the financial capacity of landholders to consider adoption of different management practices. Given that infrastructure provides one aspect of

achieving management practice change the ability to have extension support through other programs has been critical.

Reef Policy – Legislation and Extension


The Great Barrier Reef Protection Amendment Bill 2009 (Qld) was introduced to form a regulatory structure that aims to reduce the impact of agricultural activities on the water quality entering the GBR and contribute to Reef Plan. The legislation requires landholders to change land management practices for improved water quality and reef health, through activities such as monitoring of bare ground at the end of the dry season, completing an environmental risk management plan and further record keeping.

The legislation is only for three of the catchments for the GBR: the Wet Tropics, Burdekin and the Mackay Whitsunday catchments. The legislation applies to commercial sugarcane and grazing businesses greater than 2,000 ha, and has resulted in additional employees to provide extension services, regulation and training (Queensland Department of the Premier and Cabinet 2009). Through the introduction of the legislation there have been a number of extension officers deployed to improve adoption of practices and initially to help develop environmental management plans. Extension officers have provided support on pasture composition, land regeneration, animal health and animal production. This has been through a one on one extension role and these officers have also been involved in the development of grazing BMP.

Grazing Best Management Practices (BMP)

In addition to the provision of incentive funding through Reef Programme the Fitzroy Basin Association (FBA) and NQ Dry Tropics in Townsville has facilitated change through graziers' participation in Grazing Best Management Practice (BMP) program. In this program graziers complete a voluntary self-assessment of their management practices. Groups of graziers are brought together to self-assess themselves against industry standards. This approach has been instigated by FBA, NQ Dry Tropics and in conjunction with AgForce (industry body) and the Department of Agriculture, Forestry and Fisheries with support from the Queensland and Australian Governments in part as a policy shift from regulation to industry self-assessment.

There is a direct relationship between the levels in the grazing BMP program (below, at and above industry standard) and the ABCD grazing management practice framework. The 'Above industry' standard is regarded as "A" level, including practices such as making stocking rate decisions based on pasture monitoring measurements. The 'Industry standard' is in line with "B" level, including practices considered as standard such as making stocking



decisions based on district benchmarks and long term paddock records. The 'Below industry' standard is defined as "C/D" level, and includes examples such as making stocking rate decisions based on undocumented experience and poor records.


Grazing BMP is a strategic self-assessment review of all aspects of the grazing business. The delivery of the program is working on the premise that a high level of participation will lead to industry wide improvement in management practices together with integration with the other policy mechanisms of incentives and extension. There are five modules covering all areas of the business from 'Grazing Land Management' to People and Business'.

Completion of a module provides a graziers the opportunity to self-assess where they believe they fit within the BMP framework of below, at or above across 157 industry standards.

Graziers then have the opportunity to develop an action plan and identify practices they might modify or adopt to allow them to shift towards industry standard and above. Equally they may identify an information gap which may be addressed through training. In the Fitzroy some grazing BMP workshops also deliver technical information related to the module in an effort to stimulate greater workshop participation and provide a level of information that is often sought by participants.

Through participating in the grazing BMP program graziers are provided access to training funded by other programs grow their knowledge and in-turn improve their level of industry standard. One example of training is a *Stocktake* workshop to obtain forage budgeting skills. Participants are also made aware of the opportunity to apply for incentive funding for on-ground works to improve water quality outcomes identified in an action plan. As grazing BMP standards cover all aspects of the business, where identified, graziers are supported in the provision of animal production and business information and advice ranging from herd modelling to workplace health and safety which in the main provides economic or private benefits. These critical management practices are the focus of many of the grazing BMP industry standards which graziers benchmark themselves against.

Improved land management practices are often technically complex and difficult to implement. As a consequence it is important to be able to communicate the relative advantage of a 'new' practice for a grazier to consider integration into their grazing system. Likewise the practice needs to have the ability to be 'trialled' to both lower the financial risk and demonstrate that it can be integrated into their current production system. Graziers are always concerned about the costs of a new practice both in terms of initial costs and forgone or delayed income. To gain confidence the grazier needs to learn by doing and realise the benefits in a realistic time frame.



The framework for grazing BMP provides different insights into program design for grazier participation and NRM outcomes. The program is widely focused and the targeted engagement is relatively high to shift the grazing industry to a A and B level of the ABCD framework.

Business performance


The ability for graziers to adopt improved management practices involves investment in capital, human resources, technical skills, along with an economic or financial impact on the business. Therefore it is critical that graziers understand the current health of their business this means assessing the businesses profitability, the total value of assets and debts, the expected whole property net cash flow before and after servicing debt. There currently are number of private providers of this service such as Resource Consulting Services, AGASSIST, and FARMANCO.

There are a number of steps (Figure 7) that first must occur before the overall health of the business can be measured. These include return on assets; turn over, fixed costs (overheads), gross margin in order to understand these indicators a stock flow, liabilities and finance, labour and administration, direct costs and income must be accounted for.

Return on asset is essential to overall profitability of the business. This is presented as a ratio or percentage of all earnings relative to the value of closing assets. Assets include: land, machinery, building materials, fuels, and cash on hand. Ideally, a business would like to achieve a percentage greater than a business bank interest rate which for the commercial banks a variable rate business interest rate is 8.48% (CommBank May 2014).

To understand this overall indicator the turnover of the business, overheads and gross margin must also be understood. Turnover is essentially the gross product as a percentage of assets and helps to understand if assets are being used effectively. This indicator is one in which graziers hope to improve, to ensure they are achieving the sustainable long term level of production from the assets. Approach's to improve this have been to modify farm infrastructure to utilise the land resource effectively, improved land condition, improved pasture, and increased weight gains leading to stock to reach market specifications faster.

Gross margins explore the difference between the price received per unit of output minus the direct cost of producing a unit of output. This is an indicator that graziers look to increase. Direct costs are often charged as per head costs and include items such as freight costs, supplements and animal health products. The gross product is essentially the quantity (weight and number of head) multiplied by the price (price per kilo and number of head). To



improve this ratio improved live weight gains, reduced calf losses, improved timing of supplements, heifer management, and animal health all increase this indicator.

Fixed costs or overheads are an indicator that graziers seek to decrease as it impacts negatively on their return on asset. This indicator is essentially, overhead costs relative to the gross product. Overhead costs are expressed as those which do not vary per unit of output and are often also termed fixed costs. These include costs such as wages, vehicle registration, depreciation, wages, insurance, and repairs.

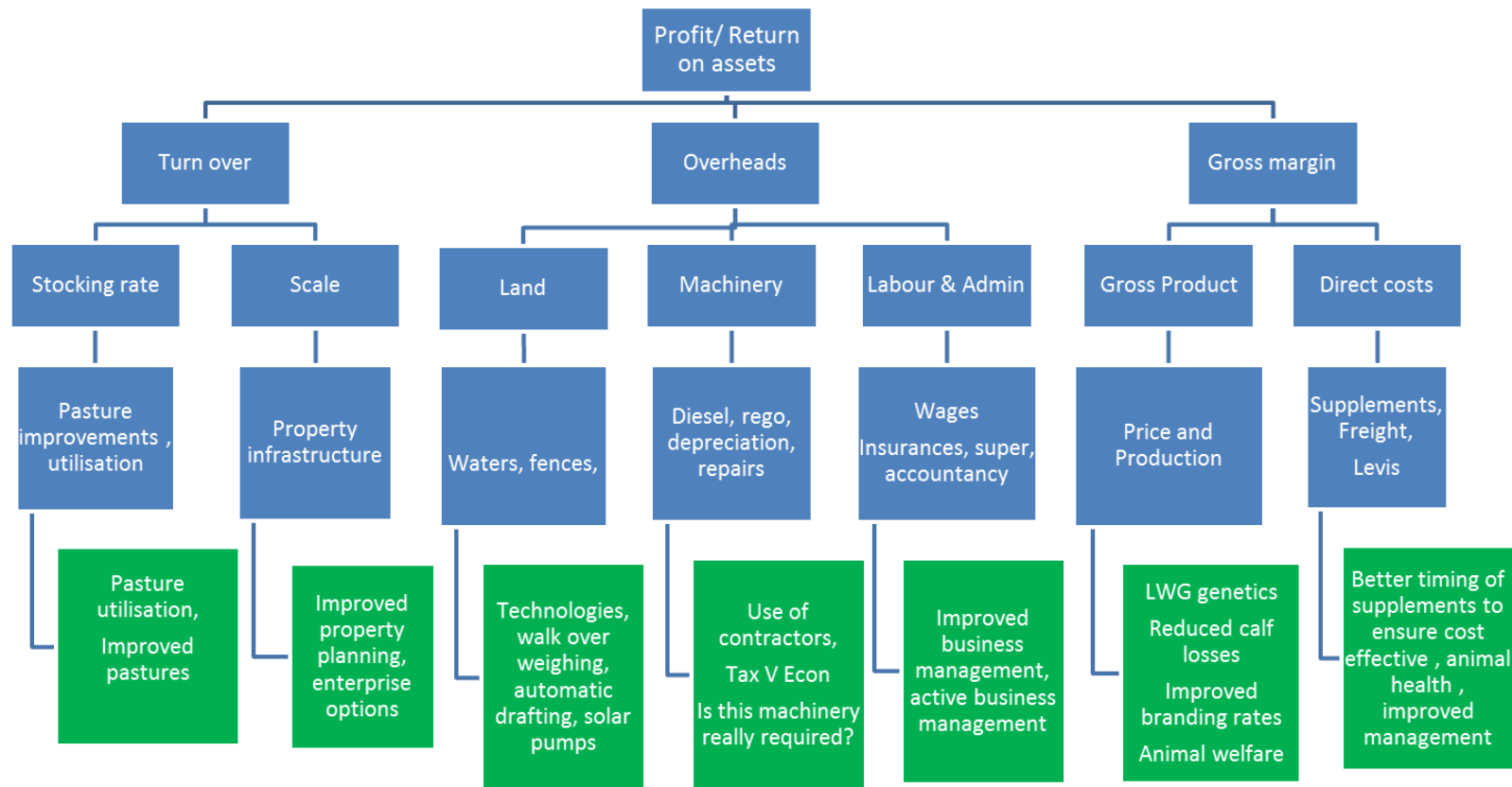


Figure 7. Illustration of the key components of a business are represented by the blue boxes. The green reflect suggestions to improve the relevant indicator.

Beef industry performance

Profitability of the beef industry across Northern Australia¹ is highly dependent on seasonal and market conditions and varies significantly between years and between enterprises. As shown in Figure 8, very large enterprises (>5,400 head) have had significantly higher profit than smaller properties over the last five years (Martin et al. 2013; Thompson & Martin 2011; Thompson & Martin 2012). Large enterprises (1,600-5,400 head) typically have positive profits and are more able to be resilient to variations in seasonal and market conditions. The consistency of small or negative profits in small (<400 head) and medium (<1,600 head) enterprises is a concern for the industry as these enterprises represent three quarters of farms and one third of total value of cattle sales in Northern Australia (Martin et al. 2013).

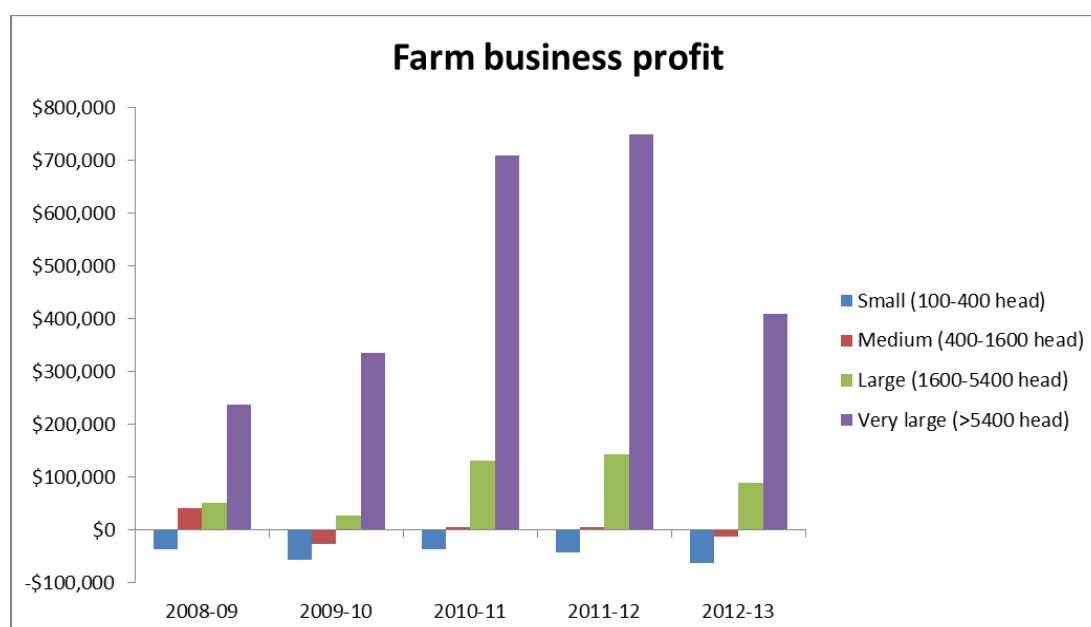


Figure 8 Farm Business Profit (Martin et al. 2013; Thompson & Martin 2011; Thompson & Martin 2012)

Low profits are also reflected in the low returns on assets achieved within the sector (Figure 9). Excluding capital appreciation, the average Return on Assets (ROA) in 2013-14 was -3.0% for small (<400 head) enterprises, compared to 2.3% for very large (>5,400 head) (Martin et al. 2013). Over the last five years, small enterprises have consistently had negative rates, while enterprises with >400 head have managed to achieve a positive, but low return on assets. These rates are historically consistent and are largely driven by a combination of declining returns as profit margins, and the increasing cost of land. These factors have led enterprises to increase scale to try and exploit economies of size and reduce average production costs, both in Queensland and across Australia (MacLeod &

¹ Northern Australia is defined by ABARE as QLD, NT and the northern part of WA.

McIvor 2006b). Due to the large asset base required to run most extensive beef operations, the value of land has a major impact on both long term return on assets and shorter term operational viability.

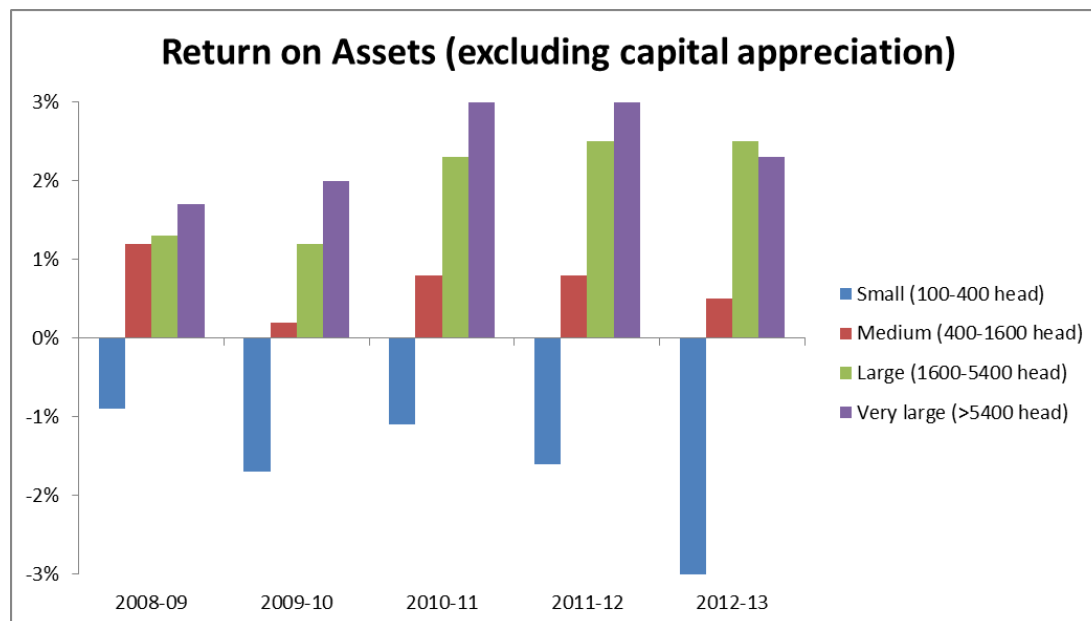


Figure 9 Return on Assets (Martin et al. 2013; Thompson & Martin 2011; Thompson & Martin 2012)

During the 1990s and through to 2008, land values across most of Northern Australia (Hooper 2010) and particularly Queensland rose significantly, partly due to ready availability of credit (Mackinnon, 2009). This allowed many landholders to expand operations, but at high prices. However, appreciation of land values does not necessarily indicate productivity or profitability of the herd operation (Hooper, 2010; Mackinnon, 2009; McCosker, McLean, & Holmes, 2010). Since 2008 land values have fallen by up to 30 per cent (Department of Environment and Resource Protection, 2011) although the three most recent years have shown relatively static valuations (Department of Environment and Resource Management 2012, Department of Natural Resources and Mines 2013, Department of Natural Resources and Mines 2014). Lower property valuations mean that the average after-tax cost of debt is now higher than average ROA which is unsustainable (McCosker et al. 2010).

Decreases in land values may have serious implications on land condition as graziers could be tempted to overstock their properties in order to service debt. Similarly, graziers under financial pressure who opt to sell cattle to meet debt repayments face selling at a loss. Given this financial pressure, graziers are less likely and able to focus on environmental issues.

Key industry drivers

Key drivers of business profitability and sustainability for the northern beef industry can be divided into internal and external factors. External factors include: seasonal conditions; the high Australian dollar; high land values with induced high debt levels; decreasing beef consumption; and increasing government legislation (McCosker et al. 2010). Current domestic beef consumption has fallen from around 42 kilograms per person in 1988-89 (Fletcher, Buetre, & Morey, 2009) to approximately 33 kilograms per person in 2012-13 (MLA 2014), due to changes in consumer appetite related to cultural influences, health preferences, sensitivity and elasticity of beef prices on demand (ABS 2005). Seasonal variability is a major influence on the productivity of herds, reflected in weaning rates and live weight gain. Seasonal variation can also have an effect on cattle prices, as during droughts larger numbers of cattle are sold causing a reduction in price received (ABS 2005), and conversely, when droughts subside, graziers move to increase herd numbers, reducing the quantity of beef on the market, and increasing prices.

However, McCosker et al. (2010) identified that while seasonal conditions affect the gross value of production from year to year, internal factors such as management skill is more responsible for sustainable profits at the business level. The key internal drivers of low profitability are: high finance costs; increasing overhead costs; and poor herd performance. McCosker et al. (2010) noted that more profitable businesses had larger scale, smaller overhead costs and lighter stocking rates, while the break-even cost of production for the top 20 per cent of producers was 40c/kg lower than the average.

BMP and improved profitability

The BMP covers management practices linked across the indicators of turnover, overheads and gross margin. Although not all practices directly relate to these specific areas they either contribute in regards to better monitoring and/or awareness of business performance. The key aspect of Grazing BMP is for graziers to be able to prioritise what practices are required to be adopted in regards to their current business position. The practice standards are listed below.

Table 1: Management practices categorised into the area of business impacted.

Turn over	Overheads	Gross Margin
SH 1.1 Soil types	AH 1.3 Staff training	GM 4.1 Setting stocking

SH 1.2 Soil structure	AH 3.1 Biosecurity planning	rates
SH 1.3 Dispersive soils	AH 3.2 Livestock health	GM 4.2 Adjusting stocking rates
SH 1.4 Water storage capacity	AH 3.3 Livestock movements	GM 4.3 Timing livestock management
SH 1.5 Maximising ground cover	AH 3.4 Quarantine procedures	GM 4.4 Managing the grazing system
SH 1.6 Restoring bare areas	AH 3.5 Vehicle movements	GM 4.5 Managing for even pasture use
SH 2.1 Nutrient supply	AH 3.6 Vehicle and equipment hygiene	AP 2.1 Market specifications
SH 2.1 Salinity	AH 3.7 Fodder biosecurity	AP 2.2 Marketing strategy
SH 2.3 Soil pH	AH 3.8 Feral animals and wildlife	AP 2.3 Managing production
SH 3.1 Soil organic matter	AH 3.9 Record keeping	AP 2.4 Food safety and livestock traceability
SH 3.2 Soil organisms	AH 4.1 Animal welfare responsibilities	AP 3.3 Breeder body condition
SH 4.1 Fertiliser application	AH 4.2 Sick or injured livestock	AP 3.4 Breeder herd performance
SH 4.2 Fertiliser run-off	AH 4.3 Feed and water	AP 3.5 Breeder culling
SH 4.3 Fertilise records	AH 4.4 Facilities and equipment	AP 3.6 Bull management
SH 4.4 Fertiliser storage	AH 4.5 Livestock handling	AP 3.7 Fertility diseases
GM 1.1 Property mapping	AH 4.6 Environmental conditions	AP 4.1 Weaning facilities
GM 1.2 Knowing paddock sizes	AH 4.7 Husbandry procedures	AP 4.2 Weaning preparations
GM 1.3 Identifying land types	AH 4.8 Staff training	AP 4.3 Weaner segregation
GM 6.1 Identifying weed incursions	AH 4.9 Breeding management	AP 4.4 Weaner nutrition
GM 6.2 Controlling weeds	AH 4.10 Humane destruction	AP 4.5 Weaner training
GM 6.3 Preventing weeds	PB 1.1 Business goals and plans	AP 4.6 Weaner health
GM 6.4 Pest animals	PB 1.2 Natural resource planning	AP 4.7 Post-weaning management
GM 6.5 Controlling pest animals	PB 1.3 Infrastructure planning	AP 5.1 Production targets
GM 3.1 Land type fencing		AP 5.2 Understanding nutrition requirements
GM 3.2 Water points		AP 5.3 Nutritional
GM 3.3 Managing frontages and wetlands		

GM 3.4 Protecting and improving biodiversity	PB 1.4 Financial risk management	deficiencies
GM 3.5 Legislative responsibilities	PB 2.1 Stock records	AP 5.4 Assessing feed supply
GM 3.6 Managing the tree-grass balance	PB 2.2 Business and financial records	AP 5.5 Assessing feed quality
GM 3.7 Fire prevention and control	PB 2.3 Budgeting	AP 5.6 Managing feed supply
GM 3.8 Using fire	PB 2.4 Cash flow analysis	AP 5.7 Managing livestock performance
GM 3.9 Legal obligations for using fire	PB 2.5 Business performance analysis	AH 1.1 Identifying health risks
GM 5.1 Improved pasture development	PB 2.6 Business decision making	AH 1.2 Health management program
GM 5.2 Managing improved pastures	PB 3.1 Personal wellbeing	AH 1.4 Recognising disease
GM 5.3 Sown pasture rundown	PB 3.2 Work life balance	AH 1.5 Monitoring livestock
GM 5.4 Using forage crops	PB 3.3 Internal communications	AH 1.6 Responding to health issues
AP 6.1 Breeding objectives	PB 3.4 External communications	AH 1.7 Managing parasites
AP 6.2 Breed selection	PB 3.5 Learning and networking	AH 1.8 Poisonous plants
AP 6.3 Breeding system	PB 3.6 Roles and responsibilities	AH 1.9 Toxicities
AP 6.4 Objective selection	PB 3.7 Labour management	AH 2.1 Planning for extreme weather events
AP 6.5 Maximising genetic progress	PB 4.1 WHS awareness	AH 2.2 Managing predation
PB 5.1 Product selection	PB 4.2 Risk management	AH 5.1 Responsibilities
PB 5.2 Chemical use	PB 4.3 Consultation	AH 5.2 Planning
	PB 4.4 Training and supervision	AH 5.3 Livestock handling
	PB 4.5 Worker induction and records	AH 5.4 Vehicles and facilities
	PB 4.6 Visitor induction	AH 5.5 Pre-transport selection
	PB 4.7 Emergency response plans	AH 5.6 Time off water
	PB 4.8 Remote or isolated work	AH 5.7 Loading density
		AH 5.8 Handling and

	PB 4. 9 Child safety PB 4.10 First aid PB 4.11 Personal protective equipment PB 4.12 Environmental hazards PB 4.13 Incident reporting PB 5.3 Staff training PB 5.4 Chemical records PB 5.5 Storing chemicals PB 5.6 Chemical and container disposal	transport AH 5.9 Humane destruction
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Factors in adoption

Characteristics of adoption of different management decisions remains a key consideration. Rolfe and Gregg (2013) identified some of the key reasons why graziers find it difficult to adopt pasture spelling, riparian management, rotational grazing, and sustainable stocking rates. The key reasons included capital costs, not fitting with current operations or goals, not flexible enough, required investment in skills and it is too complex. The results varied by strategy and there was little concern over long term profits.

Although RP70G Grazing Management Report demonstrated the benefits in grouping practices such as wet season spelling and stocking management to protect from downside risk. However the work from Rolfe and Gregg (2013) indicates that the capital costs from increased need for fencing would hinder the adoption of such a practice if such infrastructure was required.

Similarly for adoption of practices for frontage management, capital costs and investment in skills were sighted as the most common limitation for adoption (Figure 10.). This highlights the importance of having a mix of policy mechanism such as Reef Rescue, and grazing BMP, and the requirement of follow up extension to improve skills and allow the private benefits to be achieved.

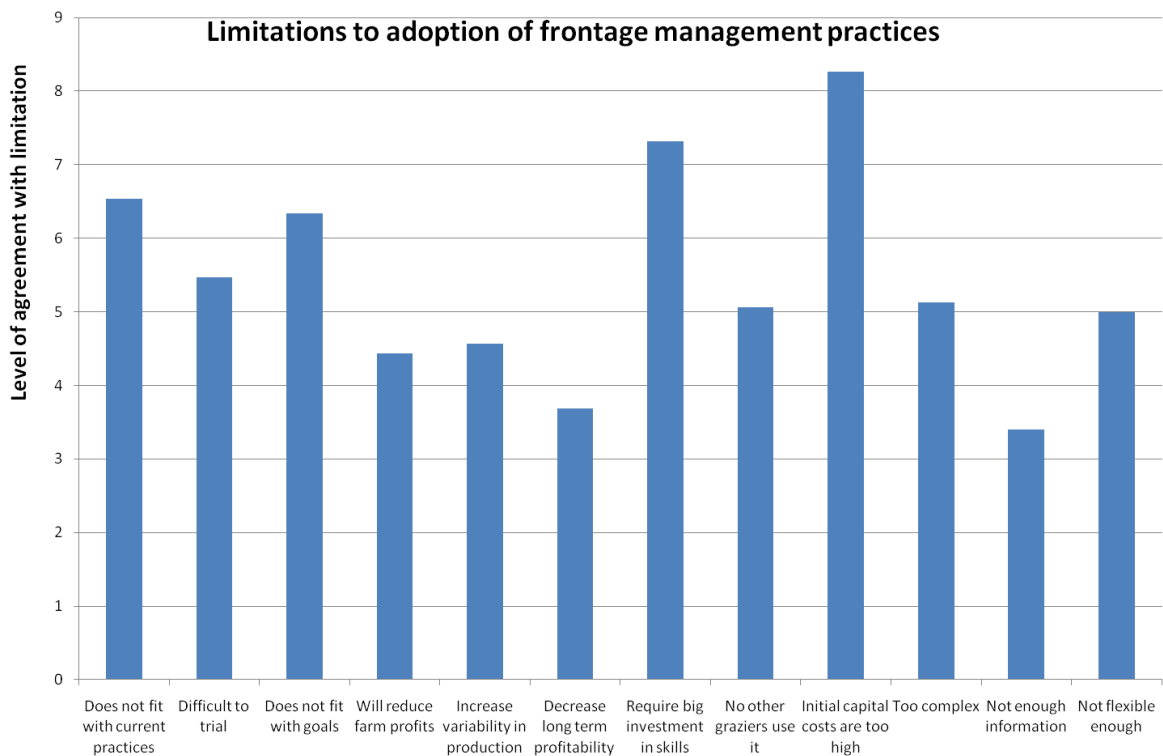


Figure 10. Limitations to adoption of frontage management practices

Rainfall Risk

The impact of climate cycles is critical in achieving private benefits. The current approach of grazing BMP through allowing people to consider where they are in relation to the rest of the industry creates a flexible opportunity for the various policy mechanisms to be considered. There is also the opportunity to consider what the current climate sequence is and what approach suits the particular spatial location based on what the private benefit has the potential to be. The ability to provide quality extension and development is critical in supporting the adoption of practices to mitigate the risk and uncertainty.

The motivations of particular graziers are also critical in considering what form of extension and education and what the constraining factors will be in adoption. Targeting the suite of practices and the approach of adopting a group of practices may require tailoring the adoption process to the motivation of the grazier to over time. The ability service finance, and have the capacity or time to learn about new practices may prove challenging and hinder adoption.

The bioeconomic modelling for the RP70G Grazing management practices report demonstrates that the average rainfall for each of the 20 year blocks shows limited variation in average rainfall. However the annual rainfall and the pattern of rainfall have a significant

impact on profitability. The breakdown of the results to relate it to particular years or disaggregate the results back to 20 year blocks, highlights the dynamic management decisions required (Figure 11). It also highlights the difficulty in suggesting that a particular suite of management practices will always have private benefits.

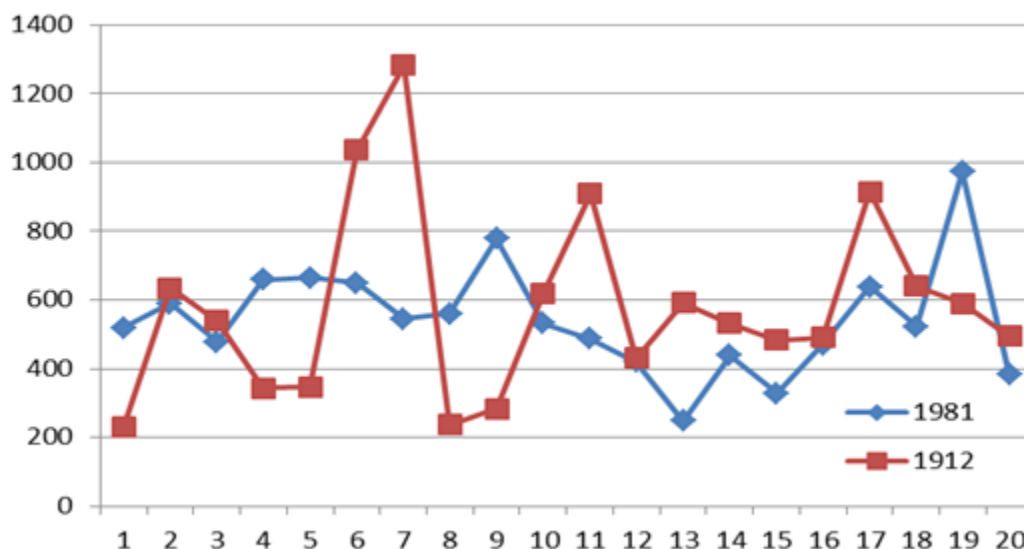


Figure 11. variance in rainfall over two different 20 year periods.

Tools to improve decision making processes

A key aspect of business management is decision making. This will be even more critical with the development of El Nino. Having the correct and timely tool that allow decisions to be guided and considered particularly as the ability to maintain viability over this period becomes critical. The Reef Plan Science Program has funded a number of projects to contribute to such tool to deliver Forage reports (Figure 12), and cover trends (Figure 13).

Work completed by Beutel et al (2013) highlighted the importance of ensuring decision are made earlier in period of low rainfall, to ensure recovery of pasture and land condition in periods of good years. Beutel et al demonstrated that once land had reached a level of bare ground it proved difficult to regenerate it even after years of good rainfall. This demonstrates the importance of improved decision making on long term outcomes.

It is the timely delivery of these tools and mechanisms that inform graziers and allow them to make decisions before cover is too low and financial capacity is too limited to make viable

and sustainable decisions. Integration with extension to support knowledge building and the on ground actions is critical. The ability for extension officers to have a clear understanding of how to interpret these tools and then engage with the grazer to best inform them is critical.

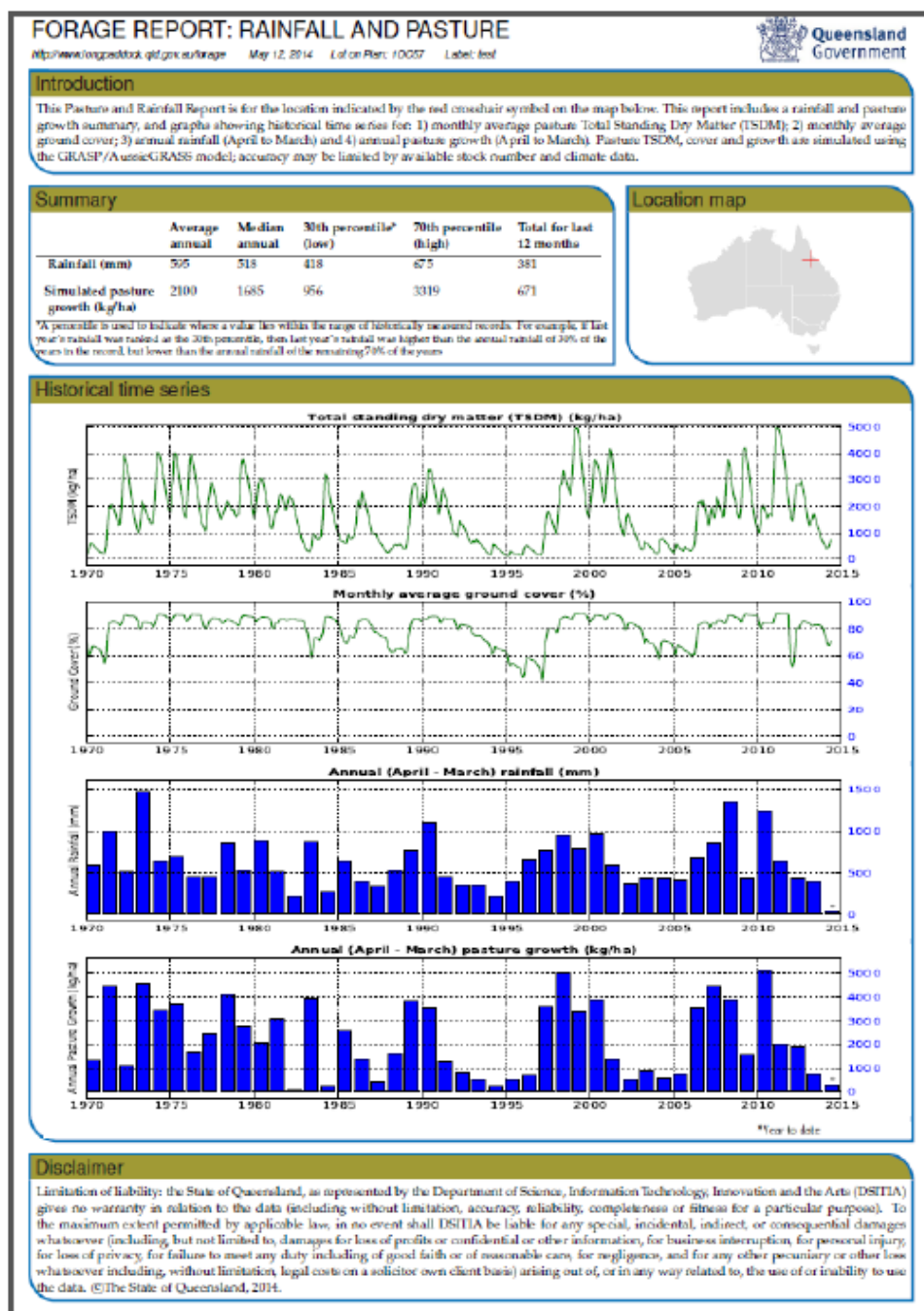


Figure 12. Forage report

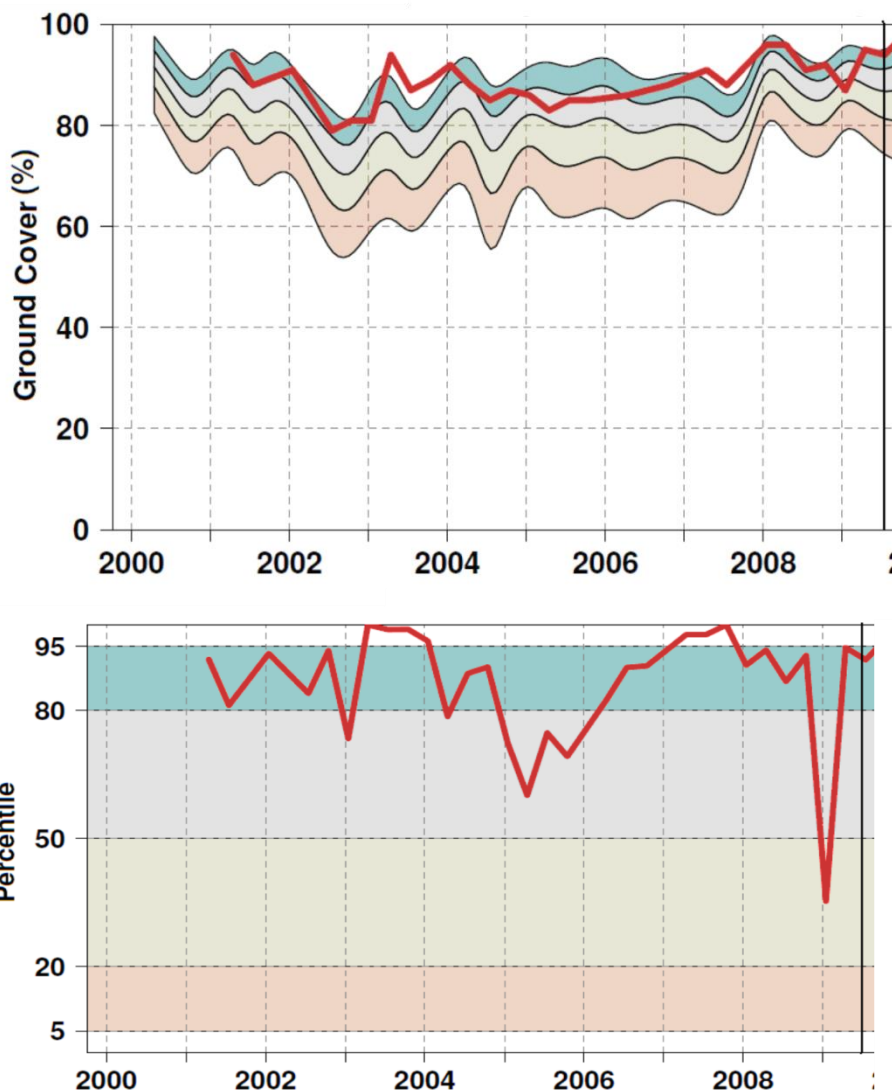


Figure 13. Cover trend reports

Recommendations

The pressure for nutrient and sediment reductions to achieve the Reef plan targets is significant to improve the health of the Great Barrier Reef in a timely manner. This paper presents an application of different mechanisms when there is such uncertainty and dynamic variation in the private benefits. It subsequently provides recommendations into four key areas to improve adoption. Firstly, it highlights the importance of understanding business viability and the key areas where improvements can be made. Secondly, it presents a framework for improved adoption of management practices in circumstances where there are high risk characteristics. Thirdly, it highlights the linkages with existing programs and policies and how the importance of a mix of mechanisms is critical. Finally, it highlights the importance of utilising tools in extension and how it is critical for extension to understand the

application and interpretation of these tools. It presents opportunities for improved timing of decision making and extension linkages.

Recommendation one- Understand landholders whole of business


The ability to understand where different business are financially and scope for improvement allows clearer links to the private benefits of adoption of management practices. To undertake this process can be time consuming and requires specialist training however is critical to ensure that landholders understand their business fully and have aims and goals for improving particular areas of their business. It ensures that landholders seek to adopt relevant practices to their production system and increase overall business profitability. It also allows a plan to be developed once particular milestones or indicators are achieved additional practices can be adopted.

Landholders are aware of the risks in their business and are not willing to adopted practices that present high risk for losses. This therefore highlights the need for incentives in the mix of policy mechanisms as the private benefits of a number of management practices are not always clear. The provision of an incentive lowers the capital cost risk. Capital costs have been identified as a barrier to adoption and therefore it is critical for landholders to identify and plan for how their contribution in capital cost will be covered and finance maintenance achieved.

Currently extension officers are trained and skilled in one particular aspect of business management components i.e. animal production. To increase their capabilities in whole of business understanding may provide them with an understanding of why landholders are not able to adopt a particular practice at a point of time, or help them problem solve with the landholder to achieve a profitable and sustainable solution. It also will help determine which practices would be adopted first and the ability of the landholder to sustain the management practice long term.

Recommendation Two - Consideration of the climate cycle relative to management practices

Rainfall risk is a critical component to be considered in adoption of management practices. Certain management practices may not realise private benefits if adopted through periods of low rainfall. Similarly, capacity to trial practices is significantly reduced due to labour and cost pressures. This is required to be considered in conjunction with the rest of the business parameters. Potentially, low capital cost infrastructure or practices with a perceived lower risk should be sought for adoption during these periods. The current approach of grazing BMP through allowing people to consider where they are in relation to the rest of the industry



creates a flexible opportunity for the various policy mechanisms to be considered. There is also the opportunity to consider what the current climate sequence is and what approach suits the particular spatial location based on what the private benefit has the potential to be. The ability to provide quality extension and development is critical in supporting the adoption of a group of practices to mitigate the risk and uncertainty.

Recommendation Three – Understand how mechanisms complement each other

A key component to the success of achieving sustainable businesses is understanding how incentives and extension link together. Different NRM groups have undertaken different prioritisation of where incentives will be used. Therefore it is critical that extension officers understand what is being targeted and where access to capital infrastructure is for different practices.

As capital is a barrier to adoption it is important the NRM groups, DAFF and private providers need to understand how this can be effectively utilised to achieve outcomes. It also must be considered that the extension can be a time consuming process and that land holders are likely to opt out if there is no clear parameters regarding the timelines for engagement and regular ongoing engagement (Fraser 2013). It must also be considered that the time frames for a number of practices are likely to be a number of years and therefore landholders will opt out if initially there are no clear private benefits.

The capability in extension is critical and therefore professional development of extension officers is critical. Their ability to work together and leverage skills and knowledge off each other is critical in achieving long term success.


Recommendation Four - Improved decision making

Finally, tools for improved decision making are critical. It is the timely delivery and ability to interpret these correctly which is also a key role for extension. The ability for landholders to have improved understand of how these tool actually relate to management practice is also key. Tools will not provide any insights for improved management if the landholder does not understand or value the tool and therefore extension is critical in starting a conversation.



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