



# Motivations, risks and skills of graziers to inform extension for management of high levels of ground cover



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## Key Findings

- More data is needed to quantify the results of this research as well as to provide more statistically relevant data for further analysis.
- This case study indicated the lack of data surrounding the relationship between ground cover and management sophistication of graziers. This finding validates the need for further research to understand this relationship.
- The motivations and goals of graziers with respect to practice adoption and ground cover is highly complex and not well understood. This confirms the need to undertake future research to collect relevant data aimed at addressing this complexity. Research should be targeted to specifically understand what motivates graziers to manage for ground cover with the results used to tailor future extension programs.
- The importance of both grazing management and business skills in a grazing enterprise with respect to ground cover is not well understood. This finding indicates the need to understand the skill development associated with the various past and present extension programs available to graziers such as CQ BEEF.
- There is a lack of information regarding the benefits associated with the CQ BEEF program. An evaluation of CQ BEEF should be undertaken to accurately quantify the benefits associated with the program, with the learning's used to develop future extension programs.



## Introduction

The Great Barrier Reef (GBR) is the largest coral reef system in the world extending 2,000km along the Queensland coast, covering an area of 347,800km<sup>2</sup> (Brodie et al., 2011). The health of the GBR is in decline due to increased levels of sediments and associated nutrients entering the reef attributed to grazing and sugarcane industries (Bartley et al., 2014). Rangeland beef grazing is the primary land use in these catchments and contributes significantly to the long-term annual load discharge of sediments into the GBR lagoon (Packett et al., 2009, Furnas, 2003).

The Fitzroy Basin is the largest catchment adjacent to the GBR lagoon and has been identified as a significant polluter of the GBR. The major tributaries include the Nogoia, Comet, Mackenzie, Isaac/Connors, Dawson, Fitzroy and Theresa Creek (Packett et al., 2009). Agriculture land use in the Fitzroy Basin accounts for approximately 95% of the catchment and is dominated by vast areas of predominantly rangeland beef grazing (88%) (Brodie et al., 2011, Packett et al., 2009). The Fitzroy has the greatest levels of sediment and nutrient discharge into the GBR lagoon compared to other adjacent catchments with export from the basin having increased substantially in the last 100 years (McKergow et al., 2003, McKergow et al., 2005, Packett et al., 2009). Recent studies suggest that the long-term annual suspended sediment export from the Fitzroy to the GBR lagoon range from three to four and a half million tonnes per year, representing approximately 33% of the annual suspended sediment load from all catchments (Dougall et al., 2005, Packett et al., 2009, Queensland Department of Premiers and Cabinet, 2011).

Unsustainable grazing practices result in a reduction of vegetation cover leading to a major increase in run-off and sediment loss from grazing lands adjacent to the GBR (O'Reagain et al., 2005). Ground cover plays a significant role in both the generation and control of run-off from grazing lands (Bartley et al., 2006, Carroll et al., 2000). Run-off of sediments into waterways is caused by three main erosion processes; hillslope, streambank and gully erosion. All of which are a result of unsustainable grazing land management practices (Bartley et al., 2010). Poorly managed and over grazed areas reduce ground cover and are important 'hot-spots' for sediment generation affecting downstream water quality (Packett et al., 2009, Bartley et al., 2010). A combination of extreme weather events and wet to dry climate regimes, when combined with unsustainable grazing pressure further increases the amount of bare ground (Bartley et al., 2006, Packett et al., 2009).

A number of policy efforts have been developed to halt the decline of water entering the GBR lagoon such as the Reef Water Quality Protection Plan (Reef Plan) (Queensland Government, 2013). By 2018 Reef Plan aims to have 90% of grazing lands managed using best management practices in priority areas (Queensland Government, 2013). So far both Australian and Queensland governments have invested \$375 million into Reef Plan activities, with \$8.6 million of this funding going towards the establishment and development of Best Management Practice (BMP) Programs for grazing and sugarcane (Queensland Government, 2013). These BMP programs are important tools for achieving and increasing end of catchment water quality (Greiner et al., 2008). There are a number of other extension and education programs that support the BMP. The participation rate of BMP and extension programs has been substantial, but adoption rates of best management practices have been low.

Prior to the development of BMP programs for the grazing industry, the Central Queensland Better Economic and Environmental Futures (CQ BEEF) program was established in late 2006 as one of two pilot programs as part of the Future Beef initiative of the Queensland Department of Primary Industries (DPI). The aim of CQ BEEF was to improve the business skills and grazing land management practices of graziers in the Fitzroy Basin. CQ BEEF engaged small groups of producers in different areas of the Fitzroy utilizing continuous improvement and innovation, adult learning and empowerment principles, along with components of five different extension models (Storey, 2008).

The principal elements around risk, motivations and adoption of best management practices in relation to graziers, has received detailed consideration (Greiner and Gregg, 2009, Greiner et al., 2009, Greiner and Gregg, 2011, Willock et al., 1999, Gregg et al., 2008, Greiner et al., 2007, Greiner et al., 2008, Marra et al., 2003). There appears to be a limited understanding of the linkages between ground cover management practices, adoption of these practices amongst graziers and the effect of extension programs, such as CQ BEEF on the long term performance of the grazing business. This report will address this deficiency by further understanding firstly, what are the management practices of graziers with high levels of ground cover. Second, what are their motivations to do so, and thirdly, what is their level of skill and how much access



have they had to past extension programs. Additionally, the report evaluates the long term outcomes of the CQ BEEF program in relation to uptake of sustainable management practices, and overall business performance compared to graziers who were not part of the CQ BEEF program. By understanding how these areas link, it will provide insights into how we can improve current extension methods and adoption approaches to increase the uptake of sustainable grazing practices.

## Adoption of best management practices by graziers with specific attention to ground cover

The degradation of grazing lands in the Fitzroy resulting from low ground cover levels due to poor or unsustainable management practices, is a major concern due to the increase in sediment run-off (Packett et al., 2009, Carroll et al., 2011, Bartley et al., 2010, O'Reagain et al., 2005, Bartley et al., 2014, Bartley et al., 2006, Silburn et al., 2011). Chilcott et al. (2005) defined land condition as the capacity of grazing lands to respond to rain and produce useful forage, and is also a measure of how well the grazing land ecosystem is functioning. An ABCD land condition framework was developed based on the density of 3P grasses (perennial, palatable, productive), soil condition, presence of weed species and density of woody areas (Karfs et al., 2009, Chilcott et al., 2005). The framework is used to classify land condition that allows adjustment of pasture growth estimates and provides management options to improve land in declining condition (Chilcott et al., 2005). Where 'A' condition is defined as being the 'best' and 'D' condition defined as being the 'worst' (Star et al., 2011). According to Tothil and Gillies (1992) approximately 20% of Queensland's native pastures are degraded and 40% are in deteriorating condition. Degraded areas of land have high soil erosion rates and contribute to the loss of sediments and nutrients, reducing subsequent pasture production and ground cover (Silburn et al., 2011).

As a result of the development of the ABCD land condition framework, an ABCD management practice framework for water quality improvement was designed to facilitate communication about the different management practice levels or standards for the grazing industry (Drewry et al., 2008). The framework describes a suite of management practices on a scale of improvement from 'unacceptable' (D) practices through to 'cutting-edge' (A) management practices relevant to soil, nutrient and herbicide management (Carroll et al., 2012, Queensland Government, 2014). An ABCD management practice framework for both rangeland and wet coastal grazing was developed, with specific focus on three priority management actions to address water quality issues (pasture, riparian and gully management). The management practice framework for both rangeland and wet coastal grazing refer to eight performance indicators that identify specific management practices that can improve ground cover, therefore reducing the potential for sediment run-off via hillslope, streambank, and gully erosion (McCosker, 2014).

Sediments are delivered to waterways by three main processes, hillslope, streambank and gully erosion. Hillslope erosion is estimated to be the most significant contributor of sediment run-off from grazing lands in the Fitzroy (Bartley et al., 2006, Silburn et al., 2011). Hillslope, streambank and gully erosion processes contribute 50%, 29% and 21% respectively to the total suspended sediment input into the Fitzroy Basin (Dougall et al., 2005). The source and rate of sediment export depends on the type of soil, geology, rainfall and slope. Ground cover is therefore extremely important, especially on soils in the western regions of the catchment that have a high incidence of hillslope, streambank and gully erosion. Ground cover is one of the primary factors that graziers can control without having to make significant investment (Bartley et al., 2014).

### Ground Cover

Bare patches have been noted by Bartley et al. (2010) as the primary source of run-off and erosion from hillslopes with the majority of sediment discharged into rivers composed of suspended (fine) material (Bartley et al., 2006). Hillslopes with small patches of bare ground and high levels of mean cover have up to 60 times more sediment loss via run-off than hillslopes with no areas of bare patches (Bartley et al., 2006). Hillslope erosion is not necessarily the primary source of sediment run-off from grazed areas, as gully and streambank erosion could be playing a more significant role in terms of sediment run-off than initial findings first considered (Bartley et al., 2006). When cover is less than 30-40% sediment export from grazing lands dramatically increases, and when above 50-75% cover, sediment exports begin to decline (Bartley et al., 2010, Bartley et al., 2006).

Increasing the level of ground cover on grazing lands has been shown to improve rangeland condition (Ash et al., 2011, Bartley et al., 2010, Bartley et al., 2014), making them more resilient to extreme weather events (O'Reagain et al., 2011) and improves the water quality entering the GBR (Silburn et al., 2011). The two most widely recommended management practices for improving the level of ground cover of grazing lands are (1) reducing stocking rates to maintain appropriate levels of pasture utilization and (2) wet season spelling (WSP) (Bartley et al., 2014, O'Reagain et al., 2011). Previous research suggested that grazing lands required approximately 40% ground cover to reduce sediment and nutrient run-off (Ash et al., 2001, Bartley et al., 2010). This has now been increased to 75%, as sediment yields start to decline when cover levels are in the order of 50-75% (Bartley et al., 2010). Regardless of the type of management system used, one of the most significant drivers of ground cover is stocking rate (Ash et al., 2001).

## Stocking Rates

Stocking rates determine the level of pasture utilization achieved, which ultimately regulates the presence or absence of 3P (productive, perennial, palatable) pasture species. When pastures are repeatedly heavily grazed it reduces the amount of leaf area causing some plants to die, reduces the root vigour causing tussocks to form and causes land degradation resulting in a reduction in ground cover (Ash et al., 2001, Ash and Stafford Smith, 1996). Past research suggests that the implementation of conservative stocking rates will minimize the effects of drought and land degradation while maintaining land condition and hence improve the level of ground cover (O'Reagain and Bushell, 2011). This research is consistent with the three stocking rate strategies that O'Reagain et al. (2011) recommended for graziers for sustainable land management. First, conservative or moderate stocking and second, adjusting stocking which involves varying stocking rates with utilization levels that allows graziers to capitalise on wetter years and avoid over grazing in dry years. Thirdly, spelling of pastures to provide fodder and address shortages in poor years (O'Reagain et al., 2011). These strategies demonstrate how moderate or conservative stocking rates based on the long term carrying capacity (LTCC) are not only sustainable grazing land management practices but can improve the levels of pasture utilization and density of 3P grasses by reducing the presence of potential bare patches and maintain appropriate levels of ground cover in the order of 50-75% (Bartley et al., 2014, O'Reagain and Bushell, 2011, Orr and O'Reagain, 2011).

Pastures are sensitive to defoliation, especially during the wet season (Ash et al., 1997). Spelling pastures during the wet season maintains pastures in B+ land condition and enables a greater availability of pasture during the rest of the year (Ash et al., 1997, O'Reagain and Bushell, 2011). Increasing the long term carrying capacity through adoption of longer and more frequent wet season spelling is important to increase ground cover of rangelands (Bartley et al., 2014, O'Reagain et al., 2011). Past trials have recommended that annual and early wet season spelling combined with moderate to low pasture utilization levels significantly improved pasture condition and appeared to ameliorate the impacts of high pasture utilization rates on pasture condition (Orr and O'Reagain, 2011).

Perennial grasses are the key to sustainable grazing communities because they are a reliable source of fodder during in severe droughts and protect the soil surface from erosion (Orr and O'Reagain, 2011). Orr and O'Reagain (2011) looked at the impact of grazing strategies on the presence of five perennial pasture species. One of the grazing strategies tested was rotational wet season spelling applied in a simulated three-paddock system. Orr and O'Reagain (2011) failed to demonstrate any influence of wet season spelling on the recruitment, survival or basal area of any of the five grass species. Similarly this project found marginal profit implications as a result of undertaking the sustainable grazing strategies. This finding is inconsistent, considering the accepted importance (Scanlan and Mclvor, 2010) and support of wet season spelling as a management practice that allows moderate increases in stocking rates without adverse effects on pasture condition (Ash et al., 2011).

## Adoption and Past Programs

A grazier's decision to adopt more sustainable practices depends on their values and goals, which are influenced by a range of economic, cultural, personal, social and physical factors (Lankester, 2013, Pannell et al., 2006). The goals and motivations of graziers and their risk attitudes relate significantly to the types of management practices they choose to adopt. This also impacts the extent to which they adopt those management practices which target water quality improvements (Greiner et al., 2008, Greiner and Gregg, 2011, Maybery et al., 2005, Pannell et al., 2006, Greiner and Gregg, 2009). When considering the adoption of different conservation practices, graziers may follow different pathways depending on their motivations

(Greiner and Gregg, 2009). Adoption of conservation practices is primarily influenced by circumstances and characteristics of the grazier, practice characteristics and the trialability of the practice by the landholder (Pannell et al., 2006, Greiner and Gregg, 2011). There are clear correlations between both risk attitudes and motivations of farmers, and the adoption of recommended BMP's (Greiner et al., 2008). Both extrinsic and intrinsic motivation incentives are comparatively important influences of the adoption of conservation practices (Greiner and Gregg, 2009). There are three common motivational factors that can be attributed to the adoption conservation practices by graziers: (1) economical and financial factors, (2) social factors and (3) conservation and lifestyle factors (Greiner et al., 2008, Greiner and Gregg, 2011, Greiner et al., 2009, Fairweather and Keating, 1994, Maybery et al., 2005).

Current studies suggest that graziers with strong lifestyle and conservation motivations and goals have higher adoption rates of conservation practices compared to graziers with strong economic/financial or social motivational goals (Greiner and Gregg, 2011). Conservation practices are more readily adopted by these graziers due to the alignment of these practices with their attitudes, values and intrinsic goals and motivations (Greiner et al., 2008). Similarly, graziers who took more risks compared to other graziers, reported high adoption rates of conservation practices (Greiner and Gregg, 2011). Previous research suggests that incentives are required to influence graziers who are motivated by economic, financial and social factors to adopt the required conservation practices (Greiner et al., 2008, Maybery et al., 2005). When developing policy programs to promote the adoption of region specific conservation practices, it is vital to develop an understanding of the specific goals and risk conditions of graziers to ensure high levels of adoption (Greiner et al., 2008).

A mix of policy tools that directly target the motivations, goals and risks of graziers can ultimately influence the behavior of graziers and their decision making process (Storey, 2008). A decision making process that involves consultation of the end users, being the graziers, enables ownership of the problem. This ensures that when new practices are introduced, it is more likely to be accepted and adopted if graziers are involved in both the development and trialing of the practice. Moreover, they not only feel ownership of the problem but they can understand and observe the compatibility of the new practice with their own enterprise leading to increased rates of adoption (Storey, 2008). The CQ BEEF project engaged graziers using elements of these five extension (Storey, 2008). The project was based on self-directed participatory action learning groups whereby the decision-making process was driven by the producers and facilitated by an independent group leader (Hickey, 2009). Graziers were provided with information that allowed them to identify opportunities within their business for enhanced performance and develop and implement strategies to improve both their economic and environmental performance. This project improved business performance, capability to source information, record keeping and analysis, increased the confidence of graziers in the future profitability and sustainability of their enterprises and improved their overall grazing management (Hickey, 2009). The success of this project is a direct result of the initial extension and policy mechanisms/tools that were employed at the beginning of the project, whereby graziers were able to identify and take ownership of their problems, observe and trial new practices and understanding the compatibility of those new practices with their own enterprises.

## Methodology

The case study area for this study encompasses the Fitzroy Basin which is one of the largest catchments draining into the Great Barrier Reef lagoon covering an estimated area of 142,300 km<sup>2</sup> (Figure 1) (Karfs et al., 2009). The data analyzed in the report is drawn from surveys completed by two groups of five graziers at various locations in the Fitzroy catchment over two periods during November of 2014 (four days) and March of 2015 (three days). Graziers from group one were chosen based on their cover levels, while graziers from group two were selected due to their involvement and participation in the CQ BEEF program. The aim of the surveys was to address the linkages between ground cover management practices and the drivers of the adoption of these practices amongst graziers. This was done by further understanding firstly, what are the management practices of graziers with high levels of ground cover. Second, what are their motivations to do so, and thirdly, what is their level of skill and how much access have they had to past extension programs.



Figure 1 - Location of case study area: Fitzroy River Basin<sup>1</sup>

The survey questions used for this case study are based on an amalgamation of four different surveys (Thompson et al., 2014, Greiner et al., 2008, Department of Agriculture Fisheries and Forestry, 2014, Fitzroy Basin Association, 2014) and guided by the relevant literature. Each survey was conducted on property with the primary decision makers of the grazing enterprise. One-on-one interviews were conducted as they have been shown to increase response rates, reduce self-selection bias and preserve autonomy of responses (Thompson et al., 2014). Interviews ranged from 40 minutes to one and a half hours with the average duration of one hour. As the research was interested in the motivations, practices and demographics of graziers with high ground cover levels, survey participants for group one were chosen on the basis of their level of ground cover over the previous 10 years (2004-2014), while graziers from group two were chosen based on their involvement in the CQ BEEF program regardless of their cover levels. Both groups of graziers were asked a set of 59 close ended questions that were categorized into six separate sections in order to provide a general description of both grazier, enterprise and management characteristics and identify how motivations, risks and skill development impact on adoption of grazing best management practices with respect to ground cover (Figure 2). (Full survey Appendix A)

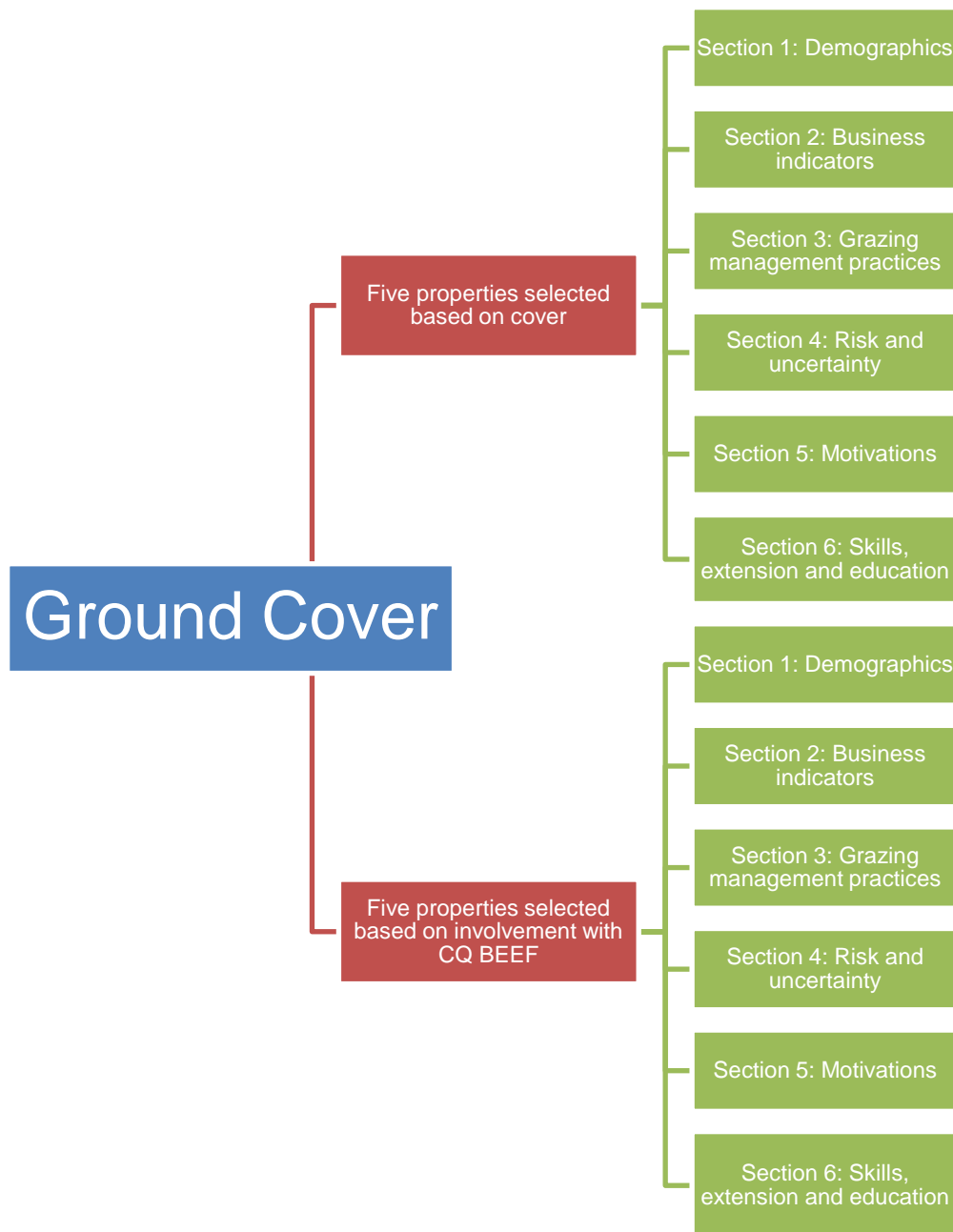
<sup>1</sup> DEPARTMENT OF NATURAL RESOURCES AND MINES. 2014. *Fitzroy basin catchment* [Online]. Brisbane: Department of Natural Resources and Mines. Available: <https://www.dnrm.qld.gov.au/water/catchments-planning/catchments/fitzroy-basin>.



Section 1 contains demographic information about graziers and their families. Section 2 contains information describing the current grazing land management practices undertaken on surveyed properties. In this section grazing land management responses were grouped based on their corresponding erosion process; either hillslope, streambank or gully erosion. Each property had their management practices benchmarked based on the current weighting for the Reef Plan Water Quality Risk Framework for Dry Grazing where each erosion process was aligned to specific questions that indicate the level of current management of graziers (Department of Agriculture Fisheries and Forestry, 2014) (Appendix B). It should be noted that between the surveying of group one and group two the individual question weighting for hillslope in the Reef Plan Water Quality Risk Framework was re-weighted, but did not affect the overall results significantly.

The Reef Plan Water Quality Risk Framework for Dry Grazing included 13 questions that are specific to key management practices that impact on the management of hillslope erosion. Each question gave graziers at least two options and each was ranked in such a way that allowed calculation of the overall level of management sophistication of the grazier with respect to hillslope erosion. Streambank erosion, although not as significant as hillslope erosion, still contributes approximately 29% to the total suspended sediment input into the Fitzroy Basin catchment (Dougall et al., 2005). The Reef Plan Water Quality Risk Framework for Dry Grazing includes one question that is highly specific to the management of streambanks for rangeland grazing to prevent and manage streambank erosion. This question addresses how graziers manage and control grazing pressures on frontage country through the use of fencing by excluding stock from riparian areas or other infrastructure (Queensland Government, 2014). Gully erosion like streambank contributes far less sediment into discharge water than hillslope erosion. Both streambank and gully erosion are thought to play a more significant role in terms of sediment run-off than initial findings first considered (Bartley et al., 2006). The Reef Plan Water Quality Risk Framework for Dry Grazing includes three questions that are highly specific to the management of gullies for rangeland grazing to prevent and manage gully erosion. The score for gully management also includes 30% of the graziers score for hillslope.

Section 3 contains information specific to enterprise business characteristics and performance indicators. Section 4 captured grazier's preferences with regards to risk and how this impacted on their decision making. Three questions were asked for this section. Graziers were asked how willing were they to take risks in relation to a number of parameters, how risky they thought their behavior was relative to other graziers in the region using the same parameters as the previous question and how risky a number of parameters were in relation to how much they played a part in the decision making process for the grazing business. Section 5 explored grazier's motivations and how these impacted on their decision making. Three questions were asked for this section. Graziers were asked to rank a series of management criteria based on how relevant they were to themselves and how important these same management criteria were in influencing their management decisions. The final question asked graziers to rank the importance of several parameters specific to their enterprise. Section 6 aimed to capture the current skill set of the grazier and their involvement in past extension programs and activities run by both private and public extension providers. Graziers were asked to list their three key skills for business management, to rank their level of skill across a number of management areas and to indicate from a list provided the different extension activities they had participated in over the last five years and which of those they found the most effective in terms of gaining knowledge, skills and/or improving their business management. Graziers were also asked where they had gained these skills from in order to manage their grazing businesses effectively and to list their top five sources of information in terms of their level of importance for their management decisions.



The five properties chosen for group one (high cover) ranged in size from 1,821 hectares to 32,000 hectares and the five properties from group two (CQ BEEF) ranged in size from 530 hectares to 7,000 hectares. These two groups covered an estimated area of 93,917 hectares. Levels of cover were estimated using the landsat based seasonal ground cover images (TERN-AusCover, 2014b). This product provides a quarterly estimate of the amount of vegetation on the surface of the ground. It differs from the seasonal fractional cover (TERN-AusCover, 2014a) in that the contribution from woody vegetation has been accounted for. The spatial resolution is 30 metres, and at each location, an estimate of bare, green and non-green vegetation is provided. This project used the sum of the green and non-green vegetation as an indicator of total ground cover. To identify management effects on cover levels as opposed to regional effects, a comparative approach was used, in the manner of the FORAGE Regional Ground Cover report (Department of Science Information Technology Innovation and the Arts, 2014). If absolute total cover were used, those properties ranked highest are likely to be selected from the wetter more productive regions of the catchment, and drier western areas would be under-represented. The comparative approach compares a given property with locations within a 50km radius of the centre of the property. Comparison locations are also chosen from



similar land use, so grazing properties aren't compared with state reserves, stock routes or more intensive land uses. The level of cover of the property in question is compared to these locations and given a rank at each season. Figure 3 provides an example of the comparison. In this diagram, the range of cover for the area around the property is indicated by the coloured bands. Brown shades indicate cover levels below the regional median value, and green shades cover levels above the regional median. The average cover for the property is shown by the red line. Properties that in general have higher cover than the comparison region will have the red line predominantly in the green bands.

Each property was summarised by the average rank over the last ten years. This time period was chosen to minimise the influence of possible prior management practices, but is sufficiently long to reduce impact of short term events. Where possible, properties for group one were chosen from the top five percent based on the average rank. Two properties were chosen for practical reasons that lay below this level but remained in the top quartile based on average rank. This approach thus implicitly controls for factors such as soil type and climate, and identifies those properties that have higher cover than similar nearby properties.

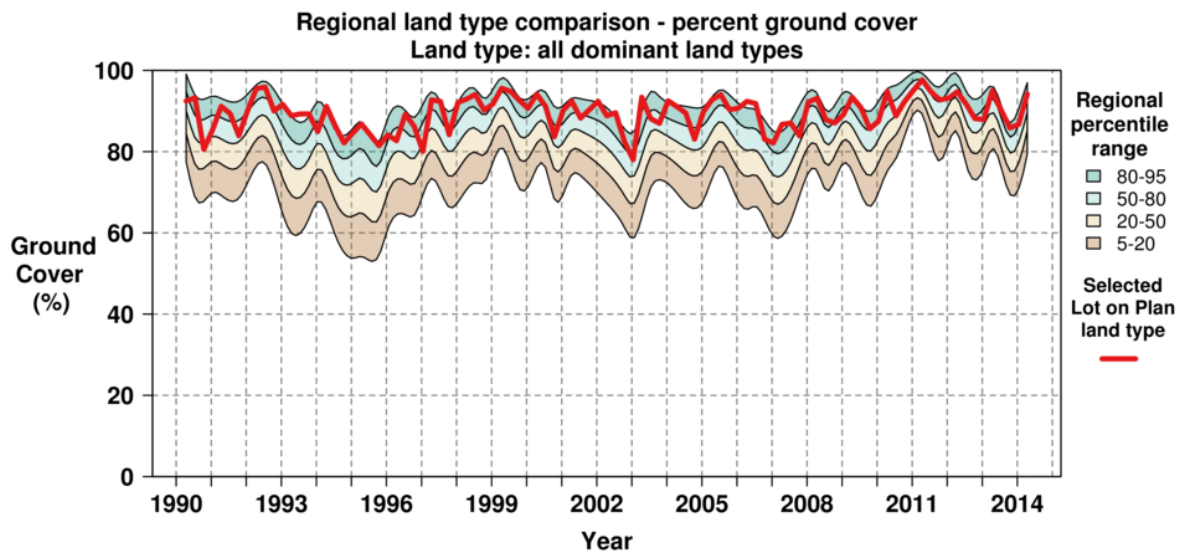


Figure 3 - Regional comparison plot for an example property\*.

\*The regional cover range is shown in the coloured bands. Bands in green are above the regional median, and bands in brown below. The red line represents the average cover of the property in question. The red line lies predominantly in the green band, indicating that the property in question tends to have higher cover than its surroundings. The average rank over the ten year period 2004-2014 for this property is 0.81 and places it in the top 5% of properties assessed.

The main enterprise type as indicated by survey results was *Breed and finish mainly slaughter cattle* with six responses, with an average of 96% of each property being utilized for grazing. The average number of stock run across the ten properties was 1,735 head of cattle and ranged from 300 to 4,000 head of cattle. The average annual rainfall varied significantly between the ten properties, ranging from 590mm to 1,389mm. The top three most common land types across all ten surveyed properties were brigalow with softwood scrub species (Figure 4), brigalow with melonholes (Figure 5) and spotted gum ridges (Figure 6).

Brigalow with softwood scrub species land type is associated with soils that can be described as dark brown, grey cracking clay soils or dark brown, deep gradational uniform soils (Figure 4) (McIntosh, 2012). The expected pasture species consist of desert, forest and Queensland blue grass, curly and bull Mitchell grass and kangaroo grass (McIntosh, 2014). The total standing dry matter utilization level for this land type is 30%. Woody vegetation consists of brigalow and belah scrub with wilga or yellowwood, occasional bottle trees, bonewood, crows ash, ooline, bauhinia, myall and popular box with an understory of currant bush, false sandal wood and limebush (McIntosh, 2014). This land type is suitable to be over sown with buffel and panic grass, creeping blue grass, purple pigeon and angelton grass as well as leucaena, butterfly pea and caatinga stylo. This land type is suitable for finishing enterprises (McIntosh, 2014).



Figure 4 – Brigalow with softwood scrub species<sup>2</sup>

Brigalow with melonholes land type is associated with shallow, highly sodic, brown or grey vertosol soils (gilgaied, brown or grey cracking clay) (Figure 5) (McIntosh, 2014). The expected pasture species of this land type consists of Queensland, forest and desert bluegrasses, silky browntop grass, bull and curly Mitchell grasses (McIntosh, 2014). The total standing dry matter utilization level for this land type is 30%. Woody vegetation consists of brigalow scrub with an understory of sandalwood, currant bush and occasionally yellow wood (McIntosh, 2014). This land type is suitable to be over sown with a range of productive grasses and legumes including buffel, bambatsi, purple pigeon and angelton grasses as well as leucaena, a highly productive legume, butterfly pea, desmanthus, caatinga and caribbean stylos. This land type has low to moderate nitrogen and phosphorus levels and is primarily suited to finishing enterprises (McIntosh, 2014). Brigalow with melonholes is not suitable for cultivation as it is prone to melonholes and regrowth (McIntosh, 2014).



Figure 5 - Brigalow with melonholes<sup>3</sup>

Spotted gum ridges accompany tenosol or kandosol (Shallow rocky texture contrast or gradational) soils of low nitrogen and phosphorus are the primary soils associated with this land type, making it suitable for breeding and growing enterprises (Figure 6) (McIntosh, 2014). This land type is associated with mountain and range country primarily consisting of spotted gum forests or woodlands associated with narrow-leaved ironbark, lemon scented gum, and lancewood woody vegetation (McIntosh, 2014). Black speargrass, kangaroo grass, hairy panic and desert blue grass are the preferred species of grasses for this land type (McIntosh, 2014). The total standing dry matter utilization level for this land type is 15%. Legumes such as shrubby stylo are suitable sown species for this land type to increase the nitrogen levels of the soils (McIntosh, 2014). Spotted gum ridges are often associated with steep slopes, shallow soils and rocky surfaces (McIntosh, 2014).

<sup>2</sup>MCINTOSH, F. 2014. *Fitzroy Region GLM Land types* [Online]. Brisbane: Future Beef. Available: <http://futurebeef.com.au/topics/grazing-land-management/land-types-of-queensland/fitzroy/>.

<sup>3</sup> Ibid.



Figure 6 - Spotted gum ridges<sup>4</sup>

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<sup>4</sup> Ibid.

## Case Study Results

The results section are structured into two parts, each containing six sections. Section 1 contains demographic information about graziers and their families. Section 2 contains information describing the current grazing land management practices undertaken on surveyed properties. In this section grazing land management responses will be grouped based their corresponding erosion process; either hillslope, streambank or gully erosion. Each property will have their management practices benchmarked based on the current weighting for the Reef Plan Water Quality Risk Framework for Dry Grazing (Department of Agriculture Fisheries and Forestry, 2014). Section 3 contains information specific to enterprise business characteristics and performance indicators. Section 4 and Section 5 explore grazier's risks and motivations separately and how these impact on their decision making. Section 6 details the current skill set of the graziers and what level of previous interaction and/or participation they have had with both public and private extension providers and activities, as well as the skills they have gained for these experiences.

### Part 1 – High Cover Properties

Properties for round one were chosen based on their cover levels being in the top five percent among graziers in the Fitzroy basin (Table 1). The table below indicates the percentage ground cover for each property since 1991 and over the last five and ten years.

Table 1 - Ground cover metrics for graziers with high cover

<b>Property</b>	<b>Cover from 1991 (%)</b>	<b>Cover over previous 5 years (%)</b>	<b>Cover over previous 10 years (%)</b>
<b>Property 1</b>	79	86	79
<b>Property 2</b>	93	93	92
<b>Property 3</b>	92	95	94
<b>Property 4</b>	93	94	94
<b>Property 5</b>	88	92	89

### Demographics

Survey results indicated that graziers came from various generations with the majority coming from both the Baby Boomers and Generation X and one from the Greatest Generation (Table 2). Industry experience ranged from 30 to 70 years for graziers. The experience of the partners of Generation X graziers was lower compared Baby Boomers. The respective grazier coming from the Greatest Generation had approximately 70 years of industry experience.

Table 2 - Grazier demographic survey results for generation and industry experience.

<b>Surveyed Properties</b>	<b>Generation</b>	<b>Industry Experience (Years)</b>	<b>Industry Experience (Partner)(Years)</b>
<b>Property 1</b>	1930 – 1945 (Greatest Generation)	70	-
<b>Property 2</b>	1965 – 1979 (Generation X)	37	14
<b>Property 3</b>	1946 – 1964 (Baby Boomers)	30	30
<b>Property 4</b>	1946 – 1964 (Baby Boomers)	53	53
<b>Property 5</b>	1965 – 1979 (Generation X)	35	35

All five survey graziers indicated that they expected their children to continue working in the business four of these five indicated currently having a number of dependent children (Table 3). All graziers intended to undertake succession planning with three out of five graziers indicating they had partially planned for business succession.



Table 3 - Extent of Grazier succession planning and number of dependent children.

<b>Surveyed Properties</b>	<b>Number of dependents</b>	<b>Succession Planning</b>	<b>Extent of Succession Planning (1 – not at all to 5 – completely)</b>
<b>Property 1</b>	0	Yes	3
<b>Property 2</b>	3	Yes	3
<b>Property 3</b>	4	Yes	2
<b>Property 4</b>	1	Yes	3
<b>Property 5</b>	3	Yes	1

All surveyed graziers had achieved differing levels of education ranging from completion of Grade 9 through to a trade and university qualifications. Graziers and their partners from Properties 1 and 3 had obtained university qualifications while graziers from Properties 2 and 5 had obtained a trade or diploma and their partners, a Grade 12 certificate. Property 4 grazier had completed school up to grade nine with the respective partner completing a Grade 10 certificate.

## Grazing Management

The results for this section be will discussed in three subsections; hillslope, streambank and gully. This is based on the Reef Plan Water Quality Risk Framework for Dry Grazing where each erosion process is aligned to specific questions that indicate the level of current management of graziers (Department of Agriculture Fisheries and Forestry, 2014). The framework describes a suite of management practices on a scale of improvement from 'Unacceptable' (D) practices through to 'Cutting-edge' (A) management practices relevant to soil, nutrient and herbicide management (Carroll et al., 2012, Queensland Government, 2014).

### Hillslope

All graziers except one were ranked as having 'C' (conventional) practice rating, with Property 2 scoring a 'B' (best) practice score indicating better management than the other four properties for hillslope erosion (Table 4). In this section graziers were asked to identify how they managed their stocking rates. All five graziers provided the same response to this question; *'Use long term experience to look at stock numbers and pasture available in each paddock after the wet season. Cattle numbers adjusted to ensure adequate residual pasture and groundcover at break of season'*, which is a 'B' level industry practice. Another question asked graziers *'what grazing strategies do you employ to better maintain areas of land that are declining in condition?'*. All graziers scored reasonably high for this question with four out five indicating 'B' level management and the other 'A' level management. When graziers were asked about what paddock records they kept to inform their grazing decisions, three graziers were scored as 'D' management.

Table 4 - Hillslope management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
<b>Property 1</b>	56.5	C
<b>Property 2</b>	67	B
<b>Property 3</b>	42.5	C
<b>Property 4</b>	47	C
<b>Property 5</b>	40	C

### Streambank

Survey results indicate varied results with two properties being ranked as having 'A' management practices. The other three properties indicated 'B', 'C' and 'D' management (Table 5).

Table 5 - Streambank management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
Property 1	100	A
Property 2	33	C
Property 3	66	B
Property 4	100	A
Property 5	0	D

## Gully

All graziers were ranked as having 'C' management practices for gully erosion management (Table 6). For gully management, graziers were asked 'How do you recover degraded areas of land (scalding, collapsed banks, gully erosion)?' All five responses for this question were low, with three 'C' responses and two 'D' responses indicating the lack of management of degraded areas of land on each property. Graziers were also asked 'How are fences located to minimize erosion risk?' Four out of five graziers indicated their current management practice was 'Fences follow contour or ridge lines where possible in steep country, whoa-boys are used on fence lines where required', an 'A' level practice indicating good management of gully or riparian areas to minimize the risk of erosion and loss of sediments.

Table 6 - Gully management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
Property 1	35	C
Property 2	62	C
Property 3	44	C
Property 4	37	C
Property 5	45	C

## Business

Four out of the five surveyed graziers had ownership of their currently property and were owner/managers. One grazier was part of a family business, and therefore not having total ownership of the property. This grazier was the fulltime manager, and as result had to include others from the business in the decision making process. Each of the four graziers that owned their properties had off-property investments, mainly shares or investment properties, with one having an external business. The grazier that was a manager did not have any off-property investments. Cattle were the major source of income for four of the surveyed graziers. The grazier that specified that cattle were not the main source of their income had an external business that provided income. This grazier hoped that the external business would enable them to build up the current grazing business to be the main income source.

In terms of business performance, three graziers (Properties 1, 2 and 4) knew their overall business return on asset (Table 7). Two (Properties 2, 4) of these four also knew their fixed cost ratio, gross margin, finance ratio and turnover ratio. The other grazier of the three (Property 1) only knew their gross margin and turnover ratio. The other two surveyed graziers (Properties 3, 5) had no records of their overall business return on asset or other business performance indicators. Both graziers from Properties 2 and 4 updated these ratios; with Property 2 updated these on a quarterly basis and Property 4 on an annual basis. Where improvement of business performance indicators was concerned, Properties 1, 2 and 4 were looking to improve. Property 1 is aiming to improving their fixed cost ratios, gross margins and finance ratios.



Table 7 - Business performance indicators

Surveyed Properties	Do you know your overall business return on asset?	Fixed Cost Ratio	Gross Margin	Finance Ratio	Turnover Ratio
Property 1	Yes	No	Yes	No	Yes
Property 2	Yes	Yes	Yes	Yes	Yes
Property 3	No	No	No	No	No
Property 4	Yes	Yes	Yes	Yes	Yes
Property 5	No	No	No	No	No

## Risk & Uncertainty

Properties 2 and 5 indicated a high level of willingness to take risks for all parameters (Figure 7). Property 4 was the least inclined to take risks with low scores for most parameters. All graziers except for those from Property 4 were more inclined to take a risk involving maintenance of the appropriate level of pasture utilization through adequate herd management. Similarly, all graziers except those from Property 4 were more inclined to risk the introduction of new practices into their operation regardless of the outcome. These same properties were also more willing to use credit to purchase infrastructure technologies. Properties 2, 3 and 5 all rated themselves highly with respect to overall risk taking, while Properties 1 and 4 rated themselves lower.

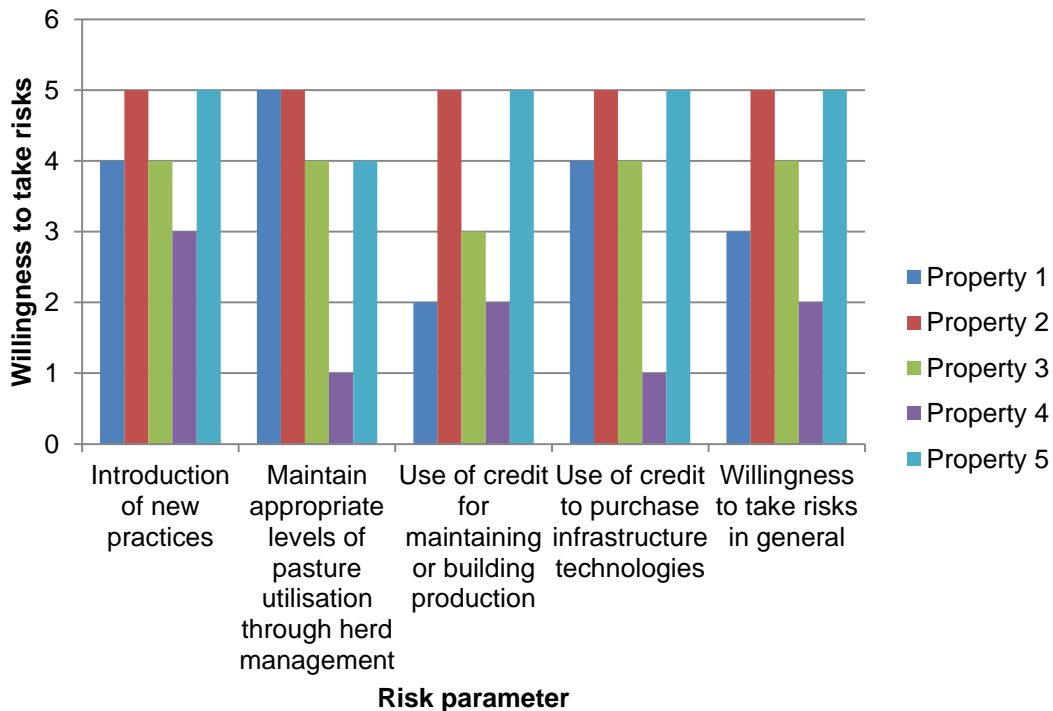


Figure 7 - Graziers willingness to take risks (1 unwilling – 5 extremely willing)

Both Properties 2 and 5 ranked themselves higher for willingness to take risks compared to other graziers in the region (Figure 8). Properties 1, 2 and 4 considered their willingness to take risks as much lower than other graziers. Property 4 again ranked their willingness to take risks to be lower compared to other graziers. Both Properties 2 and 5 again ranked themselves as having more risky behavior overall compared to other graziers while Properties 2, 3 and 4 ranked themselves as low risk takers overall compared to other graziers.

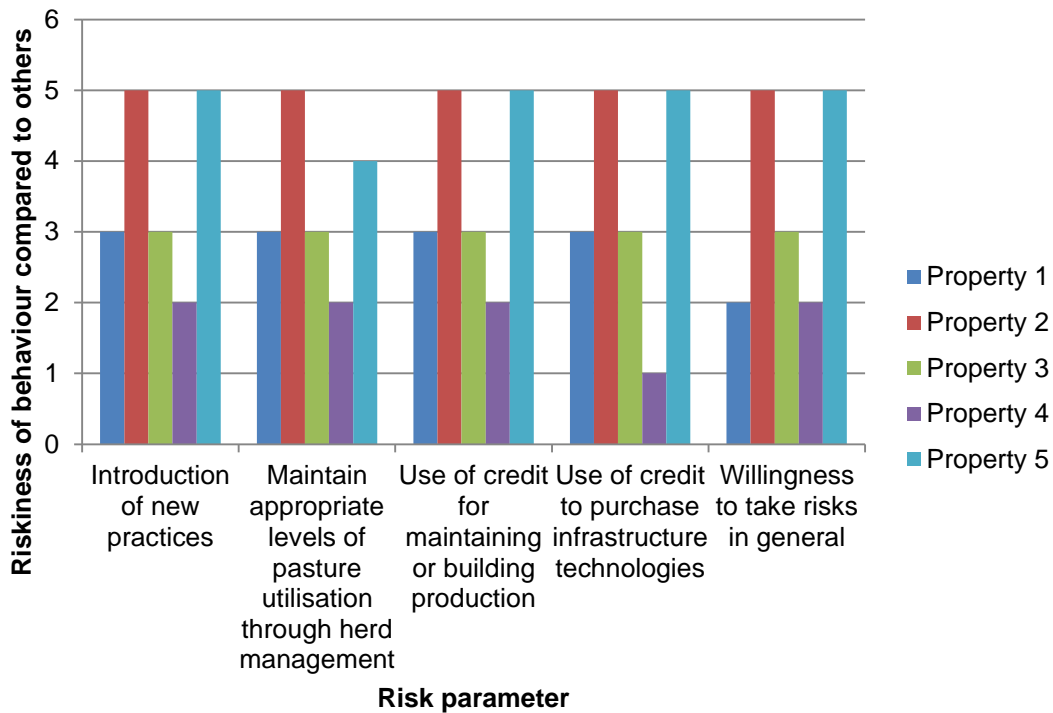


Figure 8 - How graziers ranked their behavior in terms of riskiness relative to other graziers (1 much less risky - 5 much riskier)

Annual rainfall, pasture growth levels and market prices for beef were the highest scored sources of risk relevant to decision making among all surveyed properties (Figure 9 and 10). Interest rates and debt repayments also scored highly among graziers. Extreme weather events were seen to be the lowest source of risk where business decision making was concerned.

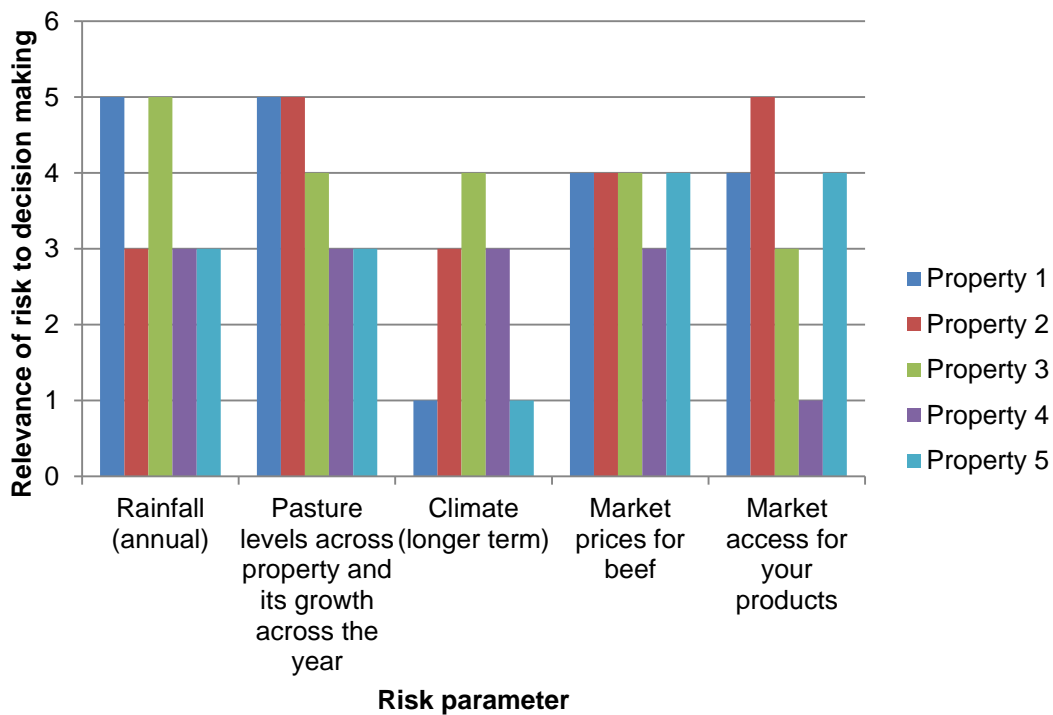


Figure 9 - Sources of risk and how relevant they are in the decision making process to graziers (1 not relevant – 5 extremely relevant)

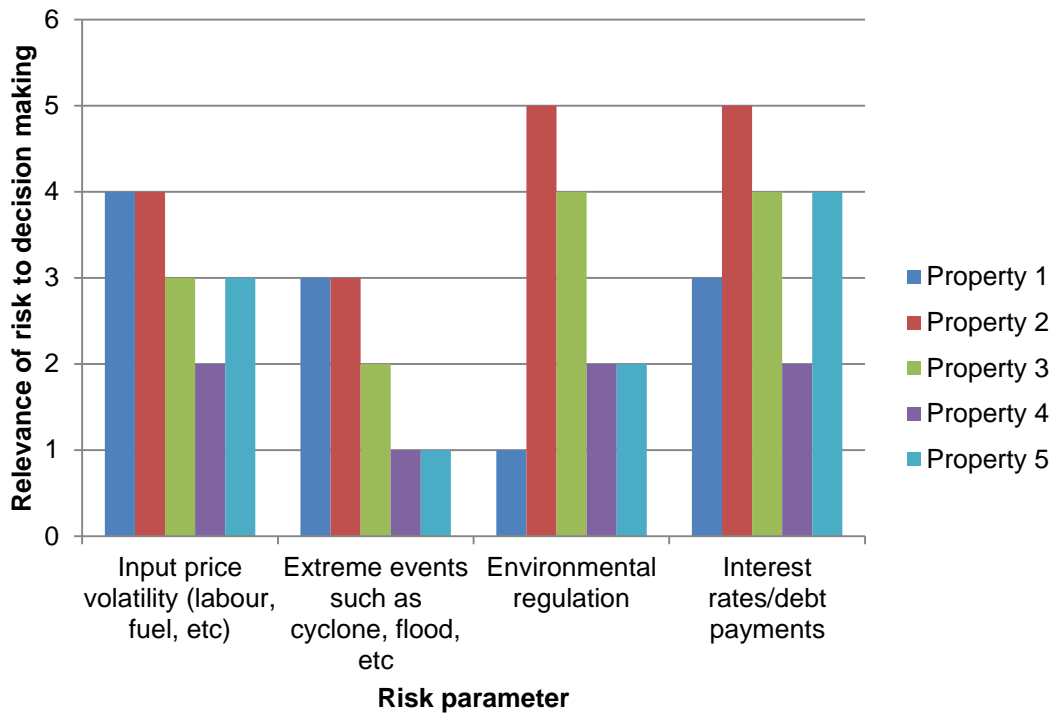


Figure 10 - Sources of risk and how they relevant they are in the decision making process to graziers (1 not relevant – 5 extremely relevant)

## Your Motivations

All graziers ranked *maximize the current year production of beef and maintain herd levels* as extremely relevant management criteria (Table 8). Similarly four out of five graziers indicated that *maximizing profit, maximize ground cover at the end of the dry season, keep good financial records and stock at a level which minimizes the need to use fodder* as highly relevant management criteria. Three out of five graziers ranked *minimize the likelihood of making a loss, minimize costs and maintain or build-up the natural resources on the property* to be relevant management criteria.

Graziers consistently rated *high cost for capital investments, cash flow and family commitments* to be highly important factors that influenced their management decisions (Table 9 and 10). The majority of graziers, three out of four, rated *concerns over meeting financial commitments, uncertainty over selling markets and vegetation management restrictions* as important factors influencing their management decisions. The lowest consistently rated influencing factors for all graziers were *peer pressure to manage in a 'conventional manner'* and *difficult to identify appropriate stocking rates*. It was also evident that both graziers from Properties 2 and 3 consistently rated most factors as having a high level of influence on their management decisions, compared to Property 5 who considered most factors as having a low level of influence on their management decisions.

All graziers consistently ranked *timely access to information sources to make decision, clear vision for the property and cash flow* as being extremely important to their enterprise (Table 11). The majority of graziers also ranked *skills, training and capacity building and access to peer and technical support* as moderately relevant to their enterprise.

Table 8 - Relevance of management criteria to grazing business (1 not relevant – 5 extremely relevant)

	<i>Maximize the current year production of beef</i>	<i>Minimize the likelihood of making a loss</i>	<i>Maximize profit</i>	<i>Maximize ground cover at the end of the dry season</i>	<i>Do 'well enough' in the business to stay on the land</i>	<i>Maintain herd levels</i>	<i>Keep good financial records</i>	<i>Minimize costs</i>	<i>Maintain or build up the natural resources on the property</i>	<i>Maximize leisure time</i>	<i>Change stocking rates annually to reflect expected conditions</i>	<i>Stock at a level which minimizes the need to use fodder</i>
<b>Property 1</b>	4	4	5	4	1	4	4	3	4	2	2	4
<b>Property 2</b>	4	5	5	5	5	5	5	5	4	4	5	5
<b>Property 3</b>	5	3	3	5	3	5	4	4	4	4	4	4
<b>Property 4</b>	4	4	4	3	4	4	4	4	3	2	3	5
<b>Property 5</b>	5	3	5	4	1	4	3	3	2	1	3	2

Table 9 - Factors that influence management decisions (1 not important – 5 extremely important)

	<i>High costs for capital investments (e.g. fencing)</i>	<i>Peer pressure to manage in a 'conventional' manner</i>	<i>Cash flow</i>	<i>Family commitments</i>	<i>Concern over meeting financial commitments (e.g. loans)</i>	<i>Concern over meeting environmental goals</i>	<i>Uncertainty over selling markets</i>
<b>Property 1</b>	4	1	5	5	5	2	2
<b>Property 2</b>	4	1	4	5	5	5	4
<b>Property 3</b>	5	1	5	5	5	4	4
<b>Property 4</b>	5	2	5	4	3	3	2
<b>Property 5</b>	2	1	4	3	3	2	4

Table 10 - Factors that influence management decisions (1 not important – 5 extremely important)

	<i>Uncertainty over climate in the near term</i>	<i>Uncertainty over climate in the long term</i>	<i>Difficult to identify appropriate stocking rates</i>	<i>A lack of information about grazing for sustainable resource/pastures</i>	<i>Vegetation management restrictions</i>	<i>Concern over uncertainty over leasehold tenure</i>	<i>Business management decisions are difficult to make (i.e. more than one owner)</i>
<b>Property 1</b>	2	1	2	2	5	N/A	N/A
<b>Property 2</b>	4	4	1	3	4	3	3
<b>Property 3</b>	4	4	4	4	4	4	1
<b>Property 4</b>	3	3	1	2	3	1	1
<b>Property 5</b>	2	1	2	3	1	1	4

Table 11 - Importance of aspects relevant to grazing enterprise (1 not important – 5 extremely important)

	<i>Timely access to information sources to make decisions</i>	<i>Skills and training, capacity building</i>	<i>Clear vision for the property</i>	<i>Access to peer and technical support</i>	<i>Cash flow</i>
<b>Property 1</b>	4	5	4	4	5
<b>Property 2</b>	4	3	5	3	5
<b>Property 3</b>	4	3	4	4	5
<b>Property 4</b>	1	3	4	3	5
<b>Property 5</b>	4	3	5	4	5

## Skills, Extension and Education

Based on survey results the top three most important skills as indicated by graziers were *record keeping*, followed by *communication* and *planning* (Figure 11).

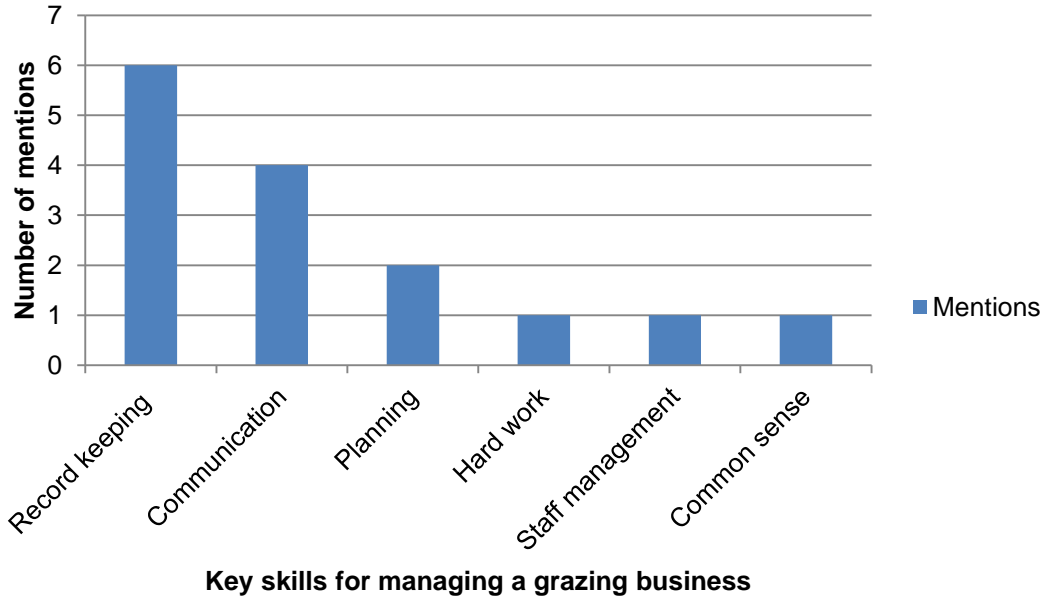


Figure 11 - Key skills for business management

## Public Extension Support

Life experience was the most commonly referred to instance of where graziers had obtained their skills from (Figure 12). Other instances of skill development mentioned included rural suppliers, observations, out of necessity and general business experience.

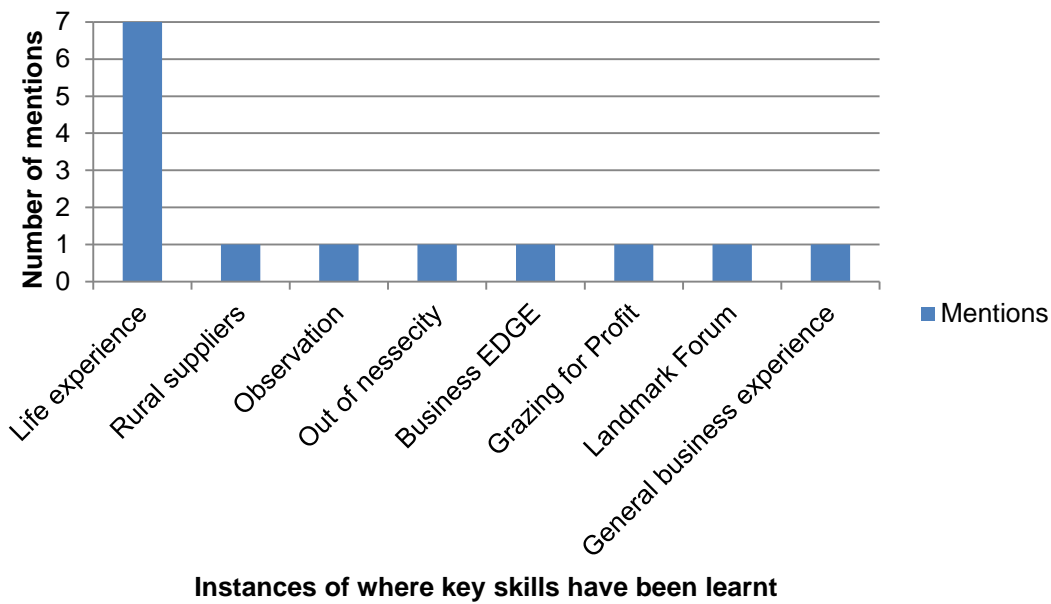


Figure 12 - Instances of where skill development has occurred



All graziers ranked themselves as having a moderate to high level of skill for animal production management, pasture management, business management, and land management (Figure 13). The level of skill for off-farm investment management was slightly lower than the other management areas. Properties 2, 4 and 5 rated themselves as having a higher level of skill across a number of areas compared to Properties 1 and 3.

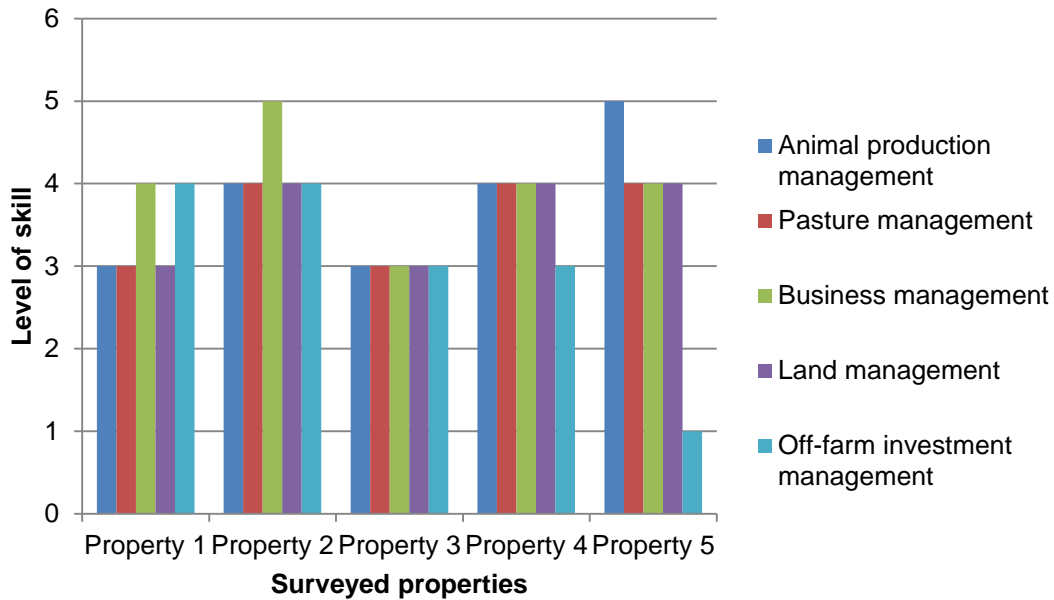


Figure 13 - Level of skill across different management areas (1 being poor – 5 being excellent)

Out of the five graziers surveyed four had received extension support from the Department of Agriculture and Fisheries (DAF) in the form of workshops/group settings and one-on-ones interactions. None were a part of large extension investment programs such as CQ Beef or Research to Reality. Of those that did receive support it was mainly in the areas of animal production and pasture management (Figure 14). Both extension support settings were preferred by graziers with half indicating they preferred workshop/group settings and the other half indicating they preferred one-on-one extension support. Of the four graziers that had received extension support from DAF, each rated their involvement as a very positive experience.

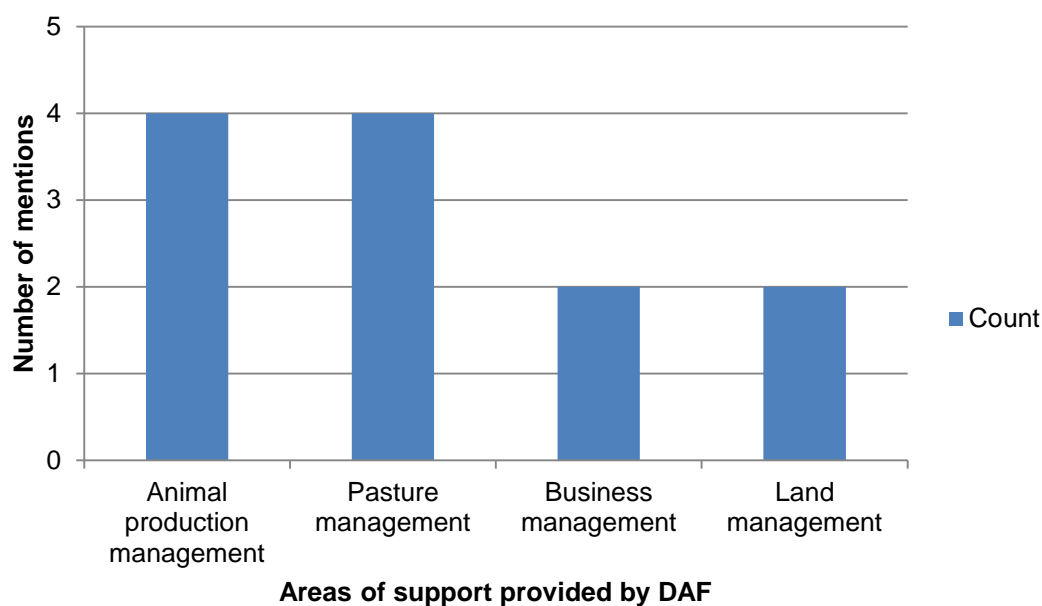


Figure 14 - Areas where graziers received support from DAF

## Private Extension Support

Four out of the five surveyed graziers had received extension support from private providers. The main providers mentioned were Resource Consulting Services (RCS) and Meat and Livestock Australia (MLA). Others mentioned included AgForce, Fitzroy Basin Association (FBA), The University of Queensland (UQ), Australian Brahman Breeders Association (ABBA), and Brennan Mayne Agribusiness (Table 12). Graziers also rated their experience with the involvement of each private provider. Graziers involved with FBA indicated that their involvement was a highly positive one, while graziers from Properties 4 and 5 indicated a negative experience with their involvement with AgForce.

Table 12 - Involvement experience with different private extension providers

	<i>Fitzroy Basin Association (FBA)</i>	<i>AgForce</i>	<i>Other</i>	
<b>Property 1</b>	5	-	3	ABBA
<b>Property 2</b>	-	-	-	-
<b>Property 3</b>	4	-	-	-
<b>Property 4</b>	5	3	4	RCS, MLA
<b>Property 5</b>	4	2	5	RCS, UQ, Brennan Mayne Agribusiness

Those graziers that indicated receiving support from FBA, received support in the form of a funding grant. Funding grants were available to graziers for land type and riparian fencing, watering points and voluntary land management agreements. The most common funding grants undertaken by graziers were funding for land type fencing and implementation of off-stream watering points (Table 13). Three out of the five graziers undertook these grants. Two graziers also applied for and implemented riparian fencing as a result of grants from FBA. Graziers from Properties 4 and 5 received three funding grants each for land type fencing, watering points and riparian fencing.

Table 13 - Funding grants received from FBA

	<b>Funding grant</b>	<b>Landtype fencing</b>	<b>Riparian fencing</b>	<b>Watering points</b>
<b>Property 1</b>	Yes	1	-	1
<b>Property 2</b>	No	-	-	-
<b>Property 3</b>	No	-	-	-
<b>Property 4</b>	Yes	1	1	1
<b>Property 5</b>	Yes	1	1	1

## Past Extension Involvement

The workshops participated in by graziers were mapping workshops (AgForce), RCS Grazing for Profit and Grazing Best Management Practice (BMP) (Table 14 and 15). Stocktake, Breeding EDGE and project development visits were also commonly participated in workshops. Graziers from Properties 1, 4 and 5 also noted they had been involved in 'Other' extension programs with various private extension providers and also part of research projects.

The graziers who indicated they had been involved in extension activities over the past five years, the most effective workshops in terms of gaining knowledge, skills and/or improving their business management were mapping workshops run by AgForce, followed by Breeding EDGE, RCS Grazing for Profit and Grazing BMP workshops (Table 13 and 14). Of the four graziers that did participate in extension activities, all indicated that by attending the activity it had greatly improved their confidence in their decision making for the grazing business and each had done some form of follow-up research to further their knowledge.



Table 14 - Program participation over the last five years

	<b>StockTake Workshop</b>	<b>Grazing Land Management EDGE</b>	<b>Breeding EDGE</b>	<b>Business EDGE</b>	<b>Nutrition EDGE</b>	<b>Mapping Workshop (AgForce)</b>	<b>Mapping Workshop (Grazing Best Prac)</b>	<b>Soil Pit Day (FBA)</b>	<b>Pasture rundown field days</b>	<b>RCS Grazing Clinic</b>	<b>RCS Grazing for Profit</b>
<b>Property 1</b>	-	-	-	-	-	1	-	-	-	-	1
<b>Property 2</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Property 3</b>	1	-	1	-	-	-	-	-	-	-	1
<b>Property 4</b>	1	-	-	1	-	1	-	-	1	-	-
<b>Property 5</b>	-	-	1	-	-	1	-	-	-	-	1

Table 15 - Program participation over the last five years

	<b>RCS The Business of Grazing</b>	<b>RCS Graduate Link</b>	<b>Forage budgeting on property support (FBA)</b>	<b>Project development visit (FBA)</b>	<b>Grazing BMP Modules</b>	<b>CQ Beef</b>	<b>Research 2 Reality</b>	<b>Other</b>	
<b>Property 1</b>	-	-	-	-	1	-	-	1	Part of cash cow project
<b>Property 2</b>	-	-	-	-	-	-	-	-	
<b>Property 3</b>	-	-	-	-	-	-	-	-	
<b>Property 4</b>	-	-	-	1	1	-	-	1	RCS Kit day, MLA Beefup forums, Bull buying seminar
<b>Property 5</b>	-	-	-	1	1	-	-	1	Breedplan workshops, Epigenetics project, B-smart futures, Herd master workshop

## Sources of Information

*Rural print media, the internet and other producers* were the most commonly accessed sources of information among graziers (Table 16 and 17). These were followed by *resellers/ rural supply agents, industry bodies, DAFF extension officers* and *NRM group officers*.

Table 16 - Preferred sources of information

	<b>DAFF Newsletters</b>	<b>Rural print media</b>	<b>Radio</b>	<b>Television</b>	<b>Internet</b>	<b>Resellers / rural supply agents</b>	<b>Industry bodies e.g. AgForce, AgForward</b>	<b>DAFF (previously DPI and DEEDI) extension officers</b>
<b>Property 1</b>	-	1	-	-	1	-	1	
<b>Property 2</b>	-	1	-	-	1	1		
<b>Property 3</b>	-	1	-	-	-	-		1
<b>Property 4</b>	-	1	-	-	1	1	1	
<b>Property 5</b>	1	1	-	-	1	-		1

Table 17 - Preferred sources of information

	<b>NRM group officers (e.g. enter in relevant NRM group)</b>	<b>DNRM Officers</b>	<b>Private consultants</b>	<b>Other producers</b>	<b>Banks</b>	<b>Accountants</b>	<b>Solicitors</b>	<b>Other</b>
<b>Property 1</b>	1	-	-	-	1	-	-	-
<b>Property 2</b>	-	-	-	1	-	-	-	-
<b>Property 3</b>	-	-	1	1	-	-	-	-
<b>Property 4</b>	1	-	-	-	-	-	-	-
<b>Property 5</b>	-	-	-	1	-	-	-	-

## Part 2 - CQ BEEF Producers

Properties for round two were chosen based on their involvement with CQ BEEF, regardless of their cover levels (Table 18). The table below indicates the percentage ground cover for each property since 1991 and over the last five and ten years.

Table 18 - Ground cover metrics for graziers from CQ BEEF

<b>Property</b>	<b>Cover from 1991 (%)</b>	<b>Cover over previous 5 years (%)</b>	<b>Cover over previous 10 years (%)</b>
<b>Property 6</b>	85	91	88
<b>Property 7</b>	80	86	82
<b>Property 8</b>	83	87	85
<b>Property 9</b>	83	84	84
<b>Property 10</b>	83	87	83

## Demographics

Survey results indicated that graziers came from various generations (Table 19). The average industry experience for graziers from Generation X, Baby Boomers and the Greatest Generation were all quite high with the average being approximately 50 years. The industry experience for partners was above 40 years for properties 8, 9 and 10, and 25 years for property 7. Graziers from Property 6 were from the youngest generation and therefore had the least amount of industry experience and did not have a partner in the industry.

Table 19 - Grazer demographic survey results for generation and industry experience.

<b>Surveyed Properties</b>	<b>Generation</b>	<b>Industry Experience</b>	<b>Industry Experience (Partner)</b>
<b>Property 6</b>	1980 – 1994 (Generation Y)	25	0
<b>Property 7</b>	1965 – 1979 (Generation X)	45	25
<b>Property 8</b>	1946 – 1964 (Baby Boomers)	53	48
<b>Property 9</b>	1930 – 1945 (Greatest Generation)	47	44
<b>Property 10</b>	1965 – 1979 (Generation X)	53	40

Three out of the five graziers indicated they expected their children to continue on in the family business. Three graziers indicated currently having a number of dependent children (Table 20). All graziers intended to undertake succession planning with four out of five graziers indicating they had partially or more than partially planned for business succession.

Table 20 - Extent of Grazer succession planning and number of dependent children.

<b>Surveyed Properties</b>	<b>Number of dependents</b>	<b>Succession Planning</b>	<b>Extent of Succession Planning (1 – not at all to 5 – completely)</b>
<b>Property 6</b>	1	Yes	3
<b>Property 7</b>	2	Yes	1
<b>Property 8</b>	3	Yes	3
<b>Property 9</b>	0	Yes	4
<b>Property 10</b>	0	Yes	4

All surveyed graziers had achieved differing levels of education ranging from completion of Grade 10 through to a university qualification. The majority of graziers and their partners achieved a Grade 10 certificate, while graziers from Properties 6 and 9 obtained university qualifications.



## Grazing Management

### Hillslope

All graziers scored high, with three out of five graziers were ranked as having (A) (cutting-edge) management practice rating while Properties 6 and 9 were ranked as having 'B' (best) practice management (Table 21). Four out of five graziers indicated that they accounted for the different size and age of cattle when assessing stocking rates through recording; '*Numbers in each paddock recorded every time there is a change in numbers within a paddock. Use AE or LSU to account for different animal class and size/age*', which is an 'A' level industry practice. All graziers scored reasonably high for '*how do you assess land condition?*' with all five indicating 'A' level management.

Table 21 - Hillslope management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
Property 6	68	B
Property 7	81	A
Property 8	94	A
Property 9	71	B
Property 10	82	A

### Streambank

Survey results indicate varied results with two properties being ranked as having 'A' management practices, one with 'C' management and two 'N/A' (Table 22). The properties who scored 'N/A' had '*No significant areas of river and creek frontage or wetlands*' and therefore could not score a 'D' as that would have skewed the results.

Table 22 - Streambank management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
Property 6	33	C
Property 7	N/A	N/A
Property 8	100	A
Property 9	N/A	N/A
Property 10	100	A

### Gully

Graziers scored varied results for this section with Properties 7 and 8 indicating 'A' level management, Property 6 'B' level and Properties 9 and 10 'C' level management (Table 23). For gully management, graziers were asked '*How do you recover degraded areas of land (scalding, collapsed banks, gully erosion)?*' Three out of the five responses to this question were high with three 'A' responses. Two graziers did respond to this question with 'D' level management responses indicating poor management of degraded land. Graziers were also asked '*How are fences located to minimize erosion risk?*' Two out of five graziers indicated their current management practice was '*Fences follow contour or ridge lines where possible in steep country, whoa-boys are used on fence lines where required*', an 'A' level practice indicating good management of gully or riparian areas to minimize the risk of erosion and loss of sediments, while the rest indicated 'D' level management of their gully and riparian areas.

Table 23 - Gully management practice ratings and scores for surveyed properties

<b>Surveyed Properties</b>	<b>Overall Management Practice Score</b>	<b>Overall Management Practice Rating</b>
<b>Property 6</b>	75	B
<b>Property 7</b>	85	A
<b>Property 8</b>	89	A
<b>Property 9</b>	52	C
<b>Property 10</b>	47	C

## Business

Three out of the five graziers indicated they had current ownership of their enterprise, and all were owner/managers. Properties 6 and 9 indicated they had split ownership of their enterprise as they were still part of the family business and therefore did not have total ownership. Graziers from Property 6, although did not have total ownership, were the fulltime managers of the enterprise. Graziers from Property 9 were semi-retired and although still had part ownership of the business they were no longer the full time managers. All graziers surveyed had off-farm investment, with one having an external business. Cattle were the major source of income for three out of the five graziers. The two graziers that specified that cattle was not the major source of their income relied on their off-farm investments, mainly shares, and both were semi-retired.

All graziers had undertaken a Profit Probe as a result of their involvement with CQ Beef. As a result three out of the five graziers (Properties 6, 7 and 8) knew their current overall business return on asset as well as their fixed cost ratios, gross margins, finance ratio and turnover ratio (Table 24). Property 6 updated their business indicators every three years, Property 7 updated theirs every two years and Property 8 updated their indicators on an annual basis. Properties 9 and 10 mentioned that due to their move into semi-retirement and passing on the business to their children they no longer felt they needed to review their business indicators but that if they were still running the business full time they would update these figures at least bi-annually. All graziers agreed that their involvement in CQ beef and the resulting profit probe had provided them with the tools and skills to undertake a business analysis and more importantly, how to record the data required to do so. The three graziers that did know their business indicators noted they were aiming to improve their fixed cost ratios (Property 6), finance ratio (Property 7) gross margins (Properties 7 and 8), and turn-over ratio (Property 8).

Table 24 - Business performance indicators

<b>Surveyed Properties</b>	<b>Do you know your overall business return on asset?</b>	<b>Fixed Cost Ratio</b>	<b>Gross Margin</b>	<b>Finance Ratio</b>	<b>Turnover Ratio</b>
<b>Property 6</b>	Yes	Yes	Yes	Yes	Yes
<b>Property 7</b>	Yes	Yes	Yes	Yes	Yes
<b>Property 8</b>	Yes	Yes	Yes	Yes	Yes
<b>Property 9</b>	No	No	No	No	No
<b>Property 10</b>	No	No	No	No	No

## Risk & Uncertainty

All graziers except those from Property 9 indicated a high level of willingness to take risk for all parameters (Figure 15). All graziers were more inclined to take a risk involving maintenance of the appropriate level of pasture utilization through adequate herd management. Similarly, all graziers were more inclined to risk the introduction of new practices into their operation regardless of the outcome. All graziers except those from Property 9 were willing to use credit to maintain or build production and purchase infrastructure technologies. Only two out of the five graziers (Properties 6 and 8) indicated they were willing to take risks in general which is in contrast to how risky graziers from Properties 7 and 10 rated themselves for the other parameters.

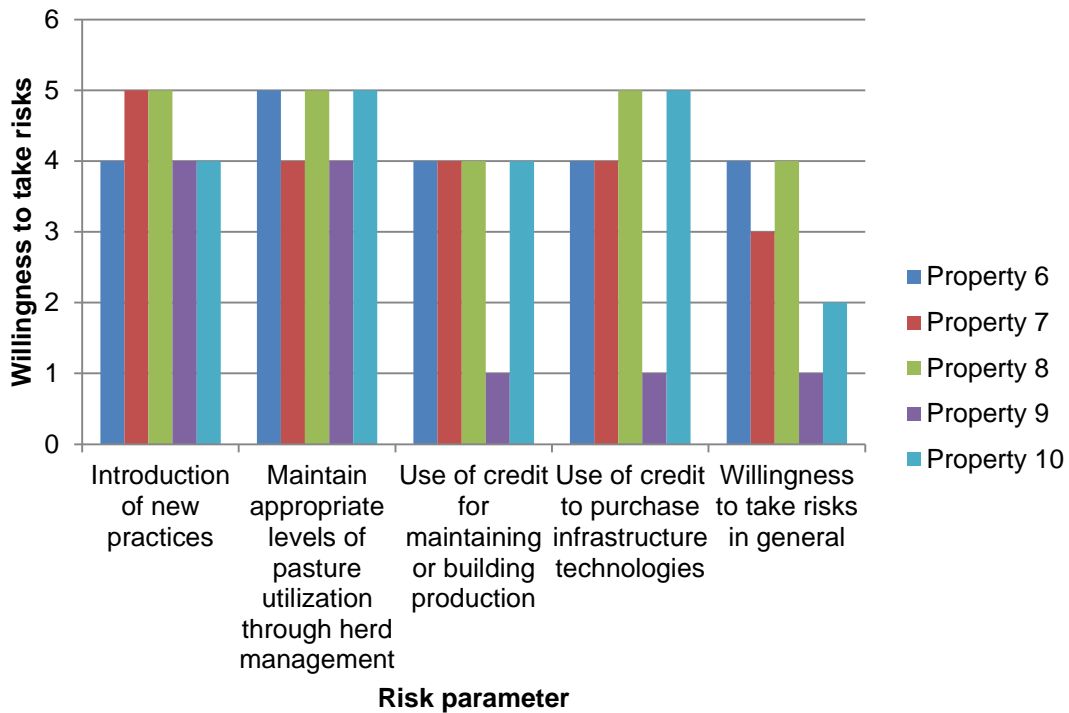


Figure 15 - Graziers willingness to take risks (1 unwilling – 5 extremely willing)

Annual rainfall and pasture growth levels were the highest scored sources of risk relevant to decision making among all surveyed properties (Figure 16 and 17). Climate in the longer term, market access for products, input price volatility, environmental regulations and interest rates/debt repayments also scored highly among graziers. Extreme weather events and market prices for beef were seen to be the lowest source of risk where business decision making was concerned.

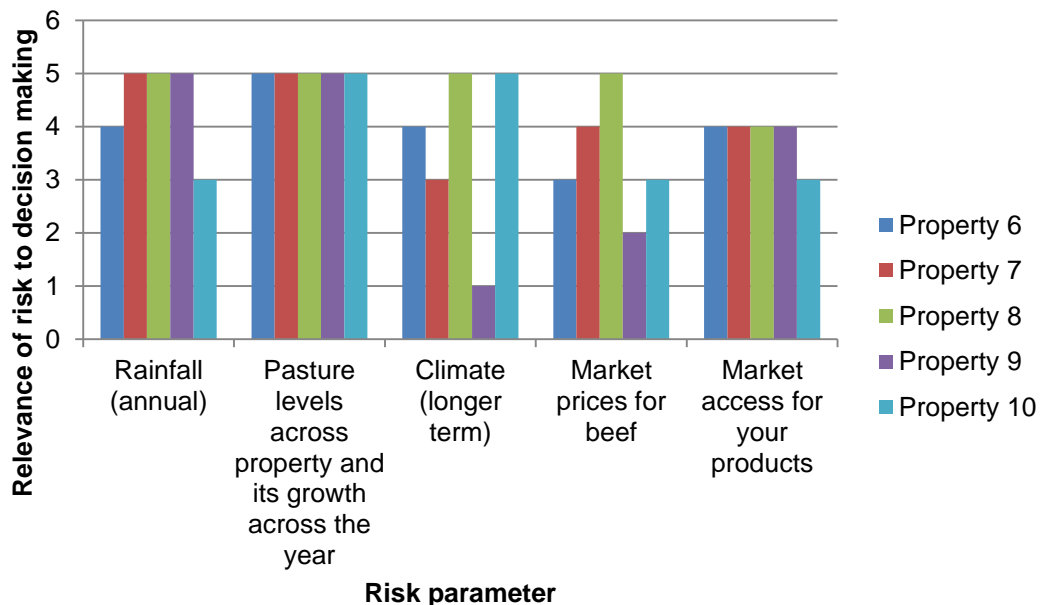


Figure 16 - Sources of risk and how relevant they are in the decision making process to graziers (1 not relevant – 5 extremely relevant)

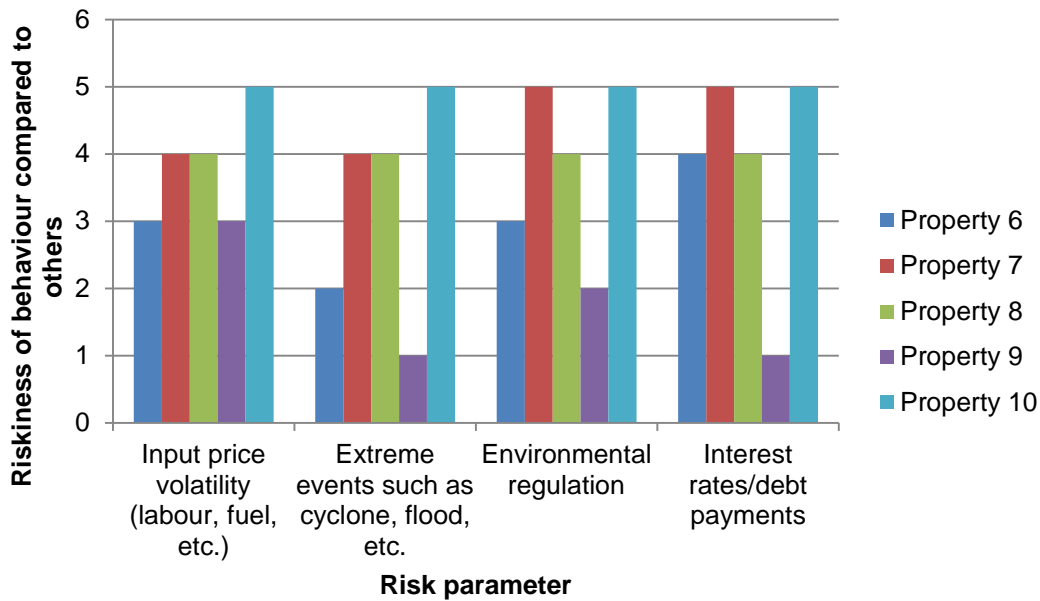


Figure 17 - Sources of risk and how relevant they are in the decision making process to graziers (1 not relevant – 5 extremely relevant)

Both Properties 6 and 8 ranked themselves as being much riskier relative to other graziers in the region (Figure 18). Properties 7, 9 and 10 were the least risky in terms of their behavior compared to other graziers. Property 9 again proved to take fewer risks overall compared to other graziers. Both Properties 6 and 8 again ranked themselves as having more risky behavior overall compared to other graziers while Properties 7, 9 and 10 ranked themselves as low risk takers overall compared to other graziers.

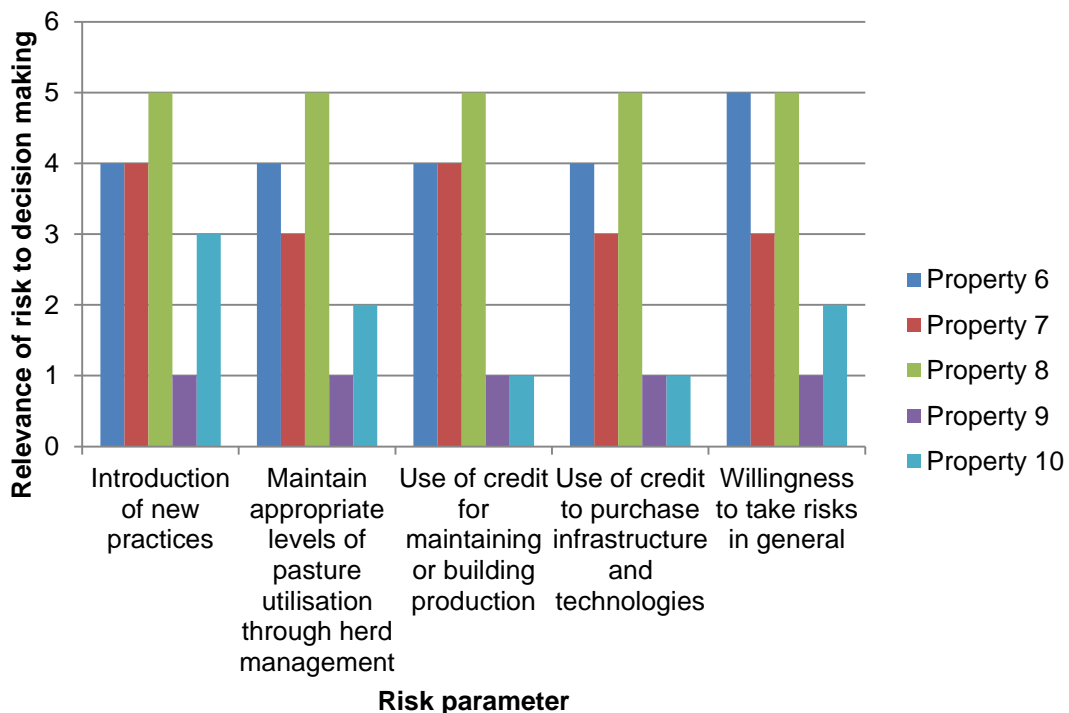


Figure 18 - How graziers ranked their behavior in terms of riskiness relative to other graziers (1 much less risky - 5 much riskier)



## Your Motivations

All graziers ranked *maximize ground cover at the end of the dry season, keep good financial records, minimize costs, and change stocking rates annually to reflect expected conditions* as extremely relevant management criteria (Table 25). Similarly four out of five graziers indicated that *maximizing the current year beef production and stock at a level which minimizes the need to use fodder* were important management criteria.

Graziers consistently rated *high cost for capital investments, cash flow, family commitments and concern over meeting financial commitments* to be highly important factors that influenced their management decisions (Table 26 and 27). The lowest consistently rated influencing factors for all graziers were *peer pressure to manage in a 'conventional manner', difficult to identify appropriate stocking rates, concern over uncertainty of leasehold tenure and business management decisions are difficult to make*. It was also evident that both graziers from Properties 7 and 8 consistently rated most factors as having a high level of influence on their management decisions, compared to other graziers 5 who considered most factors as having a low level of influence on their management decisions.

All graziers consistently ranked *timely access to information sources to make decision, and cash flow* as being extremely important to their enterprise (Table 28). The majority of graziers also ranked *skills, training and capacity building and access to peer and technical support* as moderately relevant to their enterprise.



Table 25 - Relevance of management criteria to grazing business (1 not relevant – 5 extremely relevant)

	<i>Maximize the current year production of beef</i>	<i>Minimize the likelihood of making a loss</i>	<i>Maximize profit</i>	<i>Maximize ground cover at the end of the dry season</i>	<i>Do 'well enough' in the business to stay on the land</i>	<i>Maintain herd levels</i>	<i>Keep good financial records</i>	<i>Minimize costs</i>	<i>Maintain or build up the natural resources on the property</i>	<i>Maximize leisure time</i>	<i>Change stocking rates annually to reflect expected conditions</i>	<i>Stock at a level which minimizes the need to use fodder</i>
Property 6	4	2	3	4	4	3	5	4	5	2	4	2
Property 7	5	5	5	5	1	2	5	5	3	3	5	5
Property 8	5	5	5	5	5	5	5	5	5	5	5	5
Property 9	1	1	1	5	3	2	5	4	5	2	4	5
Property 10	5	5	5	5	5	5	5	5	4	3	5	5

Table 26 - Factors that influence management decisions (1 not important – 5 extremely important)

	<i>High costs for capital investments (e.g. fencing)</i>	<i>Peer pressure to manage in a 'conventional' manner</i>	<i>Cash flow</i>	<i>Family commitments</i>	<i>Concern over meeting financial commitments (e.g. loans)</i>	<i>Concern over meeting environmental goals</i>	<i>Uncertainty over selling markets</i>
Property 6	4	1	5	5	5	2	2
Property 7	4	1	4	5	5	5	4
Property 8	5	1	5	5	5	4	4
Property 9	5	2	5	4	3	3	2
Property 10	2	1	4	3	3	2	4



Table 27 - Factors that influence management decisions (1 not important – 5 extremely important)

	<i>Uncertainty over climate in the near term</i>	<i>Uncertainty over climate in the long term</i>	<i>Difficult to identify appropriate stocking rates</i>	<i>A lack of information about grazing for sustainable resource/pastures</i>	<i>Vegetation management restrictions</i>	<i>Concern over uncertainty over leasehold tenure</i>	<i>Business management decisions are difficult to make (i.e. more than one owner)</i>
<b>Property 6</b>	2	2	1	1	3	2	1
<b>Property 7</b>	3	5	3	1	5	1	1
<b>Property 8</b>	5	5	1	5	2	2	2
<b>Property 9</b>	2	1	1	5	2	1	3
<b>Property 10</b>	3	3	1	2	5	1	1

Table 28 - Importance of aspects relevant to grazing enterprise (1 not important – 5 extremely important)

	<i>Timely access to information sources to make decisions</i>	<i>Skills and training, capacity building</i>	<i>Clear vision for the property</i>	<i>Access to peer and technical support</i>	<i>Cash flow</i>
<b>Property 6</b>	5	4	3	3	5
<b>Property 7</b>	5	5	5	5	5
<b>Property 8</b>	3	2	5	1	4
<b>Property 9</b>	5	4	4	4	4
<b>Property 10</b>	5	4	4	5	5



## Skills, Extension and Education

Based on survey results the top three most important skills as indicated by graziers were *budgeting*, *stock management skills* and *on-farm skills* (Figure 19). All graziers also saw *recording keeping* as an important skill as well.

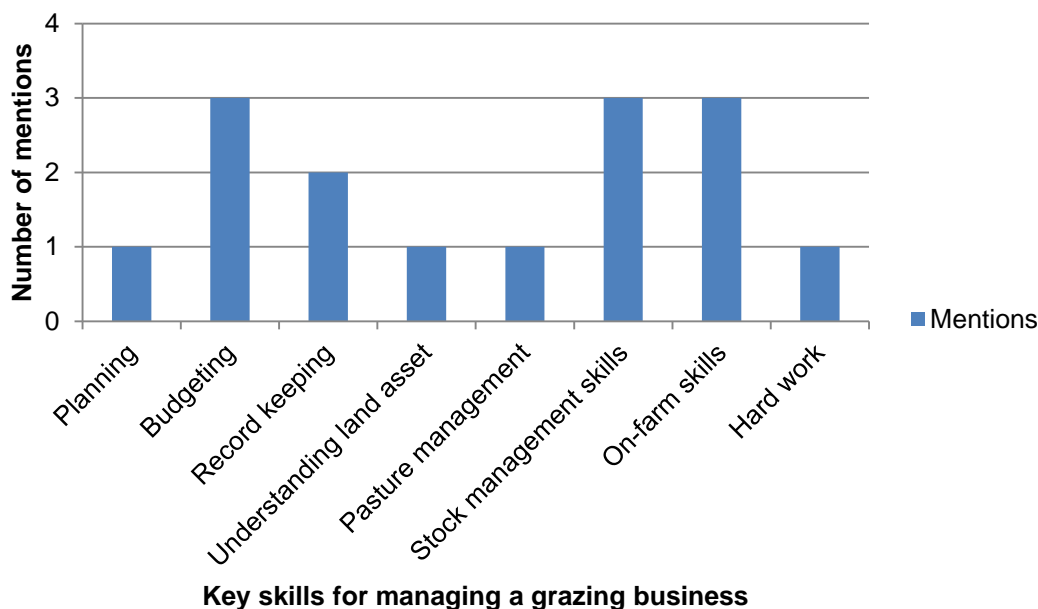


Figure 19 - Key skills for business management

## Public Extension Support

*Education, life experience, DAF extension, grazing land management EDGE and private courses and workshops* were the most commonly referred to instances of where graziers had obtained their skills from (Figure 20). Other instances of skill development mentioned included *previous employment, nutrition EDGE, peers and mentors, Strategic rural management, resource consulting services and MLA courses*.

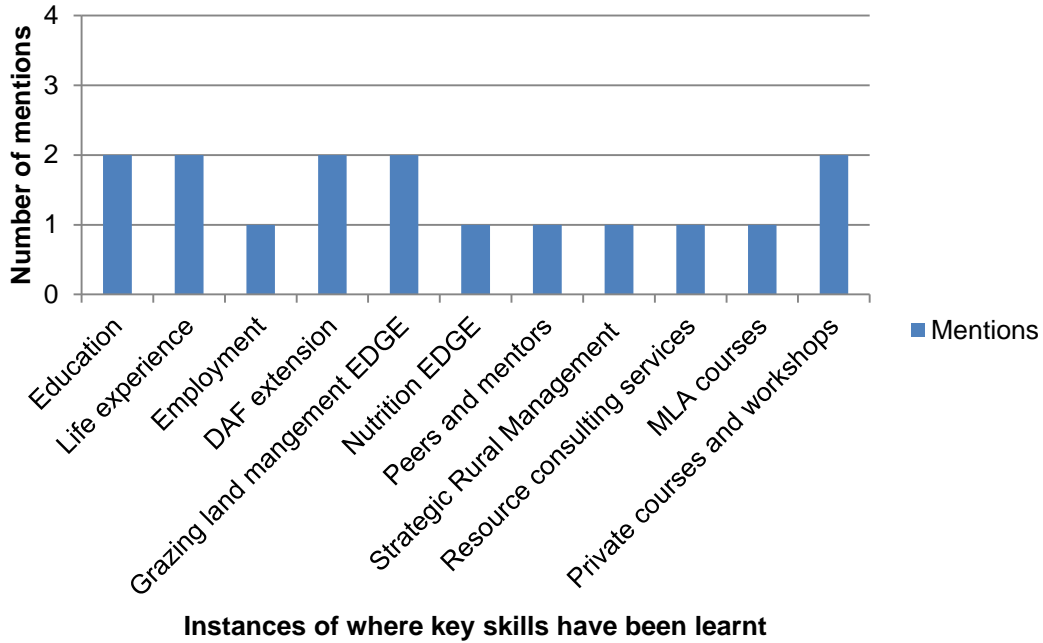


Figure 20 - Instances of where skill development has occurred

The level of skill for *off-farm investment management* was lower than the other management areas (Figure 21). Properties 6, 8, 9 and 10 rated themselves as having a higher level of skill across most areas compared to Property 7.

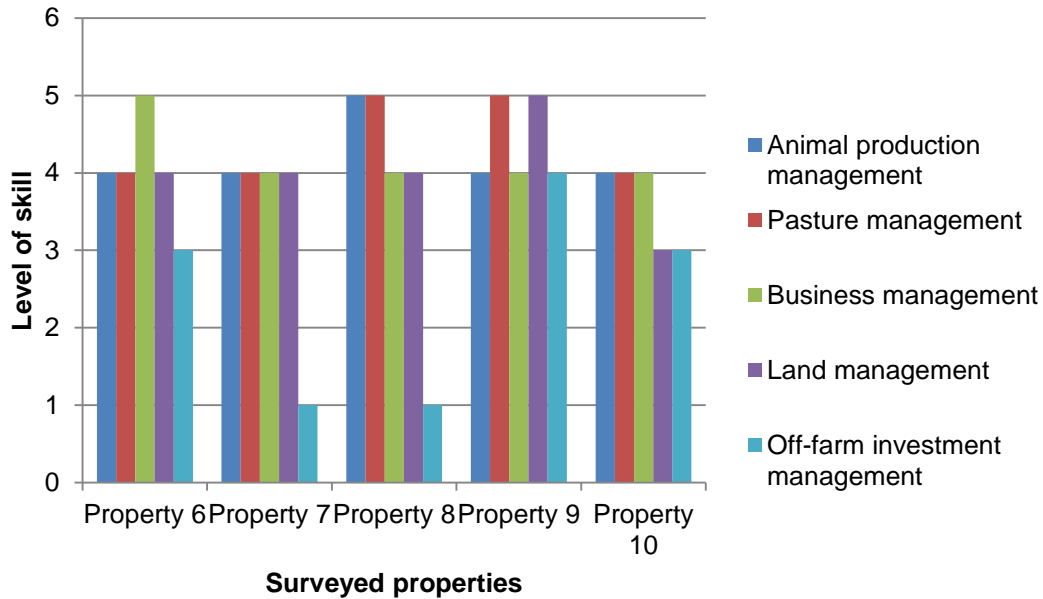


Figure 21 - Level of skill across different management areas (1 being poor – 5 being excellent)

Out of the five graziers surveyed all had received extension support from the Department of Agriculture and Fisheries (DAF) in the form of workshops/group settings and one-on-ones interactions. All graziers surveyed in this round were part of the CQ BEEF extension program. Graziers received support mainly in the areas of *animal production management*, *pasture management* and *land management* (Figure 22). Both extension support settings were preferred by graziers with two indicating they preferred both workshops/ group settings and one-on-one while two graziers only preferred workshops and one grazier only preferred one-on-one. All graziers that had received extension support from DAF rated their involvement as a very positive experience.

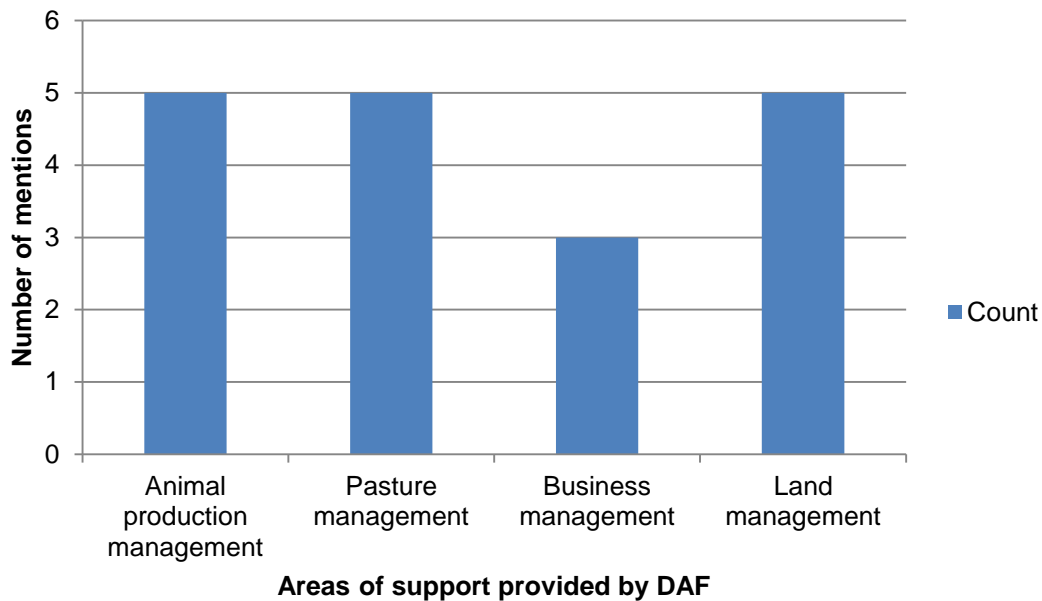


Figure 22 - Areas where graziers received support from DAFF

## Private Extension Support

Four out of the five surveyed graziers had received extension support from private providers. The main providers mentioned were Resource Consulting Services (RCS), AgForce and Grazing Best Prac. Others mentioned included Fitzroy Basin Association (FBA), veterinarians and Strategic Rural Management (Table 29). Graziers also rated their experience with the involvement of each private provider. Graziers involved with FBA indicated that their involvement was a highly positive one, while graziers from Properties 7, 9 and 10 indicated a negative experience with their involvement with AgForce.


Table 29 - Involvement experience with different private extension providers

	<i>Fitzroy Basin Association (FBA)</i>	<i>AgForce</i>	<i>Other</i>	
<b>Property 6</b>	5	5	3	Grazing Best Prac, Vets
<b>Property 7</b>	5	3	3	Strategic Rural Management
<b>Property 8</b>	3	4	3	RCS, Strategic Rural Management, Grazing Best Prac
<b>Property 9</b>	4	1		
<b>Property 10</b>	4	1	3	RCS

Only two graziers indicated that they had received funding support from FBA. One grazer received funding to cover the cost of attending a course while the other received a funding grant for land type fencing, riparian fencing, implementation of off-stream watering points and a voluntary land management agreement. Funding grants were available to graziers for land type and riparian fencing, watering points and voluntary land management agreements.

## Past Extension Involvement

The most commonly participated in workshops among graziers was CQ Beef and mapping workshops (AgForce) (Table 30 and 31). Pasture rundown field days and forage budgeting on property support (FBA) were also commonly participated in workshops. Graziers from Property 10 noted they had been involved in 'Other' extension programs in the form of leucaena and woody weed field days.



Of those graziers who indicated they had been involved in extension activities over the past five years, the most effective workshops in terms of gaining knowledge, skills and/or improving their business management was CQ Beef. Graziers from Properties 7 and 10 indicated they had not participated in any extension activities in the past five years but did note that they had done several courses in the past. Of the graziers that did participate in extension activities indicated that by attending the activity it had significantly improved their confidence in their decision making for the grazing business and four out of the five graziers has done follow-up research as a result.



Table 30 - Program participation over the last five years

	<b>Stocktake Workshop</b>	<b>Grazing Land Management EDGE</b>	<b>Breeding EDGE</b>	<b>Business EDGE</b>	<b>Nutrition EDGE</b>	<b>Mapping Workshop (AgForce)</b>	<b>Mapping Workshop (Grazing Best Prac)</b>	<b>Soil Pit Day (FBA)</b>	<b>Pasture rundown field days</b>	<b>RCS Grazing Clinic</b>	<b>RCS Grazing for Profit</b>
<b>Property 6</b>	-	-	1	-	-	1	-	-	1	-	-
<b>Property 7</b>	-	-	-	-	-	-	-	-	-	-	-
<b>Property 8</b>	-	-	-	-	-	1	-	-	-	-	-
<b>Property 9</b>	-	1	-	-	1	1	-	-	1	-	-
<b>Property 10</b>	-	-	-	-	-	-	-	-	-	-	-

Table 31 - Program participation over the last five years

	<b>RCS The Business of Grazing</b>	<b>RCS Graduate Link</b>	<b>Forage budgeting on property support (FBA)</b>	<b>Project development visit (FBA)</b>	<b>Grazing BMP Modules</b>	<b>CQ Beef</b>	<b>Research 2 Reality</b>	<b>Other</b>	
<b>Property 6</b>	-	-	1	-	-	1	-	-	-
<b>Property 7</b>	-	-	-	-	-	1	-	-	-
<b>Property 8</b>	-	-	-	-	1	1	-	-	-
<b>Property 9</b>	-	-	1	-	-	1	-	-	-
<b>Property 10</b>	-	-	-	-	-	1	-	1	Leucaena and woody weed field days

## Sources of information

It was evident that *radio*, *DAF* and *solicitors* were the most commonly accessed sources of information among graziers (Table 32 and 33). These were followed by *DAF newsletters*, *rural print media*, *other producers* and *accountants*.

Table 32 - Preferred sources of information

	<i>DAF Newsletters</i>	<i>Rural print media</i>	<i>Radio</i>	<i>Television</i>	<i>Internet</i>	<i>Resellers / rural supply agents</i>	<i>Industry bodies e.g. AgForce, AgForward</i>	<i>DAF (previously DAFF, DPI and DEEDI) extension officers</i>
<b>Property 6</b>	1	1	-	-	1	-	-	-
<b>Property 7</b>	1	1	-	-	1	-	-	1
<b>Property 8</b>	-	-	1	-	1	1	1	-
<b>Property 9</b>	-	-	1	-	-	-	-	1
<b>Property 10</b>	-	-	1	-	1	-	-	1

Table 33 - Preferred sources of information

	<i>NRM group officers (e.g. enter in relevant NRM group)</i>	<i>DNRM Officers</i>	<i>Private consultants</i>	<i>Other producers</i>	<i>Banks</i>	<i>Accountants</i>	<i>Solicitors</i>	<i>Other</i>
<b>Property 6</b>	-	-	-	1	-	-	1	-
<b>Property 7</b>	-	-	1	-	-	-	-	-
<b>Property 8</b>	-	-	-	-	-	-	1	-
<b>Property 9</b>	1	-	-	1	-	1	-	-
<b>Property 10</b>	-	-	-	-	-	1	1	-

## Discussion

This case study aimed to understand firstly, what are the management practices of graziers with high levels of ground cover. Secondly, what are their motivations to do so? Thirdly, what is their level of skill and finally how much access have they had to past extension programs. By understanding how these areas link, it will provide insights into how we can improve current extension methods and adoption approaches to increase the uptake of sustainable grazing practices. This study contributes in four main ways, firstly, understanding the alignment of management practices to ground cover. Secondly, understanding how the motivations and goals of graziers influence the adoption of management practices. Thirdly, how past and current extension experiences influence the skill development of graziers, and lastly, understanding of the importance of succession planning in relation to grazing land management practices.


The most significant finding to come out of this research is the misalignment between remote sensed ground cover and the management practice rating for each property. This incongruence is particularly evident for those graziers from group one who had high levels of ground cover but scored poorly for their hillslope, streambank and gully management. Similarly, graziers from group two had lower ground cover than the first group but scored highly for their management. The low cover levels and high management sophistication of group two could be attributed to this group being more aware and profit focused as a result of their involvement with CQ BEEF. However, the motivations and goals of graziers from group two suggest they are primarily driven by conservation and lifestyle goals, contradicting the reason for their low levels of cover. Similarly the high cover levels and low management sophistication of graziers from group one would suggest they are primarily motivated by conservation and lifestyle goals. However, the results from this report suggest that group one graziers are primarily motivated by economic and financial goals. These results highlight the gap in the current knowledge and literature base surrounding the linkages between ground cover management practices, what drives the adoption of these practices amongst graziers and what effect have past extension programs, such as CQ BEEF had on the long term performance of the grazing business.

Results from this case study further demonstrate the lack of knowledge and understanding regarding the motivations and goals of graziers. The study also demonstrated the limited knowledge regarding how these factors influence ground cover. The differences in motivations between the two groups is potentially attributed to the involvement of group two in the CQ BEEF program, however both groups had strong motivations towards succession planning. These results indicate that succession planning may be linked with increased adoption of sustainable practices and ground cover but more research is needed to quantify this link.

Findings from this case study further validate the importance of both grazing management and business skills in a grazing enterprise. Overall group two graziers indicated a greater level of skill development across all areas and identified CQ BEEF as a significant contributor to the development and progression of these skills. All graziers noted that while the mapping workshops run by AgForce were the most beneficial in terms of skill development. Graziers from both groups used and accessed a variety of information sources. The most commonly used information sources across both groups were the internet, DAF extension officers, other producers and rural print media. Due to the high incidence of positive benefits resulting from grazer involvement with CQ BEEF, this presents a viable model for the development of programs to improve the overall skill level of graziers to encourage adoption of sustainable grazing practices.

Although this research found some interesting results the caveats must be noted. The sample size of 10 is too small for appropriate statistical analysis but sufficient to justify an initial exploratory investigation. Ideally a number of 30 or more would provide more robust statistical insights. Sample selection and hence collection of data was biased towards those graziers with high levels of ground cover and those that were a part of a significant extension program. Results were also collected during and after a successful wet season with high rainfall totals across the majority of the Fitzroy basin catchment and at a time when cattle prices are significantly high. These may have a 'warm glow' bias effect on the overall results and should be noted. It should also be noted that graziers from group one were interviewed knowing they had the best cover in the catchment and this may be reflected through biased management practice results. Should there be the potential for future studies to be undertaken, a much larger sample size would allow for appropriate statistical analysis as this





would increase the confidence of findings from this report. Other limitations to this research include the lack of defined benchmarks for skills, risks or business record keeping. This would provide a more reliable process to allow statistical comparison of graziers based on defined benchmarks.

Further research would be beneficial to obtain statistically relevant data to assist with the development of extension programs and tools targeted at developing grazer's knowledge and skills. These programs should target appropriate management practices to maintain and increase ground cover such as sustainable stocking rates and how to manage land in declining condition. Further research would also be beneficial to understand the long term effects of a significant extension program like CQ BEEF on grazing land management practices and ground cover of those graziers involved. This case study provided an insight but more research is required.

Future research into the disparity between remote sensed ground cover, rainfall biased and how management practice sophistication is measured is a high priority for future research. This will enable a further understanding of the linkages between ground cover management practices, what drives the adoption of these practices amongst graziers and what tools should be used to measure this accurately. Finally, further research is required to identify the motivations of the CQ BEEF participants in relation to the uptake of conservation practices and ground cover outcomes.



## Conclusion

The results from this case study reinforce the need for further research to clearly articulate and explore the significant relationships between ground cover and management practices. The motivations and skills of graziers although had some similar characteristics only highlights the complexity and lack of knowledge regarding the motivations and goals of graziers and how these influence adoption. This case study also highlighted the high level of skill development attributed to CQ BEEF as well as the lack of information regarding the benefits associated with the CQ BEEF program. The case study however does set a framework for how this could be done and the parameters that are of interest to be further explored.



## Appendix

### Appendix A: Case Study Survey

#### **Survey of graziers motivations and decision making in the Fitzroy catchment**

This survey is being undertaken by the Queensland Department of Agriculture, Fisheries and Forestry. It is supported by funding from the Queensland Government and Australian Government Reef Rescue program.

The aim of this research is to consider the linkages between understanding what motivates graziers to manage for optimum ground cover and which past extension programs have been effective at increasing the skills of graziers to do so while also taking into consideration the grazier's business position. This information will be used to identify previously effective extension mechanisms and to tailor future extension programs.

All data from this research will be completely confidential. All publicly available results will be reported in a summary manner to ensure no individual enterprises or persons can be identified. No contact details or other identifying details will be released as a result of this research.

By participating in this research you agree to the use of the generated data in research. All data will be unidentified ensuring your participation is anonymous.

The information gathered in this survey will allow better insights into:

- What motivates graziers to manage for optimum ground cover
- Constraints in decision making for graziers
- How participation in past extension programs influences the skills and management technique of the grazier
- How key industry shareholders can better address the aims of creating a financially healthy grazing industry whilst improving environmental performance in terms of ground cover.

The survey should take about 1 hour to complete.

To verify your agreement for participation in this survey please provide your signature

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(Signature of participant)

## Section 1: About You

In this section we will ask you some questions about your personal circumstances. This type of information is important to consider the relevance of information on choices over management/risk.

We again assure you that all information is completely anonymous and confidential and that you or your property will not be able to be identified in results published from this research.

**Q1. When were you born?** (please circle)

- a. 1930 – 1945 (Greatest generation)
- b. 1946 – 1964 (Baby boomers)
- c. 1965 – 1979 (Generation X)
- d. 1980 – 1994 (Generation Y)

**Q2. How many years' experience do you have in the beef industry?**

You: \_\_\_\_\_ years      Your partner: \_\_\_\_\_ years

**Q3. How many children (dependent) do you have?** \_\_\_\_\_

**Q4. If you have children, do you expect any of them to continue on with your farm business?** (please circle)

Yes                      No                      N/A

**Q5. To what extent have you planned for business succession?** (Please circle one number)

Not at all                      =>                      Partially                      =>                      Completely  
1                                      2                                      3                                      4                                      5

**Q6. Currently are any of your children working in the business?**

- a. Yes
- b. No

**Q7. What education do you/your partner have?** (Please circle, multiple responses accepted)

- a. Grade 10 certificate
- b. Grade 12 certificate
- c. Diploma or Trade
- d. Undergraduate tertiary degree
- e. Post-graduate tertiary degree
- f. Other \_\_\_\_\_

## Section 2: Your Farm

In this section we will ask you some general questions about your enterprise

**Q8. What kind of enterprise do you have?** (Select one ONLY)

- a. Stud breeding/ seedstock
- b. Breeding and selling store cattle
- c. Breed and finish mainly slaughter cattle
- d. Growing/finishing transferred /purchased store cattle

**Q9. What is the total land area of your enterprise?**

\_\_\_\_\_ Hectares or \_\_\_\_\_ Acres

**Q10. Is this property operating in conjunction with other properties?**

- a. Yes
- b. No

*NB: the remainder of this survey focuses on this specifically selected property*

Q11. What percentage of this is used for grazing?

\_\_\_\_\_ %

Q12. How many cattle are normally run?

\_\_\_\_\_ head

Q13. What is your average annual rainfall?

\_\_\_\_\_ mm

Q14. What are the 3 main land types on your property and what do you think the safe long term stocking rates are for each land types

Landtype	Safe long term stocking rate

Q15. What best describes the management of your different landtypes?

- a. No landtypes are managed separately
- b. Some of the different landtypes are managed separately
- c. Most of the different landtypes are managed separately
- d. Not applicable

Q16. What control do you have of grazing on river and creek frontages and wetlands?

- a. Generally no fencing or off-stream waters and don't manage frontages separately
- b. Limited fencing, limited off-stream watering and sometimes spell frontages
- c. Fenced frontage country and mostly have off-stream watering points. Ensure frontages are stocked moderately and occasionally wet season spell
- d. Fenced as much as practically possible/cost effective, use off-stream water points throughout, use moderate stocking rates and wet season spelling, use fire and chemicals for weed control
- e. No significant areas of river and creek frontage or wetlands

Q17. What paddock records do you keep to manage grazing?

- a. Paddock areas
- b. Stock numbers by paddock
- c. Pasture yields
- d. Photo points
- e. Break of season ground cover
- f. Other

Q18. How do you account for different age and size of cattle when assessing stocking rate?)

- a. Numbers recorded annually. Effects of animal class and size/age accounted for by rough estimation or not at all
- b. Numbers in each paddock recorded annually. Use common sense and rules of thumb to account for effects of animal class and size/age.
- c. Numbers in each paddock recorded at each muster. Account for different animal class and size/age.
- d. Numbers in each paddock recorded every time there is a change in numbers within a paddock. Use AE or LSU to account for different animal class and size/age

Q19. How do you assess land condition?

- a. Pasture yield
- b. Density of perennial grass species (3P species)
- c. Soil condition
- d. Presence of weeds
- e. Shrub and tree encroachment
- f. ABCD land condition

- g. Break of season ground cover
- h. Don't assess land condition
- i. Photo monitoring sites at end of growing season

**Q20. For long term planning what do you base your average carrying capacity on?**

- a. Historical experience and/or anecdotal advice not documented
- b. Long term stock and stocking rate records documented in diaries, paddock records etc.
- c. Objective measure of safe stocking rate calculations, including property map and based on historical data, subjective assessment of resource condition
- d. Documented records, including property map and safe stocking rate calculations based on land type, property infrastructure and objective assessments of land condition

**Q21. How do you manage stocking rates?**

- a. Rarely adjust stock numbers based on a whole of property assessment of feed supply and cattle numbers before dry season starts or after
- b. Broad assessment of whole property for pasture available and cattle numbers before dry season starts or soon after
- c. Use long term experience to look at stock numbers and pasture available in each paddock after the wet season. Cattle numbers adjusted to ensure adequate residual pasture and groundcover at break of season
- d. Routinely use forage budgets and paddock/stock records for each paddock and adjust cattle numbers to ensure adequate residual pasture and groundcover at break of season

**Q22. How do you manage for residual season ground cover?**

- a. Don't actively manage groundcover
- b. Observe amount of pasture and groundcover at the end of the dry season and try to keep enough residual pasture for stock
- c. Regularly monitor ground cover and manage grazing to keep it above 50% at break of season.
- d. Regularly observe groundcover, density of 3P grasses and land condition. Aim to maintain paddock and ground cover specific to region, rainfall and land type.
- e. Photo monitoring site at end of dry season.

**Q23. How do you manage selectively grazed land on your property?**

- a. No specific management for these areas
- b. Spell country if get the chance and may burn occasionally
- c. In the process of fencing these areas also use wet season spelling and use of fire and lick to even out grazing
- d. These areas are fenced and regenerate through wet season spelling. Use fire, lick and water points to even out grazing.
- e. Not applicable

**Q24. How do you use fire?**

- a. No planning.
- b. Use burning in a planned manner (reactive; force of nature).
- c. Fire management plan with clear objectives, consistent with grazing plan (eg. manage grazing to ensure adequate fuel load and use post-fire spelling. Burn after first storms and consider seasonal forecasts)
- d. Do not use fire as a management tool
- e. Not applicable

**Q25. How are tracks, waters and firebreaks located to minimise erosion risk?**

- a. Very few precautions taken
- b. Some whoa- boys used to minimise erosion risk or use invert, floodway, culvert or bridge when track crosses creeks
- c. Whoa-boys used to minimise erosion risk and use invert, floodway, culvert or bridge when track crosses creeks
- d. Locate on contour where possible, whoa-boys used including table drains where required and use invert, floodway, culvert or bridge when track crosses creeks

**Q26. How are fences located to minimise erosion risk?**



- a. Whoa-boys rarely used with fencelines on steep country and fencelines follow shortest route
- b. Fences follow contour or ridge lines where possible in steep country, whoa-boys are used on fencelines where required
- c. Not applicable

**Q27. How would you describe your wet season spelling?**

- a. No pasture/paddock spelling
- b. Minimal pasture/paddock spelling
- c. Pastures/paddocks spelled on a regular basis
- d. Annual pastures/paddock spelling determined by pasture monitoring

**Q28. How did you manage the last poor season? (will be different years for each region)**

- a. Lighten stocking rates by selling selected dry stock
- b. Reduced breeder numbers by culling less productive animals
- c. Reduced numbers across all classes of stock
- d. Use protein supplements eg. urea licks, blocks, liquid supplements
- e. Use energy/protein feeds eg. fortified molasses, protein meals, grain based rations
- f. Early wean
- g. Open up spelled paddocks
- h. Agist stock elsewhere
- i. Other \_\_\_\_\_

**Q29. With the value of hindsight, how would you manage that situation differently in the future to have a better outcome? Production, financial and personal outcomes.**

- a. Reduce stock numbers sooner
- b. Increased culling of breeders
- c. Greater reductions in numbers across all classes of stock
- d. Use protein supplements eg. urea licks, blocks, liquid supplements
- e. Use energy/protein feeds eg. fortified molasses, protein meals, grain based rations
- f. Earlier Weaning
- g. Open up spelled paddocks
- h. Agist stock elsewhere
- i. Wouldn't do anything differently
- j. Other \_\_\_\_\_

**Q30. Do you have any strategies to recover land in declining (C-class) condition?**

- a. Yes
- b. No
- c. Not applicable – no land in declining condition

**Q31. What grazing strategies do you employ to better maintain areas of land that are declining in condition?**

- a. I have set stocking
- b. Stocking rates are not adjusted and I occasionally use pasture spelling.
- c. I adjust stocking rates and frequently use pasture spelling.
- d. I adjust stocking rates, fence for stock control and frequently use pasture spelling.

**Q31a. Do you have any paddocks that have gullies?**

- a. Yes
- b. No

**Q31b. If so, what proportion of paddocks have gullies?**

- a. 0-25%
- b. 25-50%
- c. 50-75%
- d. 75-100%

Comment: \_\_\_\_\_

**Q31c. Are the gully heads actively eroding?**

- a. Yes
- b. No

- c. Not applicable

**Q31d. Which best describes how you manage these gullied areas?**

- a. Little or no change in management for gullied areas
- b. Some efforts made to distribute grazing pressure away from gullied areas
- c. Gullied areas are fenced to exclude stock and encourage revegetation. Grazing if any, managed to ensure low utilisation rate
- d. Range of measures including stock exclusion, mechanical reshaping of gully heads and sides, installation of porous check dams.

**Q32. How do you recover any other degraded areas of land (such as scalding, collapsed banks)?**

- a. No significant areas of severely degraded land
- b. Little or no change in management. Degraded land is treated as being area out of production.
- c. Assessment on how degraded area impacts on productivity of whole paddock. Paddock managed for grazing accordingly.
- d. Fence to control grazing, review management of whole paddock, including stocking rates. Wet season spelling may be incorporated to let grasses re-establish.
- e. Fence to control grazing, undertake mechanical measures eg ripping or other erosion control methods and sow grass seed and review management/stocking rates across the whole paddock.

### *Section 3: Your Business*

In this section we will ask you some questions about your business, and how you make decisions based on business indicators

**Q33. Do you have ownership of your property/enterprise?**

- a. Yes
- b. No (lease/rent/manage)
- c. Split (own/lease or share arrangement)

**Q34. What BEST describes your role in the business?**

- a. Owner (not manager)
- b. Owner/manager
- c. Manager
- d. Employee
- e. Other (please specify .....)

**Q35. If you are a tenant or manager, does the landlord have a significant role in property decision-making?**

- a. Yes
- b. No

- c. Partly
- d. NA

**Q36. Do you have any off property investments?**

- a. Investment properties.....
- b. Shares.....
- c. External business i.e. Contracting out equipment/services.....
- d. Wages.....

**Q37. What do you estimate this to be as a % of total income? \_\_\_\_\_ % of total income**

**Q38. Is cattle the major source of income?**

- Yes                  No                  NA

**Q39. Do you know your overall business return on asset?**

- Yes                  No                  NA

- |                     |     |    |    |
|---------------------|-----|----|----|
| a. Fixed cost ratio | Yes | No | NA |
| b. Gross margin     | Yes | No | NA |
| c. Finance ratio    | Yes | No | NA |
| d. Turn-over ratio  | Yes | No | NA |

**Q39a. If yes, how often do you update these ratios?**

**Q40. If you do use other indicators to measure business performance, what are these?**

**Q41. What are the key business indicators you are aiming to improve?**

- a. Fixed cost ratio.....
- b. Overheads ratio.....
- c. Gross margin ratio.....
- d. Finance ratio.....

## Section 4: Risk and uncertainty

The next two sections aim to capture some of the factors in decision making.

In this section we will ask you some questions about your preferences with regard to risk and uncertainty.

**Q42. How willing are you to take risks? Rate the following in terms of your willingness to take risks (1) and unwillingness to take risks (5).**

	Very unwilling	Somewhat unwilling	Indifferent	Somewhat willing	Extremely willing
	1	2	3	4	5
a. Introduction of new practices.....					<input type="text"/>
b. Maintain appropriate levels of pasture utilisation through herd management.....					<input type="text"/>
c. Use of credit for maintaining or building production.....					<input type="text"/>
d. Use of credit to purchase infrastructure and technologies.....					<input type="text"/>
e. Willingness to take risks in general.....					<input type="text"/>

**Q43. Please rank the following sources of risk AGAIN, but this time in terms of how much they play a part in the decision making for your business (i.e. how much you actually use information on them, whether it is your feelings or published information, to make your decisions):**

a. Rainfall (annual).....		<input type="text"/>
b. Pasture levels across property and its growth across the year.....		<input type="text"/>
c. Climate (longer term).....		<input type="text"/>
d. Market prices for beef.....		<input type="text"/>
e. Market access for your products.....		<input type="text"/>
f. Input price volatility (labour, fuel, etc).....		<input type="text"/>
g. Extreme events such as cyclone, flood, etc.....		<input type="text"/>
h. Environmental regulation.....		<input type="text"/>
i. Interest rates/debt payments.....		<input type="text"/>

**Q44. In your opinion, how risky is your behaviour relative to other graziers in the region? Rate the following in terms of how much riskier your behaviour is (1) and how less risky your behaviour is (5).**

	Much Less Risky	Somewhat Less risky	About Average	Somewhat riskier	Much riskier
	1	2	3	4	5
a. Introduction of new practices.....					<input type="text"/>
b. Maintain appropriate levels of pasture utilisation through herd management.....					<input type="text"/>
c. Use of credit for maintaining or building production.....					<input type="text"/>
d. Use of credit to purchase infrastructure and technologies.....					<input type="text"/>
e. Willingness to take risks in general.....					<input type="text"/>

## Section 5: Your motivations

In this section we will ask you some questions about your motivations and your approaches to grazing management.

This information will allow us to identify how you would ideally like to manage your grazing business and factors that constrain you from doing so.

When answering these questions you do not need to take a long time on each question – a few moments on each item is usually sufficient to identify an accurate response.

If you feel you have made a mistake, feel free to change your response by simply clearly marking your correct response and crossing out the incorrect one.

When filling out questions which require a rating, please make sure you utilise the whole scale available – this means try to use the lowest and highest numbers and as many of them in-between as possible.

### Q45. How relevant are the following management criteria to you? (Select top 5)

	Not at all relevant	Somewhat relevant	Moderately relevant	Quite relevant	Extremely relevant
	1	2	3	4	5
a. Maximise the current year production of beef.....					<input type="checkbox"/>
b. Minimise the likelihood of making a loss.....					<input type="checkbox"/>
c. Maximise profit.....					<input type="checkbox"/>
d. Maximise ground cover at the end of the dry season.....					<input type="checkbox"/>
e. Do 'well enough' in the business to stay on the land.....					<input type="checkbox"/>
f. Maintain herd levels.....					<input type="checkbox"/>
g. Keep good financial records.....					<input type="checkbox"/>
h. Minimise costs.....					<input type="checkbox"/>
i. Maintain or build up the natural resources on the property.....					<input type="checkbox"/>
j. Maximise leisure time.....					<input type="checkbox"/>
k. Change stocking rates annually to reflect expected conditions.....					<input type="checkbox"/>
l. Stock at a level which minimises the need to use fodder.....					<input type="checkbox"/>

### Q46. How important are these factors in influencing your management decisions?

(Select top 5)

	Not at all important	Somewhat important	Moderately important	Quite important	Extremely important
	1	2	3	4	5
a. High costs for capital investments (e.g. fencing).....					<input type="checkbox"/>
b. Peer pressure to manage in a 'conventional' manner.....					<input type="checkbox"/>
c. Cash flow.....					<input type="checkbox"/>
d. Family commitments.....					<input type="checkbox"/>
e. Concern over meeting financial commitments (e.g. loans).....					<input type="checkbox"/>
f. Concern over meeting environmental goals.....					<input type="checkbox"/>
g. Uncertainty over selling markets.....					<input type="checkbox"/>
h. Uncertainty over climate in the near term.....					<input type="checkbox"/>

- i. Uncertainty over climate in the long term.....
- j. Difficult to identify appropriate stocking rates.....
- k. A lack of information about grazing for sustainable resource/pastures.....
- l. Vegetation management restrictions.....
- m. Concern over uncertainty over leasehold tenure.....
- n. Business management decisions are difficult to make (i.e. more than one owner)

**Q47. Rank the importance of the following aspects in your enterprise (1 being very important)**

- a. Timely access to information sources to make decisions.....
- b. Skills and training, capacity building.....
- c. Clear vision for the property.....
- d. Access to peer and technical support.....
- e. Cash Flow.....

### *Section 6: Your Skills*

In this section we will ask you some questions about your management skills and where you may have obtained these skills from

**Q48. In your opinion what are three key skills to managing your business?**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Q48a. Where did you learn these?**

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_

**Q49. Rank in your opinion, your skills on a scale of 1 (being excellent) to 5 (being poor)**

- a. Animal production management.....
- b. Pasture management.....
- c. Business management.....
- d. Land management.....
- e. Off-farm investment management.....

**Q50. Have you ever received extension support from DAFF? (Please circle)**

- a. Yes
- b. No



**Q50a. If yes, was it:** (Please circle)

- a. One-on-one support
- b. Workshop/ group setting
- c. Other: \_\_\_\_\_

**Q50b. If yes, in what areas:**

- a. Animal production management .....
- b. Pasture management .....
- c. Business management .....
- d. Land management .....

**Q51. Which setting did you find the most effective and why?** (Please circle)

- a. One-on-one support
  - b. Workshop/ group setting
  - c. Other: \_\_\_\_\_
- 

**Q52. Have you ever received extension support from private extension providers?**

- a. Yes: \_\_\_\_\_
- b. No

**Q53. What activities from the list below have you participated in over the last 5 years?**

- StockTake Workshop
- Grazing Land Management EDGE
- Breeding EDGE
- Business EDGE
- Nutrition EDGE
- Mapping Workshop (AgForce)
- Mapping Workshop (Grazing Best Prac)
- Soil Pit Day (FBA)
- Pasture rundown field days
- RCS Grazing Clinic
- RCS Grazing for Profit
- RCS The Business of Grazing
- RCS Graduate Link
- Forage budgeting on property support (FBA)
- Project development visit (FBA)
- Grazing BMP Modules
- Other
- CQ Beef
- Research 2 Reality

Please list other activities attended in the last 3 years, run by any organisation:

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**Q54. Which did you find the most effective in terms of gaining knowledge, skills and/or improving your business management and why? (Select top 5)**

- StockTake Workshop
- Grazing Land Management EDGE
- Breeding EDGE
- Business EDGE
- Nutrition EDGE
- Mapping Workshop (AgForce)
- Mapping Workshop (Grazing Best Prac)
- Soil Pit Day (FBA)
- Pasture rundown field days
- RCS Grazing Clinic
- RCS Grazing for Profit
- RCS The Business of Grazing
- RCS Graduate Link
- Forage budgeting on property support (FBA)
- Project development visit (FBA)
- Grazing BMP Modules
- Other
- CQ Beef
- Research 2 Reality

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**Q55. Have you done any further research or made any follow-up enquiries as a result of your participation into the activity topic(s)?**

- c. Yes
- d. No

**Q55a. If yes, what?**

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**Q56. How much has attending the activity improved your confidence in the decisions you learnt from the event(s)?**

Answer on a scale from 1 - 5, (1 being not at all, 5 being very much so)

- 1
- 2
- 3
- 4
- 5

**Q57. What are your sources of information and how would you rate them according to their level of importance for your management decisions? List your top 5**

- |  |                      |
|--|----------------------|
| a. DAFF Newsletters                                      | <input type="text"/> |
| b. Rural print media                                     | <input type="text"/> |
| c. Radio   | <input type="text"/> |
| d. Television  | <input type="text"/> |
| e. Internet  | <input type="text"/> |
| f. Resellers / rural supply agents                       | <input type="text"/> |
| g. Industry bodies eg. AgForce, AgForward                | <input type="text"/> |
| h. DAFF (previously DPI and DEEDI) extension officers    | <input type="text"/> |
| i. NRM group officers (e.g. enter in relevant NRM group) | <input type="text"/> |
| j. DNRM Officers   | <input type="text"/> |
| k. Private consultants                                   | <input type="text"/> |
| l. Other producers                                       | <input type="text"/> |
| m. Banks   | <input type="text"/> |
| n. Accountants   | <input type="text"/> |
| o. Solicitors  | <input type="text"/> |
| p. Other – please specify _____                          | <input type="text"/> |

**Q58. Have you received any funding grants through FBA (Fitzroy Basin Association) or your local sub-regional body?**

- a. Yes
- b. No

**Q58a. If yes, what was the funding obtained for?**

- |   |                      |
|---|----------------------|
| a. Landtype fencing.....                    | <input type="text"/> |
| b. Riparian fencing.....                    | <input type="text"/> |
| c. Watering points.....                     | <input type="text"/> |
| d. Voluntary land management agreement..... | <input type="text"/> |
| e. Other.....                               | <input type="text"/> |

**Q59. How would you say your involvement, if any, with the following organisations has been on a scale of 1 (not very positive) to 5 (very positive)?**

- |                             |                      |
|-----------------------------|----------------------|
| a. DAFF.....                | <input type="text"/> |
| b. FBA.....                 | <input type="text"/> |
| c. Ag Force.....            | <input type="text"/> |
| d. Others (List below)..... | <input type="text"/> |

# Appendix B: Reef Plan Water Quality Risk Framework for Dry Grazing <sup>5</sup>

Weighting	Indicators & Associated Practices	Question	Allocated score				
			A	B	C	D	
25%	<b>Performance Indicator 1: Average stocking rates imposed on paddocks are consistent with district long-term carrying capacity benchmarks for comparable land types, current land condition, and level of property development</b> High-level actions There are realistic expectations of the average stocking rate each paddock will likely carry over a number of years (long-term carrying capacity or LTCC). Supporting actions Property mapping and inventory of natural resources enables objective assessment of long-term carrying capacity and stocking rate. Records and analysis of stock numbers allow planning and management of stocking rate. Land condition is assessed and taken into account when estimating LTCC and when planning grazing management.	11	15%	15	10	5	0
				9	5	3.5	1.5
				10	5	3.5	1.5
				<b>Performance Indicator 2: Retention of adequate pasture and groundcover at the end of the dry season, informed by (1) knowledge of groundcover needs and (2) by deliberate assessment of pasture availability in relation to stocking rates in each paddock during the latter half of the growing season or early dry season.</b>			
35%	High-level actions Balance between stocking rate and pasture quantity in each paddock, and implications for groundcover, are objectively evaluated. Supporting actions Pasture attributes managed to ensure erosion risk is low Groundcover monitoring Groundcover thresholds inform paddock management Planned burning, where practiced, is done in a way that reduces risk of poor pasture regrowth and associated slow recovery of groundcover	12	12.5%	12.5	8	4	0
				10	5	3.5	1.5
				8	5	3.5	1.5
				13	7.5	7.5	5
25%	<b>Performance Indicator 3: Strategies implemented to recover any land in poor or very poor condition (C or D condition).</b> High-level actions Management is tailored to encourage recovery of land in declining or poor (C) condition. Management is tailored to encourage recovery of areas in very poor (D) condition.	22	7.5%	7.5	5	3.5	0
				23	10.0%	10	7
				18	7.5%	7.5	5
15%	<b>Performance Indicator 4: The condition of selectively-grazed land types is effectively managed</b> High-level actions Where there has been, or is, strongly selective grazing of land types within a paddock, management actions are in place to maintain/recover land condition of those land types.	6	7.5%	7.5	3.5	0	0
				14	7.5%	7.5	5
100%	<b>Performance Indicator 5: Timing and intensity of grazing is managed in frontages of rivers and major streams (including associated riparian areas) and wetland areas.</b> High-level actions Grazing pressure on frontage country is able to be effectively managed (enabled by infrastructure). Grazing pressure on frontage country is managed carefully (where fencing allows control)	7	100%	100	66	33	0
				<b>Performance indicators 1-4: Hillslope erosion assessment.</b>			
30%	<b>Performance Indicator 6: Strategies implemented to remediate gullied areas.</b> High-level actions Where possible, remedial actions are taken to facilitate recovery of gullied areas.	23	30%	30	20	10	0
40%	<b>Performance Indicator 7: Linear features (roads, tracks, fences, firebreaks, pipelines and water points) located and constructed to minimise their risk of initiating erosion.</b> High-level actions Planning. Managing risk of erosion associated with roads and tracks. Managing risk of erosion associated with fences.	16	25%	25	16	8	0
				17	15%	15	0
0%	<b>Performance Indicator 8: Use of agricultural chemicals</b> High-level Use of Tebuthiuron (where used) Application of fertilisers (where used on significant areas of perennial pasture) Application of phosphorus (P) fertiliser Application of nitrogen (N) fertiliser						

<sup>5</sup> MCCOSKER, K. 2014. Reef Plan Water Quality Risk Framework - Grazing. In: DEPARTMENT OF AGRICULTURE FISHERIES AND FORESTRY (ed.). Rockhampton.

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