finalreport

NORTHERN BEEF PROGRAM

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Decision making in the grazing industry:

The case of controlled breeding

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Abstract

Adoption of new ideas and technologies within the grazing industry is variable. Controlled breeding may be a way of reducing the impacts of overgrazing by targeting births to the season of highest forage availability, whilst improving the profitability of grazing enterprises, yet not all graziers have embraced the practice. Investigating how graziers choose whether to practice controlled breeding, or not, and the circumstances under which they make decisions, may provide insights into how graziers adopt new practices. In this honours study, I directly test the hypotheses that (i) resource dependency and (ii) targeted media are significant influences on graziers' decisions to practice controlled breeding. Theses hypothesis were tested using standard quantitative and qualitative face-to-face and telephone surveys on 26 graziers in the Upper Burdekin. Results suggest that aspects of resource dependency and media are significant influences on the decision making process. Specially, formal and informal networks and the strategic approach of graziers are important. Extension officers and brochures were identified as the most effective media to influence change.

Executive summary

The aim of this project was to explore the influence of resource dependency and targeted media on graziers' decisions to practice controlled breeding in the Upper Burdekin region, North Queensland. Controlled breeding may be a way of reducing the impacts of overgrazing by targeting births to the season of highest forage availability, whilst improving the profitability of grazing enterprises, yet not all graziers have embraced the practice. Investigating how graziers choose whether to practice controlled breeding, or not, and the circumstances under which they make decisions, may provide insights into how graziers adopt new practices.

The objectives of the study were to:

1. describe the context of controlled breeding in the Upper Burdekin region
2. describe and quantify the circumstances under which graziers choose, or do not choose, to adopt controlled breeding in terms of (i) available information and (ii) their level of dependency on the grazing resource
3. identify an appropriate method for disseminating information about control breeding to the grazier community

Twenty six graziers were interviewed using both quantitative and qualitative survey techniques in order to describe the practice and ascertain why graziers made the decisions they did in relation to controlled breeding, and what were the main influences on these decisions. Results suggest that there is great diversity in the way in which graziers practice controlled breeding. Results also suggest that many social aspects of resource dependency (attachment to place, attachment to occupation, family dependents and employability) were poor influences on the decision. However, both formal and informal networks were identified as important influences on the decision to control breed. Economic aspects of resource dependency (financial characteristics and approach to business) were highly correlated with the decision to control breed. That is, graziers that used controlled breeding in their herds (or aspects of the practice) demonstrated increased strategic skills in their business approach and were mostly financially motivated. All graziers that employed the practice said that they could forecast their annual income more efficiently. Many of the graziers who chose not to control breed had less financial incentive to look at new practices and technologies since they had little or no debt.

Results also showed that respondents rely heavily on their local extension officer for communication about new practices, but they were also open to the use of new communication strategies. Initially graziers ranked DVD's as a low communication choice but during qualitative interviews graziers discussed how DVDs might be a substitute for an extension officer and it might help them build trust in 'faceless' government agencies.

The implications of this research are:

- that the facilitation of informal networks in the region may encourage opportunities for collaborative learning to encourage graziers to be more strategic and experimental with innovative approaches such as controlled breeding
- extension officers are a very important part of formal networks; where trust and relationship building is nurtured, more influence can be expected
- increasing the relevance and detail of information about new innovations is important. This might be achieved through brochures, and possibly through DVDs

- increasing the strategic skill-set of graziers may give confidence to graziers to see opportunities in new technologies and assist them to effectively manage risk associated with change
- showcasing graziers with different experiences of controlled breeding may efficiently disseminate relevant information to other graziers and inspire them
- the practice of controlled breeding may be appealing to many graziers because it is not overly prescriptive, and graziers have the opportunity to exercise their own judgements in applying it to their own social, economic and environmental circumstances.

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1 Background

In 1788 the first European settlers in Australia brought with them six head of cattle and from this, the beginnings of the cattle industry in Australia has grown to what it is today; a billion dollar industry (ABS, 2005). Whilst changes in practices and technologies have typified and often improved the industry during its history, graziers can be slow to adopt new practices. A higher adoption of many new ideas may significantly assist primary resource enterprises to be economically profitable in the short-term and sustainable in the long-term. The pastoral industry is expected to be the main income earner in the rangelands areas as much of the land in northern Queensland is not be able to sustain cropping or many of the other agricultural uses that apply in the south and therefore has little other commercial value (Holmes, 2002. McAllister *et al*, 2006, Whan *et al*, 2006). The industry needs to remain viable, despite extreme variability in weather patterns, uncertain markets for cattle, declining rural populations, an ageing population, conservation concerns, rural tourism and other extant stressors (Curtis and Byron, 2002, Allen and Kilvington, 2005). Hence, industry members will need to improve their adaptive responses to their challenging and changing environment, and potentially be more responsive to new technology and practices. A better understanding of the influences on the adoption of new technologies will assist industry, government and communities to better facilitate the adoption process.

This study focused on the practice of control breeding which is not highly recommended to graziers by government or industry in the Upper Burdekin region but is a practice which some have chosen to adopt. Controlled breeding potentially offers graziers many benefits. To date there has been little research done on controlled breeding and the advantages of it for industry members in the Burdekin region in Queensland. The adoption of the practice of controlled breeding, including pregnancy diagnosis and foetal ageing, can be used to increase female cattle productivity and reduce the impacts of overgrazing by targeting births to a specific season. However, only a small proportion of graziers in the region are currently undertaking these activities. Investigating how and why people choose whether or not to adopt these practices and the circumstances under which they make decisions can provide much needed insights into how and why people adopt new practices in general. Some studies (Greiner *et al*, 2003 and Rolfe *et al* 2005) have shown that aspects of social and economic factors can influence the adoption process in North Queensland or in beef grazing regions ; however our knowledge is still in its infancy.

This study is based on an honours research study based through James Cook University and CSIRO and funded through MLA. One of the main foci of the study is to ascertain the differences in circumstances between those graziers that have chosen to practice controlled breeding and those that have not. Improved understanding of the conditions under which graziers make decisions may also assist in the allocation of funding for improving adoption rates from industry and government organisations. Strategies such as providing targeted information to assist with better decision making for the individual may be more easily developed with such knowledge.

2 Project objectives

The objectives of the study were to:

1. describe the context of controlled breeding in the region
2. describe and quantify the circumstances under which graziers choose, or do not choose, to adopt controlled breeding in terms of (i) available information and (ii) their level of dependency on the grazing resource
3. identify an appropriate method for disseminating information to the grazier community

3 Methodology

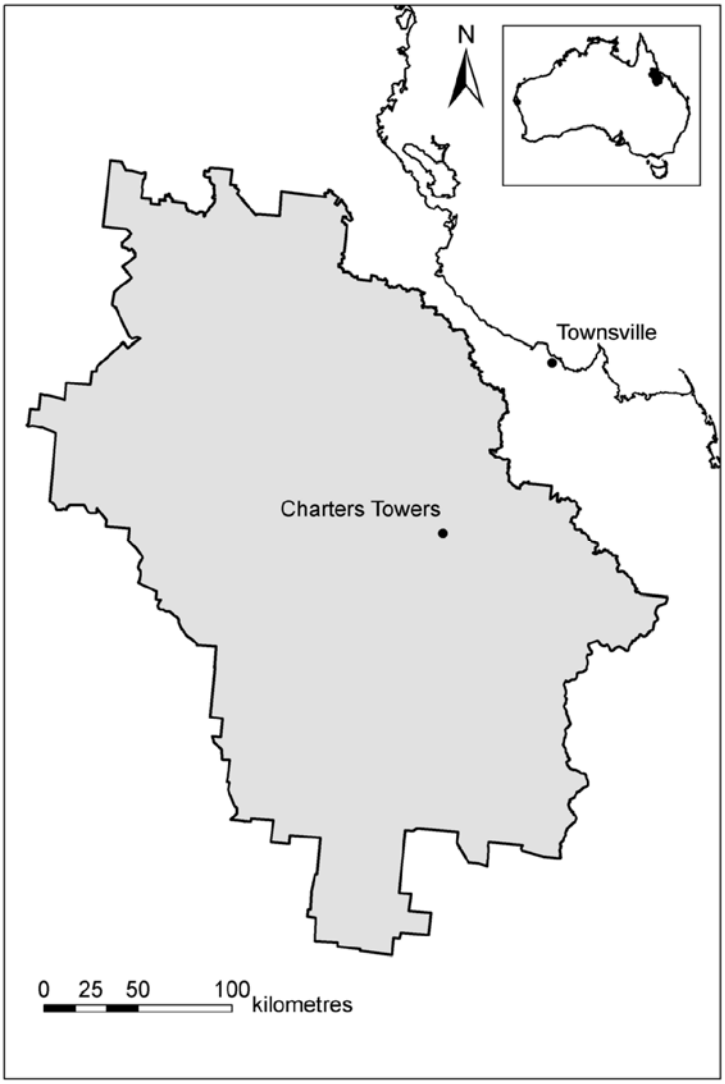
3.1 Research approach

In this study both qualitative and quantitative methods were used to elicit as much information as possible to address the objectives of the study. This mixed methods approach is popular amongst social researchers as the quantitative results are useful for identifying patterns and the qualitative results are useful for providing richness to the interpretation of data from the formal survey. In addition the qualitative discussions were aimed at capturing the unusual responses that may not have been so easily captured in a formal questionnaire (Becker, 1986, 1992. Briggs, 1986. Pelto and Pelto, 1978). Quantitative data were used to understand the extent to which patterns, at least within a small grazing community, might exist between the decision to practice controlled breeding and various aspects of resource dependency. Qualitative research is a practical complement to quantitative research and can assist in this study by creating a more complete understanding of the ways in which decisions are made in a grazier specific context (Golafshani, 2003. Hammersley, 1992. Taylor and Bogdon, 1998).

The survey process can be used as a tool to assist in measuring decision-making by looking at what past decisions were made and how. Yet this process has been criticized since it can show an incomplete picture of the actual process that graziers undergo and merely show the end result (Barnett, 2007). Barnett (2007) claims that the survey process cannot measure the adoption process as it is too complex a matter and is more likely to measure a respondent's intentions rather than the resulting behaviour. Nonetheless, the survey process can assist in quantifying the significance of potential influences on the decision outcomes. Survey data also provides a snapshot in time of what practices are currently being undertaken, and can accurately show what decisions were actually made and not just what was intended to be done. In this study, surveys were used as a tool to systematically and consistently measure past choices/decisions as well as to test for potential influences on the decision making process. Definitions and justifications for examining the influence of resource dependency on the decision to control breed is not described in the current study, but can be found elsewhere (Williams 2008

3.2 The study area

The Upper Burdekin was chosen for this study due to its proximity to Townsville and the relative ease of access to properties in this region. Earlier involvement in CSIRO-based research in the region suggested that some graziers did practice controlled breeding whilst others did not.



Map 1. The Study Site (Courtesy of Brett Abbott, CSIRO)

3.3 Survey development and design

The survey was designed to quantify and test the influence of (i) financial, social and environmental dependency on the grazing resource, and (ii) various communication strategies, on the decision to practice controlled breeding. Specifically, I aimed to quantify attachment to place and occupation, employability and strength of formal and informal networks. In order to inconvenience the graziers as little as possible it was necessary to design the survey to be as short, but as comprehensive, as possible.

The initial questions were designed to ease the grazier into the survey by having short quick questions and answers as advocated by Oppenhiem (1966) in his 'funnel' approach, before leading into the longer and more detailed answers. The advantage of having personal contact with the grazier was that a rapport could be built up which allowed for richer data to be obtained. Many interesting insights came to light as a result of the qualitative surveys that would have otherwise

been missed had only a quantitative survey been conducted. In addition the qualitative survey does not have the same constraints of question type and style that a quantitative survey has.

For this study, three methods of structured interviews were employed: 1) personal face to face, 2) self administered and 3) telephone interviews. It was initially hoped that only personal face to face interviews would take place however the graziers were subjects of my research and not objects of research and as such I had to accommodate their requests as to how to conduct the interviews. Due to mustering requirements and wet weather it was therefore necessary to conduct almost half of the interviews over the phone. However, I had already developed a relationship with several of these graziers through prior research in the region. Attempts were made to minimize bias and all questions were read out in the same way. Interestingly, even during the face to face interviews, graziers preferred me to read out the questions rather than read them themselves. There are both advantages and disadvantages to all of these techniques (Bernard, 2002). No technique is preferred over any other; it was more a matter of what could be achieved with each individual grazier at that point in time and weather permitting whilst maintaining consistency in method. The face to face and the telephone interviews were the most preferred by graziers and provided more in depth and elaborate answers (Barnes et al, 1995. O'Brien and Dugdale, 1998.).

In order to iron out any problems with readability, ambiguity and survey length, a pre-test of the survey was conducted on CSIRO staff. Subsequent comments and advice were taken on board and incorporated and the questions were fine tuned before a pilot test on a small number of graziers was conducted prior to the final release upon the grazier community. Any question that was deemed problematic during the pilot study was modified and attempts to minimize biases were made. Advice from graziers in the pilot stage on some specific wording was very helpful as trying to word the questions in local cattlemen talk was not always easy. A copy of the final questionnaire can be found in Appendix 3.

3.4 Selecting respondents

Respondents were randomly selected from a list of graziers using the Atlas of Queensland and Northern Territory pastoral stations (Alick and Alick, 2006). Names, telephone numbers and addresses were obtained through the yellow pages telephone directory. The Upper Burdekin region has over one hundred cattle properties, and for this study small cattle properties of less than 30,000 acres were excluded as being considered to be more hobby farm than industry. This made the sample random within that size range. A list of 35 names was collected from the region, representing approximately just over 30% of the total graziers in that category. It was necessary to double check the validity of some properties as several properties were owned by the same family and therefore could only be counted once to maintain a valid and representative sample.

Callback phone calls were made to unanswered letters and phone messages to maintain an unbiased sample (Dillman, 1978). Because previous research had been conducted by the author in the region, a rapport had already been built with many of the graziers which was advantageous in gaining a higher response rate from the respondents. Of the graziers approached to participate in the study, none refused to assist. One grazier, however, was busy each time he was contacted and four were unable to be contacted. The response rate was therefore 96% for the graziers who were contacted.

3.5 Data collection and analysis

All data collection was performed between December 2007 and February 2008. The project was promoted during a local media campaign which was used to increase the perceived validity of the project. Each grazier received a letter in the mail introducing the study to them and inviting them to participate. It was also made clear at this time that any information given was confidential and participation was not obligatory. Telephone calls were then made to establish survey times. Quite often, several phone calls were made to a grazier as the letter that had been sent remained unopened or unattended to. Some properties were located in excess of 220 km from Townsville thus making the data collection a lengthy process.

Once the quantitative data was collected it was entered into SPSS for analysis. Correlations and cross-tabulation analyses were used to see what patterns, if any, were occurring within the data (Pallant, 2005). Variables were correlated against the decision whether to undertake the practice of controlled breeding or not in an attempt to determine whether there were significant contributing factors or themes amongst the data. Chi-square tests were used to test for significant differences to test whether correlations between independent factors and the decision to control breed were significant or due to chance. (Pallant, 2005. Kinnear & Gray, 1998).

In the analyses it was determined that when a p-value was 0.05 or lower it was considered to indicate a significant correlation between two factors with a 95% chance that the correlation is not a chance event.

3.6 Ethics approval

Ethics approval from James Cook University was applied for and granted in advance of the project (Appendix 1). Prior to conducting the interview, graziers were asked to sign the 'informed consent' form agreeing to the interview and reassurances were given that all information given was confidential and that there would be no way of recognizing any given property or grazier in the final report. In many instances the graziers thought the informed consent a bit of a joke and made comments such as: *"If I didn't want to talk to you I would've said no…of course it's bloody alright!"* Due to weather constraints many interviews were conducted over the phone and the consent forms were agreed to verbally.

4 Results and discussion

4.1 The practice of controlled breeding

4.1.1 General characteristics of the practice in the Upper Burdekin

[Fourteen (54%) graziers in the sample practiced controlled breeding in their cattle herds and 12 (46%) did not. The length of time for which the bulls were separated from the herd varied amongst the graziers who control breed as can be seen from table 1. Seven, eight and nine months were the most frequent separation periods. Interestingly, of the graziers that do practice controlled breeding only just over half did it for financial reasons.

Some of the other reasons cited were:

- *Better herd management*
- *Improve financial control and expectations*
- *To improve calving rate and herd fertility*

One grazier commented:

> *"there is no such thing as a free dinner on a cattle property, but doing controlled breeding along with (and this is the important bit) early weaning at the right time of the year is the closest thing you will get to a free dinner….it makes perfect sense, although it took me a while to get my head around it, but once I did I couldn't believe how easy it was and how much more money I was making… I never looked back really"*
>
> *"…the thing is you have to get the calves born around July – September if you can and wean at 3 months. If you do this then the mother won't lose too much fat off her back by only feeding the calf for three months, and if it hasn't rained by then the mother will survive on what grass is available and the only ones you will be feeding (extra feed to) will be the calves and they don't cost as much to feed as the mothers. So when the wet comes all of them can fatten up on lovely fresh green grass, the mother will re gain her previous weight and be ready to go in calf again (of course she may already be in calf as she wont have lost too much weight and her fertility will still be high)…..of course it doesn't always work as easy as that but it comes pretty close!"*

Table 1 Frequency table showing how many months the bulls are separated from female cattle

How many months are the bulls separated for?	Total responses
4 months	1
5-6 months	1
7 months	3
8 months	5
9 months	2
10 months	1

4.1.2 Knowledge of controlled breeding

Of the graziers who control breed, only one has been using this practice for more than 20 years. Five have been using this method for between ten and twenty years and eight have been doing it for less than ten years, however nearly all of them had heard of it over twenty years ago. Even the graziers who chose not to use this practice had heard of it a long time ago.

The group who uses controlled breeding had a much higher rate of conducting pregnancy testing (92%) and utilized it mainly on all their breeders with only three testing sale cows only. Only one grazier who uses controlled breeding (7%) does not use pregnancy testing in herd management. Alternatively only 50% of the group who does not control breed in their herd uses pregnancy testing. In addition the group who chooses not to control breed either only tested sale cows or none at all. Chi–square for the correlation between controlled breeders and non controlled breeders and pregnancy testing is significant ($p=0.001$). The graziers who control breed indicated that they have a higher accuracy rate of pregnancy testing earlier than the graziers who do not control breed, with the majority rating themselves at 95% accuracy or higher. Both groups have high numbers (11) stating they can tell the age of the foetus and the age of which they can accurately tell is from five to eight weeks.

Of the people who responded to the question of "where did you learn how to conduct pregnancy testing?" a high percentage (80%) learned in the formal setting of a course or Agricultural college while 7% learned from friends. Only three graziers used a vet to conduct the testing.

Eleven participants (42%) did not answer the question about foetal ageing however during qualitative interviews 7 of those eleven graziers stated they would like to learn more about pregnancy testing and foetal ageing but alternatively others (4) did not want to.

4.1.3 Cattle management techniques

The cattle management techniques varied for the two groups. Almost half of those who control breed separate the cows by stage of pregnancy whilst none of those who do not control breed do this. (Chi – square is significant for this factor $p=0.012$). The age at which cattle are culled is between 8-12 years for almost all the graziers with little differences between the groups. The controlled breeders were the only group to cull all dry cows. Few graziers (11%) kept their breeders for more than twelve years.

The weaning age for calves varied amongst graziers with eleven (78%) controlled breeders weaning between three and six months, and seven non-controlled breeders (58%) weaning at the same age. Eight producers (30%) weaned at six months or over. The preferred time for calving is from October to January/February for the majority (61%) of participants (table 2). Only five (19%) graziers preferred their calving season to start in the July –September period.

Table 2 Results of correlation between graziers who do and do not control breed and what the preferred time of year is for calves to be born.

Preferred time for calving	***Do you practice controlled breeding***		Total responses
	Yes	No	
Dec-Jan	1	2	3
Dec-Feb.	0	2	2
Nov-Feb	1	0	1
Nov-Dec	1	0	1
December onwards	1	4	5
Late Nov- late Jan	1	0	1
Oct-Dec	1	0	1
Oct-Jan	3	0	3
Sept-Dec	1	0	1
Sept-Oct	1	0	1
July-Dec	3	0	3
All year	0	4	4
Total	14	12	26

4.1.4 Calving season

The length of the calving season varied amongst graziers with 4-6 months being the most common length of time. Nearly all the respondent bred from their heifers when they were aged 18 months-2yrs. Only one grazier waited until his heifers reached 4 years of age to breed from them, saying: "*its terrible country up here, all rocks and stuff…they don't have enough fat on them and they haven't grown enough until they're about 4 yrs old, not like down in the basalt areas...good grazing down there*". Most of the group who use controlled breeding knew their calving percentage in advance as opposed to the group who does not control breed who mainly did not know. A chi-squared analysis shows this to be a significant factor (p=0.014). In addition half of the group who chose to control breed separates their cows by stage of pregnancy to assist in herd management while the other group does not.

The calf mortality rate was known by almost a third of the controlled breeders yet few non controlled breeders knew their calf mortality rate. There was not much difference between the groups in breeding from heifers selected for optimum growth or temperament or breeding from all the heifers. Most bulls were kept for between six and ten years with only six graziers (23%) keeping them for five years or less.

4.1.5 Discussion of results

Controlled breeding is not a new practice and is certainly not something that only the younger generations of graziers are undertaking as can be seen by the 8 graziers (30%) in the over 55 age category. Fourteen respondents practice controlled breeding in their cattle herds and twelve graziers did not. Many graziers took years to implement the necessary infrastructure to allow them to conduct controlled breeding which suggests they use foresight and forward planning capabilities in their business.

Many participants discussed how they had been using this practice for a long time now or had heard of it a long time ago. The graziers in the sample were taking the elements of controlled breeding that appealed to them and using those useful aspects in their business. For example not all graziers were able to achieve 100% removal of the bulls and some were removing the bulls for less than the usual 9 month period.

Calves are weaned between 3-6 months with most graziers trying to wean as close as they can to 3 months in order to let the mother recover faster and allow her to fall pregnant again. This approach is supported by Frank (1995) whom states that early weaning leads to improved reproductive efficiency. It can be seen that despite the practice of controlled breeding not being advocated in this region many graziers are undertaking aspects of it that suit them and adapting the process to suit their individual needs. This shows that graziers are receptive to change and will undertake practices which they think will work for them despite it not being not recommended.

The herd management practices used today differ considerably from the 1970's where there was no culling of females, fertility rates were low, mating was random through the year and there was little infrastructure. Since then improvements to infrastructure have led to better herd control. For example, cattle in the rangelands are culled between 8 and 12 years of age. Graziers that practice controlled breeding demonstrate a high level of business acumen and an understanding of the financial advantages of improved herd management. For example, the majority of graziers who conducted pregnancy testing on their cattle culled all dry females as they did not want to keep a female that was not producing or earning her keep. For many, it was a common sense business decision. The graziers who control breed had a much higher rate of conducting pregnancy testing of the entire female breeder herd (with only 3 testing sale cows only). Decisions like this show that some graziers are striving to achieve maximum yield from the herd and may be risk takers (albeit calculated risks) as opposed to some of their peers who may be risk averse. Graziers who are using controlled breeding appear more pro-active in their business strategy and herd management techniques.

4.2 Social descriptors of resource dependency

4.2.1 Attachment to place

Many graziers (almost half) had lived on their properties for over 21 years, while only 7 had lived on their property for less than ten years. Even the graziers who had not lived on their property for an extended length of time had usually come off another property prior to this one. This indicates that almost half of the respondents are long term on their property. In addition, 15 (60%) of the participants were either third or fourth generations on the land with only two being first generation. Even these were not completely new to the industry as one married into the industry and one was from a sugar cane background. Twenty one planned on being a long term resident of their community.

4.2.2 Age

Eighteen graziers (69%) were aged forty years and over with only eight (31%) in the twenty five to thirty nine years category.

4.2.3 Attachment to occupation

The cattle industry was described as a way to earn a good living and be able to work with your family without the complications of city life. When asked why they want to stay out there working on the land, I received comments such as:

> "*Its bloody hard work mate, but you couldn't beat it, out here you're at one with the land"*
> *"Lifestyle, I get to pretty much do what I want and see my family while I'm doing it…it's healthy for the kids too"*
> *"You can make good money if you work hard; I couldn't make this kind of money anywhere else and still be my own boss"*

All participants except one stated that they would like to remain in the area long term. When asked 'if they felt it was a close knit community for them' the responses show that half felt it was and half felt it was not such a close knit community for them.

When asked the reasons for remaining in the industry and on the land, there was a definite theme of lifestyle and independence and love of the outdoors (86% of respondents). Some stated they 'just love it' (8%) and only one grazier was remaining on the land for his sons.

Almost all the respondents talked about their love of what they do for a living and few felt they could work as happily anywhere else. The majority of graziers (85%) had grown up on cattle properties and many felt it was in their blood and was what they could do best.

Six graziers (23%) had lived on this property for over 40 years with an additional 5 being there for between 21-40 years. This question was aimed at finding out their attachment to and length of residence at this particular property. Only 23% had been on their current property for less than ten years. All of the graziers were married except one and the wives contributed greatly to the running of the property in particular the bookwork side of things but also the practical aspects such as branding.

4.2.4 Education levels

Education levels varied greatly amongst the respondents with some having attended university, and others leaving school at an early age. Some graziers (11%) had been to agricultural college but many (89%) had grown up on the land and learned by working on the land. Nearly all (96%) had attended courses to improve their business. All graziers felt they had high levels of employability in the region if they needed to find work elsewhere.

4.2.5 Networks

The formal networks from which graziers receive information were important to them. Just less than half of the participants felt that they had enough contact with extension officers and just over half felt it was either not enough or almost enough contact. No grazier stated that they had too much contact with extension officers and only one said "…*we have never seen one*".

Many graziers respected other (successful) graziers in the region as being knowledgeable in regards to running a property. The DPI was very highly regarded closely followed by neighbours as being knowledgeable about ways to successfully run a property. One grazier made the comment "I like to

know who I am talking to when I call someone, otherwise you feel a bit stupid" and for this reason limited the opportunities to calling the local QDPI&F representative or a neighbour. Nearly all the graziers discuss their important business decisions with family and their accountants the most frequently. Family was used on a daily basis by almost half of the graziers, while the formal government organizations were mainly used as needed.

4.2.6 Discussion of results

A major aim of this study was to understand some of the reasons why graziers choose to practice controlled breeding. Results suggest that some graziers do not practice controlled breeding as they perceive it to be too much hard work, or it would not possibly work for them on their property due to their particular geographical restraints. One grazier in particular resisted the idea for many years as he did not truly understand it but once he gave it a try he never looked back. Apparently, some properties are not geographically suited to the practice as they have rivers which flood and knock down the majority of fences every year and the maintenance on fence repairs is too great (time wise and financially) for it to be successful. Other graziers commented that they have little need to change anything (management strategies) as with little or no debt the property is making a profit so why bother.

The graziers who were located in excess of 200kms from amenities such as a vet or shops were the same graziers who stated they found it difficult to attend Landcare meetings etc. For these reasons of isolation and too much time away from the property they do not make the effort to regularly attend informative sessions and as such are left out of the information loop in a direct way. This may be indicative that strategies need to be developed to allow information to not only be inclusive of these more isolated graziers but to particularly value and promote more strategic thinking.

Feelings were quite divided as to whether or not the community was close knit. This could be attributed to there being considerable movement within the cattle industry in recent years with several properties changing hands and newcomers arriving in the area. Another reason mentioned could be the time factor, as despite all the advances and new practices within the industry many graziers do not have time to socialize a great deal. Graziers have less time than the previous generation to socialise as they are now all suffering from the combined effects of a labour shortage and the economic push to achieve more from their property than ever before. Many discussed how even though it was not a close knit community for them you still felt like a part of it and could easily call up any one in the community for help if you had to. This shows how even if they were not in frequent contact they had reliable informal networks to fall back on, if needed. Graziers had some strong friendships within the community although those that had businesses outside of the cattle industry had a more diversified group of friends both within and external to the grazier community.

Yet despite these mixed feelings on the close knit community all the graziers felt a strong attachment to place or social identity and wanted only to do this job. It allowed them freedom to make decisions and live a lifestyle they would not be able to attain if they lived in a city. The education levels varied amongst respondents but all were able to run their business's and felt confident doing so. All the graziers felt they had enough skills to find work elsewhere if they had to. Graziers discussed how they would easily find other jobs if necessary but none of them felt it would come to that as despite fluctuations in the beef industry the demand for beef remains strong. Graziers vary from other resource dependent industries in this aspect as they feel they have high levels of employability (albeit within the same industry) and a willingness to work. Some authors

discuss how others in primary industries such as fishing or logging do not have the same flexibility as the skill set they possess may be confined to a narrower field (Marshall *et al*, 2007).

4.3 Economic descriptors of resource dependency

4.3.1 Business approach and economic factors

The business approach taken by graziers varied a great deal; from factors such as the size of the property to debt levels and management plans. Landholdings varied in size from one property of 30,000 acres up to one grazier who owned four properties (in excess of 250,000 acres). Over half of the graziers owned or ran only their current property while twelve had additional properties. Two graziers had an additional two properties and four graziers held an additional three or more properties. This suggests that almost a quarter of participants hold considerable holdings in cattle properties and are major landholders.

4.3.2 Debt levels

Debt levels also varied considerably with some graziers having little or no debt (20%) to some other graziers having debts of millions of dollars (15%). The attitudes to the debt also varied greatly. Some saw a large debt as the only way to grow their business while others focused on remaining debt free. As a consequence of the varying debt levels and business size, the income levels associated with each property also varied a great deal. One grazier explained that often:

> "…*they are so busy keeping their heads above water that they don't have time or money to do things any differently on their property…*".

Another commented:

> "*mate, prices are going up all the time, and the price of beef stays the same….something's gotta give….we all need to push our land a bit more …buy more feed for the cattle so we can keep them, but it all costs money*"

He explained it further by adding how some people are going into debt to buy feed for the cattle to keep them going through winter and until it rains and the debt ratios were shifting.

Over half (66%) were either only a little or moderately worried about their debt levels, five (21%) were not worried at all as they had little or no debt and just 12% were worried quite a lot by their debt levels. A high proportion (85%) of graziers thought that it was important to have financial investments outside/apart from their cattle business. Just over three quarters (76%) of the twenty six participants thought there was a need to change operational methods on their property and cited reasons such as:

- *To keep ahead*
- *To keep up with market and technological change*
- *And being able to deal with market changes and prepare for them*

Twenty one participants (80%) had a long term management plan to assist in this forward planning while four said they had no long term plan and just did what they had to do. Of the group with the long term management plan, seventeen referred to it on a monthly basis or more frequently. Many discussed how this was a relatively recent development for them (ie less than 5 yrs) and was something that had come up in discussions with the accountant, and was also discussed at Landcare meetings and with the DPI. The graziers discussed seeing the value in having a long term

plan with goals of what to achieve and how to plan to achieve them. It was not something that was a formal written document for all graziers, as one said:

> *"it is more of a mud map really…I can draw it in the dirt with a stick when I am out in the paddock if I want to, it is more a set of pictures with connecting lines I suppose"*

Another grazier commented:

> *"my oath- if you don't have a long term plan nowadays you will get left behind, it's not like when I was a young fella and Dad just did what he could year to year"*

Most graziers felt there was a need to change operational methods on their property and cited reasons such as "…*keeping up with markets…new drivers of profitability and trying to keep one step ahead*" as the motivation to change. Six graziers felt there was no need to change their operational methods as everything was "*working fine the way it is*".

The current markets for beef cattle preferred by the graziers were in order of preference: Australia, United States, Japan, Korea, and Taiwan, with many using a variety of markets, as one grazier put it: "*it's more a matter of what market your cattle fit into when you want to sell"*

4.3.3 Discussion of results

Graziers with little or no debt do not feel vulnerable to environmental or economic changes and have the financial stability to maintain the lifestyle they live. Many of these financially stable graziers cannot understand how some of their fellow graziers can tolerate millions of dollars in debt in order to own additional properties and then need to constantly find new and improved methods in order to service the debt. Alternatively the graziers with extensive business skills and confidence in the industry look at those who are not expanding their business enterprise and looking at new practices and technologies as being stuck in the past and not moving forward. Most of these graziers wish to expand their business as part of personal desire to achieve more and partly to allow for easier succession planning. These producers who wished to expand their business were of varying ages but all shared the desire to strive for larger more successful landholdings.

The profit margins on a property need to be healthy to allow for improvements in infrastructure and new technologies or practices to be adopted; as most new methods will require some sort of modification or adaptation on the property such as fencing. If the profit margin is not healthy then the producer takes the risk of going further into debt for a practice or technique with no guarantees of success. For these reasons some graziers will prefer to see somebody else trial it first before they do it. Even though the profit margins on the properties that do not control breed were good some of the participants felt that some practices like controlled breeding did not offer enough of a significant advantage to them to warrant the additional infrastructure required.

Participants were choosing to undertake some practices even if there was not a financial need to do so. This often resulted in financial gain but that was not the objective as the primary goal was to achieve better herd control. Often a particular practice could not be undertaken until preparatory steps had been taken first which in some instances took many years.

Graziers who are dependant solely on the cattle grazing industry may have a different perspective to a grazier that has diversified financial interests outside of the cattle property. It was initially thought

that they would be older graziers of a particular stereotype however quantitative data has shown this to be untrue.

An interesting observation was that approximately half of the participants who control breed felt a financial need to control breed as opposed to their peers who did not control breed who felt no financial need to do this. This shows that controlled breeding is being adopted by those who are generally more financially in need but also more willing to try new techniques although this could be due to necessity. Even the graziers who had no financial need to undertake this practice benefited financially from doing so.

4.4 Environmental descriptors of resource dependency

A high percentage of graziers (70%) did not feel as if their location prohibited them from attending Landcare or field days etc although eight felt that their location was prohibitive to them attending as the distance was too far. Just over a quarter of participants (29%) lived relatively close (less than 100kms) to the nearest shops or vet while half (50%) were between 100 and 200 kms distance from these conveniences. Not many graziers (21%) were living over 200kms from the closest shops or vet.

4.5 A description of targeted media

4.5.1 Communication strategies

Graziers were asked if they felt whether the information they received was accurate and specific for their situation and the results were almost identical for both groups of breeders and split almost evenly on whether they agreed or disagreed. The majority (77%) felt the information was relevant to them and 65% felt information was easy to access. Comments such as too much information and too detailed were made by numerous graziers but generally they appreciated receiving information. Many stated that they received far too much generic information aimed at primary producers in general and not cattle properties and that it was time consuming to sift through it to find anything relevant.

Almost all graziers (84%) felt that the information from governments was important for their business and wanted to continue receiving information about new technologies and practices that may be relevant to their business life or situation. Only two graziers did not feel comfortable contacting government agencies for further information about ways to improve their business. Information received was read by at least one person in the household and often discussed by two people. Pertinent issues were often read by all people involved in making the business decisions.

Eighteen graziers (69%) thought that the information they had received through their formal networks with industry and government had impacted on their decision making processes while only eight (31%) felt it had little or no impact on their decision making.

The most popular choice for receiving information from government or industry in the future was from extension officers, closely followed by brochures, then email, Landcare and DVD (table 3). However many graziers commented on the fact that much of the information they receive is too long winded and they would prefer briefer brochures with websites for further information. Some graziers commented on other government workers/offices and deemed them "*unapproachable*" or "*just didn't*

know what they were talking about" or "*were all textbook talk but didn't know the first thing about running a cattle property*", another said:

> "*some of them have never gotten off their backsides and even left their air conditioned offices to see what we are really about out here in the bush, not like Bob, he's a good bloke, he knows what happens out here and if he cant help us straight away he will find out what we need to do or who to talk to…you ring up some of these government departments and don't even talk to a person for ages and if you do they could be in Sydney, what would they know about a cattle property up here?*"

During qualitative interviews graziers discussed how DVDs might be a substitute for an extension officer and it might help them build trust in unknown government agencies.

Table 3. Preferred ways for graziers to receive information about new practices or technologies that may be useful to them on their property

Ways of receiving information	***1st choice***	***2nd choice***	***3rd choice***	Total responses
Extension officers	10	9	1	**20**
Brochures	8	6	5	**19**
Email	2	3	7	**12**
Landcare	2	3	4	**9**
DVD	0	1	6	**7**
Website	1	2	1	**4**
Other (newspaper etc)	2	1	1	**4**

The local senior QDPI&F representative was highly regarded as a first source of information by almost of the participants. Qualitative data shows that just over one third of participants attended all Landcare meetings in their area, others attended as frequently as they could manage while some (15%) did not attend due to distance or lack of interest.

4.5.2 Discussion of results

The graziers in this sample are receptive to change. Though it may not happen quickly, the information does flow from key community members along to others. There are definitely members of the community who actively seek out new information and research it well, while others wait to see how it works on someone else's property before making a decision to adopt or not adopt it themselves. Rogers diffusion model does not appear accurate in its ability to describe how innovations are diffused as what he terms as laggards may be early adopters who are putting the infrastructure in place to allow them to adopt the new practice at a later date, but that it takes time.

Graziers feel that the best ways for them to receive information is from an extension officer or by brochures. They realize that it is a costly process to have extension officers available but consider it money well spent as opposed to the amount of paper information that goes to waste. They currently receive information on sheep farming and other such irrelevant issues. Most participants were interested in receiving information in the future and like to hear about a new idea. This indicates that new information is welcome and they are receptive to new ideas and change. A significant finding from this study is that a new practice or technology has an increased likelihood of adoption if the financial benefits are clearly outlined at the beginning (Beswell et al, 2007). Results from this study

also show that Landcare is important to many graziers, which this is consistent with other research (Curtis and Byron, 2002).

It may be helpful in the future to attempt to engage all stakeholders including the more reticent or isolated graziers; as the benefits of full community engagement (particularly in the early stages) will affect and benefit all members of the community (Andrews, 2003). If only the more active community members or network leaders are targeted it will take much longer for information to flow through to each and every person and for the new practice or technology to take effect. Therefore it is essential from the beginning to be inclusive (Hammer, 2004. Lynch *et al*, 2000).

While most graziers felt that the information they receive was relevant to their situation (although slightly less than half felt that it was not accurate or specific enough for them) they suggested that more detail and accuracy for their situation would be welcomed. Yet on the other hand many graziers complained about too many brochures and emails and not enough time to read them. The findings were very interesting: the most popular way was by having extension officers and this was closely followed by brochures. Email was the next most popular choice. Only 7 graziers selected DVDs as being in their top three choices. The popularity of DVD based information may grow with more usage of it in the future. However increasing usage of DVDs at seminars and Landcare meetings may assist in the uptake of information by this means.

The formal avenues for seeking information from federal government were seldomly used and then on a needs only basis, whereas the local senior QDPI&F officer was on familiar terms with most graziers and they felt comfortable contacting him with any issues or concerns. Most graziers did not regard him as a formal avenue of information as they had a good rapport with him. Many comments illustrated how important it is for graziers to have the local contact and feel that the person they speak to actually can relate to the graziers circumstances. It is a matter of concern that there is such strong reliance on the local DPI representative as if he was no longer able to act in that position then that particular avenue of information is lost for many graziers and it could take many years to rebuild such a connection with a new representative.

The informal networks of family were the most frequently used by all graziers as a source of information and to discuss any important decisions. The one grazier that was not married relied heavily on neighbours for discussions on new and existing topics instead of discussing them with family members.

Distance did not seem to be a mitigating factor although there were more graziers in the group who does controlled breeding that lived closer to amenities than the other group however the results were not conclusive enough in this sample size.

4.6 The decision making process

All graziers were happy with the decision made to adopt controlled breeding and would not change it in the foreseeable future. Most of them were happy with the decision to control breed in less than two years and the most common way of hearing about the practice was from friends (54%) and the DPI (27%). No grazier had heard about it from either reading books or the television but a few had heard of the practice from Landcare meetings with some unsure of where they had heard about it as it was some time ago. The set of graziers who control breeds also knows many others who do this also and chi-square tests show this to be significant.

Table 4 shows the time spans involved in deciding whether to control breed or not. Most graziers (73%) took between one and five years to decide. There were a variety of reasons cited as being the motivating factor to decide whether to change to this practice or not (table 5). The main reasons were 'dry years' and 'infrastructure was now sufficient'.

Table 4. Length of time to decide on whether to control breed or not

How long did it take you to decide?	**Do you practice controlled breeding?**		*Total responses*
	Yes	No	
Straight away	5	8	13
Less than one year	1	0	1
1-5 years	2	3	5
More than 5 years	6	0	6
Total	14	11	26

Table 5. The factors that motivated graziers to change to controlled breeding or not

What was the motivating factor?	***Do you practice controlled breeding***		*Total responses*
	Yes	**No**	
Dry years	2	1	3
Infrastructure now sufficient	2	0	2
Not sufficient infrastructure	1	1	2
Reduce supplement bill	2	0	2
Property not suitable	0	2	2
Made good mgt sense	1	0	1
Economics	1	0	1
To increase herd fertility	1	0	1
To improve calving rate	1	0	1
Owned own property	1	0	1
Better feed technology & infrastructure	1	0	1
Change of property location	1	0	1
Lack of production	0	1	1
Don't own property	0	1	1
The river	0	1	1
Total	14	9	23

4.7 Influences on the control breeding decision making process

4.7.1 The significance of social factors

The age group with the highest number of graziers who control breed is the 40-50 years age category with 30% as opposed to only 11% of graziers who do not control breed in the same age category (Table 6). Yet in the remaining categories (younger and older) it was slightly reversed with marginally more in each group not practicing controlled breeding.

Table 6. Age brackets of graziers who do and do not control breed

		Do you practice controlled breeding		*Total responses*
		Yes	No	Yes
Age Bracket	25-39 yrs	3	5	8
	40-55 yrs	8	3	11
	Over 55 yrs	3	4	7
Total		14	12	26

The informal networks of family and friends were influential on decision making processes in general. The majority of graziers (82%) knew other people who used the practice of controlled breeding in their cattle herd, although the group that does control breed knew twice as many others that used this practice. The chi-square test showed a significant correlation between the decision to control breed and the number of other graziers known that control breed (p=.023). Other social factors of resource dependency were tested against the decision to control breed and showed no significant influence (table 8).

Table 7 Results of correlations of social aspects of resource dependency with the decision to control breed

Social aspects of resource dependency	**P value Significant at p <=.05**
Age bracket	.249
Training in the industry	.112
Types of training	.355
Knowing other graziers that control breed	.023
Importance of seeing others trial first	.630

Table 8. Importance of seeing other graziers conduct trials with a new practice.

		Do you practice controlled breeding		*Total responses*
		Yes	No	Yes
Importance of seeing others trial it first	Strongly disagree/disagree	5	5	10
	Agree/strongly agree	9	7	16
Total		14	12	26

4.7.2 The significance of economic factors

Financial circumstances

The majority of graziers (89%) said their finances were often the main barrier to implementing change followed by a need (77%) i.e. if there is no need to change then they will not change. When asked whether there was a financial need to control breed or not, just over 34% of respondents said there was a financial need to change while 65% said there was not, this is a significant finding ($p=.029$) (significant at the $p <= 0.05$ level). All the participants who do not practice controlled breeding also felt no financial need to do so. There was not a significant difference between those that do and those that do not control breed in regard to having financial investments outside of the cattle industry. In addition, almost all the graziers who use controlled breeding said the practice has helped them financially.

Business approach

Some graziers felt a combination of factors contributed to them not trying new methods. Some felt a lack of confidence (56%) in trying new methods and technologies and others (53%) thought new practices to be too experimental for them to try and lastly some (38%) did not plan for the future a great deal and so did not change.

Business management plans

Variety existed amongst the management plans also; some were in-depth documented items covering the next twenty years but were still living documents adapting as conditions changed (85%), while others had a rough set of notes or a picture in their heads (15%). Many participants referred to their plans on a monthly basis (37%) while some only weekly (16%) and other continually referred to it (30%). Few only referred to it on an annual basis (17%).

Business size

The business size of the surveyed graziers showed no significant differences between the groups of those that do and those that do not control breed with both large and small enterprises in both groups.

Lease conditions

Property tenure varied greatly amongst the respondents. Five graziers had properties that were either on a perpetual lease or were freehold and almost half the respondents had properties that held leases which expire in less than ten years. All of the graziers on a lease felt that there would be no problem renewing their lease, however some mentioned the increasingly difficult and time consuming paper trail involved in this process.

The lease expiry factor was not a major influence on decision making as almost 70% of graziers said that their lease expiry date did not impact on their decision making in any way; yet 56% of respondents held leases which expire in less than 10 years. They felt confident their leases would be renewed.

No other significant correlations were detected between economic factors and the decision to control breed (table 9).

Table 9. Results of Pearson Correlations of economic/business aspects of resource dependency with the decision to control breed

Economic Aspects of resource dependency including business approach	P value Significant at p <=.05
Other properties/business plan	.290
Financial need	.029*
Business size	.529
Lease conditions	.196
Worried about debt levels	.678
Additional properties	.197
Review or refer to management plan	.418
Long term management plan	.250

4.7.3 The influence of environmental factors on decision making

The environmental factors of resource dependency were tested against the decision to control breed and no significant correlations were detected (table 10). Qualitative results suggested some graziers do not practice controlled breeding due to having too much 'poison country' which is land that is extensively covered in heartleaf bush (*Gastrolobium grandiflorum*. DPI, 2007) which is toxic to cattle or having rivers running through the property making it unviable to fence and finding no need to change.

Table 10 Correlations of environmental aspects of resource dependency with the decision to control breed

Environmental aspects of resource dependency	***P value Significant at p <=.05***
Years lived on property	.835
Generation on the land	.427
Distance to vet or shops	.209
Does isolation prohibit attendance at Landcare	.332

4.7.4 The influence of targeted media on decision making

The group that chose to control breed trusted the information more than the graziers who did not control breed. In total 68% of graziers did trust the information yet 32% of the survey sample felt that they did not trust the information received. When discussing the trial phase that graziers have with a new practice or technology, some 35% agreed that they use a trial period and others (56%) said they did not as they had already researched the proposed item well enough to know it would work for them on their property. Despite this sixteen graziers (61%) said it was important for them to see someone else trial the practice first. There was little difference between the two groups of graziers.

Many of those who control breed (64%) were not happy with the information received on the variety of issues that were a concern to them on their property in contrast to those who do not control breed (75%) who were mostly happy.

Field and industry days were the most utilized types of training by graziers within the survey sample, there were little differences between the groups of breeders. However the group who control breeds attended more training overall than the non controlled breeders group.

Table 11 Results of correlation between communication factors and the decision to control breed

Communication strategies	*P value *Significant at <=.05*
Happy with quality and quantity of information received on issues of concern to me on my property	.199
Reasons why decision made to control breed or not	.018*
Preferred ways to receive info in future Website	.225
-Brochures	.473
-Extension	.281
-Email	.629
Degree of contact with extension officers	.870
Information received in the past from industry has impacted on decision making	.981
Trust information	.697
Read information	.253
Comfortable contacting government for information	.431
Information accurate and specific for my needs	.567
Relevance of information for my situation	.214
Information easy to access	.643
Interested in receiving information in the future	.461
Government important as means of information about new practices or technologies	.121

4.7.5 Discussion of results

The graziers in this sample are receptive to change. Though it may not happen quickly, the information does flow from key community members along to others. There are definitely members of the community who actively seek out new information and research it well, while others wait to see how it works on someone else's property before making a decision to adopt or not adopt it themselves. Rogers diffusion model does not appear accurate in its ability to describe how innovations are diffused as what he terms as laggards may be early adopters who are putting the infrastructure in place to allow them to adopt the new practice at a later date, but that it takes time.

Graziers feel that the best ways for them to receive information is from an extension officer or by brochures. They realize that it is a costly process to have extension officers available but consider it money well spent as opposed to the amount of paper information that goes to waste. They currently receive information on sheep farming and other such irrelevant issues. Most participants were interested in receiving information in the future and like to hear about a new idea. This indicates that new information is welcome and they are receptive to new ideas and change. A significant finding from this study is that a new practice or technology has an increased likelihood of adoption if the financial benefits are clearly outlined at the beginning (Beswell et al, 2007). Results from this study also show that Landcare is important to many graziers, which this is consistent with other research (Curtis and Byron, 2002).

It may be helpful in the future to attempt to engage all stakeholders including the more reticent or isolated graziers; as the benefits of full community engagement (particularly in the early stages) will affect and benefit all members of the community (Andrews, 2003). If only the more active community members or network leaders are targeted it will take much longer for information to flow

through to each and every person and for the new practice or technology to take effect. Therefore it is essential from the beginning to be inclusive (Hammer, 2004. Lynch *et al*, 2000).

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The formal avenues for seeking information from federal government were seldomly used and then on a needs only basis, whereas the local senior QDPI&F officer was on familiar terms with most graziers and they felt comfortable contacting him with any issues or concerns. Most graziers did not regard him as a formal avenue of information as they had a good rapport with him. Many comments illustrated how important it is for graziers to have the local contact and feel that the person they speak to actually can relate to the graziers circumstances. It is a matter of concern that there is such strong reliance on the local DPI representative as if he was no longer able to act in that position then that particular avenue of information is lost for many graziers and it could take many years to rebuild such a connection with a new representative.

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Distance did not seem to be a mitigating factor although there were more graziers in the group who does controlled breeding that lived closer to amenities than the other group however the results were not conclusive enough in this sample size.

5 Success in achieving objectives

The first objective of the study was to describe the context of controlled breeding in the region. Whilst the sample size used in this study was small, results were still able to capture diversity within the industry and diversity in the way controlled breeding is practiced. One of the key learnings associated with this objective is that graziers have interpreted the practice to suit their own needs. That is, the practice may be appealing to many graziers because it is not overly prescriptive, and graziers have the opportunity to exercise their own judgements in applying it to their own social, economic and environmental circumstances.

The second objective of the study was to describe and quantify the circumstances under which graziers choose, or do not choose, to adopt controlled breeding in terms of (i) available information and (ii) their level of dependency on the grazing resource. Again, whilst the sample size used was very small, it was possible to detect some statistically significant differences between those that practice controlled breeding and those that do not. For example, graziers who are using controlled breeding are more pro-active in their business strategy and herd management techniques and are less likely to be risk averse. Of particular significance is that not all graziers are striving to achieve maximum yield from their herd. Associated with this second objective is the key learning that the practice of controlled breeding has an increased likelihood of adoption if the financial benefits are clearly outlined at the beginning.

It should be noted that a larger sample size could confirm or reject the significance of the findings between the decision to control breed and each aspect of resource dependency and targeted media. Whilst a quantitative approach was used to examine the influence of resource dependency on the decision to control breed, the results are not representative. They serve mostly to qualify that such relationships can exist, even within a small sample.

The third objective was to identify an appropriate method for disseminating information to the grazier community. Several targeted media strategies were investigated and the sample size used prohibits general statements to be made. Nonetheless, observations made during the study enable hopefully useful recommendations to be put forward for consideration.

The current study may be especially useful as a scoping study. If future adoption research was to be conducted in the Upper Burdekin it would be beneficial to use a larger sample size to ascertain how representative patterns are within the general region. Research in other regions and in other primary industries will also further our understanding of how adoption rates might be improved.

This research has provided some indication of what is happening at one point in time. To fully understand a process as complex as the decision-process it may require a monitoring study that measures change through time over an extended period of time. More complicated methods and analyses may also be required that take into account interactions between social, economic and environmental factors. More scoping as to other potentially important influences on the decision to adopt new practices may also be useful.

6 Impact on meat and livestock industry

The study of the social components of natural resource management systems is still in its infancy. Gunderson and Holling (2002) observe that the way resource-users respond to change and reorganise is, “the most neglected and the least understood aspect in conventional resource management and science”. This study represents a minor contribution towards the development of our knowledge of the social components of the grazing industry. Yet, it has potential to inspire a larger commitment to developing new social knowledge.

In the immediate term, the impact of this study on the Meat and Livestock Industry will be to confirm or dispel inclinations or tendencies towards developing the outcomes of the research and considering the recommendations. The recommendations are certainly not novel as they have been promoted elsewhere, but they possibly require creative effort to be implemented.

In the longer term, we believe that with better social knowledge and the implementation of the recommendations from this study will enhance the viability and sustainability of the cattle grazing industry. The recommendations are made with reference to the practice of controlled breeding, but it is highly likely that benefits will also manifest in other ways; for example through the higher adoption of other practices believed to promote longer-term sustainability.

7 Conclusions and recommendations

This research shows that in the Upper Burdekin, many different types of graziers are running cattle properties. Graziers range in the size of their land holdings, their debt levels and in their business/lifestyle orientation. They are making decisions for an array of economic and social reasons. In the context of controlled breeding, graziers appear to be mostly influenced by the local QDPI&F representative, financial circumstances and informal networks.

The implications of this research include:

- that the facilitation of informal networks in the region may encourage opportunities for collaborative learning to encourage graziers to be more strategic and experimental with innovative approaches such as controlled breeding
- extension officers are a very important part of formal networks; where trust and relationship building is nurtured, more influence can be expected
- increasing the relevance and detail of information about new innovations is important. This might be achieved through brochures, and possibly through DVDs
- increasing the strategic skill-set of graziers may give confidence to graziers to see opportunities in new technologies and assist them to effectively manage risk associated with change
- showcasing graziers with different experiences of using a new practice (such as controlled breeding) may inspire other graziers and efficiently disseminate relevant information to them
- the practice of controlled breeding may be appealing to many graziers because it is not overly prescriptive, and graziers have the opportunity to exercise their own judgements in applying it to their own social, economic and environmental circumstances.
- identifying leaders in the area to informally promote the benefits of practices such as controlled breeding

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9 Appendices

9.1 The Survey Instrument

I would like to start by asking you some questions about you and your lifestyle.

1. How many years have you lived on this property?

Less than 10, 10-20 yrs, 21-40yrs, Over 40yrs

2. Have you always lived on the land? *Eg first generation, 2nd generation etc*

3. Would you mind telling me what age bracket are you in?

Under 25, 25-39, 40-55, Over 55

4. What makes you want to stay on the land?

5. Do you plan on being a long term resident of this community? *Yes No*

I would now like to ask you some questions about the decisions you make on your property.

6. Is there a need for you to change operational methods on your property?
Yes No (and why/why not?)

7. Do you have a long term management plan for your property? *Yes No*

8. If yes, approximately how often do you refer to it?

9. Is this the only property you own/run/manage? *Yes No*

10. Can you please tell me how many additional properties you have if any?

11. When does your lease expire?

12. Do your conditions of lease influence your management decisions? *Yes No*

13. Do you think your lease is likely to be renewed? *Yes No*

14. I am worried about the debt levels of my business
Please circle the appropriate answer (if any)

1.Not at all 2.A little 3.Moderately 4.Quite a lot 5.A lot

The following is a list of statements about information you may receive from industry and government organisations. . We would like to know how much you agree with each one. Could you please use the following scale to indicate how much you agree or disagree with each statement:

1 strongly disagree
2 disagree
3 agree
4 strongly agree

If you cannot answer a statement (e.g. if it is irrelevant), then please leave it blank

How strongly do you agree with each of the following statements?

15. I feel it is important to have financial investment in other business types apart from my cattle property?

Strongly disagree 1 2 3 4 Strongly agree

16. Government agencies/industry are important to me as a means of information about new technologies and practices that may be useful in running my property

Strongly disagree 1 2 3 4 Strongly agree

17. I am interested in receiving information about new practices and technologies from government organisations and industry bodies such as the MLA or CSIRO

Strongly disagree 1 2 3 4 Strongly agree

18. I feel that information from the government / industry about ways to improve my business is easy to access?

Strongly disagree 1 2 3 4 Strongly agree

19. I think the information that I receive from the government/industry about new technologies is useful/relevant?

Strongly disagree 1 2 3 4 Strongly agree

20. I feel that the information that I receive from the government/industry is concise and accurate for my specific business life and environmental situation?

Strongly disagree 1 2 3 4 Strongly agree

21. I feel comfortable contacting government/industry representative to find out further information on a particular issue relating to my property?

Strongly disagree 1 2 3 4 Strongly agree

22. I read the information I receive from government and industry agencies

Strongly disagree 1 2 3 4 Strongly agree

23. I trust the information I get from these agencies

Strongly disagree 1 2 3 4 Strongly agree

24. The information I have received from government authorities' or industry organisations in the past has impacted on my decision making

Strongly disagree 1 2 3 4 Strongly agree

25. Can you please describe the amount of contact you have with extension officers?

1.Not enough *2.Almost enough*
3.Enough *4.Too much*

26. What would be the most useful way to receive information from government and/or industry in the future?

Please rate in order of importance	
1. DVD	
2. Email	
3. Website	
4. Brochures	
5. Extension officers	
6. Landcare	
7. Other	

On a scale of 1-4 (1 being for "Least" or "not much" and 4 being "Most" or "very") please indicate your experience

27. How influential are your friends and family members on your decision making about important aspects of your business?

Not much *1* *2* *3* *4* *Very Influential*

28. Is this a close knit community for you?

A little *1* *2* *3* *4* *A Lot*

29. What groups or people do you respect as being knowledgeable in this region in relation to running a property?

30. How regular is your contact with the following as sources of information that you would use in the running of your property?

Eg: Daily Weekly Monthly As needed Not at all

1. Neighbours	
2. State government	
3. Federal government	
4. Local government	
5. Family	

31. Who do you discuss your important business decisions with most?

	Please rate in order of importance
1. Family	
2. Friends	
3. Neighbour	
4. Accountant	
5. DPI	
6. MLA	

7. Other	

I would now like to ask you some questions about the practice of controlled mating/breeding in your cattle herd and management decisions in regard to your cattle.

32. Do you practice controlled breeding/mating in your cattle herd?.....*Yes* *No*

33. Why/Why not?

34. If yes how long do you separate the bulls from the cows for? *Months*

35. If yes, when did you start?

36. Regardless of your decision when did you first hear about it?

37. How long did it take for you to make a decision?

38. Can you remember what the motivating factor was for you to change or not?

39. Were you happy with the decision?

No *1……2……3……4* *Yes*

40. How long did it take for you to be happy with the decision?.....

41. How did you hear about controlled breeding originally?.....
Please circle the appropriate answer (if any)

Friends *Government* *DPI* *Book* *Television* *Internet* *Other*

42. Do you know many other graziers that use this method?..... *Yes* *No*

43. Was there a financial need for you to change to this method?

No *1……2……3……4* *Yes*

44. If so, has it helped financially?

No *1……2……3……4* *Yes*

45. Do you Preg test all your breeders, or just sale cows? …….*All* *Yes* *No*
.....Sale *Yes* *No*

46. How long have you been doing this?..... *Years*

47. How did you learn?.....*Course* *Friends* *Ag college*

48. How accurate do you think you are? ……. *%*

49. Can you tell the age of the foetus?..... *Weeks*

If yes is it only after a certain age you can tell? And what age is that?
50. Do you separate the cows by stage of pregnancy? *Yes* *No*

51. How old are your cows when you cull them?

52. What age are your calves when you wean them?..... *Months*

53. When is the preferred time of year for your calves to be born?

54. How long is the calving season on your property? *Months*

55. What age do your heifers start breeding? *Years*

56. Do you know your calving % in advance ……*Yes* *No*

57. What is the approximate calf mortality rate on this property? *%*

58. Do you breed from all your heifers or select the ones with optimum growth, temperament and condition?

59. How many years do you keep your bulls for? …….. *Years*

60. Current information shows that these are some of the main markets for beef cattle; can you please indicate which ones you use?

Australia *United States* *Japan* *Korea* *TaiwanOther*

This next section has some questions about your environment and training which you might have done. This might help me understand the importance of your physical, social and political landscape in making important business decisions.

61. What sort of issues are of a concern to you on your property? If any.

	Please rate in order of importance (1 being most important to you)
1. Environmental	
2. Government intervention, Red tape	
3. Leasehold issues	
4. Intensive breeding	
5. Fencing	
6. Succession planning	
7. Profits	
8. Labour shortage	
9. Regrowth in cleared areas	
10.Weeds	
11.Other	

62. I am happy with the quality and quantity of information I receive about how to deal with these issues?

Strongly disagree 1 2 3 4 Strongly agree

63. Do you feel that your land management and animal management habits have changed much from your fathers or the previous generation? If so in what ways?

64. Have you attended any training courses within your industry? *Yes No*

65. What type? Field days Industry courses Ag college?

66. What do you consider the most important issue that industry should be concentrating on to help people like you on the land?

67. When trialing a new practice or technique do you have a trial phase and if so how do you decide on how long to trial it for?

Using the same scales as earlier on….

68. I am confident doing what I do and like trying new practices/technologies that may benefit me and my business

Strongly disagree 1 2 3 4 Strongly agree

69. How important is it for you to see someone else trial a new method first before you try?

A little 1 2 3 4 A Lot

70. When thinking of incorporating a new practice such as breeding techniques, pest management etc. these may be some of the barriers to change. Can you please list the following in order of importance. (if applicable)

	In order of importance
1. Financial	
2. Confidence	
3.Need	
4.Experimental	
5.Thinking of the future	
6.Other	

71. To what extent does your location (isolation) prohibit you from attending Landcare or field days etc?

A little `1 2 3 4 A Lot

72. How far are you from your nearest vet? Shops? *Kms*

Thankyou so much, I really appreciate the time you have taken to answer these questions. I can send you a summary of the results if you are interested when I have compiled them all.(mid 2008)