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Department of **Employment, Economic Development and Innovation**

CQ BEEF

Better Economic and Environmental Futures

CQ Issue 10 DEC 2010

Economic evaluation of forage options for central Queensland

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The first phase of a project co-funded by DEEDI and Meat and Livestock Australia (MLA) has just been completed to examine the relative profitability of alternative forage options for finishing cattle in the Fitzroy River catchment area. The project, called 'High-output forage systems for meeting beef markets', was a 12-month study designed to review, collate and document best-practice agronomic information and animal performance data for high-quality (or 'high-output') forages and to conduct a detailed economic analysis of forage options for selected locations in the Fitzroy River catchment. The objective of the project was to provide better information to beef producers to support decision making about how best to utilise the cropping country that they have allocated to forage production. This information has been presented in a guide for producers called *Using high quality forages to meet beef markets in the Fitzroy River catchment.*

As part of the study, detailed economic analyses were conducted for three case study sites across the target region of the Fitzroy River catchment: Site 1: South Queensland Brigalow (Taroom-Wandoan area), site 2: Central Queensland Brigalow (Bauhinia-Theodore area) and site 3: Central Queensland Open Downs (Capella area). Six forage types were evaluated at each of the sites over a 30-year time period, including the annual forages: oats, sorghum and lablab, the perennial forage systems: butterfly pea-grass and leucaena-grass, and baseline pasture for comparison: buffel grass at sites 1 and 2, and Queensland bluegrass pasture at site 3. These forage options were targeted for analysis due to being the most important forages currently grown and utilised throughout the Fitzroy River catchment. Zero till and cultivation planting methods were compared for each of the sown forages.

In our example analyses, forage preparation and planting costs were based on contract rates. Figures for annual forage crops were adjusted for the proportion of years that conditions were not suitable for sowing (based on climate modelling for each of the regions). In addition, figures for the perennial forages were adjusted for the time-lag in production after planting.

Cattle production from each of the forage types was assessed by comparing the scenario of steers finished to the same target weight (596 kg liveweight; 310 kg carcase weight). The grazing days, stocking rate and daily liveweight gain for each forage at each site were based on an assessment of measured values in both unpublished and published reports and the considered judgment of DEEDI beef research and extension staff. These values are based on the assumption that forages had been grown and grazed using best-practice agronomic management and represent the expected long-term average performance over both good and bad rainfall years.

The economic analyses were conducted using a partial budgeting approach which considers only those costs and benefits directly related to the investment and does not incorporate analysis of alternative methods of funding the investment nor the impact on the whole-farm cash flow. These factors should be taken into consideration in making the final investment decision. In addition, social, environmental and managerial factors may also influence the decision-making process.

To allow comparison of the range of annual and perennial forage systems on the same basis, a discounted cash-flow was constructed over a 30-year period, for each of the forage types to produce a net present value (NPV). The term NPV refers to the net returns (income minus costs) over the life of an investment (in this case forage

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Editorial

Please use the feedback sheet provided to let us know of any topics you would like covered in the newsletter. Alternatively if you know of anybody who would like to receive the newsletter, ask them to fill out their details and return the feedback sheet.

Since our last newsletter most CQ *BEEF* groups have hosted a ProfitProbe results interpretation meeting. During these meetings businesses valued the opportunity of some one on one time with CQ *BEEF's* Project Economist Rebecca Gowen. Rebecca is about to commence a years study leave and will be spending 6 months in her home town of Armidale and six months at a university in Canada to finish her PhD. Rebecca's experience with Probe, Breedcow Dynama and her ability to crunch the numbers on a swag of case studies and projects that are thrown her way will be sorely missed. The best thing about this whole situation is that Rebecca will be back in a year. Shall we begin the countdown!!!

The Middlemount group met in November with VegMachine technology and the High Output Forages (HOF) project being the topics of the day. Our cover page article presents some of the findings from phase one of the HOF project. If you are interested in being a commercial property case study in phase two of the project please contact Maree Bowen or Stuart Buck.

In September the Broadsound group undertook a study tour to properties at Bowen and Homebush to concentrate on reproductive and animal performance in coastal country. October saw the Biloela group host a Managing Woody Weeds field day and the Billaboo group involved in a Planning grazing management for the wet season field day. The Moura group looked into Sally wattle and limebush management in November while the Bajool group also met in October to discuss their annual business reviews. Members of the Bajool group have also taken steps towards obtaining certificates in land management or agriculture through recognized prior learning.

A group of producers in the Clarke Creek region have formed to be involved in the Climate Clever Beef (CCB) Project. The purpose of the CCB project is to demonstrate climate change adaptation and mitigation technologies through on farm case studies. The Clarke Creek group are investigating soil carbon and soil microbiology. Seven businesses are involved and each business will undertake soil tests on different management strategies on the same soil type. You can look forward to reading the results from these tests in the newsletter next year. The group have commenced data collection and recently hosted a *Stocktake* refresher day.

Joe O'Reagain from FBA interviewed the Smith family from the Biloela CQ *BEEF* group for this edition's Producer Profile. The Smith family have been involved with the project since inception.

We are also excited to announce plans for a CQ *BEEF* forum next year. We are looking for producers to sit on a steering committee and drive the process, If you are interested please let one of the team know. The event will be an opportunity to share the activities and outcomes of CQ *BEEF* with the wider industry and for groups to interact with each other.

CQ *BEEF* staff would like to wish you all a very Merry Christmas, prosperous new year (we have certainly had a good start to the season). We would also like to thank you all for being such positive proactive people to work with, our jobs would be a whole lot less inspiring if you weren't.

Byrony Daniels, CQ *BEEF editor*

systems), expressed in present day times. The NPV methodology takes into account the 'time value of money' which means that money received now is worth more than the same amount of money received in the future. The investment with the highest NPV is preferred.

The animal and economic performance of the forage types at the Central Queensland Brigalow and Open Downs sites is shown in tables 1 and 2, respectively. Forage sorghum and the perennial legume grass pastures; leucaena-grass and butterfly pea-grass were the best performing forages.

Using the zero till method of fallow weed control produced higher returns than using cultivation for all forages grown at each of the three sites due to the relatively higher operating cost of machinery required for the cultivation systems. However, this result is highly dependent on the assumed chemical, fertiliser and fuel prices, the variations of which were not included in this analysis. The ranking of forages for NPV differed between zero till and cultivation methods of fallow weed control due to differences in planting costs between the systems.

It is important to note that the relative ranking of forages within a site differed for modelled animal production (kg/ha/yr) and economic performance in terms of NPV. The liveweight production figures (kg/ha/yr) were indicative of the average production for that forage type for years in which the forage was planted and were not adjusted for the percentage of years with unsuitable conditions for planting or for the time-lag in production after planting the perennial legume–grass forage systems. Both of these aspects were accounted for in the economic modelling, producing a more accurate ranking of forages in terms of overall performance. Other factors that were taken into account in the economic analysis and contributed to differences in ranking of forages for NPV vs. animal performance include differences between

forages in:

- planting costs (e.g. annuals incur planting costs every year but perennials less regularly)
- seed, fertiliser and chemical costs
- animal health treatments (e.g. 5-in-1 vaccinations for oats and rumen fluid inoculum for leucaena–grass pasture)
- grazing days, which affects purchase price when animals are finished to the same finishing weight as in our examples (e.g. less grazing days means buying animals that are heavier and thus more expensive).

A spreadsheet calculator, *ForageCalc*, has been produced to allow producers to calculate their own estimates based on production and input figures relevant to their business.

In a proposed Phase 2 of this project, set to commence in January 2011, it is intended to gather objective data from commercial property case study sites to benchmark production systems and to validate the results from the desk-top study. Whole farm economic analyses will also be conducted provide a better understanding of the factors influencing the relative whole-farm profitability of high-output forage options.

Key points

- **It is important to consider economic performance as well as agronomic and livestock performance when comparing forage options as the ranking of forages may differ for each aspect.**
- **There is a wide range in the profitability of annual and perennial forage options in CQ.**
- **A new guide has been produced, called *Using high quality forages to meet beef markets in the Fitzroy River catchment*, which includes information on best-practice agronomic and grazing management, expected forage nutrient content and animal performance as well as economic analyses for example scenarios. Contact one of the authors or your local CQ *BEEF* officer to obtain a copy of the CD.**
- **A spreadsheet calculator, called ForageCalc, is also available on the CD and allows producers to calculate their own forage partial budgets.**

Definition of terms and calculations in tables below

[A] Net present value is the sum of discounted values of future income and costs associated with an investment.

[B] Liveweight production figures not adjusted for the percentage of years with unsuitable conditions for sowing oats and lablab or for the time-lag in production after planting the perennial legume-grass forage systems. Note that the economic figures have been adjusted to account for these factors.

[C] Liveweight gain (kg/ha/year) of perennial pastures was calculated using a stocking rate of actual animals/hectare determined from stocking rate in AE/ha, at the liveweight of steers at the half-way point. AE (adult equivalents) = 450 kg, non-lactating beast.

[D] Liveweight gain (kg/ha/year) of oats and lablab is the production from total area, including access to grass pasture as 10% of the total grazing area.

Table 1. Central Queensland Brigalow: comparison of cattle production and net present valueA (NPV) for key forage options over a 30-year period

	Forage					
	Baseline pasture (buffel)	Oats	Forage sorghum	Lablab	Butterfly pea–grass	Leucaena–grass
NPV ($/ha)						
Zero till	$679	$728	$2444	$799	$1184	$2131
Cultivation	$679	$172	$1478	–$167	$964	$2017
Liveweight gain (kg/ha/year)[B]	58[C]	147[D]	185	157[D]	104[C]	138[C]
Liveweight gain (kg/head/day)	0.43	1.1	0.6	0.8	0.6	0.9
Stocking rate (AE/ha)	0.33	1.8[D]	3.0	2.3[D]	0.8	0.6
Grazing days (days/year)	365	83	120	100	250	270

Table 2. Central Queensland Open Downs: comparison of cattle production and net present valueA (NPV) for key forage options over a 30-year period

	Baseline pasture (native)	Oats	Forage sorghum	Lablab	Butterfly pea–grass	Leucaena–grass
NPV ($/ha)						
Zero till	$285	–$468	$899	$387	$1497	$1581
Cultivation	$285	–$683	$397	–$509	$1282	$1417
Liveweight gain (kg/ha/year)[B]	26[C]	145[D]	203	157[D]	124[C]	138[C]
Liveweight gain (kg/head/day)	0.38	1.1	0.6	0.8	0.65	0.9
Stocking rate (AE/ha)	0.17	2.0[D]	3.0	2.3[D]	0.8	0.6
Grazing days (days/year)	365	76	130	100	270	270

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Emerging Precision Livestock Management technologies

Introduction

Precision Livestock Management (PLM) has been described as 'emerging technology applications with the potential to improve the efficiency and cost effectiveness of individual animal or herd measurement, monitoring, movement and management.' This definition is far reaching and covers technologies ranging from a crush side reader through to virtual fencing. However at the heart of PLM is the recognition that new and more detailed information of how livestock are performing has the potential to enable improved management intervention strategies and in some cases the intervention might include automated decision-making.

At the first Australia and New Zealand Spatially Enabled Livestock Management Symposium held at the University of New England in July 2010, a group of scientists got together to discuss opportunities for PLM technologies. Presenters provided some exciting insight into future opportunities. Whilst individual presenters talked about specific technologies there were also some common themes and messages. Integration of technologies can add value to an application and multiple data sources enable greater precision. There is a range of examples of specific technologies but they all fall into one of four main categories, off-animal monitoring, off-animal control, on-animal monitoring and on-animal control. Throughout the presentations at the symposium the extent to which individual technologies were ready to be used in industry also became clear.

Off-animal monitoring

The PLM technologies for monitoring animals in the yards are the most developed and have had the greatest industry uptake and use. The introduction of the National Livestock Information System (NLIS) using radio frequency identification (RFID) equipment has provided the opportunity for producers to monitor cattle as they move through a crush or race. While the livestock have an electronic ID (microchip) integrated into an ear-tag this tag is essentially a passive device and requires a reader to energise it and enable the unique ID number to be read. The reader processes all of the data and information that is used for PLM. Producers that have installed readers use them to improve and automate crush side data collection and record keeping.

A recent extension and development of the RFID tag is the development of a self-powered radio transmitter tag. Taggle (www.taggle.com.au), a radio tag company specialised in low cost tag solutions, has developed radio-tag capability. The Taggle system is able to provide near real time geo-referenced positional information. The Taggle ear tag emits a signal at a set time interval ranging from five minutes to an hour. This signal is picked up by a minimum three base stations and the minute time differences that each station receives the signal are logged and transmitted to a server. Software is used to calculate the position of the tag based on the time difference and Taggle claim they can achieve a spatial accuracy of between 5–15 metres.

This capability is still undergoing testing and evaluation and the full range of applications is not yet mapped out but it does provide an exciting opportunity for applications that require livestock location information. Uses currently being investigated include the tracking of stock in order to know about livestock theft or cattle straying. Taggle have a trial site at Tedlands Station, Koumala (south of Mackay), which has been running as a pilot study for 6 months. The study is partially funded by Reef Rescue, through the Reef Catchments natural resource management group and currently 120 head are tagged up with Taggle tags. Tags are 'pinging' (sending information to the base stations) every 15 minutes and the area covered is approximately 50 km^2. Some of the information gleaned so far is the time in different land types i.e. riparian zones and tracking when cattle 'escape' from their grazing area and into cane growing areas.

Taggle is working with MLA on a project to investigate the development of a calving-alert system. Although the project is not pitched at commercial beef producers, the technology will have tangible benefit for researchers examining reasons for calf losses, which can hopefully be used to generate new knowledge and solutions to neo-natal calf losses.

Off-animal control

Off-animal control is a progression of automated monitoring with the added capability that the system is programmed to make automated decisions. The technology that is most advanced in this area is the development of automated walk cver weighing (WOW). Recording the live-weight of an animal as it crosses a weigh cell and comparing the live-weight with previous records can be used to automatically draft the animal if it meets a predetermined growth rate or live-weight specification.

Producers that are able to control water points and force animals to routinely walk down a race and across a weigh cell can implement WOW to deliver PLM outcomes. For example, drafting animals that reach market specification or a system for automatically weaning calves over a certain

Animal tagged with a Taggle radio tag

weight. While the technology has developed very rapidly and shows significant promise there are challenges in determining accurate live-weight measurements. These systems rely on a single animal standing still on the weigh cell for a long-enough period to get an accurate weight. The Sheep CRC and Desert Knowledge CRC have been progressing and working with producers to refine the walk over weighing technology.

Commercial use of the WOW technology is being driven by large-scale cattle operations in northern Australia. Precision Pastoral Pty Ltd (www.precisionpastoral.com.au) is the company leading the way in WOW technology. Commercial systems are in use where cattle are scanned as they proceed through a spear trap and over liveweight scales, weaners are drafted off when they fall within a weight range and calves are returned to their mothers.

On-animal monitoring

On-animal monitoring is routinely used by researchers but the technology platforms are currently too dear for commercial use. Perhaps the most interesting on-animal monitoring capability that is being developed and used by researchers is the use of radio transceiver technology to monitor social interactions of cattle and sheep. These radio devices log and store information about the time of day and duration of all close proximity (less than 4 m) encounters that an individual animal has throughout the day. These data have been used to explore variations in mothering up for cattle and sheep, to explore bull cow interactions at joining, to identify issues associated with reproduction such as a bull with low libido or a cow that keeps returning to oestrus and to ascertain parentage of the dam and progeny.

The use of GPS tracking devices is providing useful information about how animals use the landscape. While GPS data is both interesting and valuable there are some serious limitations to its practical uptake. The battery power requirements for a GPS receiver limit long-term deployments and the cost of the technology is too much for most commercial applications. Due to the power requirements GPS receivers are large and require collars with battery packs to be fitted to an animal rather than simply being an ear tag.

On-animal control

On-animal control is restricted to virtual fencing. Virtual fencing relies on monitoring the movement and location of animals in the landscape and then using a combination of audio and electrical controls to prevent them accessing certain areas of the paddock. The controls are automatically activated based on location information. The movement of the animal is continuously monitored with a cut-off capability activated if the animal shows signs of stress or has an adverse response to the automated controls. The virtual fencing system relies on the principles of associative learning such that the animals learn to avoid the aversive stimuli and avoid areas in a paddock that have been identified as not to be grazed. While virtual fencing appears to provide some real opportunities for PLM, the technology that has currently been developed is still research grade and the cost of the devices is neither practical nor economically viable. However, the technology will offer the greatest potential in large open paddocks, which have low stocking rates and high per animal fencing costs.

Cattle proceeding through a WOW system with their identity read, weight recorded and drafted accordingly.

Conclusions

NLIS has had its fair share of detractors. Arguments supporting NLIS have focussed on the benefits associated with enhanced traceability and the links with food security that is required to maintain export markets. However there are a number of people that question the benefits of traceability in maintaining international markets. Management benefits from using NLIS have focussed on issues related to the high cost of implementing the technology and poor tag retention. It is clear that NLIS has heralded the start of a major innovation change for livestock producers. A range of PLM technologies are starting to emerge. Precision Livestock Management has the capacity to revolutionise the livestock industry but producers need to actively engage in a critical evaluation of the technologies to ensure they are developed to meet specific beef industry needs.

We are looking for volunteers to work on a project that aims to involve producers in evaluating and refining PLM tools. If anybody is interested in being involved in this project please contact the authors.

Cattle control using virtual fencing technology

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Evaluating pregnancy testing results

With many herds experiencing a drop in pregnancy rates this year due to very poor seasonal conditions in 2009, it is timely to reflect on how the best use can be made of pregnancy testing and the data collected.

The critical considerations when looking at pregnancy data are;

- What was the pregnancy rate?
- What was the pattern of conceptions over the mating period?
- What does it mean for 2011?
- What does it mean for future business performance?

What was the pregnancy rate?

Pregnancy, branding and weaning rate comparisons are meaningless unless the classes of animals, basis of calculations and the timeframes are properly defined. Branding and weaning rates are traditionally miscalculated usually giving a higher rate. The problem is the time between mating and weaning. A cow that conceived in November 2009 will not wean that calf until April–June 2011. Without good records it is hard to define the number of cows mated to produce the calves in question.

Pregnancy testing occurs closer to mating than branding or weaning and provides an excellent measure of mating performance provided the number of cows mated is accurate and all animals are pregnancy tested. Pregnancy testing provides a good set figures from which losses to branding and weaning can be calculated and consequently overall breeder performance determined. However, the value of the exercise and the data depends on accurate pregnancy testing of all animals. Not testing cows that 'look calfy' produces data of little value, because no one will ever know whether the 'calfy' cows were in fact pregnant.

While the overall conception rate is interesting and useful for calculations of potential sale numbers in future years, it important to know the conception rate and conception pattern of maiden heifers, first calf cows (cows on their second mating) and mature cows. If conception rates are low knowing the conception rate of these three groups can help diagnose the problem.

Table 1. Impact of conception date on calving date, weaner weight and value for 2011 calves based on weaning date of 1/6/11

Joining time (days from start of mating 1/12/09)	Conception date	Calving date	Weaning age (months)	Estimated Weaner weight (kg)[1]	Estimated Weaner value @ $1.90/kg ($)
1	1/12/09	10/9/10	8.8	245	466
60	30/1/10	9/11/10	6.8	197	374
120	31/3/10	8/1/11	4.8	149	283
180	30/5/10	9/3/11	2.8	101	192

[1] Calculated on birth weight of 34 kg and calf growth rate of 0.8 kg/day

Joiner heifers Joiner heifers are the most critical animals in the breeder herd because if they get off to a good start their lifetime performance will be better. If heifers are joined at two years they should be achieving a 90% conception rate in four months. Many well managed herds achieve 90% conception in three months. These heifers need to be managed as a separate group so that they can receive special attention in poor seasons and ensure they have the maximum opportunity to reconceive.

Yearling joining With yearling joining conception rates tend to be lower and more variable. Yearling heifer conception rates on properties participating in the CQ *BEEF* project are in the range 60–85% over four months. With only six to nine months from weaning to mating seasonal conditions have a much greater impact on yearling mated heifers. On tougher country where heifers struggle to achieve good mating weights (300 kg+) a poor maiden conception is often followed by low conceptions as first calf cows.

In deciding whether to yearling mate performance over the first two joinings is important. If a majority of yearling mated heifers' only producer one calf by the time they are three year old there is little economic advantage and the practice should be questioned. On all but the very best country these heifers will need special attention to ensure a satisfactory conception at their second mating.

First calf cows This group usually has the lowest conception rates due to the combined stress of lactation and their requirements for growth. Conceptions rates are generally 10–40% below that of the maiden heifers.

Wet and dry cows In herds with year round mating or where empty cows were retained the previous year there will be dry cows at the pregnancy test. The dry cows have been under far less pressure than those which have raised a calf. Consequently, it is important to record the lactation status of cows at pregnancy test so that the pregnancy rate of wet and dry cows can be assessed separately.

These dry cows should conceive early in the mating season and should be culled if empty.

What was the pattern of conceptions over the mating period?

Of equal importance to the overall pregnancy rate of each group of cows is the conception pattern. The conception pattern of a herd indicates;

- The most fertile cows that is those that conceive early. Where possible replacement heifers should be kept from cows that conceive and calve early.
- A disease or body condition problem. A large percentage of late pregnancies can indicate a disease problem in the herd or that the cows were not in good enough body condition at the start of mating.

Value of early conceptions

The length of the production cycle is a key problem for beef enterprise profitability. No 8 bullocks sold in June this year would have been born September 2007 to January 2008 and were therefore 33 to 29 months at sale. The situation is worse when you consider that on most properties a considerable proportion of No 8s will not be sold until 2011. Your competitors in the protein trade produce a meat chicken in six weeks.

Obviously the aim should be to have as many conceptions as possible early in the mating season (table 1). This means that calves will be older and bigger at any given time of the year and can be the difference between finishing and sale in the current year or having animals held over.

Heifer growth

In maiden heifers the principal cause of delayed conceptions is heifers not being heavy enough at joining. For many years 280 kg was considered the target mating weight for *Bos indicus* heifers but recent research has shown that these animals reach puberty on average at 330 kg.

Weighing maiden heifers at the pregnancy test is useful because it shows how well heifers have grown and if mating weights were high enough. Data in table 2 demonstrates the impact of heifer weights on conception rates.

Table 2. Heifer weights at pregnancy test and conception rates for a north west Queensland property in 1999 and 2002

Year	1999	2002
Pregnancy test date	12/5/99	21/5/99
Average heifer weight (kg)	402	388
Pregnancy rate (%)	91	79

Data recently collected from properties participating in the Billaboo CQ *BEEF* group fertility management PDS shows much lower conception rates in heifers under 360–380 kg at the pregnancy test. These lighter heifers obviously spent much of the joining period reaching puberty and conceived late or failed to conceive.

Heifer weights should be monitored from weaning to ensure they will achieve the target mating weight. This allows early intervention if the heifers growth fall below the desired level.

Breeder body condition

Breeder body condition prior to calving is the major determinant of conception rates. Figure 1 shows how cows in body condition score (BCS) 3 and 4 conceived quicker and achieved higher pregnancy rates than those in BCS 2.

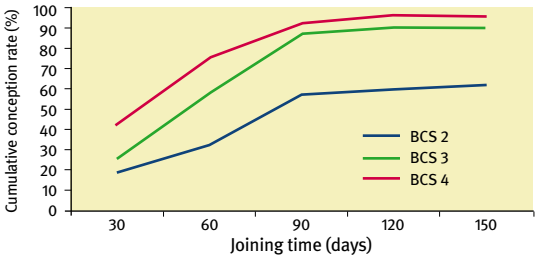

Figure 1. Cumulative conception rates for cows in a range of Body Condition Scores at pregnancy test

Recording BCS at pregnancy test assists evaluation of the results and planning. If there are significant numbers on animals in BCS 2 dry season supplementation should be considered to prevent these animals slipping further. Drafting off these animals at pregnancy test would enable targeted supplementation as cows weaned in BCS 3 or 4 may require no dry season supplementation.

If a large proportion of the breeder herd is in BCS 2 at pregnancy test, it indicates that changes in grazing management and or the timing of weaning are likely to be required to help cows maintain body condition.

Fertility diseases

Delayed conception patterns can arise due to diseases such as vibriosis and trichomoniasis with animals aborting then re-conceiving later in the joining period. Figure 2 shows the delayed conceptions and lower overall conception for a herd in 1998 when vibriosis was detected compared to 1999.

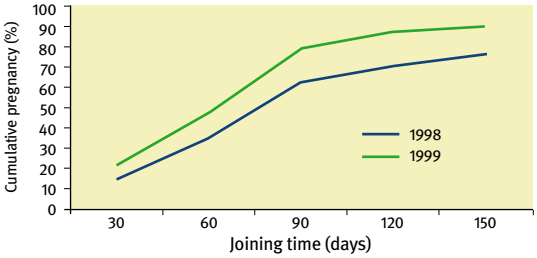

Figure 2. Cumulative conception rates for maiden heifers in 1998 and 1999

What does it mean for 2011?

Good pregnancy testing data enables better planning for the next 12 months. Data from properties participating in the Billaboo CQ *BEEF* group fertility management PDS has been collated into calving summary tables like the example in table 3. Knowing what cows will calve when assists;

Key points

- Pregnancy testing with accurate foetal ageing is critical for assessing reproductive performance.
- Body condition scoring provides valuable data for managing weaning, grazing strategies and supplementation.
- Pregnancy test data allows better planning of grazing management, weaning and cull cow turnoff for the next 12 months.
- The forward planning of weaning and turnoff which pregnancy test data enables is critical for business planning and financial management.

- Grazing management
- Planning branding
- Planning weaning to manage cow body condition.

It also identifies the likely number of cows which will have lost their pregnancy or calf and can be drafted off at branding for sale. These animals are usually in good condition and as well as generating cash flow early in the year their sale will reduce the stocking rate for the latter part of the growing season by 5–10% with no impact on future herd performance.

What does it mean for future business performance?

Collecting and utilizing pregnancy test data puts businesses in a much better position with financiers for whom the reliability of future cash flow is a critical consideration. In most central Queensland Jap Ox enterprises the 2011 steers will be turned off in 2013. Knowing in 2010 how many will be available is a valuable starting point for planning future cash flow. If turnoff numbers are going to be down, there is time to identify opportunities to fill the gap. This type of planning is even more critical in herds with a younger turnoff as there is less time to fill income gaps.

In many herds, there is considerable opportunity to tighten the calving period and increase the selection for fertility by culling the 5–10% of animals which conceive in the last month of the joining. Joiner heifers are an excellent group to implement this approach with as the late calvers are less fertile and the animals most likely to have trouble re-conceiving as a first calf cow.

Table 3. Estimated 2005 calving data for Swans Lagoon CRC Brahman cows

Pregnancy test date	1 June 2004
Gestation length (days)	290
Estimated breeder mortality (%)	1
Estimated foetal & calf losses (%)	6
Mean birth weight (kg)	31
Mean calf growth rate (kg/hd/day)	0.8

Estimated cow numbers at weaning	No	%
Wet cows	240	94
Dry cows (lost calf)	15	6
Total cows	**255**	**100**
Estimated cow deaths	3	

Estimated cow and calf numbers, losses, calving dates and calf ages at 30/5/05

Pregnancy status (months)	No of cows	Calving date	Calf numbers	Age of calves (days)	Age of calves (months)	Mean calf weight (kg)
2	5	17 Jan 2005	5	133	4.4	137
2.5	21	2 Jan 2005	20	148	4.9	149
3	36	18 Dec 2004	34	163	5.4	161
3.5	97	3 Dec 2004	90	178	5.9	173
4	69	18 Nov 2004	64	193	6.4	185
4.5	30	3 Nov 2004	28	208	6.9	197
Total	**258**		**240**			**175**

Paul Jones
DEEDI, Emerald

Northern Grazing Systems project in the Fitzroy Basin

Overview

The NGS approach is about identification and promotion of practical and cost-effective grazing land management practices for improving productivity, land condition and risk management in relation to climate variability and climate change for nine regions across northern Australia – Fitzroy, Burdekin, Maranoa, Mitchell grass, southern gulf in Queensland; Barkly Tablelands, VRD and Katherine region in NT; and the Kimberley in WA.

MLA, through a review of previous research and development projects, has identified the priority areas of infrastructure development (fencing,

Key points

- A technical guide on pasture spelling, stocking rate management, infrastructure development and burning has been developed
- An information day on-property woith practical examples of the recommendations is planned for early 2011
- A defined information need on spelling strategies to improve land condition has led to new research on this topic
- We will continue to identify and evaluate increasing adoption of best practice grazing land management

waters), stocking rate management, pasture spelling, and prescribed burning. The benefits and costs of these have been demonstrated at various field research sites. However, MLA is unable to predict how manipulating these practices will affect productivity and land condition. In addition, the economic and practical implications at an enterprise scale are often unclear. This situation is also making it difficult to identify the specific research needs.

A scientific review of all information relevant to grazing land management in northern Australia has been completed. The NGS initiative has integrated the key findings from previous research, current bio-economic modelling and beef producer experience to produce a technical guide on best management practice options (BMPOs) for each region. NGS will now roll out this information, support extension activities that encourage uptake of these practices, and commission research to address priority knowledge gaps.

Fitzroy region activities

For the Fitzroy region BMPOs were developed for the strategies – spelling, stocking rate, fire and infrastructure development. Representatives from the grazing industry, catchment groups, DEEDI, DERM, CSIRO and MLA participated in two workshops to progress BMPOs for the Fitzroy woodlands.

Similar workshops across northern Australia have revealed the major issues for the grazing industry are;

- Matching pasture supply to animal demand
- Poor pasture condition
- Woody plant problems
- Ungrazed areas distant from water.

Two representative hypothetical properties were developed for the modelling exercises. The properties were located at Anakie and Duaringa and all the resources and management associated with running those properties were documented. Modelling of varying stocking rates, spelling and burning management regimes generated land resource and economic outcomes. BMPOs were developed for the strategies – spelling, burning, stocking rate and infrastructure development. A draft document on Regional Grazing Management Guidelines in the Fitzroy has been produced which reviews the BMPOs in relation to the major issues above.

Also at the second workshop, information was presented on climate trends and likely climate challenges for the Fitzroy Basin. Vulnerability of the industry and adaptation options were discussed. This information was used to refine the BMPOs. A final discussion session was held on the sorts of projects for Phase 2 that should be implemented, from the information presented.

Important practices identified

Participants thought one BMP that is commonly practiced and should be recommended is conservative stocking rates without increases in numbers during good years. Numbers are reduced during dry seasons so that grazing pressure does not become too high. This is a low risk strategy with many practical advantages, especially for breeding herds. If the stocking rate is wrong, more damage will be done than can be offset by the benefits of spelling.

An understanding of the interactions to achieve benefits from wet season spelling was thought to be lacking and more research work needed. Decreasing land condition in buffel grass areas and the role of spelling is also important. Despite this, participants acknowledged that spelling should always be considered a net long term benefit. The short term loss of grazing days should not be thought of as a negative. However, the practicalities of spelling need to be considered, and if the grazing pressure on other paddocks is too high, then there is no net benefit.

Demanding legislative requirements are limiting the amount of burning being practiced. Benefits of repeated burns in the long term are probably not recognised as most graziers make observations on the basis of one-off burns. Animal production responses from burning for green pick are variable and still not well understood.

Good pasture yield at the end of the growing season was identified as critical and particularly for the less productive land types.

Information requirements

The next phase of the project is developing extension tools and activities.

More information is needed on the use of fire, duration, timing and frequency of spelling, spelling regimes for buffel grass, maintenance and improvement of land condition.

A producer demonstration site or case study on fire, spelling and stocking rate management, linking with other projects was thought to be important.

Peggy Rohan
DEEDI, Emerald

Days to calving – a tool to improve herd fertility

Herd fertility is the major driver of profitability in breeding enterprises. In general, more calves equals more money, therefore we want our breeders to be delivering one calf per year from her first mating. Nutrition, weight and body condition score are important factors to consider when joining your females as they play a critical role in cow and heifer performance. The genetic makeup of a cow or heifer also has a significant impact on her ability to conceive, and more specifically, on the time it takes for her to conceive once the bull goes into the paddock. An effective measurement of that length of time is the days to calving (DC) estimated breeding value (EBV).

The DC EBV is an estimate of the genetic difference between animals in the length of time from the start of the joining period until calving (see figure 1 below). It identifies animals that are more likely to conceive at the beginning of the mating period. A lower or more negative DC EBV is generally more favorable.

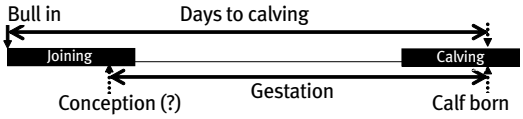

Figure 1. Days to calving is the time between the start of joining and the date of calving

DC should not be confused with the length of gestation. The gestation length EBV provides an estimate of the genetic difference between animals from conception to calving and is commonly recorded for calves conceived by either AI or hand mating as it requires the exact date of conception. The DC EBV is currently only calculated for natural joinings where the actual date of conception is usually unknown.

So what does the DC EBV mean for your herd? Females with a lower DC EBV are more likely to go into calf earlier in the joining period, which means that they calve earlier than their peers, the calves are smaller and less prone to causing dystocia and they also have more growing time in the lead up to weaning. The DC EBV is heritable so bulls pass the trait onto their daughters. A bull with a DC EBV of – 5 days would be expected to produce daughters that conceive earlier in the joining period than the daughters of a bull with a DC EBV of + 5. Females with shorter DC EBVs also tend to reach puberty at an earlier age and are more likely to return to oestrus sooner after calving thereby increasing their chance of producing a calf every year.

Figure 2 shows a breeding calendar with a four

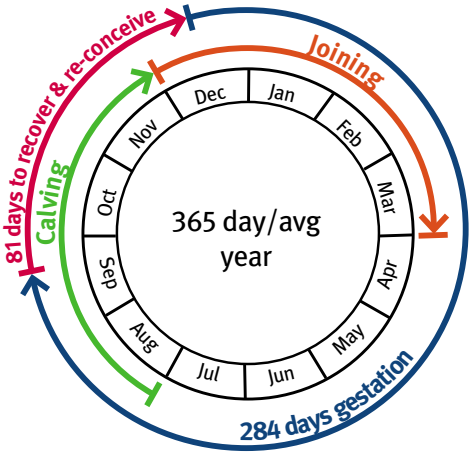

Figure 2. Breeding calendar

month joining period resulting in a four month calving period. The average length of gestation for a cow is 284 days. Assuming that a cow conceives at the start of the joining period in December, she will then calve out roughly 284 days later, leaving her 81 days to recover and start cycling again in order to go back into calf at the start of the next joining period. A shy breeder might not conceive until March meaning that she will have her calf in November and have less than a month before the bull goes back into the herd. Two thirds of heifers won't conceive until their second cycle (each cycle is 21 days long) therefore each year a shy breeder will conceive later and later in the joining period until she fails to conceive one year and is therefore not doing her job and consequently costing you money.

Results from Beef CRC work with Brahman herds have shown that significant economic gains can be made by selecting bulls with superior genetics for reproductive traits such as days to calving. The 50 bulls used in the project had DC EBVs ranging from -12.9 to +16.6. Daughters of the bull with the lowest EBV would be expected to calve 15 days sooner than those of the bull with the high EBV.

The project also found that the age of puberty in heifers (determined via regular ovarian scanning to detect the age at first Corpus Luteum) is strongly genetically correlated with both days to calving and calving success following first joining of heifers at approximately 25 months of age.

If breeding is your main enterprise then keep in mind both the genetic and environmental factors that affect the fertility and productivity of your herd. A combination of selecting low DC EBV bulls and a stringent culling program for non-productive cows will enhance the reproductive performance (and therefore profitability) of your herd, but remember to also keep a balance between selection for reproductive traits and selection for growth traits in order to meet your market targets.

Key points

- Using days to calving EBVs when selecting bulls can improve profitability in a breeding enterprise
- A lower (or more negative) DC EBV is better
- Females conceive earlier in joining period
- Calves are born sooner and there is a smaller spread in birth dates

Responsible management of leucaena

Duncan Swan
DEEDI, Emerald

Many graziers in central Queensland are turning to leucaena as an option to increase production and improve land condition. With these benefits come risk, and the main risk is of leucaena becoming a widespread weed.

Leucaena as a weed

As leucaena becomes more popular in central Queensland, so does the risk of it escaping and becoming weedy. Leucaena is a recognised weed and readily establishes outside of managed crops, particularly in areas of disturbance such as riparian areas. Leucaena is a significant environmental pest, establishing dense thickets which reduce biodiversity. Leucaena is also a significant pest of infrastructure, primarily along roadsides.

Weedy leucaena is usually associated with *Leucaena leucocephala* subspecies *leucocephala*. This subspecies was introduced in the 1920s and has now become an established pest in coastal and subcoastal areas from the Torres Strait to northern New South Wales. The subspecies currently being planted, *Leucaena leucocephala* ssp. *glabrata*, has the same weed potential as *leucocephala*, and weedy infestations have been recorded throughout Queensland.

Councils are increasingly being required to actively control leucaena on roadsides, and many of the new infestations are adjacent to cultivated leucaena. It is vital for landholders to ensure they are actively managing their leucaena to prevent the establishment of weedy infestations.

Code of practice

The Leucaena Network has a code of practice for managing leucaena to prevent weed establishment. The code of practice outlines actions that can be taken, and includes:

- keeping leucaena plantings away from watercourses and flood areas to prevent seed dispersal;
- maintaining a buffer between leucaena plantings and boundary fences and watercourses;
- maintain strong grass pasture cover in these buffer areas to prevent leucaena seed germination; and
- controlling all leucaena plants that germinate outside of the managed cultivation, including the buffer areas and on roadsides and watercourses.

Refer to the Leucaena Network for more information on the code of practice. It can be found online at: http://www.leucaena.net/codeofconduct.pdf

Control options

Control options for managing leucaena are limited. Only one herbicide is registered for leucaena control. Read the label carefully before use and always use the herbicide in accordance with label.

Method	Herbicide	Rate
Basal bark	triclopyr (240 g/L) + picloram (120 g/L) e.g. Access®	1 L per 60 L diesel (for plants with stem diameter <5 cm)
Cut stump	triclopyr (240 g/L) + picloram (120 g/L)	1 L per 60 L diesel

Mechanical control is also effective, but the roots must either be dug out or cut off deeply by a blade plough.

Leucaena is a valuable fodder crop, and provides significant benefit to the beef industry. It is the responsibility of every landholder with leucaena to manage it responsibly. I encourage everyone in the industry to prevent weed establishment and protect leucaena's production values.

For more information, please visit the Biosecurity Queensland website at: www.dpi.qld.gov.au/biosecurity and the Leucaena Network at: www.leucaena.net, or contact your local council Rural Lands Officer.

Roadside leucaena infestation

Producer profile

Scott and Judy Smith

Biloela CQ *BEEF* Group

Scott and Judy Smith are members of the Biloela CQ *BEEF* group and share their family beef property *Glenlivet* with their three children Lachlan, 13, Ashlea, 12 and Cameron, 10. *Glenlivet* is situated approximately 13 km south of Thangool and forms the hub of the Smith's operation that is comprised of a total of three blocks. *Glenlivet* is 2552 ha in size, one third comprised of scrub country and the remainder being made up of eucalypt forest. On the scrub soils, pastures are predominantly buffel grass, green panic, Rhodes grass and urochloa, while the forest country is native species dominated by black spear grass, kangaroo grass and native millet, complemented with seca stylo. The second block *Prospect Valley* is located on the Crowsdale Camboon Road, south of Biloela. It is 222 ha in total, of which, 73 ha is irrigated leucaena pasture with the remainder having been sown to buffel grass and siratro. *Rocky Valley* is the third property in the business, located around 15 km south west of Thangool. It is 742 ha in size and is composed almost entirely of forest country. The family has been at *Glenlivet* for 13 years and Judy and her father have owned *Rocky Valley* since 1991. In 2001 40 ha of leucaena was planted on *Glenlivet*, and after Scott and Judy observed the productive capability of leucaena through their grazing charts, they decided to purchase *Prospect Valley* in 2004 and develop it with leucaena.

Up until five years ago the Smiths ran mainly bullocks, targeting a dressed weight of 300 kg. However, the combination of shorter growing seasons and the higher feed demands of the larger stock prompted them to rethink their approach and switch to growing out young heifers. This was done with the aims of attaining a higher turnover of stock and better feed conversion rates. This alteration in business framework also coincided with the family shifting from a continuously stocked system to a cell rotational system. The Smiths now implement this growing operation across all three of their blocks, which are stocked according to seasonal variations in available pasture. They mainly source store heifers with a weight range of 250–300 kg from Gracemere with high Brahman content to optimize production on the lower fertility forest soils. Heifers are purchased in spring and are finished within one season. They also aim to finish any cull cows that they purchase over the same period of time. All finished animals are sold into the meat works at Biloela, with the Smiths providing all of their own transport. Purchased animals are classed and drafted on arrival at *Glenlivet*, with the youngest animals being sent to *Rocky Valley* and the larger stock retained at *Glenlivet* for finishing. Any two-tooth heifers are sent directly to the leucaena-grass pastures at *Prospect Valley* for finishing along with any other animals approaching this stage of maturity. As the young animals on the forest country of *Rocky Valley* mature, they are mustered and forwarded to *Prospect Valley* to be finished.

The Smiths also run some agistment cattle on *Glenlivet*, the number of which is determined by seasonal conditions. The Smiths have now offered agistment for a number of years and say that it is useful in reducing the risks associated with variability in both weather and prices, providing both cash flow and an easy destocking option in drier years.

The Smiths are driven strongly by their business vision, which they regularly revisit.

'To own a profitable and ecologically sustainable business where we allow the energy from the land be our guide. Listen, observe and learn from the messages that the land gives us. Our investments will generate huge income which will create absolute financial freedom. There are systems in place to free up our time for personal pursuits.'

The Smiths also have a personal vision and they are careful to balance the needs of the business with those of their family, health and lifestyle.

Currently the Smith's efforts are focused on extending infrastructure for rotational systems into the forest country on *Glenlivet*. These works are intended to facilitate improved and more even pasture utilization, stock rotation, herd effect and seasonal spelling. Of the works that have been put in place thus far they report that all is working well as planned.

An interesting feature of *Glenlivet* is the herd of 40 camels that were purchased four years ago to aid in regrowth control. The current numbers are not high enough to make a significant impact across the whole property, but in specific paddocks more light intercepts the pasture through the effects of tree browsing.

The Smiths have been involved with CQ *BEEF* since its inception, having initially been involved in BeefPlan. Being involved in the program has enabled them to gain a better overall understanding of their business. It has also exposed them to some interesting courses. 'We found the mapping and GPS workshops particularly useful in property planning and the placement of new cell systems' says Scott. Another component of CQ *BEEF* that the Smiths enjoy is the interaction with the other group members and the opportunity to put ideas forward and provide feedback on those of others.

Over the years, the Smiths have been involved in a number of different industry related activities, with Scott holding the position of president with Callide Valley Landcare for some years as well as having been the treasurer of The Leucaena Network for some time during its early days. Presently however, Scott and Judy are most strongly focused on their personal development and health.