



Future Beef

CQ Beef

Information for rural business in Central Queensland

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— COVER IMAGE by SARAH COULTON

Issue 23 SUMMER 2014



Queensland Government

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The Best in the West

Welcome to our CQ BEEF 23rd issue - ready for summer

THE 23rd issue of CQ BEEF features some great articles including the to-date findings of the Wet Season Spelling project. Have a read.

The information may help you plan your spelling program this summer.

If you've faced a tough season and cattle market in 2014, an article by MLA's Ben Thomas on the growing global demand for Australian beef will be a refreshing read.

The Grazing Best Management Practises (BMP) self-assessment program has identified some training gaps for beef producers Larry and Ann Coward from Calliope. If you're keen to benchmark your practices against industry standards and identify areas for improvement, get in contact with your local beef extension officer. We are only too willing to help.

When you brand your calves this summer remember the correct formulae for calculating a branding percentage is;

$$\text{Branding \%} = \frac{\text{No. of calves branded in 365 days}}{\text{No. of cows mated in last year's 365 days.}} \times 100$$

Also some important questions to ask at branding time are: How many conceptions did you loose from your pregnancy testing to branding?

What was the pattern of conception like? When did the calves come and how many calves dropped after Christmas this year? Are the cows in a body condition score of three at calving?

Our first edition for 2015 will be in The Queensland Country Life issue printed on the 26th of March.

We wish all our readers a very Merry Christmas and hope 2015 brings widespread rain.

Byrony Daniels
CQ BEEF editor
Beef Extension Officer
Emerald
(07) 4983 7467



What's on:



● Turn to page 12 to find out about the AI training course to be run at Mundubbera.

Grazing best practice

The first step towards identifying training needs

IF you do what you've always done, you'll get what you've always got, but choosing the 'new thing to do' can be a daunting prospect.

Past experience tells us that learning something new takes time and effort and that new knowledge, once gained, must fight against old habits and the safety of the 'comfort zone' before it can be used.

Because making change is hard, the motivation to persist needs to be strong.

Many beef producers are currently experiencing the pressures of negative motivating forces such as poor seasons, low returns and high debt burdens.

These factors certainly provide motivation for change but provide no guidance for what change is needed, apart from 'get out of cattle'!

For those looking for more positive motivation, the process of completing a self-assessment module in the Grazing BMP program might be the answer.

The old adage "you can only manage what you can measure" is one that fits well with Grazing BMP – a program that allows producers to measure what they do to better manage the outcomes they achieve.

The program also provides a link to training, extension and some funding opportunities to producers choosing to improve an area of their business.

Many central Queensland graziers have been motivated to think about change after looking at how they 'stack up' against industry 'best practice' in Grazing BMP.

One of these graziers is Ann Coward who, with husband Larry, runs two properties in the Fitzroy catchment: Fairview north of Calliope and Mystery Hills south east of Biloela.

Larry and Ann have been producing beef for many years and have learnt to adapt to changing markets, weather patterns and regulations (both industry and government imposed) to ensure their business has continued to prosper.

Keen to stay up to date with 'best practice', Ann has completed all five modules of Grazing BMP and has been involved with the program since the running of the first 'pilot' workshop in Calliope back in October 2011.

Ann attended a 'Grazing BMP – People and Business' workshop in April this year and listened to a presentation by guest speaker Steve Banney.

Steve is passionate about helping graziers become financially literate and spoke to the group

KEY POINTS

- Grazing BMP (best management practice) can provide positive motivation for change of practice.
- The Grazing BMP program is linked to extension, training and support.
- For graziers looking to improve their financial literacy and understanding of business performance, Business Edge is a great training option.
- Larry and Ann Coward from Fairview, Calliope, travelled the path from BMP to Business Edge and are working to implement new knowledge and skills into their business.

about the need to understand their cost drivers and how to calculate their cost of production.

Steve quoted the recently published Northern Beef Report commissioned by Meat and Livestock Australia, which indicates that many Queensland cattle producers are not economically sustainable. It also recommends that producers take steps to:

1. Improve their financial literacy and debt management.
2. Understand their profit drivers and focus on them.
3. Look to increase income through increased production.
4. Improve their climate risk management.
5. Better manage their expenses; and
6. Aim to match their stocking rates to their long term carrying capacity, to preserve land condition.

One of the authors of this report, Ian McLean, also has a passion to help graziers improve their business outcomes and through his work has been able to do just that.

As a deliverer of the Business Edge workshops, Ian has provided practical training in business analysis to many graziers, challenging them to truly understand the strengths and weaknesses of their own business.

The points covered by Steve Banney's presentation at the Grazing BMP workshop really hit home for Ann.

As she completed the self-assessment standards it became clear that although they were meeting most of the requirements for being at 'industry standard', there was room for improvement.

"I have always found the BMP self-assessment process a very positive experience," said Ann. "It reinforces to me that we operate at best practice in most areas, with just a little tweaking required here and there.

"However, in the business module, there were a few areas where we just weren't up to speed."

Larry and Ann have worked hard to 'trim the fat' from their operation and feel they really have little room to move in reducing costs.

"In our industry, the margins are now so small, we have to be able to put our businesses under the microscope," said Ann.

"Larry and I knew we needed to be able to analyse our business more closely, but we didn't know where to start.

"We had looked at the Business Edge course before, but had been unable to justify the expense."

However, following the BMP workshop, the decision was made to invest time and money in gaining new knowledge and skills and Ann attended the Business Edge workshop in Rockhampton on August 14-15.

The Fitzroy Basin Association (FBA) provided some welcome funding assistance, covering part of the cost of the workshop for attendees from the Fitzroy Basin.

"We were looking for some alternatives that didn't just involve working harder; we wanted to maintain a balanced lifestyle by maximising what we could get out of our business," said Ann.

After attending the Business Edge course, Ann feels she now has the starting point to be able to truly determine what they should be focusing on.

Using their current accounting package, Ann has made some adjustments in order to generate her own management reports.

These reports will show true business performance without the distortion of tax compliance, which relies on unrealistic depreciation and stock values.

Larry and Ann are keen to look at where their business may be under-utilised and now have the tools they need to analyse possible alternative options, such as intensive cropping on their small parcel of irrigation land.

Whatever Larry and Ann decide to do in their business, they will have confidence that their decision is based on realistic figures.

Proper business analysis gives producers far greater control of the outcomes they achieve and in today's market, that's worth a lot.

Jo Gangemi
Beef Extension (FutureBeef)
DAFF Biloela
07 4992 9178



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management program

Botulism risk increases during drought times



Ann and Larry Coward at the Gracemere Saleyards. - Picture courtesy of Kathleen Calderwood/APN

“ We were looking for some alternatives that didn't just involve working harder; we wanted to maintain a balanced lifestyle by maximising what we could get out of our business. ”

WHAT IS IT?

BOTULISM is a paralysing disease caused by botulinum toxin, which is produced by the bacterium *Clostridium botulinum*. Botulinum toxin is reported as one of the most potent toxins known to mankind. Only a small quantity is needed to produce disease.

Clostridium botulinum spores are common in the soil, and also in the gut of healthy cattle and other animals in tropical environments (which includes most of Queensland), where they are not a problem. Spores are the dormant form of the organism.

Only the actively growing *Clostridium botulinum* bacteria produce botulinum toxin. It is the toxin that causes disease. *Clostridium botulinum* spores only germinate and grow where oxygen is totally excluded, such as within rotting animal and vegetable matter. The toxin binds strongly to nerve endings, preventing nerve impulses to muscles and causing paralysis.

Seven types of toxin have been identified, designated A to G. In Australia most botulism outbreaks in cattle and sheep are due to type C or D toxin. Once produced, the toxin is quite stable and may remain in contaminated feed or water for some time. Vaccination is the only effective way to prevent botulism from occurring.

WHERE IS IT SEEN?

Botulism is commonly seen in Queensland, especially in phosphorus deficient areas and during droughts, where it is often associated with cattle eating bones and carrion to satisfy a craving for phosphorus and/or protein.

Outbreaks are also seen in intensively fed beef and dairy cattle mostly due to feedstuffs contaminated with dead animals such as snakes, birds, possums, mice. Large outbreaks have occurred in dairy cows being fed total mixed rations based on silage. In some cases, producers have lost two-thirds of their dairy herd over a two-week period.

Other outbreaks have involved dairy herds where poultry litter has been used to fertilise pastures.

Legislation now prohibits feeding animal matter, including chicken faeces and chicken litter, to livestock and livestock must be denied access to this material.

SYMPTOMS

Symptoms vary dramatically depending on the dose of toxin and any pre-existing immunity that may be present. Signs vary from sudden deaths (animals collapse and die in a couple of hours) to a slowly progressive paralysis where animals may take days to die. In the latter case, the first signs are cattle off their feed and water. Then they develop a wobbly gait (staggers) and eventually go down. During the staggers stage, some cattle become aggressive because they feel helpless. Not all cattle that develop botulism symptoms will die. Some mildly affected cattle will recover. Generally speaking, once cattle go down, their likelihood of recovery is poor.

More information: www.daff.qld.gov.au/animal-industries/welfare-and-ethics/animal-welfare/natural-disasters/animal-disease-issues-after-flooding/infectious-diseases/botulism



Online information at your fingertips

THE FutureBeef website is home to a suite of more than 150 projects.

From cutting-edge research to innovative extension, you will find the FutureBeef team in the thick of it!

Working with producers, the FutureBeef team is supporting sustainable and profitable productivity gain through collaborative projects including:

- Climate Clever Beef - to deal with the impact of climate change and manage greenhouse gas emissions while improving business resilience
- Grazing BMP program - to improve the economic and environmental performance of beef enterprises
- Next Gen Beef Breeding Strategies - investigating genetic and genomic strategies to increase beef reproductive efficiency in northern Australia.

Join the other 87,000 people who visit our website each year and check out more of the FutureBeef projects on our website www.futurebeef.com.au/resources/projects.



Tips for using Breedplan data when selecting your bulls

Critical tools to guide objective selection

Lot	Id	Gestation Length (days)	Birth Wt (kg)	200 Day Wt (kg)	400 Day Wt (kg)	600 Day Wt (kg)	Mat Cow Wt (kg)	Milk (kg)	Scrotal Size (cm)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Rump Fat (mm)	Retail Beef Yield (%)	IMF (%)	Export Steer Index (\$)	Domestic Steer Index (\$)	Comments
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BREEDPLAN estimated breeding values (EBVs) and individual animal data, e.g. scrotal circumference, are critical tools to guide the objective selection of bulls that will improve the growth, fertility and carcass traits of the herd. However, the volume of data available can make evaluation difficult and time consuming. The tips presented below can make handling and evaluating Breedplan data easier.

COLUMN HEADINGS FOR BREEDPLAN DATA
When sale catalogues or data is downloaded from Breedplan into Excel, the column heading for each of the Breedplan EBVs, e.g. 600 Day Wt (kg) and breed indexes are spread over three or four rows. This makes sorting data difficult.

The solution is to create a one-row header of the Breedplan EBVs traits, which can be placed on top of the data. The table above shows the header row for Brangus Breedplan data. Applying the Excel data tool

filter to the column headings makes it easy to sort the data by any EBV, e.g. sort the animals from highest to lowest scrotal size (cm) EBV.

Adding a comments column enables notes to be made on individual bulls when looking at the data and the bull.

COLOUR CODING EBVS

For all breeds, Breedplan produces breed average values for each EBV, e.g. 600 Day Wt (kg). Percentile bands tables are also produced by Breedplan. These show the EBV for the top 10 per cent, top 20pc, etc. for each EBV and breed index.

The breed EBV average data and percentile bands can be used to determine the relative merit of a bull, e.g. is he above or below breed average for 600 Day Wt (kg)?; is he in the top 20pc of the breed for the trait?

Colour coding the EBVs that meet particular criteria makes evaluating the data easier.

For example, EBVs in the top 20pc could be coloured green; those above average blue; and the average EBVs yellow.

This system avoids having to refer back to breed average and percentile bands data.

Colour coding makes it easier to identify bulls with a good balance of growth, fertility and carcass traits.

PHENOTYPIC DATA

The phenotypic data (commonly called supplementary data) presented can comprise:

- live weight
- scrotal size
- horn status
- carcass scan data (e.g. EMA, rump and rib fat, IMFpc)
- sperm morphology.

Guidelines for scrotal size relative to live weight are used to identify bulls with better phenotypic

scrotal size.

A column can then be added to the bull data table to identify bulls with above average scrotal size for their weight.

FORMATTING DATA

It is worth taking some time to format data and pages so the data is easier to look at on the screen and when printed.

Good formatting also makes printed sheets easier to handle when looking at bulls in the yard.

If you would like help with organising and evaluating Breedplan data please contact your local beef extension officer.

*Mick Sullivan
Beef extension officer
DAFF Rockhampton
(07) 4923 6223*



Global demand for Australian beef likely to hold strong

QUEENSLAND cattle markets continue to feel the pinch after two very dry years for most regions have driven slaughter levels to numbers not seen in almost four decades and minimal interest from re-stockers.

However, while there has been heavy pressure on the markets from the large cattle supply, some very positive factors are likely to remain in place over the coming years, adding support to cattle markets once the drought breaks.

Northern beef producers have seen incredibly strong live cattle export demand, where more than one million head of cattle were destined in the past 12 months. The total number of live cattle exports for 2014 and 2015 is forecast to exceed one million head, with demand from Indonesia and growing demand from newer markets such as Vietnam. Through the strong live export trade,

KEY POINTS

- Australian beef exports will exceed one million tonnes again in 2014
- Live cattle exports will surpass one million head in 2014
- Australian cattle supplies for slaughter will contract considerably once the drought breaks

indicative light feeder steer prices to Indonesia have been above \$2/kg lwt for most of the year.

While the Australian adult cattle kill has been at levels not seen since 1978, with the national cattle kill on track to finish 2014 in excess of eight million head, back-to-back for the first time in 35 years, the entire surge in production has found a home, with no product left in stores.

In line with the high slaughter, Australian beef

exports for 2014 are comfortably on track to exceed one million tonnes swt for the second year in a row, with shipments extending to an ever diversifying range of markets. About 70 per cent of national production is destined for export.

The US will be Australia's largest beef export market in 2014, with the tight US supply situation causing manufacturing beef prices to find new highs over the course of the year.

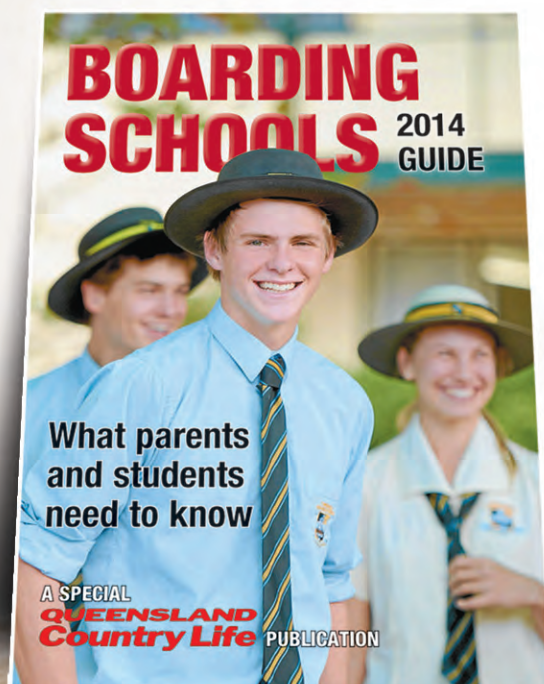
The imminent Free Trade Agreement (FTA) with Korea and Economic Partnership Agreement (EPA) with Japan will further assist beef trade with two of Australia's largest trading partners over the coming years.

While demand from our traditionally largest customers (Japan, Korea, and the US) is likely to remain

strong, markets such as the Middle East, Indonesia, the EU and China continue to demand high volumes of Australian beef during the extended period of surging supplies.

The current national herd liquidation is at the cost of the breeding herd, with female kill rates at levels rarely seen, meaning once there is a break in seasonal conditions, the capacity for herd growth to respond will be slower than in previous years. This, combined with the likely maintenance of strong global demand for Australian beef, should provide plenty of support for cattle prices over the coming years.

*Ben Thomas
manager, market information
Meat & Livestock Australia
bthomas@mla.com.au*



BIG DECISIONS REQUIRE THE BEST INFORMATION

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Bookings close 5 December 2014.

45%

Old farmers with high school aged children send them to a boarding school.

AM155591

Leasehold to freehold: opportunity knocks

Suite of changes to rural leasehold land legislation



THE Queensland government has released a suite of changes to rural leasehold land laws.

These changes make leases more secure and allow for easier and more affordable conversion from a lease to freehold title. Lease payments for term leases will also become more affordable under the new arrangements.

To make leases more secure, the government has committed to rolling term leases. Rolling term leases have already been offered to all eligible rural leases that are due to expire before December 31, 2034.

Rolling term leases offer an immediate extension of a lease term for the same period as the lease was originally issued for.

To reduce costs and help ease the financial burden on rural leaseholders, the government has changed the way it calculates annual rental.

These changes affect term leases, licences and permits to occupy that are for primary production purposes (Category 11.2 leases).

The calculation has reduced the rental from 1.5 per cent of the current unimproved value down to 0.75pc. Many landholders will take advantage of this saving to

pay for the costs of conversion to freehold title.

The hottest topic at many landholder forums has been the changes to rules relating to the conversion of leasehold land to freehold title.

The purchase price of freehold title on Category 11 (primary production) leases has been reduced by using a new calculation method known as the Net Present Value of Revenue calculator.

The government is encouraging landholders to take up the offer of freehold title by reducing the conversion price and by contacting all perpetual lease land holders.

The new freehold rate is also applicable to all eligible Category 11 leases including term leases, special leases and pastoral holdings over state land.

Leases issued over roads, reserves, state forests, national parks, timber reserves and regional parks cannot be converted to freehold through this process because they are deemed to have a different primary land use.

The new calculation method for freehold land is complicated.

Landholders can get an idea of the price by multiplying their prescribed annual land rent (rent a landholder would pay if there were no capping, rebate or deferral arrangement) by 13. Using the calculator, the purchase price of a property with an unimproved value of \$485,000 would now be \$95,302 as opposed to \$485,000.

This example demonstrates that there is a significant saving in purchase price. The government hopes leaseholders will take advantage of this saving to offset other costs that may be associated with a conversion to freehold such as addressing native title, survey costs or purchasing the rights to commercial timber.

There are other changes to rural land administration including the rules relating to subdivision, buying and selling leases which also offer more flexibility and security.

If you would like to know more about these changes or any of the information above, call in to the nearest Department of Natural Resources and Mines (DNRM) business centre, call 13QGOV (13 74 68) or visit DNRM at www.dnrm.qld.gov.au.

Qld vegetation management laws receive update

VEGETATION management laws in Queensland have changed significantly over the past two years.

The introduction of self-assessable clearing for many routine clearing activities has made life a lot easier for many primary producers (and department staff).

The self-assessable code (SAC) for clearing fodder trees in the mulga lands was released in December 2013 along with SACs for property infrastructure, managing thickened vegetation in the mulga lands, weed control, managing regrowth vegetation, managing encroachment and clearing to improve operational efficiency.

An example of the significance of these changes is the case of fodder harvesting in the mulga lands.

Applications took months to assess under the old development permit system. The requirement for clearing under a SAC is that the landholder notifies the Department of Natural Resources and Mines (DNRM) of the clearing and follows the self-assessable code while clearing.

Notification can generally be done online in a matter of minutes and the result is, in most cases, a more practical set of clearing conditions.

It should be noted that SAC clearing activities are auditable. So while there is less red tape around doing the clearing, and the codes are less complex, there is more responsibility on the landholder to follow the codes.

The SACs cover a broad range of routine clearing activities, however there are still cases where individuals or groups want to clear outside the conditions of the SACs. In these cases, permits can still be applied for and groups can tailor clearing conditions in an Area Management Plan for a larger area of operations.

A second round of SACs was released on August 8. These SACs include clearing to manage thickened vegetation in the other bio-regions (brigalow belt, New England tablelands, south-east Queensland, Mitchell grass downs, channel country, north-west highlands, gulf country, desert uplands and the rest of Queensland), clearing for necessary environmental works and a new code for forest practice on freehold land.

To look through or download codes and to notify for clearing, visit www.qld.gov.au/environment/land/vegetation/management/. While you are there, check the new regulated vegetation mapping. The mapping represents another significant change to Queensland's vegetation management laws. The regulated vegetation mapping is now available to view on Google Earth using the vegetation management globe.

More information is available at www.dnrm.qld.gov.au or by contacting the vegetation management hotline on (07) 4529 1391 during business hours. Also watch for workshops and field days in your area.

Seamus Batstone
DNRM, Charleville
(07) 4654 4276



BEEF DRIVING AHEAD

- TRANSPORT
- FENCING
- CATTLE YARDS
- EAR TAGS
- HEALTH
- EXPORT
- PROCESSING
- STOCK FEED

ALL SYSTEMS ARE GO FOR THE BEEF INDUSTRY IN 2015

This specialised feature will focus on our innovative cattlemen and the steps they are taking to place themselves at the forefront of the marketplace today.

With Beef Australia just around the corner now is the time start preparing and put your business in front of potential clients. If you are a supplier of goods or services or have an affiliation with the beef industry don't miss the opportunity to target over 86% of Queensland's top cattle producers.

Published: February 5
Booking & Copy Deadline:
JANUARY 29

BONUS OFFER
Online advertisement on our Qld Country Life - Beef Australia site, launching February 2015 from \$150

QUEENSLAND Country Life

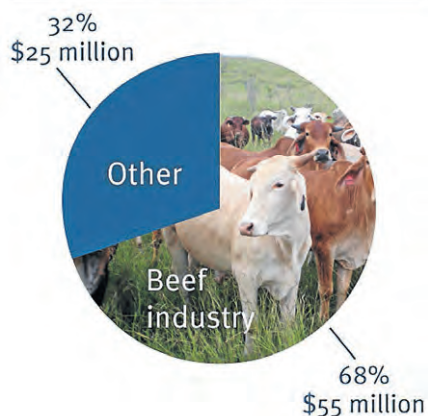


Contact your Queensland Country Life Representative for further details

Concessional farm finance and loans benefit producers

More than \$80 million has been approved under the current schemes to date

Approvals from August 2013 - October 2014



Sixty-eight per cent of concessional loans – \$55 million – has been approved for the beef industry.

PRODUCERS facing drought conditions or responding to difficult market circumstances are making good use of farm finance and drought concessional loans of up to \$1 million available through QRAA.

Based on current approvals, producers could be realising a benefit of up to \$150,000 over the five-year concessional loan term (\$20,000 to \$30,000 per year).

More than \$80 million has been approved under the schemes to date, with 68 per cent (\$55 million) of loans being approved to beef production enterprises.

Thirty-four per cent of all loans have been approved for producers located in central Queensland with these enterprises benefiting from nearly \$28 million in loans.

With the Bureau of Meteorology forecasting drier than average conditions to continue until the end of 2014, interest in and uptake of drought concessional loans continues to increase.

QRAA client Jeff Coy explained how his farm business has benefited from the financial

Concessional loans now available to assist farm businesses

Welcome relief for farmers

- over \$80 million approved
- interest savings of approximately \$20,000 - \$30,000 per year*
- total interest savings of approximately \$100,000 - \$150,000* over five years

* averages based on application statistics available as at October 2014.

Drought Concessional Loans Scheme

Loans of up to \$1 million are available to eligible farm businesses to:

- restructure existing farm business debt
- assist with operating expenses (new debt)
- fund drought recovery and preparedness activities (new debt)
- variable concessional interest rate currently set at 4 per cent
- valid Bureau of Meteorology Rainfall Deficiency Report required (www.bom.gov.au/climate/ada/)
- closes 30 June 2015.

Farm Finance Concessional Loans Scheme

Loans of up to \$1 million are available to eligible farm businesses to restructure existing farm business debt.

- variable concessional interest rate currently set at 4.5 per cent
- closes 30 April 2015.



“ We have a long association with QRAA and we have found them to be always helpful and easy to deal with. ”

assistance available through QRAA.

“The Farm Finance Concessional Loans Scheme has given us a chance to reduce our repayments,” Mr Coy said. “While our income has reduced due to the drought, this assistance has been an enormous help.

“QRAA has been excellent to deal with and a client liaison officer visited on-farm to assess our situation, giving us a better perspective on what we are doing and what we are going through.

“The farm finance concessional loan has taken some stress out of life and will enable us to look into replacing some of our machinery down the track.” Longstanding QRAA client Andrea Stewart weighed in on how receiving a loan under the Drought Concessional Loans Scheme had assisted.

“We have a long association with QRAA and we have found them to be always helpful and easy to deal with,” Mrs Stewart said.

“The Drought Concessional Loans Scheme is helping us to continue on from difficult times, as well as lessening the burden of our interest bill. QRAA are not only a huge help financially but also psychologically. They have a strong rural sense and

an understanding of what we are going through.”

It is important for producers not to self-assess their eligibility for a loan. QRAA has client liaison officers based in Rockhampton, Mackay and Emerald who are available to visit producers on-farm to explore how the eligibility criteria may apply to a producer’s individual situation and help with the application process.

A number of temporary offices are scheduled in November and December.

QRAA customer relations staff are also available to assist on Freecall 1800 623 946 or via email: contact_us@qraa.qld.gov.au.

Drought and farm finance concessional loans schemes are funded by the Australian government and delivered by QRAA.

For more information on eligibility criteria, loan conditions and how to apply, visit www.qraa.qld.gov.au or Freecall 1800 623 946.



BEEF AUSTRALIA 2015

4-9 MAY

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and pasture performance?*

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- ✓ *How to manage fire and the tree-grass balance*
- ✓ *Managing weeds*
- ✓ *Pasture restoration and the role of sown pastures*

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"This will be the first workshop I have felt inspired to go home and implement what I have learnt."

PRICES (gst inc):

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Three people - \$1210 each

CONTACT: Byrony Daniels

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Spelling strategies for the recovery of pasture condition

Updated research data from the Monteagle and Wambiana sites

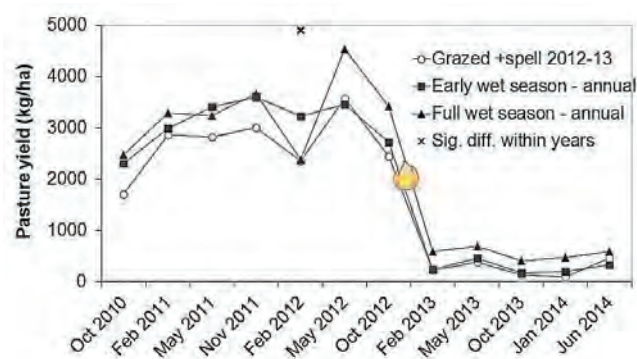


Fig 1a

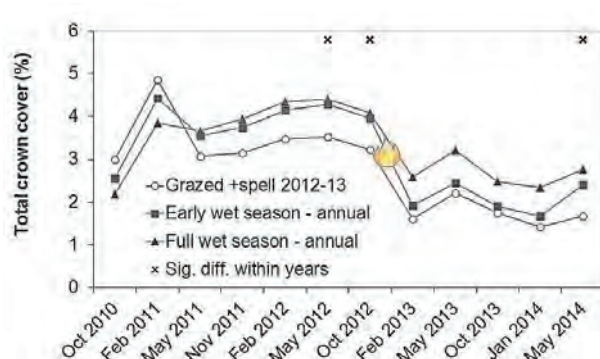


Fig 1b

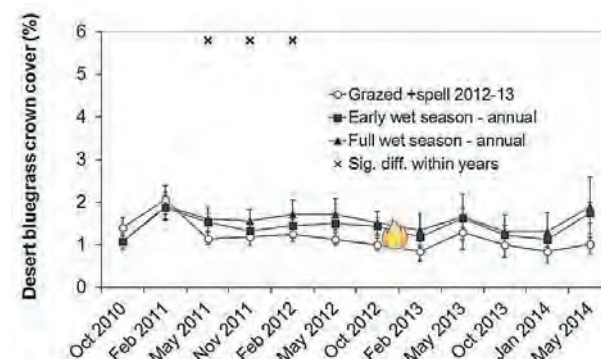


Fig 1c

Figure 1. The effect of spelling strategies at Monteagle on (a) pasture yield, (b) total crown cover, and (c) desert bluegrass crown cover. The site was destocked in November 2012 for six months following a wildfire (orange flame).

SUMMARY

THE Spelling Strategies Research Project now has four years of information from the Monteagle site, and two years from Wambiana.

Spelling has given a small improvement in the crown cover of desert bluegrass when compared to continuous grazing at moderate stocking rates, at both sites.

This improvement is too small to have any impact on land condition, but it does demonstrate the beneficial processes occurring with spelling, and is a very encouraging result.

The lack of a significant viable seed bank for desert bluegrass is responsible for the lack of new seedlings establishing and is therefore a major contributor to the lack of demonstrable land condition improvement. Both sites have a large contribution of wiregrasses to the pasture, which may need to be reduced by burning to assist land condition improvement.

Monteagle has had two years of very good rainfall, followed by two very dry years, while the Wambiana site has had one average, and one below-average rainfall year. The Monteagle site was destocked over the 2012/13 summer following a

KEY POINTS

- Spelling has given a small improvement in the crown cover of desert bluegrass but only under moderate stocking rate.
- Land condition and pasture composition have been stable whether spelled or grazed so far.
- Under high stocking rate, end of wet season pasture yields are increased with spelling.
- There has been very little effect from spelling under moderate or high stocking rates, and land condition improvement will take many years.
- Seedling establishment of 3P grasses happens episodically, and is necessary to drive land condition improvement.
- Spelling to improve land condition will take many years and must be in synergy with grazing best management practices.

wildfire through the trial paddock in November 2012 and very dry conditions. At Wambiana, the research is conducted under a moderate or a high stocking rate.

Improvement in land condition can take many years and/or be episodic and difficult to detect.

Spelling is a key management strategy to improve land condition, however, the poorer the land condition the greater the duration and frequency of spelling needed. The spelling research is beginning to show small improvements in the key pasture parameter – crown cover of desert bluegrass.

Desert bluegrass is an important 3P grass across much of northern Australia, and is a cornerstone of productivity and sustainability. Spelling to improve land condition will take many years and must be in synergy with the best management practices: stocking to long-term carrying capacity; managing stock numbers for the feed available in a risk-adverse manner; and managing for even grazing distribution through burning and infrastructure development.

BACKGROUND

Wet season spelling of grazing land is a key recommendation for improving land condition. However, there is little reliable and relevant information on which to guide the design of cost-effective and practical regimes of wet season spelling.

This project is improving the evidence base and

modelling capacity underpinning recommendations for use of wet season spelling to recover poor-condition grazing land and design more reliable and cost-effective spelling options for producers.

On-property research at Monteagle generating important pasture data to drive these outcomes includes small plots treated with a range of spelling strategies: early wet season and full wet season spelling annually or biennially; one-off spells to determine the impacts of seasons; and continuous grazing.

At Wambiana, similar treatments are applied under a moderate or high stocking rate. Funding is acknowledged from MLA and DAFF.

RESULTS SO FAR

Monteagle

Monteagle has had variable rainfall over the previous decade, with predominantly dry or very dry conditions. Good growing conditions, prior to and during the first summer, and for the second summer of recordings resulted in high pasture yields and crown cover.

The third year of the trial was very dry with a

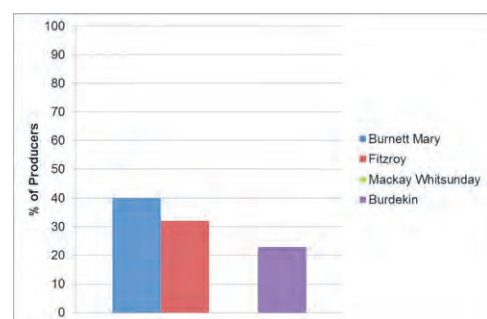


Table 1. Number of producers surveyed for DAFF management practices surveys 2011-14

TO provide a better understanding of beef industry practices, the Department of Agriculture, Fisheries and Forestry surveyed beef producers in selected regions. This information will be used to better target research and extension activities.

Herd and grazing management information was collected in 2011-2014 from 228 producers in the Burnett Mary, Fitzroy, Mackay Whitsunday and Burdekin regions. This article covers the cattle tick and

Cattle ticks and tick fever management strategies: the facts from

tick fever management strategies used by producers. Table 1 (left) shows the number of producers surveyed.

CATTLE TICK CONTROL

Survey results showed that a large proportion of producers are undertaking chemical tick control (Figure 1). Consequently, tick control is a major component of their operating costs.

Region	No. producers surveyed
Burnett Mary	47
Fitzroy	74
Mackay Whitsunday	25
Burdekin	79

Figure 1. Percentage of producers undertaking tick control in the Burnett Mary, Fitzroy, Mackay Whitsunday and Burdekin regions.

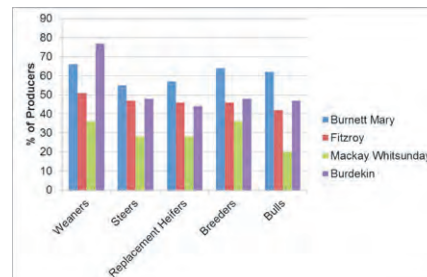


Figure 2. Percentage of producers using Composite, *Bos taurus* and *Bos indicus* breed bulls in the Burnett Mary (BM), Fitzroy (FZ) and Burdekin (BK) regions.

Tick control treatments were used by a higher proportion of Burnett Mary producers, with 55-65 per cent of producers treating the key classes of livestock (Figure 1). Mackay Whitsunday had the lowest rates of treatment at 20-35pc and Burdekin producers had the highest weaner treatment rate of 77pc.

Cattle ticks are a serious economic pest of

Queensland's cattle industry that significantly reduce cattle liveweight gain and milk production and can transfer tick fever. With significant numbers of producers not undertaking tick control are there opportunities to improve the effectiveness of tick control programs and can the amount of treatment be reduced?

BEEF BREEDS

In the 1970s the composition of the Queensland cattle herd changed significantly as *Bos indicus* breeds and crosses replaced British breeds. The change was most pronounced in the tick-infested areas of Queensland.

Introducing *Bos indicus* cattle was a major development as it reduced the impact of ticks and the need for tick control treatments. European breeds were also introduced in the 1970s and have been used extensively in crossbreeding with *Bos indicus* cattle. In the last decade many producers have reduced the *Bos indicus* content of their herds. This is due to increased crossbreeding and composite breeding and demands

Spelling has given a small improvement in the crown cover of desert bluegrass when compared to continuous grazing at moderate stocking rate, at both sites.

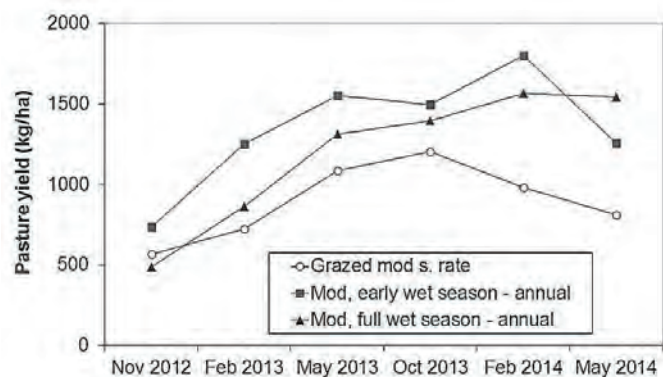


Fig 2a

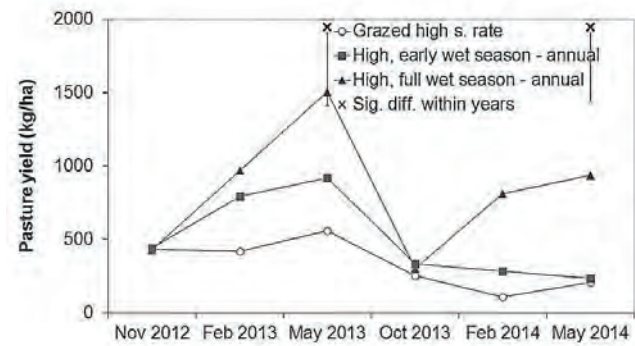


Fig 2b

Figure 2. The effect of spelling strategies at Wambiana on pasture yield under (a) moderate, or (b) high stocking rate.

wildfire in November 2012 and subsequent destocking of the trial site. The fourth year of the trial has also been very dry.

The pasture yield increased across all treatments through the first two wet years of the trial (Figure 1a). The increase was driven by growth of the key plants desert bluegrass (*Bothriochloa ewartiana*) and wiregrass (*Aristida spp.*).

The burn and dry summer of 2012-13 significantly reduced standing pasture yield. Spelling strategies have not affected pasture yield. Overall, pasture composition has not varied greatly with treatments or recording dates, however desert bluegrass has increased noticeably since the fire.

Crown cover has varied with seasonal conditions across all treatments (Figure 1b).

Desert bluegrass and wiregrass contributed equally and made up the majority of the crown cover during the first two wet years of the trial.

The burn and dry summer in 2012/13 decreased total crown cover due to a decrease in the wiregrass while the desert bluegrass crown cover was stable (Figure 1c).

Both spelling treatments had significantly more total crown cover than the grazed treatment in May and October 2012, and May 2014.

Desert bluegrass had significantly more crown cover than the grazed treatment in May and November 2011, and February 2012. These small increases in crown cover have not produced increases in pasture yield or land condition.

Wambiana

The 14 years prior to trial establishment in 2012 included runs of very wet years and very dry years. The three years immediately prior to trial establishment (2009/10, 2010/11 and 2011/12) had well above average rainfall and good growing conditions. The 2012/13 year had an average rainfall and growing conditions after a wet July. The 2013-14 year had a dry winter, followed by below average and late summer rainfall resulting in below average growing conditions.

Total pasture yields were relatively low and there has been an increase over time in the moderate stocking rate trial.

Treatment effects are not apparent under moderate stocking rate, however the full wet season

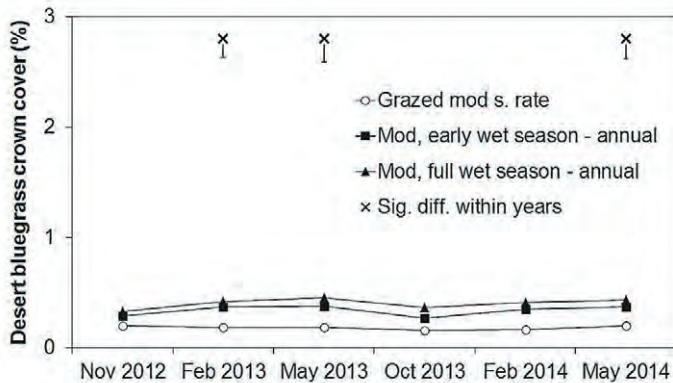


Fig 3a

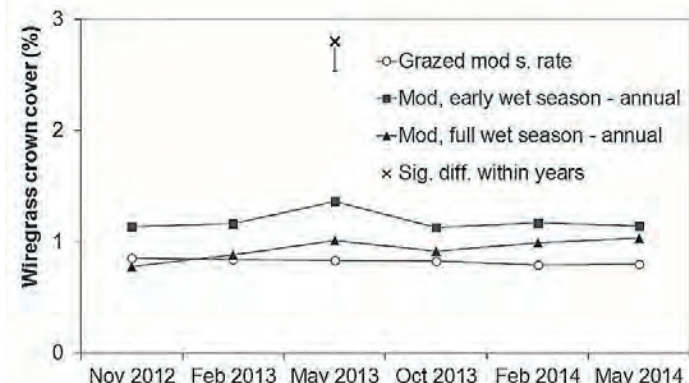


Fig 3b

Figure 3. The effect of spelling strategies at Wambiana under moderate stocking rate on (a) Desert bluegrass crown cover, and (b) Wiregrass crown cover.

annual spell has significantly increased pasture yield in the high stocking rate trial in May 2013 and May 2014. The increased yield was soon reduced by the high stocking rate through the 2013 dry season (Figure 2a and b).

Total crown cover has been stable under both the moderate stocking and high stocking rate trials. Spelling treatments have not affected total crown cover.

Desert bluegrass had a significant increase in crown cover under the full wet season annual spelling treatment in February 2013, May 2013 and May 2014, but only with moderate stocking.

Wiregrass also had a significant increase in crown cover with full wet season annual spelling with moderate stocking, but only at one recording, May 2013 (Figure 3a and 2b).

DISCUSSION

Grazing trials across northern Australia have had varied responses in land condition with wet season spelling.

However, many ecological studies have shown a sensitivity of perennial grasses to grazing during the early wet season growth period.

The spelling strategies research has shown that seasonal conditions appear to have the overriding influence on pasture parameters.

Desert bluegrass has been slow to improve composition under favourable management and good growing conditions. Its expansion has been restricted by a small, viable seed bank and therefore a lack of seedling establishment.

Wet season spelling should commence after some effective grass growing rain at the beginning of the wet season (~40-50mm).

Spelling needs to be for the whole growing season to provide a reliable benefit. To improve land condition, the poorer-condition pasture will need more frequent spells and good growing conditions compared to an average condition pasture.

Wet season spelling management should be in synergy with established grazing best management practices. The first is to stock at long-term carrying capacity.

This will maintain land condition by ensuring there is adequate pasture available in most years, and therefore ensure long-term profitability.

Varying stocking rates to match pasture available is another key recommendation. Overgrazing during dry years can largely be prevented with variable stocking.

Stocking rates can be set at the end of the wet season as further pasture growth is unlikely for the next six to nine months.

Efficiency of pasture use and preventing patch grazing can be managed by promoting evenness of pasture use. The selective grazing behaviour of cattle can never be completely controlled. However, fencing to land type, burning and spelling will help improve evenness of pasture use.

Recent research does not support the view that intensively managed multi-paddock grazing systems will deliver improved land condition or cattle production.

The aforementioned best management practices will largely achieve acceptable outcomes regardless of the grazing system applied.

Wet season spelling will always be a key strategy for maintenance or improvement of land condition, despite there being very little evidence to draw on. Stocking rate management is of primary importance and there are increasing recommendations that stocking rates can only be marginally increased (~10pc) when subject to a wet season spelling system. Wet season spelling is a key management strategy to allow recovery of overgrazed patches and land types.

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the most recent research

from some store and slaughter cattle markets for lower *Bos indicus* content cattle. Reduced *Bos indicus* content increases the susceptibility of herds to ticks and increases the risk of tick fever.

Survey results showed that *Bos indicus* bulls are still the predominant breed of bull (Figure 3). Mackay

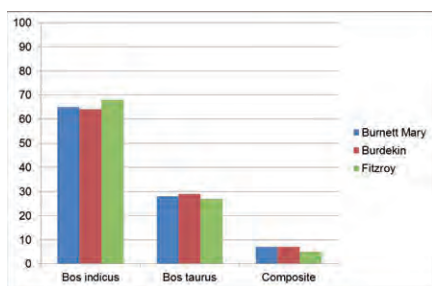


Figure 3: Percentage of producers undertaking key tick fever vaccinations in the Burnett Mary, Fitzroy and Burdekin regions

Whitsunday data for bull breeds was not included as it was incomplete.

The Fitzroy had the highest number of producers using *Bos indicus* bulls at approximately 68pc (Figure 3). The surveys show the substantial use of *Bos taurus* and Composite bulls in breeding programs.

TICK FEVER VACCINE

Despite tick fever vaccination of weaners being a long-standing recommendation for tick-affected regions, vaccination rates were low in the Burnett Mary (40pc), Fitzroy (32pc) and Burdekin (23pc) (Figure 3). None of the properties surveyed in the Mackay Whitsunday region vaccinated weaners for tick fever but this could reflect the small sample size.

Calves raised in tick endemic areas that are exposed to tick fever organisms (*Babesia bovis*, *Babesia bigemina* and *Anaplasma marginale*) between three and nine months of age rarely show symptoms and develop a strong, long-lasting immunity. It is a

commonly held belief that cattle born and raised in tick endemic country are immune to tick fever; and it is common not to vaccinate homebred stock, but only vaccinate introduced stock.

However, the percentage of calves exposed to all three tick fever organisms is not high and varies from year to year, so a proportion of calves may remain susceptible to one or more types of tick fever. These calves can die if exposed to tick fever organisms once their calfhood resistance wanes.

Most outbreaks occur in non-vaccinated homebred stock and the most common animals affected are aged 18-36 months, which includes young steers and replacement heifers. In most situations vaccinating young stock with tick fever vaccine prevents outbreaks and deaths. All cattle raised in tick free areas are susceptible to tick fever if introduced into tick endemic areas.

Both vaccines protect against all three tick fever organisms. The chilled vaccine is the most commonly used as it is conveniently delivered ready to use. However it only has a four day shelf life so you need to plan carefully before ordering it. It can be delivered to

most places within 24 hours.

For more remote areas, the frozen vaccine is a better alternative. It is shipped and stored in liquid nitrogen, has a long shelf life and can be stored on site until ready to use. This is preferable where large numbers of animals are to be vaccinated over several days or weeks, and overnight delivery of chilled vaccine is difficult.

Frozen vaccine can be thawed out and used as required, but it must be used within eight hours of thawing. Tick fever vaccination does not mean you can forget about tick control.

It is still worth keeping ticks under control to avoid heavy burdens establishing, especially in introduced cattle as this prevents condition and liveweight loss, anaemia and death as well as preventing the potential for the transmission of tick fever.

Tick fever vaccines can be ordered through the Tick Fever Centre (07 3898 9655), your local veterinarian or rural agency by phone or fax.

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Wet season spelling: a producer case study site

Oakland site adds to research from Clermont and Charters Towers

KEY POINTS

- Spelling has had minimal impact on pasture parameters when compared to grazing at a conservative stocking rate.
- While ground cover is good land condition remains poor across all treatments due to a poor pasture composition and low crown cover.
- Research conducted under the spelling strategies project at the Clermont property has shown similar results.

BACKGROUND

WET season spelling of grazing land has long been considered a key recommendation in improving land condition to benefit sustainability, production and profit in agriculture. The spelling strategies project aims to improve the evidence base and modelling capacity unpinning such recommendations.

CASE STUDY SITE - OAKLANDS

In addition to two research sites at Clermont and Charters Towers, a producer case study site has been established on the Oaklands property 80km south of Duaringa, owned by the Dunne family, in central Queensland.

Primarily a Climate Clever Beef Project focusing on integrating carbon farming practices into beef businesses, the pastures are being monitored to add further understanding to the effect of wet season spelling on poplar box woodland to achieve land condition maintenance and/or improvement. Data has been recorded for two wet seasons at this site.

Four treatments are being measured, with each vegetation type subject to two grazing treatments – continuously grazed and wet-season spelled. The treatments include:

- remnant box woodland (RemnGraz or RemnSpel)
- 10 year old box regrowth (SuckGraz or SuckSpel)
- recently cleared 10 year old regrowth (ClearGraz or ClearSpel)
- completely cleared with Graslan herbicide (GraslGraz or GraslSpel).

RESULTS SO FAR

The 2012/13 wet season resulted in increased pasture yields across all treatments. There appeared to be an

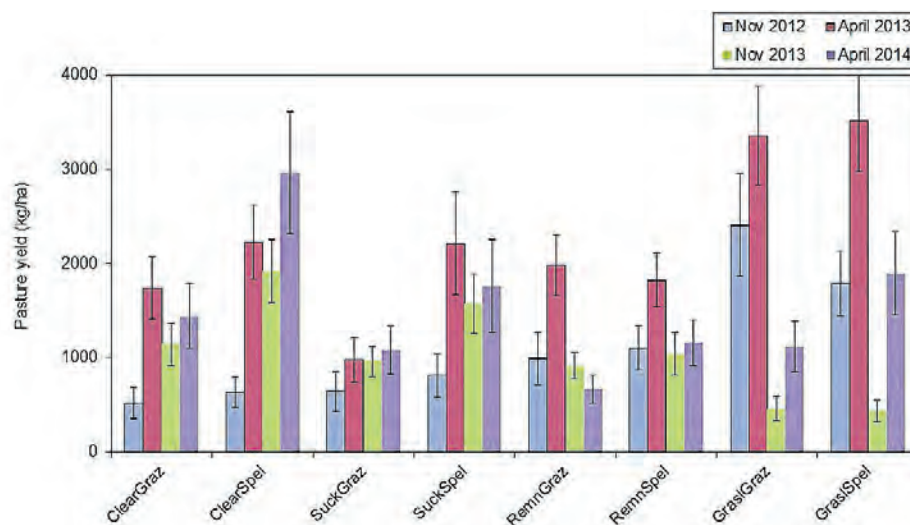


Figure 1. Pasture yield of treatments over two wet seasons

increase in pasture yield in spelled treatments compared with those grazed, however this was not consistent across all treatments and is not a strong effect (Figure 1).

Spelling lifted pasture yield in the Graslan cleared and 10-year-old regrowth treatments compared with those grazed, while the remnant and cleared regrowth treatments did not. Ground cover was high across all treatments and did not change, however crown cover appeared to increase under spelling compared to grazing.

Pasture yields increased over the 2013/14 wet season however were reduced compared with the previous summer. The remnant treatments were the exception with tree competition probably limiting pasture growth. The Graslan cleared treatments were burnt in November 2013, which resulted in reduced pasture yield, ground cover and crown cover. Spelling appears to have improved pasture yield for the cleared, regrowth and Graslan-cleared treatments. Land condition is generally poor across all treatments, however the cleared treatment appears to have an improving trend, whether grazed or spelled. This is due to improving pasture yield and crown cover (Figure 2).

DISCUSSION

The 2012/13 wet season was wetter than average and resulted in good growing conditions. The growing

paddock and variation in stocking rates may be confounding the results.

While there appears to be a small increase in pasture yield due to spelling, it is quite variable across all treatments and is not a strong effect. The varying stocking rates across the site may have masked the effects of spelling, while the conservative stocking rate or better starting condition in the Graslan-cleared treatment may have influenced the large increase in pasture yield. Land condition remains poor across all treatments due to a poor pasture composition and low crown cover.

Research conducted under the spelling strategies project at the Clermont property has shown similar results over the 2010/11 and 2011/12 wet seasons. During these good seasons, spelling has had minimal impact on pasture parameters when compared to grazing at a conservative stocking rate. Pasture yield and composition has not changed with spelling, and this is consistent with the Oaklands monitoring.

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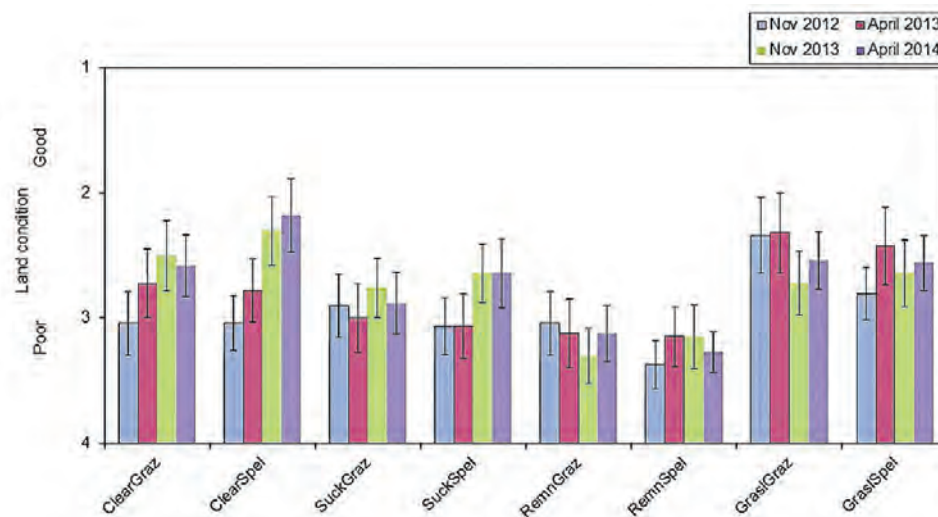


Figure 2. Land condition is stable across treatments over two wet seasons of recording. The cleared treatment appears to be improving.

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Water quality: the effects on cattle during dry seasons

Water is often overlooked when calculating dry season and drought rations

WHEN calculating dry season and drought rations the water component is often overlooked. Access to good quality water is essential as it affects feed intake, paddock utilisation, cattle growth rate, lactation and reproduction.

For example, in Central Queensland daily intakes of breeders forced to drink poor quality water during winter dropped as low as 9-12L/head but recovered to ~25L/head when water quality improved (Entwistle & Jecott 2005).

This article looks at water quality factors that can adversely affect cattle and other livestock. Some of which, such as cyanobacteria (blue green algae) and salinity, are exacerbated during extended dry periods and/or high temperatures.

The following information is from the 'Review of the effects of water quality on ruminant health and productivity' prepared by Dr Raj Kurup et al. (2011) available from Meat & Livestock Australia.

Water quality varies depending on the source, climatic conditions, soil type, etc.

The degree of impact water quality has on cattle varies due to their diet and physiological state. If in doubt or you're in an area known for water quality issues it's best to get it tested.

Factors that affect water quality include: odour and taste; physical and chemical properties; presence of toxic compounds; concentrations of micro- and macro-minerals, and; microbial contamination.

Some potential culprits of poor water quality are:

- pH
- total dissolved solids or electrical conductivity, including:
 - sodium
 - calcium
 - magnesium
 - nitrate and nitrite
 - sulphate
- heavy metals (e.g. fluoride)
- blue green algae

PH LEVEL

pH level is determined by the concentration of hydrogen ions in water. A pH of 7 is 'neutral', values less than 7 are increasingly acidic and values greater than 7 are increasingly alkaline. The optimum pH range for beef cattle is 6.5 to 8.5. For the most part the pH of groundwater across northern Australia is within the acceptable range for cattle.

Alkaline water (pH greater than 8.5) may cause digestive upsets, diarrhoea, poor feed conversion, reduced water and/or feed intake. If the pH is less than 5.5 acidosis and reduced feed intake may occur (Kurup et al 2011).

TOTAL DISSOLVED SOLIDS

'Total dissolved solids (TDS) is a measure of all inorganic salts dissolved in water and is a guide to water quality. The measurement also includes other dissolved substances such as organic compounds, when present ... the TDS of natural waters reflects the geology of source areas; the major contributing ions are typically calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulphate and in some cases, nitrate' (Livestock drinking water guidelines).

Rainwater has a TDS of less than 1mg/L, sea water has a TDS of ~35,000mg/L, water with TDS greater than 15,000mg/L is not suitable for stock.

Even if the salinity or TDS is within limits, specific ions can cause health problems. Where TDS exceeds 4000mg/L it is advisable to do a detailed analysis of the ground water. TDS concentration in water can

Livestock	Total dissolved solids (mg/L)		
	No adverse effects on animals expected	Animals may have initial reluctance to drink or there may be some scouring, but stock should adapt without loss of production	Loss of production and a decline in animal health and condition would be expected. Stock may tolerate these levels for short periods if introduced gradually
Beef cattle	0-4000	4000-5000	5000-10,000
Sheep	0-4000	4000-10,000	10,000-13,000 ^b
Horses	0-4000	4000-6000	6000-7000

^a Adapted from ANZECC (1992); ^b Sheep on lush green feed may tolerate up to 13,000mg/L TDS without loss of condition or production.



When calculating dry season and drought rations the water component is often overlooked.

increase through evaporation.

Tolerances of livestock to total dissolved solids (salinity) in drinking water (Livestock water guidelines, page 9.3-11)

SODIUM TOXICITY

Sodium toxicity is related to the availability of water. If animals can drink enough good quality water they can increase sodium excretion. However if they can't drink sufficient good quality water they'll suffer acute sodium toxicity. Acute sodium toxicity results in dehydration, neurological signs (e.g. blindness, incoordination, convulsions) and death. Acute intoxication of cattle has occurred when they've drunk water containing around or over 5000mg/L of sodium.

Chronic sodium toxicity in cattle has resulted after drinking water containing 2500mg/L of sodium. Cattle suffering from chronic sodium toxicity drink more, have diarrhoea, eat less and produce less milk. The 'safe' level for sodium depends on the availability of low saline water, feed intake of salt and the metabolic state of the animal, e.g. dry, pregnant, lactating or growing.

Salt (sodium chloride) toxicity has been reported in animals drinking both surface and ground water. It was suspected in Queensland in 2003 where five year old Merino wethers died from drinking very salty bore water.

They suffered incoordination and recumbency before death. 'There have also been reports of animals dying from urinary calculi and obstruction, presumed

to be due to the high mineral content of the water' (Kurup et al 2011).

Calcium levels of up to 1000mg/L can be tolerated by cattle. However high levels are less tolerated if: dietary phosphorus is inadequate; high concentrations of sodium and magnesium are present, or; if additional calcium is added to the diet in supplements.

High calcium levels can interfere with phosphorus absorption and cause phosphorus deficiency. Although not common, excess calcium can result in skeletal disorders and under some circumstances can be deposited in skeletal and heart muscle, potentially compromising heart function.

Magnesium at high levels such as 5000mg/L have been associated with diarrhoea, lethargy, lameness, decreased feed intake and decreased performance.

Nitrate and nitrite occur naturally in waters and both can cause toxicity.

Nitrate concentrations less than 400mg/L in stock water are unlikely to cause a problem, however nitrite concentrations greater than 30mg/L can be hazardous. High levels are usually associated with contamination from fertiliser, manure or other waste material.

Sulphate is also found in most natural waters. Less than 1000mg/L of sulphate shouldn't cause a problem, however concentrations of 1000-2000mg/L can adversely affect young or lactating animals (e.g. diarrhoea). It can also be a problem in dry hot weather when cattle drink more. Levels greater than 2000mg/L can cause chronic or acute health problems.

Fluoride can be an issue in bore water, concentrations greater than 2mg/L may be hazardous to stock. Because it's a cumulative toxin animals that live longer are more likely to develop chronic fluorosis. Australia's National Animal Health Information System reports one case of fluorosis in 2003 affecting three year old Santa Gertrudis cows near Longreach. The cows had generalised lameness, thought to be associated with the high concentrations of fluoride (18mg/L) in the bore water.

BLUE GREEN ALGAE

Algae blooms, including blue green algae (cyanobacteria) are more likely to occur:

- in stationary surface water sources with high concentrations of organic material, e.g. manure, runoff from fertilised pastures,
- during periods of sunny weather with temperatures between 15-30°C, and
- in water with a pH of greater than or equal to 6.

Kurup et al (2011) found that the two most commonly reported causes of water quality related livestock deaths in Australia were cyanobacteria poisoning and salt toxicity.

MORE INFORMATION

More information about water quality and its effects on cattle, improving water quality and water quality sampling can be found in:

'Review of the effects of water quality on ruminant health and productivity', Kurup et al. (2011) www.mla.com.au/News-and-resources/Publication-details?pubid=5650

'Water requirements for cattle' www.futurebeef.com.au/topics/nutrition/water-requirements-for-cattle

'Water medication: a guide for beef producers', Entwistle & Jecott (2005) www.mla.com.au/News-and-resources/Publication-details?pubid=4977

'Australian and New Zealand guidelines for fresh and marine water quality (2000) Volume 3, Chapter 9 Primary industries - rationale and background information, 9.3 Livestock drinking water guidelines' www.environment.gov.au/resource/australian-and-new-zealand-guidelines-fresh-and-marine-water-quality-volume-3-primary

'Animal Health Surveillance Quarterly Report', Animal Health Australia www.animalhealthaustralia.com.au/elibrary





WHEN calculating dry season and drought rations the water component is often overlooked. Access to good quality water is essential as it affects feed intake, paddock utilisation, cattle growth rate, lactation and reproduction.

For example, in Central Queensland daily intakes of breeders forced to drink poor quality water during winter dropped as low as 9-12L/head but recovered to about 25L/head when water quality improved (Entwistle & Jepcott 2005).

In BeefTalk 37 (p32) we looked at how much cattle eat and drink. This article looks at water quality factors that can adversely affect cattle and other livestock.

Some of which, such as cyanobacteria (blue green algae) and salinity, are exacerbated during extended dry periods and/or high temperatures.

The following information is from the 'Review of the effects of water quality on ruminant health and productivity' prepared by Dr Raj Kurup et al (2011), available from Meat and Livestock Australia.

Water quality varies depending on the source, climatic conditions, soil type, etc. The degree of impact water quality has on cattle varies due to their diet and physiological state. If in doubt or you're in an area known for water quality issues it's best to get it tested.

Factors that affect water quality include: odour and taste; physical and chemical properties; presence of toxic compounds; concentrations of micro- and macro-minerals; and microbial contamination.

Some potential culprits of poor water quality are:

- pH.
- Total dissolved solids or electrical conductivity, including:
 - Sodium.
 - Calcium.
 - Magnesium.
 - Nitrate and nitrite.
 - Sulphate.
 - Heavy metals (e.g. fluoride).
 - Blue green algae.

THE PH LEVEL

pH level is determined by the concentration of hydrogen ions in water. A pH of 7 is 'neutral', values less than 7 are increasingly acidic and values greater than 7 are increasingly alkaline. The optimum pH range for beef cattle is 6.5 to 8.5. For the most part the pH of groundwater across northern Australia is within the acceptable range for cattle.

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TOTAL DISSOLVED SOLIDS

Total dissolved solids (TDS) is a measure of all inorganic salts dissolved in water and is a guide to water quality. The measurement also includes other dissolved substances such as organic compounds, when present. The TDS of natural waters reflects the geology of source areas; the major contributing ions are typically calcium, magnesium, sodium, potassium, bicarbonate, chloride, sulphate and in some cases, nitrate' (Livestock drinking water guidelines).

Rainwater has a TDS of less than 1mg/L, sea water has a TDS about 35,000mg/L, water with TDS greater than 15,000mg/L is not suitable for stock.

Water quality: How it affects your cattle

Golden rule – if you have any doubts about quality, get it tested

Livestock	Total dissolved solids (mg/L)		
	No adverse effects on animals expected	Animals may have initial reluctance to drink or there may be some scouring, but stock should adapt without loss of production	Loss of production and a decline in animal health and condition would be expected. Stock may tolerate these levels for short periods if introduced gradually
Beef cattle	0-4000	4000-5000	5000-10,000
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^a Adapted from ANZECC (1992); ^b Sheep on lush green feed may tolerate up to 13,000mg/L TDS without loss of condition or production.

Tolerances of livestock to total dissolved solids (salinity) in drinking water (Livestock water guidelines, page 9.3-11)

Even if the salinity or TDS is within limits, specific ions can cause health problems. Where TDS exceeds 4000mg/L it is advisable to do a detailed analysis of the ground water. TDS concentration in water can increase through evaporation.

SODIUM TOXICITY

Sodium toxicity is related to the availability of water. If animals can drink enough good quality water they can increase sodium excretion. However, if they cannot drink sufficient good quality water they will suffer acute sodium toxicity. Acute sodium toxicity results in dehydration, neurological signs (for example, blindness, incoordination, convulsions) and death. Acute intoxication of cattle has occurred when they have drunk water containing about or over 5000mg/L of sodium.

Chronic sodium toxicity in cattle has resulted after drinking water containing 2500mg/L of sodium. Cattle suffering from chronic sodium toxicity drink more, have diarrhoea, eat less and produce less milk. The 'safe' level for sodium depends on the availability of low saline water, feed intake of salt and the metabolic state of the animal, for example, dry, pregnant, lactating or growing.

Salt (sodium chloride) toxicity has been reported in animals drinking both surface and ground water. It was

suspected in Queensland in 2003 where five-year-old Merino wethers died from drinking very salty bore water. They suffered incoordination and recumbency before death. "There have also been reports of animals dying from urinary calculi and obstruction, presumed to be due to the high mineral content of the water" (Kurup et al 2011).

Calcium levels up to 1000mg/L can be tolerated by cattle. However, high levels are less tolerated if: dietary phosphorus is inadequate; high concentrations of sodium and magnesium are present; or if additional calcium is added to the diet in supplements. High calcium levels can interfere with phosphorus absorption and cause phosphorus deficiency. Although not common, excess calcium can result in skeletal disorders and under some circumstances can be deposited in skeletal and heart muscle, potentially compromising heart function.

Magnesium at high levels such as 5000mg/L have been associated with diarrhoea, lethargy, lameness, decreased feed intake and decreased performance.

Nitrate and nitrite occur naturally in waters and both can cause toxicity. Nitrate concentrations less than 400mg/L in stock water are unlikely to cause a problem, but nitrite concentrations greater than 30mg/L can be hazardous. High levels are usually

associated with contamination from fertiliser, manure or other waste material.

Sulphate is also found in most natural waters. Less than 1000mg/L of sulphate should not cause a problem, but concentrations of 1000-2000mg/L can adversely affect young or lactating animals (for example, diarrhoea). It can also be a problem in dry hot weather when cattle drink more. Levels greater than 2000mg/L can cause chronic or acute health problems.

Fluoride can be an issue in bore water, concentrations greater than 2mg/L may be hazardous to stock. Because it is a cumulative toxin, animals that live longer are more likely to develop chronic fluorosis. Australia's National Animal Health Information System reports one case of fluorosis in 2003 affecting three-year-old Santa Gertrudis cows near Longreach. The cows had generalised lameness, thought to be associated with the high concentrations of fluoride (18mg/L) in the bore water.

BLUE GREEN ALGAE

Algae blooms, including blue green algae (cyanobacteria) are more likely to occur:

- In stationary surface water sources with high concentrations of organic material, for example, manure and run-off from fertilised pastures.
- During periods of sunny weather with temperatures between 15-30 degrees Celsius.
- In water with a pH of greater than or equal to 6.

Kurup et al (2011) found the two most commonly reported causes of water quality related livestock deaths in Australia were cyanobacteria poisoning and salt toxicity.

More information about water quality and its effects on cattle, improving water quality and water quality sampling can be found in:

'Review of the effects of water quality on ruminant health and productivity', Kurup et al (2011), www.mla.com.au/News-and-resources/Publication-details?pubid=5650

'Australian and New Zealand guidelines for fresh and marine water quality (2000) Volume 3, Chapter 9 Primary industries – rationale and background information, 9.3 Livestock drinking water guidelines', www.environment.gov.au/resource/australian-and-new-zealand-guidelines-fresh-and-marine-water-quality-volume-3-primary



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