FutureBeef

Beeftalk

Taking stock of your future

in this issue

Flock talk

— COVER IMAGE by SARAH COULTON

ISSUE 41 SUMMER 2014

Queensland Government

QUEENSLAND Country Life

Strategies to restore drought-hit paddocks

WELCOME to Beeftalk 41. In this issue, we bring you the results from the Wambiana grazing trial.

This significant trial has been running for 17 years since 1997, measuring the impact of moderate and heavier stocking rates upon pastures, stock performance and economics.

With the continuing dry weather, the land condition of many paddocks is under pressure.

Jill Alexander discusses land condition and describes some strategies to help restore paddocks.

While on land condition, the Stocktake Plus App, which helps people to monitor pastures, has been enhanced. Be sure to update to the latest version.

Botulism is a constant risk in phosphorous deficient areas and an increasing risk during dry times.

The article 'Are your cattle phosphorus deficient?' outlines indicators of phosphorus deficiency including a map of generally deficient areas in southern Queensland.

When the rains come and if cattle are not performing on lush pastures as well as expected, then phosphorus may be a problem.

For people with enough soil moisture there are some tips to consider for summer forage.

Also, if you are interested in learning artificial insemination, you can read about the short course running from December 16-19, 2014, near Mundubbera.

We hope you get value from Beeftalk.

Please provide your feedback and suggestions for future issues using the short survey at www.surveymonkey.com/s/beeftalk41.

Happy reading!

— The Beeftalk team

Beeftalk edition 41

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NRM Spatial Hub provides rangeland managers with information for better decisions

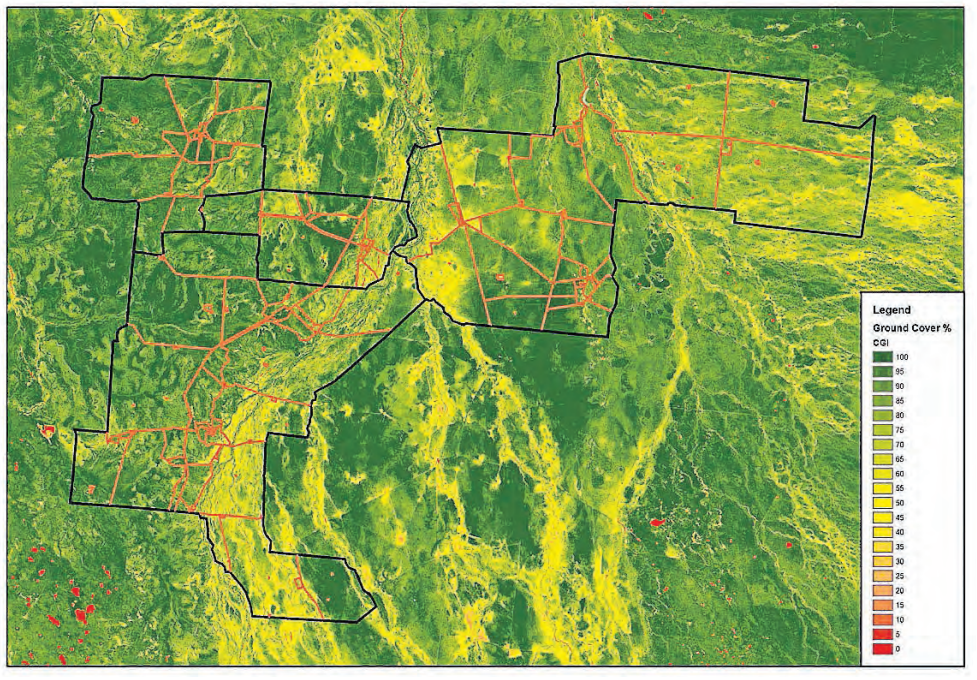
THE NRM (Natural Resource Management) Spatial Hub is a central element of the 15-year blueprint of the Australian Rangelands Initiative which provides guidance for on-going management and protection of the natural resources of Australia's rangelands.

The stage 1 development and demonstration of the hub is part of a $1.6 million investment over two years from Caring for Country and Meat & Livestock Australia.

The hub will give land managers systems, tools, data and skills to improve access to property scale information and knowledge. These improved capabilities will underpin better management decisions and lead to improved productivity, land condition and conservation.

A small team of NRM Spatial Hub, NRM rangeland regional bodies and Department of Agriculture, Fisheries and Forestry staff have identified Queensland land managers interested in participating in the project. There will be at least four properties in each of the seven NRM rangeland-based regions (Cape York, Northern and Southern Gulf, Desert Channels, NQ Dry Tropics, Fitzroy and South-west) committed to the project.

Queensland's participating land managers will use the hub online property planning and information system to get data and mapping tools that will help them develop and maintain comprehensive digital property plans, infrastructure maps and data necessary to help develop grazing plans.



Land managers will be given simple tools for analysing land condition over months, years and decades. These maps show ground cover estimates from satellite data in May 2009 after the Queensland Gulf floods, and the average ground cover for each paddock.

Hub users will have secure online access to the latest spatial data such as high resolution and time-series satellite imagery and land condition products; tools that manage and process property information; and will be able to capture information in the paddock using handheld devices such as GPS or smartphones.

DAFF grazing specialists will provide land managers with paddock and property carrying capacity information for different developments (e.g. watered area), land condition and woody cover scenarios.

This carrying capacity information, combined with remote sensing products that provide direct measures of woody vegetation extent, ground cover and estimates of pasture biomass, will help land managers to develop grazing plans to achieve sustainable production.

After the property demonstrations, a series of workshops will be held around Queensland in 2015 to show how to access and use the online property planning and information system, tools and products.

For more about the NRM Spatial Hub project and future workshops contact Michael Digby from the Australian Rangeland NRM Alliance on 0428 611 599 or email rmsc@northerngulf.com.au

Phosphorus: Are your cattle deficient?

P deficiency in cattle significantly limits their performance

PHOSPHORUS is needed for almost every vital bodily function, including building bones and teeth, producing milk and using feed efficiently.

Phosphorus deficiency in cattle significantly limits their performance.

Phosphorus-deficient cattle have poor appetites, eat less and consequently grow less, have decreased fertility and milk production, and are at a greater risk of death.

If you answer 'yes' to one or more of the following three questions it is worthwhile investigating the phosphorus status of your cattle further:

1 Is your district known to be phosphorus deficient?
- Ask your local vet, consultant or FutureBeef officer
- Look at the phosphorus status map for northern Australia
- Review soil analyses for your property if available.

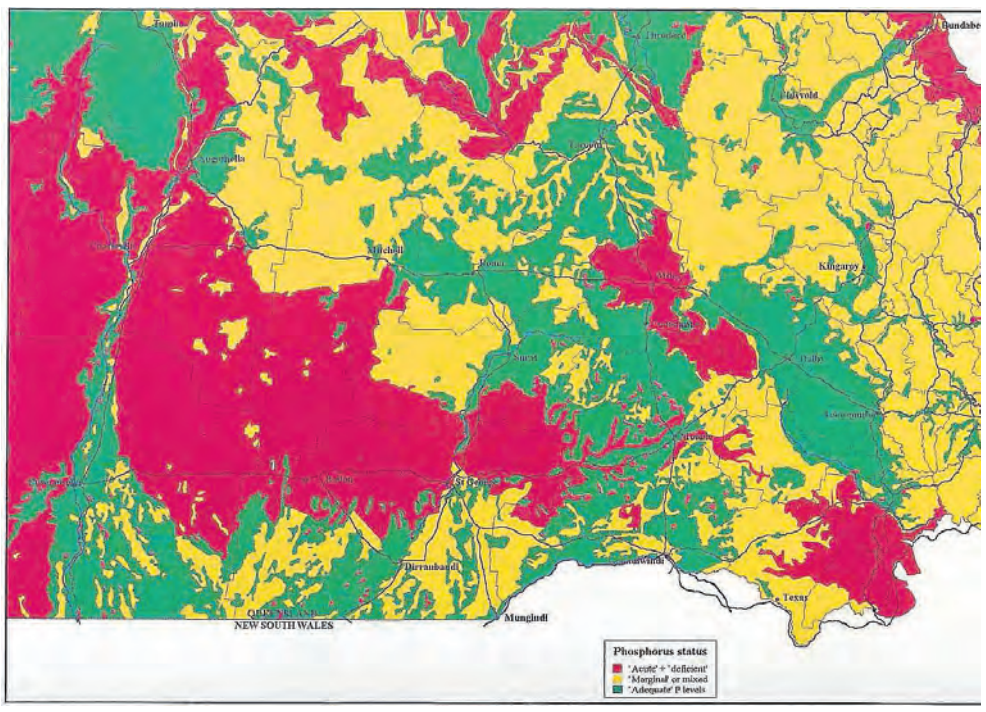
2 Do your cattle show any signs or symptoms of phosphorus deficiency?
- Chew old bones
- Have peg leg
- Break bones
- Die of botulism.

3 Are your cattle performing below expectations?
- Growth rates (especially when on good feed)
- Reproduction rates
- Body condition.

Put simply there are four main ways of identifying phosphorus deficiency in cattle: trial feeding, soil tests, blood tests, and faecal tests.

1. Trial feed a group of heifers, steers or first-calf cows with a phosphorus supplement when they are on lush feed and compare their performance with a group of similar, unsupplemented animals.

2. Test your soil – soil phosphorus levels (i.e. bicarbonate extraction of phosphorus) of:
- 5mg or less of phosphorus per kilogram (5ppm) are considered deficient to acutely deficient for cattle production
- 6-8mg of phosphorus per kilogram (6-8 ppm) are considered marginal
- 8mg or greater of phosphorus per kilogram (8ppm) are considered adequate on native pastures while higher levels are needed on oats for high performance.



Phosphorus status of land in southern Queensland as it relates to animal performance Red = 'acute' + 'deficient'; Yellow = 'marginal' or mixed; Green = 'adequate' phosphorus levels (McCosker and Winks, 1994).

> There are four main ways of identifying phosphorus deficiency in cattle: trial feeding, soil tests, blood tests, and faecal tests.

3. Take blood tests – blood tests taken at the end of the wet season from growing animals not fed phosphorus supplements will give accurate results.

4. Take faecal samples – faecal samples taken from animals not supplemented with phosphorus in the middle of the wet season will give you an indication of their phosphorus status.

The 'Phosphorus management of beef cattle in northern Australia' manual explains phosphorus deficiency, diagnostic tests and practical management options in much more detail.

You can download, or order, a free copy from Meat & Livestock Australia at www.mla.com.au/News-and-resources/Publication-details?pubid=6024 or phone 1800 023 100.

How often do we receive 50mm of rain in three days?

Annual Rainfall (mm)	Rainfall Consecutive days Time period	50mm 3 days Nov/Dec	50mm 3 days Dec	50mm 3 days Dec/Jan	100mm 3 days Dec	100mm 3 days Dec/Jan
1110	Gympie	74	60	86	14	34
956	Toowoomba	72	52	78	12	23
899	Esk	66	49	77	12	29
617	Roma	49	31	60	6	14
675	Dalby	65	43	55	11	17
491	Charleville	26	14	45	2	9
630	Goondiwindi	38	22	43	3	14
544	St George	37	20	43	3	12
401	Cunnamulla	18	11	40	3	15
377	Quilpie	20	11	37	2	6

Annual rainfall and percentage of years in which specific rainfall events have occurred for different locations across southern Queensland.

NATIVE pasture production in Queensland relies heavily on wet season rainfall. The earlier the wet season starts the better, however how often can significant rainfall events be expected to break the dry season?

How much rain within how many days is enough for useful pasture growth?

Is 50mm in three consecutive days enough?

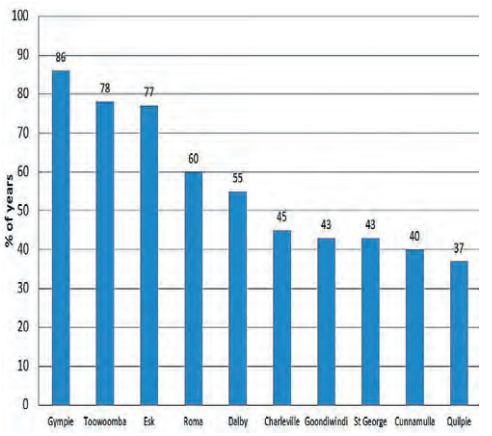
How often has this occurred in the past?

'CliMate' is a useful website (www.australianclimate.net.au) and app that uses historical rainfall data to see how often different rainfall events have occurred in the past.

It is easy to select different locations, rainfall events and time periods to see how often different events have happened before.

Although this is not predictive, it can guide general expectations based on past events.

The table and graph shows a range of figures for locations across southern Queensland.



How often do we receive at least 50mm in three consecutive days from December 1 to January 31 (using historical rainfall from 1950)?

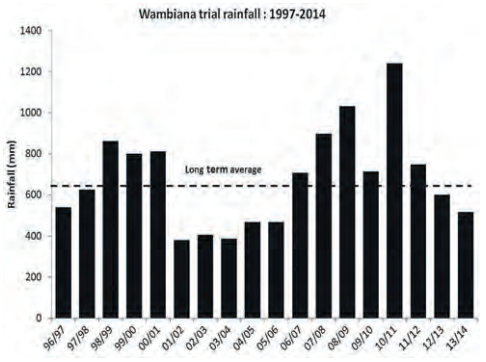


Figure 1: Annual rainfall at the Wambiana grazing trial from 1997-2014.

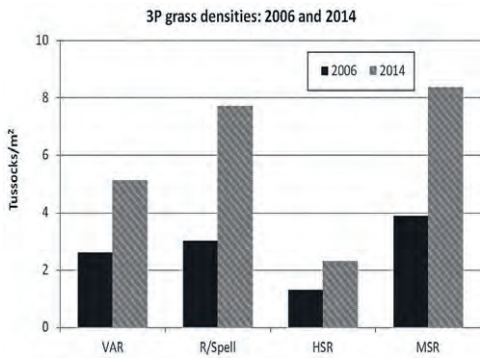


Figure 2: The density of 3P grasses in 2006 (after six dry years) and in 2014 (after seven good to average years).

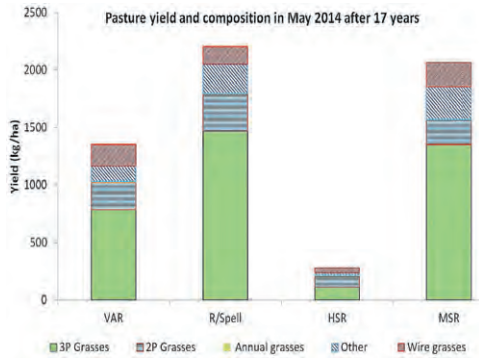


Figure 3: Pasture yield and species composition in May 2014 after 17 years in the different grazing strategies at the Wambiana trial.

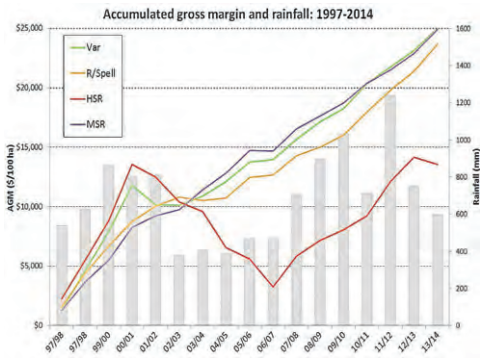


Figure 4: Accumulated gross margin (AGM) and rainfall from 1997 to 2014 (gross margins based on value of beef produced less costs including interest at 7.5%).

Grazing for the climate

Profitable, sustainable grazing management in a variable climate

THE current drought affecting much of Queensland highlights a recurring challenge to the grazing industry: how do you manage sustainably and profitably when rainfall can vary so much between years?

In an attempt to answer this question the Department of Agriculture, Fisheries and Forestry (DAFF) started a long-term grazing trial in 1997 on the Lyons family property Wambiana, near Charters Towers. Phase 1 of this Meat & Livestock Australia-funded trial (1998 to 2011) looked at five grazing strategies:

- **Heavy stocking** (HSR) at 4ha/animal equivalent (AE = 450kg beast).
- **Moderate stocking** (MSR) at the calculated long-term carrying capacity of 8ha/AE. (Long-term carrying capacity was calculated based on the rainfall that could be expected in 70% of years i.e. not average rainfall.)
- **Rotational wet season spelling** (R/Spell) in a three-paddock system (8ha/AE).
- **Two variable strategies with stocking rates** varied based on either available forage (VAR) or available forage and a climate forecast (SOI). Because of the similar response of these two strategies, results are only discussed from the VAR.

In Phase 2 of the trial (2012 onwards) some of the treatments were adjusted to apply learnings from Phase 1, i.e. both the 'variable' strategies were changed to 'flexible' stocking and then applied as either flexible stocking with wet season spelling or flexible stocking without wet season spelling. As these changes were made only recently, data from the new flexible treatment is included with the original VAR data.

There are two experimental paddocks (replicates) for each strategy. Paddocks are 100ha and contain a mixture of box, silver leaved ironbark and Brigalow land types. The cattle are 1.5 and 2.5 year old Brahman-cross steers, supplemented with wet season phosphorus and dry season urea. Cattle stay on the trial for two years before going to the meatworks. While the trial is near Charters Towers, the grazing principles and outcomes are of general applicability to tropical pastures across Queensland.

RAINFALL AND STOCKING RATES

Rainfall varied a lot over the length of the trial beginning with four good years followed by six dry years in the early 2000s. However, over the last seven years (2007-2014) the seasons ranged from average to very good (Figure 1).

Stocking rates in the VAR were increased to very high levels (up to 3ha/AE) in the early wet years leading to overgrazing in the following dry year (2001-02).

However, stocking rates in the VAR were cut sharply thereafter to about 9ha/AE and since then have been adjusted far more conservatively in this strategy.

While the HSR coped well in wet years, drought feeding with M8U was required in four of the dry years. Stocking rates in the HSR also had to be reduced from 4-6ha/AE between 2005 and 2009 due to the ongoing feed shortage. One HSR paddock also had to be destocked for three months in late 2004. In contrast to the HSR, the 8ha/AE stocking rate in the MSR was sustained in all years without drought feeding or destocking being required (Figure 1).

PASTURE PRODUCTION AND COMPOSITION

The grazing strategy applied had a major impact on pasture condition: thus in 2014 after 17 years, the density of 3P (perennial, palatable and productive) grasses is highest in the MSR and R/Spell, but by far the lowest in the HSR (Figure 2).

Importantly, despite seven recent favourable seasons, in the HSR there has been little or no recovery in the population of 3P grasses since the end of the drought in 2006. The slightly lower 3P density in the VAR in 2014 compared to the MSR and R/Spell is a direct result of the heavy stocking rates applied in the VAR leading into the drought of the early 2000s. This shows how long the ill effects of a period of poor management on pasture condition can take to recover.

These differences in 3P density have also had major impacts on pasture production and composition. In 2014 which had reasonable rainfall (517mm), the end of wet season pasture mass was 10 times greater and the proportion of 3P grass many times higher, in the R/Spell and MSR than in the HSR (Figure 3). Currently, (November 2014) there is less than 100kg/ha of forage in the HSR, i.e. almost bare ground.

There has also been a massive increase in *Bothriochloa pertusa* (Indian couch) across the trial since 2006, with by far the greatest increase in the HSR. With an inevitable return to drier years the loss of 3P grasses in the HSR will undoubtedly reduce animal production and carrying capacity further.

ANIMAL PRODUCTION AND ECONOMIC PERFORMANCE

Over all years, average annual liveweight gain (LWG) per head was highest in the MSR (119kg) and lowest in the HSR (98kg), with the R/Spell and VAR averaging 114kg/hd/year. After two years on the trial, steers in lighter stocked treatments finished 30 to 60kg heavier and in better condition than those in the HSR. As a result these steers received a price premium of between $0.07 to $0.20/kg more at the meatworks than heavily stocked steers.

In contrast to individual animal production, average annual LWG/ha over 17 years was highest in the HSR (23kg/ha) but lowest in the MSR and R/Spell (15kg/ha) followed by the VAR (18kg/ha). Note however that the high LWG/ha in the HSR came with the expense of drought feeding in drier years. After 17 years accumulated gross margin in the HSR is some $10,000 per 100ha less than in the other strategies. Although the HSR was very profitable in the early wet years of the trial, in the dry years it lost money due to the cost of drought feeding, reduced LWG/ha and the price penalty for poorer condition animals. In contrast to the HSR, in the MSR and R/Spell, accumulated gross margins grew steadily over all years.

Hence after 17 years, accumulated gross margins in the MSR and R/Spell are far higher than in the HSR, despite running only half the number of cattle. Although the VAR strategy was also heavily stocked in early years, the sharp cut in stocking rates going into the dry years avoided the penalties incurred in the HSR. Consequently, the accumulated gross margin in the VAR is far better than in the HSR (Figure 4).

WHAT WOULD HAPPEN WITH BREEDERS?

Would these outcomes also hold with breeders at a property level? Our colleague Joe Scanlan attempted to answer this question using the trial data to model the outcomes of different strategies for a 23,000ha property over 30 year sequences of rainfall data for Charters Towers. Modelling results clearly showed that both breeder profitability and pasture condition were maximised at moderate stocking rates. However the actual 'optimum' stocking rate varied with rainfall, reinforcing the need to adjust stocking rates as seasons vary.

GENERAL STRATEGY PERFORMANCE

The heavy stocking rate was ultimately unprofitable due to poor individual animal performance and high costs. The strategy was also unsustainable, caused pasture degradation and a long-term loss of productive capacity. Importantly, this degradation was not reversed despite a run of recent good years. Further pasture deterioration with an associated decline in animal production can be expected when the inevitable dry years return.

Moderate stocking at long-term carrying capacity was far more profitable than the HSR due to good individual animal production, meatworks price premiums and low costs. The MSR also maintained the density of 3P grasses and, with the R/Spell, had the best pasture condition. Our experiences at the trial nevertheless indicate that the MSR would benefit from wet season spelling as well as some form of stocking rate flexibility as seasonal conditions changed.

The R/Spell gave good individual animal performance and was also far more profitable than the HSR. The strategy also maintained 3P grass density and currently probably has the best pasture condition of all treatments. Over the past four years, individual

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Toxic topic: Botulism

The risk of this deadly disease increases during drought

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 and 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 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. The toxin is quite stable and may remain in contaminated feed or water for some time. Vaccination is the only effective way to prevent outbreaks.

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 and 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. Cattle have eaten litter piled ready to be spread on pastures or litter that has been spread on pasture but not incorporated into the soil.

Legislation now prohibits feeding animal matter, including chicken faeces and chicken litter to livestock and livestock must be denied access to this material. Animals are only allowed to graze pasture fertilised with chicken faeces or litter if it is ploughed into the soil or given time to be incorporated into the soil first.

SYMPTOMS

Symptoms vary dramatically depending on the dose of toxin and any pre-existing immunity that may be present. Signs vary from sudden death (animals collapse and die in several hours) to a slowly progressive paralysis where death may take days. 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. Cattle affected by botulism do not develop a fever. They show no response to treatment for other common causes of 'downer cow syndrome' like three-day sickness or milk fever. Cattle may progress to the stage where they have difficulty breathing and typically lie on their brisket with their hind legs stretched out behind them. Tongue paralysis may or may not be a feature of the disease (cattle cannot pull their tongue back in when it is pulled out of their mouth). At post-mortem, there are no obvious signs other than those associated with being down.

VACCINATION THE ONLY LONG-TERM PREVENTION STRATEGY

The only effective long-term prevention strategy for botulism is vaccination with bivalent botulinum vaccines. In phosphorus deficient areas where botulism risk is very high, vaccination against types C and D botulism has been widely adopted as standard industry practice.

Beef and dairy producers who feed their cattle a prepared ration, especially those based on silage or by-products such as brewer's grains, should vaccinate their cattle against botulism. Whenever possible, cattle should be vaccinated well before any suspected period of risk and before the ration is introduced.

A range of different botulism vaccines on the market are highly effective. Some newer vaccines only require a single shot where the traditional vaccine requires two shots a month apart. Both the one-shot and two-shot vaccines produce a similar end result, and the decision on which type of vaccine to use depends largely on product cost and convenience.

All vaccines require boosters to be given to maintain protective levels of immunity. Consult package information or the vaccine manufacturer for advice on the timing of booster vaccinations.

Other prevention strategies include:

- Phosphorus and/or protein supplementation may assist in reducing bone chewing
- If possible prevent stock having access to rotting animal and vegetable matter, including in water
- Ensuring that feedstuffs are not contaminated with botulinum toxin
- Vermin control during the harvest, preparation and storage of animal feedstuffs
- Prevent stock from having access to piles of chicken litter (there is a chicken litter feeding ban in Queensland)
- Incorporating chicken litter into the soil immediately after being spread

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

Grazing for the climate: Sustainable grazing management

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liveweight gain in the R/Spell has also been the highest of all strategies suggesting an emerging effect of improving pasture condition on animal production. Experience also suggests that some reduction in stocking rates will be important in drier years.

Variable stocking was also more profitable than heavy stocking and of similar profitability to the MSR and R/Spell. However, high stocking rates in 2000-01 leading into the dry years adversely affected pasture condition. Variable stocking would thus be improved by setting upper limits to stocking rates, making stocking rate adjustments in a more risk-averse manner and some form of wet season spelling. The main stocking rate adjustment should be based on forage availability at the end of the wet season (May/June) with other secondary adjustment points in the late dry season (October/November) and possibly, in the early-mid wet season.

These long-term results indicate that the most profitable and sustainable strategy for managing climate variability will involve flexible stocking around long-term carrying capacity with stocking rates changed in a risk averse manner as rainfall varies. Periodic wet season spelling is also essential to maintain land condition. Different combinations of these strategies are currently being tested in Phase 2 of the Wambiana trial. We look forward to sharing these results with you in future Beeftalk articles and welcome inquiries from producers wishing to visit the trial.

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Introducing the FutureBeef Stocktake Plus app – the grazier's new best mate in the paddock.

Monitoring and decision support

FutureBeef STOCKTAKE PLUS

THE FutureBeef Stocktake Plus app is a grazing monitoring and management decision support tool for graziers and advisers predominantly located in northern Australia. It has partial functionality for producers in other regions.

It is a mobile tool assisting grazing best management practices by helping users to monitor land condition, stock numbers and rainfall.

It includes a forage budgeting tool for calculating the appropriate balance of stock to available pasture.

Producers set up their own properties and paddocks and the app can produce reports, including land condition monitoring and long-term benchmark carrying capacities.

The app's mobility allows users to capture data whilst in the paddock directly onto their device and then later securely sync their device (via Wi-Fi or 3G access) and upload the data to their personal account. This allows users to:

- Capture important production data for analysis
- Manage property resources
- Understand their property environment over time
- View and export their data through a personal and secure portal.

Since the app's launch its adoption has exceeded expectations with favourable feedback on its functionality and user friendliness.

Valuable feedback has also led to some recent enhancements.

You can download the app for free from either the App Store (iOS users) or Google Play (Android users).

The FutureBeef Stocktake Plus team continue to work closely with users and developers to deliver a quality product with enhanced user experience. They always appreciate your feedback.

To find out more, register an account and download the app visit the Stocktake Plus website www.stocktakeplus.com.au

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Recovering land condition

After the dry season had broken, the paddock grew mostly mint weed and soft roly poly. Grass present, but less than 30% of pasture composition. (Picture March 2008)

Paddock slashed, sprayed with broadleaf herbicide and wet season spelling. Strip on left was not sprayed. Just by reducing weed competition and spelling till the grass dropped seed allowed the grass to get away. (Picture May 2009)

Recovered productive pasture. (Picture May 2010)

WHETHER it is land or people, the process of recovery requires rest, nourishment and time. There are no shortcuts, no silver bullets.

The poorer the condition of the land, the more rest that is required to get back to full carrying capacity. Land condition declines more rapidly than it improves. Why? Because country needs resting during wet seasons to improve condition, and as you know, they can often be few and far between.

Trial work has demonstrated that when 30 per cent or more of the pasture is still comprised of perennial grass species, vigilant grazing management which incorporates early wet season spelling and retention of grass stubble, can recover pasture condition within three wet seasons. However, when there is little or no perennial grass left in the paddock, re-sowing of pasture is often required.

GRAZING LAND CONDITION

Grazing land condition is the capacity of land to respond to rain and produce useful forage. It's not a measure of how much feed is on hand or the quality of it, but rather a measure of the health of the grazing system in its capacity to convert water, sunlight and nutrients into plant tissue.

As land condition declines, so does carrying capacity. The long-term carrying capacity of land in poor condition is less than half of that in good condition.

Perennial grasses are the backbone of robust grazing systems and management to preserve these plants should be the focus of any grazing strategy. Annual grasses and weeds will provide some feed during the wet season, but they are fair-weather friends in the dry.

MOST DAMAGE IS DONE TO PASTURE HEALTH IN THE WET SEASON, NOT THE DRY

At the end of the growing season, perennial grass tussocks cure and set seed. They relocate important nutrients such as nitrogen and phosphorus from the leaves of the plant down to the crown and roots where they remain over the dry season. This is why hayed-off pasture is of low nutritive value to stock.

Grazing during this period removes few nutrients from the pasture and does little damage to the seasonally dormant plant - as long as the crowns and growing points are left alone.

When the dry season breaks, plants draw on these stored nutrients and energy from the roots to grow new shoots.

If these new shoots are immediately grazed, the plant must again draw on stored energy and nutrients to grow new shoots.

Persistent grazing early in the wet season depletes plant energy reserves and results in small, weak root systems. If the pasture is rested at the start of the wet season, the new shoots start to photosynthesise, collecting energy from the sun rather than the roots, and rebuild both the root and shoot components of the plant.

LEAVE GOOD GRASS STUBBLE IN THE DRY

While most damage is done to the pasture during the wet season, what you leave at the end of the dry season is a good predictor of how quickly the pasture will respond to rain when it does finally arrive.

Consider the crown and the stalk as the scaffolding off which the grass plant can grow leaf. If you graze right down to the butt of the tussock, the plant has to regrow this scaffolding to hang the leaf. This can delay a return to full carrying capacity by months.

Grass stubble and organic ground cover play an important role in protecting and feeding the soil. Plants can only access water using their roots so you have to get rainfall down into the soil profile to facilitate new plant growth.

Grass stubble and mulch buffers the impact of extreme temperatures and heavy rain, keeping it in the topsoil rather than running off the paddock. It also minimises evaporation. If you consider that falls of less than 5mm are mostly ineffective due to evaporation, minimising this effect is critical.

Soil organic matter is king when it comes to improving the long-term productivity of pastures. Leaving more rather than less organic matter to be incorporated into the soil will pay back dividends in years to come.

Humus can hold 80 to 90pc of its weight in moisture, significantly increasing the water holding capacity of the soil.

Soil microbes decompose organic matter and release nutrients for plants to use. As a grazing land manager you should be budgeting on providing feed for both your aboveground livestock and your underground livestock, as they really do matter.

MANAGING PROBLEMS IN OLD CULTIVATION

A lot of old cultivation country is let go to pasture because productivity declined over time. This is often due to a lack of inputs to compensate for the outputs (silage and hay production remove the most nutrients and organic matter from the paddock). Don't expect a sown pasture to thrive unless you are prepared to replenish the soil with what has been removed over the years - organic matter and nutrients.

Six demonstration sites set up on the Western Downs tested strategies for improving the land condition. Five of the six paddocks were old cultivation, the pasture comprised roughly 30pc perennial grasses and all had ongoing problems with broadleaf weeds and patchiness across the paddock.

The paddock which had the quickest recovery used a combination of wet season spelling and broadleaf herbicide application at the onset of the wet season. The cost to benefit ratio in this case was 1.91:1, which indicates that for every dollar invested, $1.91 was generated.

Using a selective herbicide instead of cultivation benefited the pasture by retaining organic cover which could protect the soil until the perennial grasses grew and spread.

In small paddocks where sticks and rocks aren't a problem it may be feasible to slash the upper canopy to allow better coverage of herbicide on the weeds.

SOME RULES OF THUMB FOR IMPROVING LAND CONDITION

1. Rest paddocks in the wet - early in the season is when you will have most impact

If the paddock is in poor condition, rest the paddock from break of season until the grasses have set and dropped seed.

2. Leave good grass stubble in the dry season

The more you can leave the quicker the pasture will respond when it does rain.

3. Minimise competition

If the pasture still comprises at least 30pc perennial grass species, controlling broadleaf weeds early in the wet season and subsequent spelling will give these grasses the best chance of outcompeting the less desirable species.

4. Build organic matter and replenish soil nutrients

Especially in old cultivation. Leave more plant litter and stubble to improve soil condition. Get a soil test done and assess if you need to add fertiliser to get pastures growing to full capacity. A legume will be a longer term solution than nitrogen fertiliser.

5. Re-sowing pasture

This is the most expensive and risky option. Good soil preparation, fallowing and subsequent weed control is critical to maximise plant establishment.

Avoid planting in the middle of summer. Follow-up rain is often a key success factor in establishing new pastures.

Jill Alexander, Applied Ag

Top tips for forage in summer 2014-15

Securing quality seed is important in maximising overall results

Cattle grazing Dolichos lablab

WITH summer approaching, many producers may think about sowing annual forages to complement existing grass pastures. With average to below average summer rainfall predicted, what are the key issues to consider to maximise cattle production and economics if the season breaks and planting happens?

By now the forage type should have been decided and, importantly, seed ordered or at least discussed with your local seed merchant. Securing quality seed of the preferred variety is an important step in maximising the overall production and economic result.

The type of forage grown depends on the feed attributes required and the animal production system used. For example, will stock go direct to market from the forage, or will stock be grown to a heavier weight and finished on subsequent forage?

A range of summer annual forage types exist, but they mainly fall into two categories – cereal types, for example, forage sorghum, and legume types, for example Dolichos lablab. Generally the cereal types produce higher forage yield compared to the legume types, and so these can be stocked at a higher rate.

However, they generally have a lower nutritive value than legumes, so individual animal performance is generally lower.

If high stocking rate is required, for example, to spell grass country, a cereal type forage would suit, whereas, if high liveweight gain is needed to finish stock, a legume type forage would be better.

The other considerations to maximise production are soil moisture, soil fertility and weed control. A deep profile of soil moisture before sowing could be essential this year, especially if below average rainfall conditions eventuate. This may mean regularly assessing soil moisture and delaying sowing until sufficient moisture accumulates. If soil fertility levels are unknown, a soil test is highly valuable to determine fertiliser requirements. There is no point spending the money on preparing and sowing paddocks if soil nutrient levels are low, because animal performance will also be low regardless of what forage is selected.

Weeds can significantly reduce forage production, especially in years where soil moisture is at a premium. Devise a weed management plan before sowing, especially to control in-crop weeds, as options can be limited depending on what forage is selected.

For further information, contact your local forage adviser, or visit the FutureBeef website where you can download the 'High Quality Forages' manual – www.futurebeef.com.au/resources/projects/high-output-forage-systems-for-meeting-beef-markets/

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How big is that tank?

WHEN conditions are dry and we are looking for extra water or supplemental storage all sorts of containers are brought in to service to help. But the most often asked question is how much does that tank hold?

Here are two calculations to help you work out the capacity.

VOLUME OF A CYLINDRICAL TANK

Formula is: π x r2 x h

Where π = 3.14159; r = radius from centre of tank to edge; h = height

So a tank =with a radius of 0.5m x 2m long would have a capacity of 3.14159 x (0.5 x 0.5) x 2 = 1.570795m3 x 1000 for litres = 1570.795 litres

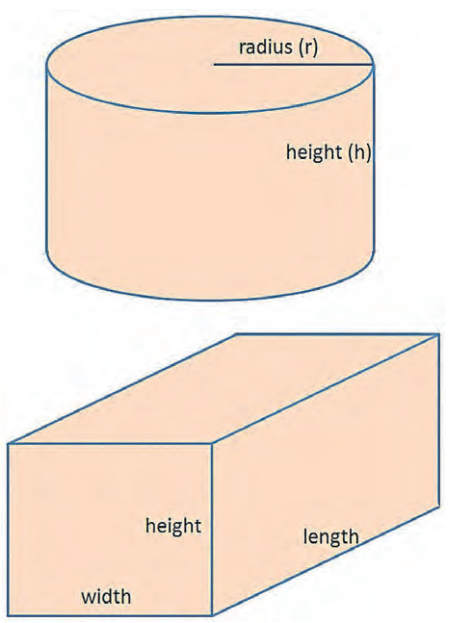
VOLUME OF A SQUARE/RECTANGULAR TANK

Formula is: length x width x height

So a tank 1m high x 2m long x 1m wide = 2m3 x 1000 for litres = 2000 litres.

A Google search for **tank volume calculator soup** gives formulas for some additional tank shapes. Sometimes it is handy to a have a dipstick in a tank to determine amounts of water or supplement.

A handy website that can help you calculate this is



found by searching for **Romsey tank calculator**.

There is a section on how to calculate tank capacity and the increments needed for a dipstick, particularly useful for a cylindrical tank.

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Removing a semen straw from liquid nitrogen storage for insemination.

AI training boosts level of success

WITH improving techniques and oestrus synchronisation programs, artificial insemination (AI) is becoming a viable option for more commercial breeders.

Artificial insemination provides benefits in access to and use of high genetic merit sires, which are not readily available or too expensive to buy, for use over large numbers of females compared to natural service.

The advent of fixed time artificial insemination (FTAI) also allows large numbers of Brahman and Brahman-infused females to be inseminated in a six-hour window thereby permitting efficient dissemination of superior genetics into large tropically adapted, northern Australian beef herds.

The cost and level of success of AI programs can vary greatly.

To maximise results it is extremely important that AI programs are planned in advance and managed well.

There are many factors to consider such as female selection, sire selection, mop-up sires, nutrition, disease management, parasite control, semen quality, types of AI programs, facilities, organising equipment and drugs, cattle handling, heat detection, semen handling, insemination techniques and record keeping.

Attending an AI training course will ensure correct planning and using the correct insemination technique for greater success. An accredited course will run from December 16 to 19 at Narayen, via Mundubbera and will provide participants with the necessary skills to conduct an AI program on their own cattle. One-day refresher courses are also available.

More information on managing AI programs and applying them to your herd is available from:

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Phone: 0408 060 822
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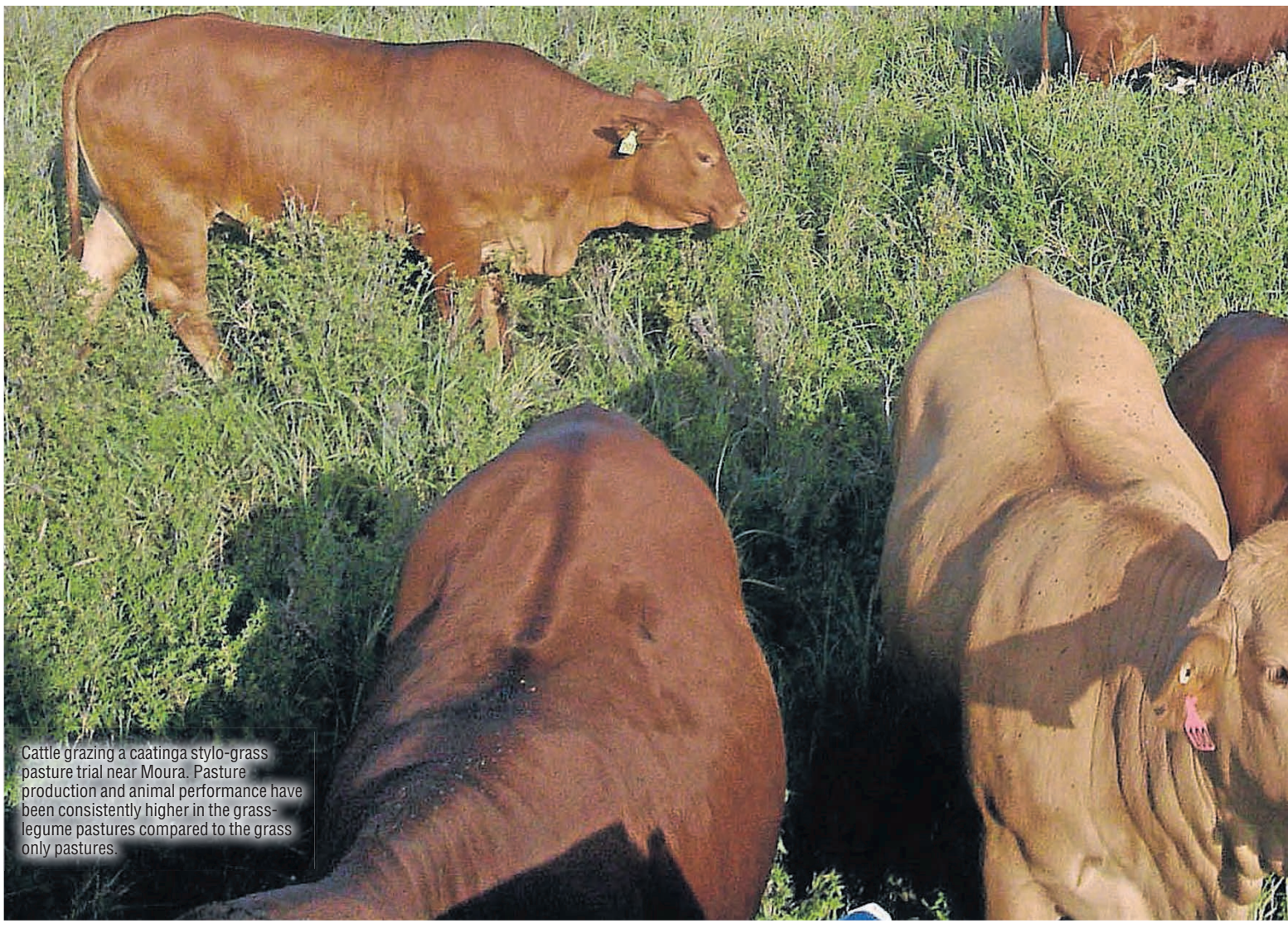
Tropical legumes for

Suitable legumes can be grown on more-fertile heavier clay soils



Cattle grazing a caatinga stylo-grass pasture trial near Moura. Pasture production and animal performance have been consistently higher in the grass-legume pastures compared to the grass only pastures.

A RANGE of tropical legumes are available for planting on the more fertile heavier clay soils to provide high quality grazing forage. These soils, which have higher fertility and water holding capacity than the light textured soils, will often have been used for cropping and will now be depleted in nitrogen, phosphorous and soil organic matter.

Legumes for grazing can be grown on these soils as short-term pastures between other crops (leys) or in permanent pasture, providing higher levels of protein for grazing stock. There are also the long-term pasture benefits of adding nitrogen to the soil.

LEY PASTURES OR SHORT-TERM PASTURES

As soil fertility declines on old croplands, ley farming is being more widely considered. Ley pastures with a grass or legume mix are grown for two to five years in rotation with crops.

The legumes used in these systems need to establish readily, grow quickly and produce high forage yields to maximise their forage value and the amount of nitrogen that can be returned to the soil.

To do so, levels of soil phosphorous (and other nutrients) need to be adequate as deficiencies can pose strong limitations on legume production. Two legumes being used in a short-term ley capacity are burgundy bean and butterfly pea.

BURGUNDY BEAN (MACROPTILIUM BRACTEATUM)

- Perennial with a relatively large seed. Can regenerate from seed but rarely lasts for more than two to three years in a grazed pasture because it is highly palatable and often outcompeted by grasses.
- Establishes easily in prepared seedbeds when planted at a depth of 2cm to 3cm.
- Grows rapidly and produces high forage yields in the first year.
- Ease of establishment allows for rapid improvement in soil nitrogen, which is highly desirable for a ley pasture.
- Planting rates for highly germinable seed are 2kg/ha when sown in a mix with grass seed and up to 5kg/ha if establishing a pure stand of legume. If using coated seed, seeding rates/ha need to increase, potentially three to five times, based on the coat:seed ratio.
- Varieties include Cadarga (an erect form) and Juanita (lower growing but can be more persistent and less affected by bean mosaic virus). These are usually sold as a composite.
- In comparison with butterfly pea, burgundy bean grows on a wider range of soils and is better adapted to cooler subtropical climates.

BUTTERFLY PEA (CLITORIA TERNATEA)

- Strong perennial twining legume that is well suited to clay soils. Flower colour ranges from white to dark blue.
- Has performed well in central Queensland, but has been less successful in southern Queensland trials.
- Not suited to areas with severe or frequent frost but will recover from some frost by regrowing from the base or the woody stems.
- Forage production is highest in summer and is limited when average daily temperatures drop below 15C.
- Large seed establishes easily when planted at depths to 5cm.
- Tolerates some inundation but does not withstand prolonged waterlogging.
- Planting rates of about 6kg/ha on ley pastures will achieve a good plant density of 5 to 10 plants a square metre. Often produces higher yields in the second and subsequent years when a good framework of woody stems has developed.
- Persists for many years under grazing, provided it is not continuously grazed and is allowed to set seed.
- Seedling recruitment is sporadic but can be very successful under favourable weather conditions.
- Palatable at most stages of growth although there have been some reports that it is not always well-eaten.

Milgarra, the Australian cultivar, is a composite of six main lines and a number of minor lines.

Both these legumes can be used in pure legume swards. There are however advantages in planting grasses with them, particularly if the grasses are not so aggressive in the establishment phase that they severely reduce legume forage yields. The grasses can take advantage of increased soil nitrogen and reduce the likelihood of weeds becoming dominant, especially in winter when the tropical legumes are not actively growing. Grasses also provide more forage for grazing and, because grasses degrade more slowly than legumes, the release of nitrogen to subsequent crops can be spread over a longer period.

LONG-TERM PASTURES

Generally in long-term pastures a grass and a legume are usually planted at the same time. The exception to this is leucaena, where grass is sometimes sown one to three years after the legume, which can improve legume growth, but delays successful grass establishment, limiting forage production.

These long-term pasture types can be slower to establish but the grass and legume components are very persistent once established. Often the legume takes some time to increase in density but this is necessary for the pasture to remain productive in the longer term. Some leucaena pastures continue to be productive and persistent almost 40 years after planting. Two other tropical legumes with potential to survive in long-term pasture systems are caatinga stylo and desmanthus.

Cattle ticks and tick fever management strategies: the facts from

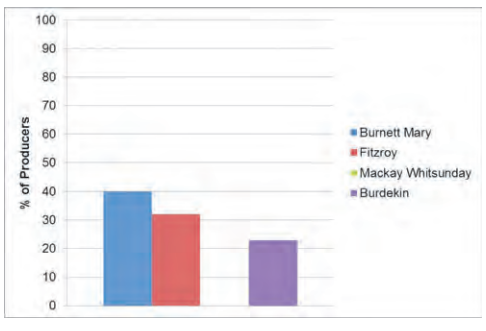


Table 1. Number of producers surveyed for DAFF management practices surveys 2011-14

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 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.

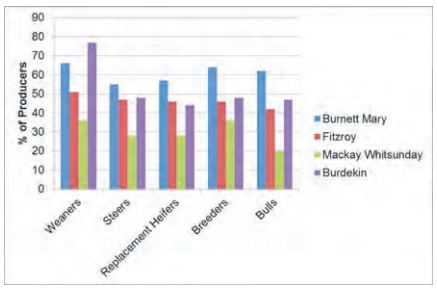


Figure 2. Percentage of producers using Composite, *Bos taurus* and *Bos indicus* breed bulls in the Burnett Mary (BM), Fitzroy (FZ) and Burdekin (BK) regions.

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

grazing – and N factor

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.

ONLINE INFORMATION AT YOUR FINGERTIPS

■ **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 the website each year and check out more of the FutureBeef projects at www.futurebeef.com.au/resources/projects

CAATINGA STYLO (STYLOSANTHES SEABRANA)

- Well suited to clay and clay loam soils.
- Woody perennial similar to shrubby stylo (Seca and Siran).
- More tolerant of cold than shrubby stylo or Caribbean stylo.
- Flowers early with prolific seeding.
- Seed is small and slippery if dehulled so should be planted at 1 to 2kg/ha on the soil surface. With coated seed, seeding rates/ha need to increase, potentially three to five times, based on the coat:seed ratio.
- Requires a highly specific inoculum which should be mixed with seed prior to planting.
- Two cultivars are Unica and Primar;both are sold together as a composite.

Caatinga stylo is not highly palatable. Grazing stock generally prefer green grass leaf over legume leaf but as the grass matures the stylo is well eaten.

Trials demonstrate steer growth rates and carrying capacities when grazing caatinga stylo-grass pasture are higher than when grazing grass-only pastures.

At a trial established in 1997 at Moura, caatinga stylo-grass pastures recorded 36 per cent more total forage production than grass-only pastures over the period November 2011 to May 2012.

DESMANTHUS (DESMANTHUS VIRGATUS)

- Long-lived perennial shrub well suited to alkaline clay soils.
- Once established, competes with aggressive grasses including buffel.
- Very drought tolerant.
- Well eaten by stock when available. Tends to shed leaf in response to dry conditions so its contribution to the pasture yield and animals' diet is variable.
- Small seed that requires scarification before planting on or close to the soil surface at 1kg to 2kg/ha. Again, with coated seed sowing rates need adjustment.
- A heavy seed producer. Seeding occurs throughout the growing season but a high proportion of seed is hard. Field softening can take some years so a good initial strike is important, but plant density can increase rapidly once the seed has softened.
- Marc has been the main cultivar. However, a new composite, Progardes, is now available.

Trials indicate that growth rates for steers grazing desmanthus-grass pasture over six years ranged from 0.43 to 0.66kg/head/day. This compared with a range of 0.29 to 0.63kg/head/day on grass only pasture.

LEUCAENA (LEUCAENA LEUCOCEPHALA)

- Long-lived shrub or small tree that produces forage of high nutritive value for cattle.
- Grows best on deep, fertile, well-drained, neutral to alkaline soils but can be slow to establish.
- Susceptible to frost. Light frosts affect the leaf and heavy frosts can kill the stems to ground level but usually will not kill mature plants.
- Usually grown in rows 6m to 10m apart. Needs to be planted into well-prepared cultivation with a full profile of soil moisture. This can be achieved through full paddock cultivation, or in cultivated strips. However, strips need to be at least 5m wide to permit adequate soil moisture build-up.

Weed control during establishment is essential and the area should be kept weed free until the leucaena plants are well established (at least 1m to 1.5m tall).

Strong stands of interrow grass are essential to achieving high production from leucaena pastures. Poor-performing grass paddocks should be fully cultivated to successfully establish leucaena and then grass resown after the legume is well established. In strong grass pastures, strips can be prepared as the grass will rapidly recolonise the planted rows once permitted.

The two cultivars most widely planted are Cunningham and Tarramba. Another cultivar Wondergraze was released in 2011. Cunningham is a lower growing, heavily branched type. Tarramba is more tree-like, whereas Wondergraze is more branched than Tarramba.

All these varieties, particularly Cunningham are susceptible to attack by psyllids, which are small sap-sucking insects that feed on the new growing leaves and can reduce forage production, particularly in autumn and spring when conditions are cool and wet. A psyllid resistant variety has been bred and is undergoing commercialisation for release in the next two to three years.

Forage yields of leucaena in subtropical areas are lower than in central Queensland due to cooler seasons and lower summer rainfall but the palatability and nutritive value of leucaena and the associated grass is still higher than with grass alone.

As a result, high animal growth rates of over 250kg/head/year (0.7 to 0.8kg/head/day) are regularly recorded. To maximise growth rates and to prevent toxicity from mimosine and its derivatives, an anaerobic rumen bacteria (rumen bug) should be transferred to the rumen of all cattle grazing leucaena.

This can usually be achieved by drenching about 10 per cent of the animals in a group and allowing the bacteria to transfer to the rest of the group. The rumen bug can be obtained from the DAFF Tick Fever Centre at Wacol by calling (07) 3898 9655.

Acknowledgement: Information in this article was adapted from an article originally compiled by Bob Clem (formerly DAFF Gympie).

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the most recent research

crossbreeding and composite breeding and demands 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 Whitsunday data for bull breeds was not included as it was incomplete.

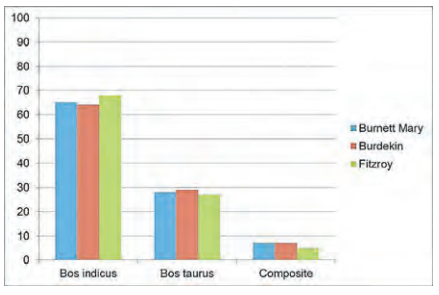

Figure 3: Percentage of producers undertaking key tick fever vaccinations in the Burnett Mary, Fitzroy and Burdekin regions

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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Summer tips for beef enterprises

Maintenance and training should be on the list

BREEDING

- Try and mate your maiden heifers with young bulls at least a month ahead of the main herd so that they have longer to get in calf the following year.
- Heifers should be well grown and in strong condition and only join the heifers you really want in your breeding program. Fatten and sell cull heifers.
- Don't let maiden heifers get too fat as this can lead to calving problems.
- Treat all cows for buffalo fly if they are bad this season.

CALVES

- Brand, dehorn, castrate, tag and vaccinate (5-in-1 or 7-in-1).
- Enter new calves into herd performance recording program.
- Enter new calves into NLIS database.

BULLS

- Observe bulls in mating paddocks. Are they all working?
- When mating multiple bulls with a group of cows, try to use bulls that are the same age and weight to avoid dominant behaviour by bigger older bulls.
- With single sire groups keep a close eye on the bull working, each time note the tag number of the cow he is with and check that she does not come back in season in 3 weeks. If a number do return get another bull into that paddock noting that not every cycle does end in a pregnancy.

YOUNG CATTLE

- Weigh; assess individually rather than on average, this is also useful when drenching the mob as you know the range of weights in that paddock.
- Assess performance against required target, do they need some form of supplementation to get to the target weight in time.
- Check whether poor calves come from one bull, if you tag all calves you will know the paddock they came from. If so, cull the bull and calves.
- Treat cattle for buffalo fly if bad this season.
- Consider HGP implants for steer calves for non-EU sale remembering it can also affect MSA grading.
- Evaluate markets and plan sales. Do you have to book cattle into meatworks or feedlots?

NUTRITION

- Start phosphorus supplementation program in deficient areas. Continue until end of the growing season.
- Make sure you have correctly estimated the amount of hay needed for weaning and any other supplementary feeding and fill your hay shed while hay is cheaper.

PASTURES

- Evaluate post-dry season pasture management.
- Spell leucaena for at least 2 months.
- Consider applying maintenance fertiliser to sown pastures.
- Lock up paddocks to build up pasture grass seedbanks in soil if you can do so without attracting feral pests and kangaroos to that spelled country.
- Consider growing a summer forage crop to carry cattle while pasture paddocks are being spelled.
- Consider setting areas aside for re-forestation.

PARASITES AND DISEASE

- Continue tick control program.
- Check young cattle for worms. Treat if necessary. Send faecal samples for worm egg counts 2 weeks after treatment to check for worm drench resistance. Get samples from smallest animals.
- Control buffalo fly where applicable with correct sprays, insecticidal ear tags and buffalo fly traps.
- Make sure all chemical treatments used are entered into correct files for traceback and observe the withholding periods and export slaughter intervals for all chemicals used on farm.
- Make sure you record all cattle treatments against each paddock so you know at a glance that all the stock in a particular paddock are out of the withholding period for a drench or treatment and can be sold.

BUSINESS

- Have annual health check.
- Have a break with family over Christmas.
- Evaluate markets and plan sales for coming year.
- Review marketing options.
- Update NLIS database regarding all cattle born, purchased, sold or died during the year.
- Check all permits and registrations etc are up to date.

PROPERTY MAINTENANCE

- While water is in dams and creeks carry out annual maintenance on windmills, pumps and watering points.
- Carry out workplace health and safety audit across property.
- Do annual electrical safety check on all household and farm equipment.
- Consider attending Chemical Accreditation Program through AgForce SMART Train.
- Look out for field days and training days relating to your business as not only do you learn plenty at them, you also get a chance to meet other landowners. You can learn as much around the smoko table as at the lectures and they can be an enjoyable social outlet.
- Carry out vehicle and machinery maintenance during 'wet season' break; especially look after dry-season supplement feed-out trailers etc so they are ready for the next dry.

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The perils of mulga fern

MULGA fern, also known as rock fern, *Cheilanthes sieberi* is a native fern that can poison cattle and sheep if they eat enough of it, commonly at the end of droughts when it re-sprouts quickly after rain.

Cattle can also suffer from chronic poisoning if they eat mulga fern over a number of years.

Mulga fern is a small, tufted, hairless fern (up to 30cm tall) with very thin, stiff stalks which are reddish brown to black in colour. It is extremely drought-tolerant. Spread across Australia, mulga fern is mostly found on hilly rocky country, inland woodlands and coastal areas. It is also found in mulga country.

Acutely poisoned cattle suffer from a bone marrow-destroying disease leading to extensive bleeding resulting in death. It is thought that, if cattle eat the fern over a long period, it will cause bovine enzootic haematuria (tumours of the urinary bladder), a condition also seen with prolonged bracken fern (*Pteridium spp.*) exposure. Cattle affected with this disease (usually three-plus years old) pass blood in their urine, become very anaemic and slowly waste away (Dowling & McKenzie 1993).

To prevent acute poisoning don't allow cattle access to mulga fern when they're hungry. To prevent chronic poisoning cattle must never eat the plant.

You can read more about mulga fern in: 'Poisonous plants: a field guide' by Ralph Dowling and Ross McKenzie, and; 'Australia's poisonous plants, fungi and cyanobacteria: a guide to species of medical and veterinary importance' by Ross McKenzie.

Big head in horses grazing tropical pasture grasses

BIG head is a calcium deficiency that occurs in horses and donkeys grazing introduced tropical grass pastures.

It is caused by soluble oxalates in the leaf combining with calcium to form insoluble oxalate crystals. This prevents the horse from absorbing enough calcium.

To compensate for low blood calcium levels, bone calcium is mobilised. Over time, so much calcium is lost that bones become soft and misshapen.

The disease can develop within two months of horses being put on hazardous pastures but commonly takes six to eight months. Cattle and sheep are not normally affected as rumen bacteria break down oxalates.

Horses are most at risk if the dominant pasture species are certain introduced tropical grasses. It is seen mostly in horses grazing pure buffel grass in western Queensland and is less common where a wider range of pasture species are available.

The signs of big head include:

- lameness - animals appear stiff and have a shortened gait
- ill thrift - loss of condition on pastures which look nutritious
- swollen jaw bones - upper jaws, lower jaws or both
- Some or all horses on a pasture may develop big head. Mares and foals are more susceptible than stallions and geldings, but all can suffer from the disorder.

WHICH GRASSES ARE HAZARDOUS?

Cases of big head have occurred on pastures of the introduced tropical species buffel grass, setaria, green panic, kikuyu, guinea grass, para grass, pangola grass, signal grass and purple pigeon grass.

The hazard is greatest when these grasses provide all, or almost all, the feed available. Soluble oxalate content is also highest in periods of rapid pasture growth. Native grasses and many introduced temperate grasses are not associated with big head and are safe to use as pasture species for horses.

HOW CAN BIG HEAD BE PREVENTED?

Use native pastures where possible. Avoid grazing horses on the grasses listed above for periods greater than one month. This is particularly important if the grasses are rapidly growing.

Horses can be grazed on these pastures if they have access to other 'no risk' pastures. Some introduced tropical grasses are nonhazardous. They include Rhodes grass, the paspalums, the couches and creeping bluegrass.

If only hazardous grasses are available, encourage the growth of a legume component in the pasture to provide a source of feed free of oxalate and feed a calcium and phosphorus supplement.

MINERAL SUPPLEMENTS

Commercial pellets and blocks are available. Home made mineral mixtures which will provide the required amount of calcium and phosphorus for horses include:

- 1kg of low cadmium rock phosphate mixed with 1.5kg molasses.
- 1kg of a mixture of ? ground limestone and ? dicalcium phosphate mixed with 1.5kg molasses.

Either of these should be fed to each horse once a week while grazing hazardous pastures. The molasses is used as a carrier and to make the supplement attractive. It can be omitted if the animals can be persuaded to eat all the minerals by other means.

Don't be concerned if horses eat their week's supplement in one or two days. It contains enough mineral to last them the full week. The weekly amount can be divided and fed each day if desired.

To provide approximately the same amount of calcium and phosphorus as the above mineral mixtures, 20kg of good quality lucerne is needed to be fed to each horse weekly.

Other mineral mixes which provide a calcium - phosphorus ratio of 2 to 1 can be used but are likely to be more expensive than rock phosphate or ground limestone and dicalcium phosphate.

CAN BIG HEAD BE CURED?

The lameness and ill thrift can be cured. The swellings of the jaws may not fully disappear if the animal was severely affected. Under veterinary supervision, use double the amount of the mineral supplements advised above for affected animals for at least six months to replace the mineral lost from their bones.

Reference: *Plants poisonous to horses: an Australian field guide.* RIRDC 02 62714100 www.rirdc.infoservices.com.au/items/06-048 (free download or $35 book, 132 pages).

Biosecurity responsibilities: an overview

QUEENSLAND beef producers grow some of the world's cleanest beef and everyone involved has a role in protecting Queensland's $3.25 billion beef industry. Whether you own a hobby farm or a large commercial enterprise, as a rural landholder, you play a vital role in minimising biosecurity risks. Landholders have responsibilities to protect their land, animals, industries and communities from the negative impacts of pests, diseases and contaminants.

REGISTERING YOUR PROPERTY

If you keep one or more head of horses, cattle, sheep, goats, pigs, buffalo, deer or camelids (camels, llamas, and alpacas), or 100 or more poultry, your property must be registered with Biosecurity Queensland, DAFF. Registration is free and can be done by visiting www.daff.qld.gov.au or at your local DAFF office. You need to supply your lot on plan (found on the rates notice). Once registered, the property is issued with a property identification code (PIC). A PIC is necessary to purchase National Livestock Identification System (NLIS) devices which are required on each and every cattle, sheep, goat or pig that moves on or off the property.

MANAGING THE LAND

- **Weeds, pests and invasive ants:** As a landholder, you are legally required to control declared pest plants and animals on your land. These include rabbits, foxes, wild dogs, feral pigs, fire and electric ants, lantana, groundsel bush and many more.
- **Chemicals and residues**: Chemical use is carefully regulated to minimise risks to health, the environment and trade. A person who sprays agricultural chemicals by aircraft, or uses ground equipment to spray herbicides to control weeds on land that they do not own or occupy, is required to be licensed. The business for which the person undertakes the spraying is also required to be licensed.

ANIMALS ON THE FARM

- **Animal welfare:** If you own or are in charge of an animal, you have a legal 'duty of care' responsibility to care for them appropriately. Duty of care is based on the internationally recognised standards of animal welfare in providing the animal's needs for the following in a way that is appropriate: Food and water; accommodation or living conditions; to display normal patterns of behaviour; treatment of disease or injury; and ensure any handling of the animal by the person, or caused by the person, is appropriate.
- **Health and diseases:** Early recognition and reporting of a serious or exotic animal disease is one of the most important factors in controlling the disease and reducing its economic and social impact on the whole community. Biosecurity Queensland monitors the health status of Queensland's animal, fish and bee populations through surveillance programs. Landowners are requested to report suspicious deaths or diseases and are legally required to report the incidence of some notifiable diseases in animals.

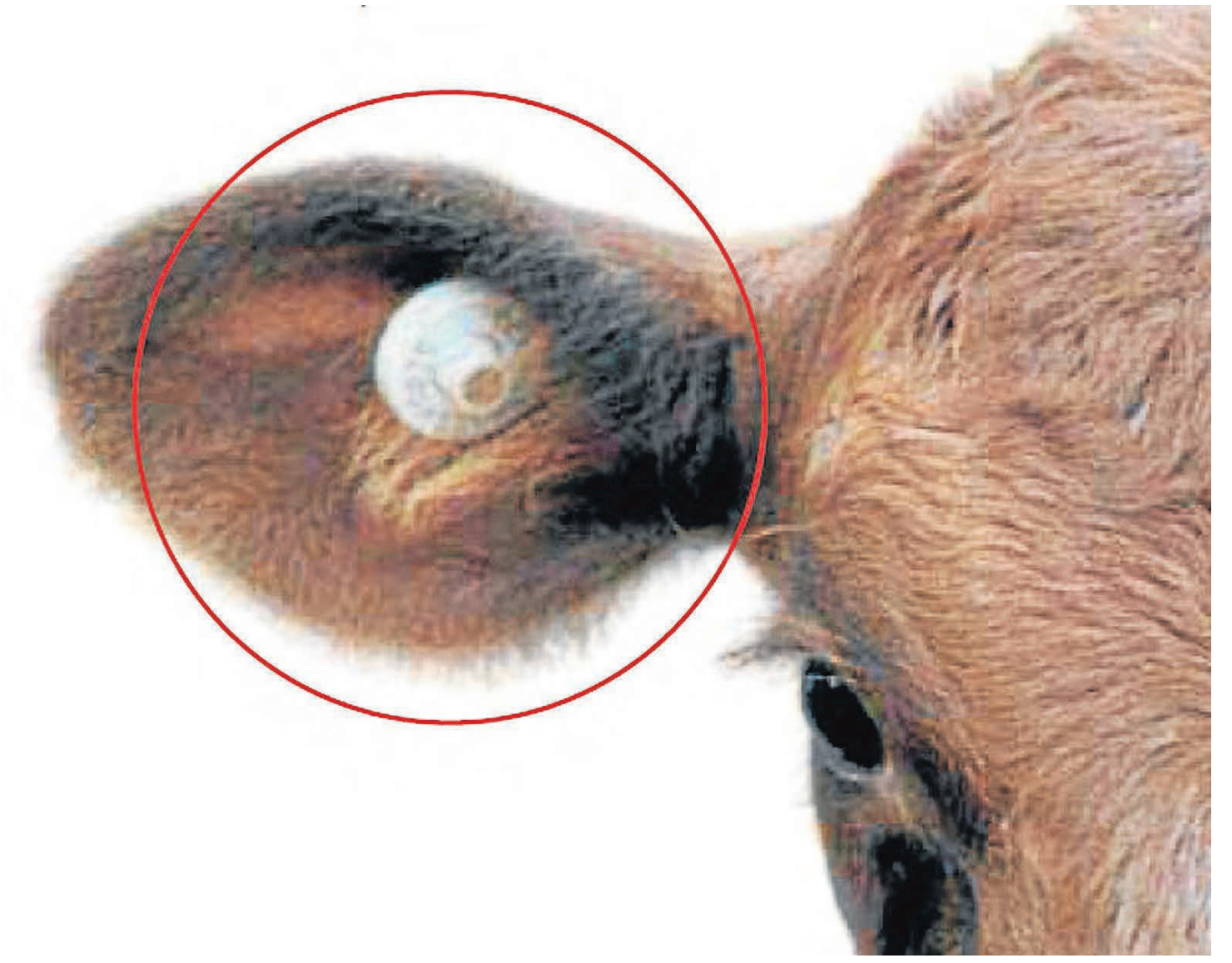
IDENTIFYING, MOVING AND SELLING LIVESTOCK

Rules apply for the identification, movement and selling of livestock in Queensland. Australia world leading system of livestock identification and traceability together with the regulations governing the movement and sale of livestock, make our food safer and more competitive in international export markets. Read the responsibilities of beef producers (below) for more information.

Contact: Biosecurity Queensland on 13 25 23 (cost of a local call within Queensland) or (07) 3404 6999.
www.daff.qld.gov.au/biosecurity

The onus is on YOU

Requirements when identifying, moving and selling livestock



WHETHER you own a hobby farm or a large commercial enterprise, rules apply for moving livestock in Queensland.

The National Livestock Identification System (NLIS) identifies and traces individual animals from their property of birth through to slaughter or the reverse.

NLIS legal requirements for identification and tracking apply to persons in charge or dealing with cattle, sheep, pigs and goats.

NLIS lifetime traceability improves product integrity and market access – particularly for export markets – and assists with the management of disease and chemical residue issues.

Reports of movements must contain standard information such as the date of movement, the property identification code (PIC) of the starting and ending place of the movement, the number of animals and the National Vendor Declaration (NVD)/waybill serial number.

The NLIS is sufficiently flexible during times of natural disasters to provide cattle owners and producers with a number of options for dealing with displaced cattle.

Travel or stock permits, available from Biosecurity Queensland, assist in disease control and animal trace-back. Most livestock movements will only require a waybill, but a travel permit may also be required for moving livestock:

- Across the tick line.
- From a property that is under quarantine for disease control or chemical residues.
- That are diseased or suspected of being diseased (a suspect permit is required – for example cancerous eye, lumpy jaw or enzootic bovine leucosis).
- To the RNA Showgrounds, Brisbane.
- To some interstate destinations.
- To export quarantine facilities.

A waybill is the minimum compulsory movement document that must accompany travelling alpaca, buffalo, camels, cattle, deer, goats, guanacos, horses, llamas, sheep and vicunas.

An equivalent document, for example, NVD, can be used instead of a waybill. The waybill is completed by either the owner, an authorised agent of the owner or the occupier of the holding where the stock originated.

A completed waybill must travel with the driver and be given to the person receiving the stock.

The waybill must be kept by the person completing it and the person receiving the stock for two years after it is completed. Penalties may apply for incorrect use of waybills.

For commercial reasons and to meet domestic and export food safety requirements, combined NVD/waybills are generally used when stock are moved to saleyards or to slaughter. When in doubt contact your local biosecurity officer or phone 13 25 23.

National Vendor Declarations (NVDs) were developed by the livestock industries to help producers document the history of chemical use and treatment of animals offered for sale.

The details provided assist processors and buyers seeking information on the history of sale stock. NVDs are an industry marketing initiative for cattle, sheep, goats and pigs.

NVDs do not have statutory basis (except where combined with a waybill) and are not compulsory when selling livestock, but some livestock buyers insist on the NVD.

People completing NVDs remain legally obliged to ensure any information made about their stock is completely accurate. Penalties exist if false or misleading information is given on the declaration. Beef producers who wish to sell cattle into the European Union market will need to complete the European Union Vendor Declaration (EUVD).

Combined NVD/waybills are available for cattle, bobby calves, sheep and goats from Meat & Livestock Australia on 1800 683 111. The combined NVD/waybill has legal recognition in that it meets the legal requirements for a waybill.

A special combined EUVD/waybill is also available. Livestock owners registered under the Livestock Production Assurance program should note that specific requirements may exist in relation to the use of NVD/waybills in order to maintain a full declaration history for the livestock.

The Australian Quarantine and Inspection Service (AQIS) recently introduced an updated vendor declaration for horses which must be completed by their owners. A Horse Vendor Declaration (HVD) and Waybill (Transported Stock Statement) is a form that records important information about all drug or chemical treatments for at least the past six months before a horse is moved to slaughter. This protects export market access.

A horse owner (or authorised agent of the owner) and a horse accumulator must complete a vendor declaration and waybill when selling a horse for the purpose of slaughter or moving/consigning a horse to slaughter. To obtain a HVD contact an AQIS export accredited horse processing abattoir or a horse accumulator known by the industry.

Brands and earmarks are used to prove ownership of livestock and avoid disputes over stray animals. In Queensland all cattle of 100kg or more liveweight must bear a registered brand before being sold. Cross branding is optional.

Brands and earmarks require annual renewal which can be done online or by contacting Biosecurity Queensland on 13 25 23.

A product's withholding period (WHP) is the length of time required to ensure any chemical residue has fallen below the maximum residue limit (MRL) at product harvest. MRLs are the maximum chemical concentrations that are permitted in foodstuffs. WHPs are legally binding and are printed on chemical/drug labels.

WHPs and export slaughter intervals (ESIs) can differ. ESIs refer to voluntary export guidelines designed to ensure chemical residues fall below overseas MRLs, as these can vary from country to country.

Tables for ESIs and WHPs are found on the reverse side of the National Vendor Declaration form. Livestock producers must ensure that any animals made available for slaughter comply with WHPs and ESIs.

All people involved in transporting livestock (consignees, consignors, drivers and receivers) must comply with both animal welfare and driver fatigue laws. It is advisable to read the animal welfare guidelines available on the DAFF website.

To protect Queensland's livestock industries, there are controls on the introduction of stock from other states and territories.

Before moving stock, owners must certify the health of their animals by completing the prescribed certificates, waybills and health statements and delivering these to the receiver of the stock. These records must be kept for a specified period.

Biosecurity Queensland
Phone: 13 25 23 (cost of a local call within Queensland) or (07) 3404 6999
www.daff.qld.gov.au/biosecurity

Water quality: How it affects your cattle

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 are 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.

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
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.

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

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.

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 about 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 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