Katherine Rural Review

DEPARTMENT OF **PRIMARY INDUSTRY AND RESOURCES**

EDITION #341 December 2019

Inside this issue:

From the editor

Welcome to issue # 341 of the Katherine Rural Review (KRR) and the 2019 build-up.

Following the dismal 2018-19 wet season, the extended dry period has morphed into a build-up of unprecedented heat. Temperatures are soaring across the Top End; some sites in the Katherine region have recorded their hottest ever October daytime temperature, with further records for the most consecutive days above 40C expected by the end of November.

Together with strong winds and very low humidity, the hot conditions have led to severe fire weather, challenging pastoralists and fire services. According to the Bureau of Meteorology, the positive Indian Ocean Dipole will continue to deliver hotter and drier than average weather until the monsoon arrives, which is likely to occur in early January. Happily, a typical wet season is predicted for January to April, which should bring much-needed relief to the drought-stricken areas of the Barkly and Victoria River District. Something to look forward to! But until then, dry conditions are expected to persist.

With confirmation of an African swine fever outbreak in Timor Leste, staff in the Livestock Biosecurity Branch have been busy with preparedness activity in the exotic disease control and quarantine space. This involves significant planning, consultation with stakeholder groups, research around practical measures such as feral pig control options, and scientific work in areas such as field diagnostics and surveillance. The Animal Health News section of this newsletter provides more detail, with respect to recent pig disease investigations, and the work done by the Department of Primary Industry and Resources (DPIR) and other agencies to maintain Australian biosecurity for primary production industries.

Plant industries have been busy with the mango season almost complete. Mango production contributes an estimated $88.5M to the Northern Territory (NT) economy each year, the largest NT farming industry by value. Around 20% per cent of all Australian mangoes grow in the Katherine/Mataranka region. In real terms, this means Katherine growers produce a staggering 30 million mangoes from 330,000 trees each year. Local residents would be well aware of the increase in overseas seasonal fruit-picking workers in town, a vital workforce which enables this industry to flourish and gives our local economy a boost.

Read on to find out more about field days sharing the good oil on soil health, the Kidman Springs fire experiments, a timely reminder about Gamba Grass control measures, results from the Sweet Spot project, which is investigating pasture utilisation and reproductive performance, and much more.

Cheers,

Megan Pickering

Editor

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NORTHERN TERRITORY GOVERNMENT

2019 bull and female sale

The annual bull and surplus female Auctionsplus sales from the selected Brahman and composite herds were held on Tuesday 18 June 2019 and Wednesday 7 August 2019 respectively.

Despite the poor season leading to limited bidders and higher than usual numbers in both of the auctions, a majority of the animals were sold. A total of 62 bulls were sold for an average price of $2,405.65 including Brahmans and Composites. 152 females were sold for an average of $979 including both breeds, heifers and cows of mixed ages and pregnancy statuses.

These averages are slightly down on last year however, considering the season and that they were mostly bought by repeat buyers, it was a good result and is a credit to the ongoing performance in fertility and adaptation of these animals.

The select Brahman and composite herds are both long term programs which have undergone rigorous selection over generations for the desirable traits needed to thrive in Northern Territory conditions and to meet the live export market requirements. The animals from both herds are on Breedplan where their estimated breeding values (EBVs) can be found along with a comparison to the average for the Brahman breed.

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Images: *Two top Brahman bulls and one of the top composite bulls, Brahman and composite females that were in the sale.*

Digging deeper workshop – Katherine Research Station

Image: Proud graduates of the workshop at KRS.

On Thursday 17 October, Katherine Research Station hosted the final session of a five-month soil extension program, Digging Deeper. The Digging Deeper program incorporated five interactive workshops with the participation of seven primary producers from the Katherine area including horticultural producers and pastoral producers. Jacob Betros (Regional Landcare facilitator, Territory Natural Resource Management) secured funding through the Northern Territory Community Benefit Fund, and the National Landcare Program: Smart Farms Small Grants scheme.[1]

All participants of the program came together to learn more about the soils on their farms and how to manage them for increased soil health and productivity. This unique program focused on the biological fraction of the soil, the soil microbes and soil organisms, which play a significant role in soil moisture holding capacity, soil fertility, soil structure, plant growth and carbon storage.

Producers were fascinated when programme facilitator David Hardwick demonstrated the Berlese funnel method[2] to extract tiny soil-dwelling creatures like nematodes, mites and springtails. David from Soil Land Food [3] is a widely regarded ecological and regenerative agriculture guru. Program attendees found this to be a once in a lifetime experience, to directly observe the microscopic organisms extracted from the soil samples they had brought from their properties.

To start the five-month program, David and Jacob used models and props to simplify the complex soil interactions of nutrients, soil biology and soil food webs, which gave each program participant an understanding of the processes happening in their soils. Participants put this new knowledge of soil health processes to practical use through hands-on field assessments of soils to link what is occurring below the surface to visible productivity above the soil surface. Each participant received a copy of the Rapid Assessment of Soil Health (RASH) manual. The RASH manual allowed participants to assess soil texture, ground cover, water infiltration, soil aggregate testing, soil organism diversity, as well as soil pH and salinity in their soil samples.

Mid program, each producer received a comprehensive soil test report of their sample, including a commentated interpretation of the soil analysis. It gave the project participants a greater understanding of the soil report and allowed them to assess their soil health. The soil test report identified soil constraints such as low organic matter, pH, soil salinity and compaction. Furthermore, participants were educated in setting benchmarks for their soils and taking effective action to address issues by using a range of fertility input options like bio-fertilisers, fertilisers, and soil amendments. Before commencing this program all the producers were requested to raise one soil related issue in their farmland, and the facilitator addressed all those soil issues during this session and farmers were encouraged share their experience with each other.

David indicated that the soils knowledge gained from the training is transferrable to any farm location or situation. To challenge the participants, he designed a case study activity to diagnose soil problems and formulate a specific soil action plan for a corn farm on a heavy clay soil in Gatton, Southeast Queensland where climate and soil type are dissimilar to the Northern Territory. The participants have correctly identified the major soil issues besetting the farm namely compaction, average soil organic matter level, and imbalance of its calcium/magnesium (Ca/Mg) ratio. They were also able to formulate specific remedial measures like ripping the soil to overcome compaction, perennial pasture cover cropping between the

[1] https://landcareaustralia.org.au/project/national-landcare-program-smart-farms-small-grants/

[2] https://www.doctordirt.org/teachingresources/berlese

[3] https://www.soillandfood.com.au/

cropping cycles to build soil organic matter, and adding gypsum to get a balanced Ca/Mg ratio.

The day concluded with David awarding a “Soil Artisan” plaque and certificate to participants who attended the program from start to finish. We look to the future with bright hope that these producers will make smart soil health and fertility decisions on their properties and exchange these ideas with their neighbours; leading to a more resilient and thriving rural Australia.

Key messages from Digging Deeper

- Match farm business with the soil type on the property.
- Address negative soil issues to improve productivity.
- Maintain a greater level of ground cover to maximize biodiversity in the paddock.
- Extend the carbon growing season and improve soil organic carbon levels.
- Reduce soil disturbance and enhance plant disturbance (by using livestock or machinery) in a managed process.
- Biologically manage soil nutrients.
- Actively monitor soil health and fertility.

Calf watch project update: developing tools for research on calf loss in extensive situations

Calf loss is a major source of lost income for northern beef producers, and it is estimated that neonatal calf loss costs north Australian cattle producers in excess of $53M annually. Reducing calf loss has the potential to improve weaning rates and profitability for northern cattle producers. In northern Australia, calf loss exceeding 30 per cent in first calving heifers and 15 per cent in cows is not uncommon; halving these losses would provide significant benefits.

It has been historically difficult to investigate and reduce calf loss, as calving females are difficult to find in large paddocks, and close observation during calving disturbs animals and alters behaviour (and in some cases may even contribute to mismothering and calf loss). In addition, calf carcasses are difficult to find under extensive conditions and so in many cases it has not been possible to conduct autopsies to determine the cause of calf deaths. If a system could be developed to remotely monitor calving in extensive conditions then it would be a game changer for research into calf loss in northern Australia.

The ability to be able to monitor calving remotely and locate calf carcasses for research in extensive situations will be especially useful for research into the effect of paddock size on calf loss. It is suspected that the incidence of calf loss is increased when calving occurs a long way from water points in large paddocks and that reducing paddock size may reduce calf loss rates. However there is currently little scientific evidence for this, and so it is difficult to justify spending large amounts of money on infrastructure without proof that it will reduce calf loss.

Researchers at the University of Florida (UF) have developed a system to remotely monitor calf loss. The Calf-Watch project aims to collaborate with the UF researchers to adapt their system for use in northern Australia and to use it to investigate the causes of calf loss. The systems developed in this project are expected to revolutionise research into calf loss in northern Australia. They will enable the time and location of calving to be recorded remotely so that researchers will be better able to locate cow/calf pairs shortly after calving for observation and also collect dead calves in a timely manner to conduct autopsies. Ultimately this research has the potential to reduce calf loss and improve incomes for northern beef producers.

The UF researchers have been using birth sensors which are placed in the birth canal of pregnant cows up to four months prior to calving. When the cow commences calving, the birth sensor is expelled and the change in temperature causes it to start emitting a signal that is picked up by an antenna mounted on a tower in the paddock. The signal then goes through a gateway on the tower to the internet and ultimately results in researchers being sent a notification that the cow has calved. The researchers can then locate the calving site and record observations. They also tag newborn calves with very high frequency (VHF) tracking tags which contain accelerometers that allow them to locate calves when they die (stop moving). This system has been working well in Florida but there were challenges that had to be overcome for it to be able to be used in extensive north Australian conditions.

Some of the problems that had to be overcome

In Florida the mobile phone network is used to send the birth sensor alert signals to the internet, but mobile phone coverage in the NT is not very extensive and so a way had to be found to send the birth sensor signals to the internet where mobile phone coverage is limited. This was able to be done with the help of a local Katherine communication technology business (Comcat).

Another challenge was to design towers that would be able to work effectively in the harsh NT environment (i.e. be able to withstand the heat, humidity, dust, rain, insects, dingoes, cockatoos etc.) and have an increased range. We came up with a design that was durable, cost effective and can pick up signals from within a 2km radius of the tower.

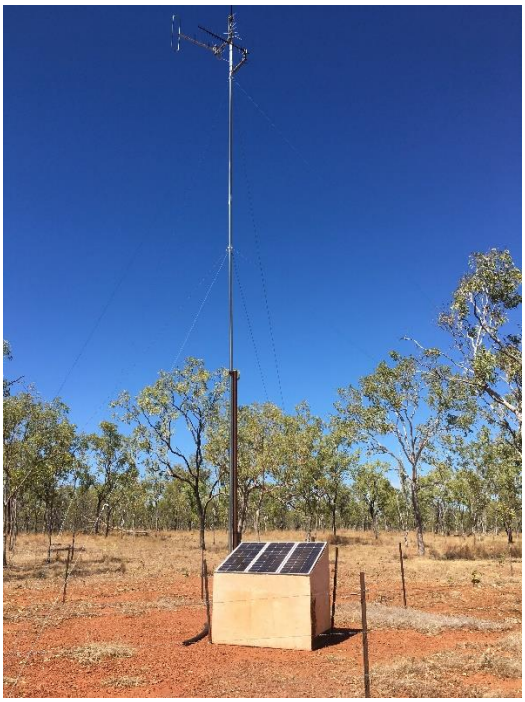

Image: One of the towers at the research site on Manbulloo (near Katherine, NT).

The paddocks in Florida where the research is being conducted are quite small and so they can be covered by one tower. Paddocks in northern Australia are much bigger and so a network of towers is required. The Calf-Watch research is being conducted in a paddock that DPIR lease on Manbulloo station (near Katherine, NT) and it was determined that four towers were required to effectively cover the 22.15 square kilometres paddock.

The research sites in Florida are quite flat, have few trees and the grass is grazed quite low, whereas in the NT paddocks are larger and are often undulating with long grass and tall timber which makes finding calving cows much more difficult. In Florida it is relatively easy to find a cow when a birth alert is received, but it quickly became apparent that some sort of GPS tracking was going to be necessary to find calving cows in the NT. Initially we were told that a new model of birthing sensor was going to be produced with GPS capability, but the company changed their mind after the project commenced and so a suitable GPS tracking system had to be found. After an extensive search only one type of GPS tracking collar could be identified that met our requirements (ability to provide location in real time with pings less than 15 minutes apart, and cost <$300 per cow).

Image: A research site in Florida.

Due to the terrain in the paddocks (lots of rocky ridges and logs hidden in long grass) and the fact that the cows are not as quiet as those in Florida (they are handled a lot less) it was decided that we would not attempt to fit VHS tracking tags to newborn calves for OHS reasons and because it was felt that it might contribute to mismothering.

A pilot study was conducted with 20 cows in a small paddock over the 2018 calving season to test the equipment and iron out any bugs. This was beneficial as we were able to identify a number of issues with the technology and find solutions before scaling the work up at the Manbulloo site over the 2019 calving season. Then in August 2019, birth sensors were inserted into 200 pregnant cows and GPS tracking collars were fitted. The cows began calving on 30/9/19 and will continue until mid December. The birth sensor system is working well and alerts are being received when cows commence calving. An interesting preliminary

observation is that most alerts (64 per cent) are being expelled between midday and 7:30pm, although it should be noted that often the calf is not actually born until several hours after the waters break and the sensor is expelled.

Image: The research site at Manbulloo, near Katherine in the NT.

The performance of the GPS tracking collars has been mixed. When the collars have continued to function normally they have been very helpful in locating calving cows. However some collars stopped working after a couple of weeks and in most of these cases it has not been possible to identify the birth site and find the expelled birth sensor. In these cases observations of the cow and calf have been made in the days after calving when they are seen at the water trough. The company that produces the GPS tracking collars is working on solutions to these problems and hopefully the issues can be resolved. The GPS tracking collars also contain accelerometers and it is hoped that it may be possible to use the time of calving identified by the birth sensor alerts to identify movement patterns from the accelerometer data that are characteristic of calving. If this can be done then it should be possible to use accelerometers to identify the time of calving in future.

This project has been challenging as it has involved learning to use new technologies and adapting them for use in challenging conditions. The assistance of our collaborating research partner from UF (Dr Raoul Boughton) has been invaluable in this work. The birth sensor system was not designed for use in such extensive conditions and having 200 cows fitted with GPS tracking collars in a single paddock is thought to be a world first. However, the project is on track to achieve the aims of developing a system to remotely monitor calving in extensive conditions thus providing better ways to study calf loss and ultimately to identify ways to reduce it.

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Trialling pain relief during castration and dehorning in the NT

What?

The Department of Primary Industry and Resources (DPIR) has recently started a joint project with Meat Livestock Australia to investigate the application of pain relief products during castration and dehorning in the Northern Territory. Production and welfare benefits from managing potential pain after routine husbandry procedures being performed will be investigated.

Why?

The industry is constantly improving animal husbandry practices. With the recent introduction and approval of several pain relief products for use on calves, there have been calls for a large scale trial to compare long-term production benefits to be conducted on ‘real world’ properties.

Outcomes

Anticipated outcomes from the trial include:

- An assessment of any production benefit from providing pain relief to calves during castrating and dehorning, through monitoring liveweight, infection and any instances of mortality.
- An assessment of the impacts of providing pain relief on animal behaviour following the procedures
- Participating producers will also be surveyed on their experiences using the pain relief

What’s involved for participating properties?

Participating properties will need approximately 600 calves that are to be castrated and/or dehorned (this may be at the same time as weaning depending on your operation). This will be worked in with your regular mustering time. Prior to castration/dehorning, calves will need to be able to

be weighed and tagged with either an National Livestock Identification Scheme tag or management tag with a unique number, so each individual animals weight change can be monitored. DPIR will provide the pain relief products and a member of the DPIR Livestock team will be there on the day to record animal information. Calves will then need to be reweighed three weeks later, this will allow the comparison of the different groups in the time following the procedures, to see if the animals that have received the pain relief products have a better liveweight response than those that did not.

Want to be part of the trial?

If you would like to be part of the trial, or would like some more information, please contact;

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Future Beef: a treasure-trove of resources for north Australian beef producers

Image: Looking for information on your heifers? FutureBeef may be what you are looking for!

FutureBeef provides the northern beef industry with information and tools to assist with making on-property changes that improve business performance.

Our strength comes from the coordinated and collaborative approach to the delivery of online information, promotion and industry engagement through government agricultural departments in Queensland, the Northern Territory and Western Australia working with Meat & Livestock Australia.

How do you like your information?

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- 1,000 pages of high quality online content plus a comprehensive industry events calendar

Examples of NT projects featured on FutureBeef include:

- The self herding trial at Kidman Springs

https://futurebeef.com.au/projects/self-herding-kidman-springs/

- The Paddock Power project looking at profitable and sustainable intensification

https://futurebeef.com.au/projects/paddockpower/

- The selected Brahman fertility project

https://futurebeef.com.au/projects/selected-brahman-project/

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Burning the bush at Kidman Springs

Despite an average wet season (512mm) there was plenty of grass to burn on our 27 year old fire experiment at Kidman Springs. This year all the different fire treatments were due to be burnt; all the two yearly, four yearly and six yearly burn plots, 12 in June for the early burn and 12 in October for the late burn plots.

The aim of this long term experiment is to test the effects of burning in different seasons (early in June vs. late in October) and with different intervals

between fires (two vs. four vs. six yearly) compared to unburnt comparisons on pasture health and woody cover. The experiment is now providing insights into the effects of different fire regimes on carbon storage and a new study by the University of Queensland is looking at the effects of fire on living soil biocrusts and whether fire can be managed to increase soil fertility in the grazed tropical savannas.

More information about the experiment and its design can be found at the Future Beef website.[4]

Image: Dionne Walsh lights up a late dry season controlled fire on the black soil at Kidman Springs in October.

The red soil fires tend to be less intense than the black soil fires due to lower and more patchy ground cover and fuel loads.

Image: Caz Pettit lights a back burn on the red soil at Kidman Springs in October.

Many larger mature trees succumbed in the days after the burn. Generally fires affect the smallest and largest woody plants the most.

Image: Mature trees that burnt through the entire trunk on the experimental October burns at Kidman Springs.

You can see our efforts from space – the black coloured plots were burnt in October this year, the grey plots burnt in June this year and the brown plots are the unburnt controls. Each small square is about 160m x 160m in area.

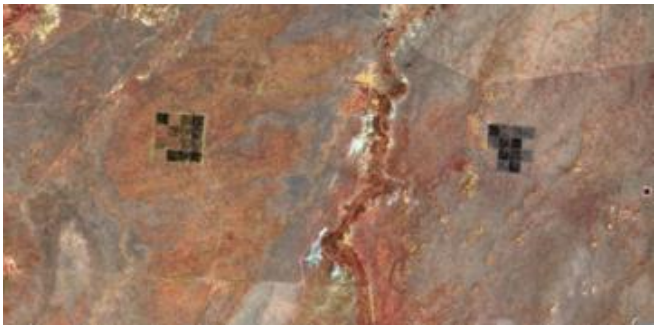

Image: MODIS satellite imagery of the fire plots taken 29 October 2019. Plots to the left are on red soil and to the right are on black soil. This image has been downloaded from the Sentinel Hub EO Browser web site.

The fire plots are now wet season spelled after burning. We started doing this in October 2013 after measuring a decline in palatable species at the sites. There has been some improvement in palatable species (mostly ribbon grass) on the black soil site since we started wet season spelling after fire (every second year). There has been less change at the red soil site where Black Speargrass dominates. We will collect data in the paddock outside the fire plots again next year, so it will be interesting to see if pasture composition of the unburnt and wet season spelled fire plots has improved compared to the surrounding paddock that is not regularly wet season spelled.

This year researchers from The University of Queensland have been collecting soil samples before and after the fires to assess the effects of fire

[4] https://futurebeef.com.au/projects/kidman-springs-fire-experiment-shruburn/

on soil biocrusts and soil fertility. In October they measured soil temperatures as the fires moved across the plots and set up soil moisture probes to measure soil moisture over the coming wet season as well as trail cameras to photograph the fire plots as they regrow after fire. They hope to link changes on the ground to the changes measured via satellite imagery, so they can upscale their results to the landscape level.

Image: Researchers from the University of Queensland and the Israeli Agricultural Organisation burying soil temperature sensors before the plots were burnt.

Image: Researchers from the University of Queensland and the Israeli Agricultural Organisation sampling soil biocrusts after the experimental fires at Kidman Springs.

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New Biocrust project - Boosting natural regeneration of the nitrogen capital in grazing lands

The University of Queensland (UQ) has been funded by MLA to research the impacts of fire and grazing on the function of *biocrusts.* The UQ researchers are collaborating with the NT Department of Primary Industry and Resources (DPIR) at the Kidman Springs fire experiment and with the Qld Department of Agriculture and Fisheries at the Wambiana grazing trial in north Queensland.

What are biocrusts?

Biocrusts are the 'living skin' on the surface of the soil. They are composed of lots of different tiny organisms including cyanobacteria, fungi, green algae, bacteria, lichens, liverworts and mosses. They grow when it's wet and become inactive when it's dry, just like plants.

Why do we care about biocrusts?

They stabilise the soil surface - the filaments of the different organisms bind together the soil surface and prevent erosion from wind and water.

They photosynthesize and fix carbon – the algae and cyanobacteria are green and photosynthesize just like plants. The carbon is incorporated into the soil and enhances soil carbon.

They fix nitrogen! – most cyanobacteria fix nitrogen out of the air just like legumes do! The nitrogen is in a form available to plants with excess stored in the outer slime (EPS). When it rains much of the stored plant-available nitrogen is washed from the EPS into the surrounding soil. Additionally, when biocrusts dry out and a proportion will break down (particularly during the early wet season rains) at which time the nutrient-rich biocrust is incorporated into the soil as organic matter. The amount of nitrogen biocrusts fix every year is similar to the amount of nitrogen fixed by native legumes in our grassy tropical savannas.

Soil fertility is a major limitation to pasture growth in tropical savannas, but it doesn't pay to add fertilisers because the extensive scale is prohibitive. We are testing if we can manage grazing and fire to maximise the natural carbon and nitrogen inputs by biocrusts into soils and enhance soil fertility in tropical savannas.

Where are biocrusts?

They are in the top one centimetre of the soil, usually covering the 'bare' spaces between plants. Biocrusts are found all over the world from freezing Iceland to hot deserts and wet-dry savannas, but different regions have different dominant organisms in the biocrusts, depending on the rainfall and temperature. In tropical savannas biocrusts are dominated by cyanobacteria.

What do they look like?

In northern Australia they often appear as dark staining on the soil surface in the dry season (Figure 1). They can form dark green slimy films during the wet season, as seen in the images below.

Image: Dark staining on the soil surface of biological crusts on the black soil in the dry season at Kidman Springs.

Images: Cyanobacteria and associated crusts in dry and recovery stages: (A) Cyanobacterium Nostoc commune in a transition state between dry stage (arrows 1) and rehydration (arrow 2), embedded in EPS (polysaccharide slime) (scale bar 20 µm); (B) Nostoc commune encapsulated in EPS (arrow 1) and embedded in ECM (extra-cellular (slime) matrix, arrow 2), (scale bar 20 µm); (C) Nostoc in gelatinous mass EPS production state overflowing new Scytonema biocrust; (D) following EPS production, consolidation of ECM occurred with defined biocrust formation; (E) Newly developed crust (still saturated from rain) that incorporated Symplocastrum, Scytonema, Symploca, Nostoc and liverworts (Riccia); (F) Dried and cracked Symploca dominated crust in situ in early stages of disintegration following the first rains early in the wet season (Merluna, Cape York, 2010) Images Wendy Williams from: https://www.biogeosciences.net/15/2149/2018/

But wait, aren't soil crusts a bad thing?

There are two types of soil crusts. **Living biocrusts are distinct** from dead physical soil crusts that form on degraded soils. Physical soil crusts can inhibit water infiltration and plant growth. Living biocrusts enhance soil moisture and plant growth.

What effect does fire and grazing have on biocrusts?

Fire can enhance biocrusts by removing litter, trees and shrubs that would otherwise compete as ground cover, yet you need the right amount of fire, not too much, not too little. Biocrusts in Australia's tropical savannas, like our native vegetation, are well adapted to fire because they evolved with fire. Preliminary sampling at our Kidman Springs Fire experiment found the highest soil plant-available nitrogen (fixed by biocrusts), was in four yearly late dry season burnt sites, more than unburnt or two yearly late burnt sites.

Grazing can also potentially open up interspaces for biocrusts by reducing plant cover. Nevertheless, the trampling by hooved animals is not something Australian ecosystems have evolved with, so our biocrusts are quite susceptible to heavy trampling. The effects of moderate vs. heavy grazing on biocrusts will be examined at the Wambiana grazing trial near Charters Towers.

If trampling is bad for biocrusts how can we manage grazing to benefit biocrusts?

Biocrusts grow during the wet season, just like plants. During the dry season they dehydrate and become dormant. The carbon and nitrogen they fix is broken down and recycled by other critters in the biocrust, and then becomes incorporated into the soil and available to plants. We suspect that spelling over the wet season and grazing during the dry season will benefit not only palatable plants, but also biocrusts, allowing them to maximise their growth and nitrogen fixation. As pruning a shrub or tree in a garden encourages growth, moderate disturbance of biocrusts can promote growth. It is also possible that some intermediate level of grazing will enhance growth and productivity of biocrusts in the savanna.

Biocrusts facts

- Biocrusts cover more than 12 per cent of the Earths land surfaces and fix ~7 per cent terrestrial carbon and 45 per cent plant-available nitrogen.
- The growth of savanna grasses and forbs that don't fix nitrogen is higher in the presence of biocrusts, probably because they benefit from the extra nitrogen fixed by the biocrusts.
- Cattle have been observed to lick biocrusts! (Anecdote from Bruce Alchin).
- There are viruses, bacteria and very small insects that make their living just off biocrusts. Samples of biocrusts from Kidman Springs examined under a microscope had 'herds' of tiny collembola (springtails) selectively grazing the cyanobacteria in the biocrusts, 'like cows in a paddock walking around from here to there searching for the legumes'. These are known to increase N-fixation by cyanobacteria!
- Biocrusts can be useful in land reclamation and rehabilitation. For example native seed germination and survival is higher when you coat them in cyanobacteria.
- Biocrusts reduce the germination of weeds.
- Biocrusts are often the dominant ground cover in deserts.
- Lichens and mosses dominate biocrusts in cold deserts (southern Australia), while cyanobacteria and liverworts dominate biocrusts in warmer environments (northern Australia).

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Sweet Spot Project keeps moo-ving across the north

The Sweet Spot project has passed its first hurdle, which was to find enough suitable breeder datasets to analyse the *sweet spot* of pasture utilisation for optimising reproductive performance in northern Australia. The project aims to develop tools to predict the impact of pasture utilisation on reproduction, so producers can manage pasture use to maximise kilograms turned off, while maintaining the resource base.

The first phase of the project was searching across the north for suitable existing breeder datasets that could be collated and modelled. The datasets needed to have the following: individual animal ID so we could calculate consistent reproductive indices; known paddock infrastructure and stock numbers by class so we could calculate stocking rates and intake; no production supplementation; at least two years and preferably three years or more data to increase the likelihood of experiencing a range of utilisation rates for the herd. We reviewed 64 datasets and found 28 to be suitable for the project. This is considerably more than originally envisaged. Given the unexpected wealth of datasets for the NT, the project was recently granted additional time and resources to analyse and model all the datasets.

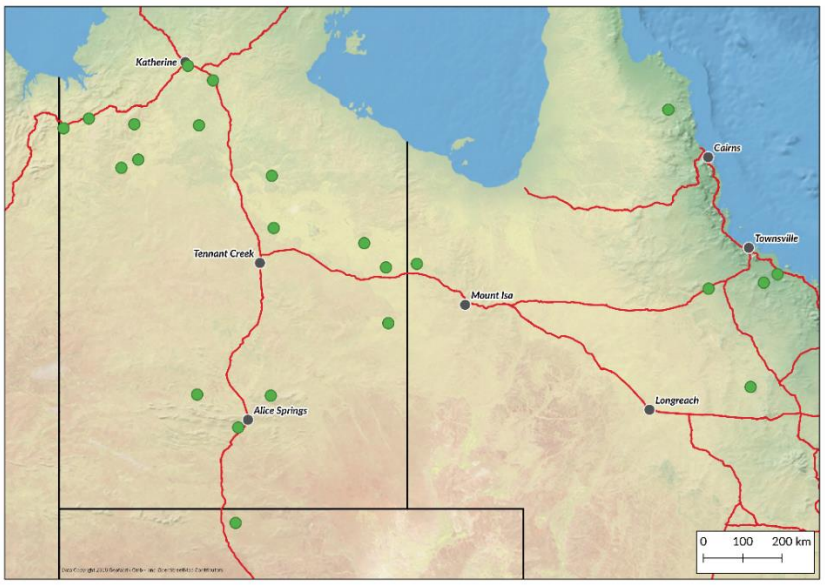
The NT is well represented with 79 per cent of the datasets (Figure 1). The data are from between 1993 and 2018. So far we have nearly 90,000 records of cattle data from 24 different properties and around 120 paddocks. Each study has at least three years of data. Some properties have data from multiple studies, paddocks and herds.

The next phase of the project is to calculate consistently derived reproductive performance indices across all the herds and to model pasture utilisation for each herd for each year. Reproduction indices include annual pregnancy, pregnant within four months of calving while lactating, foetal and calf

loss, missingness (indicator of female mortality), and weaner production.

The project is funded by MLA and brings together pasture and cattle scientists, and modellers from across the north. The $2M project, over four years, is led by the NT Department of Primary Industry and Resources, collaborating with the Queensland Departments of Agriculture and Fisheries, and Environment and Science.

For more information about Sweet Spot see https://futurebeef.com.au/projects/sweetspot/ or contact Robyn Cowley on 0419 829 493 and Kieren McCosker on 08 8973 9771.



Region	Alice Springs	Barkly	Katherine	North Qld	Qld Barkly	Sturt Plateau	VRD
NT	3	6	2			4	6
NT/SA	1						
Qld				5	1		

Image and table: Location of breeder datasets in the Sweet Spot project.

Tis the gamba season

After a scorching hot build-up it'd be nice to hear the rumble of thunder in an approaching storm front, a few showers would cool things down nicely. The rain would also help to green up a landscape crisped dry by hot desert winds.

Everything grows in the wet season and unfortunately this includes that scourge of the savannah, gamba grass. Like the vast majority of weeds, control of gamba grass is best carried out while it is in its active growth phase and the onset of the wet 'tis truly the season to get busy!

With a surge in new growth all around it can be easy to confuse friend with foe.

Gamba grass is big! It's a huge tussock grass up to 4m high and clumps of gamba grow so thick that it can be difficult to push your way in. Native perennial grasses such as giant spear grass and northern cane grass are also big but they are nowhere near as bulky, gamba really stands out in the savannah landscape. Gamba grass is fuzzy. Its leaves and stem are covered in soft white hairs and the 'v' shaped seed heads are also fluffy. Gamba grass leaves have a similar white midrib to itch grass leaves, but itch grass is smooth and hair free.

Gamba grass is a Weed of National Significance in Australia and a declared weed in the NT. Everyone has a role to play in the management of declared weeds and in the case of gamba grass, your responsibilities differ depending on where you live.

The majority of the Top End is in the Class A management zone. All public and private landholders in this area must work towards

eradicating gamba grass from their property, prioritising outlying plants and new infestations.

Owners and occupiers of properties in the more northerly Class B zone are required to actively manage the gamba grass on their patch. This means reducing the size and density of infestations, constructing buffer zones and fire breaks and ensuring that gamba grass does not spread into clean areas, road corridors or adjoining properties.

Wherever your property might be it is particularly important that you ensure that you practise good farm biosecurity. Protect your most important investment by stopping gamba grass plants from seeding wherever possible and by keeping machinery and other vehicles clean and free of weed seed.

It can be easy to get overwhelmed in the growing season. The jobs list is endless and new tasks are added on a daily basis so the secret to successful gamba grass management is planning and the best time to start that is now!

Head to the gamba grass webpage at www.nt.gov.au/gamba for all you need to know about planning for a successful weed management season including those all-important gamba grass declaration zones.

Image: Hairs on gamba grass stalks in July.

Image: Gamba grass in a class A zone.

Easing of restrictions for the control of citrus canker

The declared restricted area for the control of citrus canker disease has been removed from properties in Cossack, Katherine.

The restricted area was established in June 2018 after a plant with the citrus canker disease was found in Cossack. The restricted area affected 20 properties which were within 600 metres of a plant infected with citrus canker.

Chief Plant Health Officer, Dr Anne Walters, said she was pleased with the update and thanked the community of Cossack for their support.

“The restricted area in Katherine was cleared of all citrus canker host plants in late 2018 and there has been no evidence of citrus canker disease or any regrowth in the area,” she said.

“A designated minimum of six months without citrus canker host plants, known as the host free period, and no record of citrus canker disease during regrowth surveillance activities, has allowed for the restricted area to be removed.”

Two control areas for the control of citrus canker still remain in place around the greater Darwin and Katherine areas, and 12 restricted areas remain in the greater Darwin area.

Dr Walters said that to ensure the disease was not persisting in the environment, citrus canker host plants cannot be taken into or grown in the remaining restricted areas and citrus produce still cannot be moved out of the control areas without a permit.

"These changes are great news for residents in Katherine as it allows residents in the former restricted area to cultivate and plant citrus plants again.

"Citrus plants may be purchased from within the Katherine Control Area or areas free from citrus canker for planting within the former Katherine Restricted Area. Plants may not be purchased or moved from the Darwin Control Area as quarantine movement restrictions are still in place.

"The restriction on moving citrus fruit and juice from the control areas into a restricted area was also lifted today. This allows citrus growers within the larger control areas to sell their citrus fruit and juice to residents in restricted areas if the produce is for human consumption," Dr Walters said.

"The support and cooperation of growers in complying with these restrictions to date is appreciated and we support them in being able to start supplying locally grown citrus fruit and juice again in the restricted areas."

The movement and cultivation restrictions are in place to help eradicate citrus canker from the Territory and allow Australia to claim freedom from this serious plant disease.

Study to spice up northern Australia

***Image:** Fennel is one of several spices to be trialled at Coastal Plains Research Farm and Katherine Research Station as part of the new CRC for Northern Australia spice project.*

Northern Australia is poised to create Australia's own spice trail with plans to grow a new condiment industry part of a new Cooperative Research Centre for Developing Northern Australia (CRCNA) project, headed by Dr Surya Bhattarai from Central Queensland University (CQU). The $1.2 million spice cropping project will see five crops taken from small to large-scale production within 3 years.

The project team spans seed and crop experts from agronomists from the NT Department of Primary Industry Resources (DPIR), Agriventis Technologies, irrigation and agronomist specialists from the Burdekin-Bowen Integrated Floodplain Management Advisory Committee (BBIFMAC), economic development experts from the Rockhampton Regional Council, and the Western Australian Department of Primary Industries and Regional Development (WA DPIRD) as well as six growers from across Queensland and the NT.

The team will initially run small trials of cumin, fennel, kalonji, caraway and black sesame crops, after earlier glasshouse trials showed they had strong potential for inclusion in broadacre crop rotations. The small trials will be across several different locations and used to assess the suitability of crops for wide-scale commercial production in northern Australia.

In the NT, trials will be located at Katherine Research Station, and Coastal Plains Research Station. Rain-fed black sesame and fennel trials are scheduled for planting at the end of 2019, with a field walk planned for April 2020.

Commercial trials are due to start in the project's third and final year, by which time there will be a comprehensive manual for producers detailing which crops to grow, the best areas to grow them and an outline of the market and supply chain opportunities.

CRCNA CEO Jed Matz said the project would provide the foundation for a new, high-value industry with the potential to transform northern agribusinesses. "This project will build the supply chain links needed to establish a new and viable industry for northern Australia and create new income streams for producers."

Agriventis Technologies CEO Lewis Hunter said the long-term goal of establishing a base level of spice crop production would be achieved through extensive grower engagement focusing on extension and adoption strategies. "We hope to build support among growers for spice production and provide them with the evidence and best management strategies they need to profitably include condiments in their farming systems."

A high-value broadacre condiment industry in northern Australia could replace imports and generate exports to Asia and the Middle East and see northern producers secure their share of the

growing global spice trade – estimated to be worth around $12 billion annually.

Visit the CRCNA project page.

For more information, please contact:

Carla Keith, CRCNA project media enquiries
Phone 0499 330 051

Chelsea Moore, DPIR
Phone (08) 8999 2323
Email chelsea.moore@nt.gov.au

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Phone 0408 819 666

Cotton market update

Pete Johnson, Left Field Solutions

About the Author: *Pete Johnson is partner in Cotton Compass (a subscription based market information service) and runs Left Field Solutions (an independent cotton and grain cash brokerage business based in Toowoomba, Queensland).*

From a market perspective, the timing of the current scaled expansion of cotton production in Northern Australia perhaps couldn't be better.

An historically small crop in Southern growing areas should provide domestic support to cash values as growers in NSW and Southern QLD look to cover in shortfalls against existing forward sales commitments.

At the same time, there are emerging quality issues elsewhere in the world that are casting doubt over what the global high-grade situation will look like as we head deeper into 2020 – a situation that should support the price international mills are willing to pay for good quality Australian cotton.

This all, of course, needs to be balanced against a challenging macro-outlook, particularly concerning the US/China trade war and what has to date been its' negative impact on global business – and thus our spinning mill customers' confidence.

Overall, however, for new growers in a new area, the domestic situation will likely be the over-riding supportive market influence for the next few months at least, and will reduce the "need" to forward sell anything until you are more confident over production. Perhaps it's a case of don't shoot until you see the whites of their eyes - or bolls if you prefer.

And importantly also – this is the kind of market situation where everything is not always as it appears. In early November, for example we were seeing fresh sales from some growers at A$610/bale FOT ginyard (in order to replace bales other growers now knew they couldn't produce). This was at a time when the generic "published" market (based off export parity) was only around $585/bale. That $25/bale price difference isn't due to any kind of subterfuge from the merchant's perspective, it's just that this is, and will likely remain, an illiquid market – and these "washout" opportunities are not readily available in chunky volumes.

That said, whilst the domestic "washout" market is illiquid, we think it has some longevity, and should be well supported until growers in the south gain confidence over their production - and particularly that proportion of their production that remains unsold. And with our own Cotton Compass estimates suggesting perhaps 70 per cent of an estimated 750,000 bale national 2019/20 crop has already been committed to merchants, we doubt there will be a large volume of southern cotton come to market until perhaps February next year.

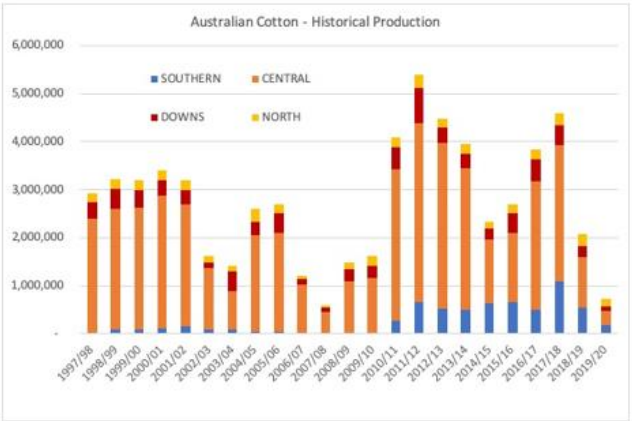

Figure 1. Historical Australian cotton production: Northern = Central QLD and Northern Australia, Downs = Darling Downs, QLD; Central = Darling River Catchment; Southern = Murray River Catchment.

Global High Grades Could Get Tight:
Additionally, as mentioned above, there are growing concerns about potential supply tightness of high-grade cotton globally. This is the market segment most Australian cotton tends to play in, and the

generally excellent quality results the last few seasons in the Ord and Katherine suggest Northern Australian production should be no different. Elsewhere in the world, however, the late and excessive monsoon in India appears to be creating quality issues as we write, and at the same time we are hearing of staple length issues as harvest progresses into Texas in the USA. Meanwhile, the crop in China's main high-grade producing province, Xinjiang, is smaller than earlier expectations, and the 2018/19 Brazilian crop is already heavily committed – particularly the high-end portion.

When combined with the prospects for a tiny Australian 2020 crop harvest, it really feels like this global high-grade position could get squeezed as we head into Q2 and Q3 next year (i.e. during our harvest and ginning season and before Northern Hemisphere new crop hits the market).

Quality Will be Critical: In this environment, we could see a two-tiered market develop – one where merchants are willing to pay significantly more for high grade cotton than they are for "out of spec" bales. If you do decide to forward sell, this means you will need to pay particular attention to Premium and Discount sheets, as they do vary significantly (see table below).

This raises an interesting point. When buying forward, merchants use three main parameters to determine the "base grade" price to the grower: 1.) Colour Grade = Middling (31-3); 2.) Staple = 1-1/8" (36) and; 3.) Micronaire = G5 (3.5-4.9). Premiums and discounts (P&D) are then allocated for other grades. This base grade, however creates a disconnect, because by far the majority of the forward sales the merchant then makes to a mill are of a higher quality, normally Strict Middling (21-3), 1-5/32" (37), G5.

So….If you decide to hold back on selling all or a portion of your cotton until after it is ginned and classed, you need to be aware – particularly in the current environment – that 31-3, 36, G5 cotton (or similar) once classed may not be worth nearly as much as it might have been if delivered forward against a P&D schedule. By the same token, there may be some lower grades that "outperform" the P&D if held back for sale after classing. This is, however, more likely in a year where low grades are in tight supply globally (rather than high grades). It is simple supply/demand theory, and every year will be different.

A stressed dryland crop, or a crop with late rain on open bolls or defoliation problems may be more at risk of quality discounts.

COLOUR - LEAF	STAPLE LENGTH					
	1-3/32"			1-1/8"		
	Worst	Best	Average	Worst	Best	Average
31-3	$ (88)	$ (26)	$ (43)	$ -	$ -	$ -
31-4	$ (95)	$ (33)	$ (60)	$ (44)	$ (7)	$ (30)
31-5	$ (106)	$ (69)	$ (85)	$ (88)	$ (44)	$ (65)
41-3	$ (124)	$ (58)	$ (90)	$ (80)	$ (36)	$ (60)
41-4	$ (139)	$ (58)	$ (98)	$ (84)	$ (36)	$ (66)
41-5	$ (153)	$ (73)	$ (120)	$ (117)	$ (73)	$ (98)
32-3	$ (117)	$ (66)	$ (94)	$ (88)	$ (40)	$ (74)
32-4	$ (146)	$ (73)	$ (104)	$ (109)	$ (55)	$ (87)
32-5	$ (182)	$ (80)	$ (118)	$ (146)	$ (55)	$ (103)

Table: A$/bale summary of key discounts from 16 different merchant's 2018/19 P&D Schedules.

Unusual Times: The current market set-up, particularly concerning the short domestic crop won't always be the case – in fact, with 100 per cent of our crop exported, usually domestic supply conditions play very little part in determining Australian cotton market direction.

Exposure to the vagaries of global supply and demand for what is, in effect a discretionary commodity, make cotton markets perhaps even more volatile than other agricultural sectors. From a historical perspective, it is not unusual to see this market move by A$100-150/bale in a 12-month period.

When combined with the fact that most gins typically do not provide warehousing facilities and require bales to be moved within short time frames once processed – this has led to the development of a well established forward market, that allows a wide time window for growers to manage their price risk ahead of ginning (rather than after it).

Normally, this is done in a "staged" approach with maybe 20-30 per cent of anticipated production being sold at any one time - depending on current price and price outlook.

For example, the chart at the end of this article demonstrates the period of time that price has spent in a particular price band since 1990. What this shows is that historically, price has only been above $600/bale for about eight per cent of the time, and above $550/bale 35 per cent of the time - and that there is a large chunk of time that we actually have spent below $500/bale!

So, in the context of history, these are currently very good prices…so may warrant forward sales

particularly if you have some production certainty and see some downside risk to price.

Forward Marketing Strategies: As new growers, in a new production environment, it will obviously be sensible to take an extremely cautious approach to forward marketing given both your production and quality risk are largely unknown. And remember, the main aim of any forward marketing plan is to protect your bottom line – not destroy it!

Depending on the scale of your operation, and your level of confidence, a fairly "risk averse" marketing plan might look something like the following (and please bear in mind that this is an example only, not a recommendation!!!):

- Sale 1: Sell to a maximum 25 per cent of "Safe Anticipated production" at first open boll – but ONLY if cash price is above A$575/bale FOT ginyard;
- Sale 2: Sell to a maximum of 50 per cent of "Safe Anticipated production" at 80 per cent open – but ONLY if cash price is above A$575/bale FOT ginyard;
- Sale 3: Sell to a maximum of 75 per cent of "Safe Anticipated production" at picking – but ONLY if cash price is above A$575/bale FOT ginyard;
- Sale 4: Sell a balance of crop once modules are delivered to the yard and weights known – but ONLY if cash price is above A$575/bale FOT ginyard;
- Sale 5 (if required): Sell any unsold bales post ginning and classing via "tender" based on known qualities.

But, if this looks a bit too hard - or looks like it will keep you up at night – then maybe your best option is just ignore Sales 1-3 and only consider entering the market once your modules are in the ginyard and production is effectively known. Obviously an irrigator will have more confidence over production potential than a dryland producer – season dependent. Everyone will be different.

The key thing is that there are plenty of people to talk to. Other growers and agronomists to get an idea of production potential and quality risk, merchants and independent brokers to get an idea of market direction and counterparty selection (particularly regarding P&D sheets).

Just take your time – in the current environment it doesn't feel like there is any need to panic into marketing decisions.

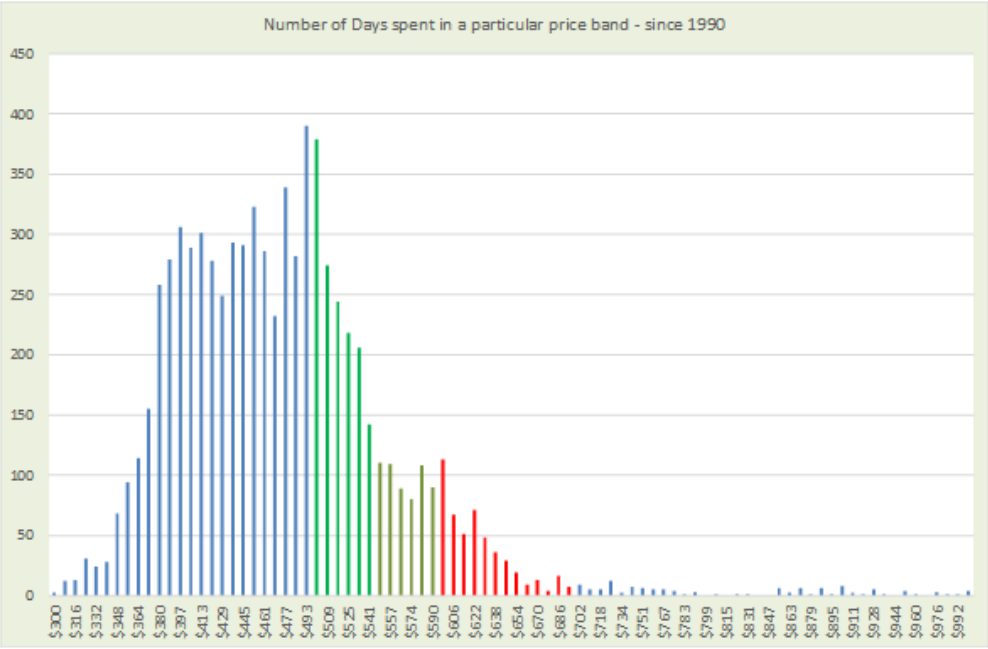

Image: The graph demonstrates that we have been spending less than $500 per bale a lot of the time.

IMPORTING PLANTS OR PLANT PRODUCTS INTO THE NORTHERN TERRITORY

Have you got an import permit and/or plant health certificate?

Import permits for plant products

- Avocado plants
- Banana plants
- Plantain, manila hemp
- Grapevine material
- Potatoes (planting)
- Soybeans
- Turf

Import permits for plant related material

- Soil, compost, potting mix
- Plant materials for diagnostic and lab testing

Import permits for used machinery and equipment

- All used agricultural and earth moving equipment and machinery
- Ploughs/seeders
- Tractors
- Harvesters
- Dump trucks
- Bulldozers
- Backhoes
- Pruning shears
- Picking poles
- Grape related machinery/equipment/tools
- Other plant related packaging, pallets and plant containers

Plant health or plant health assurance certificate

- Plants (household / potted / nursery) plants general (not otherwise specified)
- Fruit and vegetables
- Maize seed
- Peanut seed
- Citrus and fortunella plants
- Papaya plants
- Passionfruit plants
- Untreated pinewood, seasoned pinewood or pinewood articles and firewood from Western Australia

Darwin Office
(08) 8999 2118

Katherine Office
(08) 8973 9704

Alice Springs Office
(08) 8951 8166

Email quarantine@nt.gov.au

DEPARTMENT OF **PRIMARY INDUSTRY AND RESOURCES**
For more information visit **www.nt.gov.au**

NORTHERN TERRITORY GOVERNMENT

Animal Health

DEPARTMENT OF **PRIMARY INDUSTRY AND RESOURCES**

November 2019

Inside this issue:

Livestock disease investigations

The Department of Primary Industry and Resources (DPIR) provides disease investigation service, including free diagnostic testing through the Berrimah Veterinary Laboratory, to livestock owners for diagnosis or exclusion of notifiable emergency, exotic and endemic disease, including zoonotic diseases free of charge. Subsidies are available for producers to contact private veterinarians for significant disease investigations in livestock.

Subsidies for disease investigation

- Subsidies of up to $2,000 are available for disease investigations in cattle conducted by private vets as part of the Northern Australia Biosecurity Surveillance project.
- Subsidies for disease investigations in horses and other species, subsidies of up to $250 are available.
- Remember that $300 is available for cattle showing nervous signs where a post-mortem is performed and the brain is collected for 'Mad Cow' exclusion testing.

Please contact your local vet or regional Livestock Biosecurity Officer for more information.

From July-September 2019, 35 livestock disease investigations were conducted to rule out emergency diseases or investigate suspect notifiable diseases across the Northern Territory (NT).

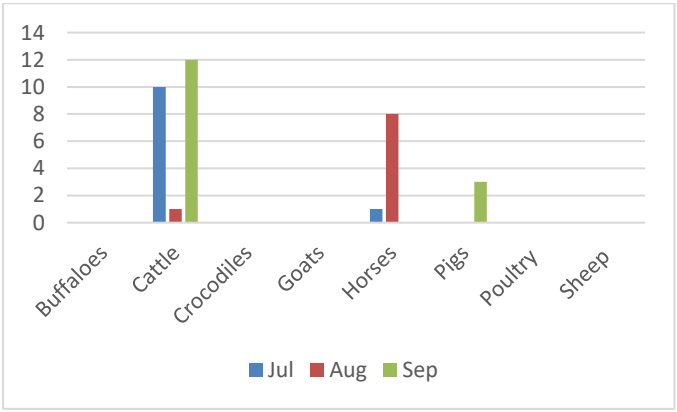

Figure 1: Livestock disease investigations in the NT, July to September 2019

The Biosecurity continuum: How livestock industries are protected from exotic disease

Images (above): Megan Pickering, Veterinary Officer (Katherine region) travelled to Nepal earlier in the year to undertake training and enhance Australia's capacity to respond to the biosecurity threat of Foot and Mouth Disease (FMD).

Because we are an island nation, Australia is able to remain free from many of the serious animal diseases found elsewhere in the world. This status is important to our ability to export live animals and their products, and is protected through high quality animal health surveillance activity, and stringent quarantine laws. The threat posed by an African swine fever (ASF) outbreak to the Australian pork industry, is a biosecurity issue that is currently under the spotlight. This article aims to outline the various activities that contribute to maintaining biosecurity for livestock producers in the Northern Territory and across Australia.

At the Territory level, biosecurity is maintained through government and industry participation in all of the onshore areas shown in Figure 1:

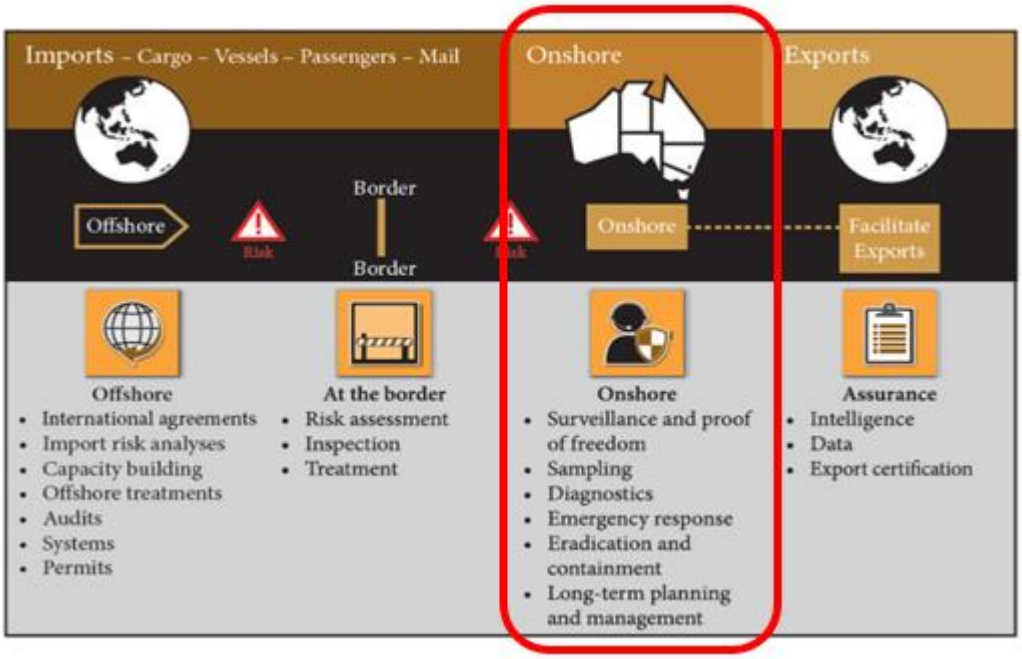

Figure 1: Graphic showing the activities that maintain the biosecurity continuum across Australia. Source: Agricultural White Paper, Australian Government

Surveillance and monitoring activities may be passive or active. Active or *targeted* surveillance involves collection of data for a specific purpose. In the Northern Territory (NT), DPIR Livestock Biosecurity Branch (LBB)

staff are involved in a range of active surveillance activities, for national programs that target significant exotic diseases, including:

- NTSEP (National Transmissible Spongiform Encephalopathy program), to provide proof of freedom from mad cow disease;
- NAMP (National Arbovirus Monitoring Program) which measures the distribution and activity of insect-borne viruses of livestock;
- SWFSPP (Screw-worm Fly Surveillance and Preparedness Program) which monitors fly species, with the aim of early detection of SWF incursion;
- Swill-feeding and Restricted Animal Material (RAM) audits of livestock producers, to ensure ongoing freedom from diseases such as mad cow disease, foot and mouth disease and ASF.

These activities enable the NT to provide certification for live export, by allowing us to have scientifically defensible evidence to claim freedom from disease, as well as identifying new markets because of disease-free status.

Passive surveillance activities occur when we gather information for more general investigation, such as post mortem examination and diagnostics, in cases of unexpected stock deaths or disease. These activities help us to identify diseases that are new to Australia, so that a rapid response occurs. Quick control of an exotic disease will minimise disruptions to productivity caused by stock movement or export restrictions.

Staff within the Livestock Biosecurity Branch are engaged in regulatory activity, surveillance and emergency responses preparedness, such as dealing with exotic disease or a natural disaster, eradication and containment of disease, and long-term planning. This work includes:

- Property Identification Code registration and database management, which creates a mechanism for easy contact with livestock producers in an emergency response,
- Maintaining the waybill database, which creates a mechanism for tracking livestock movements in the event of an emergency response,
- Tick control, allowing for the separation of tick-borne diseases into zones, and
- Regulation of the domestic meat slaughter industry, control of use of chemicals such as 1080 and monitoring of chemical residues such as lead.

There are other border surveillance and risk-mitigation activities in Australia performed by agencies such as:

- The Commonwealth Department of Agriculture's biosecurity detector dogs, at air and seaports,
- Pre-border extension activities, such as providing information about biosecurity laws in a range of different languages to potential visitors to Australia, including seasonal workers such as mango pickers,
- Northern Australia Quarantine Strategy, which employs veterinarians and indigenous ranger groups, to undertake active surveillance activities across the northern Australian coastline and in remote areas. Feral pigs are a particular target for animal surveillance by these groups.

In all states and territories, the local Department of Primary Industry (or equivalent) is responsible for planning and preparedness, in the event that an exotic disease reaches our producers, or a feral target species, which may threaten primary producers. With the high level of threat to the Australian pork industry, NT staff are currently engaged in specific disease response preparations for ASF. These activities include:

- Development of an NT-specific emergency response plan for ASF, in a nationally co-ordinated approach, which includes consultation with industry and specialists with experience in management of this disease;
- Awareness campaigns, targeted to primary producers, rural block owners who may keep pigs, pig hunters, travellers, seasonal workers and the general public;
- Specific disease investigation training and awareness for veterinarians, wildlife rangers and pig hunters;

- Increased active surveillance and regulatory activities, which may help to reduce the likelihood of infection, and severity or extent of a disease outbreak. This includes audits of swill feeding on properties and food businesses, and checking waste management facilities for compliance with NT legislation that aims to prevent pigs from accessing human food waste.
- Appointment of a feral pig policy officer, to draft specific policy around pig control options.

Ultimately, biosecurity is everyone's business. The quarantining of Australia to maintain our current level of disease containment is achieved through efforts at all levels of government, as well as personal awareness and accountability. It should, however, be recognised that although ASF is of current concern, continual vigilance is necessary to maintain disease freedom from a range of animal health threats such as foot and mouth disease, equine influenza or bird flu. The biosecurity continuum begins at the national border and continues to the property, where all producers should have a biosecurity plan. Information and resources on how to develop a personalised plan can be found at: https://www.farmbiosecurity.com.au/, or contact your NT Government Livestock Biosecurity officer for assistance and advice.

Pig mortalities in the Darwin region

Image: DPIR investigated pig mortalities in the Darwin region.

ASF is an exotic viral disease of pigs that is currently in the national and international spotlight, and a primary focus for NT DPIR LBB disease surveillance activity. Although it does not pose a public health risk, ASF is a severe and highly contagious disease, causing 95-100 per cent mortality in pigs, with no cure or vaccine available. The virus survives in a wide range of conditions, and is resistant to cooking, freezing and thawing. Because the disease can be easily spread from pig to pig by feeding virus-contaminated foods, there is currently a huge focus on both awareness around food products that can or can't be fed to pigs, as well as on monitoring and investigating unusual illnesses and deaths in pigs. There is no commercial pig industry in the NT, but at least 200 properties are known to keep pigs as pets or for home slaughter. The NT is also home to many millions of wild pigs, a population of particular interest when considering the risks of ASF infection in Australia.

In September 2019, a pig producer from Humpty Doo near Darwin, contacted the department regarding piglets that were dying. The herd consisted of two sows that had farrowed three to four weeks previously; one sow had two piglets and the other had eight. The owner first noted that two piglets had become very wobbly in the back legs; then, over the next three days, these animals collapsed and developed seizures. The owner euthanised the piglets on humane grounds. When another two piglets became sick with similar symptoms, the owner presented them to Berrimah Veterinary Laboratory (BVL), for examination and euthanasia.

The two piglets seen at BVL were in good body condition. The first animal examined was mildly affected; it was reluctant to move, knuckled over in the back legs, and collapsed easily. Some muscle tremors were seen, but this could have been shivering. The second piglet (from the original small litter of two piglets) was very unwell and unable to stand, but was conscious and appeared to be able to see. This piglet had thickened skin and swelling in the tissues around the neck, suggestive of oedema (fluid-swelling under the skin). Both piglets were euthanised and at the post mortem exam, a full range of body tissues was collected, for further testing.

A property visit was conducted by LBB officers to assess biosecurity measures. There was no reported access between wild and pet pigs, which would be very important to confirm in the event of an ASF outbreak. Another purpose for the visit was to investigate whether management or husbandry issues could have contributed to the disease event. The pigs were kept in a fenced enclosure within a ten acre block. The farrowing pens had concrete floors, automatic feeders, and were shaded by a tin roof. One corner of the enclosure had a concreted wallow area. Although cleaned regularly, the pigs (and piglets) were fed from the wallow, and also defecated and urinated there. Outside the farrowing pens and wallow area, the pigs had access to a dirt enclosure shaded by several large trees. The piglets were fed powdered milk, pig grower pellets, pineapples and vegetables.

Laboratory findings in the piglets included:

- Inflammation of blood vessels in the central nervous system (brain and spinal cord)
- Ulcers and erosions in the large intestine, with swollen and inflamed intestinal lymph nodes
- Inflammation of the liver
- Inflammation of the lungs
- Generalised depletion of the white blood cells.

The most likely cause of the major illnesses involving the large intestines and brains of both piglets is Oedema Disease. This is an inflammation of blood vessels called a vasculopathy, and is caused by a toxin-producing *E.coli* bacteria, which multiplies in the small intestine. The signs of disease seen in the large intestine were typical of Oedema Disease, and the piglets were approximately the right age for the condition. It is likely that the *E. coli* organism was introduced to the piglets through their recent mixing with the rest of the herd, or changes in intestinal bacteria as the piglets started eating food rather than exclusively nursing. However, signs of illness in other body tissues were also suggestive of a viral disease, Porcine Circovirus 2 (PCV2), which is common in Australian pig herds, and is seen as a concurrent infection in outbreaks of various pig diseases. Infection with PCV2 was also confirmed through laboratory testing.

Although the signs of illness in the piglets were not particularly suggestive of ASF, it is possible for ASF to cause intestinal illness and a central nervous system blood vasculopathy. Therefore, the piglet tissue samples were extensively tested for infection with ASF and other exotic diseases at the Australian Animal Health Laboratory, with no findings of any emergency or exotic animal disease.

After reaching a diagnosis, the owners were contacted and recommendations regarding husbandry and management provided to decrease the risk of disease events recurring, especially in relation to PCV2. Recommendations included creep feeding to gradually introduce piglets to new food, maintaining a clean and healthy environment (separating food from faeces, and not feeding at the wallow), and reducing the impact of stressful events such as mixing litters and animals during the vulnerable stages of life. The owners were appreciative for the support from the department

Protect the Territory from African swine fever

Feed your pigs right

Pig owners are reminded that feeding pigs meat scraps poses a serious risk to Australian biosecurity as ASF continues to spread rapidly throughout Eastern Europe and Asia.

It is illegal in every Australian state and territory to feed swill to pigs. Swill is the name for meat products or products that have come into contact with meat. Examples of swill include:

- pies and pasties
- sausage rolls
- pizza
- table scraps
- restaurant leftovers
- discarded cooking oils.

* Non-Australian dairy products are also banned.

Feeding swill to pigs is one of the simplest ways that serious diseases can enter the food chain.

ASF is a contagious disease of pigs, and has the potential to severely threaten the Australian pork industry. The virus survives at a wide range of pH levels, is resistant to most disinfectants and remains active in meat products through freezing and thawing.

ASF does not pose a risk to human health.

If you notice any suspicious symptoms in your pigs, such as weakness, lethargy, reduced appetite, discharge and blotchy skin lesions, please contact the Exotic Animal Disease Hotline on 1800 675 888.

More information about how you can help keep the Territory ASF free can be found at www.nt.gov.au/african-swine-fever

On-farm biosecurity is essential

- ASF is on our doorstep, strong biosecurity and hygiene practices are crucial.
- Farm biosecurity starts at the front gate. When entering a farm or production area use:
    - on-farm tools, boots and equipment if provided
    - a footbath for footwear
    - a suitable disinfectant, such as Virkon S or chlorine for disinfection of equipment.
- When you leave a farm, always
    - disinfect your boots, clothes, vehicles and any equipment you are taking with you.
    - Wash your clothes and equipment regularly to keep Australia clean.
- Strong biosecurity practices and hygiene are crucial. ASF can be spread by people on their skin, clothing, footwear, and in their hair.
- Always wash your hands with soap and water before and after handling animals.
- Overseas workers who have contact with pigs at home should wait a minimum of seven days or avoid having any contact at all with pigs in Australia.
- Overseas workers should not bring any clothes or equipment used with pigs in their home country to Australia.
- Know the signs – early detection is key. If you see something suss, call us. Report symptoms to the Emergency Animal Disease Hotline 1800 675 888.
- Protect your property - find resources to help keep your farm and pigs clean on the farm biosecurity website.

Industry

African swine fever

Protect our pigs. Protect your property.

African swine fever (ASF) is a highly contagious disease of pigs that's spreading rapidly in Eastern Europe, China and South East Asia.

An outbreak of ASF in Australia would have a significant impact on pig health, pork production and will devastate Australia's pork industry.

The disease is spread by direct contact with infected pigs, contaminated vehicles, equipment or clothing and by feeding infected swill or meat scraps to pigs.

No vaccine or treatment is available. It's vital that we keep ASF out of Australia.

Strong biosecurity practices and hygiene are crucial.

- ASF can be carried by people on their skin, clothing, footwear and in their hair. When you and your workers enter a farm or production area ensure you use:
  - on-farm tools, boots and equipment if provided
  - a footbath for footwear
  - a suitable disinfectant, such as Virkon S or chlorine, for disinfection of equipment.
- When you and your workers leave a farm or production area, always disinfect boots, clothes, vehicles and any equipment leaving the site.
- Always wash your hands with soap and water before and after handling animals.

Overseas worker vigilance.

- Those who have contact with pigs at home should wait seven days before having contact with pigs in Australia or avoid having contact with pigs in Australia.
- Workers should not bring any clothes or equipment used with pigs in their home country to Australia.

Protect your property.

Find resources to help keep your farm clean on the Farm biosecurity website at farmbiosecurity.com.au

Know the signs.

Early detection is key to eradicating disease. Symptoms of ASF include:

- sudden death or death within one-two days
- blotching of skin, especially the ears
- loss of appetite
- huddling or hiding in corners
- diarrhoea, which may be bloody.

If it looks suss, call us 1800 675 888

NORTHERN TERRITORY GOVERNMENT

Calf watch: *Brucella abortus* excluded in peri-natal death

A current investigation into causes of calf loss in extensively managed north Australian beef herds aims to establish causes of death in the immediate pre- and post-birth periods. It has been difficult to establish causes of calf death using traditional methods of observation, because calving cows are hard to find in large paddocks. Calf carcasses are similarly difficult to locate, owing to rapid decomposition and predation. Calf Watch[5] is a current DPIR Livestock Industry Development project, which uses birthing sensors inserted into the vagina of pregnant cows; an electronic calving alert allows researchers to locate calving sites when the sensors are expelled, collect dead calves for autopsy and tag live calves for further tracking.

In September 2019, researchers detected a calving cow, shortly after receiving the sensor alert. The foetus was only partly expelled through the pelvis, and staff manually delivered the dead calf. The carcass was submitted to the regional veterinary officer for autopsy, where the following findings were noted:

- evidence of some foetal distress, bright red gums and a very large, swollen tongue
- the calf was normally developed and at term
- unclotted blood was easily collected via direct puncture into the heart
- lungs were solid and did not float in water, indicating that the calf had not taken a breath
- kidneys and liver were moderately decomposed
- the heart, lungs, spleen, gastrointestinal tract and brain were significantly less decomposed.

Laboratory findings showed evidence of amniotic fluid inhalation (foetal or calf-bed fluids), indicating distress of the calf while it was still in the uterus. This finding is suggestive of dystocia (meaning the calf was stuck, and unable to be delivered without assistance) as the cause of death during the birthing process. However, the lung also showed evidence of inflammation, and possible involvement of bacteria. Therefore, culture of the lung, and exotic disease testing was requested at the Australian Animal Health Laboratory (AAHL) for *Brucella abortus* infection. *B.abortus* is a bacteria that may cause pneumonia in a calf foetus, and because it is not known in Australia, is a potential cause of infectious emergency animal disease.

Testing was also undertaken to rule-out viral causes of abortion. The calf blood was tested for antibodies to Bovine Viral Diarrhoea Virus (also known as Pestivirus) and several arboviruses (insect-borne infections) as shown in Table 1:

Arbovirus	Test	Result
Akabane	VNT	Negative
Bluetongue	ELISA	Negative
BVDV	AGID	Negative
EHD ELISA	ELISA	Negative
Palyam group	AGID	Negative

Histology (examination of tissue cells) ruled out infections that commonly cause problems in NT beef cattle and calves, such as Leptospirosis, vibriosis, *Tritrichomonas fetus*, Listeriosis, *Yersinia pseudotuberculosis* and *Neospora caninum* infections. The bacterial culture grew small amounts of two bacteria, including *Mannheimia*

1. Calf Watch – Developing a system to remotely monitor calving and study calf loss in extensive situations in northern Australia. T Schatz, K McCosker, M Wooderson, G Baily-Preston and R Boughton. Corresponding author: tim.schatz@nt.gov.au.

haemolytica, which is a cause of “Shipping Fever” pneumonia in adult cattle. Given the large amount of fluid that the calf had inhaled, it is likely that the bacterial growth represents a secondary infection of the lungs after death, and not a cause for the neonatal death. The referral testing at AAHL on the lung tissue was negative for *B.abortus*. This was established using a molecular diagnostic testing method with high reliability.

Investigation into the cause of death in this calf established that this was a simple case of dystocia, where the position of the calf in the uterus made it impossible for a normal, unassisted vaginal delivery to occur. Unless calving cows are intensively monitored, there will always be a proportion of calf deaths in the uterus. This occurs if the calf runs out of oxygen during a prolonged labour and delivery, because of disruption to the maternal oxygen supply through the umbilical cord. Eventually, the unborn calf needs to attempt to take a breath; if the head is still inside the uterus, foetal fluids will be inhaled and the calf will die shortly afterwards. However, despite the benign findings, this investigation is an important and useful example of passive surveillance, where DPIR researchers were able to rule-out an important exotic animal disease, as well as adding to the knowledge base around causes of neonatal calf death in the NT.

Lead poisoning

Lead is a naturally occurring toxic metal. Its widespread use has resulted in extensive environmental contamination, such that lead poisoning in animals and people is of major concern worldwide. In veterinary medicine, lead poisoning following opportunistic or accidental ingestion, is most common in dogs and cattle. Lead exposure may have serious consequences for human health, particularly for young children. Even low levels of exposure can affect brain development, resulting in reduced intelligence, and behavioural changes such as shortened attention span and increased antisocial behaviour. These effects are believed to be irreversible. Because of the hazards associated with ingesting lead, Australian food-producing animals that have been exposed to lead sources, and may therefore pose a risk if their meat is eaten, are subject to movement and slaughter restrictions to ensure food safety and product integrity.

Lead is the most commonly reported source of heavy metal poisoning in livestock, with severely affected animals showing a variety of nervous system signs. These may include teeth grinding, blindness (stumbling, walking through fences or crashing into solid structures), muscle spasms, lack of co-ordination, head pressing in corners or against trees, and eye rolling. Signs of acute lead poisoning occur within 12-24 hours of consumption, with severely affected animals quickly dying from seizures and breathing paralysis. Lower level toxicity may occur more slowly, with animals surviving for several days; blindness, aimless wandering or staggering and gastro-intestinal upsets may be seen. These signs are not, however, specific to lead poisoning, and a diagnosis should be made by a veterinarian to rule out other causes of brain illness. Lead poisoning may present with signs that require tissue sampling and testing, in order to differentiate the illness from other conditions such as:

- tetanus (early stage)
- botulism (late stage)
- polioencephalomalacia (vitamin B deficiency)
- nervous ketosis
- infections of the brain
- other poisonings (e.g. salt, mercury or arsenic), and
- exotic diseases such as rabies and BSE (mad cow disease).

Cattle in the NT occasionally succumb to lead poisoning when they are able to access station dump sites containing discarded lead-acid car batteries. Exposure to sunlight and chemical corrosion of the batteries over time, leads to shattering of the chemical cell housing, so animals can easily access the lead. In a discharged battery, the lead is present as lead sulphate, a salt which is tasty to cattle and easy to consume. Other sources of lead poisoning may include mine tailings, water contaminated in lead-lined pipes or ground poisoning from contamination with materials such as sump oil or lead shot. Producers should make every effort to prevent animals accessing potential sources of lead such as metal dumps or tailings dams, as the consequences of lead

exposure are long lasting and expensive. Station dumps should be securely fenced to prevent stock access, and discarded lead and other heavy metals should preferably be recycled through accredited metal recyclers, rather than discarded on site.

It is important to know that not all animals that have ingested lead will have symptoms; severely lead poisoned animals may simply be the sentinels which indicate that a herd has been exposed to a lead source. Some animals may have consumed some lead and show no symptoms, but their blood and tissue levels of lead may still be above the Maximum Level (ML) allowable under the Australian & NZ Food Standards Code. For this reason, if lead poisoning is diagnosed in a single animal on a property, further investigation and testing of herd cohort animals is likely to be necessary, to ensure that animals with lead contamination do not enter the food chain. 95 per cent of ingested lead is stored in the bones of the animal, from where it may be released at different times. This is why affected animals may be temporarily or permanently restricted from entering the food chain. DPIR livestock biosecurity officers and field veterinary officers are able to provide support and advice on herd management in the event that lead exposure is detected on your property.

Cattle tick zones change

Following a review of the Territory's cattle tick management program, livestock owners are being asked to check cattle tick zones and movement restrictions as there have been changes to the cattle tick control and infected areas.

The Parkhurst infected zone now includes Kakadu National Park and the township of Jabiru.

The cattle tick infected zone has been updated to include four properties previously in the cattle tick control zone that are focused on live export markets and therefore have no requirement to remain within the cattle tick control zone to facilitate the domestic movement of cattle.

The new map is available from the Northern Territory Government website.

Livestock owners can review movement conditions by reading the factsheet.

Cattle tick is a serious pest in the NT, affecting many livestock including cattle, horses, buffalo, camel and goats. Parkhurst ticks (a strain resistant to commonly-used chemical treatments) were first detected in the NT in 1999.

An extensive survey will be undertaken in 2020 to assess the effectiveness of the Parkhurst infected zone and determine whether Parkhurst strain cattle tick has spread outside this zone or been introduced to other properties from interstate.

For more information, please see the Northern Territory Government website.

Moving horses and/or livestock below the tick line?

Image: All horses and livestock are required to be treated for cattle tick under supervision before any movement commences.

Under the *Livestock Act 2008*, all horses and livestock are required to be treated for cattle tick under the supervision of a livestock biosecurity officer BEFORE any movement commences.

72 hours notice is required to ensure the availability of a livestock biosecurity officer for all horse sprays and livestock dipping.

Contact the Livestock Biosecurity team

Darwin		**Katherine**	
Regional Livestock Biosecurity Officer	08 8999 2034	Regional Livestock Biosecurity Officer	08 8973 9767
Livestock Biosecurity Officer	08 8999 2030	Livestock Biosecurity Officer	08 8973 9765
Tennant Creek		**Alice Springs**	
Principal Livestock Biosecurity Officer	08 8962 4458	Senior Field Veterinary Officer	08 8951 8181
Livestock Biosecurity Officer	08 8962 4492	Regional Livestock Biosecurity Officer	08 8951 8125

Department website: nt.gov.au/industry/agriculture/livestock

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