



Department of
Primary Industries and
Regional Development

Rangelands Memo

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Letter from the Editor

Matthew Fletcher, Development Officer, DPIRD, Kununurra

Welcome to the November 2018 *Rangelands Memo*. This issue is certainly a big one (maybe the biggest yet!), with a range of articles that will hopefully be useful to producers and managers in the WA rangelands.

Right up front, there is a cluster of articles on beef husbandry, with two important topics discussed — **breeder cow mortality** and **phosphorus supplementation**. Breeder cow mortality is something we are all aware of (better to sell females than have them die in the paddock), however when it comes to calculating mortality rates, it seems very few are doing it. Development Officer Mariah Maughan has put together three articles on the topic of breeder mortality, one of which gives examples of how to calculate breeder mortality rates.

One key tool for reducing breeder mortality is wet season **phosphorus (P) supplementation**. Comprehensive research undertaken at Victoria River Research Station (Kidman Springs, Northern Territory) has calculated the cost benefits of feeding wet season P in areas where soils are P deficient. The trial started in 2014 with Brahman heifers randomly allocated to +P or –P treatments. The results are undeniable: higher pregnancy rates in +P maiden heifers, heavier weaning rates in the +P weaners and a reduced mortality rate. Please take the time to read these informative beef husbandry articles.

Two articles focus on land management topics. The first deals with **Noogoora burr** (*Xanthium strumarium*), a declared weed found recently in the Pilbara along the De Grey River. Noogoora burr has not previously been found in the Pilbara. Even though I wasn't around at the time, I am reminded of the former Agricultural Protection Board's (APB) efforts from 1982-96 to eradicate Noogoora burr from the Ord and Fitzroy Rivers. Unfortunately, this campaign was unsuccessful, however biological control agents such as stem boring moth larvae and rust, have since greatly reduced its growth and spread. Best of luck to all parties involved in the planned Noogoora burr surveillance and eradication program along the De Grey River.

The second article discusses **fire, grasses and nutrients**. Fire is topical at the time of writing, with numerous wildfires burning in the west Kimberley after a bumper 2017/18 wet season left behind a large fuel load. I hope land managers in the rangelands who want to better understand fire will find this article of interest.

Finally, this will be my last issue as Editor. I will be handing over the reins to the very capable Development Officer, Stephanie Coombes, from Broome, who will steer the ship for the next issue. It has been a wonderful experience working on the Memo for the past 10 years. Thank you to all the committed authors who contributed articles; I am grateful for the pride taken in what you presented to industry. Also, thank you to all the readers who provided feedback on the Memo – it is sincerely appreciated.

It's always been a thrill, when visiting a station homestead, to see a copy of the Memo on the kitchen table, car dashboard or even toilet floor!

I wish all the readers and contributors a safe and merry Christmas. Happy reading!

Matthew Fletcher

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Shaping success in the north

Hon Alannah MacTiernan MLC, Minister for Regional Development; and Agriculture and Food

Developing our northern beef

Up until last year, the State's Northern Beef program was missing the mark and struggling to gain support from the northern industries it served.

It needed to refocus and reconnect with our pastoral industries to make sure our resources were hitting the ground where they would make the most impact.

Today, with the guiding hand of supporters such as the Pilbara Development Commission and the Kimberley Pilbara Cattlemen's Association (KPCA), we are making significant inroads in the north.

The refocussed Northern Beef Development (NBD) project within the Department of Primary Industries and Regional Development is now based in the north and building strong linkages with pastoral businesses to grow the industry as a whole and respond to its needs.

The project is targeting increased productivity and capacity, mosaic agriculture, and business development to take the industry forward.

Three development officers are working on the front line across the Kimberley and Pilbara to promote new systems and practices to boost productivity and build the skills and capacity of people working with our northern beef. This hands-on sharing of knowledge and on-farm beef extension is challenging given the sheer size of the region, but the impact is obvious.

Industry and scientific experts are partnering with the team including Meat & Livestock Australia's breeder mortality specialist, Dr Geoff Neithe, who recently visited the region. KPCA is also doing its share to ensure pastoral beef businesses are equipped to make the most of development opportunities.

The introduction of Twilight Forums has also helped the project team connect with industry and share expertise, delivering relevant and region-specific information.

Pasture research for the north

The department's mosaic agriculture team, led by Dr Clinton Revell, is carrying out comprehensive agronomic field trials on pasture and fodder for beef production in the north, including irrigated forage production and better pastures for dryland grazing systems.



Catching up with 2018 AgriFutures Rural Women's Award National Runner Up Darrylin Gordon (left) and Josie Farrer MLA, Member for the Kimberley (right)

Field trials are underway for 40 forage species across a range of locations including Marble Bar, Wallal, Broome, Derby and Fitzroy Crossing. The field trials include both direct grazing and cut and carry analysis.

Other exciting research is looking at the feasibility of sterile leucaena as a high-quality forage legume shrub for the north, co-funded with MLA Donor Company and the University of Queensland.

The development of a sterile form of leucaena, with its production benefits and significantly reduced weed risk, would be a game changer for the State's pastoral industry.

The department's research was showcased at the International Leucaena Conference in Queensland this month, and KPCA delegate Haydn Sale was supported to attend to help communicate back to industry.

Grants help businesses improve

The Business Improvement Grants (BIG) program has provided grants for business benchmarking and to encourage innovation that drives efficiency at the beef enterprise and industry level.

With strong uptake by 48 participants in the original BIG program, the State Government has expanded the program in 2018.

Extra funding of up to \$575,000 in BIG grants is supporting 20 Kimberley and Pilbara businesses to secure business advice and mentoring support and implement a priority business improvement project.

Lanza teder a an option for backgrounding cattle

Outside the scope of the Northern Beef project, the State Government is investing in other research, development and innovation to grow our livestock industries and it is paying dividends. I recently launched the new pasture cultivar, Lanza teder a, which could also benefit of our northern industry.

This new variety, developed under the leadership of DPIRD's Dr Daniel Real, was the result of more than a decade of agronomic and livestock grazing trials.

The trials have shown the potential of teder a in our farming system as a reliable high value feed option in the off season that offers green feed when everything else is brown.

Although it is best suited to Mediterranean climates and sheep production, it has scope for the value-added beef method of backgrounding northern cattle.

Backgrounding in the agricultural region improves marketing and finishing opportunities, providing improved access to live export markets and southern domestic processors.



Lanza breeder, Dr Daniel Real, DPIRD, showcases a healthy paddock of teder a at the pasture's launch

The department is also looking at opportunities to work with the University of Western Australia and Kings Park Botanic Gardens to explore potential research projects on native pastures, particularly grasses.

There is a scarcity of commercially available native pasture species suited to the WA rangelands environment and we want to provide another feed option for pastoralists to regenerate the land and manage areas impacted by high grazing pressures.

Looking into cold storage

The department is investigating diversification options in our north, working with KPCA on a pre-feasibility study for a cold storage supply chain logistics hub in the West Kimberley.

The pre-feasibility work will analyse frozen and chilled storage product requirements to determine the volume of cold storage required over time and how it could be developed in stages.

This study will consider current and potential partners for West Kimberley beef, horticulture, aquaculture and bushfood products.

While the majority of cattle processed in the north have different market specifications to those destined for live export markets, local processing represents a significant value add to the industry and contributor to the regional economy.

Transforming Agriculture in the Pilbara (TAP)

The State's \$5.9 million Transforming Agriculture in the Pilbara (TAP) project was launched in April and is another exciting step towards realising the region's potential.

This three year project builds on earlier work in the Pilbara Hinterland Agricultural Development Initiative (PHADI) looking at prospects for irrigated agriculture in the region.

TAP is tackling soil and water investigations, economic analysis and irrigation R&D, with a focus on potential water resources in the De Grey, Shaw and Upper Fortescue rivers, coastal rivers in the Karratha Hinterland and potential supplementation via mine dewater.



(L-R) Chris Schelfhout, Project Manager, DPIRD, Agriculture and Food Minister Alannah MacTiernan, Kevin Michel MLA, Member for Pilbara, and Terry Hill, CEO, Pilbara Development Commission discuss the TAP project

In an exciting development, the department's researchers will be looking at a two-year field trial of temperate fruit at Newman to determine whether the higher elevation site could have enough winter chill hours to viably grow the crops.

Carbon farming

Carbon farming offers real economic opportunity for pastoralists – to source a new long-term income stream while working to regenerate our vulnerable pastoral lands.

The State Government is working to maximise the opportunity for pastoralists to bid for the tens of millions of dollars on offer from the Federal Emissions Reduction Fund and from private purchase of carbon credits.

We gave in-principle approval to 15 pastoral properties who won \$46 million in the June 2018 of the fund for carbon farming activities.

We are confident a similar number of projects will have submitted bids in the most recent round: we will be working through the detail of those projects in coming months.

We are working closely with northern pastoralists on methodologies for carbon farming: while our initial focus is on Human Induced Regeneration, we see real opportunities in savannah burning and in soil carbon.

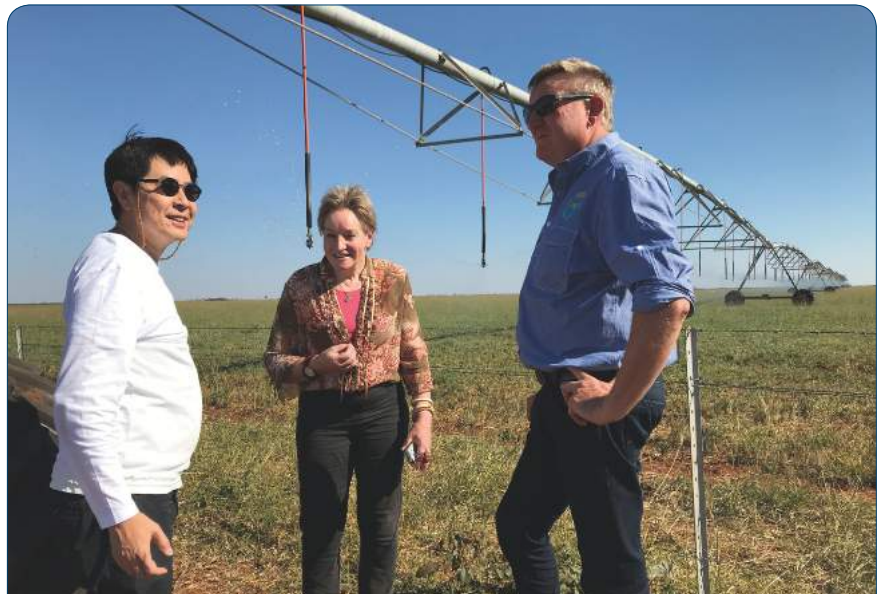
Pastoral Lands Reform

Progress continues on pastoral lands reform, to improve the sustainability of pastoral land and provide more opportunities for economic growth through tenure reform. Specific legislative changes are in the pipeline.

A framework for the implementation of a land management system for the pastoral estate is being developed and will include a costed proposal to develop and implement a combined monitoring and risk-based compliance system across the pastoral estate.

The reform package will include proposed legislative amendments to increase the certainty of tenure for pastoralists, encourage investment and facilitate economic diversification.

A Pastoral Industry Reference Group has been established to provide strategic advice to the Government's interagency Executive Steering Committee and has commenced work.



Agriculture and Food Minister Alannah MacTiernan views a pivot at Pardoo Station in the Pilbara

Three month outlook and cyclone season ahead

Matt Fletcher, Development Officer, DPIRD, Kununurra

According to the Bureau of Meteorology's (BoM) latest three month outlook, the chance of exceeding median rainfall looks grim: November to January is likely to be drier than average for large parts of WA, as shown in Figure 1 below.

Figure 2 below shows the chance of exceeding median rainfall for the November to January period across Australia. Examples of median rainfall over this period for towns in Western Australian include, Kalgoorlie 55mm, Meekatharra 48mm and Fitzroy Crossing 295mm (BoM).

A summary of BoM's tropical cyclone seasonal outlook for the 'Northwestern sub-region' for the period November 2018 to April 2019, as follows:

- There is a 41 per cent chance of more tropical cyclones than average. The outlook accuracy for the region is moderate.
- Typically, five cyclones form in, or pass through, this region each season.
- Around 40 per cent of tropical cyclones, or their associated tropical lows, affect coastal areas of the North West region.

For more information about BoM's three month outlook, visit the website at: bom.gov.au/climate/cyclones/australia/.

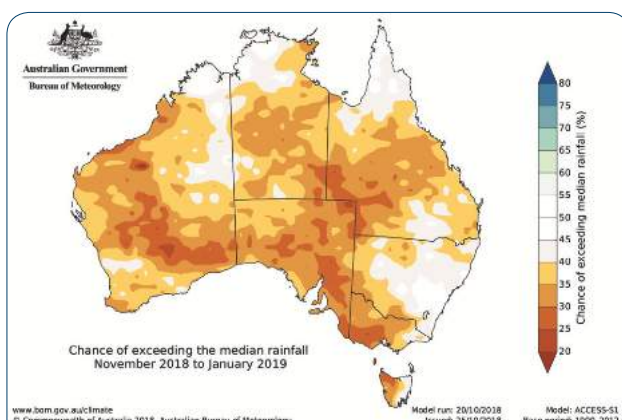


Figure 1: Chance of exceeding the median rainfall – November 2018 to January 2019

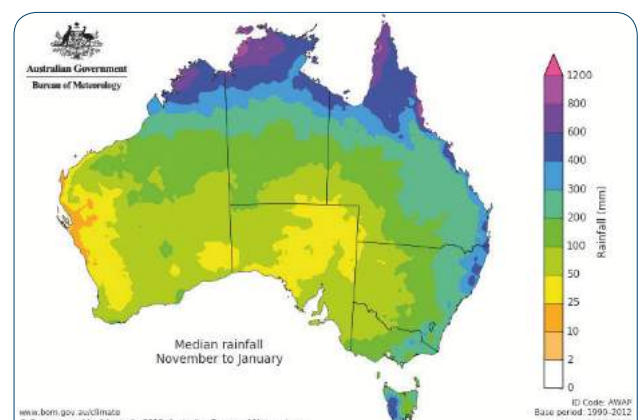


Figure 2: Median rainfall – November to January

Climate outlooks, skill and the new ACCESS–S model

Kath Ryan, Development Officer, DPIRD, Kununurra

Climate outlooks produced by the Bureau of Meteorology (BoM) are based on dynamical models that provide probabilities for a range of variables, including temperature and rainfall.

Probability is a measure of the chance of an event we are interested in, such as an amount of rainfall occurring within a given timeframe. For example, greater than 50mm opening rains.

Interactive maps showing probability on BoM's climate outlooks webpages are clickable by location, producing graphs such as the example, shown in Figure 1 for Nullagine. While a probability of below 15 per cent is close to 'Buckley's chance' (Figure 2), there is still a possibility of the event occurring.

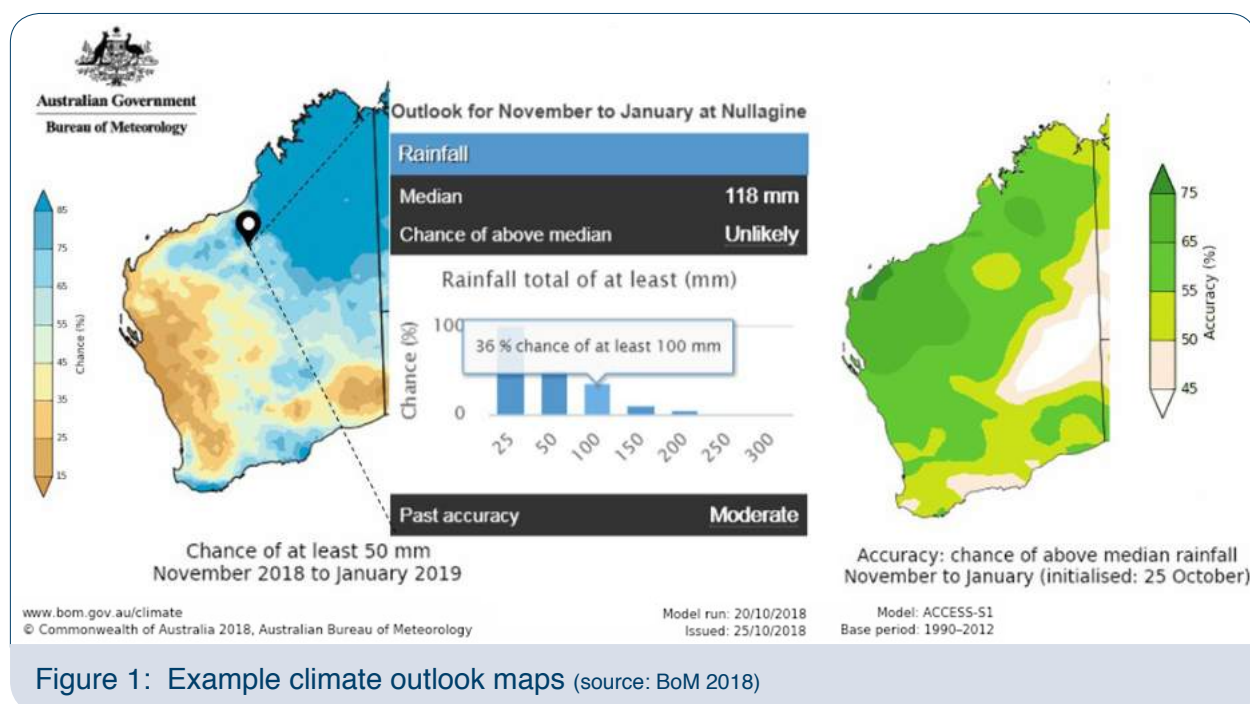


Figure 1: Example climate outlook maps (source: BoM 2018)

BoM's new climate forecast model is known as ACCESS–S (Australian Community Climate Earth-System Simulator – Seasonal). It is a physics-based forecast modelling system using ocean, atmosphere, ice and land observations to provide outlooks for the season ahead.

ACCESS–S replaced the previous model, POAMA, in August 2018. The new model's accuracy is expected to increase over time with advances in seasonal prediction, improvements in observations and how these feed into the model, as well as increases in supercomputing power.

Model accuracy, also known as confidence or skill, is a measure of how well the model has performed at the same time of year in the past (Figure 1 above).

One way that BoM measures the accuracy of its climate models is by comparing how often the climate outcomes matched the forecast. This measurement of accuracy is known as past accuracy (% consistent), and has been tested for ACCESS–S over the period from 1990 to 2012.

Past accuracy maps for all months and seasons are available from BoM's climate outlook webpages. On these maps, the greener/darker the colour, the greater the accuracy of outlooks for that area at the same time in past years, and the more confidence we can have in future outlooks.

In the least accurate areas, the outlooks perform no better than random chance (equivalent to the flip of a coin). Accuracy for the second month of the outlook is generally lower than the accuracy for the first month. Similarly, the accuracy of outlooks issued at the end of the month is typically higher than the accuracy for outlooks issued in the middle of the month, as they are closer to the time period of interest.

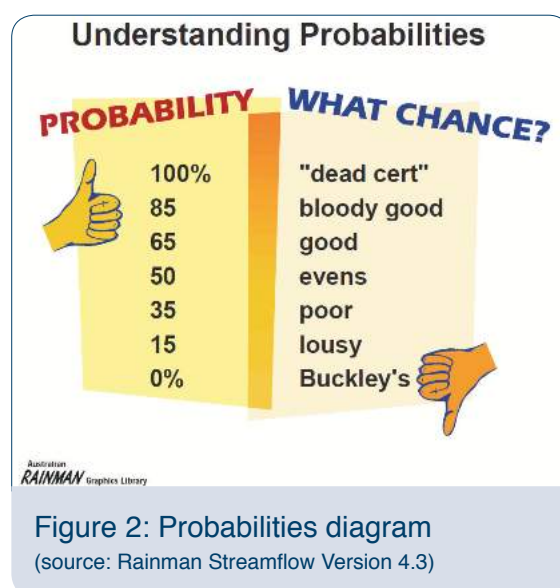
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Bureau of Meteorology website: bom.gov.au/climate/ahead/about/model/access.shtml

Further reading for technical details of ACCESS–S, see:

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The Northern Australia Climate Program – gaining a better understanding of our climate

Anne Marie Huey, Climate Mate

Northern Australia is noted for its distinct wet/dry seasons, but how much do we know about the key climate drivers that affect our region and influence our weather?

To better understand our climate, the Northern Australia Climate Program (NCAP) has been launched. It brings the best climate scientists, advisors and cutting-edge researchers together with northern beef producers to better manage the impacts of operating in a variable climate.

The program is being run by the University of Southern Queensland (USQ), the Bureau of Meteorology (BoM) and the Queensland Department of Agriculture and Fisheries (QDAF), along with program partners, Northern Territory's Department of Primary Industry and Resources, the Western Australia's Department of Primary Industries and Regional Development, and Rangelands NRM.

In practical terms, six 'Climate Mates' have been appointed, with two more to come, across Queensland, the Northern Territory and northern Western Australia, to liaise with pastoralists and determine what the industry wants and needs in relation to climate information, seasonal outlooks and decision-making tools.

A significant advantage of the program is that the design and delivery will be driven by what local producers want. Options include, workshops, webinars, regular email updates, one-on-one property visits, or any other practical format requested.

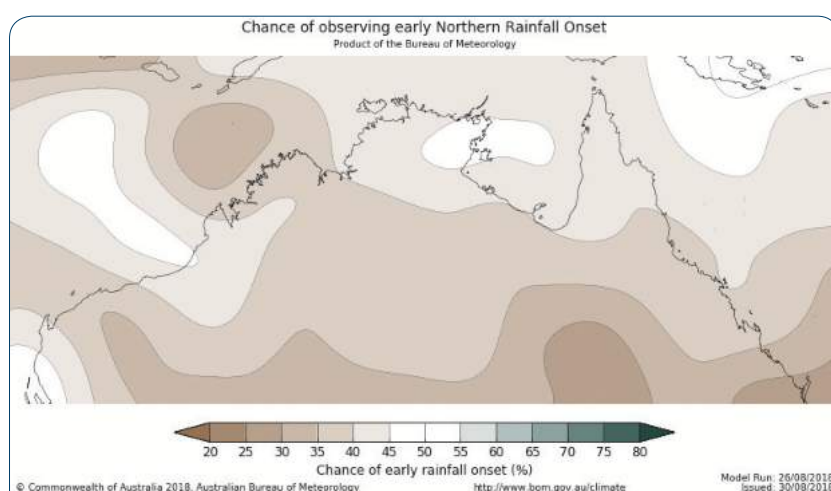


Figure 1: When will it rain? There is a 35 to 45 per cent chance of an early wet season break across the East Kimberley and Victoria River District (Source: Bureau of Meteorology)

The information delivered will also be dictated by pastoralists. There is a huge amount of climate information currently available – the trick is knowing where to look, how to interpret it and how to assess the reliability and relevance of the information.

This is where I come in. As the Climate Mate for the East Kimberley and Victoria River District, my job is to work closely with interested pastoralists to navigate the various websites and apps, so that you can find existing information. If you would prefer just to receive neatly packaged updates on a seasonal basis, that's okay, too.

At this time of year, many producers are wondering when the wet will arrive. The BoM website has a handy model that attempts to answer this question and it is available for everyone to use at any time. The map on page 11 (Figure 1) shows the likelihood of having an early onset of the wet (defined as the date when more than 50mm of rain has accumulated after 1 September) across northern Australia.

The models predict there is a 35 to 45 per cent chance of an early wet in the East Kimberley and Victoria River District. Clearly, this means that there is a 55 to 65 per cent chance of not having an early break. While this may not be particularly good news for most, it is also critical to assess the accuracy and reliability (also known as 'skill') of the forecast before making investment decisions.

Figure 2 shows the past 'skill', or reliability, of the model, based on historical observations. In this case, for parts of the East Kimberley, the consistency rating is less than 50 per cent, and therefore not much better than a toss of the coin. Further east in the Victoria River District, the consistency rating increases to a more reliable 75 per cent.

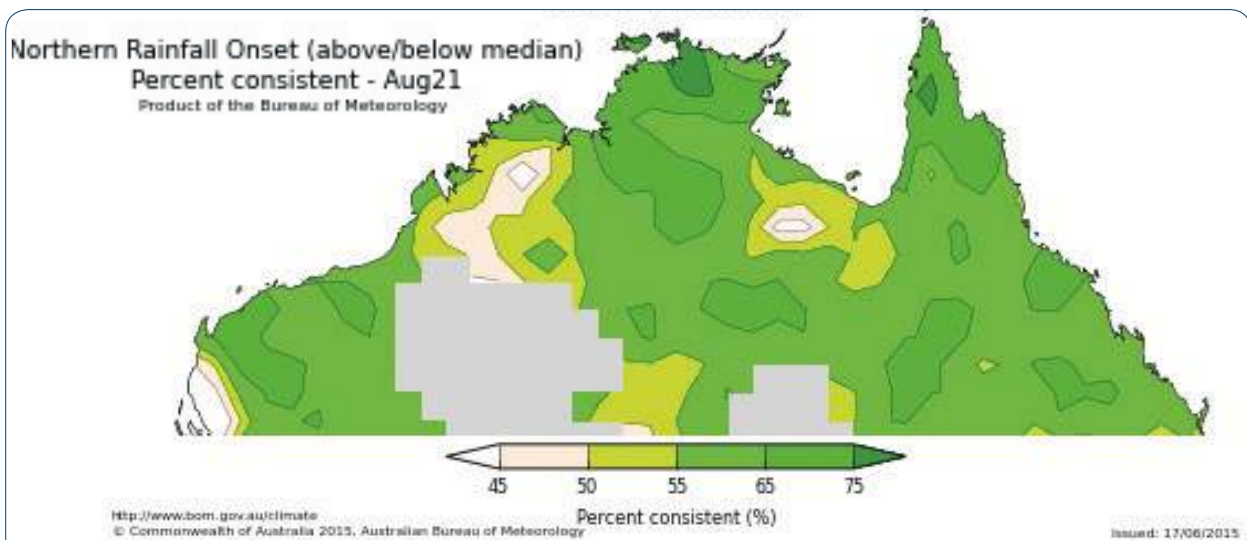


Figure 2: How reliable is this forecast? The past 'skill' is low for the East Kimberley, but improves further east (Source: Bureau of Meteorology)

The project partners are keen to hear how pastoralists envisage incorporating this sort of knowledge into the running of their properties to make more informed business, herd and land management decisions. Additionally, if you are looking for information or tools that are not currently available, this can be fed back to BoM which will investigate whether the tools requested are feasible to develop.

This is a unique opportunity for producers in the north to shape the future direction of climate research. The greater the interest we can demonstrate from this part of the world, the more resources will be directed into increasing the understanding of the key climate drivers and how they interact across northern Australia. This, in turn, will result in more accurate and reliable forecasts.

I strongly encourage anyone interested in finding out more about seasonal climate forecasting, local climate drivers or tips, tools and apps to get in touch by email at annemarie.huey@usq.edu.au or by telephone on +61 (0)8 9191 7069.

The Climate Mate for the West Kimberley and Pilbara is Kira Andrews, who can be reached by email at kiraa@rangelandswa.com.au or on +61 (0)409 841 087.

Breeder cow mortality - why is it something to talk about? (part 1 of 3)

Mariah Maughan, Development Officer, DPIRD, Broome

Breeder mortality is accepted by industry as one of the greatest challenges to individual property profitability and how the wider community perceives its ability to maintain high animal welfare standards.

Breeder mortality in extensive production systems is often caused by out-of-season calving and the consequential nutritional demand placed on the breeder to raise a calf to weaning at a time when feed quality is lowest.

Producers identify a range of difficulties with achieving calving at an ideal time nutritionally, including a lack of infrastructure, such as availability of fencing to segregate bulls and cows, feral animals, such as scrub bulls mating with cows year-round, and logistics, such as station access throughout the wet season.

Keeping aged cows, not vaccinating against botulism, and not supplementing with Phosphorus in acutely deficient country are also common causes of mortality.

To overcome the challenges outlined above, the first step in undertaking a cost benefit to determine whether to invest in changes to your management system or undertake infrastructure development is to have a good understanding of the extent of the issue on your property. Ideas on how to go about this effectively will be discussed in Part 2 of this series of articles.

What is the impact of breeder mortality rates and its effect on productivity?

There is limited reliable data available on breeder cow mortality rates in northern Australia. In 1996, one study reported rates of 14 to 18 per cent in a predominantly shorthorn based herd in the Kimberley (Jubb, Vassallo & Annand).

The 2013 Northern beef report (McLean, Holmes & Counsell) reported the following whole herd mortality rates using ABARE data, with 'n' being the number of properties sampled: Kimberley – 2.4 per cent (n=12) and Pilbara – 1.8 per cent (n=8).

An MLA study from 2013 reported the following breeder mortality rates: Pilbara – 10.7 per cent (n=3), West Kimberley – 3.7 per cent (n=4) and East Kimberley – 7.6 per cent (n=3) (Henderson, Perkins & Banney).

Substantially higher mortality rates were calculated by Neithe & Quirk (2008). Their data showed the female turnoff percentage for the Kimberley over a five-year period was around 38 per cent, however the Pilbara herd was in a build-up phase during that period as producers were moving from sheep into beef cattle.

Under the assumption that 50 per cent of births are female, and 38 per cent are marketed each year, then breeding animals are dying or the herd is increasing in size by 12 per cent each year. However, if the breeder herd is increasing in size, then the actual number of male cattle sold each year should also increase proportionally.

Historically, pastoral businesses have concentrated efforts to improve herd performance through focusing on fertility and increasing reconception rates. However, as shown in Table 1, a reduction in breeder mortality can yield a higher return than increasing reproduction rates, especially when breeder cow mortality rates are greater than seven per cent. Now that is something to talk about.

Note: the data in Table 1 looks at the effect of changing three key drivers of productivity: reproductive rate; mortality rate; and turn off weight, on a modelled herd (based on benchmark data).

Table 1. Scenario based modelling results for Central (NT), Pilbara (WA) and Katherine (NT) regions. LSU = Livestock Unit. (McCosker, T, McLean, D, and Holmes, P 2010).

	Increase 5% net reproductive rate	Decrease 5% breeder death rate	Increase 5% turn off weight	Total
Central Australia				
Gross Revenue/LSU	\$32	\$67	\$7	\$111
Kg Produced/LSU	23	53	4	83
Pilbara				
Gross Revenue/LSU	\$30	\$60	\$4	\$107
Kg Produced/LSU	22	46	1	78
Katherine				
Gross Revenue/LSU	\$26	\$73	\$5	\$116
Kg Produced/LSU	18	50	1	76

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Calculating breeder cow mortality (part 2 of 3)

Mariah Maughan, Development Officer, DPIRD, Broome

The first step in assessing whether mortality rates are impacting your business is to establish the extent of the problem. Mortality rates of all classes of cattle are a loss to your business, however focusing on the cattle that produce calves is a good place to start.

With any method of calculating mortality rates, the old adage is, “rubbish in = rubbish out,” therefore having correct and reliable data is important. Five years of cattle data is ideal when calculating mortality rates, as this allows for variation in seasons and minimises the fluctuations in the total herd size. This may not be attainable for all pastoral owners/managers, depending on circumstances, but the aim is to try to work with a minimum of at least three years of data.

Methods of calculating mortality rates

Method One

In 2013, Meat & Livestock Australia (MLA) produced a report looking into breeder mortality rates in northern Australia (Henderson, Perkins & Banney). An output of this study was the development of a breeder cow mortality rate calculator tool using an Excel spreadsheet to assist producers to determine their own mortality rates. This tool is available on the MLA website.

In order to use this tool to calculate your female mortality rate, the following data is required over a three to five year period:

- Opening females (this includes opening breeder numbers)
- Purchase of females
- Number of female calves branded (usually 50 per cent)
- The females used as rations (killers)
- Total female sales/transfers
- Closing number of females

*The accuracy of the final output is dependent on the starting number at year one and the closing number at the end.

The same information can be entered from the male data to give you an indication of steer losses.

The breeder mortality rate calculator will give you an accurate mortality rate of your female, breeder and steers, but accurate data is essential.

If there are concerns about the accuracy of the data, there are alternative ways to gaining an idea of your female mortality rate.



Stephanie Coombes and Mariah Maughan preparing data for entering into breeder mortality calculator with Geoff Niethe (MLA) in background

Method two

By assuming 50 per cent of calves born each year are females, it can be expected that 50 per cent of cattle sold (varying in age) should be female. By using the equation below, a percentage of females sold can be calculated. If the result is less than 50 per cent, it gives an indication of what the female mortality rate may be, provided the size of the breeder herd has remained constant. For example, if you reach a result of 46 per cent female sales, you can assume approximately four per cent of your females are unaccounted for/dead.

Female sales (%) = (female sales (over 3-5 years)) / (total sales (over 3-5 years)) × 100

Method three

Compare the branding/weaning numbers with the turn-off numbers. If the size of the herd has remained fairly constant, a station should sell almost all of the cattle that are branded.

By quantifying mortality rates, you are better able to assess the cost benefit of the various options identified to decrease mortality. The choice of method in regards to calculating mortality rates will determine the accuracy of the data available and the accuracy of mortality rate required.

Ideally, all three methods should be undertaken in order to provide insight into the on-property breeder cow mortality rate and to identify any key records that need to be kept to monitor annual mortality.

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When thinking about breeder mortality, a “big picture” view is best

Strategies and interventions to reduce breeder mortality (part 3 of 3)

Mariah Maughan, Development Officer, DPIRD, Broome

There are a number of factors that can impact breeder mortality rates, as highlighted in the MLA report, *Determining property-level rates of breeder cow mortality in northern Australia* (Henderson, Perkins & Banney 2013).

The primary factors influencing breeder mortality rates are age at culling, wet season phosphorus supplementation, botulism, out of season calves and inability to target 'at risk' breeders.

Age at culling

Keeping aged breeders (>11 years) is a management strategy used to increase herd size, however it is important to consider the impact on mortality rates. The report by Henderson et al (2013) showed cows 11 years or older at last weaning had a 43 per cent increase in mortality compared to cows 10 years and younger.

This relates directly to the choices made in managing older cows and highlights the impact that age of culling can have on mortality rates. The choice to return an aged cow to the breeder herd requires careful weighing up of the risk of her dying, and the alternative market options or management strategies available to the producer.

Optimum age of culling can also vary regionally due to differing landscapes and soil types. Fluoride content in water impacts on teeth health in older cows and producers in doubt about the age at which to cull a breeder should remove all animals with debilitating teeth.

Wet season phosphorus supplementation

Insufficient levels of available phosphorus results in feed intake being restricted when dietary protein and energy levels are adequate over the wet season. Phosphorus supplementation in the wet season can greatly assist cows to utilise the available nutrition, leading to improved growth, conception and lactation.

Phosphorus supplementation in the wet has the ability to reduce female mortality by up to 63 per cent, particularly in aged cows (Henderson et al. 2013). However, the benefit of phosphorus supplementation is greatest in acutely deficient soils and producers should identify the level of available phosphorus in their country through blood and soil testing, when considering this management strategy.

Segregation of breeders

Henderson et al (2013) found properties that practised segregation of breeders during the dry season had a 67 per cent reduction in female mortality compared to properties that did not segregate.

This improved mortality rate was attributed to the additional management strategies used by properties that segregate, including targeted supplementation, weaning, and management of pastures to ensure optimal nutrition is provided to classes of livestock with higher needs.

Additionally, the segregation of aged cows from the breeder herd, including bulls, reduces the chance of a cow reconceiving and being required to raise another calf through to weaning.

Botulism vaccination

Botulism is a clostridial disease that is caused by toxins produced by the bacterium *Clostridium botulinum*. Commonly found in soil, botulism bacteria produce spores that live in rotting carcasses, as well as other decaying organic material.

Phosphorus deficient cattle can develop a depraved appetite, and bone chewing leads to the ingestion of the toxin. Before the widespread use of vaccination, botulism caused a significant number of stock losses in the northern beef industry and remains a threat to unvaccinated cattle in the rangelands.

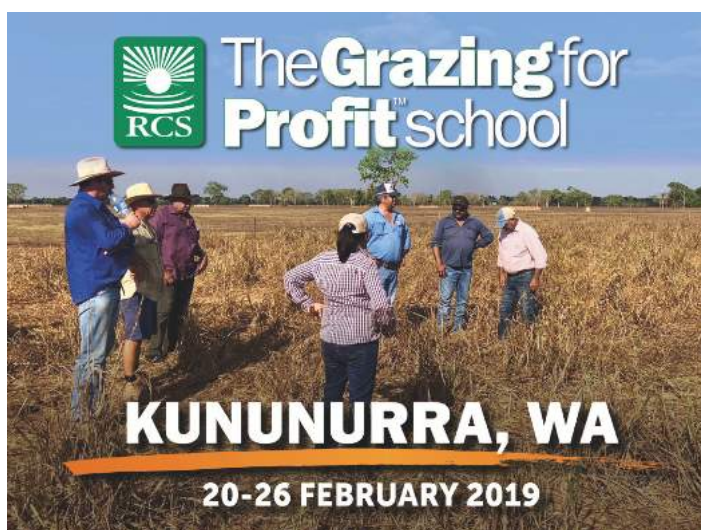
A research project in the Pilbara in young breeders (Smith 2010) demonstrated that botulism vaccination can reduce mortality rates from 14 per cent down to seven per cent in young breeders.

Botulism can be prevented with the bivalent (type C and D) botulism vaccine. There are a range of botulism vaccines available — selection of vaccine type will depend on cost and management practices.

Reference

Henderson A, Perkins, N & Banney, S 2013 *Determining property-level rates of breeder cow mortality in northern Australia*, Meat and Livestock Australia, North Sydney, New South Wales.

Smith, P, Stockdale, M, Drey, R, & Jeffery, M 2010 *Industry Initiatives to improve young breeder performance in the Pilbara and Kimberley of WA*, Meat and Livestock Australia, North Sydney, New South Wales.



Kidman Springs trial shines a light on the benefits of phosphorus supplementation in northern beef herds

Tim Schatz, Principle Pastoral Production Research Officer, Livestock Industries Development,
Northern Territory Department of Primary Industry and Resources
Email: tim.schatz@nt.gov.au

It is well documented that much of northern Australia is phosphorus (P) deficient and that P is required for almost every vital bodily function in cattle. However, supplement sales figures and industry feedback indicates that the majority of northern properties in P deficient areas are not supplementing their cattle with P over the wet season.

It seems likely that producers who don't feed supplement in P deficient areas must not think that the return on investment is good enough to justify the cost and hassle of feeding supplement over the wet season. Past studies have shown that P supplementation increases growth however, few studies have found a significant improvement in reproductive performance from P supplementation in northern Australia and quantified the benefit. This may be a reason why adoption has been so low.

A P trial commenced in 2014 at the Victoria River Research Station, Kidman Springs, to quantify the benefits of wet season P supplementation. This trial will provide producers in P deficient areas with definitive data on the effects of supplementing females with P to enable them to make better informed supplementation decisions.

Brahman heifers were randomly allocated to either a +P or -P treatment and grazed in neighbouring paddocks that were tested as acutely P deficient. Treatments swap paddocks in May each year to minimise paddock effects. Treatments are managed exactly the same year-round, except loose lick supplements either contain P (+P) or do not (-P).

Colwell P levels
Acutely deficient: $\leq 4\text{mg P/kg}$
Deficient: 5mg P/kg
Marginal: $6\text{-}8\text{mg P/kg}$

Key results

While the trial is ongoing, there are already very compelling preliminary results, as shown in Table 1.

2016/17 data (1st calf)

- The +P group were, on average, 66kg heavier at the end of their first mating (April 2016) and pregnancy rates were 10% higher in +P maiden heifers.
- Calf loss was similar in both treatments but re-conception rates were 25% higher in the +P first lactation heifers.
- When the calves were weaned in May 2017, the +P lactating heifers were, on average, 120kg heavier than -P. Additionally, the average weaning weight of calves was 34kg heavier from the +P treatment.

- The +P treatment weaned 3,072kg more calves than the –P treatment. Based on a 2017 price for weaners of \$3.50, the additional 3,072kg weaned from the +P treatment equates to an additional \$10,751 (the study started with 91 heifers in +P and 89 in –P).
- The mortality rate from the start of the study to when the first calves were weaned was 7% higher in –P (ie. 8% in –P vs 1% in +P).

2017/18 data (2nd calf)

- At the weaning muster in May 2018, the average weight of the cows in the +P treatment was 69kg heavier than the –P treatment (in both wet and dry cows).
- The wet cow pregnancy rate was 37% higher for the +P treatment.
- On average, the weaning weight of calves from the +P treatment was 13kg heavier than the –P calves.
- The total weight of calves weaned from the +P treatment was 2,806kg more than from the –P treatment.

More thorough economic analysis will be undertaken as the project progresses, but an initial comparison showed that the return on investment in P supplementation in this study has been high. By May 2018, the total value of calves weaned from each treatment was \$19,169 more from +P, while the total cost of the supplement consumed by each treatment was \$5,529 more by +P (comparing the cost of the supplement consumed by +P year round to the cost of supplement consumed by –P in the dry season only). This gives a cumulative return on investment of nearly 350 per cent.

Table 1. Results from the Kidman Springs P supplementation trial.

2014-17 Data (until first calves weaned)	P-	P+	Difference
No.14 heifer weaning weight (kg)	175	175	0
Maiden heifer pre-mating weight (kg)	238	270	32
Maiden heifer post mating weight (kg)	327	392	65
Pre-calving weight (kg)	324	393	69
Weight when calves weaned (kg)	262	382	120
Maiden pregnancy percentage (%)	60	70	10
Calf loss rate (%)	22	21	-1
First lactation heifer pregnancy rate (%)	5 (n=39)	30 (n=50)	25
Mortality rate to 3.5 y.o (%)	8	1	-7
Weaning weight of calves (kg)	139	173	34
2017-18 Data (yr after first calves weaned)	P-	P+	Difference
Dry cow pregnancy percentage (%)	92 (n=50)	96 (n=48)	4
Dry cow average weight (kg)	424	493	69
Wet cow pregnancy percentage (%)	20 (n=30)	57 (n=42)	37
Wet cow average weight (kg)	357	426	69
Calf loss rate (%)	21	16	-5
Weaning weight of calves (kg)	172	185	13

While the trial shows the positive benefits of P supplementation, responses on other properties will vary depending on the level of P deficiency in the soil. Where P deficiency is not as severe, the benefits of P supplementation may not be as great. While soil testing can provide an indication of P deficiency, it is not considered definitive. Currently, the most reliable method of assessing P status of the herd is by taking blood samples of growing animals (that have not been eating P supplement or drinking milk) at the end of the wet season and testing for plasma inorganic phosphorus. These could be one-year-old animals running with breeders to get a P status from breeder paddocks.



Image 1. Trial: -P first lactation heifers February 2017



Image 2. +P first lactation heifers Feb 2017



Image 3. -P 1st lactation heifers at weaning in May 2017



Image 4. +P 1st lactation heifers at weaning in May 2017



Image 5. -P cows in March 2018



Image 6. +P cows in March 2018

Gaining momentum towards eradication of Gamba grass in the Kimberley

Rebecca Clarke, Raitech Kununurra and Kay Bailey, DPIRD, Kununurra

Gamba grass was once considered a pasture species with potential in the pastoral industry but it is now renowned for its devastating effects in the Northern Territory (NT) and Queensland. An infestation of Gamba grass (*Andropogon gayanus*) at El Questro Station has been managed annually since 2006, gaining momentum towards eradication.

Rangelands NRM, El Questro Station, the Department of Primary Industries and Regional Development (DPIRD), Kimberley Rangelands Biosecurity Association, Department of Fire and Emergency Services (DFES), and the Department of Biodiversity, Conservation and Attractions (DBCA) have contributed funds, personnel, expertise and equipment in a collaborative effort that has reduced the infestation area from the original 1770ha planted in 1991 to less than 440ha in 2018.

Samantha Setterfield of UWA/NESP Northern Australia Hub, and Tom Price, Darwin Regional Weed Officer attended a Gamba grass field day at El Questro Station on 8 May to share their learnings from more than 10 years of researching Gamba grass in the NT.

Their work has recorded Gamba grass fuel loadings of up to 30t/ha, compared with native pasture fuel loadings of about 6t/ha - a significant fuel loading that intensifies fire heat, increases flame height and expedites the movement of fires.

Gamba grass-fuelled fires can be up to 24 times more intense than equivalent fires in non-invaded native pasture and savannah (Figure 1). The intensity of such fires exacerbate the threat to bushland, farmland, horticulture, public recreational spaces and homes.



Figure 1: Native pasture fire (left) and Gamba grass fire (right). Gamba grass fire heat intensity has been measured at up to 48,000kW/m² compared with about 2000kW/m² in native pastures. Photos courtesy of L. Hutley (CDU) and Bushfires NT

Participants at the El Questro field day learnt that the financial impacts of Gamba grass infestation go far beyond the direct damage to land and infrastructure. For example, stand-by costs for NT firefighters on Total Fire Ban days declared as a consequence of Gamba grass fire threat, have increased from \$200/day in 2013 to \$11,000/day in 2017.

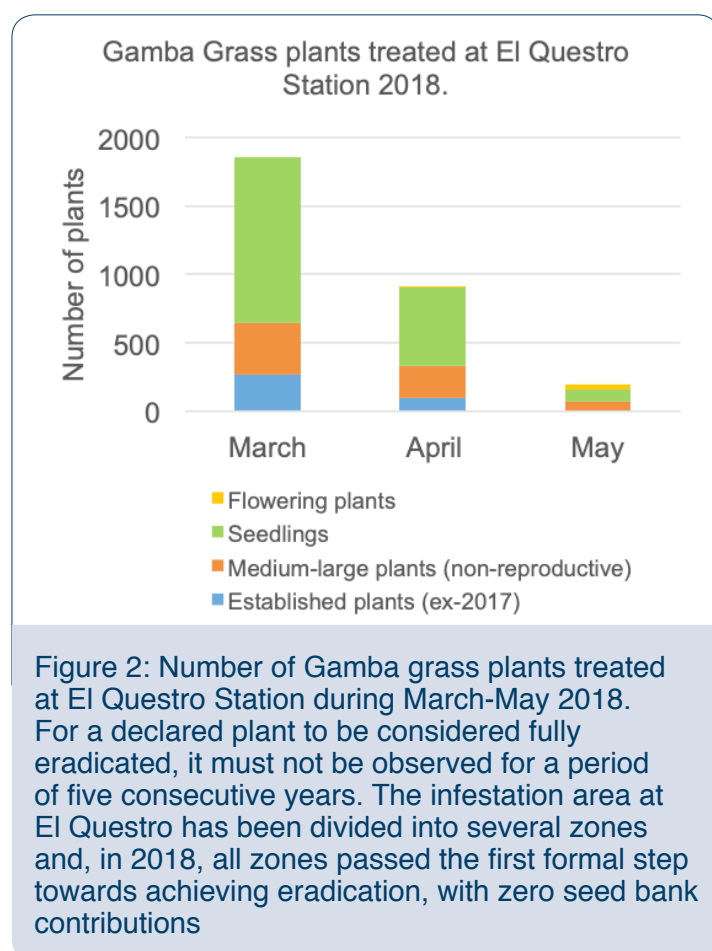
Significant areas of Litchfield National Park have been closed due to the various negative impacts of Gamba grass, including reduced biodiversity and park aesthetics, changed landscapes and increased fire threat to wildlife and tourists.

The NT government has imposed Gamba grass Management Zones, in which failure to maintain the required fire breaks around property, infrastructure and internal roads results in issue of a fine. In NT Eradication Zones, there is Zero Tolerance for Gamba grass outside registered permit areas, with failure to comply being a prosecutable offense.

In the Kimberley region of Western Australia, a targeted eradication program is effectively reducing the known area of Gamba grass, with routine surveying resulting in the successful identification and management of any new areas of infestation.

Combinations of aerial and foot surveys throughout El Questro Station are being used to map, treat and monitor Gamba grass habitat from March through to June, annually.

Gamba grass seed can be spread by animals, human activity, water and wind. One plant can produce 70,000 seeds. During the 2018 survey of El Questro, new Gamba grass plant locations were identified six kilometres from the main infestation area and a total of 3043 plants were treated.



The NT research and management experience provides a valuable reminder for WA to ensure the weed is not allowed to spread and take over the Kimberley landscape. It is important that all interested parties maintain the momentum in working towards eradication of Gamba grass in the Kimberley.

Gamba grass is identified by its broad leaves, hairy leaf and stem surfaces (although they can be smooth) and prominent white, mid-leaf vein.

If you suspect Gamba grass on your property or elsewhere, contact John-Paul Slaven, Biosecurity Officer, DPIRD on +61 (0)8 9166 4047 or +61 (0) 438 966 219. Reports can also be lodged with the department's Pest and Disease Information Service (PADIS) by emailing padis@dpird.qa.gov.au or calling +61 (0)8 9368 3080, or use the MyWeedWatcher app.

Identifying Gamba grass

Rebecca Clarke, Raitech, Kununurra

Gamba grass can be identified by its broad leaves and hairy leaf and stem surfaces, although stems can sometimes be smooth. Gamba grass also has a prominent white mid-leaf vein.

Gamba grass can rapidly dominate an area. Its fast growth and large biomass encourage intense wildfires that can destroy infrastructure, houses and habitat.

If you suspect Gamba grass on your property or elsewhere, contact Department of Primary Industries and Regional Development Biosecurity Officer, John-Paul Slaven, on +61 (0)8 9166 4047 or +61 (0)438 966 219.

Reports can also be lodged with the department's Pest and Disease Information Service by calling +61 (0)8 9368 3080 or emailing padis@dpird.wa.gov.au, or by using the MyWeedWatcher app.



Gamba grass has a thick stem, and both the stem and leaf blades can be covered by soft white hairs



Gamba grass plants at El Questro Station are predominantly removed by hand pulling, and are then lodged in a tree branch to ensure they cannot re-grow



Gamba grass leaf blades have a prominent white mid-rib

Be on the lookout for Noogoora burr

Lara Martin, Biosecurity Officer, DPIRD, Karratha

With the recent detection of Noogoora burr (*Xanthium strumarium*) in the Pilbara, on the banks of the De Grey River, travellers are being asked to keep an eye out for this invasive weed.

A surveillance and eradication program is underway, and the 24-hour rest area at the De Grey River is currently closed to help prevent spread of the burr.

Noogoora burr is a declared plant in Western Australia, occurring in some areas of the Kimberley but not established in the Pilbara or elsewhere in Western Australia.

The affected landholders on the De Grey River, including De Grey Station and Main Roads WA, together with the Pilbara Mesquite Management Committee (PMMC), the Pilbara Regional Biosecurity Group and the Department of Primary Industries and Regional Development (DPIRD), have recently undertaken surveillance to determine the full extent of the infestation.



Clusters of prickle-like burrs and grape-vine like leaves help identify Noogoora burr (*Xanthium strumarium*)

All plants found were controlled by being hand-pulled and deep buried or sprayed for later burning.

The collaborative approach will enable planning for a long-term management program to eradicate Noogoora burr on the De Grey River and ensure the infestation does not invade further through the Pilbara region.

Your help is needed to look out for the weed and report suspect plants to DPIRD, as early detection will help to prevent the weed becoming a serious problem in Western Australia.

What is Noogoora burr?

Noogoora burr is one of the most serious and widespread weeds in the world. A summer growing annual plant, it has large lobed, rough, grapevine-like leaves and fleshy stems, reaches up to two metres tall, and produces clusters of prickly-like burrs (1.5-2cm long).

It is often abundant after spring or summer floods and flourishes in areas with high rainfall and a temperate climate, particularly along rivers and creek flats, on roadsides and on pastoral land.

Noogoora burr plants are toxic to livestock and pose a threat to the environment, and the burrs can contaminate wool in sheep grazing areas.



Jo Kuiper of PMMC, and Kay Bailey of DPIRD, manually remove seeding Noogoora burr plants on the De Grey River, to be disposed of by deep burial

How is it spread?

The seed located in the burrs is spread by attaching to pets and livestock, clothing and other fibrous material. It can also spread by mud and soil on vehicles and equipment; and the burrs can also float, enabling the weed to move and spread via rivers and waterbodies.

Travellers are encouraged to check their clothing, vehicles, equipment and animals for weed burrs and carefully dispose of them prior to leaving the Kimberley to prevent Noogoora burr spreading further south.

If you find Noogoora burr or any suspect or unfamiliar plants, contact your nearest DPIRD office or the department's Pest and Disease Information Service on +61 (0)8 9368 3080 or email padis@dpird.wa.gov.au.

Information is also available on the website:
agric.wa.gov.au/declared-plants/noogoora-burr-declared-pest

Citrus canker surveillance teams hit the ground

Lara Martin, Biosecurity Officer, DPIRD, Karratha

The Department of Primary Industries and Regional Development will have surveillance teams on the ground in the Kimberley and Pilbara regions over the next few weeks as part of its ongoing response to confirm that citrus canker is absent in northern WA.

The teams will be visiting the towns of Kununurra, Wyndham, Broome, Derby, Halls Creek, Karratha, Roebourne, Port Hedland, South Hedland, Fitzroy Crossing, Exmouth and Point Samson.

The surveillance work follows the successful removal of all citrus plants around the three properties in Wyndham and Kununurra confirmed to have citrus canker in August 2018.

Previously, the department's focus was on tracing citrus plants known to have come into WA from the Northern Territory since January, 2017.

Everyone in the north who has a citrus plant, regardless of its age or condition, is asked to contact the department so it can be recorded and inspected, if necessary.

The more citrus plants that are located and inspected, the more evidence the department will have that citrus canker is absent in northern WA.

Inspectors will not remove any plants from properties, but they make take samples for further testing. The surveillance teams will be focusing their efforts on caravan parks, new housing development areas, community gardens, nurseries, garden centres and landscape businesses.

Reports supporting the absence of citrus canker from all areas are valuable, and the department encourages everyone to make reports using the free MyPestGuide™ Reporter app.

Residents can also report plants to the department's Pest and Disease Information Service on +61 (0)8 9368 3080 or email padis@dpird.wa.gov.au.

More information on citrus canker and response measures is available on the department website, agric.wa.gov.au/citruscanker

There has been no additional detection of citrus canker in WA since the initial three cases in May, 2018.



The department is continuing its response to the detection of citrus canker in the north

Extensive tree loss and ill thrift near Yalgoo

Wayne Fletcher, Development Officer, DPIRD, Northam

The Department of Primary Industries and Regional Development is currently evaluating the use of Landsat imagery to highlight changes in perennial vegetation cover in the rangelands, with the aim of making the information available to all pastoralists.

The imagery would enable pastoralists to see where and when change has occurred on properties across the pilot area that stretches from Yalgoo to Sandstone, and Paynes Find to Cue. The evaluation process involved first acquiring a set of satellite images and splicing them together to cover the trial area.

The evaluation was undertaken each year from 2002 to 2017 on a date late in October, and the trend in vegetative cover was determined for each 30m by 30m pixel, for the years 2002 to 2016.

VegMachineTM software was used to display the resulting maps and graph (Figure 1), highlighting changes over time for selected points or areas of interest.

Following mapping, on-the-ground viewing to see what the mapped changes in cover represented turned up some surprises, as the system is sensitive and can detect levels of change that may not otherwise be noticeable. For example, the software picked up changes that occurred slowly over time, such as woody thickening.

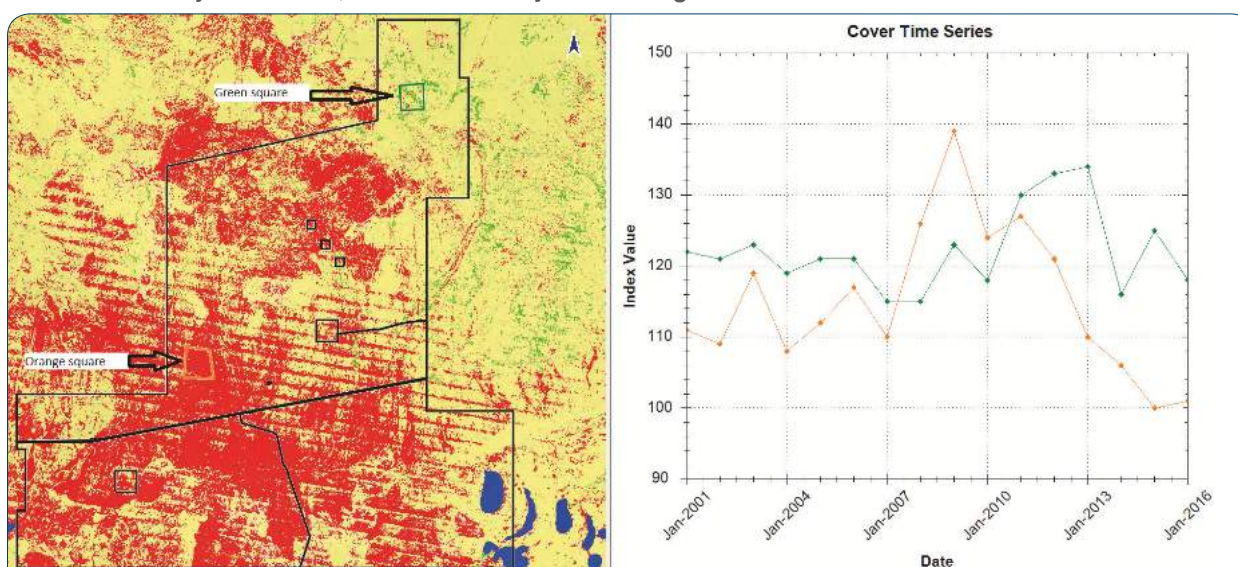


Figure 1: Wagga Wagga Station with areas coloured red showing a decline in cover, yellow highlights stable cover and green indicates increased cover over the study period. Two areas of around 100ha have been selected to study the time trace: one is an area with steady-to-increasing cover in the north of the property (green square); the other is an area of declining cover in the mid-west of the property (orange square). To the right of the map, a graph plots the average cover within those selected areas, over time. The plot shows seasonal fluctuations in cover at both locations, but from 2011 in the orange square, there is a steady decline in cover to levels not recorded in the previous 10 years.

As much of the area is relatively heavily-wooded, the tree component dominated images. This was unfortunate from a production or pasture condition perspective, as the main interest was in the shrubs and grasses present.

An extensive area displayed a decline in cover that stretched from Wagga Wagga Station, down through Muralgarra to Thundalarra. Given the recent grazing history on the properties, grazing was not thought to be the cause of decline in cover, and extensive and widespread ill thrift and increased mortality in the tree component of the vegetation was determined to be the cause.

The tree species that seem to be affected are large wattles – mulga, limestone wattle, curara, miniritchie and bowgada among others. A number of plausible theories have been put forward – drought, climate change, seasonal factors affecting tree parasites, and more.

A report (Ruthrof et al 2018) from the Centre of Excellence for Climate Change, Woodland and Forest Health at Murdoch University, details the impacts of a heat wave that hit the west coast of Australia in March, 2011.

The impacts of the massive heat wave resulted in not only tree and terrestrial plant mortality in the South West, but coral bleaching, in addition to plummeting breeding success in marine penguins, outbreaks of terrestrial wood boring insects, loss of sea grass and kelp, and more. The authors did not consider impacts in the pastoral rangelands.

The article points out that, with global warming having already warmed the planet by 1°C, some of the major ecological impacts are not a result of this warming per se, but the effect of increased extremes like heat waves, droughts and cyclones. The authors also suggested these extremes would occur with greater frequency and intensity as global warming continues. If what we are seeing around Wagga Wagga Station is related to the 2011 heatwave, there are serious implications for the future of our rangeland environment.

Assuming the remote sensing system gets up and running across the pastoral area, we will be able to look more widely for these impacts.

People who have observed areas of extensive tree deaths are asked to email wayne.fletcher@dpird.wa.gov.au, with any ideas about the causes.

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Dead curara (foreground) and mulga with reduced foliar cover (back right)



Two dead mulgas

Fire, grasses and nutrients

Rangelands Team, Kununurra and Broome

As plants grow, they take up nutrients such as nitrogen (N), phosphorus (P) and potassium (K) from the soil and store them in their roots, stems, leaves and reproductive parts. What happens to these nutrients when a fire passes through? Considering that on average approximately 28 per cent of the Kimberley pastoral lease area is affected by fire annually (Department of Agriculture and Food, Western Australia 2017), this is an important question for land managers in the region.

Nutrient relocation in perennial tussock grasses

By the time a pasture is sufficiently cured and ready to burn, perennial grasses have relocated the majority of N and P from their leaves and stems to their roots (Norman, 1963), reducing losses that occur during a fire. This relocation of nutrients from above to below ground starts soon after flowering. For example, during the wet season, bundle-bundle grass (*Dichanthium fecundum*) has a crude protein content of 10 per cent however, once the plant reaches maturity, the crude protein content declines to less than 4 per cent (Petheram & Kok 2003).

Fate of nutrients released by fire

“When plant material is burnt, some nutrients (P, K and calcium (Ca)) largely remain in the ash, while others (C and N) are lost as gasses to the atmosphere.” (MLA 2009 - see Figure 1).

During the fire, some of the ash is carried into the atmosphere and often deposited in nearby areas. Ash can be readily leached by water, and infiltrating rainfall can transfer nutrients into the soil profile, where they may become available for uptake by plant roots.



Black spear grass (*Heteropogon contortus*) illustrated on the left and ribbon grass (*Chrysopogon fallax*) on the right. Sufficient soil moisture was available for plants to produce new leaf after an early dry season burn near Fitzroy Crossing. Photo taken in June

As land managers, we do not want to lose these nutrients from the landscape as they are important for maintaining the healthy functioning of the ecosystem and for sustaining animal production.

Burning at a time when sufficient soil moisture exists for pasture growth would be expected to reduce the subsequent loss of ash and nutrients from the landscape when compared with burning when the soil is dry. Removal of pre-existing plant material including litter may be less complete, and vegetation cover can be restored more quickly to intercept raindrops (minimise splash erosion) and obstruct overland flow (increasing infiltration). Losses through the action of wind should also be lower.

Craig (1999) similarly recommended deferring the burning of spinifex until after the first storms, to reduce both the difficulty of controlling fire and the time the ground remains bare.

Late dry season fires, combined with insufficient soil moisture to grow vegetation cover leave nutrient-rich ash at greater risk of washing into local creeks and rivers during intense early wet season storms. This risk would be greater for soils with lower infiltration capacity, such as red loams, than for sandy soils. Red loams have fairly balanced proportions of sand, silt and clay particles whereas sandy soils more evenly-sized sand grains predominate. In a loam, the finer soil particles occupy more of the space between the larger particles, so the pathways available for water movement are narrower, restricting infiltration. Land that is in good range condition is likely to shed less water than similar land in poor condition, increasing the amount of water and nutrients retained in the system to support pasture growth.

However, occasionally, high intensity fires may be needed for the control of woody plants in particular areas. These fires typically require a high fuel load, high air temperatures, low humidity and a steady, low to moderate wind speed. Burning in the late dry season, from about August to October, when grasses have fully cured, is usually the most effective strategy. Careful planning and preparation, together with the availability of well-trained and equipped personnel, are essential for helping to ensure such fires are managed safely.

The potential loss of nitrogen is of particular interest as the productivity of grazing land is often limited by availability of this nutrient. However, nitrogen loss during a fire is not considered to be particularly problematic because only small amounts of N are left in the grassy fuel, with most N relocated from above-ground plant material to the roots by the end of the dry season (MLA 2009).

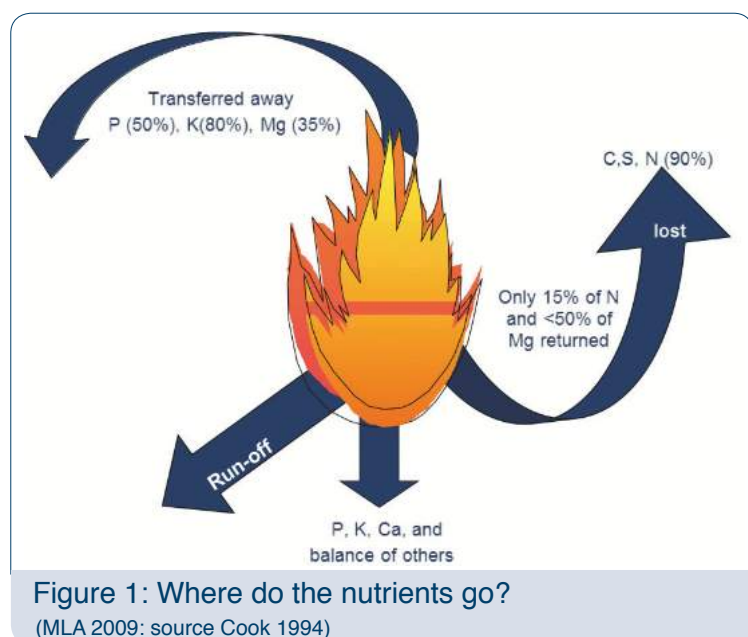


Figure 1: Where do the nutrients go?
(MLA 2009: source Cook 1994)

The amount of nitrogen lost during a typical fire is small relative to the total amount present in the soil, mostly in organic matter, and may be replaced over time through rainfall, which contains low levels of dissolved forms of N (nitrate and ammonium), and N 'fixation' by certain microorganisms. These are able to convert nitrogen molecules from air into nitrogen compounds that can assist in plant growth, and include rhizobia, bacteria living within the root nodules of leguminous plants and cyanobacteria, a major component of cryptogamic soil crusts (see December, 2017 *Rangeland Memo*, p. 16).

The rejuvenating effect of fire

The rejuvenating effect that fire can have in some situations is well illustrated in the case of long-unburnt spinifex vegetation. Pastoralists who manage spinifex country will be aware that, some years after a fire, the diversity and abundance of non-spinifex species tend to decline as spinifex hummocks increase in size and begin to dominate the understorey.

The attractiveness and usefulness of spinifex pastures to grazing stock is generally highest during the earlier stages of post-fire regeneration, however a period of initial protection to allow seedlings to establish is usually recommended and grazing pressure should be controlled.

Stafford Smith and Morton (1988) note that many species in spinifex-dominated communities persist only as seeds or dormant root-stocks between fires. They proposed that in such environments, where perennial biomass can build up to high levels and decomposition rates are low, fire plays a crucial role in maintaining diversity through the release of scarce nutrients tied up in above-ground material and the creation of space for shorter-lived species.

For information on managing spinifex pastures in WA see the department webpage: agric.wa.gov.au/rangelands/spinifex-rangeland-pastures-and-fire

The authors would like to thank Andrew Craig, formerly of DPIRD, Kununurra, for contributing to article content.

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Kapok Bush

Matthew Fletcher, Development Officer, DPIRD, Kununurra and
Andrew Craig, former Research Officer, DPIRD, Kununurra

An article in the March, 2018 issue of *Rangeland Memo* discussed the history of two introduced grasses, buffel (*Cenchrus ciliaris*) and Birdwood (*Cenchrus setiger*), in WA. Here we take a look at kapok bush (*Aerva javanica*), also introduced and historically often sown in conjunction with these species.

Kapok bush is a long-lived upright herb or small slightly woody shrub that usually grows to about 1m tall. There are male and female plants. A distinguishing feature of the species is its seed head that features white flowers arranged in long clusters at the tips of branches, which makes the plant noticeable on roadsides. Kapok bush is native to much of Africa and the south west and south of Asia, and is widely naturalised across northern Australia in arid and semi-arid areas of the country, particularly on sandy or calcareous soils (Weeds of Australia 2018). In Western Australia, the 'Florabase' map shows that kapok bush has been recorded in areas of the State north of about Wiluna (Western Australian Herbarium, 2018).

Kapok bush is not preferentially grazed by stock but towards the end of the dry season, when the protein content of native grasses is low and there is little else to eat, kapok will be grazed.



Kapok bush grows beside the road on an alluvial soil close to the Ord River

As with buffel and Birdwood grass, it is thought kapok bush was introduced to the Pilbara region in the stuffing of Afghan camel harnesses in the 1880s (Friedel 2017). The earliest specimen held by the Western Australian Herbarium was collected in 1937 along the De Grey River and there were other collections from the early 1940s in the east Pilbara and one from Meekatharra in 1947 (The Australasian Virtual Herbarium 2018).

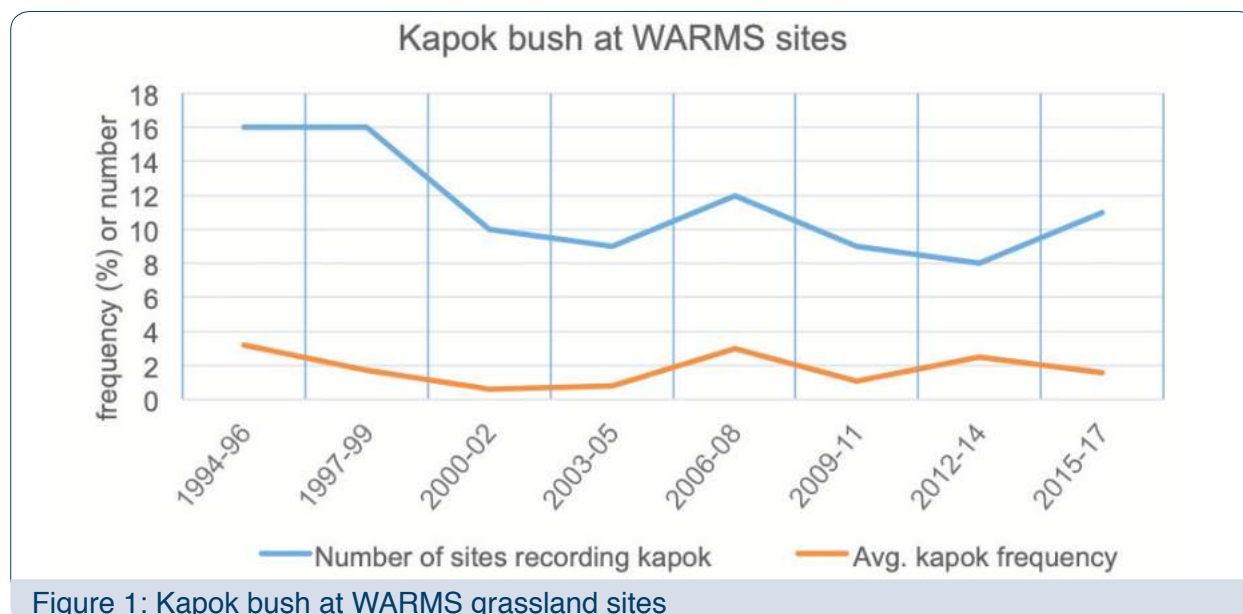
Kapok bush was introduced to the west Kimberley region in 1952 by Kevin Fitzgerald (later Principal Advisor, Rangeland Management Branch) and was subsequently used in association with buffel and Birdwood grasses in the large-scale regeneration of degraded and eroded pastoral country (Fitzgerald 1976).

The same combination of species was used extensively during the Ord River regeneration project, which began in 1960 and continued until the late 1980s. Bare areas within the catchment, particularly on units of the Nelson and Gordon land systems, were depleted of native seeds as a result of the seed bank being washed away with eroding topsoil. Removal of stock and feral animals, discontinuous contour cultivation along strips, and reseeding with suitable introduced perennials were the main elements of the regeneration strategy for these areas. Kapok, buffel and Birdwood seed supplies were available in large quantities at reasonable cost (Fitzgerald 1968).

Kapok seed was collected locally, 'using a vacuum-type machine, engine drawn, mounted on wheels and fitted with a cleaning device'. Mixed buffel and Birdwood seed was available at prices ranging from 35 to 50 cents per pound (77-110c/kg). Seeding rates varied from 2-4lb of mixed seed per mile of furrow (equivalent to 0.7-1.4 kg/km); about half the seed used was buffel and Birdwood (Fitzgerald 1968).

Of the introduced species used, kapok bush proved to be the most successful and was 'most spectacular in its spread' at the time of Fitzgerald's 1968 report. It produced large quantities of light, fluffy seed that was easily spread by wind. By 1981, a mixture of kapok bush, limestone grass and *Cenchrus* species dominated many of the previously degraded areas on the Nelson land system, but by 2002, kapok bush 'was no longer dominant or co-dominant in pastures as was the case in 1981', having been replaced by *Cenchrus* and native grasses (Payne et al. 2004).

In 2017, a rangeland condition assessment (RCA) was completed on the southern section of the Ord River Regeneration Reserve (Fox River Station). As part of this, the three main ground-storey species were recorded at each of 300 assessment sites, with 176 of these being on Gordon land system and four on Nelson. Kapok bush was recorded at only one site (Gordon). On these land systems, perennial grasses including buffel/Birdwood, ribbon grass, bundle bundle, Mitchell grass and spinifex were ranked in first place at 165 (92%) of sites. Figure 1 illustrates the number of Kapok sites recorded at Western Australian Rangelands Monitoring System (WARMS) since 1994.



Considering the successful establishment of kapok bush during the early years of the regeneration program, it seems to have served its intended purpose as a pioneer species — stabilising and modifying the micro-environment by providing litter, shelter, and improved retention of rainfall. The less harsh conditions that result, encourage plants of other species to establish, especially during favourable seasons. On the Reserve, introduced and native perennial grasses have gradually out-competed the kapok bush and now provide good levels of cover that can control runoff and reduce soil loss from the catchment.

For the northern rangelands more generally, information from the WARMS shows that the number of sites recording kapok bush decreased slightly from 16 for the 1994/96 assessment period to 13 for the 2015/17 assessment period (see Figure 1). Since monitoring began, kapok bush has been recorded at least once at a total of 28 sites but has sometimes dropped in or out at a particular site. The average frequency* of kapok bush across these 28 sites, while varying, has remained below four per cent. The highest frequency recorded has been 37 per cent at a site along the Broome coast in 2006 (buffel grass pasture type).

Department staff have monitored WARMS sites since 1994 at three-year intervals to record changes in perennial vegetation at both regional and district scales. There are 630 grassland monitoring sites spread across 160 pastoral stations.

Kapok bush has been identified as a serious environmental weed in several national parks and reserves in WA and can also be of concern within mine sites, owing to its ability to invade and alter natural habitats. Keighery (2010) included kapok bush as one of 10 major landscape-scale weeds in the Pilbara.

*Frequency is the percentage of quadrats at a site in which a given species is observed. In WARMS, 100 quadrats are recorded during each site assessment.

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Historical information on buffel grass

Dr Margaret Friedel, Honorary Fellow, CSIRO and Charles Darwin University, Alice Springs

The March 2018 *Rangelands Memo* included the article, ‘Buffel and Birdwood grass in WA’ (pp. 27-28), which invited readers to offer further information on the history of the species in WA. The following contribution was submitted via email by Dr Friedel. Thanks, Margaret.

Marriott’s 1955 observation: “The grass [buffel grass] entered Australia between 1870 and 1880 by accidental introduction from India as an escape from camel harness. The place of entry was Wallal, a coastal settlement some 150 miles E.N.E. of Port Hedland, in Western Australia,” is generally accepted as fact because there is little alternative evidence.

I can only offer a small refinement of this statement because any specific evidence is long gone. I believe that the only camels that were in the North West in the 1870s were those of Colonel PE Warburton, who left Alice Springs in April 1873 and arrived at Roebourne on 26 January 1874. He had set out with 17 camels and arrived with two survivors, which were left on the De Grey Station of Grant, Harper and Anderson.

Colonel Warburton had obtained his camels from Thomas Elder’s camel stud at Beltana, as he travelled from Adelaide to Alice Springs during 1872/3. At this remove, it seems perhaps unlikely that the camel harness used by Warburton’s cameleers still retained their original stuffing, since the camel stud had been established in 1866, but it can’t be totally discounted.

What is known is that the importation of camels (and cameleers, who brought their own harnesses) directly into Western Australia began around 1880. Camels were sourced from ‘India’ and Afghanistan, when India included Baluchistan, the North West Frontier, parts of the Punjab and Sind, now Pakistan, but then tribally affiliated with Afghanistan.

They were predominantly off-loaded at Fremantle but also at Albany, Geraldton and Port Hedland. They serviced the pastoral industry and mines both inland and up and down the WA coast. The first record of *Cenchrus ciliaris* (buffel) in the Australasian Virtual Herbarium is dated 1887, and was collected by Charles Nyulasy, the warden at the Pilbara goldfields, in the “Kimberley district. Ord [River] near Wyndham track”. This was the track to Hall’s Creek, site of a gold rush in 1885/6, and the Ord River vicinity seems a likely place for camels to be rested and/or saddles to be restuffed.

Regarding Birdwood grass (*Cenchrus setiger*), as a matter of historical interest, Birdwood’s familiarity with Afghanistan predated his 1914-18 war service. He was born in India (India then being more extensive than today) and served in numerous North West Frontier campaigns, and thus was familiar with the country.

Readers might also be interested in some comparative information from central Australia relating to WA buffel (see John Stretch in the March 2018 *Rangelands Memo*). A very observant pastoralist from this region has compared the performance of WA buffel with other strains planted on his property. Introduced in 1946, it has survived on various soils based on calcrete, granite, red earth and sand. Despite its persistence being fair, its palatability is low. Other strains can survive on poor quality country but they are not selected by cattle. In his experience, Birdwood grass has low palatability and poor persistence, Tarewinnebar, Borara, Biloela,

Molopo and Nunbank have low or no palatability and do poorly, whereas Gayndah and USA do well and are palatable. What does well in one location may not do well in another, which is not surprising, given variations in rainfall season, dry periods, soil type and more.

I'm mindful of advice received from Richard Silcock, years ago, that it is not possible to identify cultivars/varieties from physical attributes. This was endorsed by DNA finger printing subsequently done by a colleague (unpublished). She found that commercial cultivars available from seed merchants did not grow out consistently in the glasshouse, as expected. Plants of an individual cultivar were not a single colour. That is, some plants had green leaves, others were blue-green, suggesting that commercial varieties may not have been stable through time. In addition, the DNA of individual commercially available cultivars did not equate to the DNA of supposedly the same cultivars identified in the field by experts. Thus hybridisation may have been occurring in the field.



Central Australian buffel grass is sufficiently robust to enhance fire intensity (Simpsons Gap NT)



Buffel grass seed spread by camels at Nicker Creek, WA

Reference

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Buffel grass and Port Hedland

Dr Donald Burnside, former Rangelands Advisor, DPIRD, Carnarvon and Kalgoorlie

The March 2018 *Rangelands Memo* included an article entitled, ‘Buffel and Birdwood grass in WA’ (pp 27-28), which invited readers to contribute further information on the history of the species in WA. What follows is based on an email from Donald with his recollections of buffel grass in the Port Hedland area. Thanks, Donald.

My mother, Joy Burnside (nee Daddow), lived in Port Hedland from 1919 to 1924, from the age of seven in to the age of 12 when she left. Her father was the Postmaster.

Hedland at the time had a population of about 200. She told me that Joe Moore, who ran the local general store, paid the town’s kids one shilling (10 cents) for a flour bag full of buffel grass seeds from plants growing around the town.

There would not have been much else growing there, as Hedland was very short of water and there were no gardens to speak of, however there may have been some date palms or Athel tamarisk.

The kids were pretty keen, but Joe kept them honest – when they turned up with what they thought was a full bag, he would push it down to compact it and send them back out to fill it properly. My mother and her sister, Gladys Paramor (nee Daddow), purchased a Kodak camera with the proceeds from their labours – it is still a treasured possession.

I recall my mother saying the demand came from Mundabullangana Station (known as ‘Munda’), which lies over the coastal alluvial plains of the Yule River, about 80km from Hedland. It was owned by the McKay family, which ran a large number of sheep (90,000, according to one account, with 2-3000 cattle) and, until recently, there was a magnificent old, two-storey shearing shed as testament to that.



Camera purchased by Joy Daddow and her sister from the proceeds of buffel grass seed harvesting

I imagine that by 1920, the native grasses on those plains, including ribbon grass (*Chrysopogon fallax*), Roebourne Plains grass (*Eragrostis xerophila*), and perhaps Mitchell grass (*Astrebla spp*), would have been all but gone by about 40 years after settlement, so the family was actively spreading buffel grass seed obtained by Joe Moore.

The other major property along that part of the coast was De Grey Station, lying across the coastal alluvial plains of the De Grey River, but I don’t know if the people there were active in buffel grass establishment.

It must have taken a long time for the buffel to become well established, because I recall being told by Hank Suijdendorp that the then manager of Munda, Rob Lukis, said that in the 1930s it was not possible to work outside after lunch in summer when the sea breeze came in, because of the dust.

Now, the plains on Munda and those of the nearby Turner River are dominated by buffel, as are all of the riverine sandy loam plains along the Pilbara coast.

Sweet Spot Project gets moo-ving across the north

Department of Primary Industry and Resources, Northern Territory

The Cash Cow project found that there was an opportunity to improve breeder performance in some areas of northern Australia. Previous research has focused on disease, herd management and genetics, but little is known about how different levels of pasture utilisation impact breeder productivity.

The Sweet Spot project will address this knowledge gap and find the sweet spot of pasture utilisation to ensure long term optimal breeder performance in northern Australia.

The project is funded by MLA and brings together pasture and cattle scientists, and modellers from across the north. The \$2 million project, to be conducted over four years, is led by the Northern Territory Department of Primary Industry and Resources, collaborating with Queensland departments of Agriculture and Fisheries; and Environment and Science.

The project will use existing breeder datasets to ask new questions to increase the value of previously funded research.

The project team had its first meeting in August. The first phase of the project is to search across the north for suitable breeder datasets that can be collated and modelled.

Dr Robyn Cowley, of DPIR, said there was an untapped gold mine of breeder production data from sites across northern Australia and by bringing together existing datasets, new insights would be gained into how to manage breeders to improve reproduction.



This project aims to find the 'sweet spot' of pasture utilisation

The project aims to develop tools to predict the impact of pasture utilisation on reproduction, to enable producers to optimise pasture use and maximise kilograms turned off, while maintaining the resource base.

For more information, contact Dr Robyn Cowley, Senior Rangeland Scientist, NT DPIR, on +61 (0)419 829 493 or Dr Kieren McCosker, Senior Livestock Scientist NT DPIR, on +61 (0)8 8973 9771.

Review of potential carrying capacity

Dr Steve Petty, Spektrum, Kununurra

Every five years, Landgate conducts a review of annual rentals on all pastoral leases in Western Australia, as required by the *Land Administration Act 1997*. Landgate is currently conducting the five-year review.

As a part of the review, Landgate will reassess the Potential Carrying Capacity (PCC) of pastoral leases across the majority of the Southern Rangelands and Kimberley region, and the entire Pilbara region.

The recalculation of the PCC will be utilised in Landgate's review and determination of the annual rents payable for Pastoral Leases and for use by the Pastoral Lands Board and the Department of Primary Industries and Regional Development. Rentals determined in this review will apply from 1 July, 2019.

Valuer General, Lester Cousins, of Landgate, is managing the project. Landgate has appointed the private consulting group, Spektrum, to assist with the PCC assessment.

The Spektrum team includes Steve Petty, who will be involved in the Kimberley and Pilbara leases, David Blood, who will be involved in the Pilbara and Southern Rangelands leases, Jim Addison who will be involved in the Southern Rangelands leases, and Elise Petty, who will cover communications and project management.

The PCC is assumed to be the number of Cattle Units a lease could carry if it was fully developed and grazing animals could graze all of the accessible pastures on the lease.

The review will be conducted using the Grazing Land Management methodology (GLM), which is primarily based on herbage mass assessments, sustainable utilisation rates and accessibility of the land systems and land units by grazing animals.

The review will involve:

- Collection of published carrying capacity data for each land system on the focus leases.
- Assessment of the carrying capacity of land systems within areas that do not currently have published land system data.
- Limited inspection of areas where there is insufficient data to conduct the review.
- Detailed industry consultation to discuss land system carrying capacity, accessibility of the land systems to grazing animals and distribution of desirable pasture species.
- Government department consultation.
- Completing the project and final report by 30 November, 2018.

Given the variability in range condition, level of development and management of the pastoral leases across the State, the Valuer General has provided the following assumptions for the PCC assessment:

- All land systems are in good range condition.
- The PCC assessment is the average across the full range of seasons.

- Leases are fully developed, allowing 100 per cent access to water.
- Areas that are physically inaccessible are removed from assessment.
- Good grazing management has been practiced.
- Introduced pastures, such as buffel, are included in assessment.
- Feral and native herbivores are assumed to be removed.
- No supplementation is provided.
- Reserves and UCL stock routes are excluded.

The review includes industry consultation and communication. All leaseholders should have received an email from Landgate advising whether they are included in the review or not.

Spektrum will contact leaseholders by email with information about the process. Leaseholders will then be contacted by phone regarding the review to discuss the PCC of their lease.

A number of factors may contribute variances between a leaseholder's existing PCC and the reviewed PCC, including change of vegetation type, such as buffel grass colonisation, exclusion of areas of no pastoral value, such as lake bed or areas inaccessible to grazing, and adjustments to land system areas.

Spektrum will be seeking constructive feedback regarding any PCC variance, together with additional comments leaseholders may have regarding the review.

Where there is insufficient data available to accurately make an assessment, a small percentage of leases will be inspected.

If leaseholders have any queries or concerns regarding the process, contact Domenic Audino on +61 (0)8 9273 9453 or Chris Olsen on +61 (0)8 9273 9455 from Landgate.

Technical questions regarding the PCC review should be directed to Elise Petty at Spektrum by calling +61 (0)8 9169 3444.



Darrylin Gordon

Photo credit: Jackie Cooper, Jack of Hearts Studio

**Darrylin Gordon, 2018 AgriFutures
Rural Women's Award
– National Runner Up**

Revolutionising the mango industry

Tara Slaven, Development Officer, DPIRD, Kununurra

New developments are set to revolutionise the Australian mango industry, according to presentations at a mango research and development forum held in Katherine on 10 May. The innovations presented included a robotic mango picker, intensive systems, in-field fruit quality monitoring, molecular research into flowering and the use of satellite imagery.

Professor Kerry Walsh and his team from Central Queensland University have developed a camera system to identify fruit on the tree in-field. The system works best at night with a powerful light to illuminate fruit. The data collected is used to direct a robotic arm and pincer to grasp and pick the fruit. Incorporation of a near infra-red (NIR) sensor attached to the pincer could be used to determine dry matter and assess whether the fruit is ready to pick.

The main disadvantage of a robotic system is that fruit inside the canopy cannot be identified. To overcome this, intensive management systems such as trellising can ensure the majority of fruit will be on the outside of the canopy and therefore easier to identify and pick by a robotic system.

A project led by Dr Geoff Dickinson of Queensland's Department of Agriculture and Fisheries, on high density mango orchard technologies is trialling harvest efficiencies on Kensington Pride (KP), R2E2 and National Mango Breeding Program (NMBP) varieties on properties at Mareeba and Bowen in Queensland and Katherine in the Northern Territory.

High density plantings will improve management and harvest efficiencies by reducing the size of the trees. Tree vigour is being controlled by methods including the use of dwarfing rootstock, pruning and nutrient management.

This project, which is due to be completed by 2020, is funded by the CRC for Developing the Northern Australia, Manbulloo Ltd, BJM Enterprises, Queensland's Department of Agriculture and Fisheries and the Australian Mango Industry Association (AMIA).

NIR guns will be used in Western Australia this mango season as a guide to harvesting fruit at the optimum maturity. The Department of Primary Industries and Regional Development will trial the guns with assistance from AMIA's newly-employed Industry Development Officers.

Research is also being conducted by Dr Mila Bristow of the Northern Territory's Department of Primary Industry and Resources, on increasing profits through better use of nitrogen (N), as part of a nationally funded project. The main questions being address are: where does applied N go; and, how can losses be reduced? Research to date indicates that decomposition and N recycling of tree prunings may be the most important inputs of N into the mango system.

PhD students are investigating:

- The causes of resin canal disorder - a range of fruit sanitisers are being tested to determine if they can reduce the incidence of resin canal disorder. The students will also investigate if there is a relationship between fruit sensitivity to scald (chilling injury) and resin canal disorder.
- Molecular mechanisms influencing mango flowering - molecular research is being undertaken to improve our understanding of the mango flowering pathway. Dormant buds must be initiated before flowers can form. This initiation is triggered at temperatures below 20°C). The mature leaves sense the reduced temperatures and send a signal to the bud through the phloem. If the buds are in the early stages of initiation and conditions are right, floral shoots will result. But how do the flowering genes contribute to flowering? The findings of this study will potentially allow mango orchard managers to manipulate and increase flowering.

Satellite imagery can be used to forecast yields on traditional plantations, with mango yields in the Northern Territory and Queensland currently being predicted by Associate Prof Andrew Robson, University of New England, using satellite WorldView 3 (30cm resolution). This tool can be used to plan harvest activities, such as how many people to employ. It can also assist communications with customers about when and how much produce to expect.



Early flowering mango variety NMBP 1243

Banana industry eyes on Carnarvon

Department of Primary Industries and Regional Development

The 2018 National Banana Roadshow touched down in Carnarvon in late August, bringing with it a wealth of industry research and a spot of rain.

The picturesque growing region was the final stop on a tour that also took in New South Wales and Queensland, and coincided with a mid-year board meeting of the Australian Banana Growers' Council (ABGC).

The roadshow, organised by the Queensland Department of Agriculture and Fisheries, with assistance from the Department of Primary Industries and Regional Development, aimed to provide local growers with an overview of research and development through a series of short, interactive presentations. Among the topics covered were new varieties, Panama TR4, nematodes and marketing.

Speed dating-type sessions also provided an opportunity for growers to quiz the scientists and discuss issues, one-on-one.

The ABGC board, including WA representative, Tom Day, stayed in Carnarvon for a number of days to participate in the roadshow, the board meeting, as well as visit local farms and the Sweeter Banana Co-Operative packing shed.

ABGC chair Stephen Lowe said it was a successful and enjoyable trip. He extended thanks special to the Carnarvon industry for its hospitality during the week-long visit and said it was great to meet and discuss issues with growers from Carnarvon's vibrant industry.

This year's National Banana Roadshow coincided with the launch of a new website for Australia's banana growers - betterbananas.com.au.



The ABGC board and staff members, researchers, and representatives from local industry and the Western Australian and Queensland governments at the Sweeter Banana Co-Operative packing shed

KPCA Livestock handling cup and workshop on leading practice in animal health, welfare and land management

Pip Short, KPCA Pilbara Manager, Port Hedland

The Kimberley Pilbara Cattlemen's Association (KPCA) kicked off its annual events calendar at Sandfire Roadhouse on Friday 7 and Saturday 8 September, 2018, hosting the workshop on Animal Health and Welfare and Land Management and the Livestock Handling Cup.

The events saw around 100 people from 11 pastoral leases (four in the Kimberley and seven in the Pilbara) attend across the two days as well as a range of industry stakeholders and supporters and members of the public.

The workshop featured presentations from Department of Primary Industries and Regional Development (DPIRD) vet, Dr Graham Mackereth, DPIRD Senior Livestock Compliance Inspector, Sally Peacock, Broome Cattle Vets', Dr Bryce Mooring, soil conversation expert Col Stanton, and others. All presentations are available to be viewed on the KPCA website (kpca.net.au).

Saturday morning kicked off early with the Bettini Beef team volunteering for the first run at the Livestock Handling Cup. The physical part of challenge was made up of four sections:

1. de-stressing and settling
2. moving and placing
3. drafting and sorting, and the
4. obstacle course.

There was also a livestock behaviour quiz and question and answer section aimed at testing participants' knowledge of the industry while identifying future leaders and people who are able to speak confidently on behalf of industry.

Fifteen teams entered the Livestock Handling Cup which this year included an additional Novice section. The competition, whilst fiercely competitive, is more about having a go. Tasks are judged more on how you do them than on completion of the task itself, and communication and safety are vitally important.

It's a great way for station crews to get together in a fun atmosphere, support and learn from each other and build and foster positive relationships within the industry.



Station staff heard from a range of presenters at the workshop on Friday

Results from the 2018 Livestock Handling Cup are as follows:

- First Place – Kalyeeda Station, *The Tricycle* - Emma Costello, Amy Johnston and Hamish Bell
- Highly Commended – Yarrie Station, *Young Guns* - Anne Coppin, Moya Coppin and Chris Tundulin
- Encouragement Award – *The Boss Ladies* - Helen Campion (Anna Plains), Caitlin Mills (Mandora) and Jane Sale (Yougawalla)
- Kachana Innovation Award – Mandora Station - Katie O'Donoghue, David Leppard and Ben Mills
- First Place Novice – *Yougawalla Calves* - Matilda, Angus and Hayden Sale
- Second Place Novice – Town of Port Hedland - Camilo Blanco, Luke Grossmith and Armando de la Flor Olavide
- Third Place Novice – Territory Rural - Kerstan Buntine, Ian Sinclair and Barry Knight.

What started in 2016 as the Pilbara Livestock Handling Cup perpetual trophy has made its way to the Kimberley with a well-deserved win by Emma, Amy and Hamish from Kalyeeda. No doubt they will be back next year to defend their title and ensure the cup stays in the Kimberley for another year. But there are sure to be Pilbara teams determined to bring the cup back to the Pilbara, where it originated.

Events like these take an army of people and support to make them happen. Everything counts – financial support, the host station providing weeks of labour, as well as cattle, for the event, local stations providing gear and beef, and businesses donating prizes. As such, we give a huge 'thank you' to everyone involved without whose support these events would not have been possible.

If you attended either of the events and have feedback that you would like us to incorporate for next year, please give me a call on +61 (0)433 468 904 or email pilbaramanager@kpca.net.au. You can view the video about this year's event on the KPCA Facebook page.



The team from Mandora Station successfully take their cattle over the bridge in the obstacle course

New mosaic agriculture trials in west Kimberley

Geoff Moore, Research Officer, DPIRD, South Perth/Broome

This dry season, the Northern Beef Development's Mosaic Agriculture team has established a series of trials on a new land pivot at the Water Corporation's Waste Water Treatment site at north Broome.

The focus of irrigated agriculture trials is on three key areas:

Collecting high-quality baseline production data for northern WA to inform the economic analysis of dispersed (mosaic) irrigation developments. The Kimberley and Pilbara regions have different environments in terms of soils and climate than areas such as central Queensland and the Douglas Daly, in the Northern Territory, for which similar data has previously been collected. A trial evaluating the interaction between dry matter fodder production and feed quality for a range of tropical (C4) annual fodder grasses, includes different types of hybrid sorghum and pearl millet. There is also a trial looking at grain/silage production, with a range of tropical (C4) annual grasses, including maize varieties, sweet sorghum and pearl millet, plus novel crops like quinoa.

Working with industry to improve the management of Rhodes grass, which is currently the main species grown commercially under 'stand and graze' systems. A trial is designed to fine-tune Rhodes grass management and evaluate other perennial grass alternatives which may be easier to manage under grazing. The trial aims to determine whether the alternative species are as productive as Rhodes grass and, if not, whether it is off-set by higher feed quality and palatability or better utilisation? The trial measures the seasonal production and feed quality of diploid and tetraploid Rhodes grass, together with panic grass, kikuyu and Jarra grass over 12 months, with different cutting (grazing) cycles (weekly, two-weekly and four-weekly).

New plant options, including alternative legumes, grasses and crops, are being evaluated for irrigated mosaic agriculture. The trials aim to determine whether each alternative plant option is worth considering in terms of production and quality and, if so, how it should best be managed. A series of demonstration plots are intended to help in evaluating the potential of tropical legumes, including lablab, cowpea, centro and butterfly pea, temperate forage legumes including lucerne varieties and tедера, as well as perennial grasses, and fodder beet.



Mosaic agriculture trial taken at the Water Corporation trial site, 21 August 2018, four weeks post-seeding

In addition to agronomy trials, the Mosaic Agriculture team is evaluating whether agricultural plants have the potential to become weeds of the natural environment in the Western Australia's rangelands. As part of this work, weed risk field nursery trials have been established in four key environments in the Fitzroy Valley, Derby, La Grange and East Pilbara, where species are being evaluated for their potential to persist and/or spread.

Pastoralists, agronomists, consultants and interested members of the community were invited to a field-walk of the department's mosaic agriculture trials at the Water Corporation's Broome North Waste Water treatment site pivots on Crab Creek Road, on Tuesday 13 November.

For more information about the department's mosaic agriculture trials, contact Geoff Moore on +61 (0)427 448 025 or email geoff.moore@dpird.wa.gov.au.

Upcoming events

RCS Grazing for Profit School

February 2019 – Kununurra
See page 18 for details

RCS Farming and Grazing for Profit School

March 2019 – Fremantle
See page 18 for details

MLA Grazing Land Management course

March 2019 – dates and location TBA
(proposed Port Hedland area)

Contact Kath Ryan
kath.ryan@agric.wa.gov.au

Innovation Day

March 2019 – Wooleen Station, date TBA

Contact Mike Bowley
mike.bowley@mwdc.wa.gov.au

RCS Grazing for Profit School – Indigenous Pastoralists

April 9-12, 2019 - Broome

Contact Daisy Goodwin
daisy.goodwin@agric.wa.gov.au

Want your event advertised in the next Rangelands Memo?
Email stephanie.coombes@dpird.wa.gov.au



Living with Post-traumatic Stress Disorder on an isolated cattle station

Jane Sale, Yougawalla Pastoral Co, East Kimberley

Geographical and social isolation are part and parcel of living in the rangelands. Limited access to medical services, coupled with the stigma attached to receiving treatment for mental health struggles, have created barriers for people living in regional Australia to seek help, however this has started to change in recent years. I thank Jane Sale for sharing her story in an effort to increase community awareness about this issue that can affect anyone, regardless of where they live and the industry they work in. Steph Coombes, Rangelands Memo editorial team.

In July, 2011 I had an accident where I was attacked by a cleanskin bull in our yards. At the time, we were in the middle of the live export ban. My injuries, the emotional stress of facing my mortality, and the possibility of never seeing my children again, on top of having to be back in the yards within two weeks of getting home from hospital, left me suffering from Post-traumatic Stress Disorder (PTSD). I had my first panic attack [when I was] alone and on the dirt road from our yards to the homestead in October that year.

For the following four years, I struggled with an internal turmoil over loving the work we do and the lifestyle it provides our family, but hating the isolation and the pressure I felt being responsible for the safety of our staff and animals. The biggest worry was having myself and my young children living in isolation so far away from medical help.

The anxiety that I suffered from caused stomach problems and headaches. I became obsessed with the thought I was dying, even though my very rational and logical self knew this was unlikely to be true. When I was in town, I would visit my GP with one terminal disease after another which I had self-diagnosed using Google. Even though I wasn't physically ill, my brain was making me feel these things through panic attacks. It is very hard for someone who has never suffered this to understand, as my husband Haydn discovered, but all too real when you are in the middle of one.

I had tried to be strong for so long, so my staff, business partners and family were confident in me as a leader. I was heavily involved in the day to day running of the business and my family in a physical sense, but I was emotionally void and isolated. Don't get me wrong, we had lots of time out, holidays and fun times, and if you looked at my Facebook page you would have seen a happy, smiling face. This is what I mean by it being a very personal struggle and not wanting others see your failure to cope. I made sure I looked perfectly happy on the outside. The reason I have never spoken extensively about the years that followed before was because these feelings of failure in the aftermath were so great. They felt so much worse than the physical injuries.

It all came crashing down in April, 2015 when I was suffering from a panic attack at least once a week and didn't want to be away from my work, children, and the station – but I felt happier when I was in town near a hospital. Haydn was travelling a lot and not having him around made me particularly vulnerable and I battled with being completely in charge of the station. On the eve of him leaving for another trip to meetings in town, I broke down at the thought of being left behind and in charge again. Haydn insisted we pack up that morning and head into town to get me some help. Packing the kids up, and Haydn telling our closest staff what was going on with me was an awful feeling. My fears of not coping were a reality. I felt I had failed myself and everyone else.

Haydn contacted a good friend, who is a GP and had experience working with anxiety, and from my first conversation with her the most memorable part was her telling me, “You will get out of this. It may feel like you are in a really dark place, but there is a way out.” Those words were so promising for me.

I spent a couple of weeks in town and had a few counselling sessions. I was put onto medication and taking that was a further feeling of failure. I remember putting the first tablet in my mouth thinking, “Here I go, taking the easy option.” At that stage I didn't realise how ridiculous that thought was - I mean, how hard had my previous option for the past four years been? On top of this, the treatment recommended to me was a week every month in town for counselling and time out from looking after things back on the station. This, over a couple of months, was lifting me gradually out of the fog. I was much improved, although still not myself, and suffered a couple of panic attacks in that time.

My GP discussed a technique for the treatment of people suffering from PTSD called Eye Movement Desensitization and Reprocessing (EMDR). I won't go into details about what happens, as it is easy to research, but it is a natural and straight-forward therapy, and for a lot of people it works. I had a four hour session that day - it was emotionally grueling and I walked away exhausted. Over the next few weeks, a few things came back to me about the emotions of my accident and I was definitely vague and listless, but I didn't put too much pressure on myself to be productive. Within a month, I was feeling like my pre-accident self again. I walked back into the psychiatrist's office a month later and asked, “What voodoo did you do? I am me again!”

With many people suffering from PTSD, anxiety and panic attacks, I understand how hard it is to stand up and say something, but the alternative, to suffer on your own, is the tougher of the two options, by far.

It has been three years since the EMDR therapy and my last panic attack. I think I will always be a different person to the one who hadn't previously stared her mortality down, but one thing I learnt that day is I have a huge will to live and since then, I have learned to take time for myself and my own mental wellbeing. There will be more bumps on the road, I am sure, but hopefully I will be a little more capable of coping and if not, I will not be too scared to ask for help.

Reaching out for help and taking that first step, putting aside the fear of failure that can be all consuming, is the hardest step of all but, once taken, it can be life changing.

No matter where you are
HELP
is available

Lifeline: 13 11 14 lifeline.com.au

Beyond Blue: 1300 224 636 beyondblue.org.au

Men's Shed: mensheds.org.au

Suicide Call Back Service: 1300 659 467

Mindspot: 1800 61 44 34 mindspot.org.au

MindSpot is a free service for Australian adults who are experiencing difficulties with anxiety, stress, depression and low mood. They provide assessment and treatment courses, or can help you find local services that can help. The MindSpot team comprises experienced and AHPRA-registered mental health professionals, including psychologists, clinical psychologists and psychiatrists who are passionate about providing a free and effective service to people all over Australia.

Virtual Psychologist: 1300 665 234 Text 0488 807 266 virtualpsychologist.com.au

Virtual Psychologist is a free service that offers qualified and experienced counselling via phone, chat, email and text. It is available 24/7 to any farmer.



Jane Sale

Opportunities for the Kimberley Aboriginal Pastoral Industry

Daisy Goodwin, Development Officer, DPIRD, Broome

Around 30 per cent of the northern Australian landmass is Aboriginal-owned and close to one third of the region's population is Aboriginal. The majority of Aboriginal owned estate lies across three jurisdictions - the Northern Territory (49 per cent), Western Australia (29 per cent) and South Australia (16 per cent).

Aboriginal people have a significant stake in the region's development and economic future (Altman, Buchanan & Larsen 2007). The potential for improved economic development of these lands is considerable. Similarly, the contribution of Aboriginal peoples' skills to the regional development of Western Australia is significant.

According to the Department of Planning, Lands and Heritage (DPLH), there are 55 Aboriginal held pastoral leases in Western Australia. Of these, 30 are located in the Kimberley region, totalling 6.5 million hectares and 10 are located in the Pilbara, covering 1.4 million hectares.

Aboriginal pastoral leases in the Kimberley represent approximately 60 per cent of all Aboriginal pastoral leases in WA and 30 per cent of all pastoral leases in the Kimberley. Aboriginal pastoral leases in the Pilbara represent a smaller proportion of 13 per cent of leases across the State and 27 per cent of non-Aboriginal and Aboriginal leases in the region.

Aboriginal people have high aspirations for the sustainable use of their landholdings and the

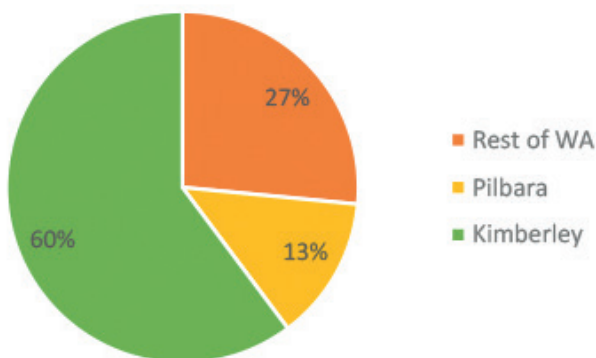
economic potential is huge. However, due to a range of limitations, productivity on the majority of Aboriginal lands are significantly lower than the potential capacity, with generally poor stock genetics, production rates and lower market values.

The constraints can range from caveats on Government purchased land, land tenure restrictions and complex ownership and management structures. These limitations are enhanced by conflicting drivers which may not be primarily motivated by economic return, such as social, cultural and environmental considerations.

The DPLH and Department of Primary Industries and Regional Development

(DPIRD) estimate there are 115 000cu (cattle units) on Aboriginal pastoral leases in the Kimberley, with a total value of \$57.6 million. There is potential for these properties to expand and increase the total herd by more than 80 000cu, resulting in an increase value of \$141.2 million to the State's economy.

Area of Aboriginal Pastoral Leases



Area of Aboriginal pastoral leases in Western Australia

If Aboriginal reserves were included in this estimate, the potential increase in value would be significantly higher due to the diverse land tenure. Aboriginal reserve tenure is less restrictive than a pastoral lease and allows various activities that contribute to the use and benefit of Aboriginal people. This allows multiple diversification opportunities, such as fodder production and other value adding opportunities.

DPIRD is committed to the economic development of Aboriginal pastoral businesses and continues to assist the Aboriginal pastoral estate to reach its potential. DPIRD is progressing a range of activities with the aim of increasing the value of Aboriginal pastoral businesses in the Kimberley and Pilbara regions.

Melissa Hartmann recently commenced as DPIRD's Manager Aboriginal Economic Development, a new business function that aims to bring together the Aboriginal Business Development (ABD) program and a range of other DPIRD initiatives to create Aboriginal economic prosperity and jobs.

Melissa has been heavily involved in supporting the development of Aboriginal enterprises and organisations across the Kimberley through her former roles as Managing Director of not-for-profit, Morrgul Pty Ltd, and Director of a private business development firm.

DPIRD's Aboriginal Business Development program is working across Government and industry to deliver Aboriginal economic development outcomes, such as training and capacity building.

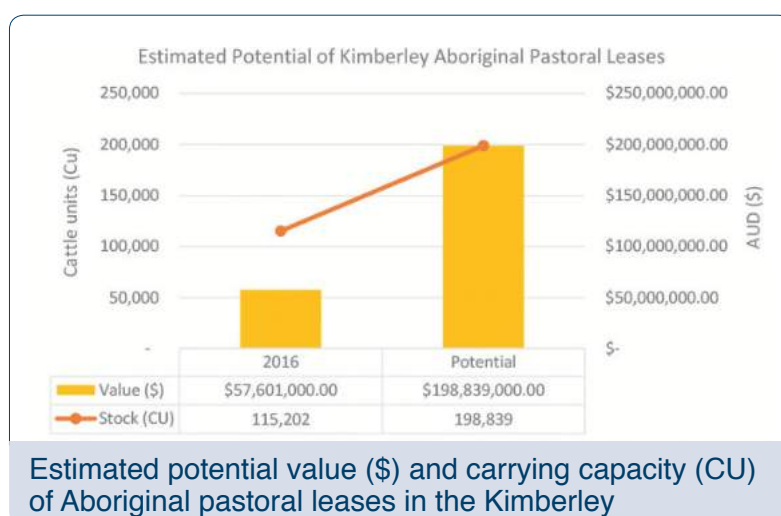
In September 2018, the program, in conjunction with Northern Beef Development project supported a development officer and four Aboriginal pastoralists to attend a 3.5 day course in Darwin. The Resource Consulting Services' Indigenous Grazing for Profit course is a highly regarded interactive program covering the key areas of people, business, land and livestock. During the course, participants are given an in-depth understanding of their role in production, ecosystem health and business.

The ABD program will continue to offer capacity building and training events to Aboriginal pastoral businesses in the rangelands, along with multiple other services to support in the achievement of social, environmental and economic outcomes, long into the future.

DPIRD received expressions of interest from over 10 pastoralists in attending an Indigenous GFP course and as a result, the course will be run in the Kimberley in early April, 2019. For more details, contact ABD Development Officer Daisy Goodwin on +61 (0)8 9194 1488 or email daisy.goodwin@dpird.wa.gov.au.

References

Altman, J, Buchanan, G, & Larsen, L 2007 'The environmental significance of the Indigenous estate: Natural resource management as economic development in remote Australia'. CAEPR Discussion Paper, [online] (286). Available at: openresearch-repository.anu.edu.au/bitstream/1885/145629/1/2007_DP286.pdf [Accessed 15 Oct. 2018].



Five key ways you can beef up your livestock biosecurity

Jess Rummery, Biosecurity and Extension Manager, Animal Health Australia
Email: jrummery@animalhealthaustralia.com.au

Every property has different biosecurity risks, which is why no two biosecurity plans are the same, and there's no point spending the time and effort to make a plan that isn't put into practice. This article highlights some key, but simple ways you can strengthen your overall biosecurity, reducing the disease, pest and weed risk to your business, and how that strengthens Australia's agricultural industries as a whole.

Segregate incoming livestock

Incoming livestock arguably present the biggest risk for the spread of disease onto your property. Incoming livestock, including new purchases and livestock returning from agistment, shows or events, can bring diseases, pests and weeds with them.

Keep these livestock separated on arrival to reduce contact with other livestock or animals (the key transmission event for many diseases). This will allow you to monitor a contained area for signs of disease, weed germination or pest incursion.

Ideally, incoming livestock should be kept isolated for three weeks to allow time for most diseases to develop enough for you to see signs of illness. If three weeks is not possible, allowing at least a week will still be enough time for signs of many diseases to show and allow for unwanted weed seeds to pass through the gut of livestock in the containment area and not over the broader property. This will save a lot of time spraying weeds that do come up down the track.

During the time that livestock are segregated, it is important to monitor them for signs of ill health or pests, and monitor the area for the germination of new weeds. Monitor the area while livestock are segregated and for the following weeks to make sure germination of weed seeds is detected and addressed early.

Consider your animal health program

A strong animal health program can significantly reduce the impacts of endemic disease on your property. Know what diseases are endemic to your area, what vaccines and treatments are available and what the treatment history is for purchased livestock. This will ensure your animal health program doesn't double up on treatments and is relevant to your region.



Farm gate signage

Information on the treatments and health status of purchased animals using the National Vendor Declaration (NVD) and an Animal Health Declaration, is available on the Farm Biosecurity website. Further information on specific diseases present in the area from which the animals have come can be requested from the seller or State agency staff.

Have an access procedure for people and vehicles

People and vehicles coming visiting your property pose a risk to biosecurity. Whilst some people may have a right to access, such as utility workers, remind them of property biosecurity expectations and access procedures.

This can be easily achieved through the use of a biosecurity gate sign which can be custom made to suit your requirements or the Farm Biosecurity website provides access to a template that can be downloaded for free and a standard sign that can be ordered.

Other examples of an access procedure include asking visitors to phone before entry to the property, or if signal is a problem, UHF radio may be an alternative, or ask them to report to the house, stay on designated driveways and tracks, or keep out of production areas.

These methods gives you an opportunity to make it convenient for everyone visiting the property while also working with those who need to enter production zones to satisfy your biosecurity expectations and their access needs.

Monitor for signs of disease and weeds

Regularly monitoring of stock for signs of disease, pastures for germination of new weeds, and property for signs of pest animals can greatly enhance property biosecurity. Detecting a problem early can assist in treatment, isolation and management — in some cases, greatly reducing the cost of the problem and the time it takes to resolve it. We all know, a stitch in time, saves nine!

Monitoring is important for endemic diseases and in response to emergency animal disease outbreaks. Early detection and reporting in these circumstances will greatly increase Australia's ability to contain and eradicate an exotic disease outbreak.

Keep good records

Running a business means there will always be paperwork. Records can include images or downloads of SMS where, for example, the date and time of vehicle access are recorded. Being able to show how your property biosecurity works in practice, and prove what you say you've done, is increasingly important.

In the event of a pest or disease outbreak, records allow for the event to be traced back to the root cause, and potentially isolate other properties that may have been impacted, enabling it to be contained quickly.

Records also help support food safety requirements. Livestock production is the first link in the food supply chain and consumers and processors expect food safety to be built into the products they are trading or buying.



BIOCHECK® and WELFARECHECK®

- vets assist producers to meet LPA requirements

Dr Tracy Sullivan, Director, Australian Veterinary Semen Morphology, Broome
Email: avetsm@gmail.com

LPA obligations

The Livestock Production Assurance (LPA) program is the Australian livestock industry's on-farm assurance program that covers food safety, animal welfare and biosecurity. It provides evidence of livestock history and on-farm practices when transferring livestock through the value chain.

An LPA National Vendor Declaration is required for all livestock movements, including property to property, through saleyards, direct to processors and to feedlots, as well as to the live export trade.

Biosecurity

Biosecurity relates to preventive measures designed to reduce the risk of transmission of infectious diseases, invasive pests or weeds. Good biosecurity practices prevent and contain the spread of infectious disease, and invasive pests or weeds between farms, as well as protecting Australia from diseases and weeds that occur overseas.

From 1 October, 2017, every LPA-accredited producer must ensure biosecurity requirements are fulfilled both on-farm and during the transport of livestock between properties and feedlots, including to slaughter and live export.

Biosecurity practices are auditable and are part of the LPA accreditation assessment process. To meet the requirements of LPA, each Property Identification Code (PIC) must have a formal, documented Farm Biosecurity Plan that addresses certain criteria.

Producers who wish to achieve or maintain a Johne's disease J-BAS score of 7 or 8 are required to have a biosecurity plan overseen by a veterinarian. J-BAS score 7 or 8 is essential to sell cattle from Western Australia into the Northern Territory.

Animal welfare

Animal welfare is increasingly important to the Australian red meat industry and the Australian cattle industry is committed to animal welfare practices.

Livestock care is fundamental to the success and sustainability of every farm and vets play an important part in working with producers to ensure animal welfare.

Since 1 October, 2017, every LPA-accredited cattle producer must ensure animal welfare requirements are fulfilled by following the Australia Animal Welfare Standards and Guidelines for cattle (AAWSGC). Animal welfare practices are auditable and are part of the accreditation assessment process.

What are the Australian Animal Welfare Standards and Guidelines?

The AAWSG cover producers' responsibilities and set out animals' needs in relation to feed and water; risk management in extreme weather, natural disasters, disease, injury and predation; facilities and equipment; handling and management/ husbandry; breeding management; and humane killing.

For cattle, the AAWSGC also covers castration, dehorning and spaying; calf rearing systems; dairy management; and beef feedlots.

Under LPA, on-farm systems must be implemented to ensure the handling of livestock is consistent with the requirements of the AAWSG.

What are BIOCHECK® and WELFARECHECK® plans?

BIOCHECK® and WELFARECHECK® are software programs run by members of the Australian Cattle Veterinarians - a special interest group of the Australian Veterinary Association Ltd.

The programs allow for a guided consultation between a producer and their veterinarian to develop farm biosecurity and animal welfare plans that ensure their farm satisfies LPA biosecurity and animal welfare component requirements.

BIOCHECK meets the LPA requirements for a Farm Biosecurity Plan, and the requirements for producers wishing to maintain Johne's disease status. The plan is designed to ensure the farm has considered the major biosecurity risks and has appropriate risk management strategies in place.

WELFARECHECK ensures farms satisfy the LPA animal welfare requirements and works by allowing details to be recorded regarding how welfare risks are being managed, might be better managed on each farm. It allows producers to demonstrate that they have properly considered animal welfare risks for their individual farm. It also documents all the AAWSGC and allows for a discussion about each.

The AAWSG provide for minimum (required) standards and highly recommended (but not mandatory) guidelines that provide a higher level of detail.

BIOCHECK AND WELFARECHECK are not audited quality assurance programs - they document the risks that have been considered, the level to which these risks are controlled on the individual farm, and any plans to reduce the level of risk.

Vets work with producers to identify major risks on their property and tailor plans to reduce them. These plans provide the documentation for the producers to meet their LPA requirements.

Check mycattlevet.com.au or contact Dr Sullivan.



J-BAS requirements for importing beef cattle into WA

Clare Atkins, Livestock Inspector, DPIRD, Kununurra

The J-BAS is now used to assess the Johne's disease (JD) risk when beef cattle are imported into Western Australia (WA). Beef cattle must be sourced from eligible properties to be able to enter WA from other jurisdictions.

An eligible property is one that, over the past 24 months, has not had any animal suspected or known to be infected with JD and has had no dairy or dairy-cross cattle on the property. If dairy or dairy-cross cattle have been present, extra requirements apply.

Table: The specific requirements for each jurisdiction that must be met to import beef cattle into WA are summarised in the table above.

Beef cattle entry requirements	NT and QLD	NSW and SA	VIC and TAS
Have been born and grazed only on eligible properties from that state and only with cattle that meet these conditions	If, over the past 24 months, a property has had no animal suspected or known to be infected with JD and had no dairy or dairy-cross cattle onsite. [Extra conditions apply if dairy/dairy cross cattle have been onsite]	If, over the past 24 months, a property has had no animal suspected or known to be infected with JD and had no dairy or dairy-cross cattle onsite. [Extra conditions apply if dairy/dairy cross cattle have been onsite]	If, over the past 24 months, a property has had no animal suspected or known to be infected with JD, and had no dairy or dairy-cross cattle onsite. [Extra conditions apply if dairy/dairy cross cattle have been onsite]
Herd status	Are not from a herd infected or suspected to be infected with JD for the last five years	Are not from a herd infected or suspected to be infected with JD for the last five years	Are not from a herd infected or suspected to be infected with JD for the last five years
Property of origin J-BAS requirements	J-BAS 7 or higher WA requires the Check Test to be a faecal test. ELISA blood testing will not be accepted.	J-BAS 8 WA requires the Check Test to be a faecal test. ELISA blood testing will not be accepted.	J-BAS 8 WA requires the Check Test to be a faecal test. ELISA blood testing will not be accepted.
Property of origin JD testing requirements	Negative Check Test within the last 12 months	A history of at least two negative Sample Tests, two years apart, and no contact with cattle of lower JD status	A history of at least three negative Sample Tests, two years apart, and no contact with cattle of lower JD status

All livestock import conditions are contained in the LB 1 form available on the Department of Primary Industries and Regional Development webpage: Forms for importing livestock into WA. agric.wa.gov.au/livestock-biosecurity/forms-importing-livestock-western-australia

For more information about J-BAS import conditions, see the webpage: Border controls for Johne's disease susceptible stock entering WA. agric.wa.gov.au/livestock-biosecurity/border-controls-johnes-disease-susceptible-stock-entering-western-australia-1



Charlotte Thomson has joined the Kununurra office as a stock inspector, as Clare Atkins joins the Northern Beef Development project.

Rangelands Memo seeks your feedback on article ideas from around the State. In particular, we would like to increase the representation from the southern rangelands regions.

Article ideas and contributions can be sent to stephanie.coombes@dpird.wa.gov.au

Beef and cattle export snapshot

Kate Pritchett, Research Officer, DPIRD, Albany

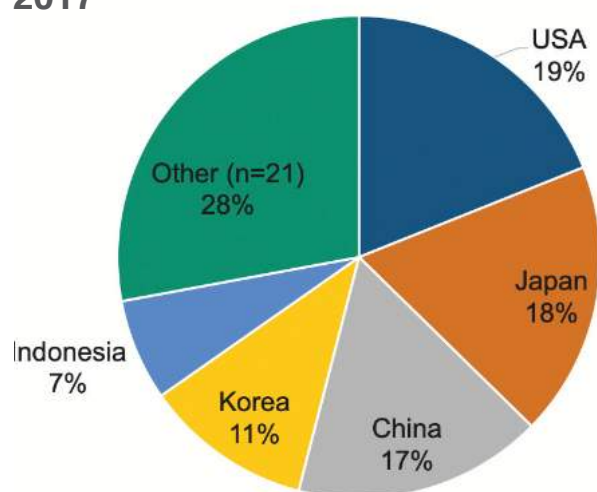
Beef exports

During the first seven months of 2018, the value of boxed beef exports from Western Australia (WA) reached \$103.4 million, a 26 per cent increase compared to the first seven months of 2017, which reached \$82 million. The value to July, 2018 is also the highest reached for that time period over the last decade.

Growth in the volume of beef exported from WA from January to July 2018 has been even more impressive when compared to 2017 (Figure 1). It increased 29 per cent from 13 million kilograms (shipped weight) to 16.7 million kilograms - also the highest volume exported in the last decade.

During the first seven months of 2017, the largest market by value for WA beef exports was the United States of America (United States), which accounted for 19 per cent of the total value exported, or \$15.5 million. In 2018, the largest market has been China, which accounted for 21 per cent of the value of beef exported or \$22.1 million, after having been the third largest market in 2017 (\$13.7 million).

2017



2018

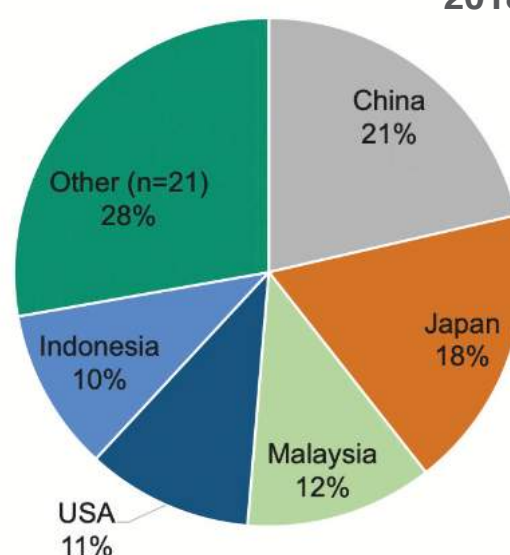


Figure 1: Major markets for boxed beef exports from WA in 2017 and 2018 (January-July) by value (based on ABS data, DPIRD analysis)

Live exports

Between January and July, 2018, WA live cattle exports (non-breeding) totalled 126 000 head, 19 per cent higher than at the same time last year. WA accounted for 23 per cent of total Australian live cattle exports, year-to-date in 2018.

The value of WA live cattle exports reached \$152.2 million in the first seven months of 2018, a 21 per cent increase year-on-year. 2016 saw the highest value for live cattle exports at \$232.1 million. There has been a 34 per cent fall since then.

Of the non-breeding live cattle exported from WA in 2018, 62 per cent have been exported out of the Port of Fremantle, 28 per cent were exported from Broome, three per cent from Darwin and two per cent from Wyndham, Geraldton and Port Hedland.

Of the cattle exported for breeding purposes in 2018, 89 per cent have been exported out of Fremantle and 11 per cent were exported from Broome.

In 2017, Indonesia was the largest market for WA live cattle, accounting for 49 per cent or \$60.8 million (Figure 2). This declined to \$49.3 million in 2018. There was also a dramatic decline in the value of live cattle exported to Vietnam between 2017 and 2018, from \$43.6 million to \$28.9 million.

China, however, is an emerging market for live cattle exports. In 2018, China began consistently importing live cattle from WA for the first time, accounting for 14 per cent of exports or \$21.9 million, making the country WA's third largest market. Turkey returned to the market, after a hiatus in 2017, with 10 per cent of live cattle exports in 2018.

During 2018, the live cattle market expanded with the addition of two extra markets compared to 2017, allowing for further market diversification that has enabled WA to be less reliant the major markets of Indonesia and Vietnam. Despite this, Indonesia and Vietnam accounted for more than 50 per cent of WA live cattle exports in 2018.

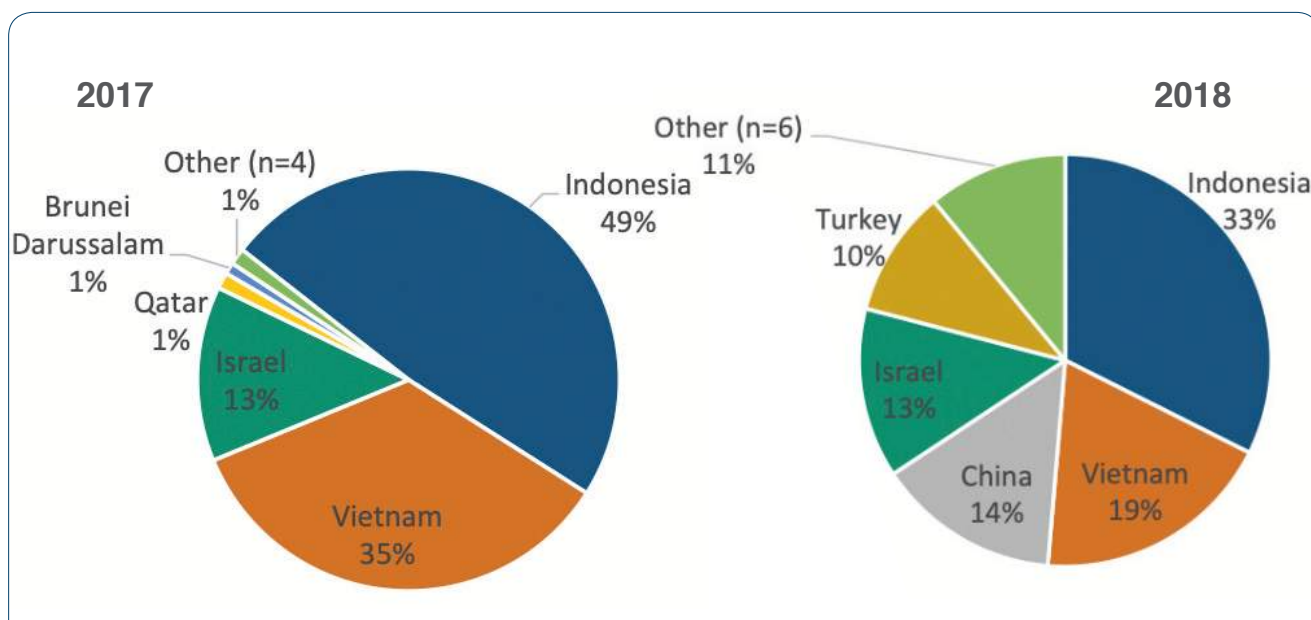


Figure 2: Major markets for live cattle exports from WA in 2017 and 2018 (January-July) by value (based on ABS data, DPIRD analysis)

Sheep and sheepmeat export snapshot

Kate Pritchett, Research Officer, DPIRD, Albany

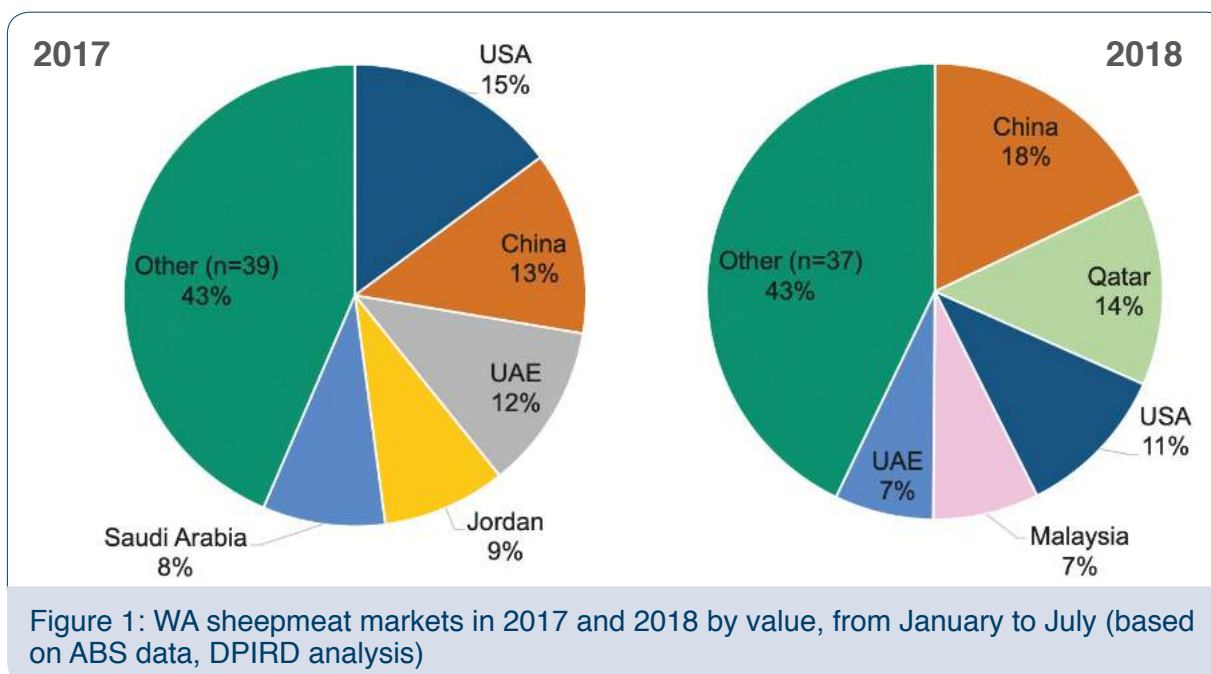
Sheepmeat exports

Over the last 10 years, the value of both WA lamb and mutton exports have been on the rise. The value of lamb exports has risen dramatically, from \$58.8 million (January-July) in 2012 to \$167.1 million in 2018, representing an increase of 184 per cent. This is a result of increasing volumes being exported, in conjunction with strong prices.

The value of mutton exports was \$62.7 million in 2008, which declined to \$23.8 million in 2012, before growing to \$71.2 million in 2018 - an increase of 198 per cent.

Between 2017 and 2018, there has been a shift in the destinations for WA sheepmeat exports (Jan-July) as seen in Figure 1. In 2017, the largest market by value was the United States of America (United States), which was worth \$29.3 million. The United States was followed by China, which was valued at \$25.4 million and the United Arab Emirates, which was valued at \$23 million.

In 2018, the largest market was China, worth \$43.2 million, which represented an increase of 70 per cent year on year. Qatar was the second largest market and saw even more impressive growth – 163 per cent from \$12.6 million to \$33.1 million, possibly due to reductions in live sheep exports to the area. The United States was the third largest market, which accounted for \$26.4 million.



There has been substantial growth in the export of fresh/chilled lamb meat from WA over the last 10 years. In 2008, the value of fresh or chilled lamb meat exported from WA totalled \$36.5 million. This increased steadily to \$96.5 million in 2018.

There has been even stronger growth in frozen lamb exports over the last 10 years. In 2008, they were worth \$16.4 million, but have increased 331 per cent to \$70.6 million in 2018. Of the lamb meat exported so far in 2018, fresh or chilled lamb has accounted for 58 per cent, while 42 per cent has been frozen.

In contrast to lamb, the vast majority of mutton exports leave Western Australia in frozen form. In 2018, frozen mutton exports made up 96 per cent of mutton exports compared to four per cent exported fresh or chilled.

Fresh or chilled lamb exports are seen as a premium product and were the highest value export on a per unit basis. In 2018, fresh or chilled lamb exports were worth \$9.59/kg, compared to \$6.82/kg for frozen lamb. Fresh or chilled mutton fetched \$6.98/kg and frozen mutton was valued at \$5.88/kg.

Live exports

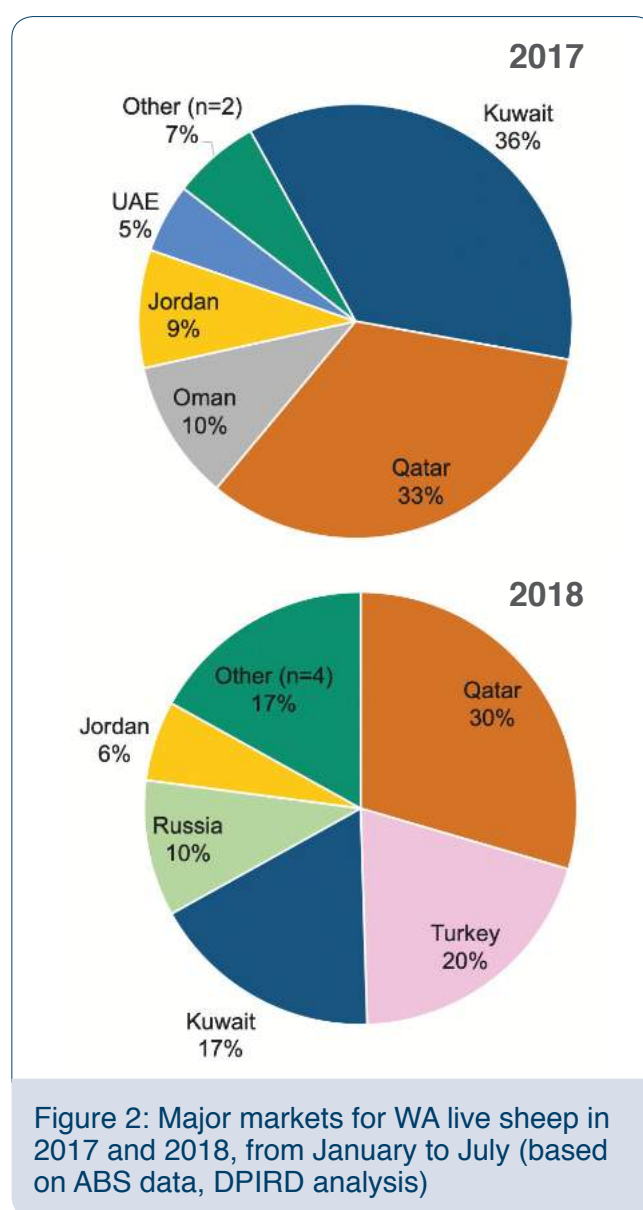
Live sheep exports from WA have been on a downward trend over the last decade. In 2008, exports totalled 1.6 million head between January and July, but only reached 821 000 in 2017 before falling a further 19 per cent to 663 000 in 2018.

Over that time, the value of exports has declined from \$111.6 million in 2008 to \$90 million in 2018, despite spiking to \$146.3 million in 2012.

This year has provided further challenges to the industry following the fallout from the Awassi Express footage. The subsequent licence cancellation of Emanuel Exports and the pause in trade by LSS has resulted in reduced live sheep exports, compared to the same time period in previous years.

Between 2017 and 2018, there has been a change in live sheep markets, which is likely due to the above-mentioned challenges (Figure 2). In 2017, Kuwait was the largest market by value for live sheep exported from WA, accounting for \$37 million worth of trade, followed by Qatar which was valued at \$34.3 million, and Oman with \$10.8 million.

In 2018, two other destinations have joined the market, making WA less dependent on Kuwait and Qatar, which in 2017 accounted for two thirds of exports. Qatar has been the largest market so far in 2018, with \$26.6 million, followed by Turkey with \$18 million value in trade. Kuwait was the third largest market, accounting for \$15.6 million, while new entrant Russia accounted for \$9.2 million.



WA Aboriginal pastoralists attend the RCS Indigenous Grazing for Profit course in Darwin

Kevin May, Development Officer, DPIRD, Broome

The Northern Beef Development (NBD) project and Aboriginal Business Development (ABD) program supported three Aboriginal pastoralists from the Kimberley to attend the Indigenous Grazing for Profit (GFP) course presented by Resource Consulting Services (RCS) in Darwin, in September.

John Butters of East Kimberley Cattle Company, Benji Laurel of Milijiddee Station, Mick Munday of Noonkanbah Station and Kevin May, ABD, Development Officer, DPIRD, attended the 3.5 day course.

The workshop covered the four key areas of people, business, land and livestock, and was delivered to 15 participants from Western Australia, Queensland, South Australia and the Northern Territory.

The participants came from varying situations, with those from South Australia and the Northern Territory running a small number of cattle and the Western Australian representatives running a large number.

It was meaningfully highlighted to all participants that there are three ways to run a business: go broke, subsidise the business, or make a profit.

Under the banner of **people**, participants analysed where community governance fits in with good business management and whether “good business management is more important than Governance” Vision and goal setting, and management efficiency and effectiveness were explored and discussed, as was the health of the business and self.

In the topic of **business**, participants looked at the money story, examining the flow of money—where it comes from and where it goes, the secrets to improving profits in the business and cutting off the dead wood that damages the business. Percentages of time spent in activities outlined in the model below must clearly be associated with allocation of monies.

Under the banner of **land**, participants considered the ‘ecological pie’, such as sunlight, rainfall and ecosystem, provided by mother-nature and how to harness the assets to improve the property’s ecosystem and reduce costs, whilst also increasing production and profit.

Planning for drought was included in the discussion and participants were encouraged to prepare for, manage and recover from key elements of drought, and create a drought management plan.

The **livestock** topic saw participants look at practical management, mustering, and the health and welfare of cattle. Pasture management, which was highlighted as critically important in ensuring there is enough feed for the cattle.

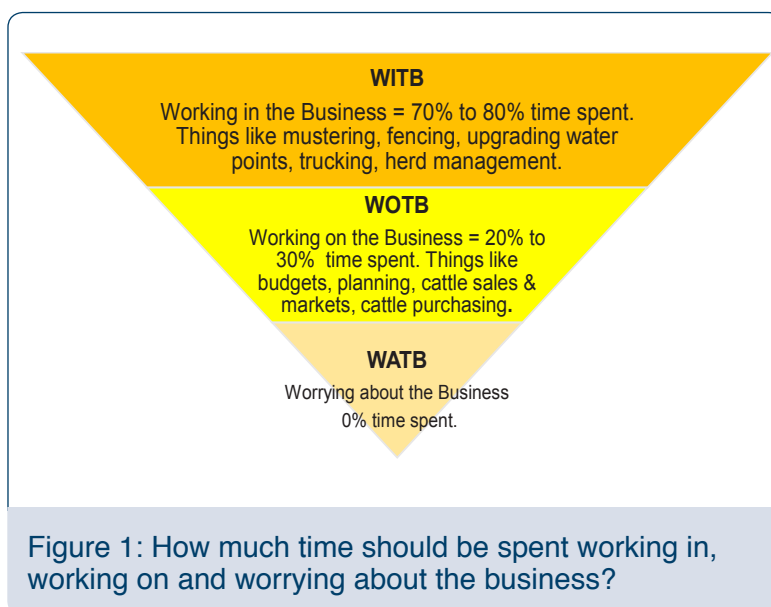
Participants learnt about the principles of nutrition and basic rumen functions, along with how to use protein and mineral supplements to increase production. They also learnt about reproduction principles to increase margins in breeding stock and managing livestock for profitable animal production, which should include an early weaning program.

On the last day of the course, participants visited Beatrice Hill Farm, a research farm managed by the Northern Territory Government, which has one of the nation's largest herds of Riverine buffalo, the milk of which mozzarella cheese is made.

At the research farm, participants identified different pasture species, phases of plant growth, and the relationship between the grass canopy and root variations of the plant, which is affected by livestock pressure on the pasture, seasonal climate ecology and soil moisture.

For more information, contact Kevin May, Development Officer, DPIRD, Broome, on +61 (0)8 9191 1426 or kevin.may@dpird.wa.gov.au.

An Indigenous Grazing for Profit course is being organised for the West Kimberley from 9-12 April, 2019. For more information or to express your interest in the course, contact ABD Development Officer, Daisy Goodwin on +61 (0)8 9191 1488 or daisy.goodwin@dpird.wa.gov.au.



Grazing for Profit course participants at Beatrice Hill Farm

New appointments to the Pastoral Lands Board

The Pastoral Lands Board (PLB) welcomed two new members at its August meeting, both of whom hail from the Kimberley region.

Darrylin Gordon, an Aboriginal interest member, is a Jaru woman who grew up on Lamboo Station near Halls Creek. In addition to her formal qualifications, she brings a wealth of experience working with Aboriginal people in her community.

Ms Gordon is the 2018 National Runner-up and WA AgriFutures Rural Women's Award winner, in recognition of her contribution to her community.

She works to empower Aboriginal people and is using her award bursaries to develop a program of work orientation and mentoring at Lamboo Station. Like many recipients, Ms Gordon has shown that location is no barrier to making a difference in regional Western Australia.

Ms Gordon said she looked forward to future meetings and the new learnings it would bring.

Jane Sale, a pastoral interest member, is an active and involved member of the Kimberley beef industry who brings long-standing experience as an owner and manager of pastoral stations.

Her land management experience is evident in the work she has undertaken across four million acres, including growing a herd and negotiating and running Aboriginal sub-leases, which have since become templates for other agreements.

Ms Sale said the board members had been welcoming and supportive and, along with Lands Minister Rita Saffioti, seemed very committed and progressive in their undertakings.

The PLB plays a key role in Western Australia by providing strategic advice on the pastoral industry to the Lands Minister, and administering pastoral leases, which cover 34 per cent of the State.

The new appointees join serving members, Tim Shackleton, Ashley Dowden, Jack Burton and Dr Gaye MacKenzie.

In welcoming the appointees, Tim Shackleton, Chair of the PLB, said the regular renewal of board membership allowed the board to keep in step with contemporary community expectations, with fresh perspectives.

PLB members represent a broad range of knowledge and diverse backgrounds and experiences.

Mr Shackleton thanked outgoing members, Gregory Stubbs and Tim Meecham, for their service and contribution to the board.



Darrylin Gordon



Jane Sale

The Master of the Muster

Keith Anderson, Jubilee Downs Station, West Kimberley

Across the black-soil plain we rode
over holes and limestone rock,
starting at a walk
then steady at a trot.

Then when we sighted cattle
the action now would start,
for we would head off at a gallop
and a quickened pulsing of the heart.

And a pounding of your horse's heart
heaving in its chest,
with the crashing of shod horses hoofs
across a limestone ridge's crest.

Riding at a break-neck speed
with the Devil in you on a run,
while the good Lord watches over
all the action and the fun.

You send your horse with rein and spur
and keep an eye upon the mob,
while he is fairly on the bit
with his eyes also on the job.

Across the black-soil plan
over holes and limestone rock,
he takes you onwards to the cattle
'til we wheel them, hold and block.

For he is the Master of the Muster
your good stock-horse of the north,
you know his worth
and rub the lathered neck
of your game and trusted working horse.

The *Rangelands Memo* team would like to invite reader to submit their own poetry or short stories to be featured in our future issues. Please contact editor, stephanie.coombes@dpird.wa.gov.au for details.

If you would like to receive future editions of the Rangelands Memo by email, or know someone who needs to be added to the postal list, please contact stephanie.coombes@dpird.wa.gov.au

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