

Top Paddock

DEPARTMENT OF PRIMARY INDUSTRY AND RESOURCES



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Message from the editor



It is that time of year again where days are hot and muggy and we are all waiting to see when the monsoon will arrive.

As happens so often this time of year, some staff are leaving us for colder climates. From Katherine Research Station Callen Thompson, Senior Extension Agronomist and his family are moving back to their hometown, Karle Bourne, Technician is trying his luck in Central Australia and Kae Wegman from Plant Industries Development is also leaving the department. These staff have worked with many growers during their time with the department and we wish them all the best.

Our survey on the newsletters, and how you would like your information is still open. Your participation in this short survey ensures that we continue to deliver information and updates to you when you want them and how you want them.

Here's to safe and happy holidays to you all from everyone here in the department.

Cheers

Ed.

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Figure 1. The leaves on this mango plant are being labelled via infusions of ^{15}N fertiliser in solution into branch xylem tissue. After drying, the labelled leaf litter will be placed on soil under mango trees to decompose while soil N gas emissions and mineralisation are measured.

Quantifying nitrogen use efficiency in tropical mango production systems

Dr Joanne Tilbrook and Dr Tony Asis (Department of Primary Industry and Resources)

Improving nitrogen use efficiency in tropically grown mangoes is part of a five-year collaboration under the umbrella of the *More Profit from Nitrogen Program* across the horticulture, cotton, dairy and sugar industries.

To quantify mango nitrogen (N) demand and cycling through the soil-plant-atmosphere system in local orchards, Dr Jo Tilbrook and Dr Tony Asis have developed a xylem (woody tissue) infusion method to label mango trees with a stable isotope of nitrogen, ^{15}N . Once the trees are labelled with ^{15}N , the amount of soil or foliar applied fertiliser taken up by the tree or lost to the environment can be quantified. Jo and Tony demonstrated the method during the Territory Natural Resource Management Field Day at Coastal Plains Research Station in November 2017 (Figure 1).

Recently they labelled leaf litter for an experiment planned by Raj Pandeya, a Queensland University of Technology PhD candidate and collaborator. The labelled leaves will be placed directly over soil in mango orchards and as they decompose during the wet season, nitrogen movement, mineralisation and gas emissions will be analysed.

Building knowledge of where and when nitrogen is lost to the environment rather than cycled or used by a crop is needed to establish how to minimise nitrogen losses and potential negative environmental impacts.

For information on resource management including nitrogen visit the [Northern Territory Government website](#).

For information on our research projects visit the [Department of Primary Industry and Resources website](#).

YouTube video on [Measuring N₂O Emissions](#).

This project is supported through funding from the Australian Government Department of Agriculture and Water Resources as part of its Rural R&D for Profit program, the Northern Territory Government Department of Primary Industry and Resources, Queensland University of Technology's Institute for Future Environments and Hort Innovation Limited. In-kind support is also provided by the Australian Mango Industry Association Inc.

Understanding plant available nitrogen in the mango root zone

Maddison Clonan (Charles Sturt University) and Dallas Anson (Department of Primary Industry and Resources)

Charles Sturt University's (CSU) Maddison Clonan joined the DPIR project team to complete her six-month trial as part of her Masters of Sustainable Agriculture. Maddie's project asked about spatial and temporal variation in soil available nitrogen (N) in mango orchards of the Darwin region.

Soils that grow mangoes in the Northern Territory are inherently low in available N and as such, N is an important nutrient to add for any plant growth and production. Most mango growers will agree that N is essential for mango tree development, fruit production and quality. But getting the right rate, timing, form and place of N supply is a tricky question. This trial is part of a big project to understand profitable use of N in mangoes.

Over time, measurements were used to compare the availability of two forms of N - nitrate and ammonium - in different locations within orchard soils. Soil available N was measured under the tree canopy and the canopy dripline and in the inter-row. Results show the largest variable is time, with a decrease in both forms of N availability across all orchard positions and sites from the late wet (March) to the dry seasons (see figure 2), probably due to declining soil moisture as the soil dries out over the season. Overall, ammonium availability in the wet season was higher than nitrate - as is typical of our Top End soils. So far, there has been no difference between orchard locations and the trial will be continued by the DPIR team to see how this might change with time.

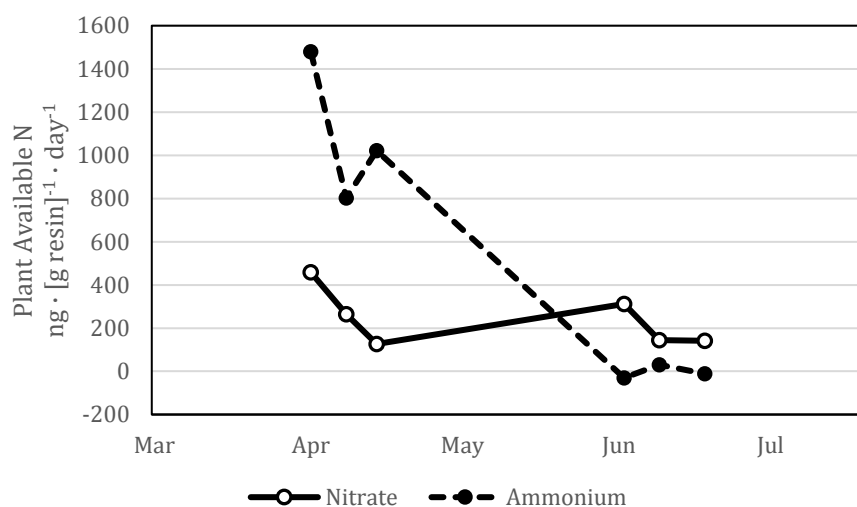


Figure 2. Average soil available nitrate and ammonium from soils under mango orchards in the Greater Darwin Region, during the late wet to dry season, 2017.

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Department participates in the Territory Natural Resource Management Conference



Figure 3. TNRM conference participants try some Rambutan from the high density orchard at the Coastal Plains Research Farm.

The 2017 Territory Natural Resource Management Conference, an event proudly sponsored by the Department of Primary Industry and Resources (DPIR), was recently held in Darwin.

Coastal Plains Research Farm and Plant Industries Development Division staff hosted a field trip as part of the conference to build awareness of our horticulture and sustainable farming research. Talks by staff included a visit to the high density tropical exotic orchards and passionfruit breeding program. Other topics covered included a discussion around termite management, demonstration of nitrogen efficiency research, soil mapping, plant biosecurity, spray reduction through nozzle choice and varietal screening of pastures. The day capped off with a taste of some of the local produce including rambutan, jackfruit and some of the new passionfruit varieties.

Participation from across the department continued throughout the conference. DPIR hosted a conference trade booth highlighting our plant biosecurity program, agricultural research, and the Darwin Aquaculture Centre was nominated for an award.

WWExplaining mango maturity with texture and colour

Maddison Clonan

The Northern Territory Department of Primary Industry and Resources (DPIR) team has been working to better understand fruit parameters that can indicate maturity. This work has been largely focussed on changes in fruit dry matter content, however this season, it was expanded to include mango flesh colour and texture. This investigation aimed to characterise the relationship between fruit maturity and these parameters, while also identifying if varieties change relative to the others.

Leading up to the 2017 mango harvest, fruit from several Northern Territory mango varieties were sampled and assessed for their flesh colour and texture. Assessments were made from September to November to measure the changes that occur as fruit matures. The measurements collected were used to compare dry matter changes over time, with changes in flesh colour and texture. Dry matter increases as fruit matures, although this trend is uniform across varieties, the timing and rate of increase did vary. Flesh texture was not found to have a uniform trend of change throughout the measurement period across the varieties assessed. Therefore changes in texture could not indicate maturity. Using objective colour measurement devices, flesh colour was found to redden and darken as dry matter increased in all varieties, however the rate of change differed. For example, flesh of the Kensington Pride variety begins to redden at a higher dry matter than NMBP 1243 variety.

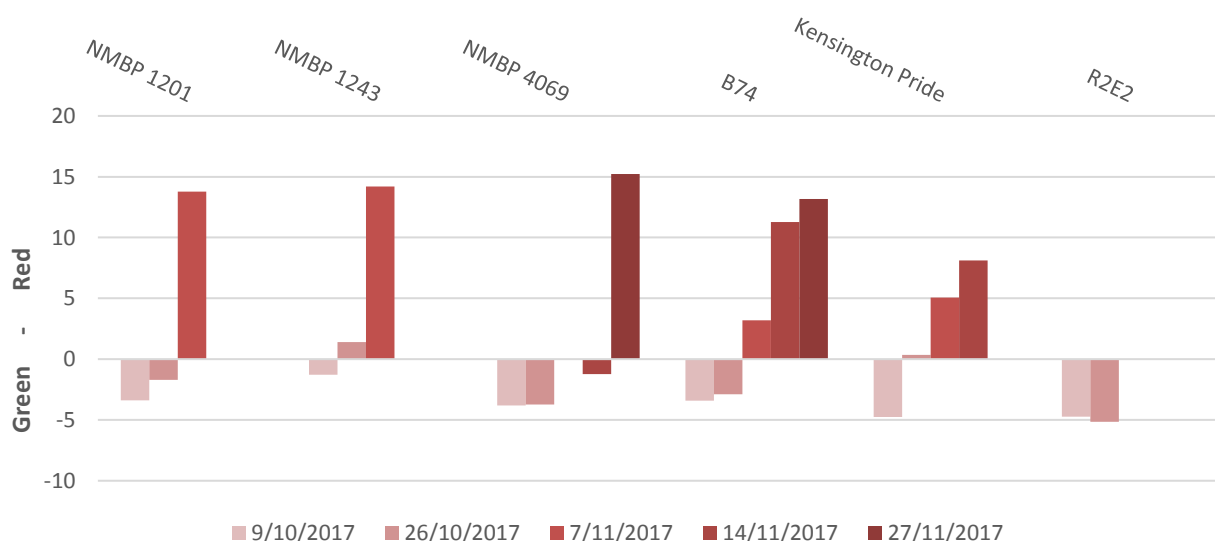


Figure 4. F

From these results we are able to develop a better understanding of the physiological changes that occur as mangoes mature, and how these changes differ across NT mango varieties.

From these results we are able to develop a better understanding of the physiological changes that occur as mangoes mature, and how these changes differ across NT mango varieties.

Table 1: Scale of red to green of mango flesh colour measured during October and November 2017.



Identifying potassium deficiency in hay paddocks

Arthur Cameron, Principal Pastures Agronomist, Darwin



Figure 5. Potassium (K) deficiency in Jarra and K deficiency in Pangola grass. Note the yellow leaf blades with tip necrosis.

I recently visited a Top End property to inspect grass pasture hay paddocks. There was a nutrient deficiency in the Pangola grass and Jarra Finger grass hay paddocks. This was diagnosed as potassium (K) deficiency from the symptoms observed in the paddocks. A potassium deficient pasture may have yellow appearance. On a plant level, the leaves have marginal and tip necrosis. This is, the edges and tips of the leaves turn yellow, then die, as shown in the images above.

A potassium deficiency is not unusual in the Top End hay crops, because most of our soils are low in potassium, and there is high removal in hay. Potassium is often about one per cent of dry matter. A 10 tonne crop of hay will remove 100 kg per hectare of K. The soil generally supplies about half of the hay crop requirements, but the other half needs to be applied as fertilisers.

In a 'normal' wet season, with prolonged periods of wet weather, K is released from the clays in the soil and is available to plants. In a dry wet season, this release may not happen, and the hay crop becomes K deficient, even if K fertiliser has been applied the previous year.

See the plant nutrient removal calculator article for more information on the approximate nutritional loss in crops.

For information on pasture crops visit the [Northern Territory Government website](#).

Plant nutrient removal calculator

Arthur Cameron, Principal Pastures Agronomist, Darwin

I was asked by Matt Dennis of E E Muirs in Katherine if I had a program to calculate the removal of nutrients in hay crops. Matt saw a need for producers to be aware of how much of each nutrient was being removed in hay, and the approximate amount required for the next hay crop.

As I could not find anything of this nature on the internet, I developed the plant nutrient calculator below. It can be used for any plant product, not just hay. It is an Excel spreadsheet, which is mostly locked, so that the integrity will be maintained for multiple uses. The only data which can be entered into the spreadsheet and changed are the nutrient concentrations in the plant product (as a percentage (%) or parts per million (ppm)), and yield in tonnes per hectare.

The output is kilograms of each nutrient entered removed.

PLANT NUTRIENT REMOVAL CALCULATOR (per tonne of yield Kg/1000kg)							
Nutrient Name	Nutrient Symbol	Plant level (%)	Factor (%*100)	Kg removed per tonne	Yield tonnes	Kg removed per hectare	
Nitrogen	N	1.46	0.0146	14.6	6.77	98.8	
Phosphorus	P	0.15	0.0015	1.5	6.77	10.2	
Potassium	K	1.11	0.0111	11.1	6.77	75.1	
Sulphur	S	0.13	0.0013	1.3	6.77	8.8	
Calcium	Ca	0.42	0.0042	4.2	6.77	28.4	
Magnesium	Mg	0.65	0.0065	6.5	6.77	44.0	
Sodium	Na	0.47	0.0047	4.7	6.77	31.8	
		ppm	(ppm/1000000)*100				
Copper	Cu	6.6	6.6E-06	0.0066	6.77	0.045	
Zinc	Zn	15.7	1.57E-05	0.0157	6.77	0.106	
Iron	Fe	150	0.00015	0.15	6.77	1.016	
Manganese	Mn	150	0.00015	0.15	6.77	1.016	
Molybdenum	Mo			0	6.77	0.000	
Boron	B			0	6.77	0.000	
Chlorine	Cl			0	6.77	0.000	

Note: only plant nutrient contents and crop yield (hay, grain etc) can be entered

Figure 6. Screen shot of the calculator.

A copy of this calculator can be obtained by emailing: arthur.cameron@nt.gov.au.

Visit the [Northern Territory Government website](#) for information on pasture crops.



Figure 7. Spray workshop held at Douglas Daly Research Farm

Limiting spray drift and improving coverage

Callen Thompson, Senior extension Agronomist Katherine

Agriculture in the Northern Territory is famous for its vast cattle stations but we know that within this landscape horticulture and hay production is often concentrated in specific areas where there is good soil and water. There is also likely to be lifestyle blocks in the same areas. In these intensive areas there is a significant risk of spray drift damaging neighbouring crops, pastures or the environment if chemicals are not applied properly.

Using spraying equipment, whether it be for weed, pest or disease control, is part of most agricultural systems and the Australian Pesticides and Veterinary Medicines Authority (APVMA) ensures that chemicals are safe for use as long as the applicator follows the directions on the label.

High value horticultural crops like mangos, Asian vegetables and sandalwood are susceptible to herbicides such as 2-4,D, which are commonly used for broadleaf or woody weed control in pasture and hay paddocks. If these chemicals are applied in-correctly, in poor weather conditions or with inappropriate equipment, they can drift onto neighbouring crops. This may cause yield loss or even death to the susceptible “off target” crop, which can lead to litigation if significant damage is caused.

Even if the chemical does not land on an off target crop it may contaminate the environment. In addition, chemical that is not landing on the desired crop is wasted, effectively decreasing the rate of chemical applied, decreasing the effectiveness of the job.

By understanding weather conditions, your equipment and the product you are using, you can limit the risk of off target drift while still getting good coverage.

Coverage

Coverage is important as chemical that does not land on the target is wasted. This is effectively reducing the rate of product you are using, which can lead to reduced efficacy and low rate herbicide resistance. Products where this is especially important are insecticides fungicides and contact herbicides, especially when applying as a protective spray.

Key Points:

- Weather, nozzles and boom height can effect spray drift and coverage
- Drift is reduced by using coarse droplets, but coverage is decreased
- Increasing water rate will increase coverage

Products like glyphosate are translocated through the plant so coverage is not as important as the chemical will travel from the point of contact to the rest of the plant. Some products, like gramoxone, are extremely poorly translocated and rely on the whole plant being covered to achieve effective control.

Pre-emergent products like S-Metolachlor need good coverage as they act as a film, stopping weeds emerging through the top soil. Timing, solubility of the product and ground cover can affect the degree of chemical coverage achieved.

Droplet size

Different nozzles can give you different droplet size ranging from very fine to extremely coarse. Fines droplets are small, slow moving and highly susceptible to drift while coarse droplets are large, fast moving and less susceptible to drift.

If landing on the desired target, fine and medium droplets will give a more even coverage compared to coarse droplets, unfortunately weather conditions and equipment setup can decrease fine droplet survival and increase movement off target. Good coverage can be achieved using coarse droplets if the water rate is increased. Figure 1 shows water sensitive paper comparing two spray rates, 100 and 50 L/ha using air induction nozzles. The higher water rate achieved far greater coverage.



Figure 8. 100L/ha of water on the left vs 50L/ha of water on the right. Both very coarse droplets.

Weather conditions effecting application

Weather in the Northern Territory is generally marginal for spraying. It is important we understand how weather effects spray quality and how we can manage it.

Wind

Wind can blow droplets off target, this is called physical drift. It is important not to spray when wind is blowing towards susceptible crops. Risk of drift can be reduced by using coarse droplets because larger droplets have greater velocity and are less susceptible to being blown off target. Spray when wind speed is between 3-20km/h and is not gusting (some products like 2-4,D label requires less than 15km/h). Never spray when there is little to no wind (less than 3km/h) as this can allow fine droplets to float upwards into an inversion layer (see below). When you are measuring wind speeds always measure at boom height.

Temperature

At high temperatures the weed may have shut down and not translocate the product so never spray when weeds are showing signs of stress. High temperatures can cause volatile chemicals to vaporise and lift off the target. This is called vapour drift and can happen hours after the chemical has been applied. Chemical companies recommend that you don't spray at temperatures over 30°C.

High temperature combined with low humidity can effect droplet survival due to evaporation. Using coarser/larger droplets will decrease the effect of evaporation. Because of this relationship, understanding Delta T is very important.

Humidity and Delta T

Increased humidity can reduce droplet evaporation rate. The relationship between temperature and humidity is expressed by delta T. High delta T (high temperature/low humidity) causes droplet evaporation and can limit the product hitting the target. Low delta T (low temperature/high humidity) can be a drift issue as fines droplets have greater survival as they are not evaporated. The graph in figure 2 is a great tool to determine the right Delta T conditions for spraying. Delta T between two and eight is ideal.

Surface temperature inversion

A surface temperature inversion is commonly known as an inversion layer, and has the potential to cause chemical drift up to 30km from the area sprayed.

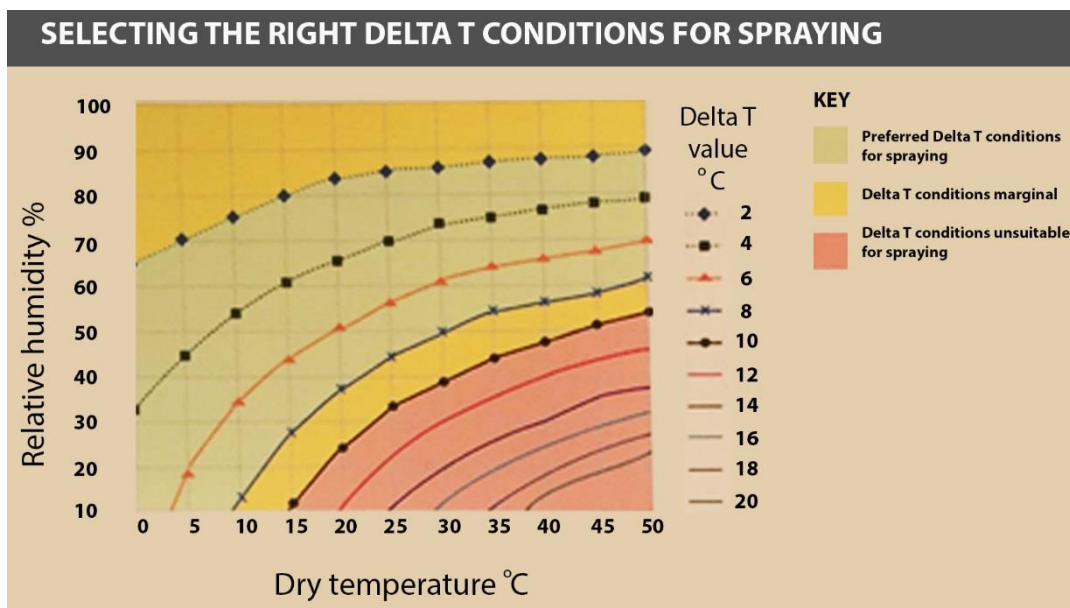


Figure 9. Selecting the right Delta T conditions for spraying, Source: Jorg Kitt, Spraywise Broadacre Application Handbook, 2008

Under normal conditions temperature decreases further away from the ground. In an inversion event temperature increases with height. The cool air doesn't mix with the warm air and layers are formed. Fine droplets or vapour can be trapped in these layers and float away.

This often happens when there is low wind, high daytime temps and low night temps. Inversion layers usually occur early evening, night time and early morning. Dust, smoke and fog can indicate an inversion layer. Fine droplets are most susceptible.

For information on using chemicals responsibly visit the [Northern Territory Government website](#).

Using spray equipment to limit drift and maximise coverage



Figure 10. Spraying at Katherine Research Station

Weather conditions in the NT can be detrimental to achieving good spray outcomes. There are ways to maximise the chance of chemical reaching the target by spray rig setup and selecting appropriate nozzles.

Boom height

It is important to set the boom high enough that there is overlap of nozzle fans but not too high that there is potential drift. Figure 3 shows that 110 degree flat fan Nozzles should be 50cm from the target. If there is a false target, which may be stubble or crop. The boom should be 50 cm above that. Grains Research and Development Corporation (GRDC) data suggests that raising the boom from 50cm to 75cm increases drift potential four times. Counteract this risk by increasing droplet size to reduce driftable fine droplets. This will also improve coverage as larger droplets will have greater velocity and will get through the crop/stubble canopy.

Speed

Increasing speed reduces the time it takes to spray a paddock which can be beneficial when trying to get a job done before weather conditions change. Unfortunately increasing speed can lead to wind shear and eddies, which creates increased fine droplets. Increased speed without increasing water rate can decrease coverage, particularly with a standing target.



Figure 11. Selecting boom height when there is a false target.

Water rate

Increasing water rate is the easiest way to increase coverage. If course droplets need to be used for drift reduction, increasing water rate can significantly reduce the issue of poor coverage generally associated with increased droplet size. Water rate can be increased without decreasing speed, if you have the correct nozzle.

Nozzle selection



Figure 12. Assorted nozzle heads.

There are many different nozzles but for broadacre boom spraying, the main groups used are conventional flat fan nozzles, pre-orifice flat fan nozzles and air induction nozzles. Characteristics of these nozzles can be seen in table 2

Table 2: Characteristics of commonly used nozzles (photo credit: TeeJet)

Conventional nozzles	Pre-orifice flat fan nozzles	Air induction nozzles
<ul style="list-style-type: none"> - XR TeeJet -single orifice -produce large amount of fines 	<ul style="list-style-type: none"> -Turbo TeeJet -pre-orifice and an exit orifice -drift reduced by 50% -Fine to course, depending on pressure 	<ul style="list-style-type: none"> Agritop AirMix Flat Fan -TTI TeeJet -Low pressure variants can produce a medium droplet -Droplets are generally course to extremely course

The pre orifice meters flow and restricts the amount of liquid which decreases internal pressure. This leads to larger droplets. The difference with air induction is that they contain a venturi which draws air bubbles into the liquid stream. The droplets exiting the nozzle are generally course to very cause and are filled with air. This can create a cushioning effect when they hit the plant so they don't bounce off, which can happen with large droplets from conventional nozzles.

Colours of the nozzle represent its size of the nozzle e.g. all yellow nozzles are 02 (0.2 gallons per min @ 2.8bar). The larger the nozzle, the more water it puts out. All nozzle manufacturers have charts for their nozzles. A nozzle chart allows the user to pick the appropriate nozzle for the water rate, speed and pressure the want to use.

Application technology workshops

The Department of Primary Industries and Resources and NT Farmers identified the need for greater training in application technology and applied for funding from Federal Government's National Landcare programme promoting sustainable agriculture. This funding was used to run training workshops at Douglas Daly, Katherine and Darwin. A [YouTube video](#) was also produced to demonstrate nozzle selection.

If you would like further information about improving your application practices or would like staff within your organisation to attend a spray technology workshop, please contact Callen Thompson callen.thompson@nt.gov.au

Spotlight on technology

Callen Thompson, Senior Extension Agronomist, Katherine.

SnapCard

Continuing with the theme of improving spray application (see article in this issue), the focus on this 'Spotlight on Technology' is an app that gives spray applicators the ability to assess the coverage they are achieving with their spraying. Applicators can place water sensitive paper (available from rural retailers) on their target, be it the crop, a weed or a mango leaf. They then spray the target and come back to collect the water sensitive paper. The applicator can then use the app to assess the percentage of coverage.

The user can compare different spraying settings to assess what is giving the best results for their current environmental conditions.

The app was developed by the Department of Agriculture and Food, Western Australia, and the University of WA's (UWA) applied entomology program. This was supported by funding from the Council of Grain Grower Organisations and the GRDC.

For more information go to the [Grains, Research and Development Corporation website](#).

DPIR has a great [YouTube video](#) demonstrating how to use water sensitive paper.

For information on using chemicals responsibly visit the [Northern Territory Government website](#).



Figure 13 SnapCard screen shot

Northern Territory seasonal outlook

December 2017, Sourced from the [Australian Bureau of Meteorology](http://www.bom.gov.au).

The national outlook for December 2017 to February 2018 indicates that:

- drier than average conditions are expected across much of the NT
- warmer than average days and nights are more likely across the entire NT.

Typically when the tropical Pacific cools towards La Niña levels, the western Pacific and seas around northern Australia warm significantly, but models suggest this is not likely to occur this summer. Likewise, La Niña periods typically see warmer than average waters develop in the eastern Indian Ocean. This season, near average to cooler waters are forecast to remain in this area, while warmer waters remain off Africa.

The combination of ocean patterns, and the likely weak La Niña itself, is why Australia does not have significant and widespread increased chances of a wetter and cooler summer.

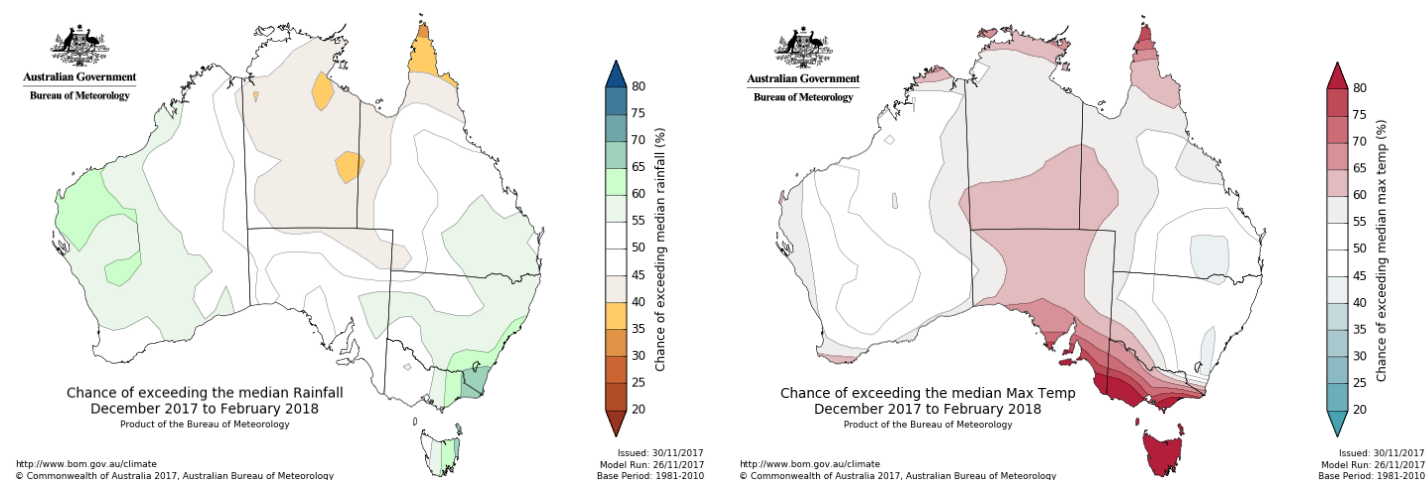


Figure 14. Rainfall and temperature maps from the Australian Bureau of Meteorology

Table 3: Seasonal indicator summary from the Bureau of Meteorology (BOM)

Seasonal indicators	Comments (sourced from the Australian Bureau of Meteorology)
El Niño Southern Oscillation (ENSO) http://www.bom.gov.au/climate/ens/o/ Current outlook: LA NIÑA ENSO status Current status: LA NIÑA	La Niña established in tropical Pacific This 2017-18 La Niña event is forecast to be short-lived and weak, with sea surface temperature patterns in the western Pacific and eastern Indian Ocean not typical of La Niña. As a result, there's little push towards widespread wetter conditions across much of the country. La Niña typically brings above average rainfall to eastern Australia during late spring and summer, however sea surface temperature patterns in the Indian Ocean and closer to Australia are not typical of a La Niña event, reducing the likelihood of widespread above average summer rainfall.
Indian Ocean Dipole (IOD) http://www.bom.gov.au/climate/ens/o/#tabs=Indian-Ocean Current outlook: Neutral	IOD also neutral. The influence of the IOD on Australian climate is weak during December to April. This is because the monsoon trough shifts south over the tropical Indian Ocean changing wind patterns, which prevents the IOD pattern from being able to form. However, to the south of the traditional Indian Ocean Dipole regions, cooler than average sea surface temperatures in the eastern Indian Ocean may be limiting the feed of moisture over Australia, and opposing more typical La Niña influences.

Livestock disease investigations

The Department of Primary Industry and Resources (DPIR) provides a free disease investigation service to livestock owners for diagnosis of notifiable emergency, exotic and endemic disease, including zoonotic diseases. Berrimah Veterinary Laboratories provide free diagnostic testing for exclusion of notifiable disease for all disease investigations, and subsidies are available to private veterinarians for significant disease investigations in livestock. The Northern Australia Enhanced Disease Surveillance program has been introduced from 2017-2019 on a trial basis providing increased subsidies for cattle and buffalo disease events reported to and investigated by private veterinarians. This program recognises the higher costs and challenges associated with conducting disease investigations in more remote regions.

During July to September 2017, 70 livestock disease investigations were conducted to rule out emergency diseases or investigate suspect notifiable diseases across the Northern Territory (NT). Figure 1 shows the number of investigations by species of livestock.

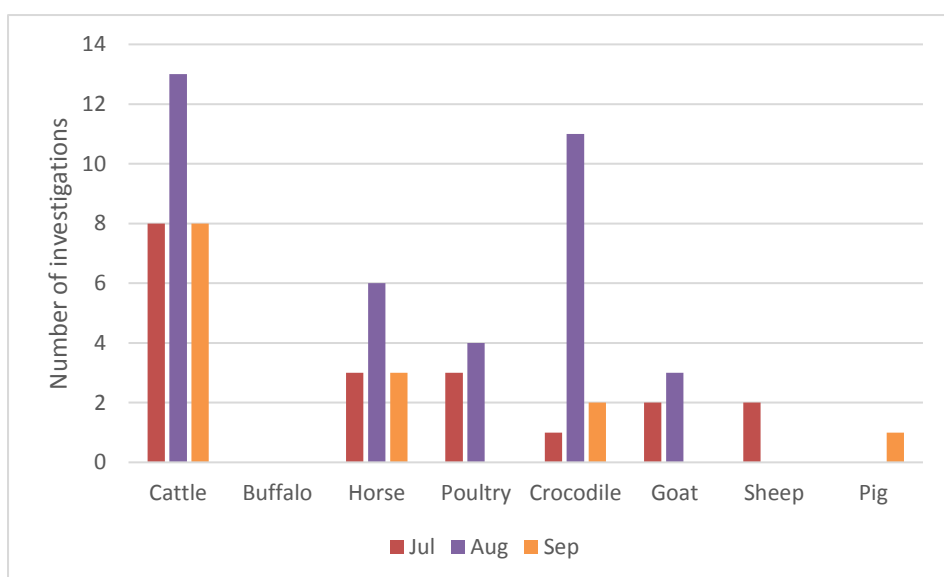


Figure 15. Livestock disease investigations by species for July to September 2017

Berrimah Veterinary Laboratories processed 177 livestock sample submissions, including samples to substantiate proof of disease freedom certifications, for accreditation programs and targeted surveillance to support market access. The following case reports are a selection of disease incident field investigations during the quarter.

Foot and Mouth Disease excluded in salivating cattle in Alice Springs.



Figure 16. The affected steer was salivating and in respiratory distress.

The manager of a property in the Alice Springs region reported four 2-3 year-old crossbred Hereford steers with signs of weight loss, salivation and loss of muscle/movement control. The steers had been recently yarded and were due to be transported for slaughter. Examination of stock by DPIR veterinarian found affected steers to have the symptoms reported, as well as being in respiratory distress. The most severely affected steer was euthanased for post mortem examination.

Post mortem examination revealed water in the lung tissue and evidence of a healing tongue lesion. While it was suspected that the steer was persistently infected with bovine viral diarrhoea virus, samples were

referred to the Australian Animal Health Laboratories (AAHL) to exclude exotic diseases including Foot and mouth disease (FMD) and Vesicular stomatitis (VS) for the tongue lesion, and Haemorrhagic septicaemia and Contagious bovine pleuropneumonia for the lung lesion. Tests excluded all exotic diseases.

Bacteriology culture found moderate growth of a *Pasteurella multocida* from the lung lesion. The diagnosis of the lung lesion was severe pneumonia.

Pasteurella multocida also plays a leading role in the development of bovine respiratory disease (BRD), a condition also known as 'shipping fever'. The condition commonly arises where the causative organism becomes established by secondary infection, following a primary bacterial or viral infection. This usually occurs after stress. In the case of BRD, pasteurellosis is usually preceded by viral infection with either infectious bovine rhinotracheitis (IBR caused by bovine herpes virus type 1), bovine viral diarrhoea virus (BVDV), para-influenza type 3 (PI3) or bovine respiratory syncytial virus (BRSV). The viral inflammation of the respiratory passage initially causes lung lesions and suppresses immunity allowing the bacteria to proliferate. BRD is a major production issue for beef feedlots and dairy.

While the IBR serological blood test results were negative, a positive BVD antigen ELISA blood test and a negative BVDV AGID antibody blood test confirmed the steer was persistently infected (PI) with BVDV. The *P. multocida* bacterial infection combined with the viral BVDV infection led to the BRD syndrome, intensified by the stress of mustering and yarding.

BVDV Type 1 is endemic in the Northern Territory cattle population, with most herds and up to 70% of cattle exposed. In-utero infection can result in PI animals which show signs of poor development, ill-thrift and early death. These PI cattle are immune-suppressed and may also develop the more acute and often fatal mucosal disease which presents as severe gastro-intestinal ulceration.

Vaccines are commercially available for the main respiratory viruses and bacteria that contribute to BRD, including IBR and BVDV. The vaccines are not widely used in Territory, but should be administered prior to entry into the feedlot and mixing of cattle.

A recommendation was made to cull the remaining three clinically affected steers. There have been no further clinical problems reported from this herd of cattle.



Figure 17. Affected steer in poor condition (left). Other cattle from the same group in good condition (right)

Pneumonia due to pasturellosis causes mortality in Brahman cows in Katherine

In August, a private veterinarian investigated mortality in a group of 180 Brahman cows which had recently been transported to a property in the Katherine region. Over a two-week period approximately 50 cows had shown signs of nasal discharge and coughing, and 30 had died.

On clinical examination the affected cattle were having trouble breathing, with heavy breathing rates and nasal discharge. A single three year-old cow was euthanised and post-mortem examination revealed liquid in the lungs, as well as the lung sticking to the thoracic wall. Examination of lung tissue under the microscope revealed a severe pneumonia, consistent with *Mannheimia haemolytica* infection. There was no microscopic evidence of viral involvement, and a heavy growth of *M. haemolytica* was cultured from lung samples. A diagnosis of pneumonic pasturellosis (shipping fever) was made. While shipping fever usually involves infection caused by *P. multocida* in cattle, it may also be caused by *M. haemolytica* in the absence of *P. multocida*. It is likely that the recent stress of mustering, long-distance transport and yarding resulted in the high morbidity and mortality in this case. This level of pneumonia is an infrequent situation in northern beef herds.

Vaccines are commercially available for the main respiratory viruses and bacteria that contribute to BRD, including IBR, BVDV and *M. haemolytica*. The vaccines are not widely used in Territory, but should be administered prior to entry into the feedlot and mixing of cattle – a process known as ‘backgrounding’.

Slaughtering, processing and sale of meat in the NT

The slaughtering, processing and sale of meat for human consumption is regulated under the Northern Territory *Meat Industries Act 2011* and associated Regulations.

The slaughtering of animals for human consumption has been a common practice on stations over many years, providing meat for owners, managers, employees and guests. It is not an offence to slaughter an animal on your property for consumption by your family and staff, provided it is consumed on the property on which it was slaughtered. The meat must not be sold, bartered, or given away.

The meat may be provided to paying guests in facilities where supplying meat is not the primary source of income e.g. bed and breakfast facilities. Any paying guests must be informed and non-paying guests should be advised that the meat has not undergone an Ante Mortem or Post Mortem inspection by a qualified meat inspector.

The sale of station slaughtered meat in a roadhouse or community store situation is considered to be an offence, and is not permitted. All meat used in these operations must be sourced from a licenced processor. The use of station meat houses to process meat for sale is not permitted unless licenced by Department of Primary Industry and Resources.

It has been common practice over many years for stations to supply meat to Aboriginal communities located on cattle stations and this practice is legal and may continue provided the meat does not leave the property of slaughter, is not on-sold, or given to others. This means that where an animal is slaughtered on a station for a local community, the carcass cannot be dressed by community members and removed from the property. If the animal was removed from the property live and transported to the community for slaughter, Northern Territory Waybill and National Livestock Identification System regulations would apply.

The supply of meat donated by a company or station to a community event such as a rodeo or campdraft is acceptable, provided that the meat is consumed on the station on which it is slaughtered and not on-sold at the event. If there is an abattoir located near the station it may be beneficial to slaughter the animal through the abattoir as the standard of meat preparation meets the Australian hygienic meat standards. The station or event co-ordinator should be able to negotiate a service kill in this situation.

All meat sold to the general public for human consumption must be processed in a registered establishment that has been issued with a stamp that has an Establishment Number. Meat must be inspected by a qualified meat inspector with a minimum Certificate III in Meat Safety.

Further information and advice concerning slaughtering and processing may be obtained from the DPIR:

David Frost
Senior Meat Industry Officer
Telephone: 89992255
Mobile 0401113090

New Livestock Biosecurity Network staff member for Northern Australia



Jess Rummery has joined the Livestock Biosecurity Network (LBN) as Manager – Biosecurity and Extension for Northern Australia. She joins LBN fresh from a role within the Australian Department of Agriculture and Water Resources, which predominantly focused on live exports. Jess brings a great deal of experience to LBN, adding her professional experience to her qualifications in animal science, public administration and national biosecurity policy.

The new LBN coordinated role aims to support producers across the Territory and the rest of northern Australia. One of Jess' first responsibilities was to deliver biosecurity planning workshops to producers in Alice Springs, Tennant Creek, Katherine and Darwin throughout September.

Jess is based in Darwin, and is available to speak to producers and provide information on Biosecurity Planning and the Livestock Producers Assurance (LPA) program.

Jess can be contacted on M: 0499 077 213, E: jrummery@lbn.org.au

Brands, National Livestock Identification System and waybills in the Northern Territory

Brands

Under the Northern Territory (NT) *Livestock Act 2011*, a NT registered brand is required on all cattle prior to being moved off their property of origin, unless they are under eight months of age. Brands can be used on horses, buffalo and camels, but it is not compulsory.

The NT *Livestock Act 2011* and associated Regulations uses a three-letter brand system, where one letter must be the letter 'T', and a distinctive (symbol) brand system. Branding is a clear way of identifying ownership of stock. In any proceedings, proof that an animal is branded in accordance with the provisions of the *Livestock Act* with a registered brand is prima facie proof that the animal is the property of the owner of the registered brand. It is important to note that National Livestock Identification System (NLIS) devices do not constitute proof of ownership.

Cross-branding

Cross-branding of cattle after purchase is not mandatory in the Northern Territory: however, if livestock are not cross branded, it provides no legal claim to purchased stock. Purchased cattle need to be cross-branded correctly to provide evidence of ownership. The Livestock Regulations clearly state that:

1. the first brand applied to livestock must be in the position described on the Certificate of Registration for the brand
2. each subsequent brand applied to livestock may be in any other position, where there is sufficient space, specified in Schedule 2
3. a person commits an offence if the person applies a registered brand to livestock in a position other than is required or permitted by sub-regulation (1) or (2)

A brand should not be applied over an old brand. It is an offence to place a brand on the cheek.

Brands – Sale of a property

While the sale of a property may include the stock, the brand cannot be sold to the new owners. Options for brands after the sale of a property are as follows:

1. If an agreement is made in the sale contract to transfer the brand to the new owners, an application to Transfer Brand must be lodged with the Registrar.
2. If the registered owner of the brand no longer wishes to use the brand, it may be cancelled. An Application for Cancellation of Brand must be lodged with the Registrar.
3. If registered owner of the brand wishes to keep the brand, but move it to a new property, a Request to Change of Run must be lodged with the Registrar, together with original certificate/s for amending.

If not the registered owner of new property, Owners Permission to Use Run form is required and must be lodged with the Registrar.

4. If other brands are registered for use on property/parcel of land, then the new property/land owner/s will need to complete Owners Permission to Use Run form, and lodge with the Registrar.
5. If the new owner of the land does not want to have other brands registered for use on their property/parcel of land (e.g. continue agreements previous owner/s may have had) then the new Owner must complete Owners Permission to Use Run - REVOKED form and lodge with the Registrar.

BRANDS ARE NOT TRANSFERRED AUTOMATICALLY BY A PROPERTY SALE OR BY A WILL

A brand is registered to a person or company for use on a nominated NT property only.

Under no circumstances are these brands to be used in any other state or territory. This means the branding iron can only be used by the registered owner (or their representative) on the registered Northern Territory property as stated on Brand Certificate/s.

It does not restrict branded cattle being agisted on other properties. To brand on a NT property not registered with the Registrar is an offence under the *Livestock Act 2011* and associated Regulations, and incurs a penalty.

If you are wanting to transfer your brand to a new property, or use your brand on a property for a specified period of time, please contact your local Regional Livestock Biosecurity Officer.

Further NT brands information and forms can be found on the [Northern Territory Government website](#).

National Livestock Identification System (NLIS)

National Livestock Identification System (NLIS) is Australia's system for identifying and tracing livestock for food safety, product integrity and market access purposes. NLIS was introduced by industry and enacted in State and Territory legislation. In the Northern Territory (NT), NLIS commenced on 1 July 2007, and has been operating now for over a decade.

In the NT, all cattle and buffalo must have an approved NLIS device attached to their off side (right ear) before they are moved off a property, regardless of the destination. All sheep and goats must have an approved transaction tag for any movement off a property.

The owner of the property must ensure all cattle or buffalo (including calves) moving off the property have an NLIS device attached to the right ear before the livestock movement begins. While calves and weaners under eight months of age do not require a brand for movement, they must have an NLIS device. Livestock that were born on the property of origin are to have a white 'breeder' NLIS device, cattle that were not born on the property (e.g. agistment cattle, purchased cattle, cattle in transit and strangers) and do not already have a NLIS device, must have an orange 'post breeder' NLIS device attached prior to moving off the property.

Please note that calves born in transit are not an exception to the rule. If calves are born in transit yards, or arrive in transit yards without a NLIS device, the transit yard is required to apply an orange 'post breeder' device.

NLIS devices are specific to the property that they are ordered for. It is an offence to apply NLIS devices to livestock on a property that the NLIS devices are not registered to.

For further NT information on NLIS and forms visit the [Northern Territory Government website](#).

Waybills

You must use a Northern Territory (NT) waybill to move all of the following kinds of livestock from one property to another within the NT:

- alpacas, camels and llamas
- cattle and buffalo
- deer
- goats
- pigs
- sheep.

You do not require a waybill for horses or poultry.

A waybill is a record of livestock details and movement. When you move livestock the waybill travels with the stock from the property of origin to the destination property. It is an offence to move cattle without a waybill in the NT.

Waybills are an important part of the National Livestock Identification System and provide detailed information which is used to trace animal movements. The system also acts as a deterrent to stock stealing, identifies the property of origin to abattoirs and export markets, and provides detailed documentation for station management.

It should be noted that any stranger cattle need to be provided with their own separate waybill if travelling in a consignment of cattle going to a property other than their most recent property of origin, e.g. transit yards, export yards, or abattoir. If stranger cattle are being returned to their property of origin, a waybill needs to accompany the cattle.

For more information about waybills, how to fill them in and what you must do with them, read the [Agnote Waybills in the NT](#).

Release of new Antimicrobial Resistance website

Antibiotics are not commonly used in Northern Territory livestock, but globally this is an enormous one-health issue that is emerging. Our current lifestyle depends on the continued successful use of antibiotics and all users are urged to consider responsible antibiotic use to limit the development of antimicrobial resistance (AMR). The Australian Chief Medical and Veterinary Officers have issued a joint statement on AMR and developed a [website](#) that contains general advice for all stakeholders.

**Statement from Australia's Chief Veterinary Officer and Chief Medical Officer
on how Australians can reduce antibiotic resistance**

World Antibiotic Awareness Week, 13 – 19 November 2017

To mark World Antibiotic Awareness Week for 2017, we are calling for all Australians, including all prescribers in human and animal health, to pause and consider antibiotic use.

Antibiotic resistance is happening now in Australia and around the world. We need to take urgent action to reduce antibiotic resistance in Australia.

The more we use antibiotics, the more chance bacteria have to become resistant to them.

We know that antibiotics are overused in human health in Australia. Australia is currently ranked one of the highest users of antibiotics compared to similar countries.

A growing number of infections – such as pneumonia, tuberculosis, and gonorrhoea – are becoming harder to treat as the antibiotics used to treat them become less effective.

The rise in resistant infections means that both human and animal health care professionals are left with limited, or in some instances, no available treatment options.

Even if new antibiotics are developed, without behaviour change, antibiotic resistance will remain a major threat.

Antibiotics are important medicines, however it is also important that everyone understands that they only work against bacteria. Antibiotics do not work against infections caused by a virus and will not make you feel better.

There are many things that you can do to take action. Visit the new www.amr.gov.au website to find out more information on what you can do to combat antibiotic resistance in Australia.

The website has information for various audiences including:

- General public
- Animal owners
- General practice
- Hospitals
- Aged care
- Veterinary practice
- Agriculture and industry

We encourage all Australian's to get involved in our efforts to reduce antibiotic resistance in Australia.

Dr Tony Hobbs, Acting Chief Medical Officer
Dr Mark Schipp, Chief Veterinary Officer

Pastoral market update

Live Cattle Exports via Darwin Port – NOVEMBER 2017

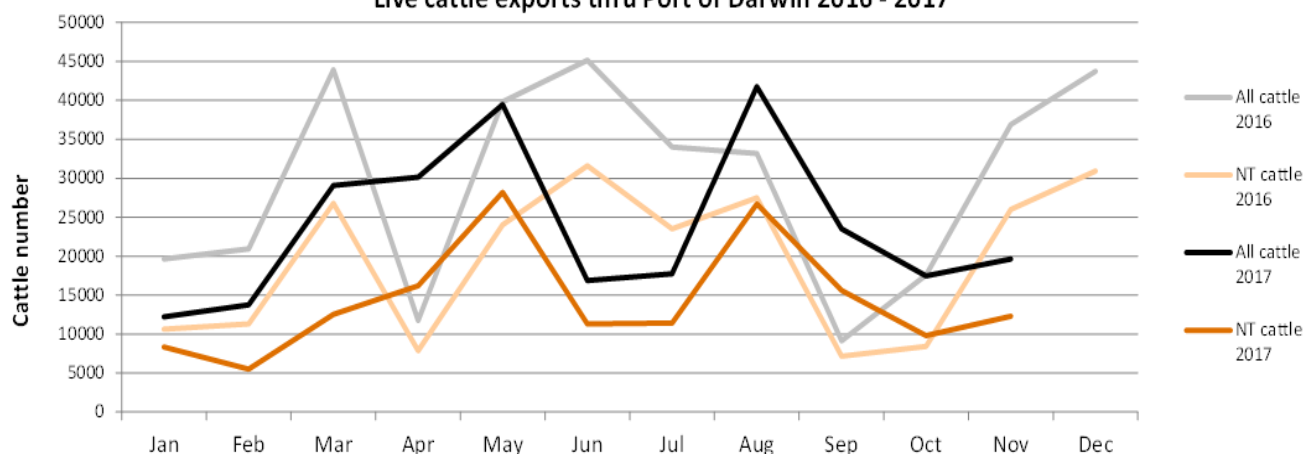
Please note: figures are for cattle exported through the Port of Darwin only; some NT cattle are exported through interstate ports.

Destination	Export of ALL CATTLE (including interstate) from Darwin Port							Export of NT CATTLE from Darwin Port (estimate only)						
	2015	2016	Last year to 30/11/16	YTD to 30/11/17	Nov	Last month	Difference	2015	2016	Last year to 30/11/16	YTD to 30/11/17	Nov	Last month	Difference
Brunei	4,122	3,379	3,379	2,793	900	0	900	2,069	2,314	2,314	1,701	563	0	563
Indonesia	341,759	296,230	257,176	206,529	13,381	12,886	495	197,155	195,037	167,426	123,646	8,377	7,216	1,160
Philippines	23,611	4,697	4,697	0	0	0	0	13,559	3,236	3,236	0	0	0	0
Sabah	0	0	0	2,640	1,140	0	1,140	0	0	0	1,680	714	0	714
Sarawak	300	1,220	1,220	2,138	0	1,798	-1,798	0	843	843	1,189	0	1,007	-1,007
Malaysia	11,503	10,959	10,959	12,557	1,623	1,693	-70	7,499	7,476	7,476	7,671	1,016	948	68
Vietnam	100,119	36,405	31,737	34,085	2,572	1,092	1,480	63,998	24,783	21,483	21,327	1,610	612	999
Egypt	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thailand	6,154	0	0	800	0	0	0	3,610	0	0	535	0	0	0
Cambodia	0	2,766	2,766	0	0	0	0	0	1,936	1,936	0	0	0	0
TOTAL	487,568	355,656	311,934	261,542	19,616	17,469	2,147	287,892	235,625	204,714	157,750	12,280	9,783	2,497

November at a glance

- 19,616 cattle through the Darwin Port during November; 2,147 more than last month and 17,284 less than in November 2016.
- 12,280 NT cattle through the Darwin Port during November; 2,497 more than last month and 14,267 less than in Nov 2016.

Live cattle exports thru Port of Darwin 2016 - 2017



Destination	Buffalo		Goat		Camel	
	YTD	Nov	YTD	Nov	YTD	Nov
Brunei	148	0	0	0	0	0
Indonesia	1,229	434	0	0	0	0
Philippines	0	0	0	0	0	0
Sabah	125	125	0	0	0	0
Sarawak	0	0	0	0	0	0
Malaysia	4,406	435	0	0	0	0
Vietnam	3,074	0	0	0	0	0
Egypt	0	0	0	0	0	0
Thailand	0	0	0	0	0	0
Cambodia	0	0	0	0	0	0
TOTAL	8,982	994	0	0	0	0

NSW	277	15,934
QLD	11306	134,474
SA	2618	60,968
VIC	2320	11,408
WA	1912	30,737
Total	18,433	253,521

NATIONAL CATTLE PRICES

www.mla.com.au/prices-and-markets

CURRENCY EXCHANGE RATES

www.oanda.com/currency/converter

Total Cattle, Port of Darwin								NT Cattle, Port of Darwin							
2009	2010	2011	2012	2013	2014	2015	2016	2009	2010	2011	2012	2013	2014	2015	2016
347,314	295,605	269,617	246,990	359,616	493,958	487,568	355,656	304,818	272,749	253,797	234,249	308,784	324,477	287,892	235,625

Want to find more information?

NT.GOV.AU

Keep up to date with the latest information from the NT Department of Primary Industry and Resources

You can find hundreds of publications on our website. Check our publications page to search for information sheets and agnotes.

Can't find what you are looking for? Drop us an email and we will help you out.

Subscribe to our newsletters, Top Paddock, Katherine Rural Review, Animal Health eNews to catch up on what we are doing, subscribe online here:

dpiir.nt.gov.au/primary-industry/primary-industry-publications/regional-newsletters

Our YouTube channel has a selection of "how to" videos on practical topics such as stock handling, grafting mangoes and date pollination. There are technical videos looking at measuring nitrous oxide emissions through to research updates.



Contact us:

Website: www.dpiir.nt.gov.au

YouTube: www.dpiir.nt.gov.au/youtube

Email: horticulture@nt.gov.au

Newsletter Survey

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

How do you want your newsletter, monthly, quarterly on demand.... The Department of Primary Industry and Resources (DPIR) is conducting a survey to better understand the needs of agricultural producers in how they access information.

The aim of the survey is to identify preferred timing and channels to allow researchers and extension staff to have a more targeted approach to delivering products and information.

The survey can be found at <https://www.surveymonkey.com/r/GTYGRWQ>

Calendar of Events

19/02/2018
14/03/2018
8/11/2018

NGIA national conference
Citrus 2018 Market Outlook Forum
2018 Melon conference