Top Paddock

DEPARTMENT OF **PRIMARY INDUSTRY AND RESOURCES**

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Message from the editor

Top Paddock is full to overflowing this issue.

Mangoes are in full bloom, there is a lot happening in horticulture, biosecurity, pastures and livestock.

Cheers

Chelsea Moore

Editor

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Nearly three million Northern Territory citrus fruit harvested and sold interstate

Figure 1. Citrus property inspection

At the close of their harvest season in March 2019, a citrus farmer in Katherine, Northern Territory (NT), had sent close to three million pieces of citrus to interstate markets. The total value of the crop of eureka lemons and flame, red flesh grapefruit was just over $1 million.

With citrus canker detected in the NT, stringent movement and quarantine restrictions are in place to stop the disease spreading interstate. Commercial farmers wanting to sell their fruit outside of the established control areas must ensure farm biosecurity processes are followed including ensuring that fruit is treated with a sodium hypochlorite solution, and that inspections and audits are undertaken and certified.

During the recent harvest period, a lemon and grapefruit grower in Katherine required:

- 26 visits to the fruit packing buildings by NT plant biosecurity officers
- 64,170 pieces of fruit being individually checked for symptoms of citrus canker
- 34 plant health certificates being issued.

Prior to the harvest season, this farm also underwent:

- four separate inspections of a sample of 800 citrus trees to check for signs of citrus canker
- an audit of the farm's processes and its ability to meet the stringent quarantine requirements
- certification that the property has no citrus canker (i.e. certificate of property freedom)

These checks, audits and processes were agreed by all Australian state and territory governments to protect Australia's $798 million citrus industry from citrus canker.

The NT Government has worked with the citrus industry to help farmers access fruit markets while the movement and quarantine restrictions are in place. This has included work to get agreement from all Australian state and territory governments on the additional checks, audits and processes for sending NT citrus fruit interstate.

The NT Government is also waiving fees for the additional quarantine inspections and audits needed by commercial growers.

Figure 2. Biosecurity signs at citrus properties to reduce risk.

Plant biosecurity officers, based in Katherine and Darwin, are also working closely and collaboratively with commercial citrus growers to ensure compliance with the biosecurity measures and access to interstate markets. Nutrano general manager Joshua Clementson says he values the commitment of the NT Government in ensuring market access for his fruit.

“We’re impressed that despite the NT having a biosecurity incursion that is devastating for our citrus industry – that with careful management and shared responsibility in the Katherine region we are able to make great returns this season.”

Procedures for interstate movement of kaffir lime leaves

Figure 3. Inspecting a Kaffir lime leaf for domestic markets.

The Territory's kaffir lime leaf growers can resume trade and movement of their crop following approval of procedures for the accreditation, treatment, packaging and movement of kaffir lime leaves. Kaffir lime leaves are harvested year-round, and the estimated annual value of the lime leaf sector in Darwin is $250,000.

Since the introduction of movement and quarantine measures to control the spread of the citrus canker disease, kaffir lime leaf growers have been unable to send their leaves to interstate markets, where the demand for the NT grown leaves is high.

While a protocol for moving citrus fruit from the NT was agreed in July 2018, it has taken longer to get agreement on procedures for moving kaffir lime leaves.

The NT Government has been working closely with growers, industry and interstate governments to develop procedures for moving kaffir lime leaves.

Citrus leaves have a different risk profile than citrus fruit for the potential spread of citrus canker, and there is no agreed international standard for the movement of citrus leaves from citrus canker control areas.

Figure 4. Kaffir lime leaves inspected, boxed and ready to head south.

Under the new procedures, a kaffir lime leaf farm must be accredited as being free of citrus canker, regularly monitored for the citrus canker disease and citrus leaf miner pest, and leaves must be soaked in an antibacterial solution before being packed. NT Government plant health inspectors will also randomly sample and inspect a large number of leaves before they are shipped to certify that all required procedures have been followed.

Agreement to the procedures is a huge relief for kaffir lime leaf growers, who were advised of the news by Dr Anne Walters, Chief Plant Health Inspector, in April 2019.

In brief: Citrus canker detected in Karama; restricted area declared

A restricted area (RA) has been declared in Karama after citrus canker was found on a lime plant in the northern suburb. The RA has been declared to prevent spread and support eradication of the bacterial disease which has serious impacts on citrus production. Citrus canker does not pose any risks to human health.

It is the 13th citrus canker restricted area to be declared in the Northern Territory since April 2018. Maps of all restricted areas in the Territory are available on the Northern Territory Government website.

Read the full news article for more information on the new detection.

Gamba grass grazing trial at Douglas Daly Research Farm

Tim Schatz – NT DPIR

Figure 5. Gamba grass in full flower

Gamba grass is a perennial tussock grass that was introduced to Australia as an improved pasture species but is now listed as a Weed of National Significance and is spreading throughout northern Australia. It grows rapidly during the wet season and when ungrazed or grazed with set-stocking becomes tall and unpalatable to cattle and other herbivores. As a result other grasses get grazed selectively which can cause gamba grass to dominate.

Gamba grass grows into large tussocks (up to 4 m tall) and the high biomass (up to >20t/ha) compared to native species (<6t/ha) which significantly increases fuel load for fires. It also matures later in the dry season compared to most native species and these changes in timing and quantity of fuel load can result in significantly hotter wildfires than those fuelled by native grass species. This can result in long-term environmental impacts through habitat change. Intense gamba grass fuelled wildfires are also a significant danger to livestock, native animals, people, buildings and property. Gamba grass has already spread through large areas on the northern NT (estimated 10-15,000 km^2) including many areas that are difficult to access. Eradication is not likely and chemical control is difficult and expensive. Therefore better ways to manage gamba grass are required. Also, while unmanaged gamba grass is a problem, many cattle graziers view it as a valuable pasture. When gamba grass is grazed with traditional methods (e.g. set stocking) it grows so rapidly that it quickly becomes tall and unpalatable and subsequent growth rates of cattle grazing it have been poor. However there are anecdotal reports that intensive rotational grazing results in better livestock productivity and may also have potential for controlling growth, seed production, spread, and reducing fire hazard, delivering a ‘win/win’ control option for graziers and the environment.

A new trial at Douglas Daly Research Farm (DDRF) began in late 2018 and aims to investigate how to use rotational grazing to control gamba grass whilst achieving good animal production outcomes. The trial aims to keep gamba grass short so that it doesn't become a fire hazard, or seed prolifically and spread. At the same time keeping it short will keep it palatable and nutritious for cattle and so should increase the cattle production from paddocks infested with gamba grass. Some commercial cattle producers have rotationally grazed gamba grass previously, but there does not seem to be any publically available objective data on cattle performance that other producers can use to decide whether to adopt such a strategy. This trial aims to provide this information.

An area of 180 ha at DDRF that has been infested with gamba grass is being used for this trial. This area used to be one of the worst on the property for cattle production due to the tall rank tussocks of gamba grass that dominated the area. Recently it was subdivided into five smaller paddocks (20-38 ha) to enable rotational grazing. A large mob of 360 cattle rotationally graze the five paddocks with the aim of keeping the grass short and palatable, and then giving it time to recover before grazing it again.

The overall stocking rate over the trial area of 180 ha is two head per ha. However, when the mob of cattle was in one of the small paddocks the grazing density in the paddock at that time ranged from 9.5 to 18.5 head per ha depending on the size of the paddock (see Table 1). The mob of cattle stayed in a paddock for between two and six days depending on how the pasture looked. Some of the paddocks were burnt in November 2018 to try and remove the old rank tussocks before grazing commenced about six weeks later. The wet season began (two inches of rain received within two weeks) at DDRF on 15 November 2019, which was about two weeks later than the average.

Table 1. The paddock sizes and stocking densities in the DDRF Gamba trial.

Paddock	Area (ha)	Number	Stock density (head/ha)	Notes – pre 2018/19 wet season
Hazels	38	360	9.5	Half burnt in Nov 2018. Not cleared.
Shottons	25	360	14.4	Burnt in November 2018
Hauslers	36	360	10.0	Quite a bit of Wynn cassia
Front of Hay	19.5	360	18.5	
Parkers	34	360	10.6	Not cleared
Gamba	27	360	13.3	
Total	179.5	360	2	

Results from the first wet season: Rotational grazing successfully kept the gamba grass short and palatable over the 2018/19 wet season and reduced seeding (very few seed heads were visible at the end of April). The growth of cattle was much better than it was previously in this area. Between 18 December 2018 and 14 March 2019 (86 days) the average daily gains of the different classes of cattle grazing the area were: number 17 heifers 0.89 kg/day, number 17 steers 0.71 kg/day, and number 18 entire males 0.58 kg/head per day. As a comparison number 17 steers grazing improved Buffel pasture put on 0.90 kg/day during this time. The average weights of the three classes of animals over the period are shown in Figure 1. Interestingly older animals performed better than younger ones, and this is consistent with anecdotal reports of cattle performance on gamba grass in South Africa (P Conradie *pers. comm.*). From 18 December 2019 to 9 May 2019 on average the number 17 heifers put on 110 kg, the number 17 males put on 92 kg and the number 18 males put on 78 kg. These figures do not represent the total growth over the wet season as the cattle did not start grazing the gamba grass until 18 December 2018 (about a month after the season

broke). It should also be noted that the 2018/19 wet season started about two weeks later than normal and that total rainfall was well below average (980 mm to the end of April), so it will be interesting to see what performance is like in a year with higher rainfall.

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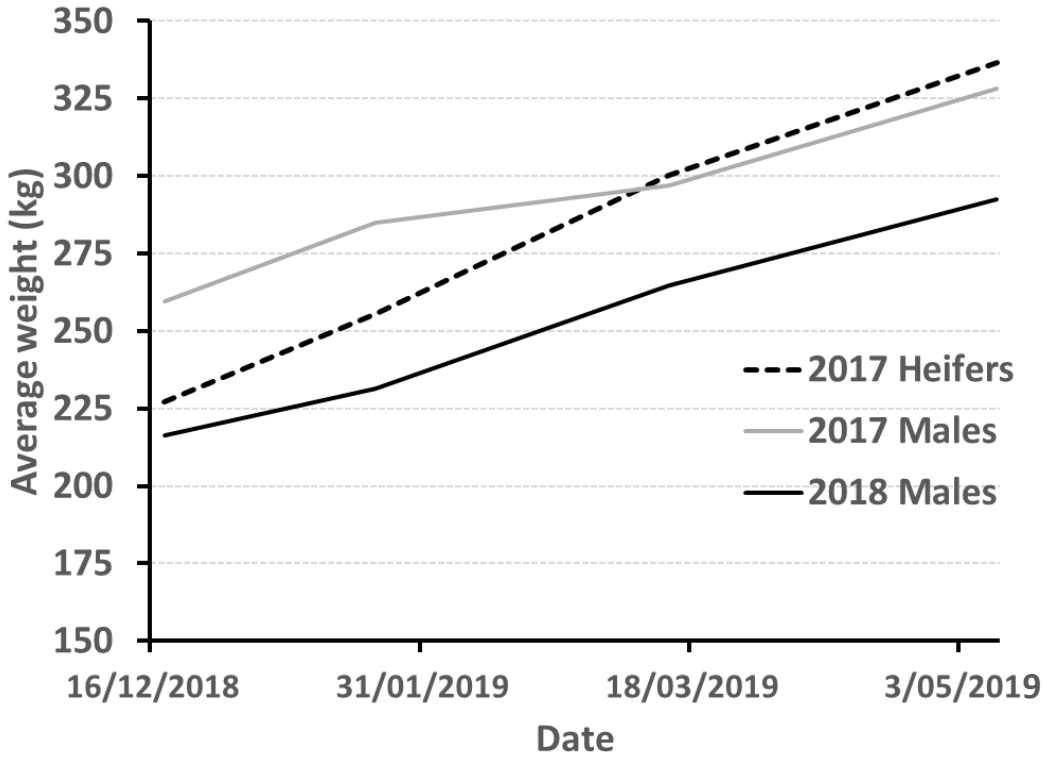

Figure 6. Average weight change of 3 classes of cattle grazing gamba grass at DDRF

This trial aims to develop and demonstrate a grazing strategy that controls gamba grass (limits its growth and spread) and increases the growth rates of cattle grazing country already infested with gamba grass. If the strategy is shown to be effective and profitable then it is likely to have a high adoption rate among northern cattle producers with gamba grass on their properties. This would be a win/win for the environment and cattle producers.

For more information on the trial contact:

Tim Schatz

E: tim.schatz@nt.gov.au

Groundwater update from Department of Environment and Natural Resources

You might have heard that groundwater levels in Darwin's rural area are lower than average for this time of year and some groundwater systems are extremely low. We know this from government monitoring bores.

Across the region, government monitoring bores all tell a similar story of aquifers sitting well below their average. The poor wet season means that aquifers and water levels have not been topped up and individual bores in the Darwin rural area may be facing some water shortages come the middle of the dry season.

Darwin's rural area has been through poor wet seasons before, but this one was different. The last time we had this sort of wet season was back 1991/92, when there were around 1500 bores, now there are around 5000 bores. Back then there wasn't this level of development, there's a lot more users in the systems now and we're seeing much greater levels of decline in groundwater. The Territory Government's prediction is that groundwater levels will fall to record low levels this year.

This is also off the back of a series of poor wet seasons during which aquifers did not recharge.

What does this mean for growers?

Growers in the Berry Springs, Middle Point and Lambells Lagoon areas are at the greatest risk of bores running dry. Water levels are at critical levels and there is a real urgency to reduce water use. Farmers are strongly encouraged to find efficiencies where they can so they can still bring their crops through to market.

It is recommended that you can:

- check your irrigation system - fix any water leaks;
- check your irrigation scheduling and if possible water at cooler times of the day, like at dusk or dawn;
- monitor your water quality (as water levels decline, quality may change or become un-useable)
- service and monitor your bore for signs of failure
- keep informed using the information at www.denr.nt.gov.au/darwin-rural-groundwater-watch

Government agencies are working together and with NT Farmers regarding improved advice to growers in these regions.

Irrigation in a drier than average year- what to be aware of

Figure 7. Irrigating crops at Katherine Research Station

This article was published in a previous edition of Top Paddock.

In the Northern Territory (NT) 90 per cent of the fresh water supply comes from groundwater. As detailed in the groundwater update, the NT Government has predicted record lows for some aquifers this year. Here are a few things to bear in mind:

1. **Use water wisely.**

Being careful with water can extend its availability. Check your irrigation and fix leaks to reduce water wastage. Consider the crop water usage when planning your dry season crops.

Know how much your plants are using and which ones can have their water reduced. Mangoes have a system where partial root zone dryness sends signals to the plant to close stomata and reduce water loss. Sapindaceae (rambutan) lack this signal and do not respond the same way to soil dryness.

2. **Know your bore**

Specifically - what the groundwater level depth is in relation to where your bore screens are. Bores may start to take in sand and silt causing bore failure, make sure you clean and maintain your pump.

3. **Watch out for salinity**

When aquifer levels get low some systems (Lambells Lagoon and Middle Point) are potentially at risk of salt water intrusion into the groundwater. If your orchard is in either of these aquifers, keep an eye on your salinity levels, the level of salt in water affects how suitable it is for irrigation. Read the Agriculture Victoria information sheet on measuring the salinity of your water and what it means in an agricultural context. Monitor the pH and electrical conductivity/salinity levels in your water and keep track of how your water quality is tracking over the dry season. There are relatively cheap hand held meters growers can buy (Hanna or Eutech Instruments) as well as pH strips (like pool shop ones).

The following table from the United Nations Food and Agriculture Organisation (FAO) crop salt tolerance data lists some generic salt tolerances for different crops that can be used as a guideline, noting that varieties, rootstocks etc can change these figures.

Crop	Threshold ECe (dS/m)	Rating
Asparagus	4.1	T
Banana		S
Cucumber	2.5	MS
Date	4.0	T
Eggplant	1.1	MS
Fig		MT
Grapefruit	1.2	S
Lemon	1.5	S
Lime		S
Mango		S
Okra		MS
Papaya		MS
Passionfruit		S
Peanut	3.2	MS
Pineapple		MT
Pumelo		S
Sorghum	6.8	MT
Soybean	5.0	MT
Sweet potato	1.5	MS
Tomato	2.5	MS
Watermelon		M
Zucchini	4.9	MT

Where T- tolerant, MT –Mildly Tolerant, MS- Mildly Susceptible, S- Susceptible,

Where can I get more information?

For agronomic advice, contact:
Matt Hall
P: 0422 938 529; **E:** horticulture@nt.gov.au

NT Farmers can provide advice and representation for producers, contact them on 08 8983 3233.

For Department of Environment and Natural Resources publications on water, water licencing information, or to contact the department's Water Resources Division visit:

- DENR Water Licencing Portal
- Darwin Rural Groundwater Watch;
- DENR water publications page

P: 08 8999 4455; **E:** waterresources@nt.gov.au

Mango leafhopper vs. planthopper

Figure 8. Leafhoppers, plant hoppers, leafhoppers, flatids….. if you are confused about these mango pests then you're not alone.

As mango flowering season shifts into full gear, it is especially important for growers to monitor for pests in their orchard. Two important sap sucking insects on mango are leafhoppers and planthoppers, also known as flatids. Many mango growers struggle to tell the difference between the two. For an up close view of the differences, watch the DPIR YouTube video.

For information on insect pests you can visit the NT insects database, or flip through our field guide to pests, beneficials, diseases and disorders or mangoes.

To speak to someone about management strategies, contact the entomology branch on 08 8999 2258, or email them at insectinfo@nt.gov.au.

In brief: Hemp Bill introduced into Parliament

On 16 May 2019 the Hemp Industry Bill was introduced into Parliament. The Bill puts forward a framework to regulate the development and operation of an industrial hemp industry in the Territory. Industrial hemp plants differ from regular hemp species in that they contain very low levels of tetrahydrocannabinol (THC). If consumed foods and products made from industrial hemp have no psycho-active effects on individuals.

Hemp fibre has been used for manufacturing of textiles, ropes and lines, paper and building materials and its grain is a highly nutritious food source, either as a whole grain, an emulsified cake, flour, or pressed oil.

Read the full news article for more information.

The effect of insecticidal fly tags on cattle liveweight gain in the Douglas Daly region

Figure 9. Cattle with insecticidal fly tags.

T Schatz , A Feez[B], M Hearnden and C Heeb

Northern Territory Department of Primary Industry and Resources; [B]Y-Tex Corporation.

Introduction

Buffalo flies can cause irritation to cattle resulting in reduced growth although the response to control measures in northern Australia has been variable (Bean *et al.* 1987). An experiment was conducted at Douglas Daly Research Farm, NT, to determine the effect of a new type of insecticidal fly tag (development tag number YT1625) on growth. The tags are a sustained-release, plastic ear tag containing a synergized formulation of Zetacypermethrin, an enriched S-isomer pyrethroid compound and Abamectin (made by Y-Tex), which have not previously been used in combination on cattle.

Materials and methods

On 14 November 2018, 118 one year-old Brahman and Brahman cross bulls (average weight = 153 kg) were weighed and randomly allocated (stratified for weight) to either a CONTROL (n=59) or TAGGED (n=59) treatment group. Weight was recorded again the following day after an overnight curfew with no feed or water and the TAGGED group were each fitted with two fly tags while the CONTROL group did not receive any treatment for fly control. Each treatment group rotationally grazed a block of eight x six ha uniform paddocks of Buffel pasture in such a way that they were never in adjacent paddocks. They were moved to a new paddock every three days and both treatments were always moved on the same day. Each time the treatments completed a rotation around the block of eight paddocks they swapped blocks of paddocks so that TAGGED grazed the paddocks that had previously been grazed by CONTROL and vice versa. Both treatments had *ad libitum* access to mineral lick blocks and were managed in the same way throughout the study except for the fly tag treatment.

The cattle were weighed after an overnight curfew on 8 March 2019 (after 16.1 weeks) and without a curfew on 9 May 2019 (after 25.1 weeks) although the tags only have an approved control period of 16 weeks. Liveweight gain (LWG) was calculated using curfewed weights for the 16.1 week period and un-

curfewed weights for the 25.1 week period. The average (LWG) of the two treatments over these periods was compared using a linear model adjusted for the initial weight covariate.

Results and discussion

After 16.1 weeks the average LWG of the TAGGED group was 9.8 kg more than CONTROL ($P<0.001$) so the growth rate was 0.085 kg/day higher in TAGGED. LWG was 16.7 kg (0.095 kg/day) higher in TAGGED ($P<0.001$) over the extended 25.1 week period. This was similar to the increase in LWG as a result of repeated spraying with insecticide reported by Bean *et al.* (1987) where treated cattle gained 14.7 kg more over 24.1 weeks (ie. 0.087 kg/day), and less than the 33 kg increase in LWG over 19 weeks (0.247 kg/day) from using diazanon ear tags reported by Spradberry and Tozer (1996).

The increase in LWG of 16.7 kg found in this study was worth $48.43/head at the current cattle price of $2.90/kg. The cost of the fly tags was $7 per head so the return on investment from the TAGGED treatment was 692 per cent assuming that the difference in weight gain persists through to the time of sale.

References

Bean KG, Seifert GW, MacQueen A, Doube BM (1987) *Aust. J. Exp. Ag.* 27, 329–334.

Spradbery JP, Tozer RS (1996) *Aust. Vet. J.* 73 (1), 6-11.

Tomorrow's agricultural science leaders: students benefit from mango project

Tony Asis, NT Department of Primary Industry and Resources and Dave Rowlings, Queensland University of Technology (Mango Project)

The More Profit for Nitrogen (MPfN) project provides a valuable opportunity for university students to have a hands on experience in tropical horticultural research. This is critical to producing future science leaders with experience in tropical production systems.

The Department of Primary Industry and Resources (DPIR), has been hosting students in collaboration with Queensland University of Technology (QUT) and Charles Darwin University (CDU). The MPfN project currently engages with Raj Pandeya, Benjamin Vickey and Dakshina Yadav.

Raj Pandeya is a PhD student whose project, funded by the MPfN project, is looking at the effect of fertiliser application on mango leaf litter dynamics. The study aims to determine the nitrogen supply, timing and interaction effects of leaf litter decomposition and urea fertiliser on N_2O and CO_2 emissions in tropical mango growing soils. The study was conducted at Katherine Research Station and Coastal Plains Research Station in Darwin. Currently, Raj is conducting laboratory experiments to evaluate the soil nitrogen mineralisation and availability as influenced by temperature and moisture content using the soil samples from several mango orchards in the NT.

Ben Vickery's Honours study focuses on understanding carbon dynamics of mango soils in the NT. He aims to examine soil carbon changes between a native vegetation and an agricultural mango orchard. Understanding the effects of land-use change is important for maintaining healthy soil while minimising the effects of climate change. Conversion of forested land for agricultural purposes is responsible for 12-15% of human induced carbon emissions. From 30 April to 11 May, Ben will collect soil samples from selected mango orchards in the Darwin and Katherine regions of the NT.

Dakshina Yadav is assisting MPfN project staff in the field experiments at Coastal Plains Research Station. Through this work experience, she is gaining knowledge on biosecurity, field work health and safety, material and data collection, methods for processing soil and plant material and ample preparation. It also provides opportunities for her to network with professional and technical staff of the department, attend seminars and meetings while in the workplace.

Getting students to generate rather than just consume knowledge is a way to relink teaching and research. Students are professionals of the future and engaging them in research enables the students to inquire and critically evaluate knowledge and make an original intellectual contribution to the discipline.

Figure 10. (from top to bottom) Raj Pandeya is analysing soil samples from mango orchards in the NT. Ben Vickery is preparing chemicals for soil analysis. Dakshina Yadav is measuring chlorophyll content of mango leaves.

Understanding mango flowering in Darwin

Figure 11. Mangoes flowering in the Darwin rural region.

Researchers have been studying flowering in mangoes in the Northern Territory (NT). The goal is to develop ways to extend the harvest window for fruit, which currently is only five to seven weeks.

Understanding flowering is an important management tool for growers in the NT, particularly the Darwin region. When it comes to domestic mangoes, Darwin has the earliest harvesting region in Australia, with

premium prices reflecting the demand for the fruit. It also has a significant overlap with the Katherine season when peak supply can create logistic issues through increased and competing demand for harvest workers and refrigerated trucks. Being able to manipulate the timing of the crop would improve harvest and packaging efficiencies, boost overall profitability, and better allow the development of an export industry.

When it comes to flower manipulation in the Darwin region there are a few key components to be aware of.

1. **Cooler night-time temperatures are critical**

There are a lot of chemicals that have been trialled as a quick fix to promoting flowering. However the effectiveness of chemicals varies greatly depending on temperature, pH and night or day application.

The critical night temperature for flower induction is >18°C for 4-5 days.

The arrival of high-pressure systems can be anticipated by viewing the Bureau of Meteorology website (www.bom.gov.au/australia/charts/indian_ocean.shtml). The appearance of a high-pressure system off Perth results in cooler temperatures in Darwin (>18 °C) five to seven days later.

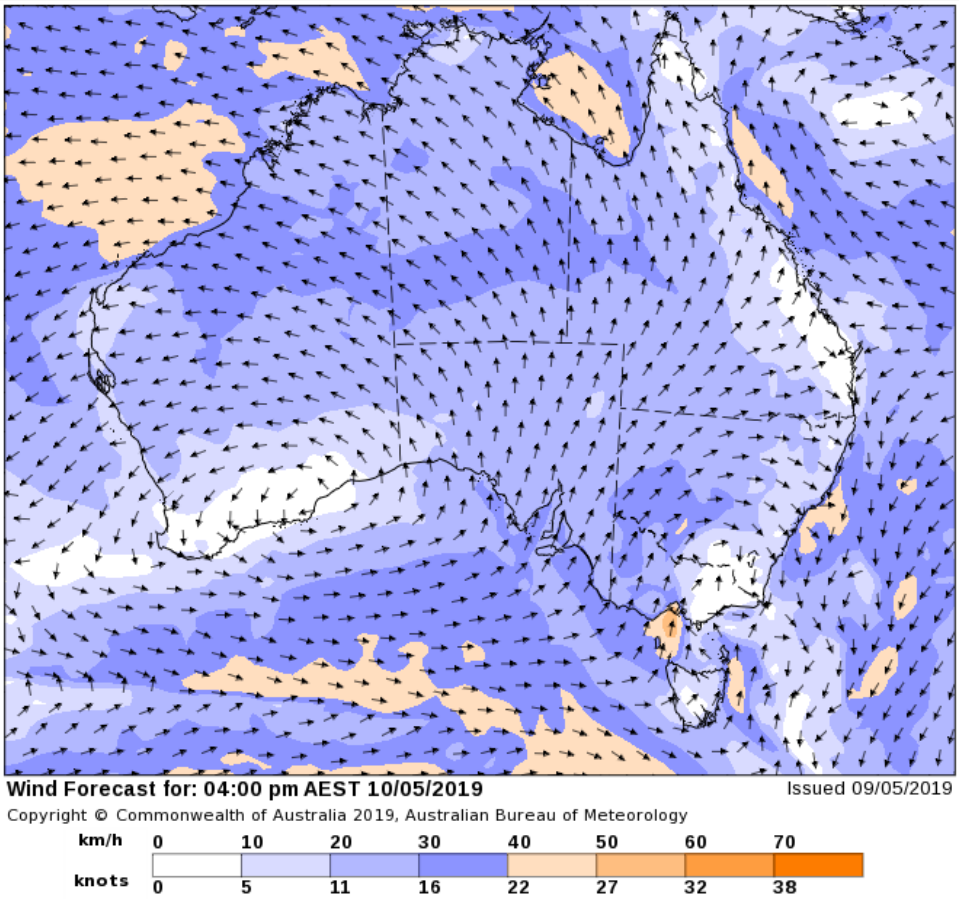

Figure 12. Wind map of Australia for 15 May 2014 showing the south-easterly winds. Wind strength is proportional to the size of the arrow and indicates the direction of air flow. The high-pressure system is in white and with low wind speeds. Wind spirals outward counter clockwise (source: www.bom.gov.au/marine/wind.shtml).

2. **Growth regulators help reduce vigour and promote mature leaf development**

Mature leaves are an important part of the flowering system in mangoes trees. These leaves generate the signal to switch the plant from vegetative flush to flowers. Tip pruning experiments have shown that leaves need to be mature and "crunchy"; at least five weeks old.

Paclobutrazol can delay vegetative flushes and promote the development of mature leaves in mangoes.

In an aeroponic system paclobutrazol starts affecting the roots and shoots within 12 hours to 24 hours. In an orchard situation paclobutrazol is applied months before flowering. Given the speed of its uptake the timing of application needs to be studied further.

3. **Potassium Nitrate (KNO_3) is effective at promoting floral buds when timed correctly.**

Several chemicals were tested for their ability to trigger flowering, potassium nitrate was the most effective product registered for mangoes. When weather conditions are unfavourable, the effect is weak, however when the temperatures drop to >18°C they become more effective. This is because potassium nitrate does not initiate flowering, rather it promotes the development of buds (bud break). At this point in development the bud can become either leaves or flowers, the determining factor is temperature. If temperatures are not cool enough (over 18°C), the buds will become vegetative growth instead of flowers. Of note, the uptake of potassium nitrate by the mango leaf occurs most efficiently at night.

Effective application of KNO_3 should occur at night time in the days leading up to sub 18°C temperatures.

Key points

Manipulating mango flowering in the Darwin is possible based on a set of key processes that have to be timed appropriately for maximum effect. Temperature is critical, without low temperatures the system described above fails. Leaf maturity and irrigation are important to ensure the plant is actively growing and ready to push buds. KNO_3 is a useful promoter in the right circumstances, but does not trigger flowering in its own right.

Figure 13. Flower manipulation in Darwin flow chart.

For further information contact:

Dr. Cameron McConchie

P: 08 8999 2310; **E:** horticulture@nt.gov.au

New resources available for managing soil erosion

Figure 14. Sheet and gully erosion requiring management intervention. Photo: Caz Pettit DPIR

Soil erosion has several negative impacts on the productivity and management of pastoral land. Some of these include reducing the amount of pasture that grows, changing the composition of pastures, woody weed increases, undermining fences and other infrastructure, and increased wear and tear on vehicles.

Two publications on managing erosion have recently been released. The concepts and management options described in these are highly relevant for NT cattle producers.

The first, published by the Burnett Mary Regional Group in Queensland, is an excellent manual on how to prevent, manage and rehabilitate gully erosion. It contains clear descriptions and photos and includes on-ground case studies from several properties.

The second publication 'Managing Outback Roads' aims to reduce the environmental impacts of erosion, the money spent on road maintenance and wear and tear on vehicles. The manual has been developed by the South Australian Arid Lands Natural Resource Management Board, Cape York Natural Resource Management, Western Local Land Services, Rangelands Natural Resource Management and Territory Natural Resource Management (TNRM). Several of the authors have considerable experience in the NT and will be well-known to many readers. The book covers planning for the prevention of problems, how to build and repair roads and how to rehabilitate or close old roads that are no longer serviceable.

Download the gully erosion manual from the Burnett Mary Region Group website.

Download the Managing Outback Roads publication from the South Australian Natural Resources website.

Jackfruit, do you want fries with that?

Figure 15. Jackfruit – is it the next big thing in meat alternatives?

Matt Hall, Senior horticulture extension officer.

Interest in meat substitutes is growing as people are becoming increasingly aware of the social and environmental costs of traditional meat products. Innovative developments to improve the product qualities of cultured meats are progressing, yet there are key considerations around its acceptance with consumers which are yet to be addressed. Plant based alternatives, such as jackfruit, offer great opportunities for this growing market as they are naturally grown, have a similar texture to meat and are truly sustainable. This article lists some ideas on the potential for processing jackfruit as a meat substitute, see the full article on LinkedIn.



Northern Territory Agriculture: Pathways to Potential
2019 COTTON DEVELOPMENT WIND-UP

What's on

Come and hear how the first season went for NT cotton trials, initial commercial and demonstration crops, considerations for potential new cotton growers and recent visits to cotton growers in Brazil by NT producers.

- Take the opportunity to have informal discussions with NT producers and researchers from the Department of Primary Industry and Resources (DPIR).
- Meet other members of the NT Cotton Growers Association and find out how to sign up for myBMP.
- Hear directly from Australian Cotton Shippers Association (ACSA). Learn more about the mechanics and competitive nature of cotton marketing and where Australian cotton fits in a global sense.
- Learn about the potential of cotton by- products in relation to cotton seed, cotton meal, trash and failed crops.
- Talk to interstate cotton industry members, local and interstate cotton agronomists, and interstate producers.

View the latest cotton trials at Katherine Research Station and enjoy informal discussions with industry, local growers and researchers.

Where

Douglas Daly Research Farm

- Monday 19 August 2019
- From 1pm to 7.30pm

Katherine Research Station

- Tuesday 20 August 2019
- From 9.30 am to 1.30 pm

Afternoon tea and dinner, including beverages, on Monday 19 August, followed by morning tea and lunch on Tuesday 20 August, proudly supported by ACSA, NTFA, Cotton Seed Distributors and DPIR

Please register your expressions of interest, catering requirements and potential accommodation needs with Joy at joy.sherlock@nt.gov.au or 0436 425 441.

Australian Cotton Shippers Association

CSD

BAYER

NT FARMERS

NORTHERN TERRITORY GOVERNMENT

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PalmCow Project starts up in Indonesia

Figure 16. Bali cattle grazing amongst palm oil plants at Sumentai village.

Arthur Cameron, Principal Pastures Agronomist and Kieren McCosker, Senior Livestock Scientist

PalmCow is an international project aiming to improve small holder beef supply and livelihoods through oil palm-cattle integration in Indonesia. This project will build capacity and experience for department staff and provide insights into grazing management under forestry plantations in the NT.

The project, along with its sister project CropCow, is ACIAR funded by ACIAR and is part of a larger research program IndoBeef. The University of New England is the commissioned organisation for the IndoBeef program while the department are providing expertise in animal production and forage advice for the PalmCow project.

The NT team, Kieren McCosker and Arthur Cameron, have expertise in tropical pastures, forage and livestock research. They will be working primarily in East Kalimantan, Indonesia in the Babulu and Paser districts, looking at production systems around Brahman cross cows held breed-lots and Bali cattle in an extensive grazing system. Arthur will also be involved in forage evaluation between newly planted oil palms in the Musi Banyuasin district of South Sumatra.

To date, the three sites have been visited to prepare scoping documents. Preschedules are being developed for experiments which will be conducted. Field officers have recently been employed to work at each of the sites.

Production styles in Indonesia differ from those in northern Australia. In the Musi Banyuasin district, the extensively grazed cattle have the lead cows tethered to keep the herd together. While the feed for housed cattle is transported by motorbike as feed rolls. In South Sumatra, maize has been planted between the rows of newly planted palms as a cash crop. At this site, Cinta Damai village there were some rubber plantations. The rubber plantations are progressively being replaced by the more profitable oil palms.

Figure 17. (clockwise from top left) breed-lot at Mekar Jaya village, feed roll transported by motor bike, newly planted oil palms at Cinta Damai.

This project will build capacity in Indonesian farmers and staff to better manage oil palm–cattle integration. Department staff will gain experience of cattle production under plantations which will provide insights into grazing management under forestry plantations in the NT.

For more information on the PalmCow project, pastures or livestock research in the region contact:

Arthur Cameron;
P: 08 8999 2214 (pastures) or

Kieren McCosker;
P: 08 8973 9771 (livestock)

Northern Territory seasonal outlook

Sourced from the Australian Bureau of Meteorology (BOM)

*This seasonal outlook was correct at the time of publication. For the most up-to-date seasonal outlook, please go to the 'climate outlook' section of the BOM website.

The outlook for June to August 2019 indicates that:

- **Drier** conditions are expected across most of the NT
- **Warmer** than average days and nights are likely for almost the entire NT

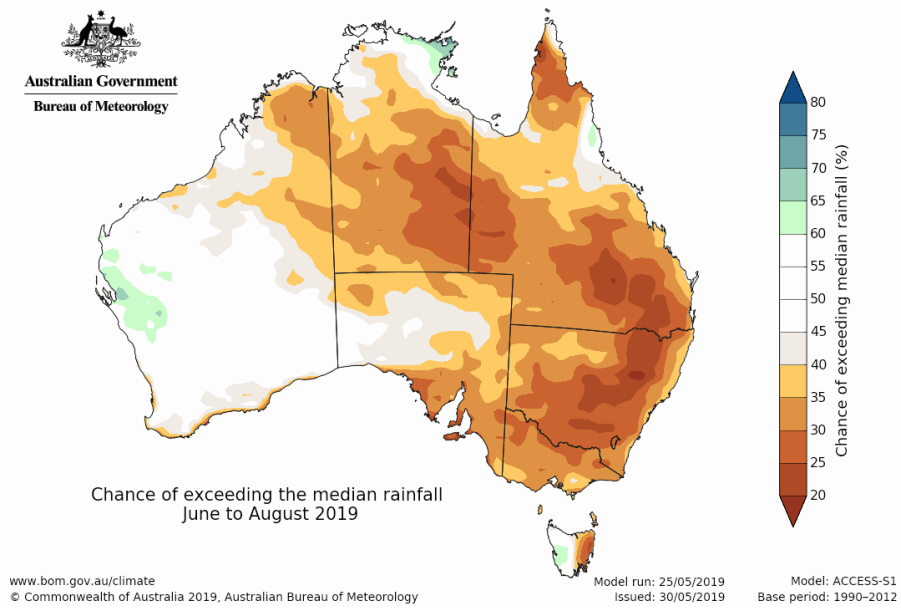


Figure 18. Chance of exceeding the median rainfall June to August 2019

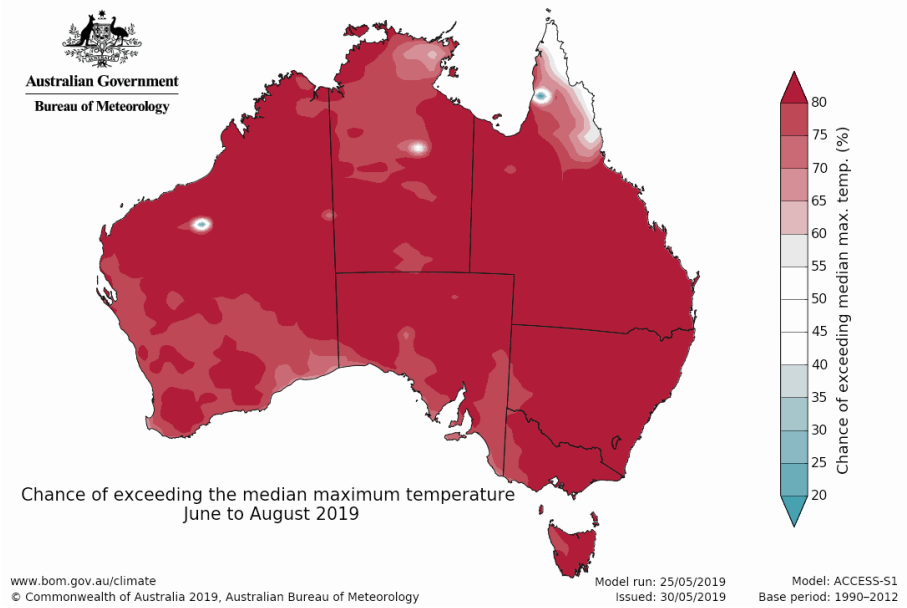
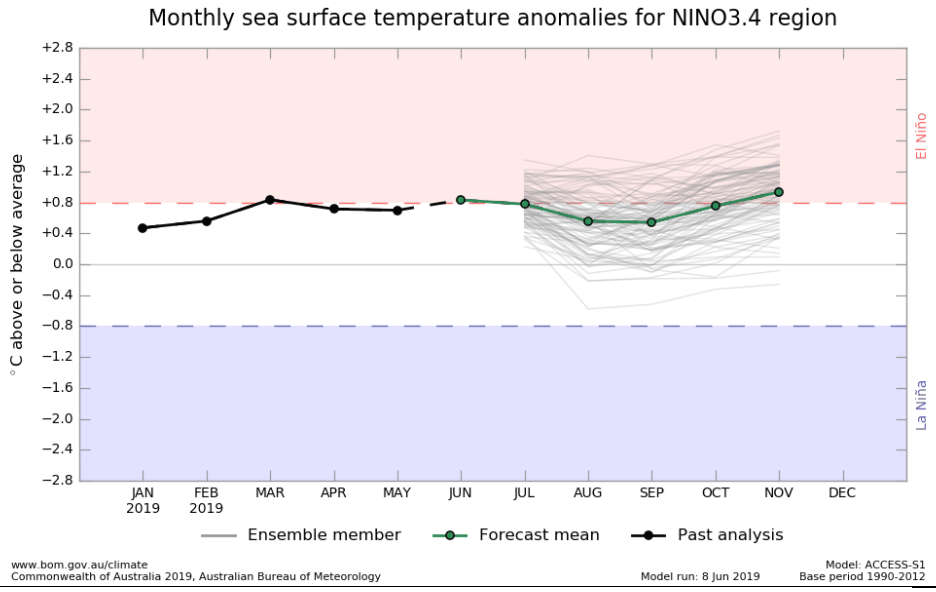
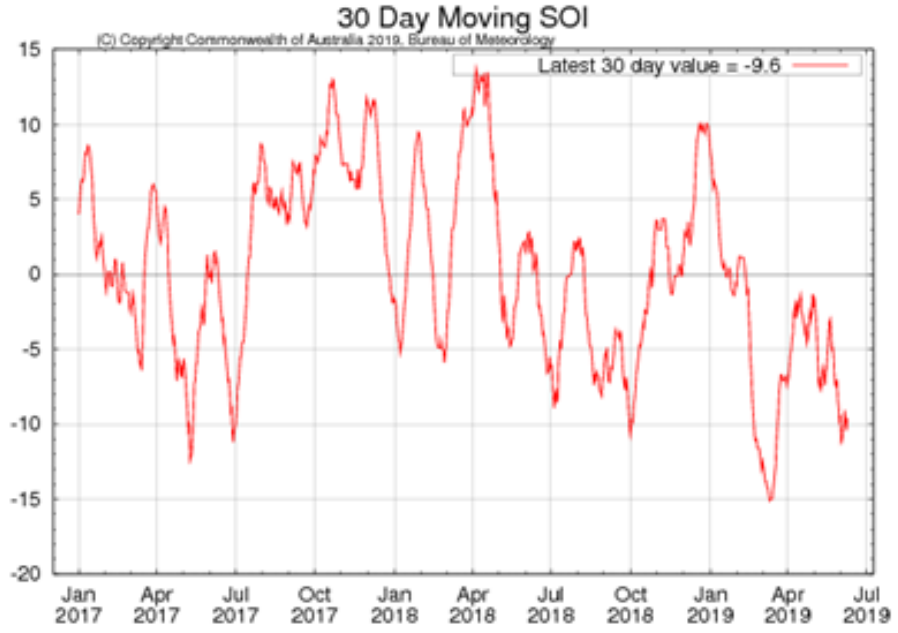


Figure 19. Chance of exceeding the median maximum temperature June to August 2019

Seasonal indicator	**Comments** (sourced from the Australian Bureau of Meteorology)
El Niño Southern Oscillation (ENSO) Bureau of Meteorology ENSO Wrap-Up Current outlook: **Neutral** ENSO status: **Watch**	**The El Niño Southern Oscillation (ENSO) is currently neutral** The tropical Pacific Ocean and atmosphere remain near El Niño thresholds, therefore the ENSO Outlook remains at El Niño WATCH, meaning there is approximately a 50 per cent chance of El Niño developing, however models indicate the tropical Pacific Ocean will ease away from El Niño levels, remaining neutral during winter. ***El Niño typically results in below-average rainfall for southern Australia during autumn and for eastern Australia during winter and spring.***

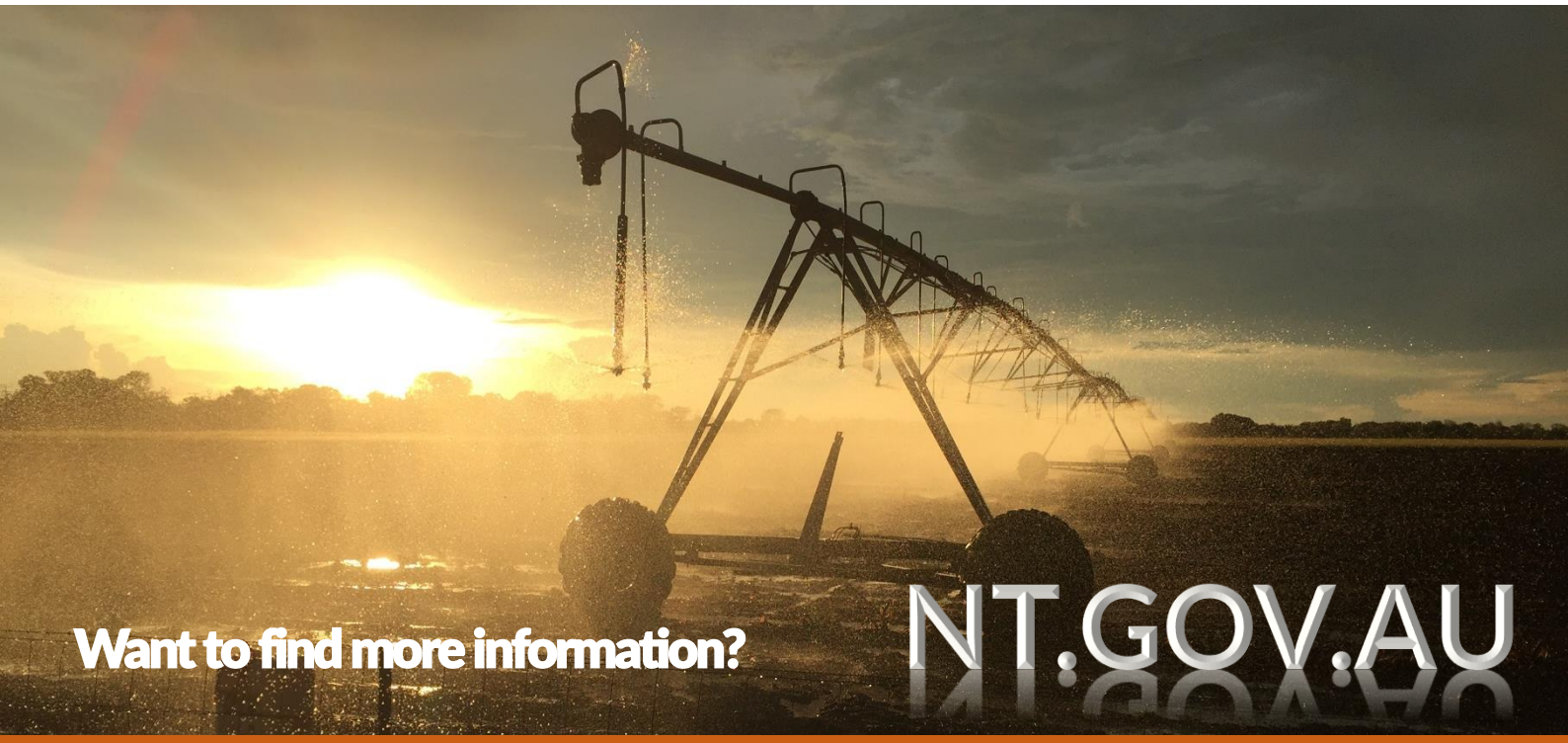
	To see larger versions of these images, go to the SOI and Outlooks tabs at Bureau of Meteorology ENSO Wrap-Up
Indian Ocean Dipole (IOD) Bureau of Meteorology ENSO Wrap-Up Current outlook: **Positive**	**Positive IOD likely for winter** Indian Ocean temperature forecasts show a positive IOD through the southern winter, which is likely to be the dominant climate driver for Australia. In the Indian Ocean, waters off Sumatra have cooled over the past fortnight, with the IOD index now exceeding positive thresholds for three weeks. All but one of the climate models suggest positive IOD values will persist through winter and into spring. To be considered a positive IOD event, positive thresholds need to be maintained for at least two months. ***Typically, a positive IOD brings below-average winter-spring rainfall for southern and central Australia.*** This is currently being reflected in the rainfall outlook for the coming months. To see larger versions of these images, go to IOD Time Series and the Indian Ocean tab at Bureau of Meteorology ENSO Wrap-Up





CALENDAR OF EVENTS

NACRA field walk	2 July 2019; Kununurra
ABARES regional outlook	3 July 2019; Darwin
Mango pre-season roadshows	7 August 2019 Katherine; 9 August 2019 Darwin
Asia Pacific food safety conference	20 August 2019; Sydney
Soil Wealth webinar: Technology for controlling weeds in vegetable production	28 August 2019; online
Rural women of the year award	11 September 2019; Canberra
TropAg	11 November 2019; Brisbane



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