

CLIMATE SAVVY FOR GRAZING MANAGEMENT

## **Barkly Tablelands & Alice Regions**



# Madden-Julian Oscillation

**What:** A large band of clouds that influence alternating wet/dry conditions during the wet/summer season. The MJO can increase the availability of moisture in the area during an MJO 'wet' phase, leading to an increased chance of rain.

**When:** Year-round, but mainly during wet season (December to April)

**Where:** All of the Barkly and somewhat into the Alice region.

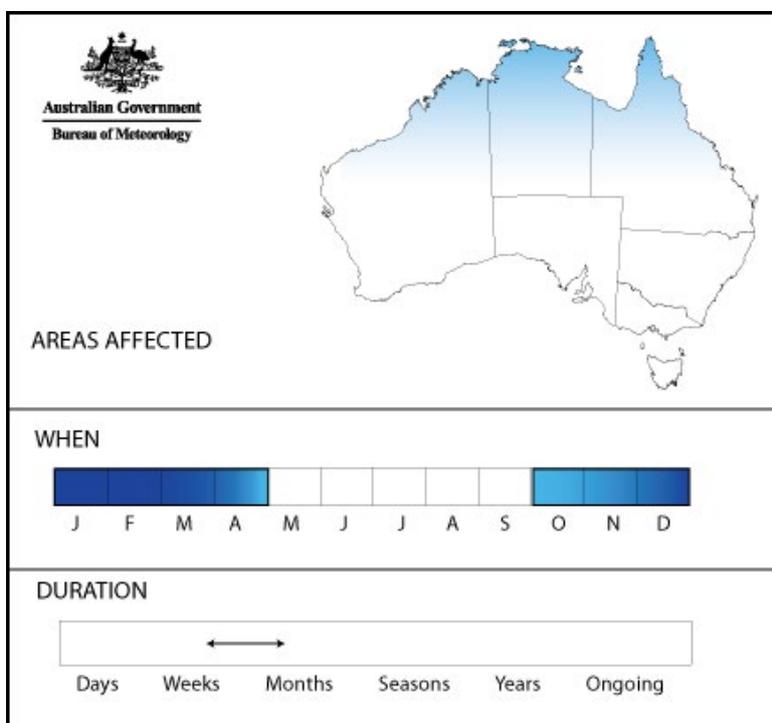
**How:** Impact varies by season and location. An active MJO in phases 5 & 6 increases the chances of a cyclone impacting this area.

Period	Wet Phases	Dry Phases
June, July, August (minimal impact)	5 (marginal)	None
September, October, November (minimal impact)	4, 5, 6, 7	1 & 2
December, January, February	4, 5, 6	8, 1, 2
March, April, May	4, 5, 6	2

## Prediction lead time:

The MJO can be predicted up to 21-28 days in advance. The MJO forecast on the BOM website is for 21-days in advance and the CPC/NOAA MJO forecast is issued 14-days in advance.

**Note:** Looking at the MJO forecast starting in early December can be useful, as an active 'wet' MJO phase in December can bring on the first of the summer rains.



The diagram above shows the area most affected by the Madden-Julian Oscillation (MJO), the seasons during which the MJO's influence on Australia is greatest, and for how long each active phase of the MJO typically lasts.

## Where to find information:

BOM: <http://www.bom.gov.au/climate/enso/#tabs=Tropics>

NOAA: <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml>

# Monsoon

*The monsoon has minimal direct impact on southern parts of the Northern Territory, but when the monsoon is active in the north, there is more moisture in the atmosphere, which creates conditions conducive to rainfall.*

**What:** An annual change in the direction of the prevailing winds to be from west to east associated with the start of the northern wet season.

**When:** November/December to March/April

**Where:** All of the Barkly and areas north, less influence in the Alice region.

**How:** Areas in northern Australia are subject to influence from the monsoon trough, which moves south with the Intertropical Convergence Zone during Austral summer. The Monsoon can be delayed by El Niño and brought forward by La Niña.

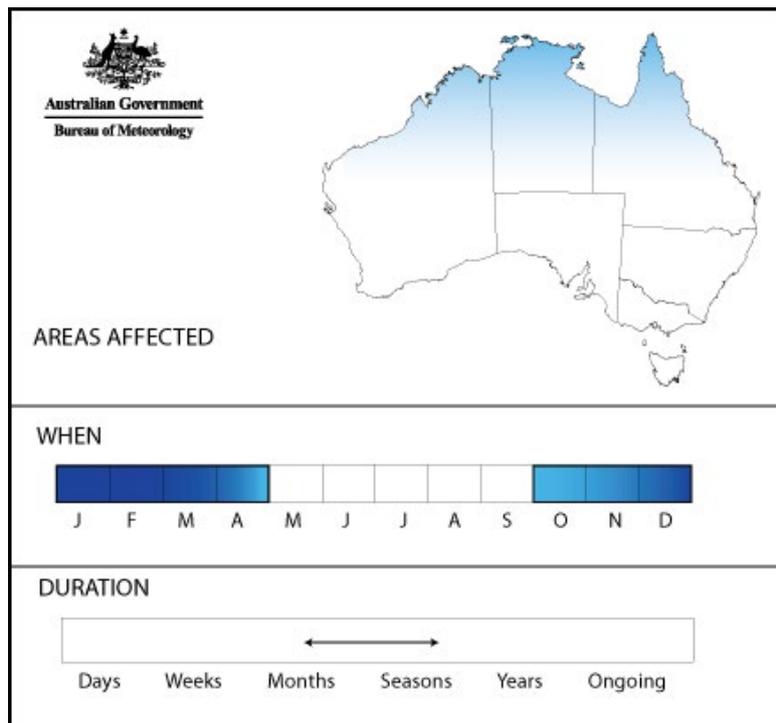
## **Prediction lead time:**

The BOM currently issues a 'Northern Rainfall Onset' forecast and also has information about timing of monsoon onset during El Niño and La Niña events, but there is not specific 'Monsoon Onset' forecast.

## **Different definitions:**

*Monsoon:* Seasonal reversal of winds over the tropics, from mostly easterly winds to westerly winds; has 'active' (rain) and 'inactive' (dry) phases. Active and inactive phases can be associated with the MJO.

*Northern Rainfall Onset:* The day after 1 September that an area receives an accumulated total of 50mm of rain.



*The diagram above shows the area affected by the monsoon, when it occurs and how long it may last.*

## **Where to find information:**

BOM Monsoon: <http://www.bom.gov.au/climate/about/?bookmark=monsoon>

BOM Northern Rainfall Onset Forecast: <http://www.bom.gov.au/climate/rainfall-onset/>

BOM Weekly Tropical Climate Note: <http://www.bom.gov.au/climate/tropical-note/>

# El Niño – Southern Oscillation

- What:** ENSO has two active phases, El Niño and La Niña, and an inactive or neutral phase.
- When:** Any time between June (start) to April (end). Main impacts of ENSO are usually from December to March. Events can span multiple years, which is more common with La Niña events.
- Where:** Entire region, but impacts vary from event to event.
- How:** El Niño tends to cause warmer days and less rainfall, fewer cyclones, and increase the risk of spring frosts (southern areas) due to clear nights. La Niña tends to cause wetter weather, increased humidity, and an increased risk of cyclones and flooding. Day time temperatures are usually lower due to increased cloud cover.

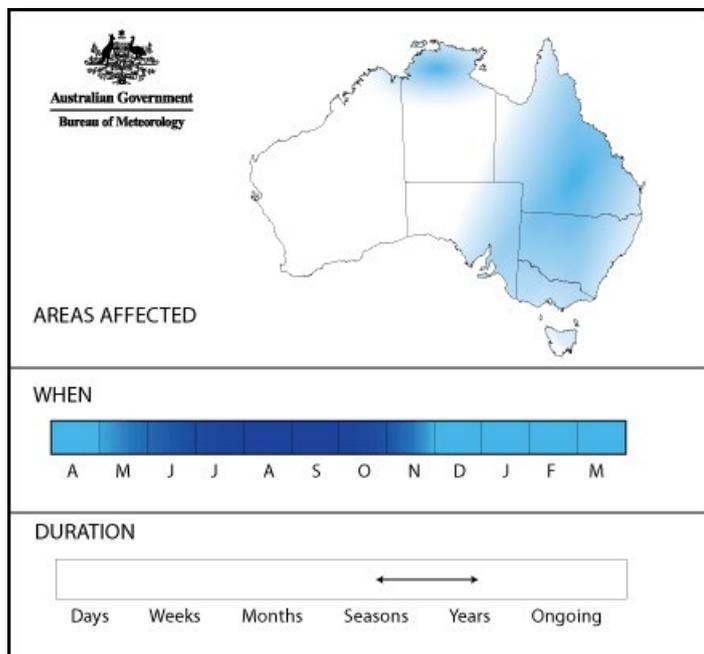
## Prediction lead time:

About 2-3 months for a more reliable forecast, up to 6 months in advance for an indication of a possible ENSO event. Start looking for a possible ENSO event in April/May, but become more confident in the forecast in June/July.

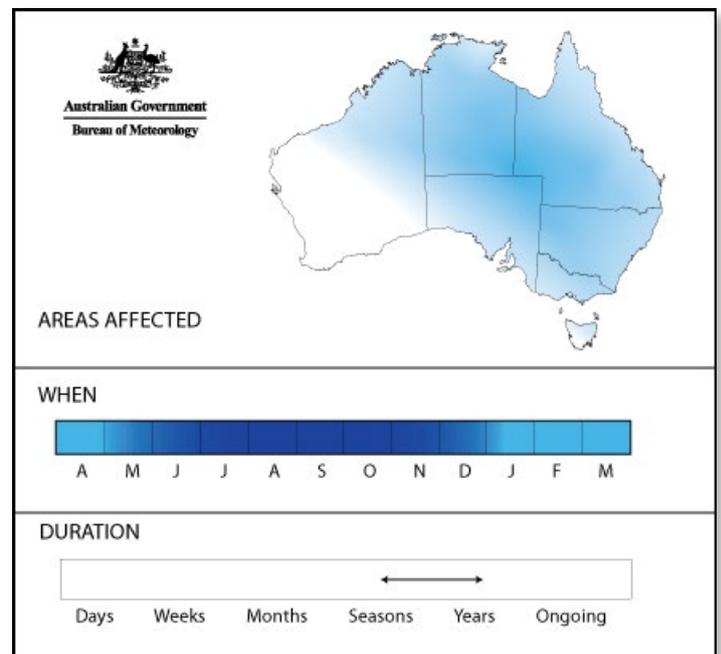
**Note:** There is a 'prediction gap' from about January to April when it is very difficult to know whether or not an ENSO event will develop in the coming winter. The Southern Oscillation Index, a measure of ENSO, can be a poor indicator from January to April due to the monsoon trough creating low pressure (unrelated to ENSO) over Darwin.

## Other Information:

During an El Niño Modoki, there is a warm pool of water in the central Pacific Ocean near the dateline (180°) and the equator (0°), which is different to a 'traditional' El Niño where the warm water is closer to South America (eastern Pacific). Recent research shows that Modoki events may have more dry/warm impacts on northern Australia than a 'traditional' El Niño event and may occur more regularly in the future.



The diagram above shows the area affected by **El Niño**, when it occurs and how long it may last.



The diagram above shows the area affected by **La Niña**, when it occurs and how long it may last.

## Where to find information:

- BOM: <http://www.bom.gov.au/climate/enso/>
- NOAA: <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/enso.shtml>
- ESRL: <https://www.esrl.noaa.gov/psd/enso/>
- SOI: <https://www.longpaddock.qld.gov.au/soi/>

# Other Climate Drivers

## Indian Ocean Dipole

**What:** The IOD has two active phases, Positive and Negative, and an inactive/neutral phase.

**When:** It can only occur between June/July and the end of December, with main impacts occurring between September and the end of November.

**Where:** IOD Positive events mainly impact western and SE Australia, with some impacts on the Barkly and Alice regions; IOD negative events mainly impact SE Australia, extending up into the southern half of the Northern Territory (refer to maps below – NOTE: These maps show changes – warmer or cooler – to usual maximum temperature).

**How:** IOD Positive events tend to bring warmer temperatures and drier conditions; IOD Negative events are the opposite, with cooler temperatures and an increased chance for rain.

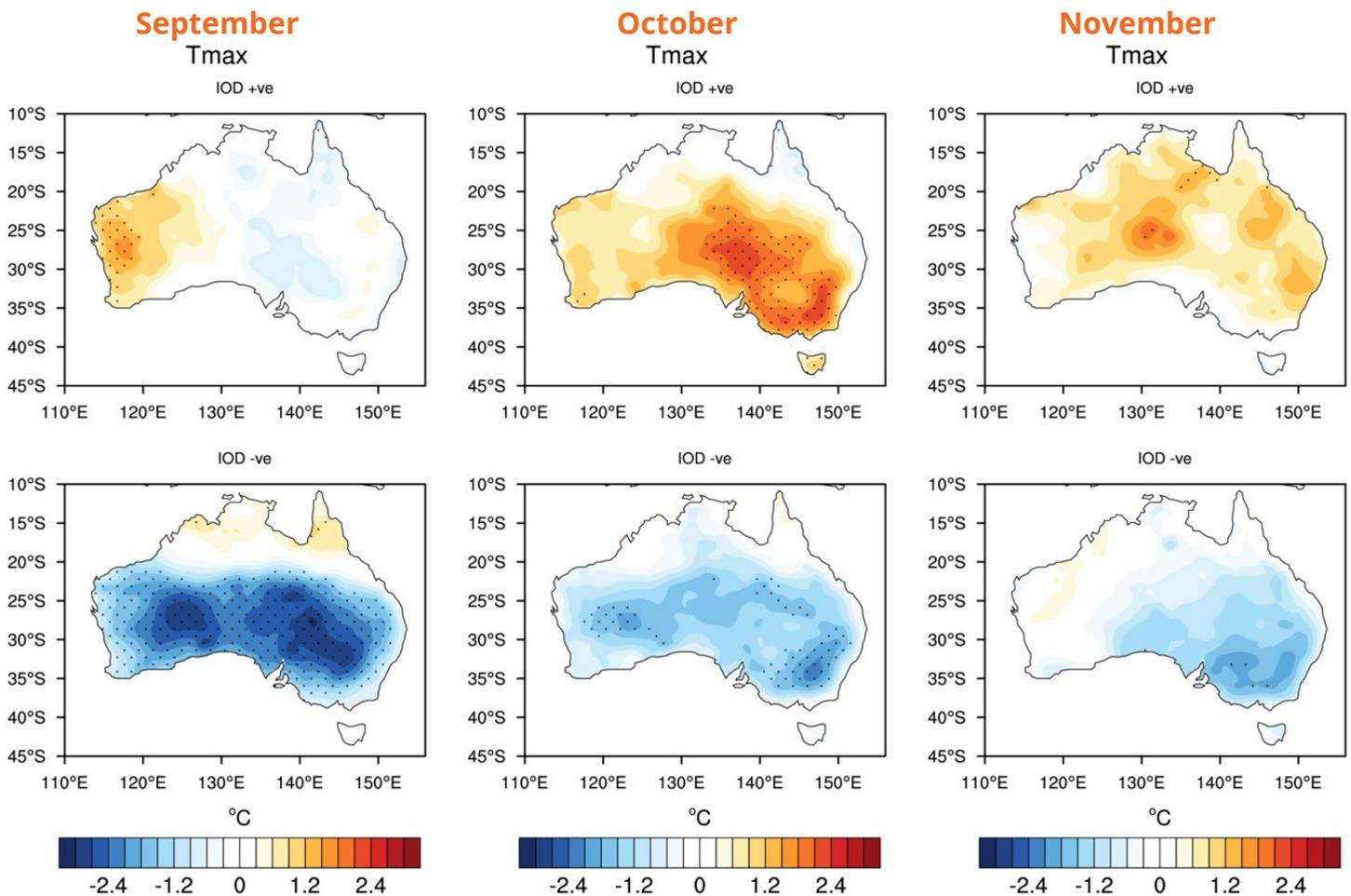
**Prediction lead time:**

The IOD can be predicted about 2-3 months in advance. Forecasters start looking for signs of an IOD event around May/June. The forecast will be more accurate from July onwards.

*Note: Because IOD is active during the dry(er) season in the Barkly and Alice regions, it won't have much of an impact either way in regard to rainfall, but it can impact temperatures.*

**Other:**

Very strong IOD Positive events, like what was observed in 2019, can indirectly delay the start of the monsoon.



Deviation of Maximum Temperatures from the mean during September (left), October (middle), and November (right) for IOD Positive (top row) and IOD Negative (bottom row) phases.

**Where to find information:**

BOM IOD information and forecast: <http://www.bom.gov.au/climate/enso/#tabs=Indian-Ocean>

# Weather Phenomena Impacting Area

## Cyclones

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**When:** November/December to April/May

**Where:** Most of the Barkly, will occasionally extend further south.

**How:** Useful rain which can lead to flooding or infrastructure damage.

**Prediction lead time:**

Minimal. General storm tracks can be predicted up to 7 days in advance, but the actual path is hard to determine more than a day in advance.

**Where to find information:**

BOM, Current Cyclones: <http://www.bom.gov.au/cyclone/index.shtml>

BOM, General Info: <http://www.bom.gov.au/climate/about/?bookmark=tc>

ECMWF: <https://www.ecmwf.int/en/forecasts/charts/latest-tropical-cyclones-forecast>

Links to other cyclone websites: <https://www.cawcr.gov.au/research/cyclone-exchange/>

## Local Convection/Thunderstorms

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**When:** Late spring, summer, autumn

**Where:** All over the NT, though impact can be very patchy, with one area getting rain and another area 1 km away not getting rain.

**How:** The land heats up faster than surrounding air, causing warming of the air near the surface. Warm air always wants to rise and is considered to be an unstable airmass. As the air rises, any water vapor condenses and cools. If there is sufficient moisture and condensation nuclei (such as dust particles), it will rain.

**Prediction lead time:**

Minimal. Sometimes a few days (general prediction), but only a few hours for a more precise prediction of timing/location of storm.

**Other:**

Currently, convection is extremely hard to model in general circulation models due to the spatial resolution required, which limits forecasting ability/lead time.

**Where to find information:**

BOM MetEye: <http://www.bom.gov.au/australia/meteye/>



# On Property Decisions related to Climate

## DETERMINING A 'GREEN DATE' AND 'PRODUCTION DATE'

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*The Green Date is the date after 1 September that you can expect to get 50mm of rainfall within 3 consecutive days in 7 out of 10 years (or 70% of the time). This is generally considered to be the amount of rain required to start pasture growth. Note that the Green Date will vary by soils (type and current moisture), land cover and type, and other climatic considerations (like high temperatures and high winds). A Production Date is when there is enough pasture growth to translate into kg gains and occurs about 2-6 weeks after the Green Date.*

### **Timing of decision:**

December to February – Has the Green Date changed? Is it coming later than in previous years? It is often a lot later than managers think! Looking at the Green Date will give an indication as to the best time to aim for returning stock to particular paddocks and when you want calves hitting the ground to ensure there is sufficient feed available to last the dry season. Note, in lighter/sandy soils, you may only need 30-40mm of rain to get a pasture response, rather than the standard 50mm.

### **Climate drivers to watch for this decision:**

Historical Climate Records; ENSO, IOD

*El Niño Year or Strong Positive IOD* – Green Date likely to be later than usual.

*La Niña Year or Strong Negative IOD* – Green Date likely to be earlier than usual.

### **Issues associated with decision:**

Is there enough feed to carry cattle through to the Green Date or, even better, the Production Date? Are cows at peak lactation around the Production Date?

### **Information needed:**

Data to determine when the Green Date is and if it has changed over time. There is concern around the change/late pasture response due to the later onset of rainfall occurring more often.

### **Information sources:**

CliMate App: <https://climateapp.net.au/>

Climate data on-line: <http://www.bom.gov.au/climate/data/>

Climate change: <https://www.climatechangeinaustralia.gov.au/en/>

## CONTROLLED MATING - WHEN SHOULD PEAK CALVING OCCUR?

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*Ideally, peak calving should occur around the break of season (Green Date), with peak lactation requirements occurring at the same time as you reach your pasture Production Date, which is about 2-6 weeks after the Green Date. Out-of-season calves are expensive to feed and often don't grow as well as in-season calves leading to productivity losses. Also, there are animal welfare implications due to poor breeder condition and higher calf mortality rates.*

### **Timing of decision:**

November – January

### **Climate drivers to watch for this decision:**

ENSO, IOD

*El Niño and/or Strong IOD Positive* – Increased risk of a dry and hot spring, with greater risk of temperature extremes, which can impact early calves. Also, very strong events can delay the start of the wet season.

*La Niña and/or Negative IOD* – Increased chance of cooler spring conditions and better/earlier rainfall, so limited issues with out of season calves.

### **Issues associated with decision:**

El Niño will affect NT and Qld cattle markets, which may affect prices for boat cattle and the number of stock turned off.

### **Information needed:**

ENSO and/or IOD forecast; Northern Rainfall Onset Forecast; reliable rainfall predictions.

### **Information sources:**

ENSO/IOD Forecast: <http://www.bom.gov.au/climate/enso/>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

## WHETHER TO CULL OR RETAIN BREEDERS

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*The timing of the onset of the wet will determine if a breeder is in-season or out-of-season. Factors to consider when making the decision include current forage available (will it last till the break?), cashflow considerations, and whether you are in a herd building, herd reduction, or steady herd phase.*

### **Timing of decision:**

July/August

### **Climate drivers to watch for this decision:**

ENSO, IOD

*El Niño Year and/or Strong Positive IOD* – Increased risk of delayed start to the wet and a dry/hot spring. If cows are out-of-season with an El Niño/IOD positive event, decisions will need to be made whether to liquidate the animal and risk losing a fertile breeder and a proportion of future years sale animals or keep her knowing you will have to feed her and the calf (see out-of-season calf issues above).

*La Niña Year and/or Strong Negative IOD* – There is an increased chance for more and earlier rain across much of northern Australia. If other regions are also having a good season and are re-stocking, what may be a liability in your herd could be a peak season calver elsewhere, leading to marketing opportunities.

### **Information needed:**

ENSO/IOD forecast; Northern Rainfall Onset forecast

### **Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

## DESTOCK EARLY – PENDING PREDICTED WET SEASON ONSET

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*In a dry year, it is important to adjust stocking rates early according to feed availability and to have a plan as to which you sell first.*

### **Timing of decision:**

August to October (second round muster); prior to wet season start.

### **Climate drivers to watch for this decision:**

ENSO (El Niño), IOD (Positive Phase), MJO

*El Niño Year and/or Strong Positive IOD* – Increased chance of a late start to summer rains and a drier than usual summer – hoping for rain is unlikely to be realistic. Feed is likely to be short due to a later start to pasture growth and reduced chance of rain and it may be opportunistic to reduce stock numbers early while cattle are still in OK condition.

*MJO* – An active ‘wet’ MJO phase in December can bring the first seasons’ rains. If there is no active wet phase in December, there is unlikely to be meaningful rain until January.

### **Issues associated with decision:**

Even in El Niño/IOD Positive years, there can still be storms and cyclones that bring a ‘normal’ amount of rain during the wet season; however, the odds of this are reduced and they are likely to start later in the season.

### **Information needed:**

ENSO and/or IOD forecast; Northern Rainfall Onset Forecast; Reliable rainfall predictions.

### **Information sources:**

ENSO/IOD Forecast: <http://www.bom.gov.au/climate/enso/>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

## DESTOCK EARLY PRE-DRY SEASON AFTER FAILED WET SEASON

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*Failed wet seasons can lead to cattle in poor condition and limited options. Decisions need to be made in the early dry season (April–May) and will depend on what has occurred during the wet season in terms of rainfall, and also pasture growth response to the season or a failed season. To be in the best position, it is imperative to have a destocking plan, decision dates, and the upcoming seasonal climate forecast.*

### **Timing of decision:**

April/May

### **Climate drivers to watch for this decision:**

ENSO, IOD

*El Niño Year and/or Strong Positive IOD in previous spring/summer* – Feed is likely to be short due to a later start to summer rains and likely reduced rainfall. Therefore, stocking rates would need to be lower for the winter season.

### **Issues associated with decision:**

Sometimes in April, we have indications as to whether there will be an El Niño or La Niña in the *coming* winter/spring. Forecast skill is usually poor from March to June, but if there is going to be a strong ENSO event, we may have an indication in April. If it looks like an El Niño, there is a decreased chance for winter rain and an increased chance for a late start to the following growing season. The opposite would be true for a La Niña.

### **Information needed:**

Realistic forage budget.

### **Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Forage: <https://www.longpaddock.qld.gov.au/forage>



## LATE SEASON MUSTERING

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*Some properties are able to move at risk livestock from flood-prone or exposed areas with just a couple of weeks' notice. ENSO and IOD can create conditions that would make it beneficial to move stock in the spring.*

### **Timing of decision:**

November/December

### **Climate drivers to watch for this decision:**

ENSO, IOD, MJO

*El Niño Year and/or Strong Positive IOD* – There is an increased risk for hot and dry conditions, which can lead to calf loss and make it difficult to move stock.

*La Niña Year and/or Strong Negative IOD* – There is an increased risk for flooding and early cyclones; muddy ground can make it difficult to move stock.

*MJO* – If coming into an active wet phase (phases 4, 5, 6), the MJO can give an indication of coming rainfall events or the likelihood of a cyclone.

### **Issues associated with decision:**

Are any temperature extremes predicted? Is calf loss likely? Are there workplace health and safety issues?

### **Information needed:**

Predictions and lead times for the likelihood of extreme weather events which could result in major impacts on business/production system, livestock, due to flooding/ extreme variations in temperatures etc.

### **Information sources:**

BOM Rainfall Outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

Temperature outlook: <http://www.bom.gov.au/climate/outlooks/#/temperature/summary>

MJO Forecast: <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml>

NT Pastoral feed outlook: <https://dpir.nt.gov.au/primary-industry/primary-industry-publications/northern-territory-pastoral-feed-outlook>

## WHEN AND WHERE TO IMPLEMENT PRESCRIBED BURNS

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*Looking at short term and longer-term weather and climate forecasts is key to effective burning. Fires to control woody thickening need to be hot fires late in the year, but when there is minimal wind and a good chance of follow-up rain. Fires to address patch grazing need to cool burns early in the wet season with good follow up rain. Wildfire mitigation burns need to be cool fires early in the dry season, before stronger winds start.*

### **Climate drivers to watch for this decision:**

ENSO, IOD, MJO

*El Niño Year and/or Strong Positive IOD* – Producers will likely get a hot burn, but follow-up rain may be more variable, resulting in the possibility of less pasture response. If it has been a dry wet season, wildfire mitigation may need to be undertaken with extra caution.

*La Niña Year and/or Strong Negative IOD* – Hot fires may need to occur earlier in the spring due to an increased likelihood of the rains start early. During one of these events could be a good time to control woody thickening, as there is an increased chance for follow-up rains.

*MJO* – An active wet MJO in the late spring/early summer may give an opportunity for cooler conditions to burn. The MJO forecast can also be useful when planning a mosaic/patch burn.

### **Information needed:**

Reliable wet season onset forecast; duration of the wet season; consistency of the wet (bursts and breaks etc.); heat wave forecasts and when the temperatures/winds change; and daily forecasts to plan optimum time for a fire.

### **Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

7-day Meteye forecast: [www.bom.gov.au/australia/meteye](http://www.bom.gov.au/australia/meteye)

MJO Forecast: <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml>

## IF AND WHEN TO START SUPPLEMENTATION PROGRAMS

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### **Climate drivers to watch for this decision:**

ENSO, IOD

*El Niño Year and/or Strong Positive IOD* – There are likely to be drier conditions with an increased likelihood of a delayed start to the wet season and possibly an early finish. Producers should consider planning for additional dry season supplementation considering likely costs and issues such as urea poisoning when the season is late.

*La Niña Year and/or Strong Negative IOD* – Increased chance of wetter conditions, which can reduce access to/on properties. Producers should consider any likely access problems and moving supplements to areas not affected by access issues.

### **Information needed:**

Reliable wet season onset forecast; duration of the wet season; and probability of out of season rain events.

### **Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

## IS DRY-LAND CULTIVATION A VIABLE OPTION TO DROUGHT-PROOF MY BUSINESS?

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**Consistent rainfall is required to ensure a viable crop and the crop must be accessible at peak harvest time.**

### **Climate drivers to watch for this decision:**

ENSO, IOD, MJO

*El Niño Year and/or Strong Positive IOD* – Generally, there is a lower chance of success during these events. Consider not planting and saving on the cost of seed and time of labour required.

*La Niña Year and/or Strong Negative IOD* – Increased likelihood of a successful cropping season, though depending on time of year, access may become an issue if rains bog roads.

*MJO* – Watching the MJO may give an indication of when a rainfall event may occur to plant the crop and/or to cut for hay if it is a fodder crop.

### **Information needed:**

Reliable wet season onset forecast; duration of the wet season; consistency of the wet (bursts and breaks etc.); heat wave forecasts; and when the temperatures/winds change.

### **Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

7-day Meteye forecast: [www.bom.gov.au/australia/meteye](http://www.bom.gov.au/australia/meteye)

MJO Forecast: <https://www.cpc.ncep.noaa.gov/products/precip/CWlink/MJO/mjo.shtml>

Soil Water balance: [www.bom.gov.au/water/landscape/](http://www.bom.gov.au/water/landscape/)

## STAFF MANAGEMENT

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**Planning when to start staff allows for an effective recruitment process and gives more certainty to both employers and employees as to most probable start date and duration of employment.**

**Timing of decision:**

September – February

**Climate drivers to watch for this decision:**

ENSO, IOD, MJO

*El Niño Year and/or Strong Positive IOD* – A later start to the wet season is more likely and the overall season may be drier, including a reduced chance of cyclones. This may allow for a longer season for workers, for more jobs to be completed, and/or a later start for staff in the new work year.

*La Niña Year and/or Strong Negative IOD* – An early onset of the wet season is more likely and may mean an early finish to the mustering season and a re-evaluation of priorities. There is an increased chance of roads becoming impassable earlier in the wet season.

*MJO* – An active ‘wet’ phase brings on the first season rains and onset of cyclones, which can affect staff movements.

**Information needed:**

Reliable wet season onset forecast; duration of the wet season; heat wave forecasts; and when the temperatures change.

**Information sources:**

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Temperature outlook: <http://www.bom.gov.au/climate/outlooks/#/temperature/summary>

## CASHFLOW AND BUDGET MANAGEMENT

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**Timing of decision:**

Wet season (November – April)

**Climate drivers to watch for this decision:**

ENSO, IOD

Seasonal conditions in other regions will impact market forces in local regions, e.g. an El Niño drought and de-stocking in Queensland usually means fewer early live export boats for leading to reduced cash flow early in year and you may need to talk to the bank and renegotiate the overdraft. Conversely, a good season and re-stocking in Queensland related to a La Niña may mean more boats– An early start to the mustering season may be needed to capitalise on this.

Seasonal conditions in other regions will also effect quality, quantity and price of supplement and fodder. An El Niño in eastern states will affect availability of feedstuffs, whereas a La Niña generally means a good supply of feedstuffs.

**Information sources:**

Rainfall outlook: <http://www.bom.gov.au/climate/outlooks/#/rainfall/summary>

Northern Rainfall onset: <http://www.bom.gov.au/climate/rainfall-onset/>



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