

CLIMATE SAVVY FOR GRAZING MANAGEMENT

Central Queensland



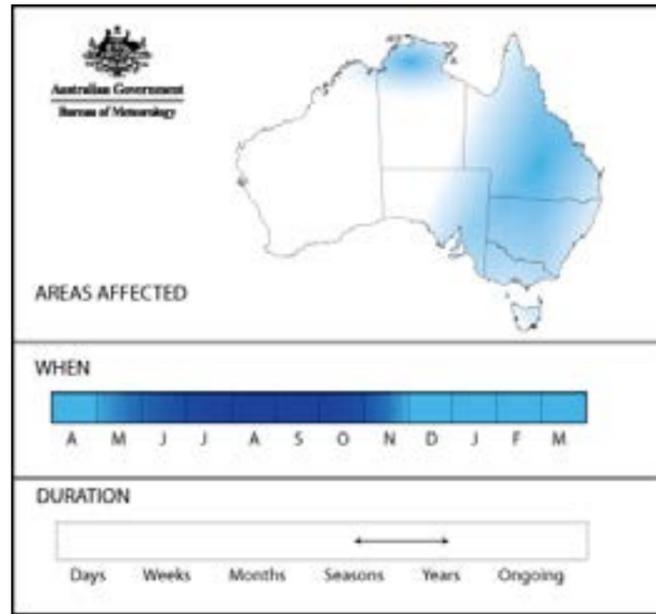
El Niño – Southern Oscillation

- 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 increased impacts more likely near coast.
- How:** El Niño tends to cause warmer days and less rainfall, fewer cyclones, and increase risk of spring frosts 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 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. We start looking for a possible ENSO event in April/May, but become more confident in the forecast in June/July.

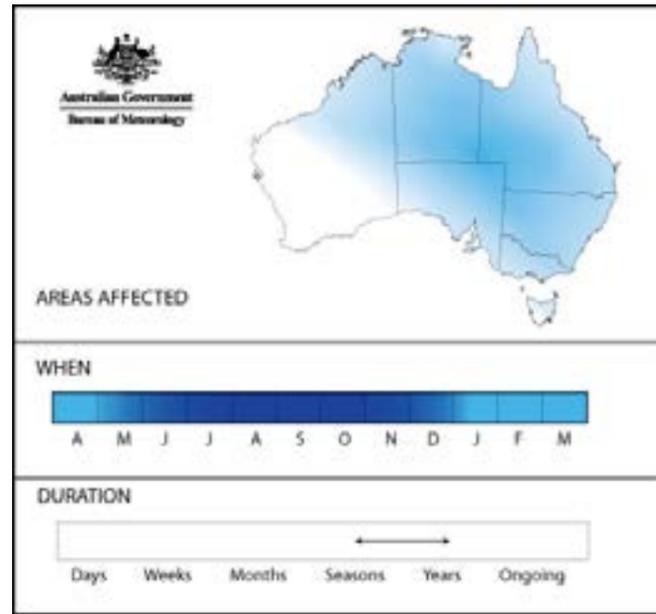
Note: There is a 'prediction gap' from about January to April when it is very difficult to know whether or not an ENSO will develop in the coming winter. The Southern Oscillation Index, a measure of ENSO, can be a poor indicator from January to April due to the monsoon trough creating low pressure (unrelated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

Madden-Julian Oscillation

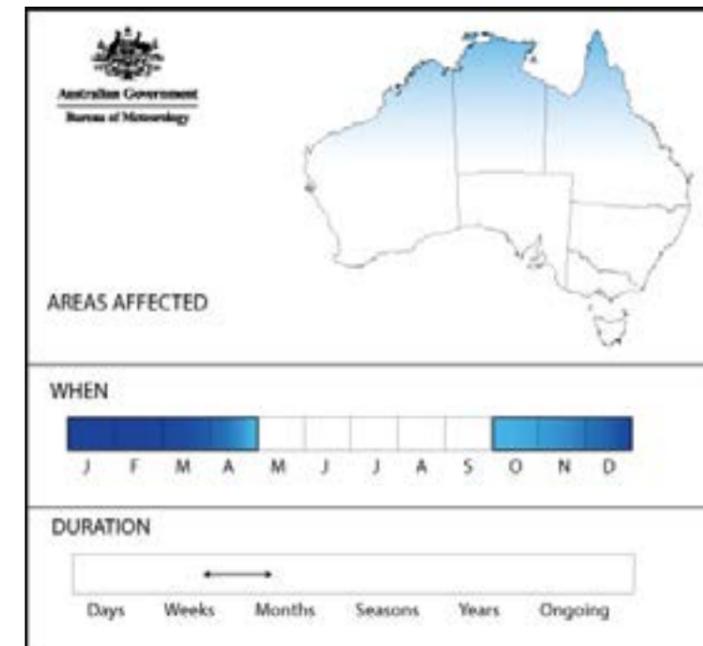
- What:** A large band of clouds that influence alternating wet/dry conditions during the wet/summer season. The MJO can increase the availability of moisture in the area during an MJO 'wet' phase, leading to an increased chance of rain.
- When:** Year-round, but mainly during wet season (December to April).
- Where:** Mostly in the tropics, but influence can extend into sub-tropics.
- How:** Impact varies by season and location.

Period	Wet Phases	Dry Phases
June, July, August (minimal impact)	4	7
September, October, November (minimal impact)	7	1 & 2
December, January, February	4	6
March, April, May	4 & 5	8, 1, 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 general 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 much of central Queensland, but when the monsoon is active in the north, there is more moisture in the atmosphere, which creates conditions more conducive to rainfall.

- What:** An annual change in the direction of the prevailing winds to be from west to east.
- When:** November/December to March/April
- Where:** Northern part of Central QLD 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.

Prediction lead time:

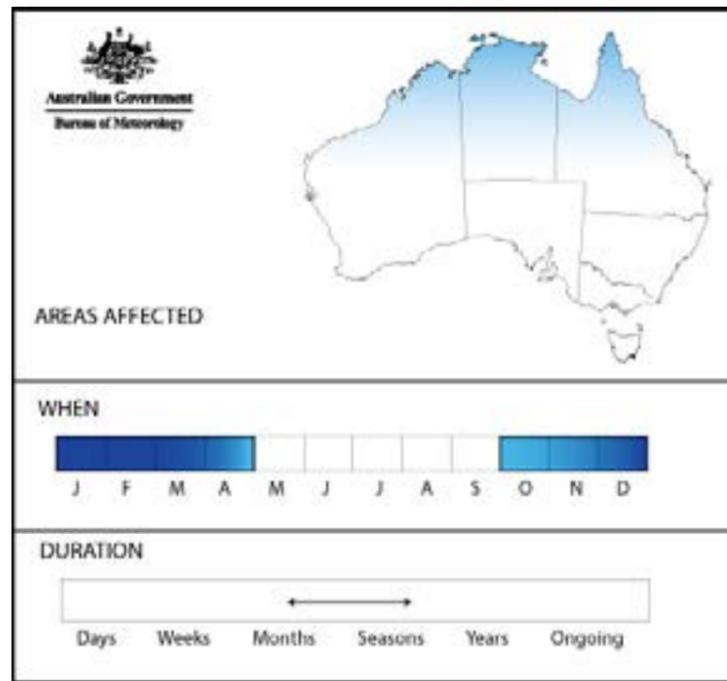
BOM currently issues a 'Northern Rainfall Onset' forecast and also has information about timing of monsoon onset during El Niño and La Niña events, but there is not specific 'Monsoon Onset' forecast.

Note: The Monsoon can be delayed by El Niño and brought forward by La Niña.

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/>

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.
- Where:** IOD Positive events mainly impact western and SE Australia, with a minor impact on Central QLD; IOD negative events mainly impact SE Australia, extending up into Central QLD.
- 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.

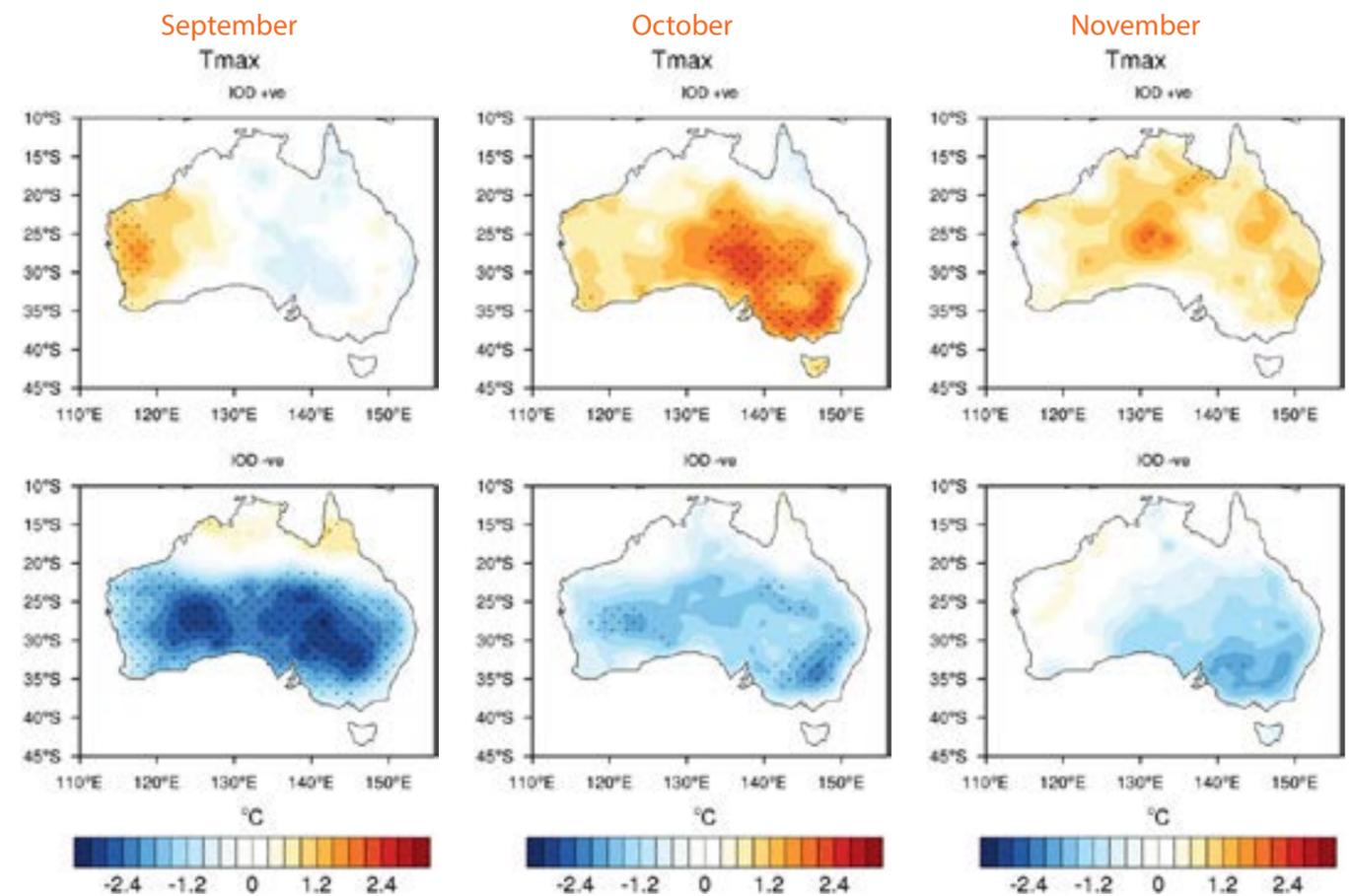
Prediction lead time:

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 season in Central QLD, it won't have much of an impact either way in regard to rainfall, but it can impact temperatures (refer to maps below – These maps show changes – warmer or cooler – to usual maximum temperature).

Other:

Very strong IOD Positive events, like what was observed in 2019, can indirectly delay the start of the monsoon. Also, if it has been very hot/dry over the land, there will be less moisture available for local thunderstorms.



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>

Cyclones

When: November/December to April/May
Where: Coastal areas of Central QLD, though rain may extend inland.
How: Useful rain often associated with flooding or infrastructure damage.

Prediction lead time:
Minimal. General storm tracks can be predicted up to 7 days in advance, but 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

When: Late Spring, summer, autumn
Where: All over Central QLD, though impact can be very patchy, with one area getting rain and another area 1km 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/>

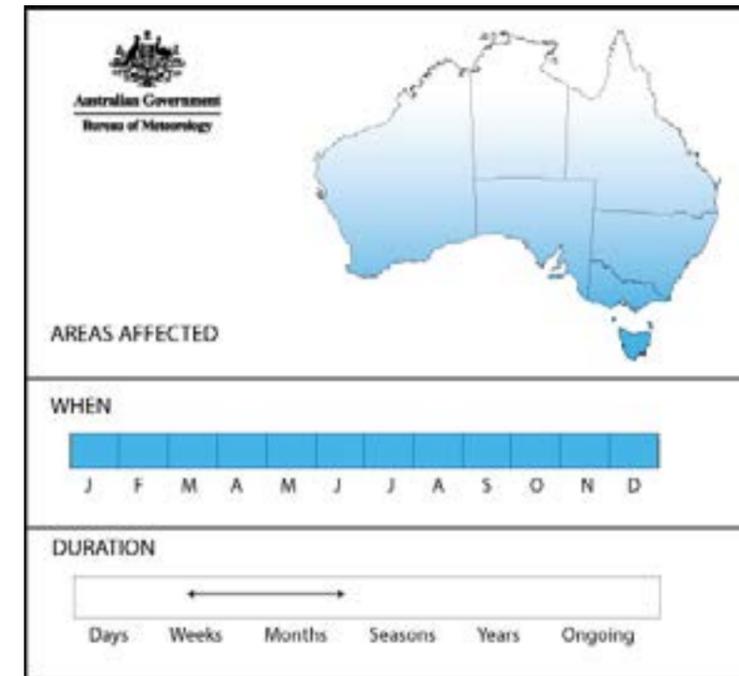
Southern Annular Mode

What: The north or south shift of strong westerly winds located to the south of Australia. These westerly winds can impact the location of the sub-tropical ridge, which affects QLD.
When: Winter, spring, and summer
Where: Mostly in southern Australia, but it can extend into southern QLD; SAM will mainly impact the southern end of Central QLD region.
How: SAM has positive, neutral, and negative phases. Each phase lasts around a week and sometimes up to several months.

Summer & Winter, Positive: Increased chance of rainfall due to onshore winds, reduced chance of hot weather – this applies to much of south Central QLD.

Summer & Winter, Negative: Increased chance of dry and hot conditions due to winds coming from interior – has less of an impact on Central QLD.

Prediction lead time:
Less than two weeks; but is more predictable during an ENSO event. Also, there tend to be more negative SAMs during El Niño and positive SAMs during La Niña.



The diagram above shows the area affected by the Southern Annular Mode, when it occurs and how long it may last.

Where to find information:
BOM (information only, no forecast): <http://www.bom.gov.au/climate/sam/>
BOM Forecast: <http://www.bom.gov.au/climate/enso/#tabs=Southern-Ocean>

REDUCE BREEDING HERD NUMBERS

In a dry year, it is important to adjust stocking rates according to feed availability: Any cows that have not calved can be sold, remaining joined cows are pregnancy tested early in winter and any found dry are sold early in winter.

Timing of decision in your region:

May-June (First round muster)

Climate drivers to watch for this decision:

ENSO, IOD

El Niño Year and/or Strong Positive IOD in the coming season – It is likely to be dry over the winter period and there is an increased chance of a delayed start to summer rains. Reducing numbers of dry cattle will benefit cows in calf by reserving feed for them.

La Niña Year and/or Strong Negative IOD in the coming season – Increased possibility of some winter rain and/or an early start to the summer rains. If feed supplies are good, some cull cows could be kept to improve weight because late in the winter season there is less supply of well finished cull cows so market prices could be more favourable.

Issues associated with decision:

Pregnancy testing needed, cattle market prices.

Information needed for decision:

Possibility of winter rain; Northern Rainfall Onset forecast; reliable longer-term forecasts.

Information sources:

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

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

EARLY WEANING

Timing of decision in your region:

Autumn

Climate drivers to watch for this decision:

ENSO (El Niño), IOD (Positive phase)

El Niño Year and/or Strong Positive IOD during the wet season just past – Increased chance of a late start to summer rains and a drier than usual summer. Feed is likely to be short due to a later start to pasture growth and reduced chance of rain, so early weaning of calves may be an option. By weaning early, there is a better chance of cows maintaining condition and returning into calf. Costs and time required to feed calves will be a major consideration.

El Niño Year and/or Strong Positive IOD in the coming winter/spring – If there are indications of an El Niño in the coming winter/spring, it is likely to be a drier wet season with a later start.

Information needed for decision:

How has the season been? Is there likely to be an El Niño in the coming winter/spring?

Information sources:

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

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

Futurebeef: www.futurebeef.com.au/wp-content/uploads/Weaner-management-in-northern-beef-herds.pdf

JOINING TIME FOR CATTLE

Timing of decision in your region:

End of winter

Climate drivers to watch for this decision:

Long-term climate records

Issues associated with decision:

Ideally, calving should start a few weeks prior to 'Green Date' i.e. better than 70% chance of receiving at least 50 mm over 3 days. Adding bulls in late January/early February usually results in a calving window starting in October and continuing through to end of January/mid-February. If cows are joined too early they will calve on poor quality/quantity feed prior to rain producing good feed. If joining is too late in the season, weaners can have low weight gain and do not reach full potential growth. With increasing summer temperatures though, calving at this time of year may become more difficult due to possibly dehydration, sustained high temps (>35°C), cows leaving calves without milk, and lower milk production in cows.

Information needed for decision:

Accurate timing of when your Green Date is most likely to occur. However, if there are hotter days earlier in the season (i.e. long-term climate patterns/change), consider shifting calving window or if it's likely to be unusually hot, provide extra feed to get cattle through (would need long/er term heat wave forecasts).

Information sources:

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

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

STOCKING RATE FOR WINTER DRY SEASON

A pasture budget is needed to determine safe stocking rate until the Green Date or, more ideally, the Production Date of the following growing season.

Timing of decision in your region:

End of Growing Season, generally March-April.

Climate drivers to watch for this decision:

Summer rainfall records; 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.

La Niña Year and/or Strong Negative IOD in previous spring/summer – Feed is likely to be available and stocking rates can remain 'normal'.

Note: 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 for decision:

Any possibility of winter rain to grow herbage; forage report; any indication of an ENSO event in the coming winter/spring.

Information sources:

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

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

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

IF AND WHEN TO START SUPPLEMENTATION PROGRAMS

Timing of decision in your region:

End of Growing season generally March-April.

Climate drivers to watch for this decision:

ENSO, IOD

El Niño Year and/or Strong Positive IOD in previous spring/summer – If there has been a dry wet season, the demand for supplements and other feedstuffs is likely to be high in the coming season.

La Niña Year and/or Strong Negative IOD in coming winter/spring – There is better chance of rain in winter and spring and there will be less need for supplementation if the season is favourable.

Issues associated with decision:

Dry season supplementation – Costs and risk of urea poisoning.

Information needed for decision:

Timing of spring rainfall; probability of out of season rain events.

Information sources:

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

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

DETERMINING A 'GREEN DATE' AND 'PRODUCTION DATE'

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 in your region:

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 to ensure there is sufficient feed available to last the dry season.

Climate drivers to watch for this decision:

Historical Climate Records; ENSO, IOD

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

La Niña Year and/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 for decision:

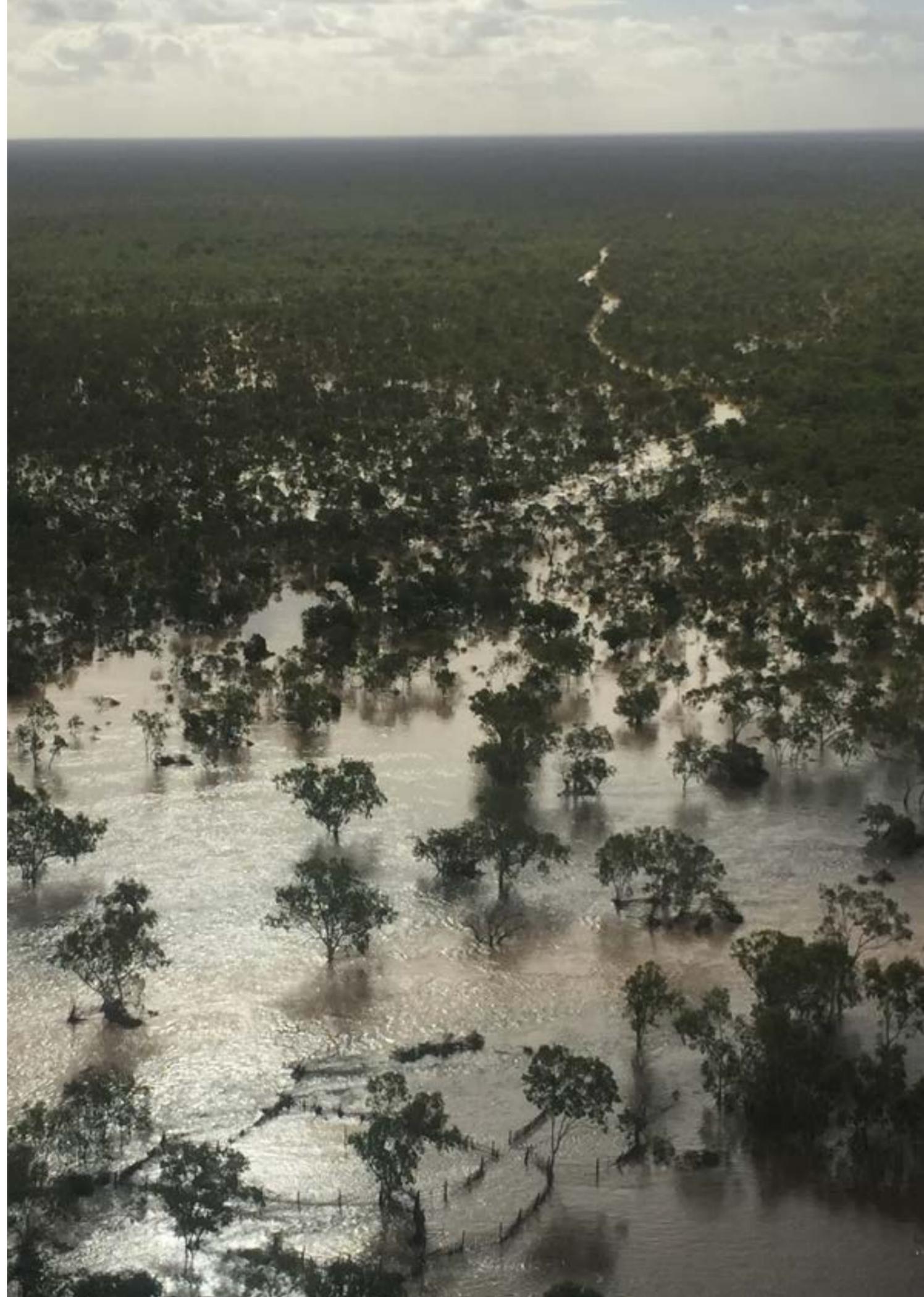
Data to determine when the Green Date is and if it has changed over time. There is concern around the change/late pasture response due to the later onset of rainfall occurring more often.

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/>



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