

Seasonal climate outlook and information

for producers and interested people in the Wide Bay Burnett region

September 2022

In this issue...

- It's official: La Nina is now established, making it a rare three in a row. What does history tell us about what is the likely seasonal pattern after this event?
- Remember the eruption of the Tonga volcano in January? The resulting massive injection of water vapour into the stratosphere has scientists researching what impact this may have on our climate. See Page 3 for details
- Climate driver update: La Nina is now established (once again) in the Pacific and the negative IOD continues. Go to Page 4 to see how long this may last
- Three to six month seasonal outlooks from the main climate agencies. After a wet start to spring in western areas, will wetter than normal conditions continue? Go to Page 5 for the seasonal outlooks from the major global climate agencies
- Forget the media hype, what do the next few months look like at your location? See Page 9 for some local examples using the CSA forecast tool

What does history tell us about climatic conditions following a period of sustained La Nina?

After several months of suggestions about a possible third La Nina, it has now been officially declared by the BoM. Key atmospheric and oceanic indicators of the El Niño–Southern Oscillation (ENSO) show an established La Nina. Tropical Pacific sea surface temperatures have been cooling since June and are now at La Nina thresholds. Atmospheric indicators including the Southern Oscillation Index (SOI), trade wind strength, and equatorial cloudiness are also displaying patterns typical of a La Nina event.

Prior to this year there have only been three 3-year La Ninas since 1950: 1954 -57, 1973-76, and 1998-2001. What have been the climatic conditions following these sustained wet periods?

The charts below show the track of the Southern Oscillation index (SOI) from 1950 to 2010 (black line), with associated La Ninas and El Ninos. The blue bars show positive SOI values, and the brown bars show negative SOI values. The three-year La Ninas are circled in red.

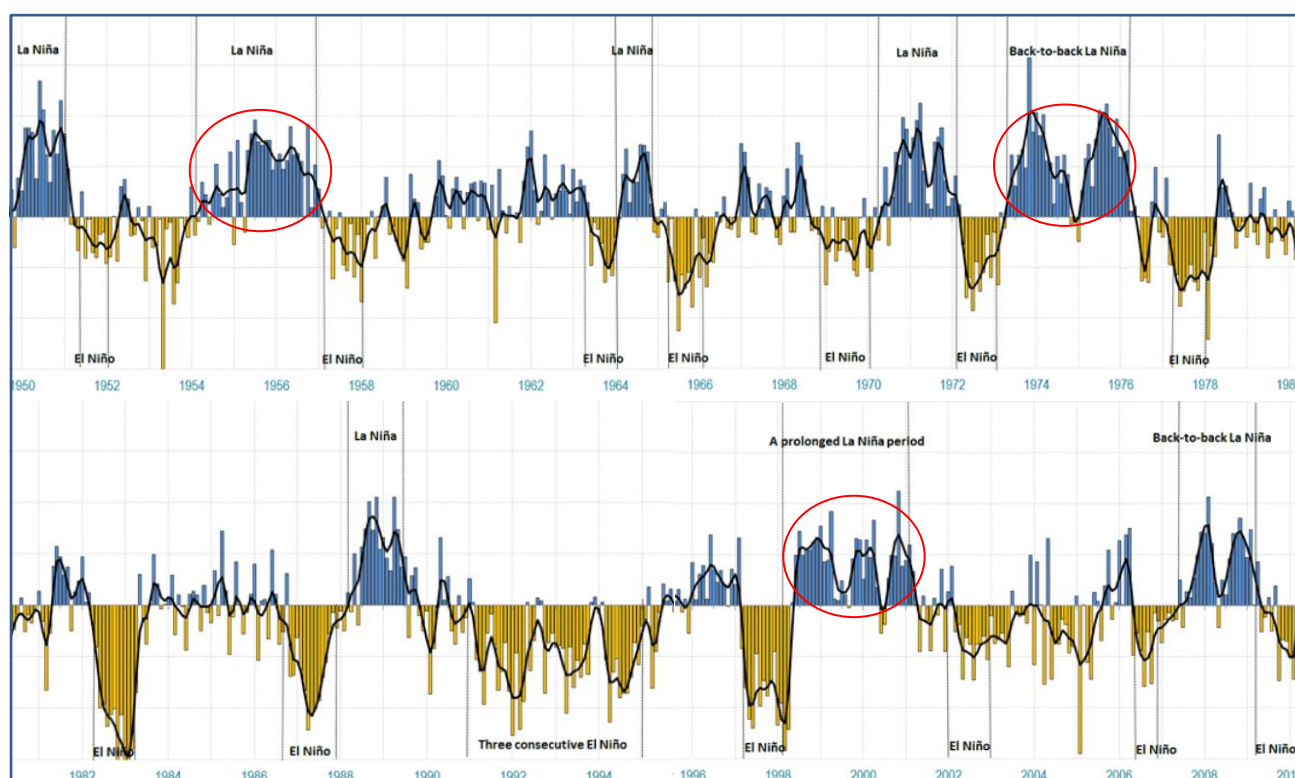


Figure 1: SOI track and values 1950-2010

There have been periods of positive, negative and neutral SOI values between La Nina and El Nino periods. However, almost without exception, each La Nina period has been followed fairly closely by a period of El Nino.

El Nino periods are generally drier than average in the Wide Bay Burnett region.

So what should producers be looking at in around eight months time (May 2023)?

1. How has the wet season gone? Despite forecasts of above median rainfall, some La Ninas have not actually delivered more rainfall in this region (eg 2020). Have we received at least our normal rainfall, and have our pastures produced enough dry matter to get us through the next eight months?
2. If at all possible, use the season to fill the hay shed. There may not be a better chance.
3. Start looking at the drivers for the season ahead. There may be early indications from the SOI and Pacific sea surface temperatures for either neutral conditions, or possibly El Nino. This is not likely to lock in until late June, but early indications may suggest it's time for some strategic selling, or early weaning.

Forewarned is forearmed. There have been many times over the last 50 years that have demonstrated that those producers who acted early on signs of a pending dry period ended up in a financially better position than those who waited until the very last minute to destock.

This extraordinary wet period will end. It would pay to consider that it will inevitably turn dry again.

The stratosphere has received a massive injection of water vapour as a result of the Hunga Tonga-Hunga Ha'apai volcano explosion in January 2022

Scientists say the eruption of Tonga's Hunga Tonga-Hunga Ha'apai volcano on 15th January was the largest explosion documented by researchers since Krakatoa in 1883.

Normally a volcanic eruption causes a release of sulphur dioxide into the atmosphere, but because this volcano is under water, the result has been a massive injection of water vapour into the stratosphere.

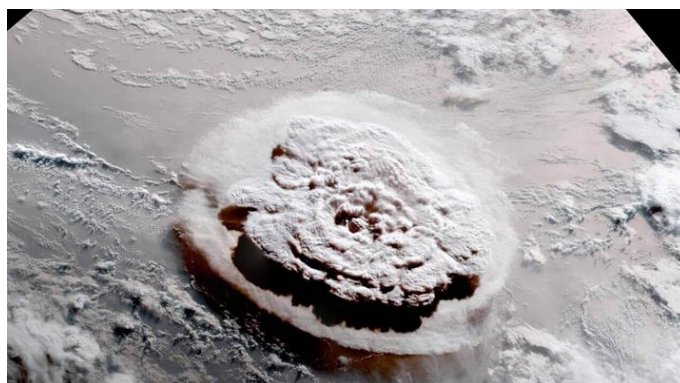


Figure 2: volcanic eruption 15/01/2022

This huge increase in water vapour in the stratosphere is causing a substantial cooling event now being observed over the southern hemisphere. Could this have an effect on our climate over the next few months/years?

The following are excerpts are from a story on the *Severe Weather Europe* webpage.

Atmospheric layers

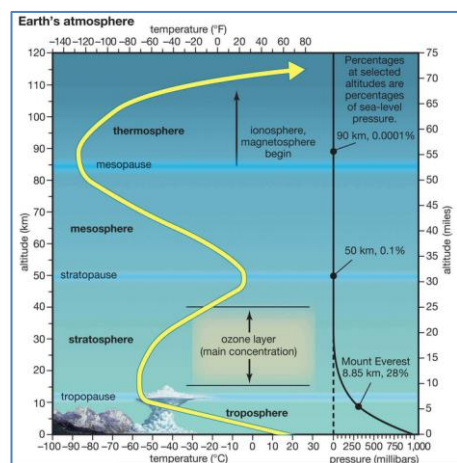


Figure 3: the earths atmosphere

All of the clouds (and our weather) are found in the lowest layer of the atmosphere, called the *troposphere*. It reaches up to around 8 km altitude over the polar regions and around 14-16 km over the tropics.

Above the troposphere there is a much deeper layer called the *stratosphere*. This layer is around 30 km thick and is usually very dry. This is where the ozone layer is found.

Following the eruption of Hunga Tonga, there was a 10% increase in total stratospheric water vapour content. This is a large amount, coming from just one event.

This large water vapour 'cloud' circles the globe in the stratosphere, as a result of the 'polar vortex', which fires up substantially during winter.

Stratospheric cooling

Water vapour is very potent at cooling the stratosphere. It deflects the incoming solar radiation, keeping the temperatures lower. Since May, there have been substantive cooling anomalies connecting all the way into the polar regions. This makes most of the southern stratosphere colder than normal.

This is a somewhat expected result after such a strong injection of water vapour directly into the stratosphere.

The map on the right is showing a significant cool anomaly over the southern polar region (August 2022).

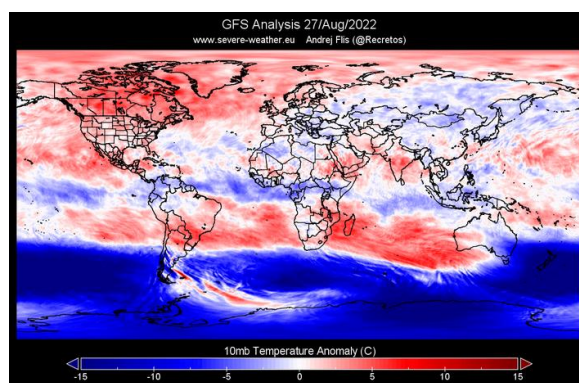


Figure 4: southern hemisphere stratosphere temp anomaly

Could this stratospheric cooling have a major impact on our climate?

Scientists agree that this event is likely to have an impact on our climate over the next few months, and even years. But just how much is unknown at this stage, and much more research will be needed to determine what impact, if any, this event will have on the climate in the Australian region.

Thanks to BoM Senior Scientist Matt Wheeler for pointing out this story. For this and other interesting weather articles, including information on the polar vortex, go to <https://www.severe-weather.eu/>

Climate driver update (issued by BoM 13th September)

The Pacific Ocean

A La Nina event is under way in the tropical Pacific and the BoMs ENSO outlook has shifted to La Nina.

All seven international climate models surveyed by the BoM show NINO indices are expected to meet or exceed La Nina thresholds by October, with five persisting at these levels until at least the end of 2022. Most models indicate a return to ENSO-neutral conditions in early 2023, suggesting a relatively short-lived event.

Keep an eye on the Pacific SST map over the next few months. The forecast model ensembles suggest neutral conditions by February; could the trend be possibly heading towards El Nino in autumn?

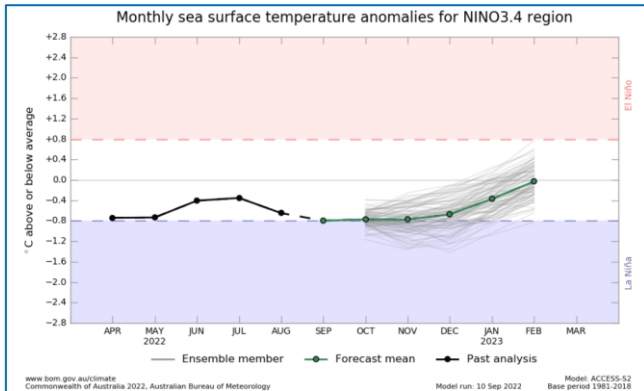


Figure 5: Pacific SST forecast chart 10th September (BoM)

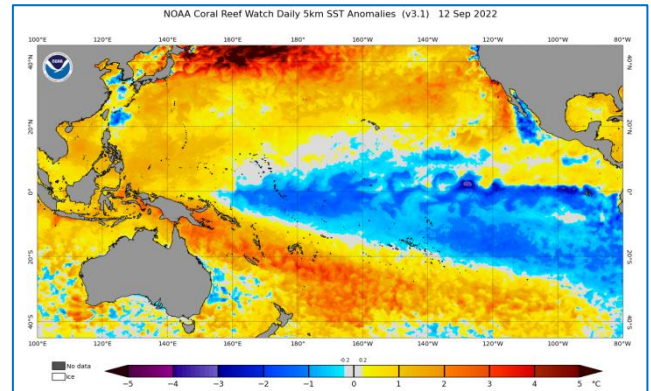


Figure 6: Pacific SST map 12th September (NOAA)

The Indian Ocean

A negative Indian Ocean Dipole (IOD) continues to be a major influence. The latest IOD index value for the week ending 11th September was -0.79°C . The IOD index value has been at or below the negative IOD threshold (-0.4°C) since June.

Cool anomalies are present in the north-west of the Indian Ocean basin close to the Horn of Africa, while weak warm SST anomalies continue across the east of the Indian Ocean, including in waters close to Indonesia and north-west Australia.

The forecast IOD track indicates a return to neutral IOD by January, which is normally the case once the monsoon becomes established.

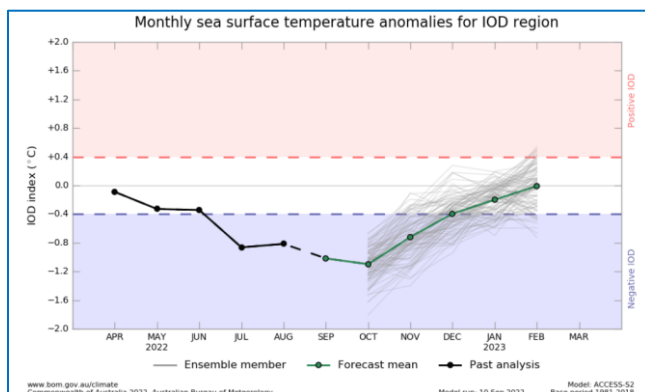


Figure 7: Indian Ocean SST forecast chart 10th September (BoM)

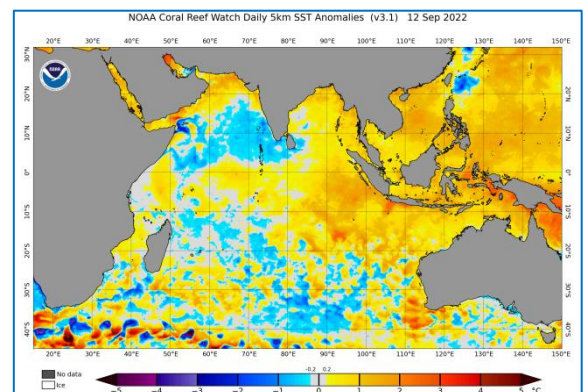


Figure 8: Indian Ocean SST map 12th September (NOAA)

The Southern Ocean

The Southern Annular Mode (SAM) index is currently positive, and it is likely to remain positive throughout much of spring.

A positive SAM during spring typically increases the chance of below-average rainfall in western Tasmania and above-average rainfall in eastern NSW. A positive SAM during spring typically increases the chance of below-average rainfall in western Tasmania and above-average rainfall in eastern parts of New South Wales and Victoria and south-eastern Queensland.

Rainfall outlooks for the next three to six months

Bureau of Meteorology (BoM) (updated 15th September)

Summary

- There is a moderate to high chance (greater than 70%) of above median October to December rainfall for much of the eastern half of Australia; below median rainfall is moderately likely (60% to 70% chance) for parts of Western Australia and central west coast to south-west Tasmania
- The pattern is generally consistent throughout each of the three months in the outlook period; chances of above-median rainfall in eastern Australia are strongest in October and November

October to December outlook scenario: 75% chance of receiving

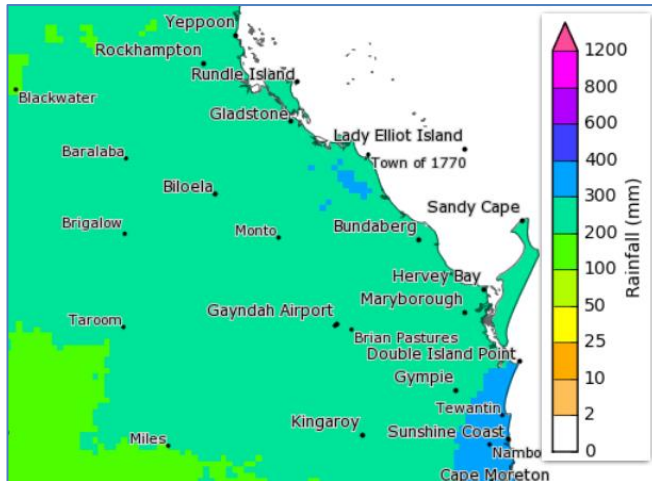


Figure 9: Oct - Dec 75% chance scenario (BoM)

The BoM is forecasting that the Wide Bay Burnett region has a high (75%) chance of receiving 200 to 300 mm from October to December. October to December medians in the table below.

Median rainfall October to December Wide Bay Burnett locations			
Location	Median	Location	Median
Biggenden	230	Maryborough	253
Bundaberg	222	Miriam Vale	262
Calliope	195	Monto	193
Childers	249	Mount Perry	228
Eidsvold	185	Mundubbera	204
Gayndah	229	Nanango	219
Gin Gin	228	Proston	217
Gympie	274	Rosedale	228
Kingaroy	218	Seventeen 70	205
Kilkivan	228	Tiaro	236
Kumbia	223	Ubobo	211
Lanark	202	Wondai	221

Table 1: WBB locations October to December median rainfall

November to January outlook scenario: 75% chance of receiving

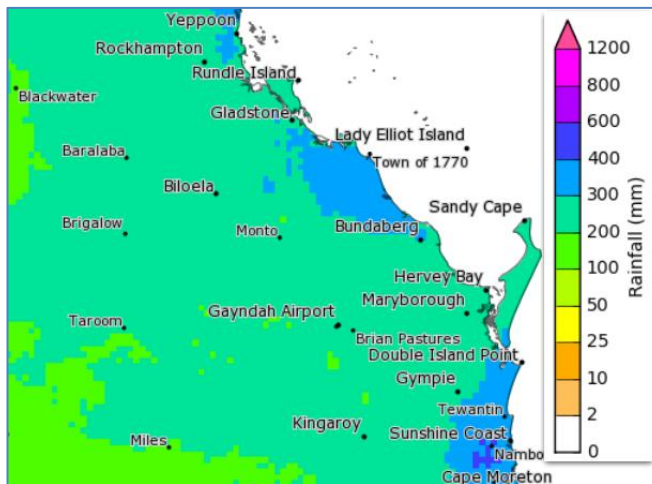


Figure 10: Nov - Jan 75% chance scenario (BoM)

The BoM is forecasting that the entire Wide Bay Burnett region has a high (75%) chance of receiving 200 to 300 mm from November to January, 300 – 400 mm coastal areas.

Median rainfall November to January Wide Bay Burnett locations			
Location	Median	Location	Median
Biggenden	286	Maryborough	320
Bundaberg	311	Miriam Vale	359
Calliope	268	Monto	246
Childers	324	Mount Perry	302
Eidsvold	225	Mundubbera	235
Gayndah	260	Nanango	257
Gin Gin	308	Proston	252
Gympie	342	Rosedale	314
Kingaroy	255	Seventeen 70	293
Kilkivan	272	Tiaro	304
Kumbia	264	Ubobo	292
Lanark	225	Wondai	265

Table 2: WBB locations November to January median rainfall

Past forecast skill: reasonably good for both periods

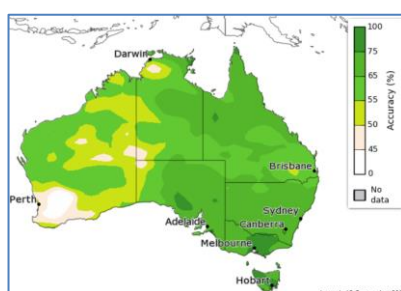


Figure 11: past forecast skill Oct - Dec

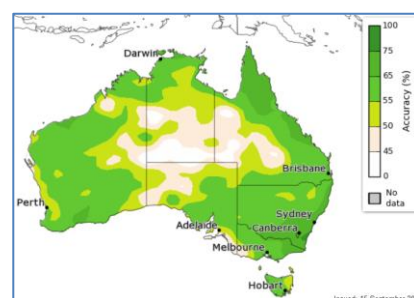


Figure 12: past forecast skill Nov - Jan

ECMWF rainfall outlooks (issued 8th September)

ECMWF are now providing forecasts up to six month ahead. The forecast charts below are set to show the probability of the most likely category of precipitation, expressed as terciles. A tercile is where the data is arranged in thirds, ie upper third, normal third, and lower third.

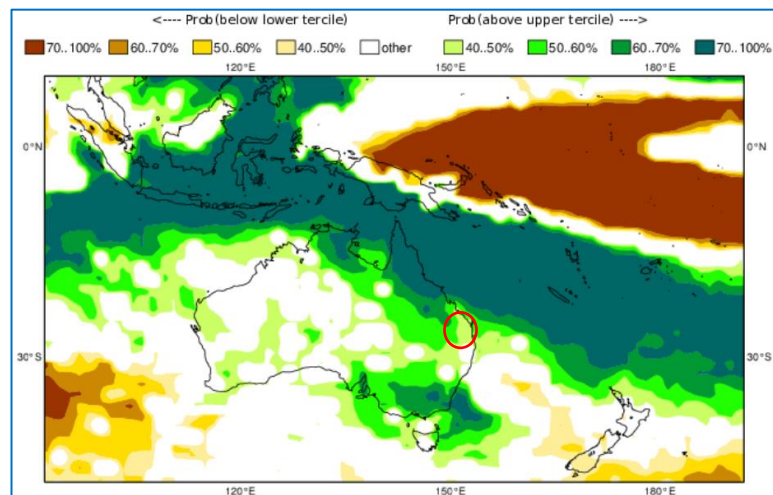


Figure 13: ECMWF rainfall outlook October to December

ECMWF is forecasting a 40 – 50% chance of rainfall being in the upper one-third of records from October to December in the Wide Bay Burnett region (circled), but much higher in the north of the state.

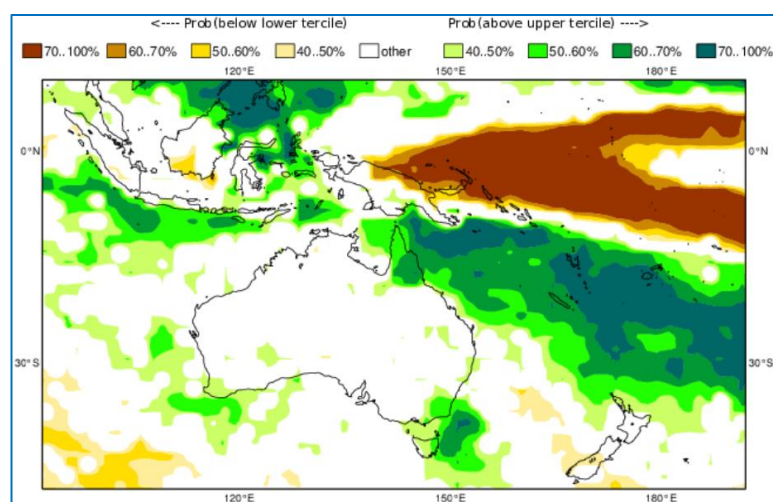


Figure 14: ECMWF rainfall outlook December to February

The rainfall forecast from December through to February is for around median, for most of the state, except for the far north. The La Nina influence is beginning to wane.

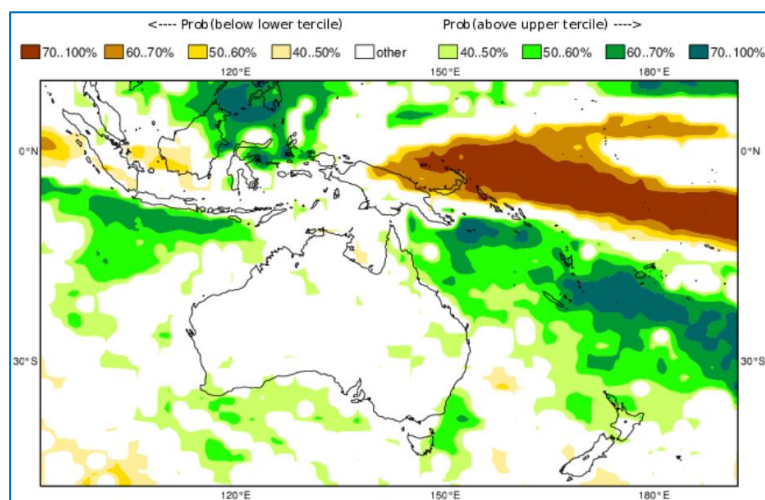


Figure 15: ECMWF rainfall outlook January to March

ECMWF is predicting that January to March rainfall is likely to be around normal for the entire continent.

UKMO forecasts (issued 12th September)

The maps below are for two forecast periods: October to December and December to February.

UKMO is forecasting a **60 – 80% probability** of exceeding median rainfall from October to December for the Wide Bay Burnett region (circled), with an 80 – 100% probability of exceeding median in tropical north Queensland.

The Wide Bay Burnett region appears to have a similar (60 – 80%) probability of exceeding median rainfall from December to February.

The UKMO forecast going into autumn differs slightly from ECMWF, and is not forecasting a return to around normal conditions December to February, at least in our region.

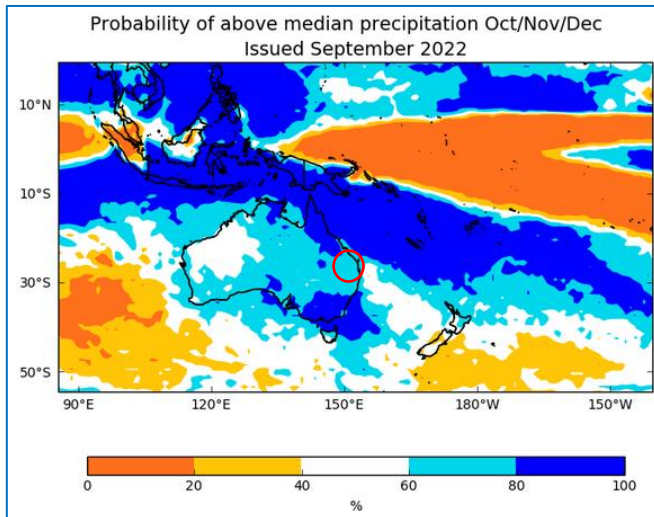


Figure 16: UKMO rainfall outlook Oct - Dec

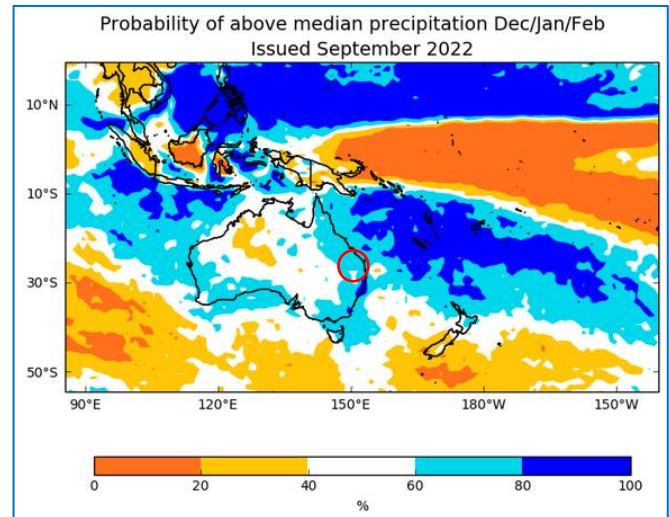


Figure 17: UKMO rainfall outlook Dec – Feb

The drought persists in the United States

Whilst most of Australia has enjoyed a prolonged period of persistent rainfall, most of us would be aware of the record-breaking drought in the US, especially in southern states.

This situation has been exacerbated by the La Nina, and unfortunately the forecasts for the next few months don't look too positive for our farming cousins in the US, especially in the mid and south west states.

The ECMWF is forecasting that rainfall is likely to have a 40 to 50% chance of being in the lower tercile (lowest one-third) from October through to March, for most of the mid and south-west of the US.

It doesn't look like the US drought is going to end anytime soon.

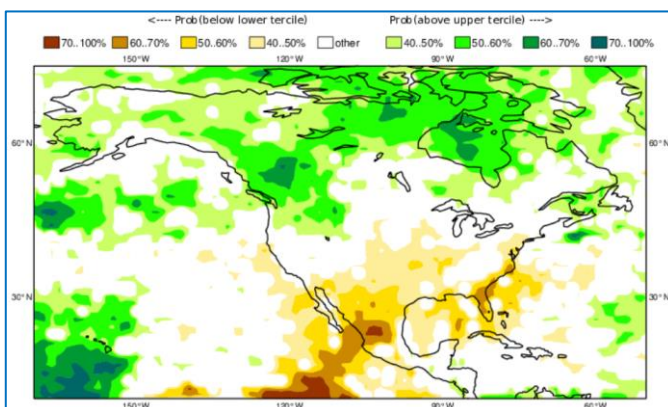


Figure 18: US rainfall outlook October to December

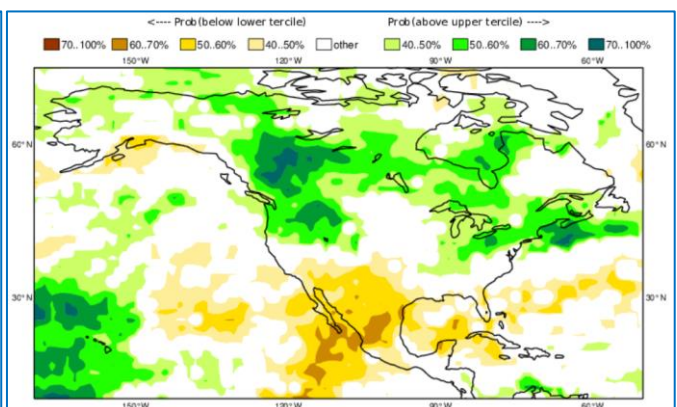


Figure 19: US rainfall outlook January to March

BoM research page

The BoM is trialling a number of different forecast products, and these are on the research webpage for testing and feedback purposes. The BoM research page can be accessed by producers on request.

The atmospheric map tool can be set to display several alternative views. The maps below are set to display **'average precipitation anomaly'**. In other words, how much more or less rainfall than average may be expected. This puts a bit of perspective on the *'chance of above median'* forecasts.

The two maps are showing the forecast rainfall anomaly from the mean for two seasons: October to December and November to January (updated 11th September).

The forecast for October to December is for 75 to 150 mm more rainfall than the long-term average in northern areas of Wide Bay Burnett, a bit less in the south of the region.

The November to January forecast is for around 25 – 75 mm more than average.

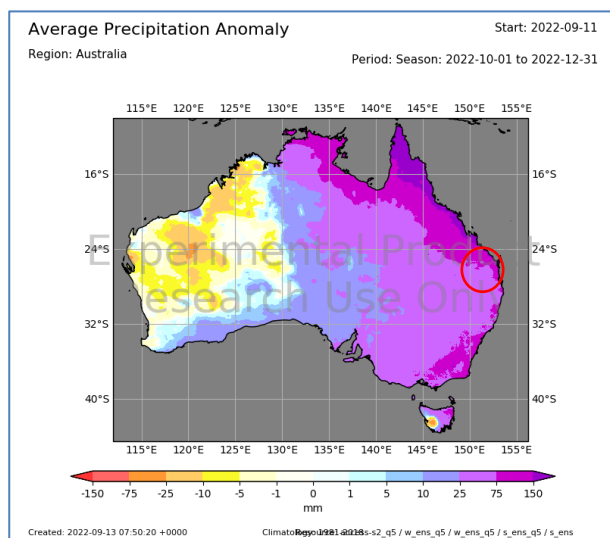


Figure 20: average rainfall anomaly Oct - Dec

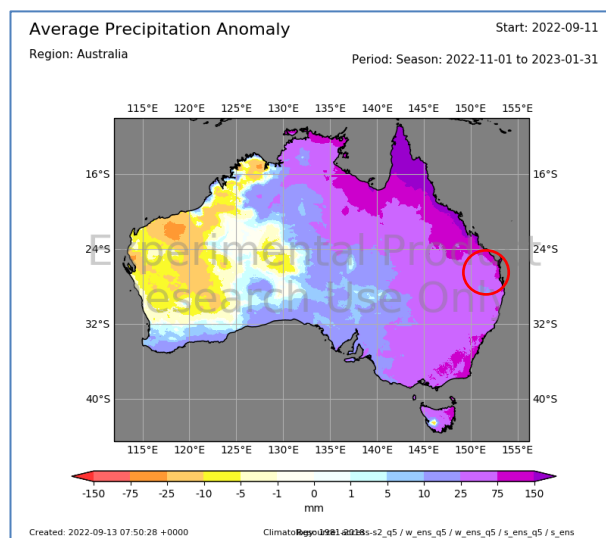


Figure 21: average rainfall anomaly Nov - Jan

Latest and final wet season onset map from the BoM

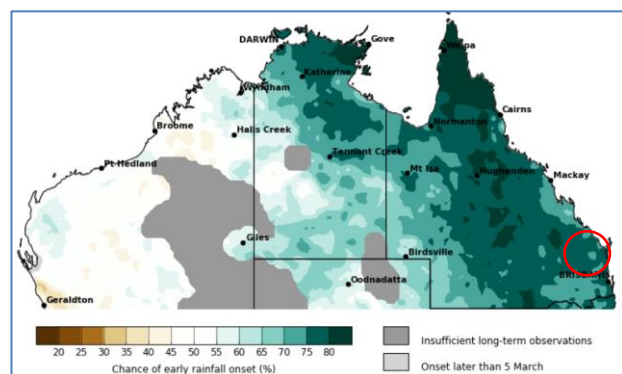


Figure 22: chance of early wet season onset map

The northern rainfall onset outlook gives an indication of whether the first significant rains (more than 50 mm) after 1st September are likely to be earlier or later than their median date.

Most of Queensland and north-eastern NT have a greater than 75% chance of an early rainfall onset. This seems to be the case for most of the WBB.

Could your 'green date' be earlier this year?

Conclusions to be reached from seasonal forecasts this month

- There is some variation between agency forecasts this month, but most suggest a wetter than normal few months from now until the end of 2022, but possibly a normal/sub-normal main wet season period
- October and November look likely to be the wetter months between now and the end of 2022
- Now we are heading into the wet season, keep watch on the monthly, as well as weekly forecasts
- Keep a close eye on the trends over the next six months. Could we be headed towards a dry period?
- Don't believe the hype: whilst some media reports are telling us that we are in for a season of doom and gloom and massive floods, the reality could be somewhat different. See the next page on how some perspective has been put into the seasonal forecasts

Don't believe the media hype: become more informed as to what the forecasts might mean for your location

The Climate Services for Agriculture (CSA) prototype tool is a very useful product to provide a range of climate information for your location. To find the tool, search for *climate services for agriculture*, open the page, scroll down and click on *explore prototype tool*. Type your location into the box and proceed from there.

Below are three examples of rainfall forecasts, each showing forecasts for the month of October, and for the 3-month period October to December. The circles represent high (75%), medium (50%), and low (25%) chance of receiving an amount of rainfall. The median rainfall for that period is in the dark box.

Compare these forecasts to the general forecasts included previously.

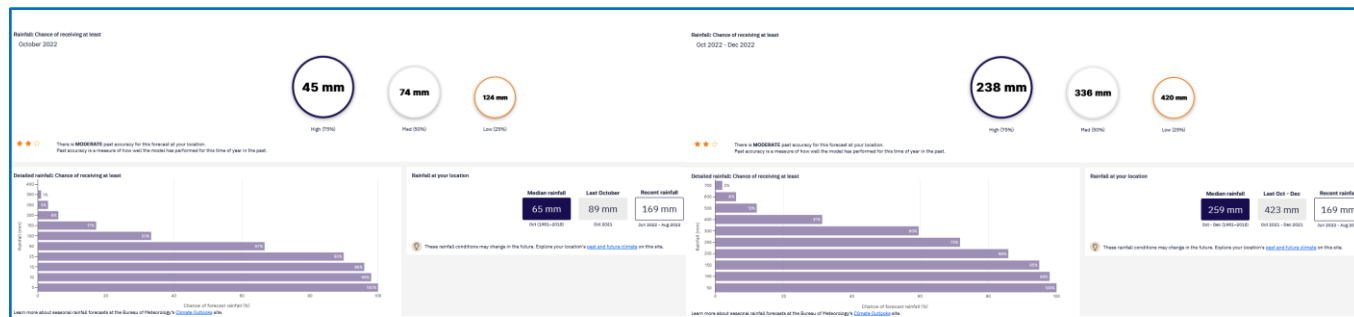


Figure 23: Biggenden October and October – December forecasts

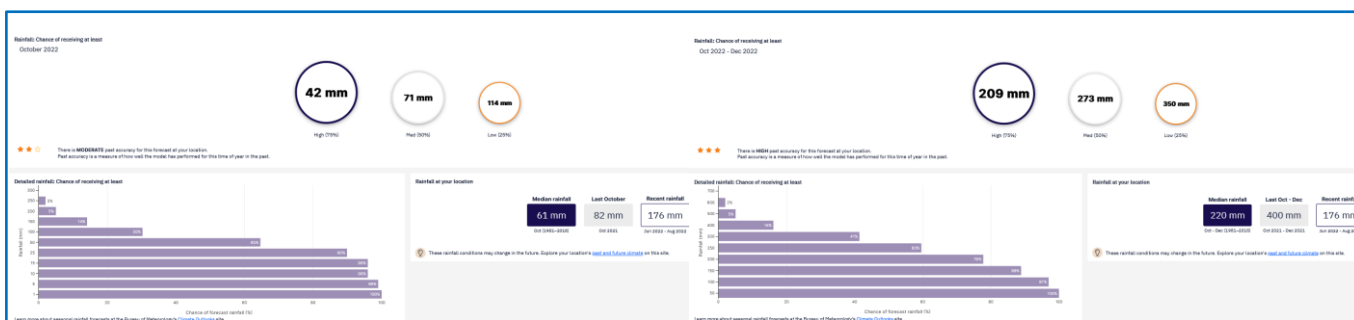


Figure 24: Mundubbera October and October – December forecasts

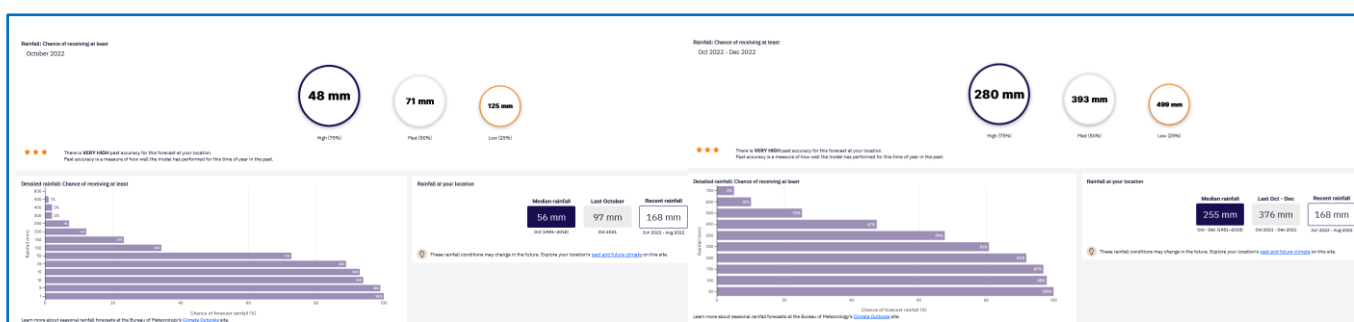


Figure 25: Miriam Vale October and October – December forecasts

Both Biggenden and Mundubbera forecasts are showing a 75% chance of BELOW median rainfall for October, and October to December. The Miriam Vale forecast is for below median rainfall for October, but slightly more than median for October to November: suggesting that either November or December, or both, could be wetter than normal.

This exercise shows just how important it is to consult as far and wide as possible to arrive at the most likely scenario for your location.

Like more information?

Peter Crawford is the NACP Climate Mate for the Wide Bay Burnett region. You can contact Peter on 0427 024 921, or e-mail peter.crawford@usq.edu.au.

Check out the Wide Bay Burnett Climate Info Facebook page at:

<https://www.facebook.com/ClimateInfoWideBayBurnett/>