MARCH 2016

BUSINESS MANAGEMENT
FACT SHEET

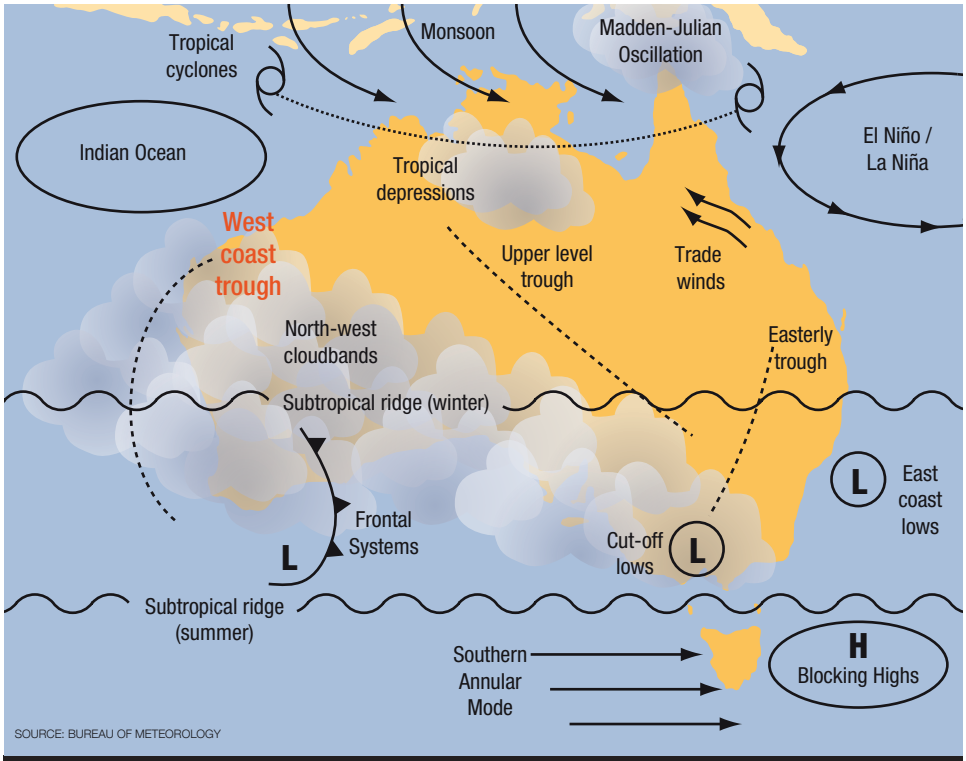
GRDC
Grains Research & Development Corporation
Your GRDC working with you

USING CLIMATE AND WEATHER DATA OBJECTIVELY

Climate and weather forecasting continue to improve as the Bureau of Meteorology (BoM) develops and refines new technology and modelling. Growers and advisers can consult a range of information to interpret emerging trends that can help with seasonal planning and decision-making.

KEY POINTS

- In southern Australia, seasonal outlooks are most accurate when made in winter and spring. They are least accurate when produced during autumn.
- Look for consistency between different outlooks and forecast models. If the majority point to a similar outcome, then it is more likely to occur.
- Seasonal forecasts alone should not be used to make firm decisions.



The main influences on Australia's climate. Influences have varying impact in different regions and at different times of year. Visit the 'Our Weather & Climate' page at www.bom.gov.au/watl for more information.

Weather and climate drivers for the southern region

Three major indicators that influence the climate of south-eastern Australia are the El Niño-Southern Oscillation (ENSO), the Indian Ocean Dipole (IOD) and the Southern Annular Mode (SAM).

ENSO is the natural oscillation between El Niño, Neutral and La Niña patterns in sea surface temperatures in the central and eastern tropical Pacific Ocean.

El Niño is associated with extensive warming of the central and eastern tropical Pacific sea surface, and is often associated with below average winter/spring rainfall over eastern Australia.

La Niña is associated with extensive cooling of the central and eastern tropical Pacific sea surface, and is often linked to above average winter/spring rainfall over much of eastern Australia.

The IOD is the difference between sea surface temperature (SST) anomalies in the western and eastern equatorial Indian Ocean.

When water in the tropical eastern Indian Ocean (near Indonesia) is cooler than average, and the water in the tropical western Indian Ocean (Tanzania, Africa) is warmer than average, it is known as a positive IOD period.

A negative period is when the situation is reversed – warmer in the east of the Indian Ocean and cooler to the west.

Positive periods are generally associated with reduced rainfall in southern Australia, while negative periods are characterised by increased rainfall over parts of southern Australia.

Level 4 | 4 National Circuit, Barton ACT 2600 | PO Box 5367, Kingston ACT 2604 | **T** +61 2 6166 4500 | **F** +61 2 6166 4599 | **E** grdc@grdc.com.au | **W** www.grdc.com.au

El Niño and positive IOD influence have the greatest impact when they take place simultaneously, as occurred during the spring of 2015.

The Southern Oscillation Index (SOI) is a measure calculated from sea level pressure differences between Tahiti and Darwin, and indicates El Niño or La Niña intensity.

The Southern Annular Mode (SAM) describes the north–south movement in the belt of strong westerly winds across the south of the Australian continent. These strong westerlies are associated with cold fronts and storm activity, and therefore influence weather in southern Australia. When it is further south than normal, rain stays further south too. This is called a positive SAM. When it is further north, and in a negative phase, rain-bearing systems are drawn further into the continent.

Other drivers include local sea surface temperatures, subtropical ridges, cut-off lows, east coast lows and frontal systems.

"The current POAMA seasonal forecast model has relatively coarse spatial resolution, with grid boxes typically 250km x 250km. This means that coastal areas and regions with significant topography, such as southern Victoria and Tasmania, are not very well represented, and therefore forecasts should be treated with caution here. Planned upgrades will soon offer improvement in several areas. Forecast grids will be 60km x 60km."

– Dr Peter McIntosh, CSIRO Oceans and Atmosphere

"ENSO is the response of the climate to movements of warm water in the Pacific Ocean. El Niño is when the warm waters move towards the eastern Pacific: the clouds move east, taking rain towards the Americas and away from Australia. This is what happened in 2015 and early 2016. The opposite, when the warmest water shifts west towards Australian longitudes and brings clouds and rain this way, is La Niña. This last happened in 2010–2012."

– Dr Andrew Watkins, Bureau of Meteorology

What are the models or modelling tools?

Models that couple atmospheric and oceanic conditions are used to make seasonal forecasts. All models have different skill and reliability. The dynamical models have become more reliable, meaning that odds tend to match outcomes.

The model currently used for seasonal climate prediction in Australia is the Predictive Ocean Atmosphere Model for Australia (POAMA).

The BoM analyses eight climate models from around the world when investigating the outlook for El Niño/La Niña and IOD events.

About 40 million pieces of data go into every BoM outlook.

Interpreting the information

In terms of the oceans, climate years essentially start in autumn, particularly for the Indian and Pacific oceans. ENSO events generally develop in winter, mature in spring and break down in summer before returning to neutral in autumn.

This means that outlooks are most accurate when made in winter and spring; for example, when made in July and predicting for August, September and October. Outlooks are least accurate when produced during autumn; for example when made in March and predicting winter rainfall.

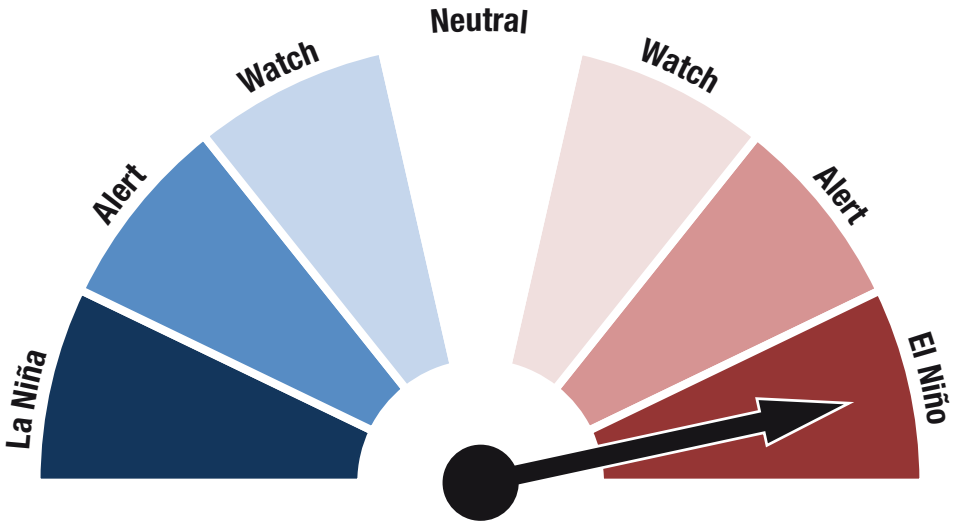
Because the accuracy of an outlook varies during the year and from location to location, it is recommended that the BoM's accuracy maps are consulted when using a climate outlook (Table 1).

Seasonal forecasts should be regarded as one of many decision-making tools. It is advisable to use a forecast to identify possible scenarios that may be faced, and plan for choices that may need to be made. Seasonal forecasts alone should not be used to make decisions.

It is also important to review the forecasts regularly, looking for consistency or trends, as the models respond to the addition of recent observations and data.

Seasonal forecasts give probability-based information about the seasonal bias and are therefore valuable in the long run rather than in any given year[1].

ENSO Tracker forewarns growers of changes in the likelihood or risk of an El Niño or La Niña occurring.



User-friendly models and information points

TABLE 1 Australian sources of climate and weather outlooks and forecasts.

Tool	Description	Website
Climate		
A main entry point	A central portal for BoM tools, including accuracy maps. Offers subscription to email updates.	www.bom.gov.au/climate/ahead http://www.bom.gov.au/climate/outlooks/#/overview/summary
Model summary	Provides an overview of climate drivers' behaviour, including summaries of key indicators in the Pacific and Indian oceans.	www.bom.gov.au/climate/model-summary/
ENSO Tracker	Forewarns changes in the likelihood of an El Niño or La Niña.	www.bom.gov.au/climate/enso/tracker/
The Break, The Fast Break and The Very Fast Break	11 models analysed by Agriculture Victoria's seasonal risk agronomist Dale Grey. Regular email updates can be received by subscribing (email thebreak@ecodev.vic.gov.au)	www.youtube.com/channel/UCIDCIII7gRZhUs03opGqH1g Regular updates can be received via email by subscribing via The. Break@ecodev.vic.gov.au Past editions of The Break newsletter: http://agriculture.vic.gov.au/agriculture/farm-management/weather-and-climate
Weather		
Interactive Weather and Wave Forecast Maps	Operates on the ACCESS platform. Can provide loop maps of air pressure, rainfall, temperature, wind speed and direction, and dew point.	www.bom.gov.au/australia/charts/viewer/index.shtml
Standard outlook	Official seven-day forecast.	www.bom.gov.au/australia/meteye/
Water and the Land	Particular agriculture focus. Outlooks and big range of localisable data.	www.bom.gov.au/watl

Strategies adjusted as El Niño outlook confirmed

Grower John Ferrier, from Birchip, Victoria, consulted the BoM's ENSO Wrap-Up and attended a talk by Victoria's seasonal risk agronomist Dale Grey, who provided an overview of the modelled outlooks in February 2015. El Niño was being mentioned. Mr Ferrier's approach is that models are never going to be 100 per cent accurate for rainfall. "It is best to look at the collective trends of all models and which way they are swinging," Mr Ferrier said. He consults the BoM, www.yr.no (from Norway) and Australian weather news, and also uses an on-farm weather station with soil moisture probe.

Using these tools Mr Ferrier was able to adjust his crop choice and variety selection, reducing his exposure to riskier crops. As the season progressed it was apparent that an El Niño posed a threat. In response to the lack of rain and the outlook, Mr Ferrier made fertiliser and herbicide adjustments to lower costs (Table 2).

TABLE 2 John Ferrier's production and risk planning through the 2015 El Niño.

January rainfall: 40-60mm*	February rainfall: 0mm*	March rainfall: 0mm*	April rainfall:15mm*	May rainfall: 14mm*	June rainfall: 45mm**
Outlook					
	BoM ENSO Wrap-Up and Dale Grey suggest a number of models are trending toward El Niño.		Little rainfall in outlook.	ENSO Tracker upgraded to El Niño.	Concerning commodity price and El Niño outlook.
What occurred on-farm					
One rain event.	Stored soil water deficiency of 30–40mm. Target 1t/ha cereal yield. Early days, but planned for contingencies.	Paddocks soil-tested (water and N). N-mineralisation estimated. Minimal levels of starter fertiliser budgeted.	Small sowing rain events. Switch to more cereals; canola dropped; lentil area reduced; two paddocks dropped to fallow.	Small late-May rain. A small amount of stored soil moisture.	Adopt conservative forward selling and marketing.
July rainfall: 22mm**	**August rainfall: 13.5mm****	**September rainfall: 10.5mm****	**October rainfall:3mm****	**November rainfall: 9mm****	**December Rainfall: 8mm****
Outlook					
El Niño outlook is strong; majority of models forecast El Niño. ENSO Wrap-Up and Fast Break explain it.		Outlook for crop potential is poor.	Heatwave in early October during wheat flowering, barley grain-fill.	Climate models confirmed El Niño transpired.	
What occurred on-farm					
N application limited to target 1t/ha. Minimal herbicide expenditure.			Began earliest harvest in farm's history.	Poor yields.	

*Data from John Ferrier's property, 'Shelton Park', Birchip.
**Data from nearby BoM weather station.

FREQUENTLY ASKED QUESTIONS

What is a probability forecast?

A probability forecast specifies, as a percentage, how likely a defined event is to occur. For example, a probability of 10 per cent means 10 times out of 100, or a one in 10 chance.

Why are seasonal outlooks least accurate in autumn?

Autumn is the period that climate drivers are mostly in a state of transition. Generally, they have not yet displayed sufficient identifiable characteristics that can be used for prediction or decision-making.

What should we be looking for when comparing various forecast systems and models?

It is important to look for consistency between different forecast systems. If the majority of the forecasts are pointing to a similar outcome, then that outcome is more likely to occur. On the other hand, if different forecasts vary considerably then the climate system is less predictable and the outcome should be considered relatively uncertain.

TABLE 3 Glossary of some key climate and weather modelling terms.

Term	Description
Climate	Average daily weather for an extended period of time at a certain location.
Season/seasonal	Outlook across a growing season for a crop. Typically between April-October.
Weather	Reflects short-term conditions of the atmosphere.
Model	A computer algorithm which predicts the climate or weather. Different models are used for climate and weather.
Skill	How well models forecast events.
Reliability	How well odds match the outcomes.
Weather forecast	A statement of what the weather is likely to be for the next day or specified number of days.
Climate outlook or forecast	With regards climate, forecast and outlook are used interchangeably and refer to predictions over medium to long periods of time, usually one to six months ahead.
Climate variability	The way climate fluctuates yearly above or below long-term averages.
Climate change	Long-term continuous change (increase or decrease) in average weather conditions or the range of weather.

Acknowledgements

1 Graeme Anderson, specialist seasonal climate, and Dale Grey, seasonal risk agronomist, Agriculture Victoria.

2 Dr Peter McIntosh, principal research scientist Marine and Atmospheric Research, CSIRO.

3 Dr Andrew Watkins, supervisor Climate Prediction Services, Bureau of Meteorology.

4 John Ferrier and De-Anne Ferrier, 'Shelton Park'.

This Fact Sheet is produced as part of the GRDC's Farm Business Management initiative.

References

1 McIntosh P, Asseng S, Wang E. (2015) Profit and risk in dryland cropping: seasonal forecasts and fertiliser management. In: *Building Productive, Diverse and Sustainable Landscape. 17th Australian Society of Agronomy Conference*. Hobart, Australia.

PROJECT CODES

CMA00003, MCV00036, ORM00015

USEFUL RESOURCES

BoM, Climate Outlooks
www.bom.gov.au/climate/ahead/#tabs=Further-information

GRDC, Climate Kelpie
www.climatekelpie.com.au

Australian CliMate
www.australianclimate.net.au

MORE INFORMATION

Climate Services, Bureau of Meteorology
helpdesk.climate@bom.gov.au

Dale Grey
Agriculture Victoria
03 5430 4444
dale.grey@ecodev.vic.gov.au

Dr Peter McIntosh
Marine and Atmospheric Research, CSIRO
peter.mcintosh@csiro.au

This fact sheet is produced as part of the GRDC's Farm Business Management initiative.

PRODUCED BY **WWW.CORETEXT.COM.AU** CONTENT PREPARED AND EDITED BY **ORM PTY LTD.**