

The role of climate science in drought management

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In the past, there has been a hope that science could solve the problem of drought by cloud seeding, irrigating vast tracts of land or breeding super-resilient plants and animals. Clearly drought is not a problem that can be solved but rather a risk that must be managed. Since the earliest days of settlement the erratic rainfall has been a recurring feature of agriculture in NSW. It is unusual for any decade to pass without one or two major droughts but no-one can say for certain when droughts will occur or how long they will last.

The future climate will always be uncertain. There are two advances in climate science for producers managing drought.

- Easy access to the rich resource of daily rainfall records collected across NSW over the last century. This data can be used to put numbers on uncertainty, in other words provide risk assessment. This data can be run through crop and pasture models to convert rainfall into crop yields and animal production. The decision on how to manage the risk is always up to the decision maker; what climate science can offer is better risk assessment.
- A growing ability to forecast the climate for the next season. There is an enormous international and national effort in climate science to understand the causes of seasonal climate variability. Much of this work has focused on the proven impact of the patterns of ocean temperatures on climate. The forecasts can not be used as categorical forecasts (for example, it will be dry, therefore reduce stocking rates), rather they must be used as part of risk management where the availability of feed, the

condition of the stock and the seasonal outlook are all considered.

The agroclimatology unit of NSW Department of Primary Industries is a statewide unit that seeks to deliver the advances of climate science to NSW producers and their advisers. This is achieved by running workshops, providing written material and conducting applied research into ways in which climate information can be integrated into NSW farming systems so that all of climate variability (the wet and the dry seasons) can be better managed.

What is an El Niño?

NSW rainfall is influenced by the Pacific, Indian and Southern oceans. Although the Pacific ocean is the main influence, the Indian ocean can play an important moderating role. In their outlook, the Bureau of Meteorology considers the influence of both the Pacific and the Indian oceans. The major impact is from the El Niño.

An El Niño event is a sustained warming by 1 degree Celsius of the surface temperature of the eastern equatorial ocean adjacent to South America. The opposite phase called La Niña is a sustained cooling by 1 degree of the same region. An El Niño event is accompanied by a negative Southern Oscillation Index (SOI) and a decrease in the strength of the Pacific trade winds, resulting in less moisture over eastern Australia from which rain may develop.

Impact of El Niño on NSW

Generally, NSW receives below average rainfall during an El Niño and above average rainfall with La Niña. It is important to note that each El Niño event is different – for example, the 1997 El Niño had far less impact on NSW than the 1994 El Niño. Also, while total rainfall over a season is commonly below average, we can expect there will be some rain, although the amount and timing can not be forecast beyond a few days in advance.



If drought is defined as drier than the lowest rainfall decile (1 year in 10) and El Niño events occur every 4–5 years, then during any one particular El Niño there will be some areas that will not have a drought.

Although Eastern Australia is more likely to be in drought during an El Niño, it is possible to have drought at other times, though these other droughts are usually more localised. During an El Niño, the risk of drought in an area increases from 10% to 50%. Hence there is a greatly increased risk of drought rather than a prediction of drought for specific areas when the sea surface conditions are in an El Niño state.

The 'classic' El Niño forms in autumn and breaks down the following autumn. The term El Niño ('boy child', i.e. Jesus) was first used by Peruvian fishermen and refers to Christmas because that was when the pattern of warm water off the coast of South America peaks. In most of NSW however, the main impact is felt in the winter and spring prior to the peak in ocean temperatures. This doesn't mean that El Niño droughts will break in summer or autumn after an El Niño winter and spring. Rather it means the probability of a dry winter or spring is higher in an El Niño year than the chance indicated from the long-term climate information while the chance of a dry summer and autumn is about the same as the long-term probability.

To make decisions with the help of this climate science, farmers now have extraordinary access to up-to-date information. Below are some readily available sources of information.

Australian rainman

Location-specific records of past extremes

One product allows access to full and up-to-date rainfall records from about 3700 separate recording sites around Australia and has the capacity to analyse them both with and without any influence from the SOI. It is the Australian Rainman computer program produced by Qld DPI and the Australian Bureau of Meteorology.

NSW Department of Primary Industries staff at most locations have access to this program and it can be purchased for personal use on home computers at a cost of \$125 from:

Queensland Department of Primary Industries & Fisheries. Phone 07 4688 1200

Analysis using this program can provide estimates of the frequency and duration of droughts at specific locations and the probabilities of getting chosen amounts of rain over specified times with current SOI conditions. It can put the probability

numbers on the risk of drought at individual locations based on historical records.

Seasonal outlooks – three month forward projections of probable rain and temperatures

Poll Fax

Bureau of Meteorology fax numbers.

Directory of available information
Freecall 1800 630 100.

Includes the following that may be of special interest. These 1902 numbers are charged at \$1.38 per minute.

- 3 month climate outlook
1902 935 251
- Southern Oscillation Index and Sea Surface Temperature update
1902 935 432
- 1 & 3 month Australian rainfall maps and Drought Statements
1902 935 262
- NSW state monthly weather summary
1902 935 234.

Internet

- Australian Bureau of Meteorology – www.bom.gov.au
- Check their Seasonal Outlook (updated monthly) and El Niño wrap up (updated weekly)
- Various forecasts are accessible via the NSW DPI Drought website www.dpi.nsw.gov.au/drought
- Additional and more location-specific detail is available from the Bureau of Meteorology in a fee for service 3-month seasonal outlook product. Contact the Silo section of their web site for access to this product, www.bom.gov.au/silo

Weather and climate information – short-term weather information out to 10 days

Poll Fax

Bureau of Meteorology fax numbers.

Directory of available information (free)
1800 630 100.

Includes the following that may be of special interest.

These 1902 numbers are charged at \$1.38 per minute.

- MSLP analysis chart, 36 hr forecast chart and latest cloud picture 1902 935 252
- Australian region 4-day forecast 1902 935 002
- 2–5 day forecast chart 1902 935 003
- 6–7 day forecast chart 1902 935 004•
- Rain radar - maps of currently falling regional rain
 - Moree 1902 935 766
 - Williamtown 1902 935 767
 - Sydney 1902 935 749
 - Wagga Wagga 1902 935 768
 - Grafton 1902 935 800
 - Coffs Harbour 1902 935 765
- Farmweather – includes latest cloud picture and 4-day forecast plus written description of the weather systems and how they are expected to develop, as well as probability estimates of forecast rain times and amounts within each region.

Cottonfields – Bourke, Moree, Gunnedah, Tamworth 1902 935 376

Stock and Grain – Coonabarabran, Dubbo, Nyngan, Parkes 1902 935 377

Vineyards – Scone, Newcastle, Mudgee, Orange 1902 935 378

Haystacks – Wyalong, Young, Griffith, Wagga, Tumut, Albury 1902 935 375

Internet

- Australian Bureau of Meteorology – www.bom.gov.au/silo
- Various forecasts accessible via the NSW DPI Drought website – www.dpi.nsw.gov.au/drought
- Additional and more location specific detail is available from the Bureau of Meteorology in two fee for service products. Contact the Silo section of their web site for 'Metograms' or the Special Services Unit section for 'Premium weather'.

Further information

The NSW Department of Primary Industries website has a wealth of information available at www.dpi.nsw.gov.au/drought

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Check for updates of this Primefact at:
www.dpi.nsw.gov.au/primefacts

Disclaimer: The information contained in this publication is based on knowledge and understanding at the time of writing (January 2007). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Primary Industries or the user's independent adviser.

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