

# Experiences in the use of climate information, and its communication in 2002/03, from the perspective of the Department of Agriculture, WA

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## Introduction

The 2002-03 El Niño-related drought had a severe impact on the southwest of Western Australia, probably the second largest behind 1914. Rainfall was the lowest ever for some regions and total grain production fell 50% from normal, at an opportunity cost of \$1.6 billion to the State. Worst affected shires were in the central and eastern margins of the grainbelt, where grain production was a quarter of normal and where extensive wind erosion occurred.

For a region covering nearly a third of the State, the last 3 years had some of the driest growing seasons in a row and this led to Department of Agriculture, Western Australia (DAWA) staff submitting two successful Exceptional Circumstances (EC) applications to the National Rural Advisory Council (NRAC). Between 2001 and 2002, water inflow into southwest dams was the lowest ever for a 2-year interval and this led to city water restrictions and water carting on many farms. DAWA was also active in communicating the likelihood of dry weather, measuring meteorological data, and assessing the impacts of the drought on productivity.

## Climate Information and Communication

### Forecasting

In the last few years DAWA has been developing a number of forecasting indices that form the basis of long-lead predictions of ENSO events and seasonal rainfall (Stephens and Lamond, 2003a). These include an El Niño Prediction Index (EPI) based on pressure over southeastern Australia (Stephens and Lamond, 2001), and a

MeanSOI which is the average of an equatorial SOI (EQSOI), the true SOI (near 15°S) and a Mid-Latitude SOI (MLSOI) near 30°S (Stephens and Lamond, 2003b). The MeanSOI is useful as all the 8 largest falls in this index from October to May (over the last 50 years) preceded El Niño events and were typically major droughts (see Table 1).

In February 2002, DAWA in conjunction with the Grains Research and Development Corporation (GRDC), ran the annual series of Agribusiness Crop Updates seminars in Western Australia. At these meetings, farmers were warned that a weak to moderate El Niño was like to develop and that average to below average rainfall was most likely (Stephens, 2002). As autumn developed, the MeanSOI continued to fall and warnings were upgraded. By early June it was noticed that the fall in the index was grouped with El Niño years and some of the worst droughts seen in Australia (Table 1). Press releases and media statements were issued and this was widely reported in the rural media e.g. Profarmer Australia (2002). By early August, DAWA issued warnings that future rainfall was likely to be below average with an 80% confidence level attached to the forecast. Farmers were grateful for the specific nature of these forecasts. Those that acted on the advice in central and eastern areas of the wheatbelt made considerable savings. The dry weather forecasts did differ from those of other agencies and this resulted in a number of press articles that compared forecasts. The BoM web-based El Niño wrap-up was well received by most climate users. Anecdotal evidence suggests that 1 to 10-day forecasts on the web were widely used by farmers in their day to day management, especially those from the US navy site.

Table 1: The 14 largest falls in the MeanSOI from 1958 between October (year(-1)) and May and a listing of El Niño years and major droughts.

RANK	MeanSOI trend October(-1) to May	
	YEAR	TREND
1	El 1997	-22.1 ●
2	El 1972	-18.2 ●●
3	El 1976	-13.0 ●
4	El 1991	-12.7 ●
5	El 1994	-11.4 ●●
6	El 1987	-10.7 ●
7	El 1965	-10.0 ●●
8	El 2002	-9.5 ●●
9	El 1982	-7.8 ●●
10	1967	-7.7 ●●
11	1977	-6.4 ●●
12	1980	-5.6 ●●
13	1981	-5.1
14	1961	-4.9

Note: El = El Niño year begins ●● = Major drought in Australia ● = Regional drought in Australia

### Assessing the impact of the drought on Productivity

DAWA has a network of Automatic Weather Stations (AWS) that record real-time hourly meteorological data. Data from these 17 stations were used to measure the severity of the drought and this information was loaded on the web. DAWA used rainfall data and maps from the Bureau of Meteorology (BoM) for monitoring the drought and defining regions for formal drought declarations. Real-time patched data from the Queensland Department of Natural Resources and Mines was also used extensively to:

- map rainfall rankings at individual locations,
- input into the STIN crop model for provision of soil moisture and crop yield forecasting maps, and

- input into farm management models (PYCAL, STIN, SPLAT, TACT, MUDAS, NAVAIL, and FLOWERCAL) for yield expectations, disease likelihood and virus spread (Tennant and Stephens, 2000).

The STIN modeled wheat yields were most useful in assessing EC, as deviations in de-trended yields are a good relative measure of when farmers are most facing difficulty (Stephens, 1998). In addition, joint work with CSIRO involved mapping modeled pasture growth rates at a regional and farm level using 10km gridded meteorological data from the BoM and NDVI satellite imagery data (Edirisinghe et al., 2000).

### Communication Tools and issues

Communication strategies employed by DAWA were a dedicated climate website ([www.agric.wa.gov.au/climate](http://www.agric.wa.gov.au/climate)), media releases for rural radio, print and electronic media, and

numerous presentations (major seminars, farmer meetings, field days and industry briefings to agribusiness and other government departments). Monthly summaries of DAWA climate indices were sent to the National Climate Centre and discussions about ENSO occurred on a regular basis.

The level of uptake of climate information in 2002/03 is difficult to discern. Interactions with farmers show that broadband access to the web has increased noticeably, especially for monitoring rainfall forecasts. Widespread availability of climate information through a multi-media approach (web, media, and at DAWA organised meetings) has certainly enhanced its usability and uptake. Most farmers and agribusiness were aware of the likelihood of an El Niño-related dryness in 2002, and better rainfall prospects in 2003 (presented at 2003 Crop Updates; Stephens, 2003).

Factors that limited the uptake of climate information related to the way the information was presented. Seasonal forecasts presented by other agencies typically had short lead-times and could not assist at crucial decision making times early in the year. Farmer confidence in forecasts and interpretation of their probabilistic format also limited usability. Comments such as “Tell me what you reckon without clouding it too much with how you derived your position” have been made. The need for a “Drought recognition scenario” was also highlighted. Farmers in southern Australia who didn’t harvest any crop in 2002 mentioned that the probabilities of rainfall exceeding the median in some forecasts were not extreme enough (30% -50%) for them to warrant changing their management. Pastoralists mentioned that “Making money in good years is not difficult, so if seasonal forecasts did nothing but make me aware of coming dry spells, they would be of tremendous benefit”. Education about forecasts and decision support tools is a real need and the Climate Risks and Opportunities Project (CROP) within DAWA is addressing this issue with primary producers and farm advisors.

## **Suggestions for Improved Services**

For climate information providers there are five major suggestions.

**1. Avoid artificial scenarios:** the impacts of drought are more realistically monitored if rainfall rankings are plotted at individual points, then spatially extrapolated; rather than spatially averaging to coarse grids, then spatially mapping rankings of the individual grids. Our first EC application to NRAC ran into difficulty because there were differences between DAWA’s point mapping of drought, compared to the Bureau of Rural Sciences gridded mapping. Farmer’s reports matched more closely to DAWA’s point source mapping.

**2. Improve data quality:** the issue of data reliability and spatial coverage needs to be looked at in the context of assessing productivity. Crop forecasting of billions of dollars of crop production requires a “priority network of quality weather stations” across the grainbelt of Australia. We propose something similar to what happens in South Africa, where one priority station per grainbelt shire reports on a daily basis. Individual reports are checked daily and observers are contacted if no reports have been obtained.

**3. Improve data network coverage:** it would be good if the BoM made use of weather stations run by other agencies to increase the station density of the real-time stations. The greatest need is in the low population regions of the grainbelt. Discussions are underway to link DAWA’s AWS network to the BoM ADAM database.

**4. Improve media communications:** quality checks of press releases should occur. For example, statements about the “Worst drought on record” should be made at the end of the ENSO year (April to March) and not before the main winter growing season has finished in early November.

**5. Issue a “drought scenario warning”** for the southern Australian growing season when a gradual sea-saw in pressure at three latitudes causes the MeanSOI to fall and become negative (Stephens and Lamond, 2003b). In this situation there appears to be the potential to warn farmers that rainfall looks to be below average. When this is done the associated confidence levels should be stated (Giles, 2002) and this should be based on the ratio of below average years to the total number of years that have an analogous downward trend in the MeanSOI.

## Future developments

In July 2003, the GRDC awarded a 3-year project to DAWA to develop "Better long-lead seasonal and crop forecasts for southern Australia". Various pressure indices will be tested and an automated analog selection function developed to select the most similar years in the broadscale weather pattern. These analogs will form the basis of ENSO and seasonal rainfall forecasts. Another proposal is with the GRDC to assess the impacts of climate change on grain production in the southwest of Western Australia. DAWA is also engaging farmer groups to improve access and uptake of climate information for more profitable and sustainable farming systems.

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