

# Assessment of climate change projections for WA – new tools for adaptation

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## KEY MESSAGES

Projections of the WA climate made in 1988 have been confirmed by subsequent observations. Weather patterns have changed as expected. Moreover, the South West region has dried out faster than predicted.

Expansion of DAFWA's automatic weather station network provides an opportunity to develop a variety of tools and applications for monitoring future climate change and improving management of seasonal and extreme events.

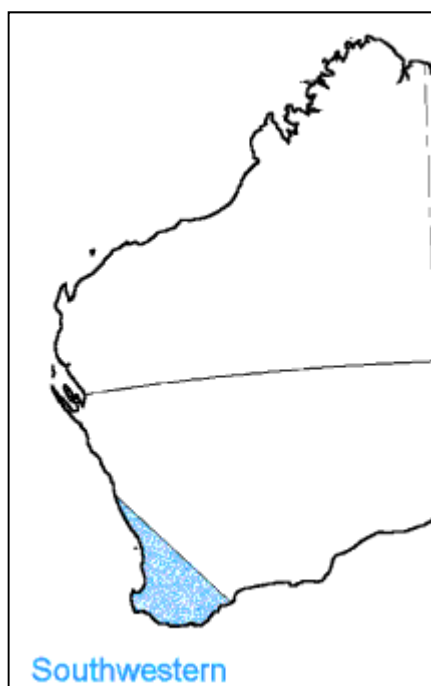
## AIMS

Climate change projections for WA have been available for almost a quarter of a century. The Bureau of Meteorology issued a climate projection at the Greenhouse 88 Conference at Challenge Stadium in Perth in 1988. The first global projections were made by the IPCC in 1990. This paper assesses the accuracy of those early projections by comparing them with the observed climate since then.

DAFWA's expanded automatic weather station network will also be showcased, with possible applications for seasonal management of both current and future climate.

## METHOD

Historical climate information for the South West region of WA was sourced from the Bureau of Meteorology ([http://www.bom.gov.au/climate/change/aus\\_cvac.shtml](http://www.bom.gov.au/climate/change/aus_cvac.shtml)). Time series of seasonal rainfall and temperature were obtained for the region below.



Seasonal rainfall and temperatures were averaged over this region for the years 1900 to 2012.

The climate change projections issued in 1988 described the most likely scenario at 2040:

- Southward shift in winter rainfall systems.
- Increased sea surface temperatures and southward occurrence of tropical cyclones.
- Decreased winter (JJA) rain between 10% and 20%.
- Increased summer rain for Kimberley and Pilbara (50%).
- Increased summer rain over the Wheatbelt and Goldfields (40%).
- Winter temperature rise by 1.8 to 2.1 °C (summer up by 1.2 – 1.5 °C).

The period 1988 to 2012 was used to compare rainfall and temperatures as projected for that period with those observed.

DAFWA installed an additional 67 weather stations in 2012, partly funded by 'Royalties For Regions'. These bring the total network to 120 stations. They measure a range of weather variables such as temperatures, rainfall, wind and solar radiation, and transmit data every 10 minutes. These are displayed on the DAFWA website (currently [www.agric.wa.gov.au/weather](http://www.agric.wa.gov.au/weather)), together with derived variables such as delta T and evaporation. A new Oracle database and web interface has been developed that will provide an integrated view of all stations.

## RESULTS

Winter rainfall trends over South West WA were projected to be between -6 and -13 mm per decade. The trend since 1988 was -22 mm per decade. The plot below shows observed rainfall in June to August, compared with projected and actual trends.

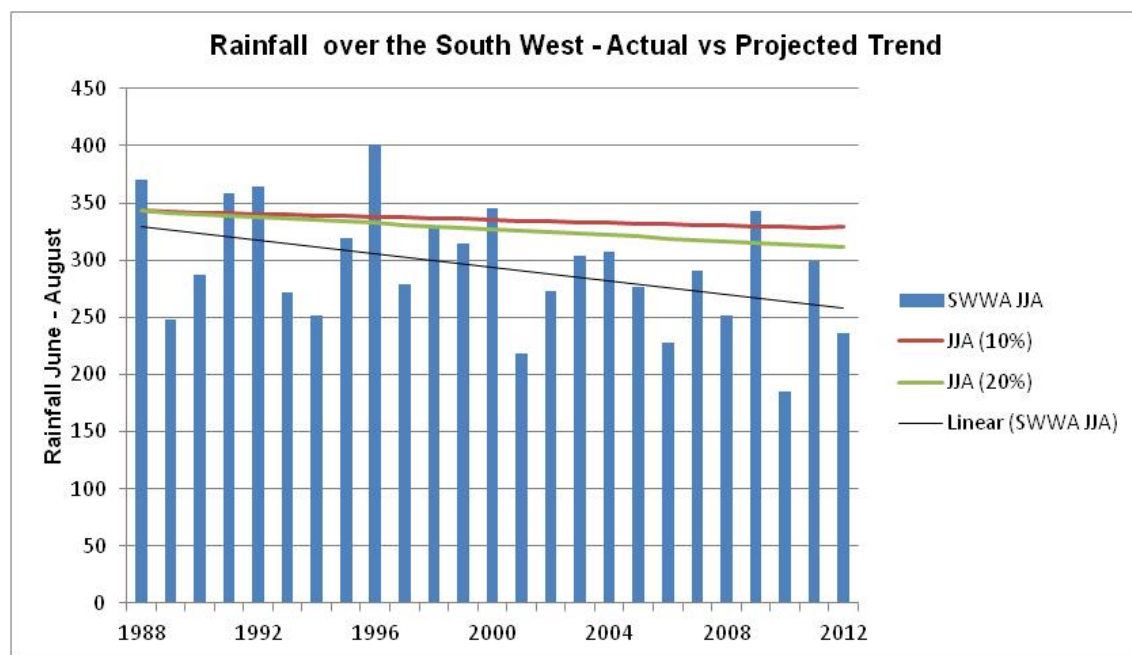


Figure 1. Seasonal rainfall (June – August) for the SW region of WA for years 1988 to 2012 (bars), with linear trends as projected (coloured) and observed (black).

Changes in seasonal mean rainfall and temperature for winter (JJA) and summer (DJF) as projected and observed are shown in Table 1. There has been a 15% decline in winter rain and a 6% increase in summer rain over the SW region. There has been warming, though not as strong as expected.

Table 1. Estimated seasonal rainfall changes at 2012, using projected changes at 2040 (ie -10% and -20% for JJA rain and up to +40% for DJF) estimated at 2012.

Changes at 2012	JJA	DJF
Projected rain	-6% to -9%	+19%
Actual rain	-15%	+6%
Projected temperature	+0.3 to +0.4 deg C	+0.2 to +0.3 deg C
Actual temperature	+0.14 deg C	+0.03 deg C mixed pattern

The atmosphere has become more stable, with a weakening and southward shift of winter weather systems. Atmospheric pressures have increased in early winter.

Key features of the expanded weather station network are improved spatial coverage and timely delivery to the DAFWA website. By providing local weather data, growers in a variety of industries can make more informed decisions to manage their enterprises. This includes decisions such as scheduling irrigation of vegetable crops and selecting the right conditions for spraying operations in cropping.

The weather data will also ultimately link into tools such as the crop yield estimator Yield Prophet to provide more robust risk management tools for growers.

This information is being used to improve monitoring of fire weather conditions and has already assisted in management of bushfires on the South Coast.

The data is also feeding into the Bureau of Meteorology weather services and website as part of a national climate data sharing arrangement.

## **CONCLUSION**

Climate projections for WA made from as early as 1988 have provided a consistent indication of likely changes to our climate. Weather patterns have changed as expected, but the South West has dried faster than projected. With the observed reduction in rainfall and future climate projections, it is clear that many sectors will need to adapt to future climate and improve efficiency of resource use.

DAFWA has developed an enhanced weather station network that will aid our understanding of future climate change, seasonal variability and extreme weather events. Expansion of DAFWA's weather station network has significantly improved spatial coverage as well as timeliness. This weather information can be used by growers, agribusiness and regional communities both directly and in a wide variety of applications. .

## **KEY WORDS**

Climate projections, Weather Stations.

## **ACKNOWLEDGMENTS**

The new weather stations have been funded by 'Royalties For Regions' programme, and funding from a Cabinet Submission, and Department of Fire and Emergency Services.

**GRDC Project No.:**

**Paper reviewed by:** Fiona Evans