Department of Agriculture and Food
GOVERNMENT OF WESTERN AUSTRALIA

# Our Changing Climate

## *Corrigin At A Glance*

**This agri-climate profile provides historical and projected climate information to support farm business decision-making in relation to a changing climate in the Corrigin area.**

## Introduction

Climate change and climate variability have already severely impacted on Western Australian (WA) broadacre crop and animal production over the past years, with serious rainfall deficiency and frost challenging farm profitability and sustainability. Historical data shows that a decrease in rainfall and an increase in temperature have already occurred over the last century. Climate projections for the south west of WA indicate further rainfall decline and higher temperatures.

The grain belt of WA contributes more than $4.5 billion to WA's economy per year. Corrigin (lat 32.32 S, long 117.87 E) is situated 230 km south-east of Perth in the central grain belt. This agri-climate profile provides a historical analysis and future projections for a range of climate variables relevant to farm businesses in the Corrigin area.

## Changes at a Glance

The total annual rainfall of Corrigin has declined by about a five per cent, and growing season rainfall by about 12 per cent (April-October), from 1939-1974 to 1975-2010. Rainfall distribution has also changed with fewer wet years and smaller, less frequent winter rainfall events.

The observed trends in Corrigin's climate include: less winter rainfall, fewer wet years, less rain days in winter, more big rainfall events in summer, more variable and later starts to the growing season, increase in average autumn maximum temperatures and increase in the number of frost events in winter.

## Adapting to Climate Change

Climate change and variability represents a significant challenge to grain production in Western Australia. Since the 1970s rainfall has declined significantly in agricultural areas, while day and night-time temperatures, particularly in winter and autumn, have gradually increased. Seasonal rainfall has also become more variable with later starts to the growing season and a general shift to more summer and less winter rainfall. To maintain viable enterprises growers require ways to successfully navigate these climatic and seasonal changes and the agronomic challenges they generate.

Adaptation requires technological and research based approaches to strengthen the resilience of farm businesses. Sustainable alternatives to maintain profits are needed – new establishment techniques, innovative farming systems or alternative crops may all help to address climate challenges.

Improved networks of communication, decision-making and knowledge production are also needed. Demonstrations of practical ways in which farming systems can adapt to climate change is the aim of the National Adaptation and Mitigation Initiative (NAMI) that includes demonstration sites in the WA grain belt.

The collaborative NAMI project led by DAFWA involves major grower groups across the WA grain belt, as well as the Commonwealth and Scientific Industrial Research Organisation (CSIRO), the University of WA and private consultants.


GRDC
Grains Research & Development Corporation
CSIRO
Australian Government
Department of Agriculture, Fisheries and Forestry

Project DAW00202 'Demonstrating adaptation to climate change in the wheatbelt of Western Australia through innovative on-farm and virtual farm approaches' is funded by the Department of Agriculture and Food, Western Australia, the Grains Research and Development Corporation and the Australian Government's Climate Change Research Program.

## Historical analysis

The following results provide a historical analysis for a range of climate variables. Given the observed shift in the mid 1970s, historic trends are shown for the periods 1939-1974, 1975-2010 and 2000-2010.

### *Rainfall*

Total annual rainfall has decreased by five per cent from 1939-1974 to 1975-2010.

Growing season rainfall (April-October) has declined by 12 per cent since the mid 1970s with a further 12 per cent decline since 2000 (Figure 1).

The chance of two consecutive drought years (decile 3 growing season rainfall or below) has increased from five per cent in the period 1939-1974 to 14 per cent in the period 1975-2010.

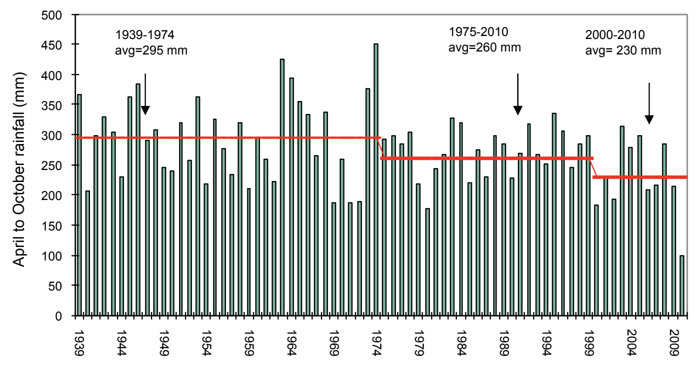


*Figure 1: Time series of growing season (April-October) rainfall (mm). Horizontal lines represent averages for the periods 1939-1974, 1975-2010 and 2000-2010.*

Around the mid 1970s there was a shift to consistently drier winter conditions. Figure 2 shows a significant decline in June rainfall from the period 1939-1974 to 1975-2010. Due to high variability among years, the change in average monthly summer rainfall is not significant between the periods 1945-1974 and 1975-2010 (Figure 2).

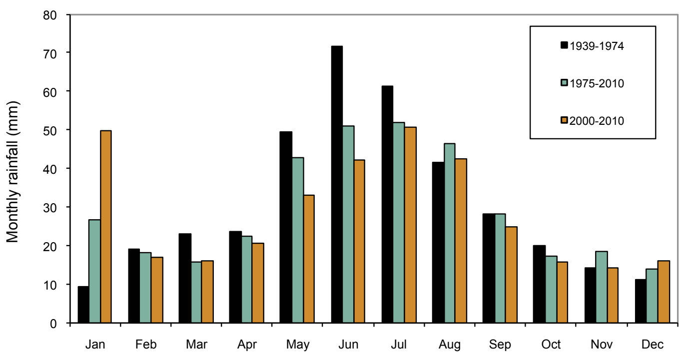


*Figure 2: Average monthly rainfall (mm) for the periods 1939-1974, 1975-2010 and 2000-2010.*

Figures 3 and 4 show that the reduction in winter rainfall has been a combination of fewer days with big rainfall events, fewer days with rain and smaller rainfall events. Figure 5 shows the average size of rainfall events in January has increased between the periods 1939-1974 and 1975-2010.

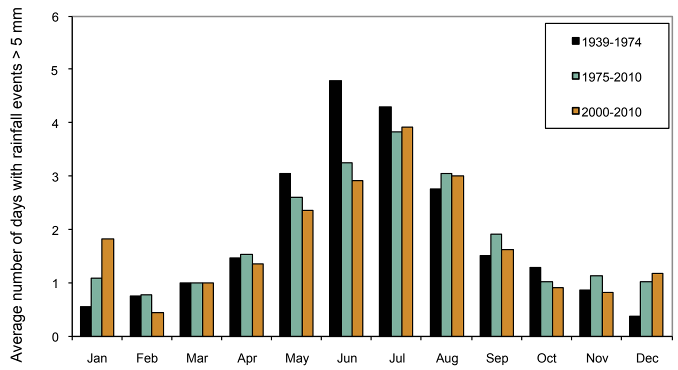


*Figure 3: Average number of days with rainfall events greater than five mm per day per month for the periods 1939-1974, 1975-2010 and 2000-2010.*

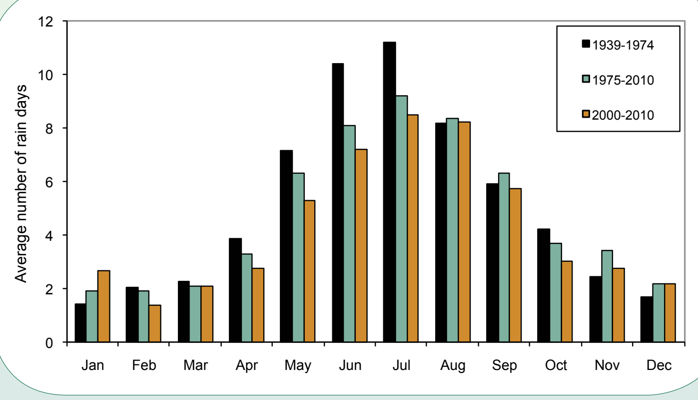


*Figure 4: Average number of rain days per month for the periods 1939-1974, 1975-2010 and 2000-2010.*

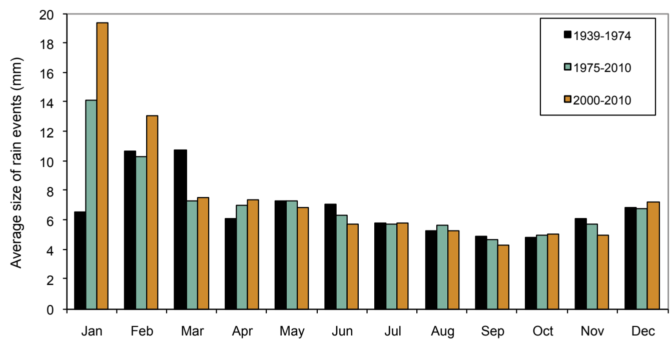


*Figure 5: Average size of the rainfall events per month for the periods 1939-1974, 1975-2010 and 2000-2010*

### *Temperature*

Since the mid 1970s, mean monthly maximum temperatures have significantly increased in the months April, May and July (Figure 6).

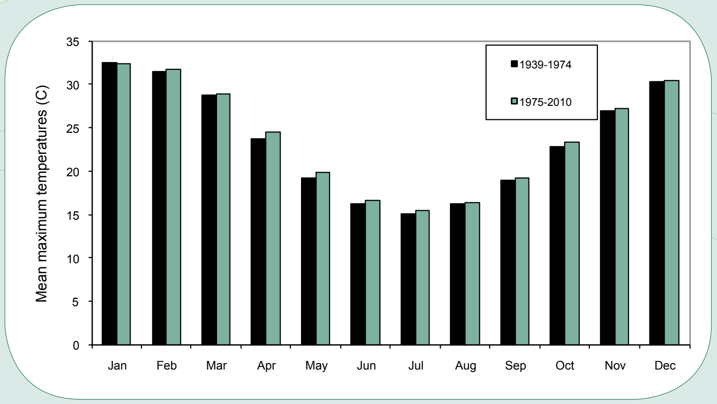


*Figure 6: Mean monthly maximum temperature for the periods 1939-1974 and 1975-2010.*

Average monthly minimum temperatures have significantly increased in February, April, May and November (Figure 7).

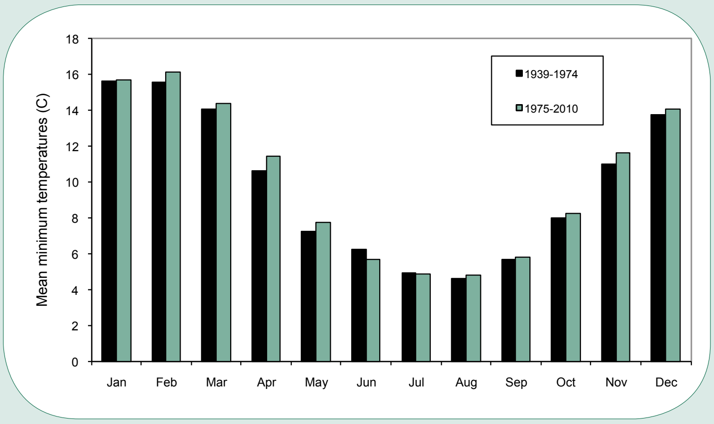


*Figure 7: Mean monthly minimum temperature for the periods 1939-1974 and 1975-2010.*

The number of days with extreme temperatures, or maximum temperature above 35˚C, has remained relatively the same (Figure 8).

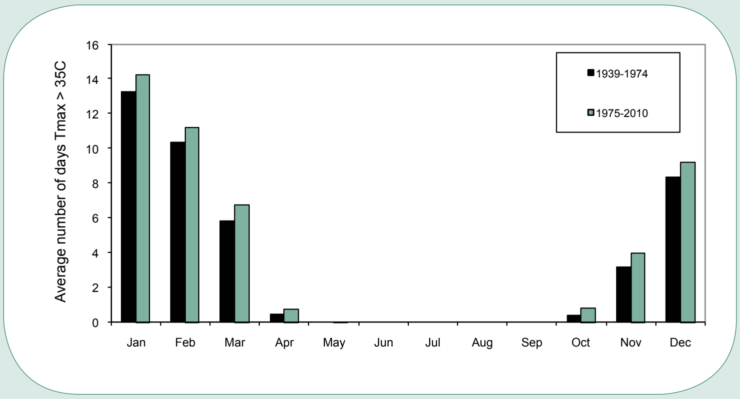


*Figure 8: Average number of days per month with maximum temperature above 35˚C for the periods 1939-1974 and 1975-2010.*

The number of frost days, or days with minimum temperature below 2˚C, has significantly increased in June. The average date of last frost was October 1 in the period 1939-1974 and October 3 in the period 1975-2010. This indicates that the frost risk around flowering is still present (Figure 9).

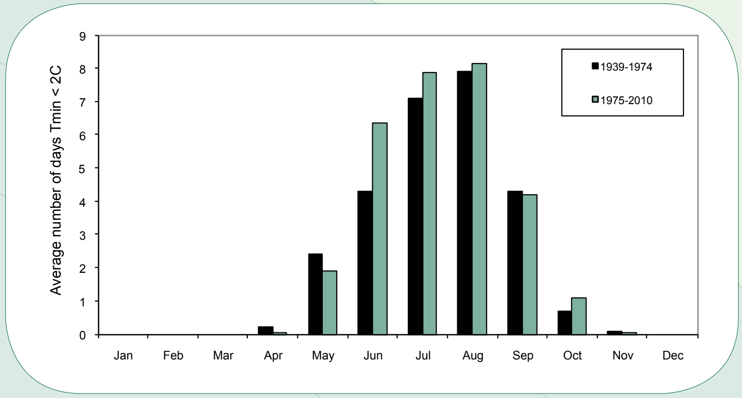


*Figure 9: Average number of days per month with minimum temperature below 2˚C for the periods 1939-1974 and 1975-2010.*

## Projected changes

The following results provide future projections for rainfall and temperature for the period 2035-2064. Projections were obtained using the emission scenario A2 and downscaled data from the CSIRO Global Climate Model CCAM.

### *Rainfall*

Rainfall projections indicate a continuation of drier autumn-winter conditions and wetter summer patterns (Figure 10).

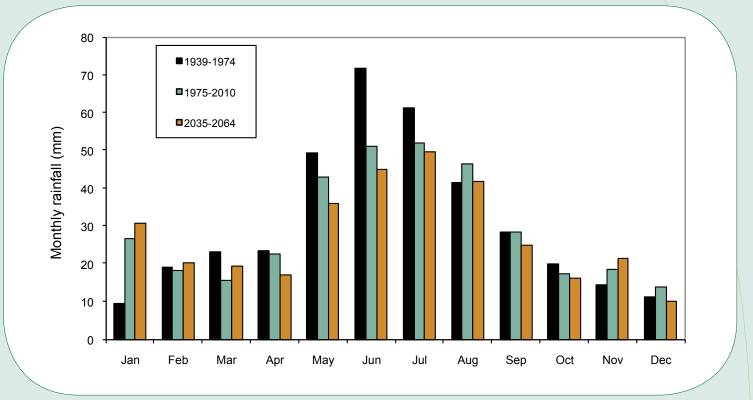


*Figure 10: Historical monthly rainfall for the periods 1939-1974 and 1975-2010 and monthly projected rainfall for the period 2035-2064.*

### *Temperature*

Temperature projections indicate a continuation of patterns observed of increasing mean monthly maximum temperatures (Figure 11).

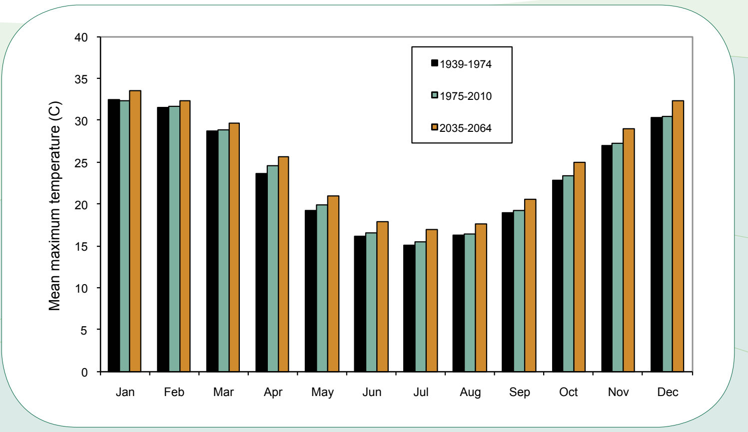


*Figure 11: Historical mean monthly maximum temperature for the periods 1939-1974 and 1975-2010 and projections for the period 2035-2064.*

## What are the agronomic implications?

- The decline in winter rainfall has led to a break of the season that is more variable and generally later (Figure 12). The average break of the season, derived from a sowing rule that uses a sowing window starting from April 25, has shifted from May 25 for the period 1939-1974 to May 28 for the period 1975-2010. For the period 2000-2010 the average break was June 1.

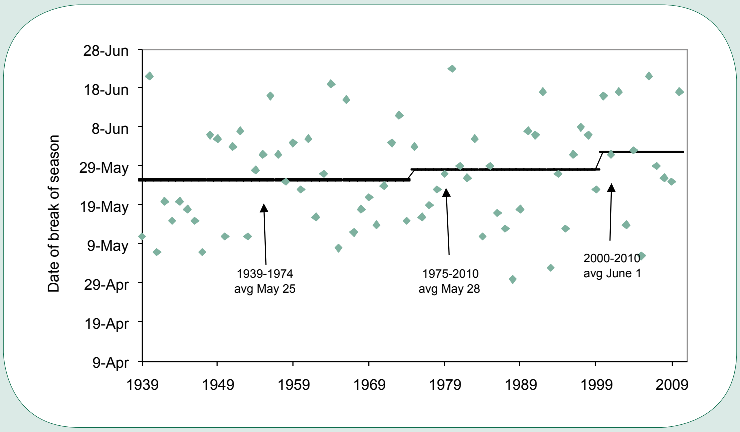


*Figure 12: Time series of date of break of the season. Horizontal lines show averages for the periods 1939-1974, 1975-2010 and 2000-2010.*

- The increased variability in the break of the season and the tendency to a later break has impacts on crop and pasture establishment in autumn. The decline in autumn rainfall is putting more pressure on the need to get the crop established in a timely way. Storage and conservation of out-of-season rain is gaining prominence. Effective management of summer weeds and stubble is becoming more important.
- The loss of big rainfall events in winter has led to an important reduction in reliability of runoff into farm dams.
- The decline in growing season rainfall and smaller rainfall events has led to greater evaporation losses and less water stored deep in the soil. This translates into less available soil moisture during spring, increasing moisture stress and resulting in flower abortion and reduced ability to fill the grain.
- Due to a decline in winter rainfall, pasture production will be reduced. Flexible lot feeding or confined feeding systems may need to be established to maintain or finish stock. Perennial pastures and native pastures should be viewed as a possible alternative to annual pastures.
- Frost still remains a significant risk in winter. The increase in cold weather may impact on lamb mortality.

To develop ways for growers to adapt to seasonal variation and climate change NAMI is exploring management options such as fallowing to conserve moisture in the following season, pre-seeding weed control to reduce the in-crop weed burden and varietal mixtures to manage frost risk.

### *Further reading:*

Department of Agriculture and Food, Western Australia website: www.agric.wa.gov.au.

Climate Kelpie: www.climatekelpie.com.au.

Indian Ocean Climate Initiative: www.ioci.org.au

Climate Change in Australia: www.climatechangeinaustralia.gov.au.

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