An initiative of the National Agriculture and Climate Change Action Plan

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Water resources in a changing climate: Western Victoria

Water availability is a key issue in Australia. A changing climate will place greater demand on water resources. We need to factor the risks associated with climate change into the ways we use water.

Key facts

- Around 89% of Australia's total rainfall evaporates or is transpired by plants into the atmosphere. Only around 9% runs off into streams, rivers and storages. The remaining 2% drains below the root zone into groundwater aquifers and, from there, into rivers.
- Exactly how much rainfall returns to the atmosphere and how much is available to recharge soil, surface, and groundwater stores depends mainly on the amount of energy from sunshine, and to a much lesser degree on the type of soil and vegetation, and the management practices on the land.
- Annual crops and pastures use less water per year than perennial vegetation, including trees, primarily because of their short growing seasons and shallower root systems. The larger canopies of native and plantation forests add to their higher evapotranspiration.
- Around 65% of continental Australia's total runoff occurs in far northern Australia and coastal Queensland. Only about 7% of runoff occurs in the Murray-Darling Basin where more than 50% of Australia's water is used.
- Around 65% of water extracted from the environment in Australia is used for irrigated agriculture (almost 90% of this in the Murray-Darling Basin), 14% for industrial uses, 11% for urban household consumption and 3% for other rural uses, such as stock and domestic needs.
- Pastures use about 35% of irrigation water in Australia, followed by horticulture (16%), cotton (15%), cereals (13%), sugar (12%) and rice (6%).
- Climate variability has by far the greatest impact on seasonal water availability and water balances in Australia—significantly greater than impacts from human extraction or land management practices. Certain river basins are exceptions.
- Shifts in climate that result in less rainfall and higher temperatures are the greatest threat to our water resources.

A cooperative venture between

Managing Climate Variability R&D Program

mla Meat & Livestock Australia

BCG shared solutions

Australian Government
Department of Agriculture, Fisheries and Forestry
Bureau of Meteorology
Bureau of Rural Sciences

Climate change projections

Australia and the globe are experiencing rapid climate change. Average temperatures in Australia have risen about 1°C since the middle of the 20th century. We had one of the most severe droughts on record in 2002–2007. Prolonged high temperatures have increased evaporation rates, dehydrated soils, and increased stress on crops, animals and vegetation.

Projections are for continued warming, less rainfall and more intense drought episodes across the temperate regions of Australia throughout the coming decades. This will affect wheat and sheep production. Anticipating and dealing with these changes in climate is critical to protect our agricultural industries.

For more information on climate change projections for specific regions of Victoria, see the fact sheet for Module 3: Glimpsing Victoria's Future Climate.

Wimmera-Mallee case study

- There is a very high level of surface water diversion from the Wimmera-Mallee region—possibly more than 50% of water availability. Losses from the distribution system are also high. Groundwater use is low and does not appear to affect streamflow.
- A 20% decline in average surface water availability is predicted in the Wimmera-Mallee region by 2030. However, potential effects of climate change range from little change in surface water availability to reductions of 50% or more.

The Wimmera-Mallee region

The Wimmera-Mallee region (Figure 1) occupies 3% of the Murray-Darling Basin. The population of nearly 50 000 is mostly located in the major centres of Horsham, Stawell and Ouyen along the Wimmera and Avon Rivers and represents 2.5% of the Basin's total population.

Land use is primarily broadacre cropping of cereals, pulses and oilseeds, with dryland livestock grazing in the south.

Irrigated enterprises account for 0.2% of the land area in the region and include vineyards, pastures and orchards. Surface water diversions are primarily for stock and domestic use, but also for urban supply and irrigation.

Figure 1: The Wimmera-Mallee region, Victoria

Current and historical water availability

The average surface water availability estimate for the Wimmera-Mallee is 206 gigalitres (GL) per year. This is much less than the modelled average annual runoff (368 GL) and most likely reflects very high transmission losses in the region. Estimates suggest that 59% (122 GL) of available water is diverted for urban and agricultural use, although actual productive use is much lower because transmission losses are high. Groundwater use is low and does not appear to affect streamflow.

Major water storages are located at the foothills of the Grampians Ranges with a total capacity in excess of 400 000 megalitres.

Average annual rainfall for the region between 1997 and 2006 was 13% lower than the long-term average, yet runoff was 51% lower during this period.

Historical trends in annual rainfall and soil moisture for the region are shown in Figure 2.

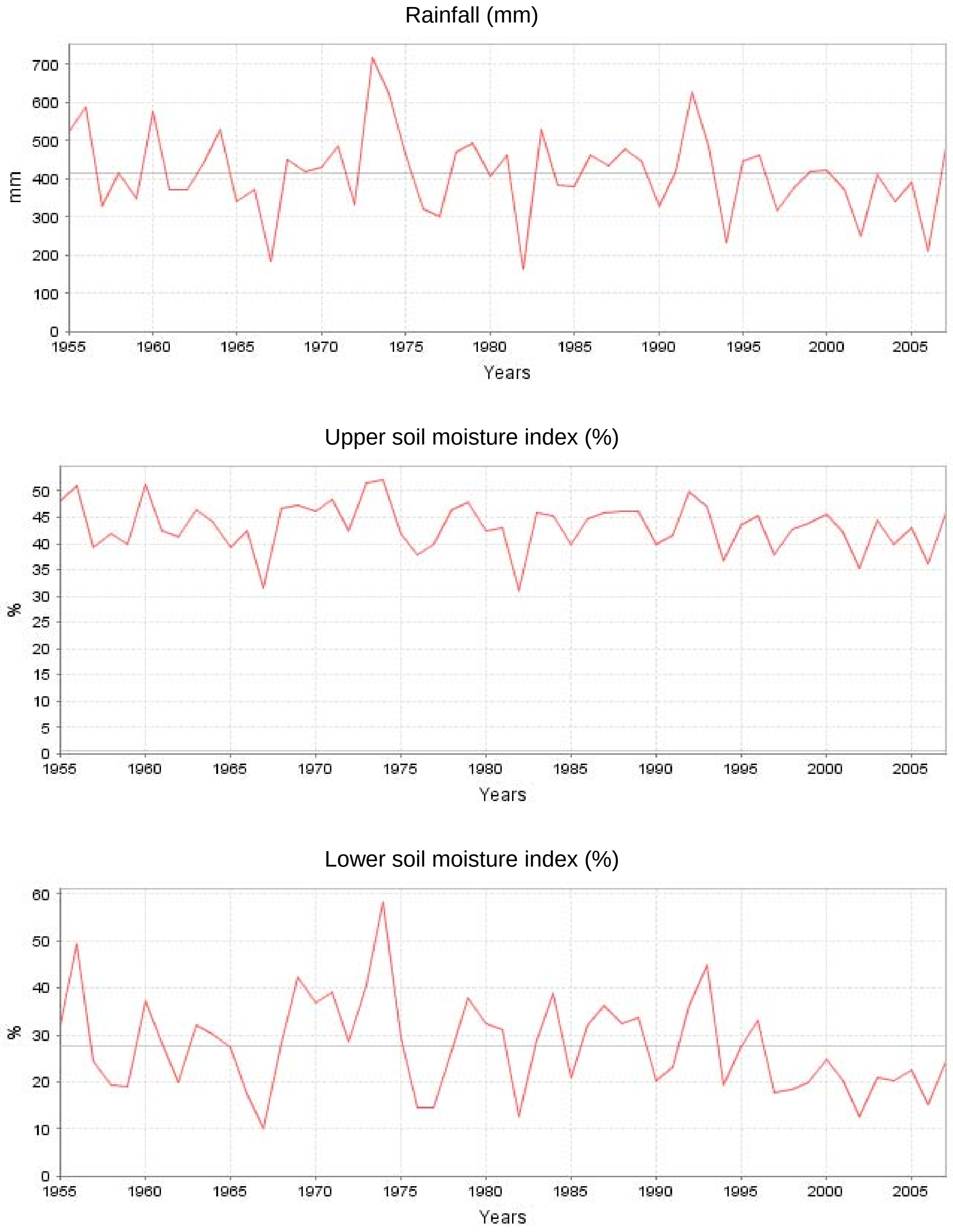

Figure 2: Historical trends in rainfall and modelled soil moisture in the Wimmera-Avon River Basin (AWAP 2008)

Projections of water availability

Almost all global climate models indicate reductions in rainfall and runoff in the Wimmera-Mallee region by 2030. If the recent climate (1997–2006) were to continue over the long term, average surface water availability and use would decline by about 50% in the region. Stock and domestic use would receive an increased share of the reduced surface water resources. The irrigation share would fall from 12% to 4%. The dry-year irrigation share would fall from 9% to zero.

The long-term continuation of the recent climate would cause major changes in the hydrology of Lake Hindmarsh and Lake Albacutya. Lake Hindmarsh would almost never fill and would experience continually shallow conditions for periods of up to 32 years (four times longer than present). Lake Albacutya would be unlikely to ever fill and would nearly always remain shallow. These changes would have considerable ecological consequences.

The 2030 climate change scenario for the region is less severe than the conditions of the recent past. Average surface water availability in the Wimmera-Mallee region could decline by around 20%. This would reduce total diversions by about 10% and total water use by around 15%, although urban use would be largely unaffected. Water allocations would be less than the current maximum in more than 50% of years. Allocations to irrigation through water sharing arrangements under a climate change scenario would be better than those in the recent climate.

Threats and opportunities for water conservation and efficiency

We are not likely to see significant development of commercial plantation forestry and farm dams in the Wimmera-Mallee region, and projections suggest that such development is unlikely to be enough to significantly affect runoff volumes by 2030.

Producers of broadacre livestock in the region may be able to manage climate change by sustainable use of groundwater sources for watering stock.

Sources

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Further information

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