

summary

Agriculture is an important component of Tasmania's economy. Projected changes to the Tasmanian climate due to rising greenhouse gases will have significant impacts on agricultural enterprises at farm, industry and regional scales.

Temperature has historically been a major driver for the choice and management of crops and pastures. Temperatures across the state are projected to increase by around 2.9 °C by the end of the century under the high greenhouse gas emissions scenario.

Tasmania continues to experience significant variability in climate. Scientists are confident that climate will continue to change in the future.

What does this mean for agricultural production in Tasmania?

TIA's information sheets identify opportunities and risks relating to Tasmanian agriculture under a changing climate.

What does climate change mean for future agricultural production in Tasmania?

Since the 1950s, Tasmanian farmers have experienced mean annual temperature rises of 0.1 °C per decade. Daily minimum temperatures have increased more than daily maximum temperatures. Total annual rainfall has decreased, with the greatest reduction in autumn. Farmers have been dealing with this climate variability, and as a result, a culture of resilience and adaptation has developed. Farmers need to continue to respond to immediate and short to medium-term climate variability, as well as start preparing for longer term changes in climate.

To assist in understanding the potential impacts of climate change on agricultural production during the next 90 years, the Tasmanian Institute of Agriculture, in collaboration with the Tasmanian Government has developed a series of information sheets.

These sheets focus on the opportunities and risks associated with climate change across a range of Tasmanian agricultural enterprises, which includes; dairy, red meat, wool, wheat, wine grape growing, a regional case study of the Meander Valley and a survey of what farmers say about climate change.



Photo: Stefano Lubiana Wines

Photo: Syzle Gaynor

Modelling the Tasmanian climate

Each information sheet uses climate modelling to describe potential changes to different farming locations throughout the 21st century. Four 30-year climate periods are used to describe the potential changes in the climate – a 'baseline' period (1971 to 2000) and three future climate periods; 2025 (2011–2040), 2055 (2041–2070) and 2085 (2071–2100).

The world-leading research carried out by [Climate Futures for Tasmania](#) generated fine-scale climate projections specific to Tasmania with an approach called dynamical downscaling. This approach allows modellers to downscale the results from global climate models (general circulation models or GCMs), taking into account the interaction between weather systems, topography and vegetation. The Climate Futures team modelled future climate scenarios at a 0.1° grid (about 10 km by 10 km area) for Tasmania. Two emissions scenarios were used; A2 which is a medium to high greenhouse gas emissions scenario, and B1, which is a low emissions scenario.

The information sheets all show projections using the high emissions scenario (A2), which projects CO₂ levels to be greater than 800 ppm by the end of the 21st century. This scenario was used because measured increases in CO₂ are similar to those modelled for the A2 emissions scenario.

The climate modelling for Tasmania under the high emissions scenario shows an increase in mean daily temperature of 2.9 °C over the 21st century. This is lower than the projected increase for mainland Australia, partly due to the moderating influence of the Southern Ocean. Temperature increases are lower in the early part of the century but the rate of change increases towards the end of the century. The daily maximum temperature rise is projected to be slightly lower than the rise in daily minimum temperature.

Mean annual rainfall is not projected to change greatly throughout the 21st century under the high emissions scenario. Decadal variability is projected to remain constant. However, there are projected seasonal and regional changes such as an increase of 20% to 30% in summer and autumn rainfall along the east coast. Rainfall is projected to decrease on the west coast by 15% in winter and 18% in summer. Rainfall is projected to decrease in all seasons on the central plateau. Changes to the general climate will impact on a range of other climate variables important in agriculture. For example, the increasing temperature will be the dominant driver of a significant increase in pan evaporation (up to 19%).

Climate and agricultural production

A changing climate will have a profound impact on current systems of agricultural production. Understanding the negative and positive impacts of a changing climate on agriculture and the merits of and cost of adaptation strategies will enable policy makers to take advantage of opportunities for industries and farming systems.

Agricultural systems are complex, involving interactions between soils, plants, water, animals, weather and management. Real-time data collection provides essential information about agricultural systems, but models can provide additional insights over space and time.

Climate change scenarios such as those provided by Climate Futures for Tasmania are used in agricultural simulation models. These models incorporate climate indices to simulate crop or pasture growth.

Even subtle changes in the projected amount or seasonal distribution of rainfall, or projected changes in temperature and evaporation rates, may influence such outcomes as seasonal crop and pasture growth patterns, nutrient and irrigation requirements, and water availability. The outputs that agricultural simulation models provide allow us to both explore the potential impacts of a changing climate on agriculture, and to evaluate possible adaptation strategies.

Projected Changes in Temperature and Seasonal Rainfall

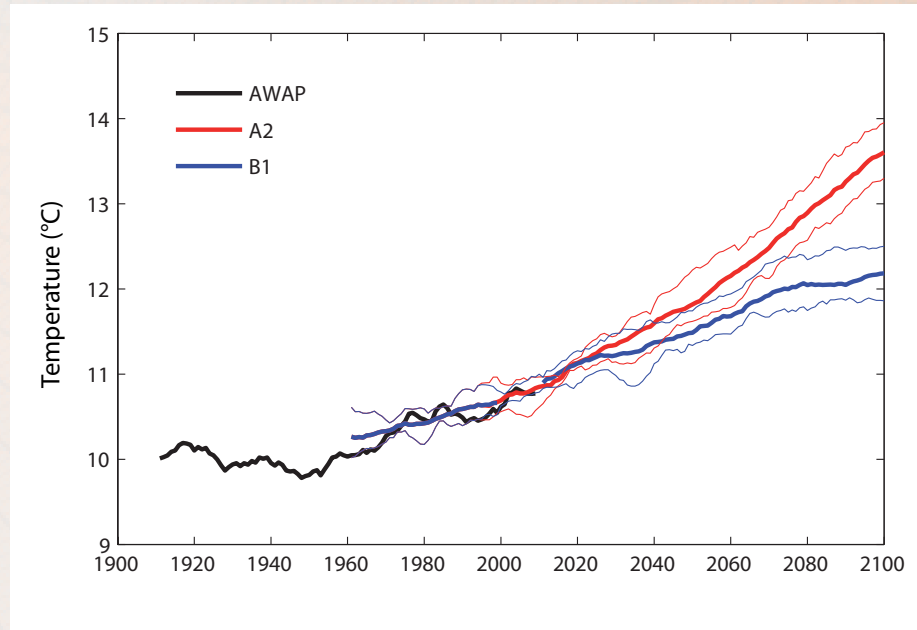


Figure 1 Changes to Temperature

Daily mean screen temperature for all grid cells across Tasmania. The time series plots show an 11-year moving average for observations (AWAP) over the period 1910 to 2009 (bold black line) and the mean of six downscaled-GCMs for B1 (bold blue line) and A2 (bold red line) emissions scenarios over the period 1961-2100. The range of the six models shown as respective faint lines, adapted from Grose et al (2010).

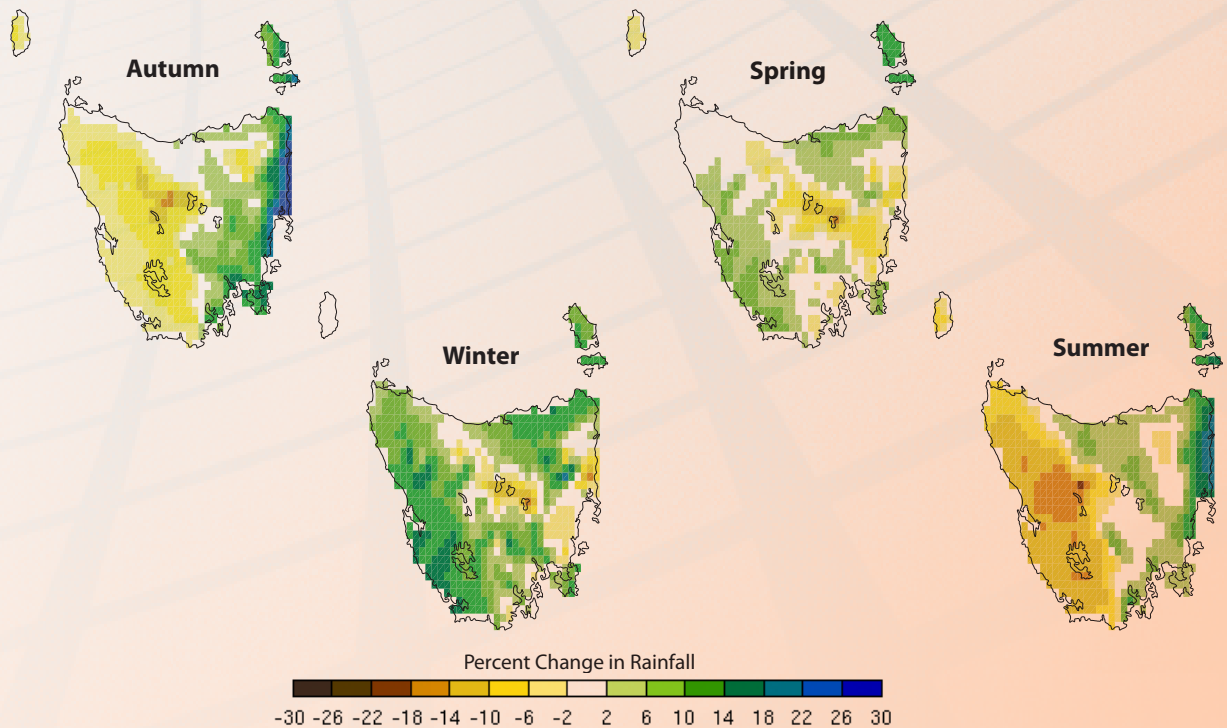


Figure 2 Changes to Rainfall

The above maps of projected seasonal rainfall for 2071-2100 (compared to 1961-1990) are for the high emissions scenario calculated from the six downscaled simulations. Note the general increase over Tasmania in the winter, except for the central plateau. In summer, there are large increases of rainfall in the east of up to 20% and large decreases in the west of up to 18% (Holz et al 2010).

Figure Sources: Grose MR, Barnes-Keoghan I, Corney SP, White CJ, Holz GK, Bennett JC, Gaynor SM & Bindoff NL 2010, *Climate Futures for Tasmania: general climate impacts technical report*, Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Tasmania.

Holz GK, Grose MR, Bennett JC, Corney SP, White CJ, Phelan D, Potter K, Kriticos D, Rawsley R, Parsons D, Lisson S, Gaynor SM & Bindoff NL 2010, *Climate Futures for Tasmania: impacts on agriculture technical report*, Antarctic Climate and Ecosystems Cooperative Research Centre, Hobart, Tasmania.

Information sheets

The Tasmanian Institute of Agriculture information sheets identify climate impacts and opportunities relating to Tasmanian agriculture. The series includes:

- Dryland pastures (*red meat production*)
- Extensive dryland pastures (*wool production*)
- Irrigated pastures (*dairy production*)
- Wheat production (*cereals*)
- Wine grape production
- Meander Valley - *barley, poppies, pyrethrum, blueberries and hazelnuts under irrigation*
- What farmers say about climate change



About Climate Futures for Tasmania

The material in this information sheet was developed from outputs from the Climate Futures for Tasmania project. In particular, from the Impacts on Agriculture Technical Report (Holz et al 2010).

The Climate Futures for Tasmania project was funded primarily by the State Government of Tasmania, the Australian Government's Commonwealth Environment Research Facilities Program and Natural Disaster Mitigation Program. The project also received additional funding support from Hydro Tasmania.

The Climate Futures for Tasmania project was managed by the Antarctic Climate & Ecosystems Cooperative Research Centre (ACE CRC). For more information about the project go to:

www.acecrc.org.au



This information sheet is a joint production of the Tasmanian Government and the Tasmanian Institute of Agriculture.

Further information

This information sheet is part of a series produced by TIA on the impacts of climate change in agriculture. The full suite of information sheets is available at:

www.dpipwe.tas.gov.au/climatechange

The Tasmanian Government's Tasmanian Climate Change Office (TCCO) provides information on climate change mitigation, and adaptation programs and options:

www.climatechange.tas.gov.au

Climate Futures for Tasmania reports provide information on the impacts of climate change in Tasmania on general climate, water and catchments, impacts on agriculture and extreme events:

www.climatechange.tas.gov.au

The Bureau of Meteorology provides data on weather forecasts and climate variability:

www.bom.gov.au

For further information to assist farmers and potential investors to allow comparisons to be made between enterprises including cash crop and livestock enterprise tools visit

www.dpipwe.tas.gov.au/wealthfromwater

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TIA is a joint venture between the University of Tasmania and the Tasmanian Government.