



KIA ORA - WELCOME TO THE  
**CONFERENCE**

# SESSION ONE

*Session One*  
Introduction and Welcome

New Zealand and Australia Avocado  
Grower's Conference'05  
20-22 September 2005  
Tauranga, New Zealand



# Climate Change

## Risks and Opportunities for the Avocado Industry



**Peter Deuter<sup>1</sup>, Mark Howden<sup>2</sup> and Simon Newett<sup>1</sup>**

<sup>1</sup>*Department of Primary Industries and Fisheries, Queensland*

<sup>2</sup>*CSIRO Sustainable Ecosystems, Canberra*

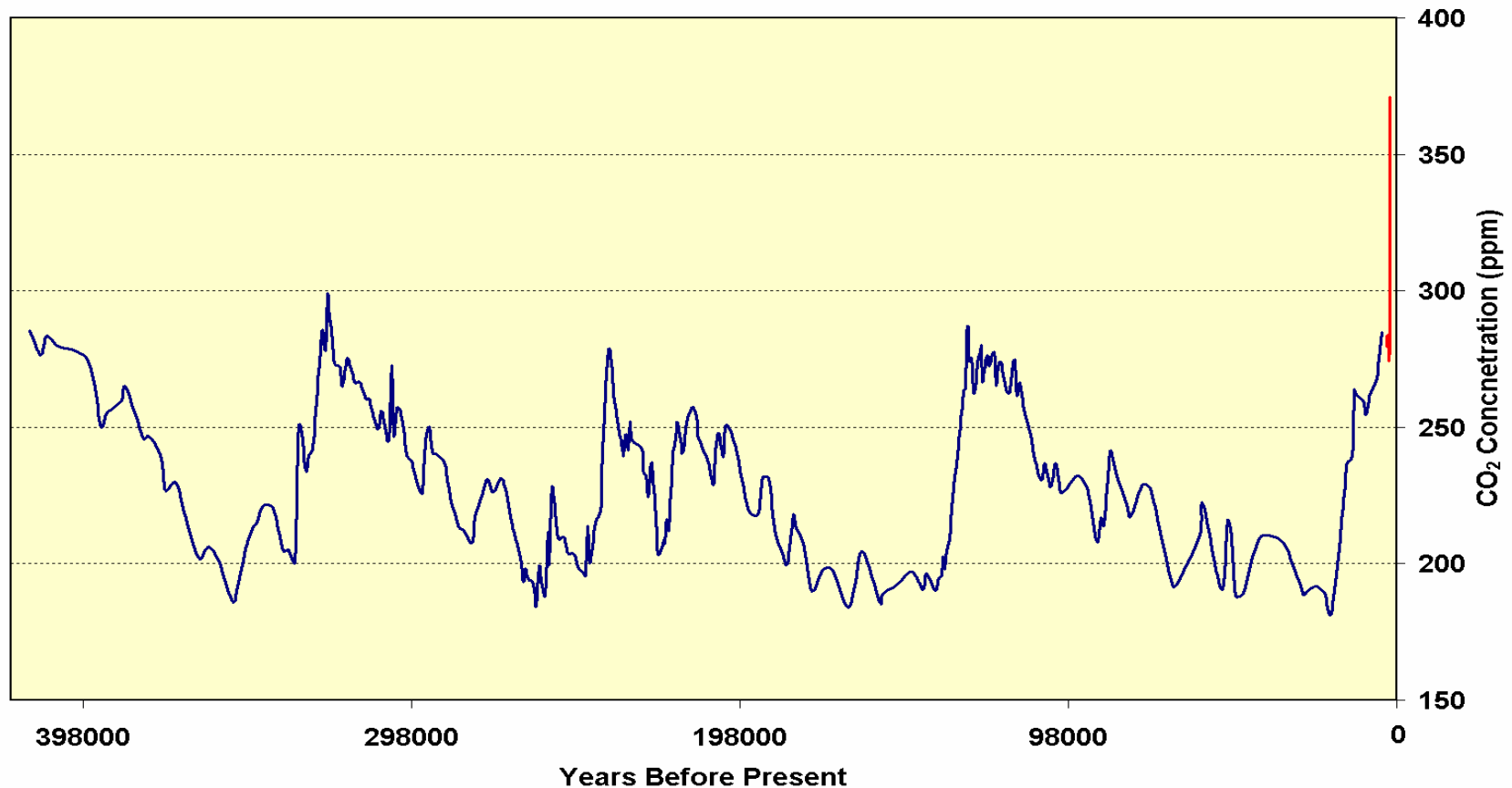
“Climate is the  
weather you are  
supposed to be  
having”

# Climate Change

- What is changing - and by how much?
- Projections of future change
- Risks for the avocado industry
- Opportunities for the avocado industry
- How can the industry adapt?
- Key research challenges

# What is changing - and by how much?

## Changing Carbon Dioxide Concentrations in the Atmosphere

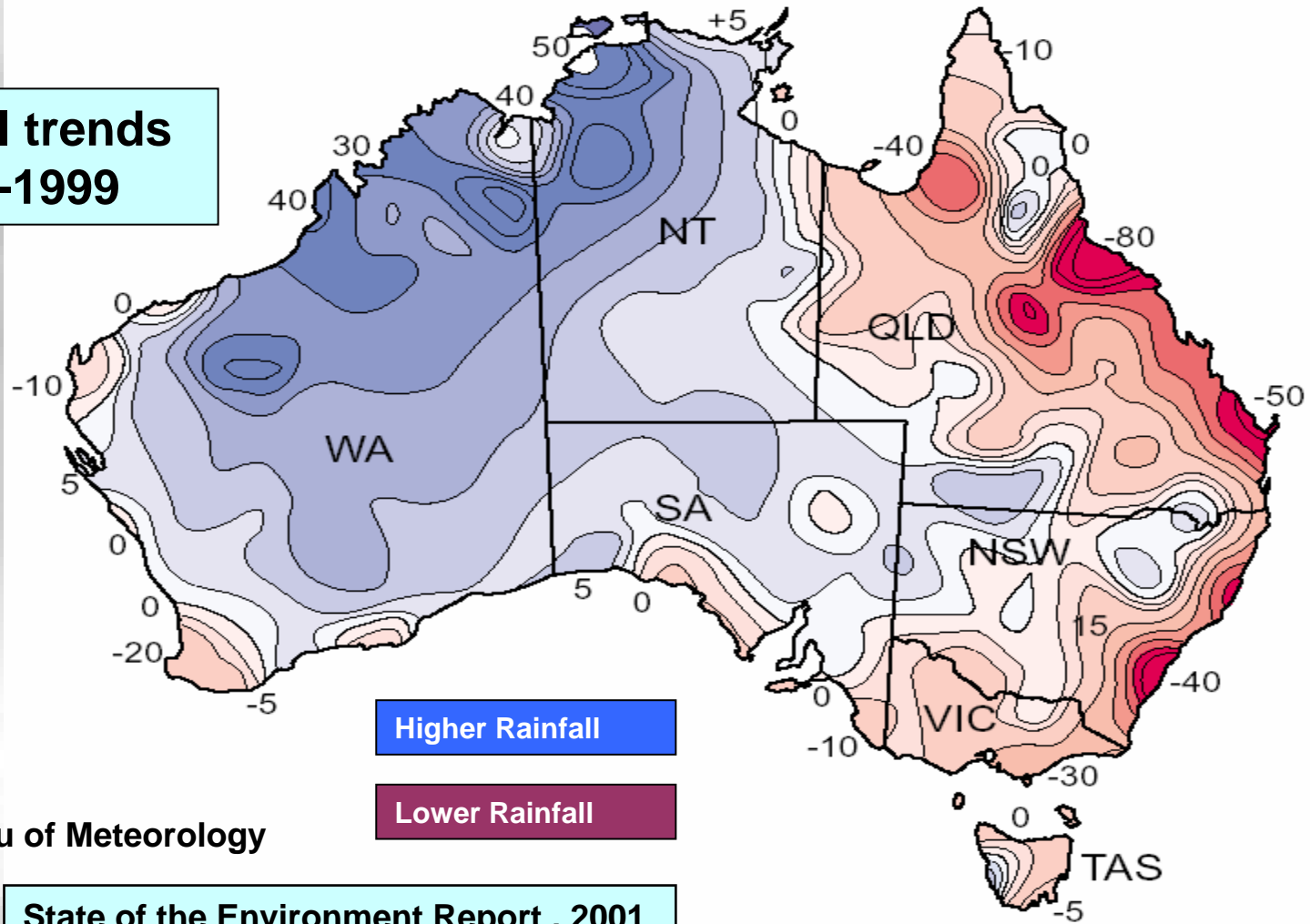


Current carbon dioxide concentrations are the highest in 400,000 years

# What is changing - and by how much?

## Changing Rainfall Trends

Rainfall trends  
1950-1999

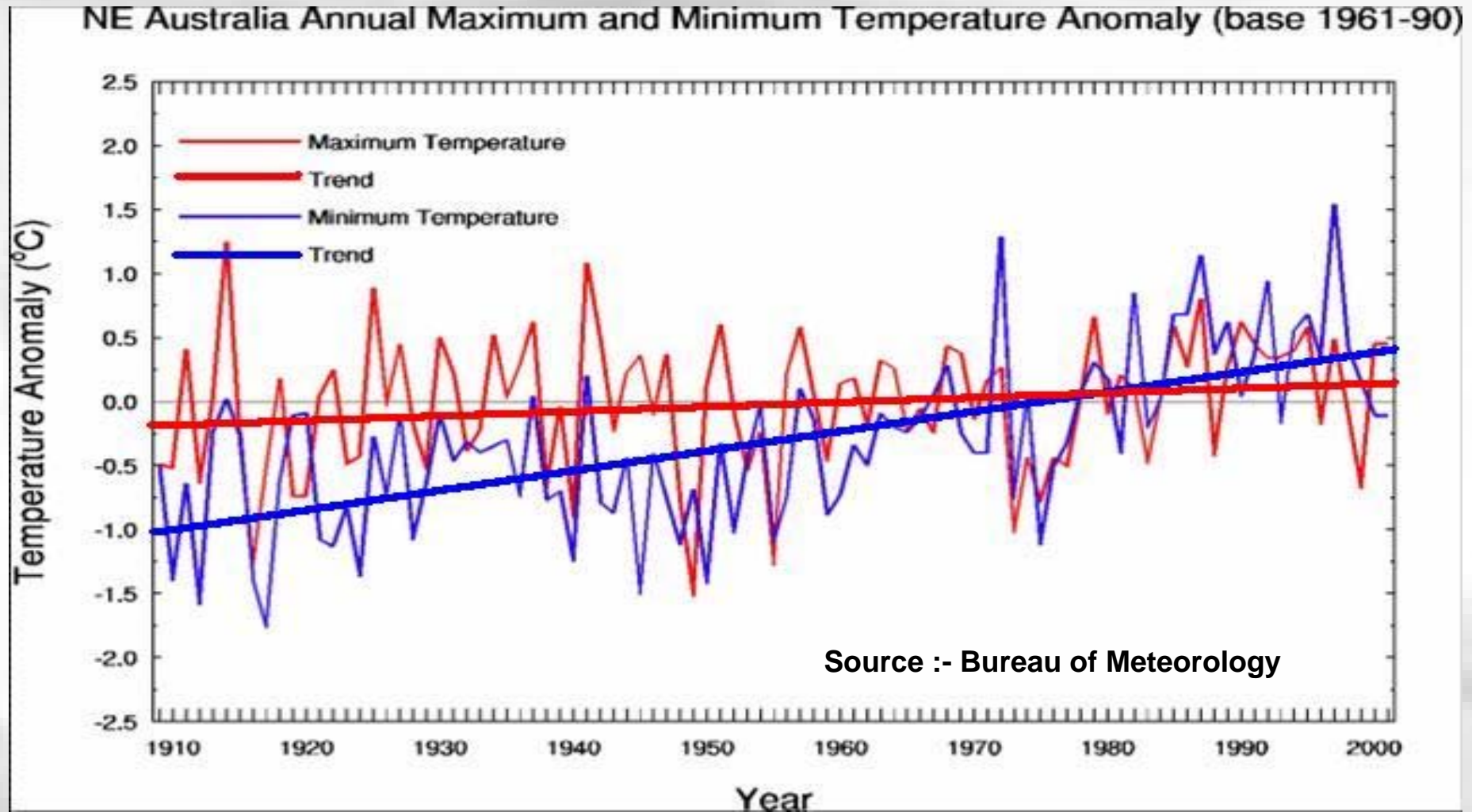


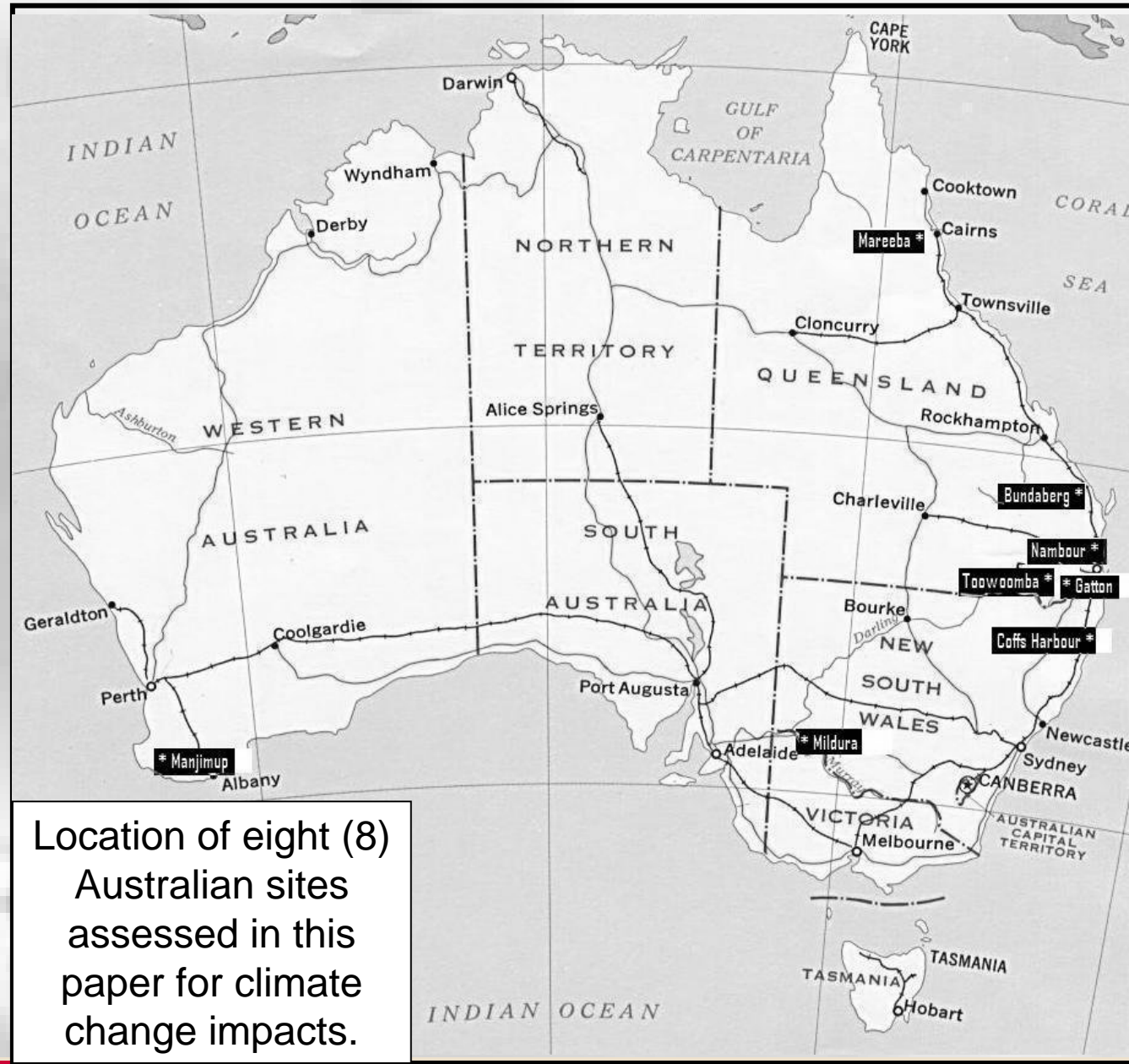
Source :- Bureau of Meteorology

State of the Environment Report , 2001

# What is changing - and by how much?

## Changing Temperature Trends





Location of eight (8) Australian sites assessed in this paper for climate change impacts.

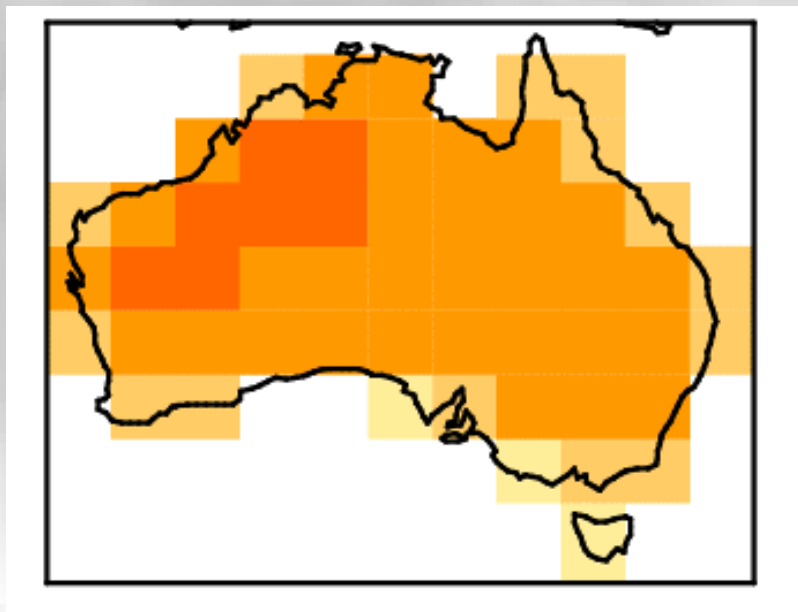
# What is changing - and by how much?

## Changing Temperature Trends

Temperature Change (°C) – 1957 to 2005.		
	Minimum Temperature	Maximum Temperature
Mareeba	2.8	0.5
Bundaberg	1.1	0.5
Nambour	3.1	0.6
Gatton	0.8	1.5
Toowoomba	1.4	0.7
Coffs Harbour	1.7	0.5
Mildura	-0.1	0.8
Manjimup	0.7	0.5

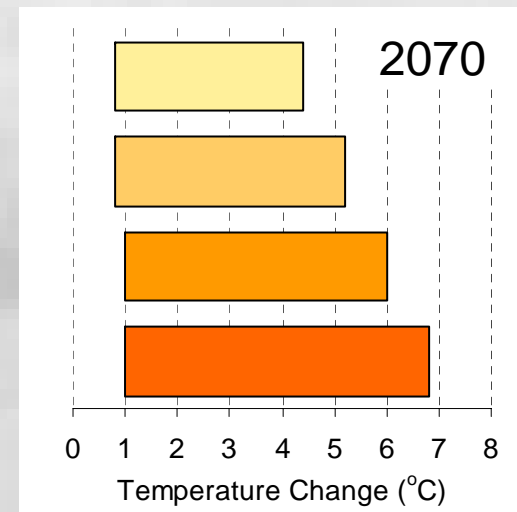
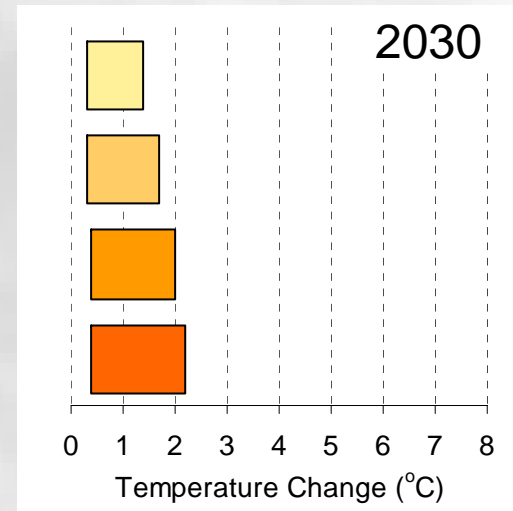
# Projections of future change Annual-mean warming (°C)

Based on results from nine climate models

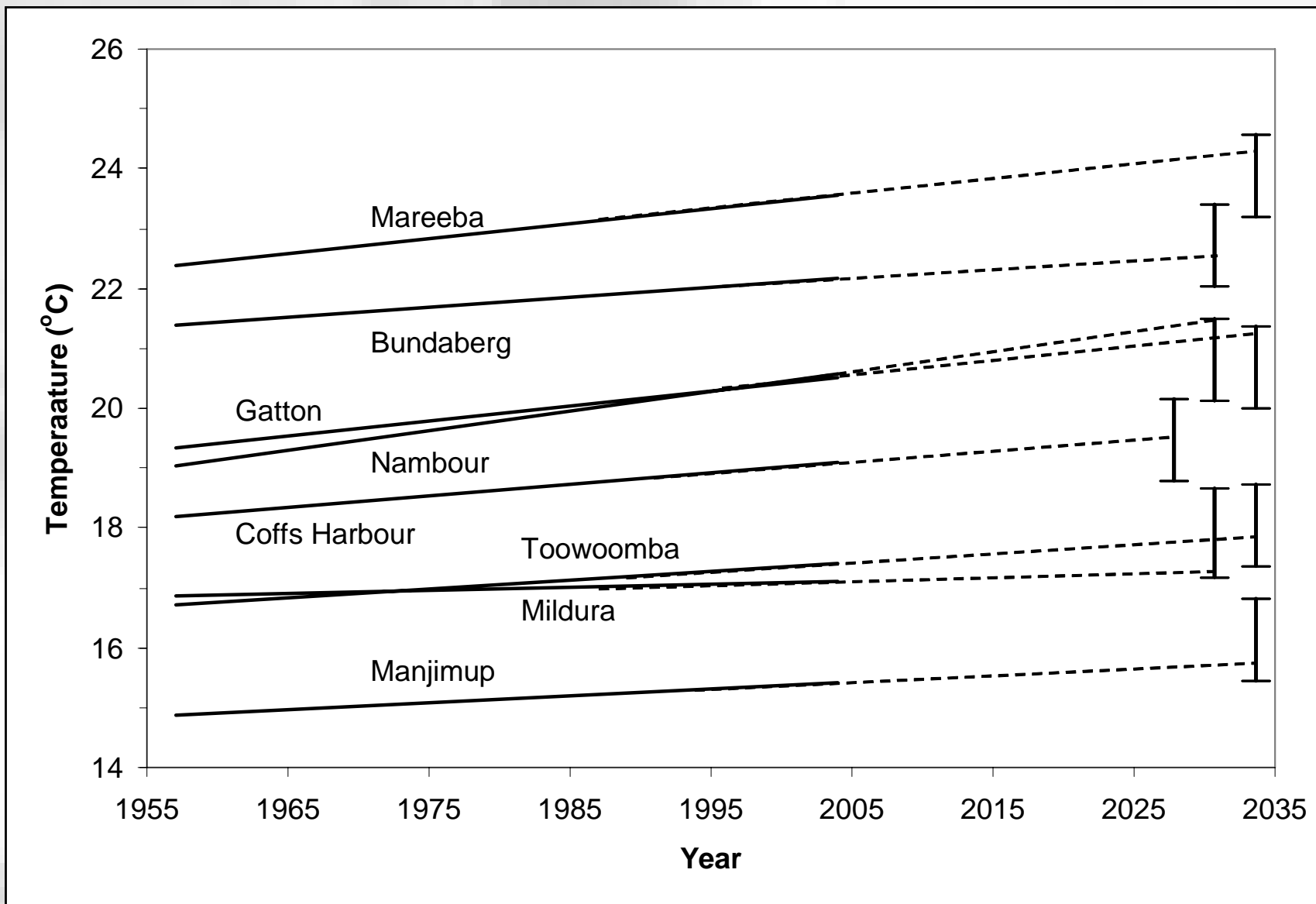


Generally: 0.4 to 2.0°C warmer by 2030

1 to 6°C warmer by 2070



# Projections of future change



## Projections of future change

<b>Site</b>	<b>Mean annual temperature increase (°C/100 yrs)</b>
<b>Mareeba</b>	<b>2.52</b>
<b>Bundaberg</b>	<b>1.70</b>
<b>Nambour</b>	<b>3.26</b>
<b>Gatton</b>	<b>1.97</b>
<b>Toowoomba</b>	<b>1.46</b>
<b>Coffs Harbour</b>	<b>1.93</b>
<b>Mildura</b>	<b>0.49</b>
<b>Manjimup</b>	<b>1.14</b>

## Risks for the avocado industry

<b>Issues</b>	<b>Potential impacts on avocado growth and development</b>
<b>Less diurnal temperature range</b>	<b>Potential to reduce the overlap between open stages of male and female flower parts thus decreasing the chances for pollination (an issue for single variety plantings)</b>
<b>Significantly warmer temperatures in general</b>	<b>A shift in the growing regions - away from the hotter producing areas towards areas currently regarded as cool</b>
<b>Time to reach maturity</b>	<b>Warmer temperatures suggest that fruit will set and reach maturity earlier in the season, shifting the harvest times for different areas</b>

## Risks for the avocado industry (cont.)

Issues	Potential impacts on avocado growth and development
On-tree fruit 'storage'	Warmer temperatures may reduce the period that fruit can be 'stored' on the tree and retain acceptable fruit quality
<i>Phytophthora cinnamomi</i> activity	A general rise in temperature means that the disease will be active for longer periods during the year
Higher summer temperatures	Smaller 'Hass' fruit
Insect activity	A rise in temperature suggests more active insect populations (e.g. spotting bug)
Increasing no. of heat stress days	Expect more pollination failures, fruit drop and sunburn

# Opportunities for the avocado industry

<b>Issues</b>	<b>Potential impacts on avocado growth and development</b>
<b>Warmer nights</b>	<ul style="list-style-type: none"><li>• <b>Less chance for fruitset failure in areas that currently experience crop failures due to cold nights during flowering</b></li></ul>
<b>Time to reach maturity</b>	<ul style="list-style-type: none"><li>• <b>Warmer temperatures - earlier fruit set and maturity, shifting harvest times in different areas</b></li></ul>
<b>Higher levels of atmospheric carbon dioxide</b>	<ul style="list-style-type: none"><li>• <b>Greater potential for fruit set and fruit retention</b></li></ul>

# How can the industry adapt?

<b>Issue</b>	<b>Potential management implications</b>
<b>Lower diurnal temperature range</b>	<ul style="list-style-type: none"><li>• Inclusion of pollinator varieties may need to be considered</li></ul>
<b>Warmer night temperatures</b>	<ul style="list-style-type: none"><li>• Areas previously considered too cool may now have potential as avocado production sites</li></ul>
<b>Higher summer temperatures</b>	<ul style="list-style-type: none"><li>• Increased irrigation requirements, increased water storage capacity, more accurate moisture monitoring systems and more efficient irrigation systems</li><li>• Re-locate to cooler micro-climates</li></ul>

## How can the industry adapt? (cont.)

Issue	Potential management implications
Significantly warmer autumn and winter temperatures	<ul style="list-style-type: none"> <li>• Long term - cease orchard operations in areas too warm to produce a consistent flowering</li> <li>• ‘Shepard’ may be successfully grown in more southerly districts</li> </ul>
<i>Phytophthora cinnamomi</i> activity	<ul style="list-style-type: none"> <li>• Even greater attention required to control this disease</li> </ul>
Insect activity	<ul style="list-style-type: none"> <li>• Closer monitoring and more responsive management of insect pests and predators</li> </ul>
Increasing number of heat stress days	<ul style="list-style-type: none"> <li>• More effective irrigation scheduling and application</li> <li>• Application of sunburn protection for fruit</li> <li>• Selectively harvest exposed fruit</li> </ul>

## Key research challenges

- Continue research into rootstocks better able to handle harsh conditions & disease pressure
- Continue to assess 'Hass'-like alternatives
- Continue to improve *Phytophthora* control measures
- Determine shifts in crop maturity times, apply to marketing plans
- Better understand and take advantage of CO<sub>2</sub> fertilization

## Key research challenges (cont.)

- **Identify current “at risk” production sites and new areas that may be suitable for production, following climate change**
- **Understand current climate variability**
- **Monitor climate changes in existing production areas**
- **Identify options to manage climate variability and adapt to a changing climate**
- **Improve the reliability of climate change modelling outputs, to reduce the variation within future scenarios**

# Further Reading

The Intergovernmental Panel on Climate Change (IPCC)

- [www.ipcc.ch/](http://www.ipcc.ch/)

Australian Working Group conclusions updated in 2003

- [www.greenhouse.gov.au](http://www.greenhouse.gov.au)

Bureau of Meteorology - Climate Change

- [www.bom.gov.au/climate/change/](http://www.bom.gov.au/climate/change/)

CSIRO – Climate Change Projections and Solutions

- [www.dar.csiro.au/publications/projections2001.pdf](http://www.dar.csiro.au/publications/projections2001.pdf)
- [www.csiro.au/csiro/ghsolutions/index.html](http://www.csiro.au/csiro/ghsolutions/index.html)



