El Niño impacts on agriculture in Australia

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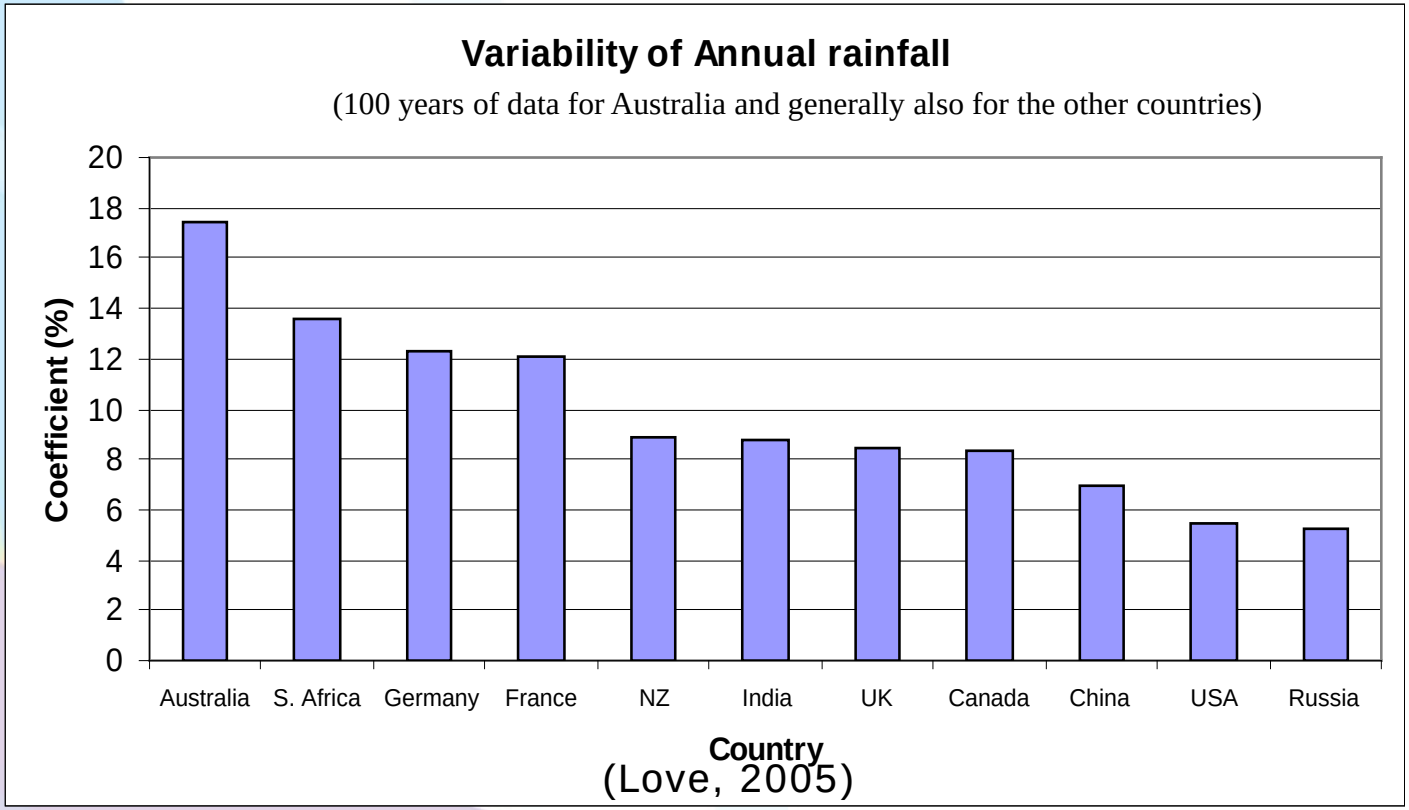
The Primary Industries Climate Challenges Centre (PICCC) is a joint venture between

THE UNIVERSITY OF MELBOURNE

AGRICULTURE VICTORIA

Introduction

- Australia is one of the most climatically variable countries
  - El Niño is part of this variability



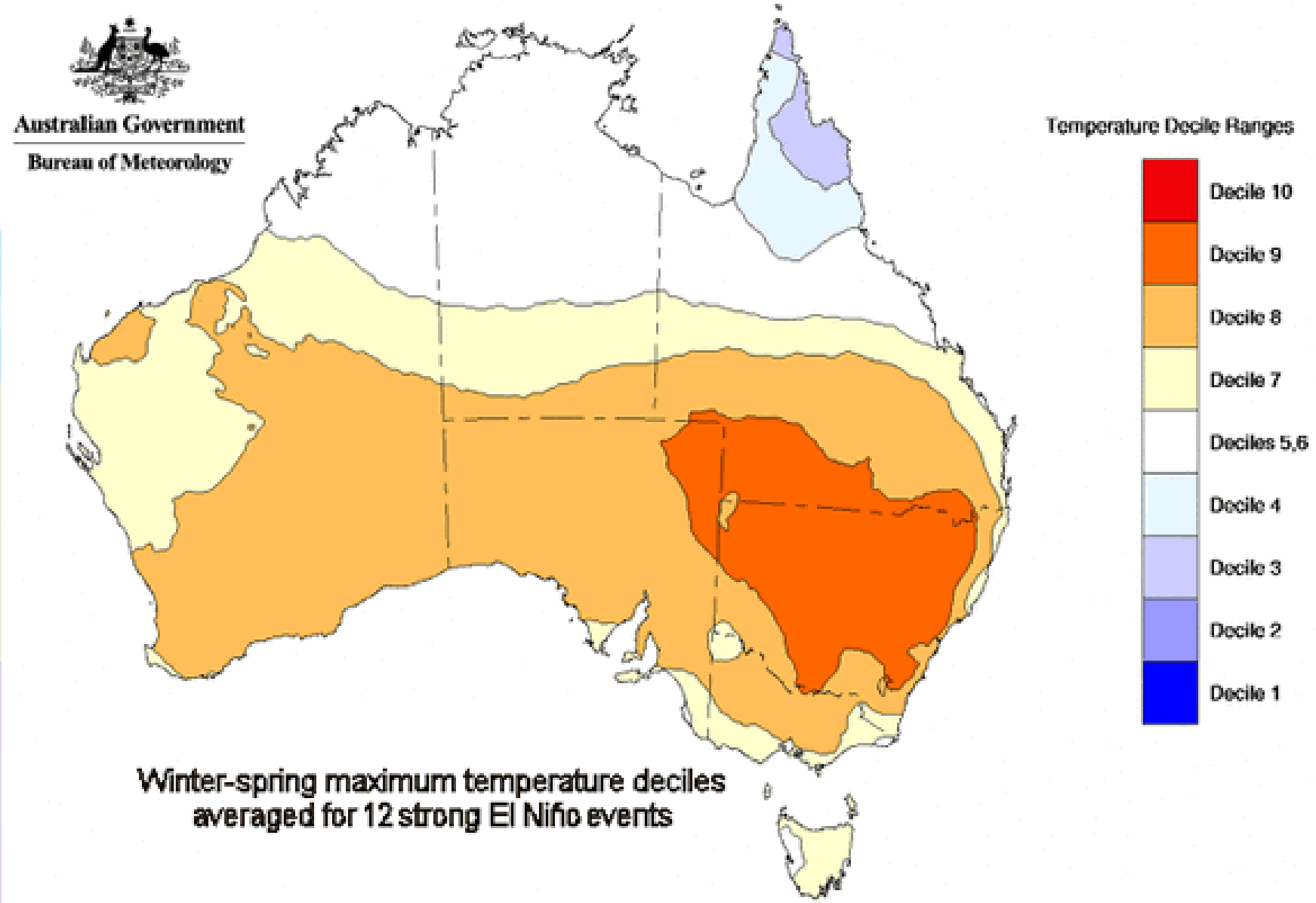
(Love, 2005)

Physical Impacts of Climate Change

- Agriculture relies on a predictable climate
- Potential effects of El Niño on Australia include:
  - Reduced rainfall
    - winter–spring in the eastern and northern Australia
    - Increased frost risk
      - (15–30% more frost days in SE)
    - Later monsoon onset
      - Northern tropics below average rain in early wet season
  - Warmer temperatures
    - Warmer-than-average across southern Australia, particularly during the second half of the year
    - Increased evaporative demand
    - Shift in temperature extremes
      - Wide-area heatwaves
      - Single-day extremes (particularly in the SE)
      - Long-duration warm spells (further north)

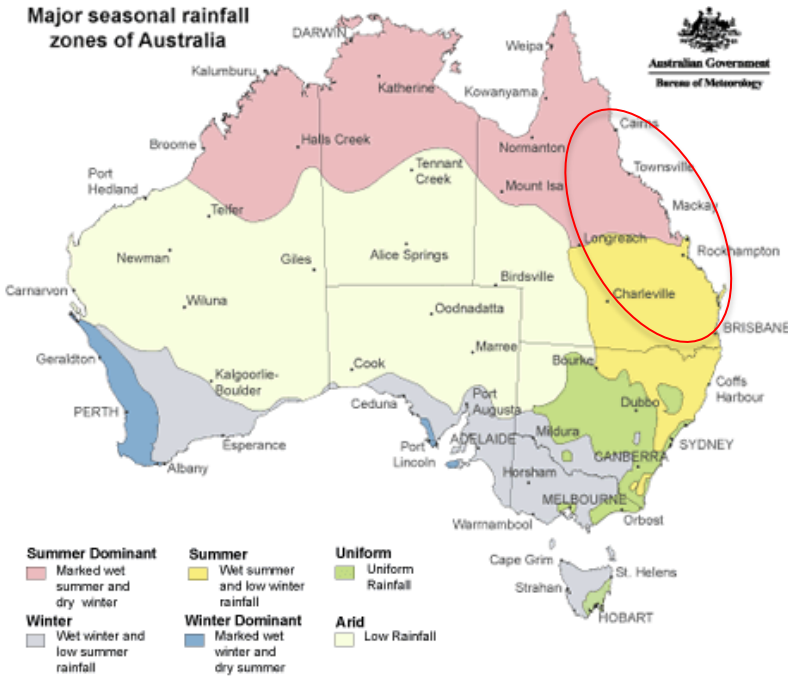
BOM 2016

Temperature effects



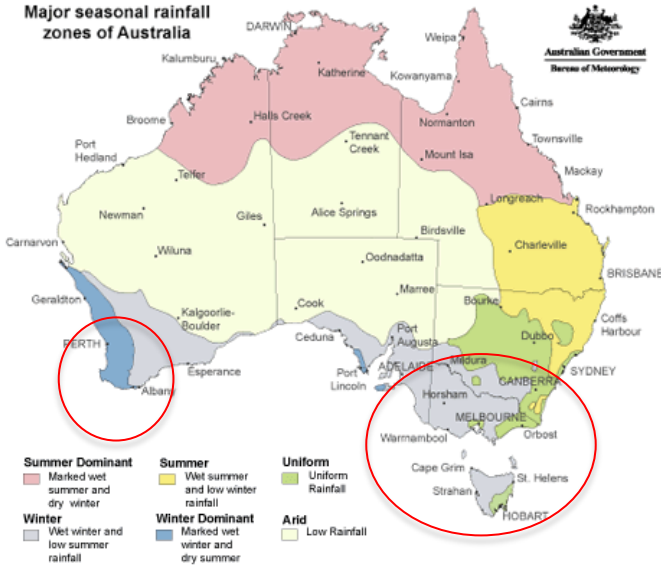
Temperature effects

- Tropical crops & pastures
  - Relatively tolerant of higher temperatures
  - But, extremes can affect
    - Reproduction, flowering, seeding, sunburn



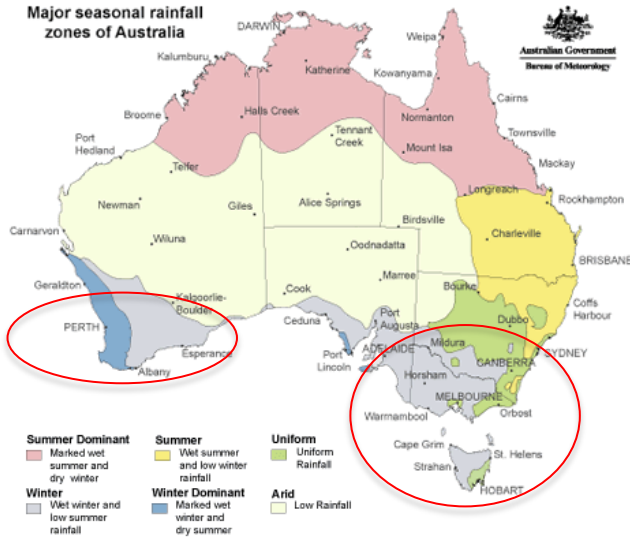
Temperature effects

- Temperature fruits & nuts
  - Winter chilling requirements
    - Cumulative number of hours below 7^0C each winter
  - Sensitive to high temperatures

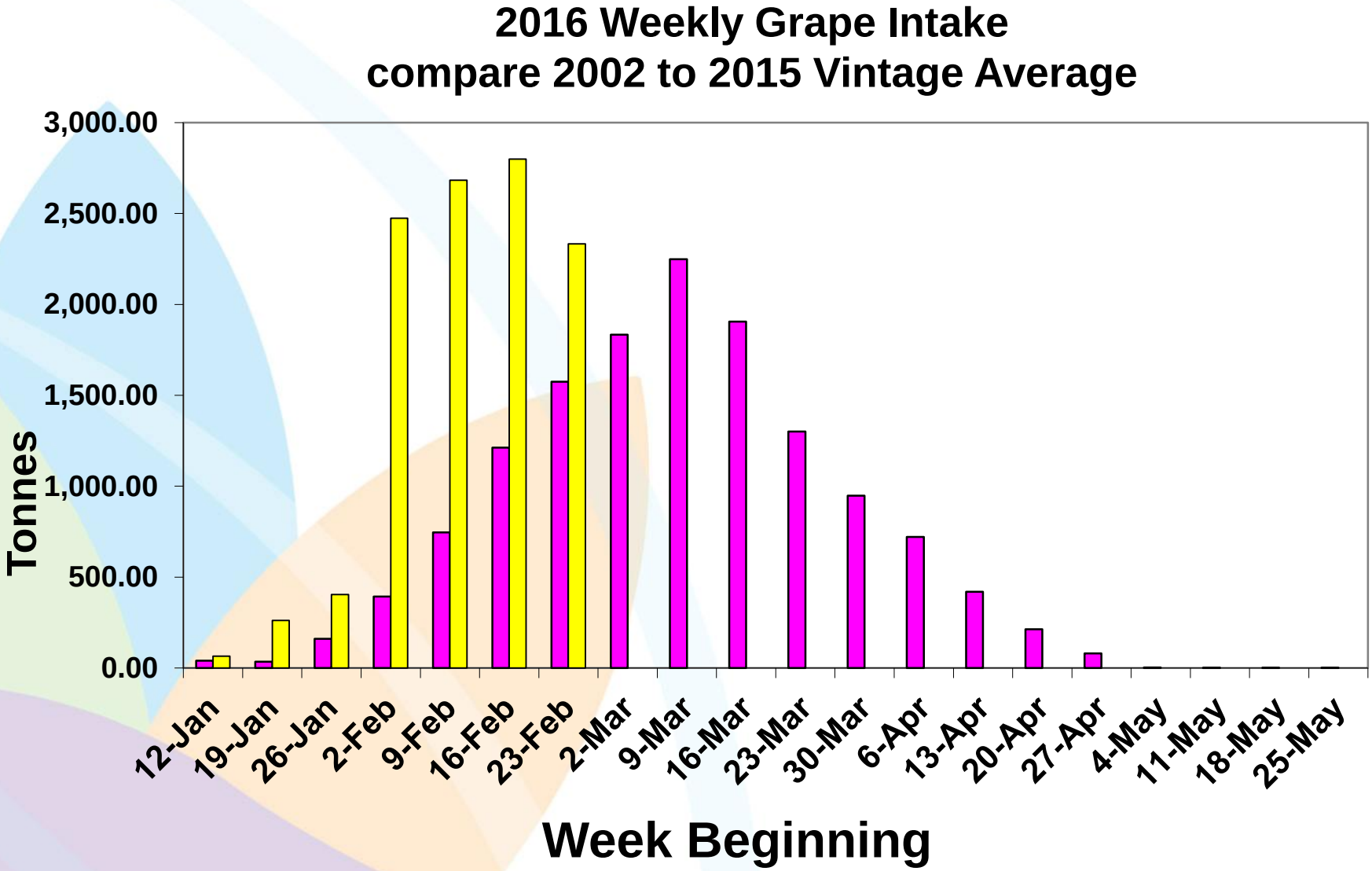


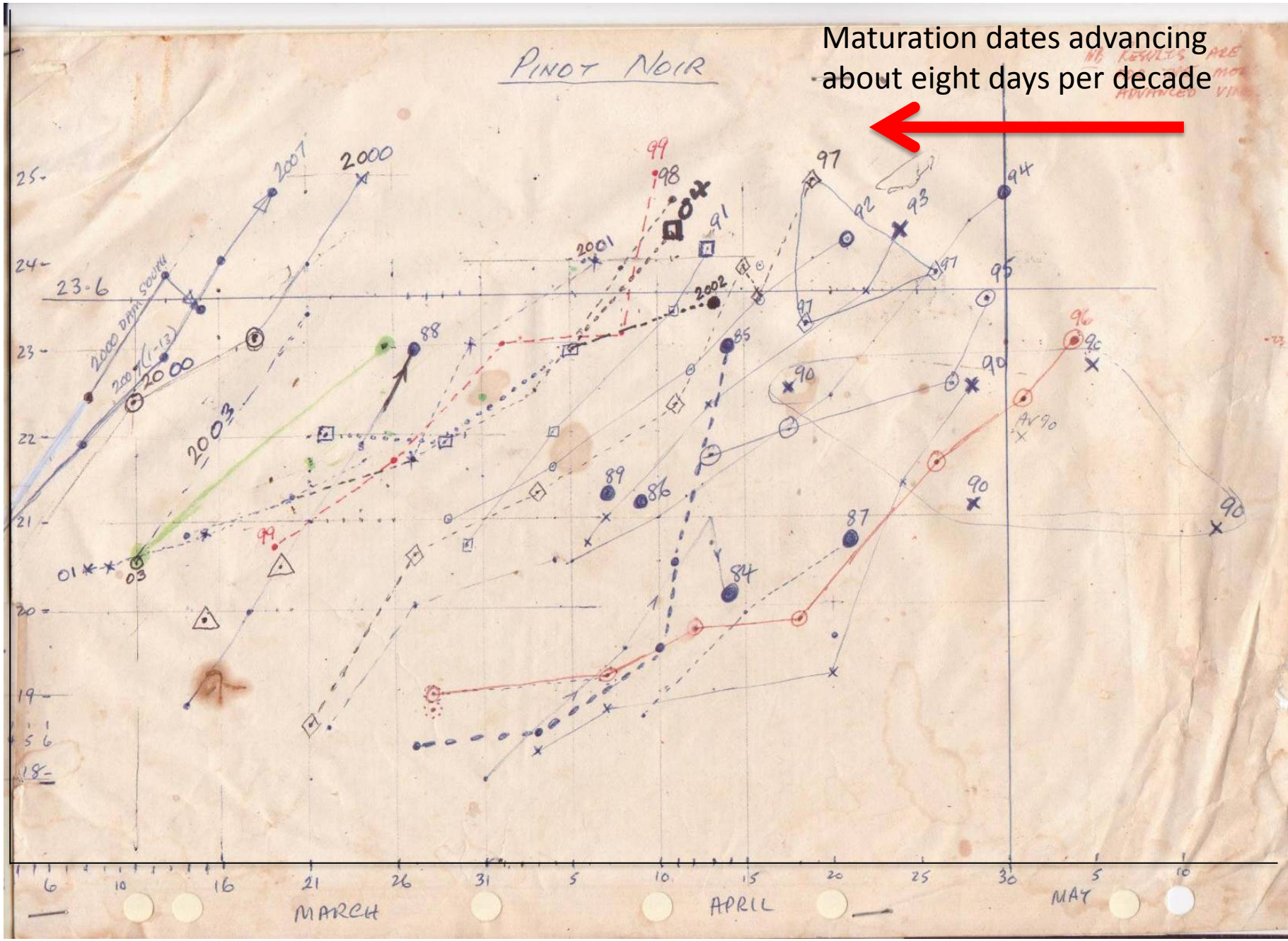
Temperature effects

- Temperate crops & pastures
  - Sensitive to high temperatures
    - Narrow range of ideal temperatures
    - Bolting, reproduction, quality, sunburn
  - Changes in timing of frosts



Viticulture





Webb *et al.* 2012

Livestock – Animal impacts

- Temperature-Humidity Index (THI)
  - Combined effects of temperature and humidity on animal health
- Water & Shade
  - Vital for survival in heat waves

THI between 72 and 78

mild stress

THI between 79 and 88

moderate stress

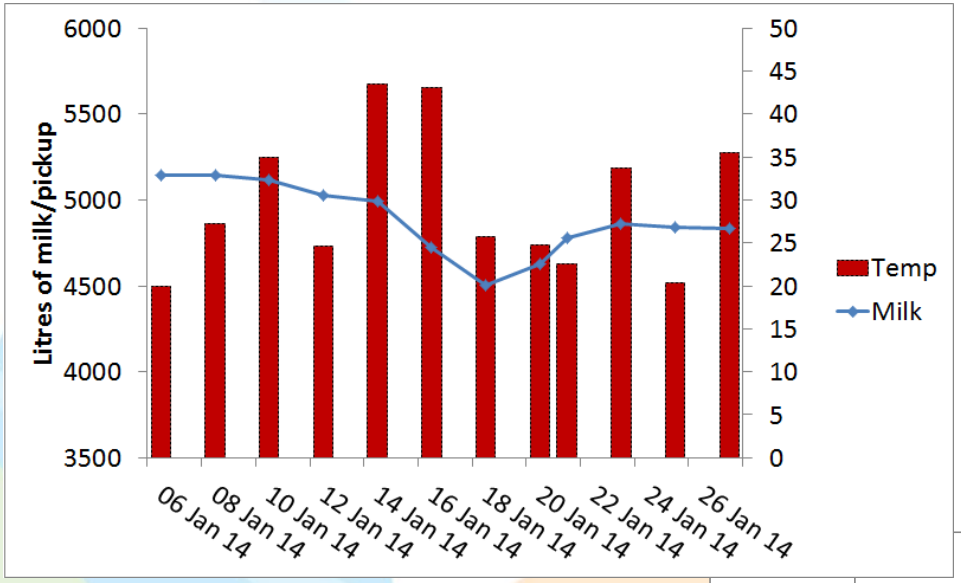
THI between 89 and 98

severe stress

THI above 98

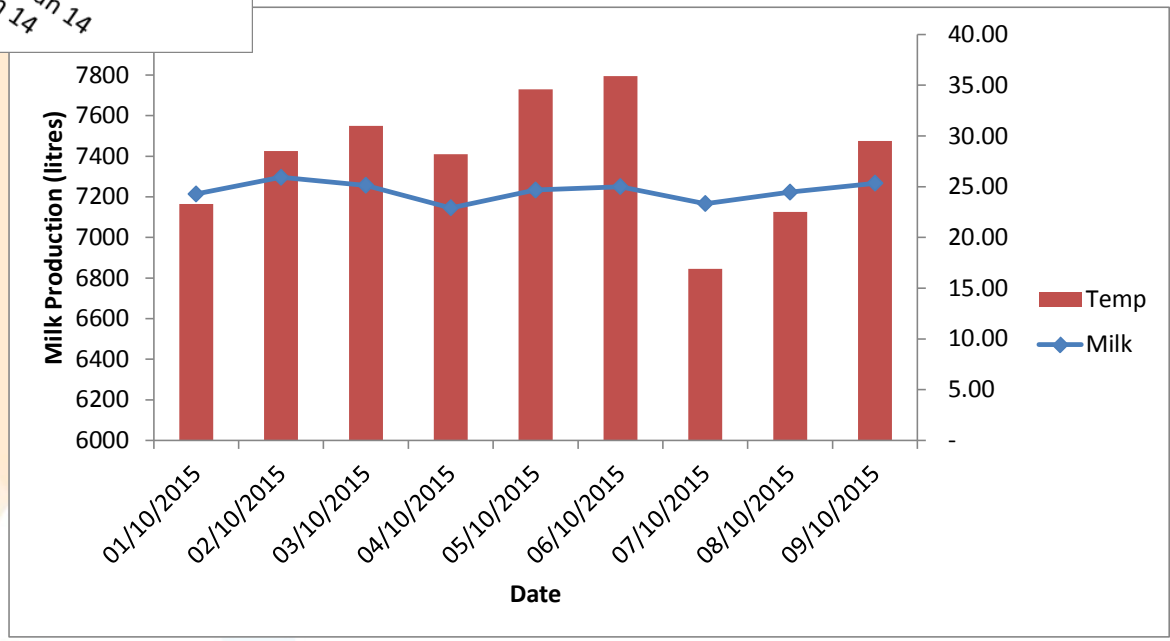
DEAD COWS!

Heat waves and milk production

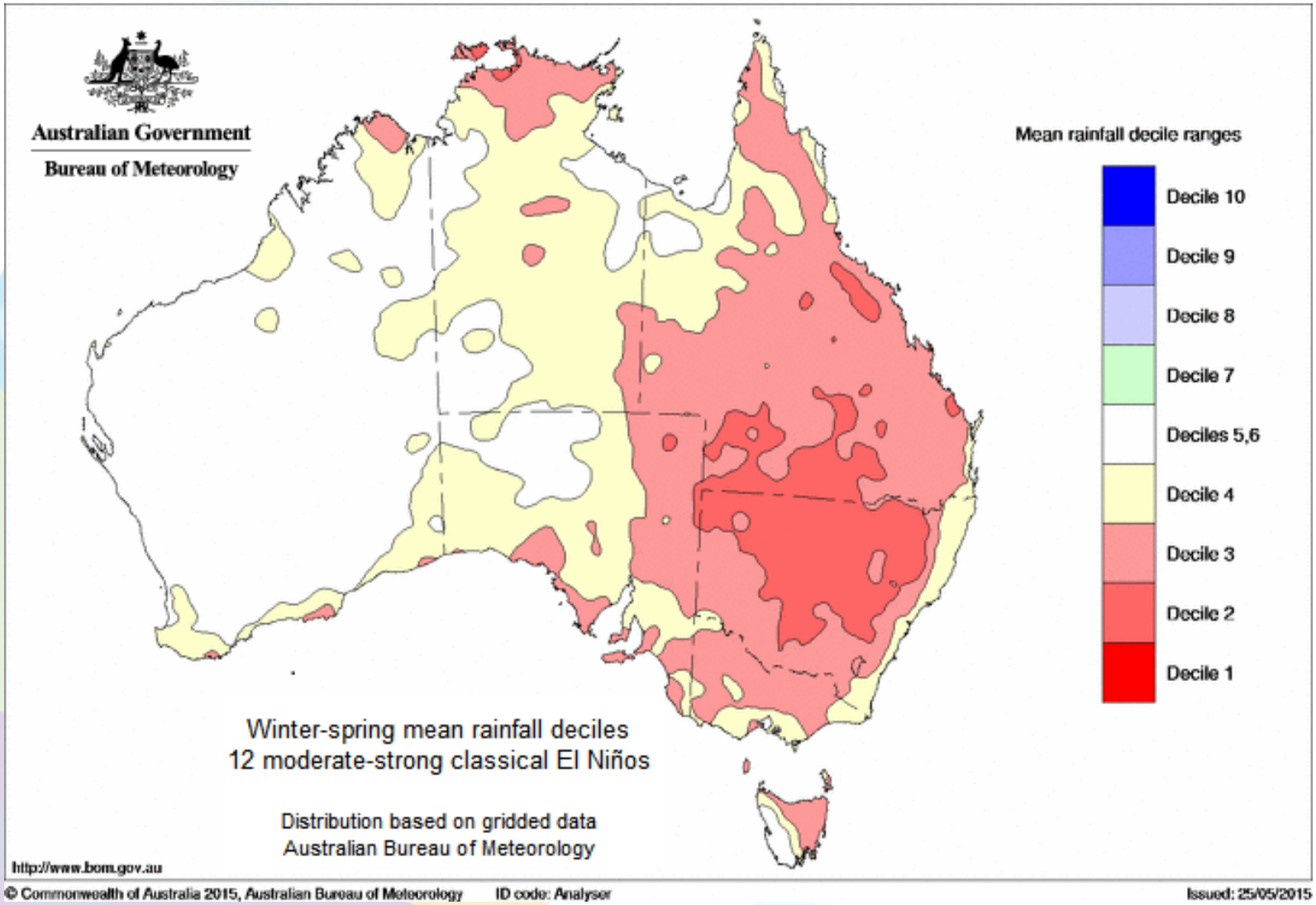


Hot days and hot nights

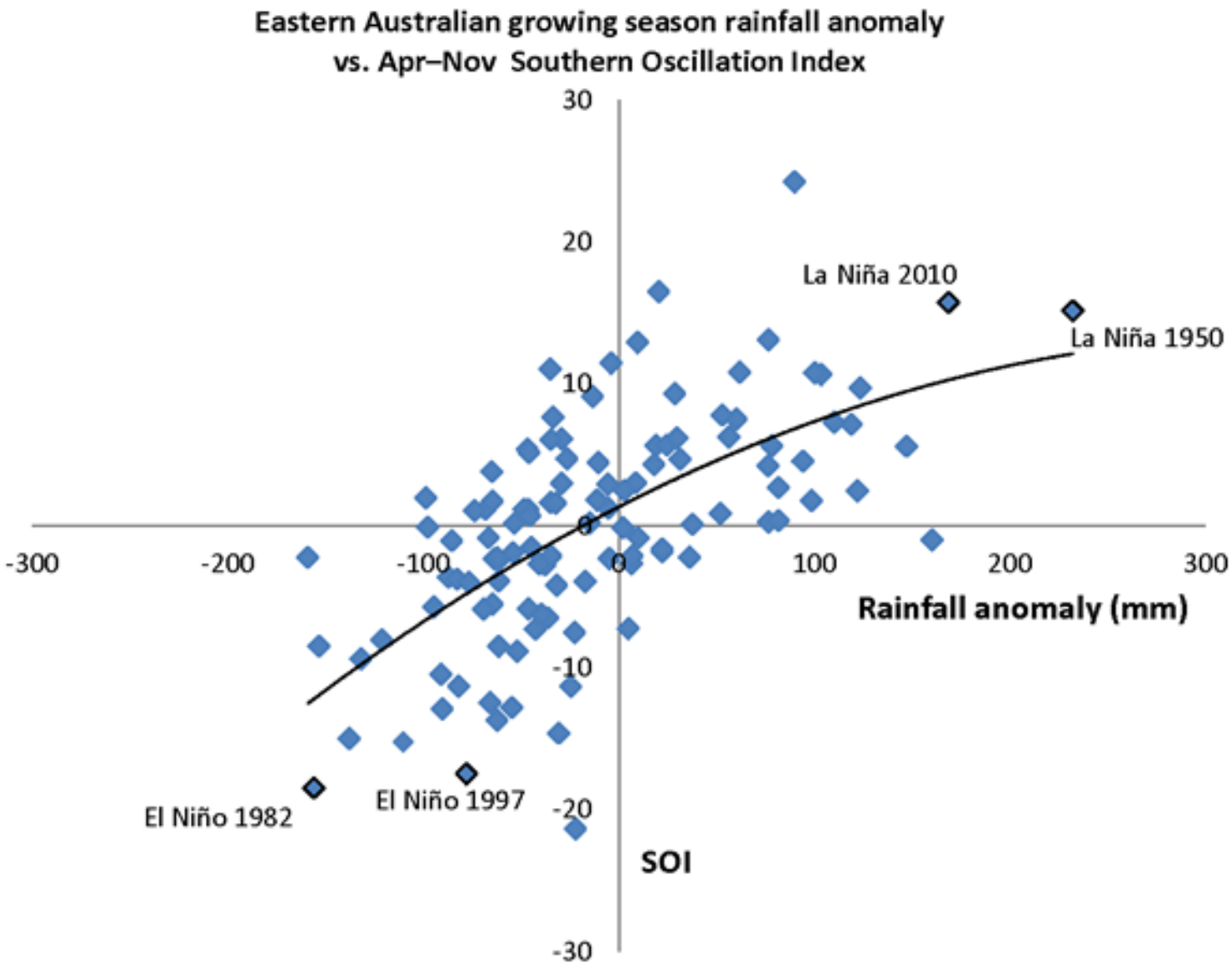
Hot days and cool nights



Rainfall – Winter/Spring



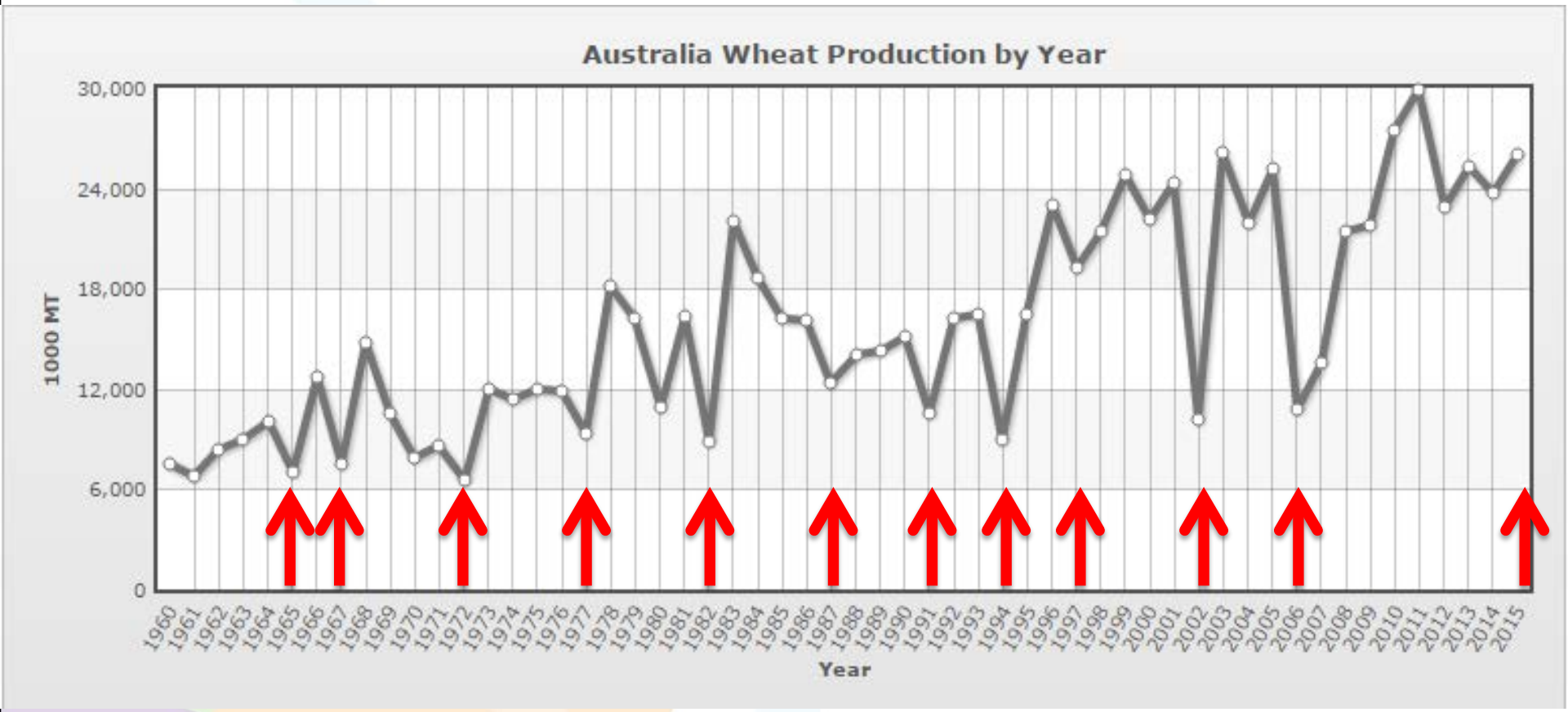
Rainfall anomaly



Rainfall effects

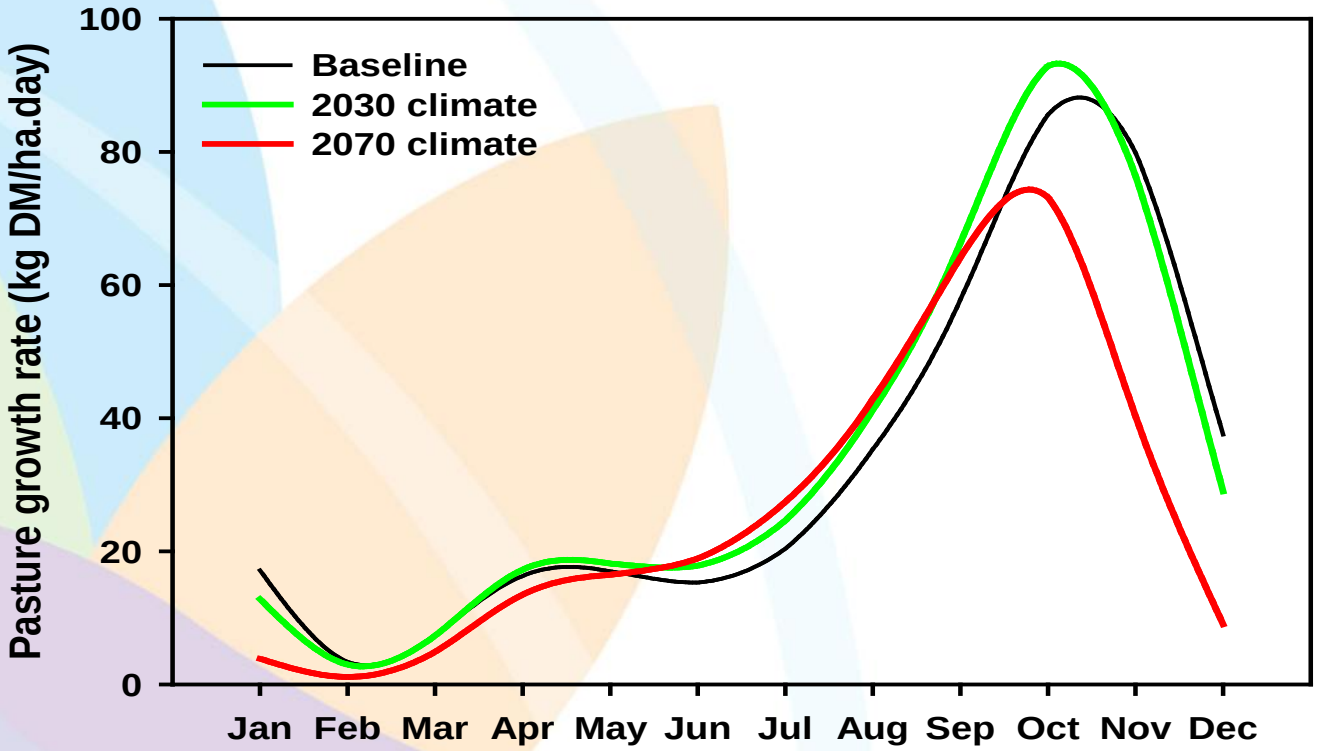
- Summer rainfall regions
  - Crops & pastures are reliant on summer rainfall
  - Can be more variable, with failed spring rains
- Winter rainfall regions
  - Crops & pastures are reliant on winter rainfall
  - Rainfall in coastal regions is more than required
    - Impact on pasture growth is limited
  - Cropping regions – major impact
  - Irrigated systems – increase price of water

Wheat and El Nino



Livestock - pasture

- Changes the pattern of pasture growth
  - But most livestock producers have experienced 2030 years before



Cullen *et al* (2009) *Crop & Pasture Science*, **60**, 933–942.

Dairy production

- No clear trend with El Nino:
  - Feed supply balanced with
    - Purchased supplements
    - Irrigation
- Major impact on economics
  - Water price
  - Purchased feed price