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Adaptation strategies to shorter growing seasons for lamb enterprises in southern Australia

Climate Adaptation National Research Flagship

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Australian Government
Department of Agriculture, Fisheries and Forestry

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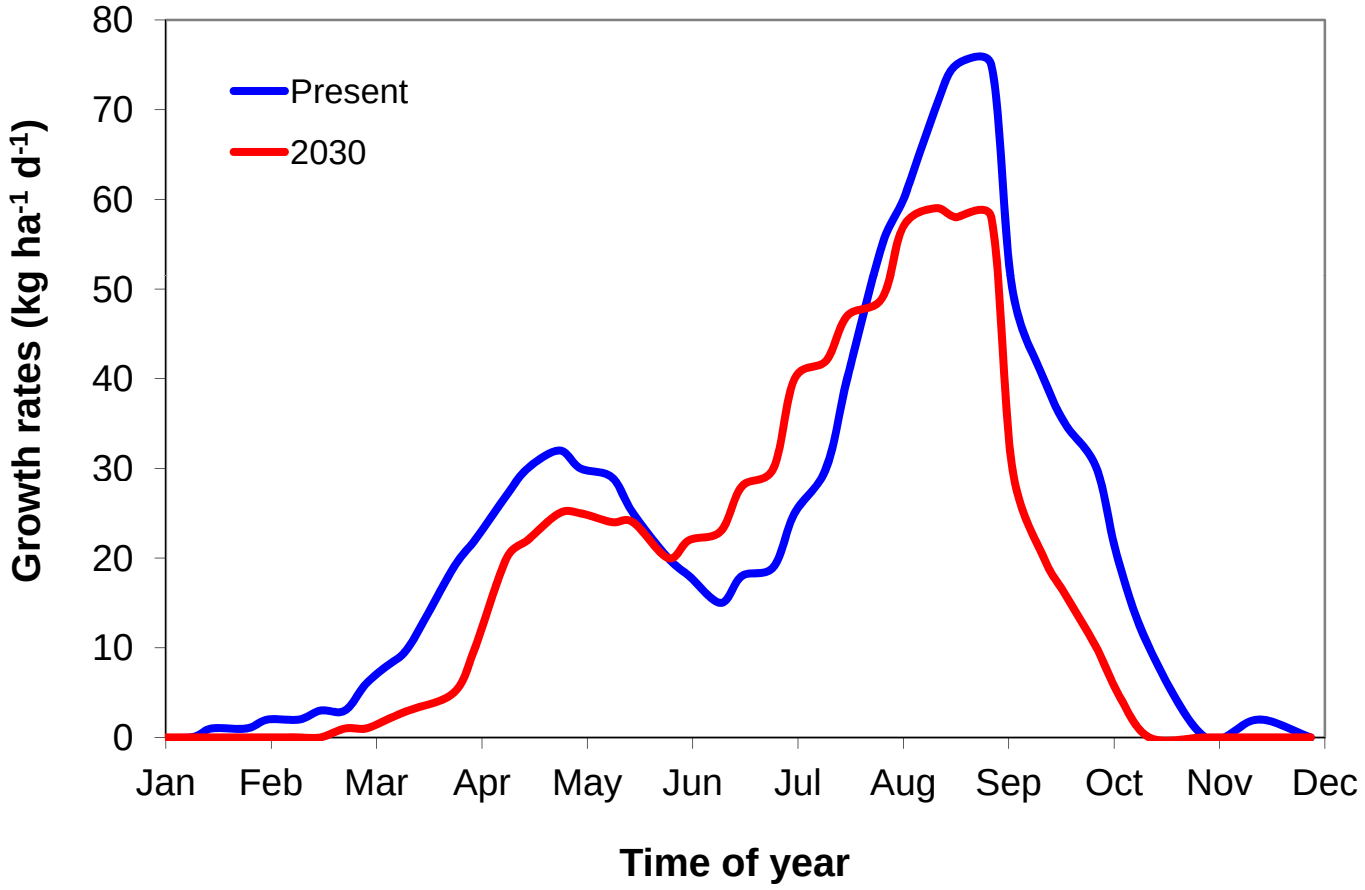
Effects of climate change on pasture production

- Current GCMs forecast increased temperatures, greater concentrations of atmospheric CO_2 and more erratic rainfall distributions for many regions in southern Australia

- In general growing seasons are likely to be of shorter duration, but growth rates are predicted to be enhanced in winter

Effects of climate change on pasture production



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Effects of climate change on pasture production

- Current GCMs forecast increased temperatures, greater concentrations of atmospheric CO_2 and more erratic rainfall distributions for many regions in southern Australia

- In general growing seasons are likely to be of shorter duration, but growth rates are predicted to be enhanced in winter

- The purposes of this study were therefore to
  1. Modify historical weather records to produce artificially shorter growing seasons
  2. Identify adaptation strategies for sheep enterprises in southern Australia that mitigate the effects of climate change

Manipulating weather records for simulation of shorter growing seasons

- For 1970-99 baseline weather at Hamilton and Wagga, we identified the earliest, median and latest ‘breaks’ and ‘ends’ of growing season using GrassGro

- Breaks were defined as the day with which available green dry matter became greater than 500 kg ha^{-1} and pasture growth rates became greater than 1 kg ha^{-1} d^{-1}

- The end of the growing season was defined as the time when available green dry matter was less than 100 kg ha^{-1}

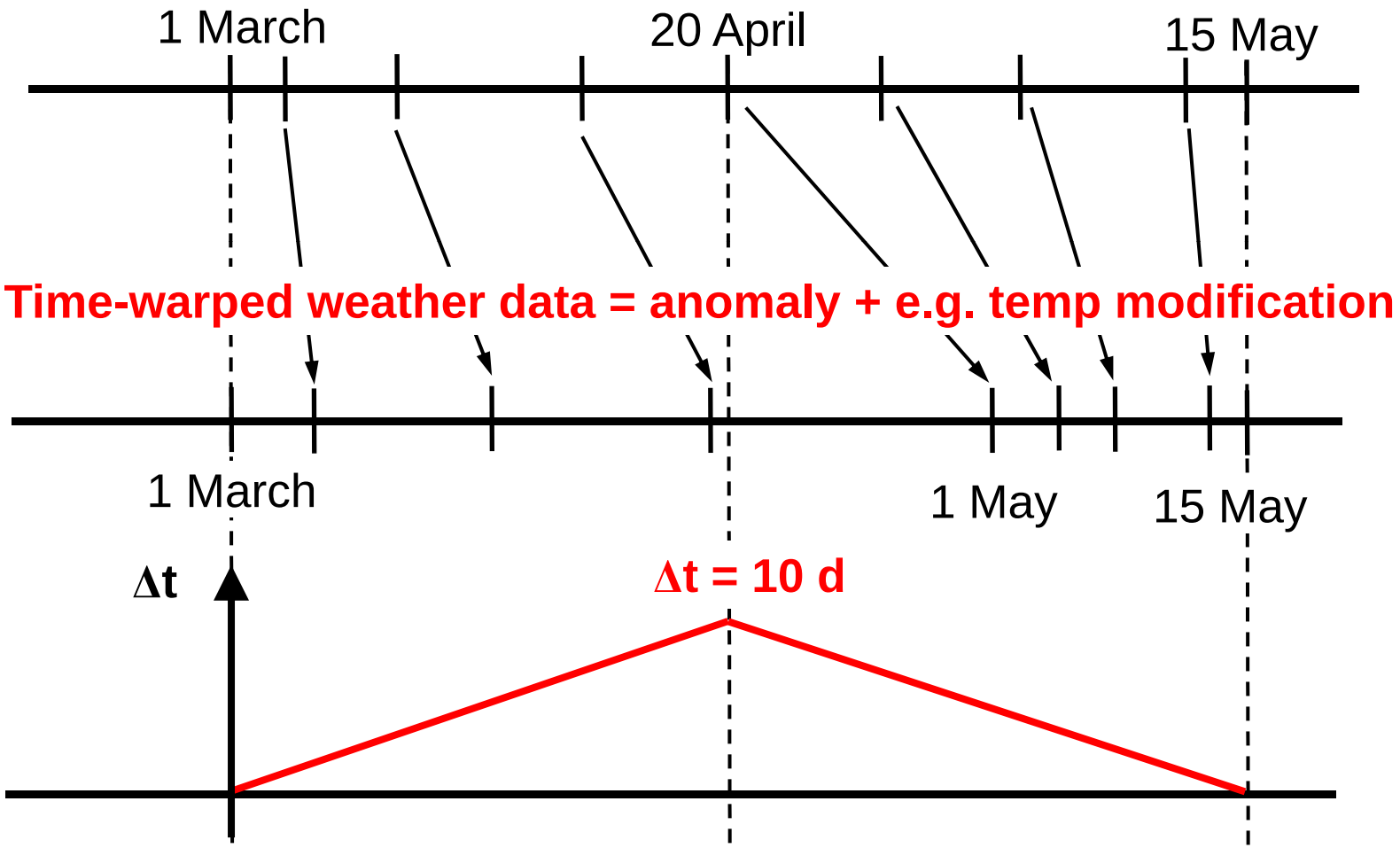
- Assumed the end of the growing season could be as late as 31 March in the following year

Manipulating weather records for simulation of shorter growing seasons

- Adjusted the median break and ends of growing season to produce a 10% reduction in growing season length from the long-term records
- Assumed a uniform 2^{o}C increase in maximum and minimum temperatures for all days
- Assumed atmospheric [CO_2] = 450 ppm

Manipulating time intervals for simulation of shorter growing seasons

Long-term average baseline weather data



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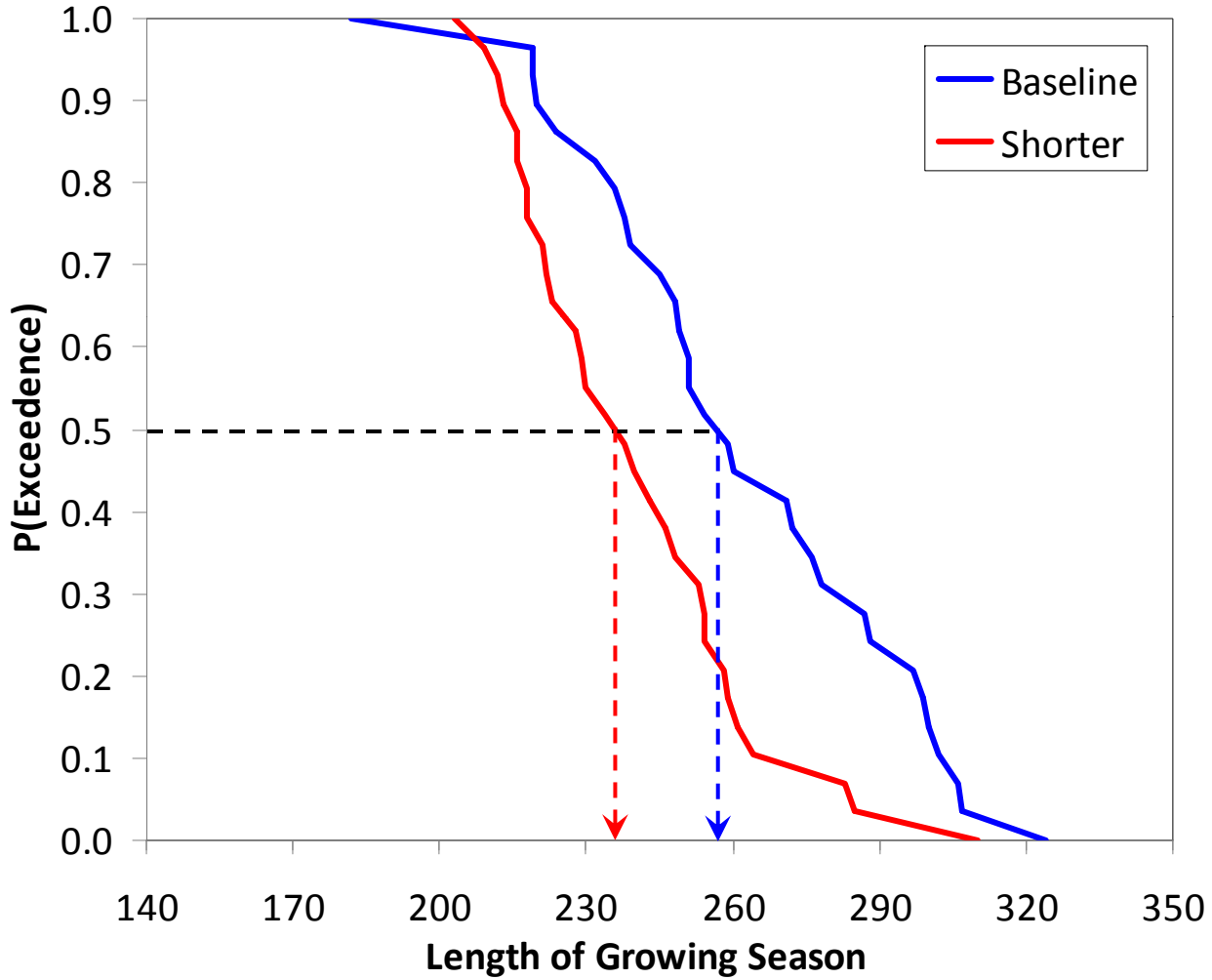
Growing season lengths at Hamilton



Baseline = 257 d

Shorter = 236 d

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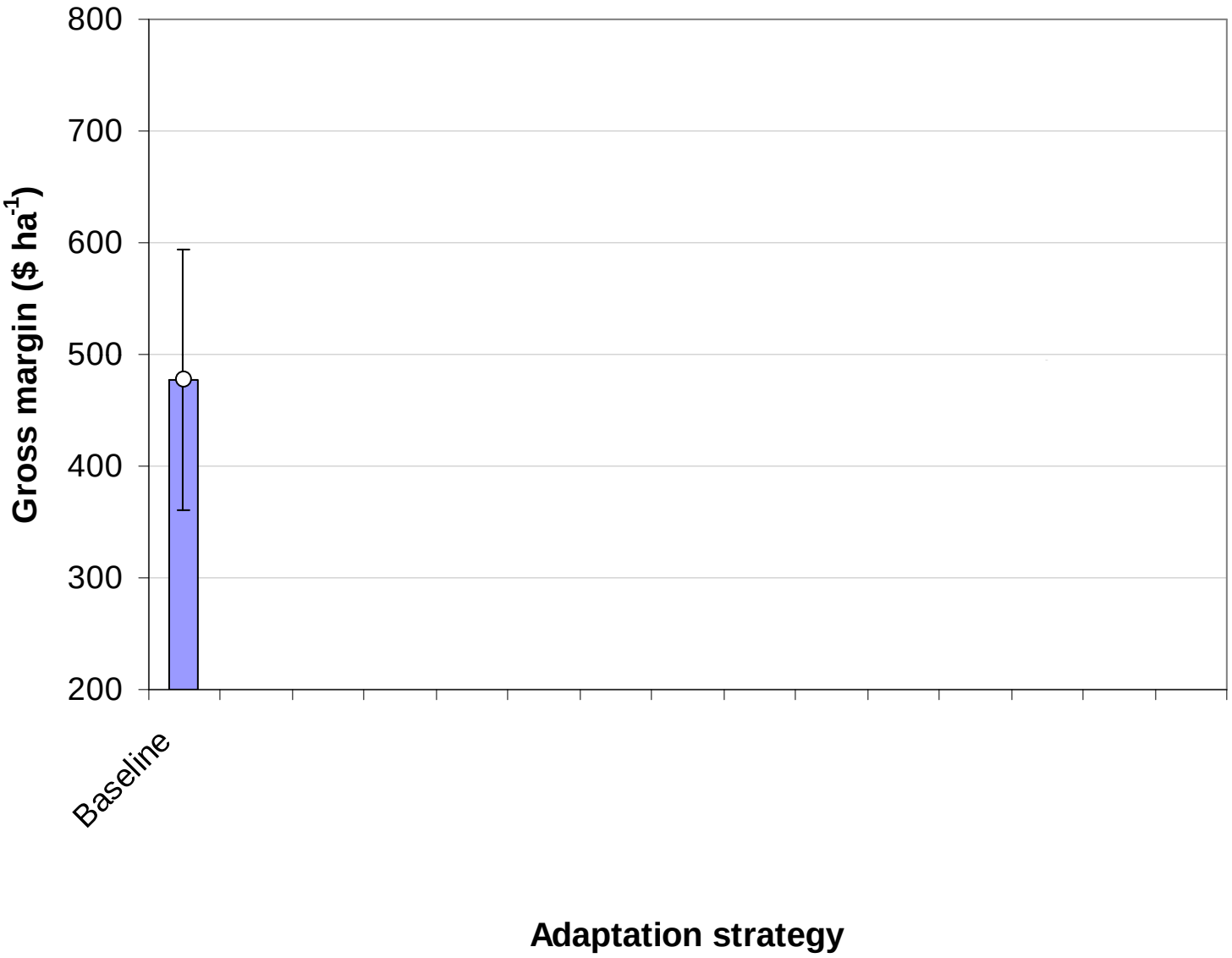
Adaptation strategies

- Ewe joining times (Young *et al*. 2010)
- Age at first joining
- Pasture fertility
  - 10% increase in base fertility level
- Confinement feeding (1 Nov-1 Aug)
  - Different turn-off levels of total dry matter
- Pasture renovation – sowing existing pastures with:
  - Phalaris
  - Annual grasses with greater development rates

Baselines for Hamilton and Wagga

- Stocking rate = 11 ha^{-1} or 4 ha^{-1}
- Join 1-2 yr old Merino ewes with Dorset rams on 1 December, lamb late April
- Sell excess young ewes and wethers between 1 Sep and 31 Jan if weight gain becomes negative
- Maintenance feeding to condition score 3.0 (mature females) or 1.5 (weaners)
- Perennial and annual ryegrass, subclover

Hamilton – adaptations under present conditions



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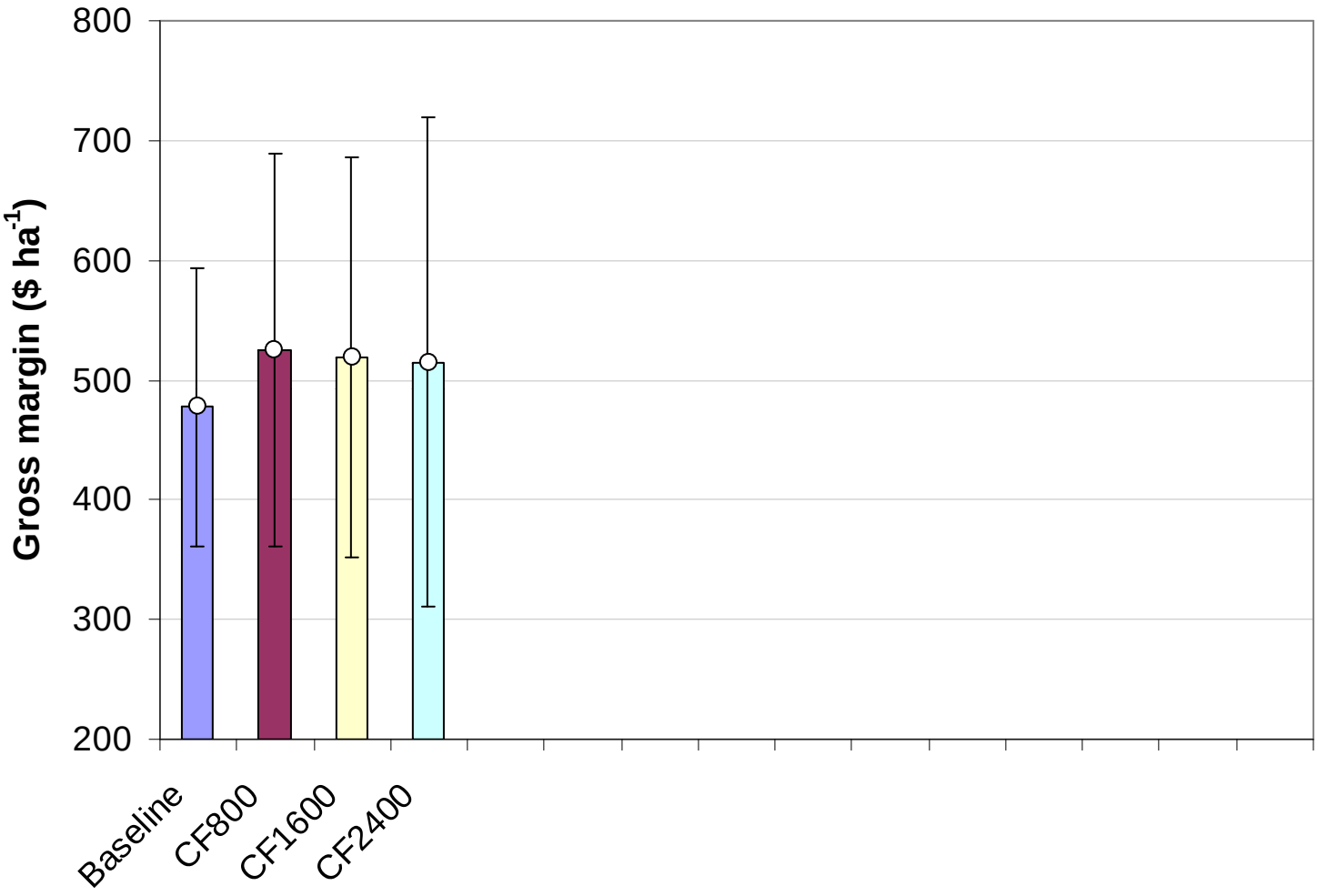
Hamilton – adaptations under present conditions



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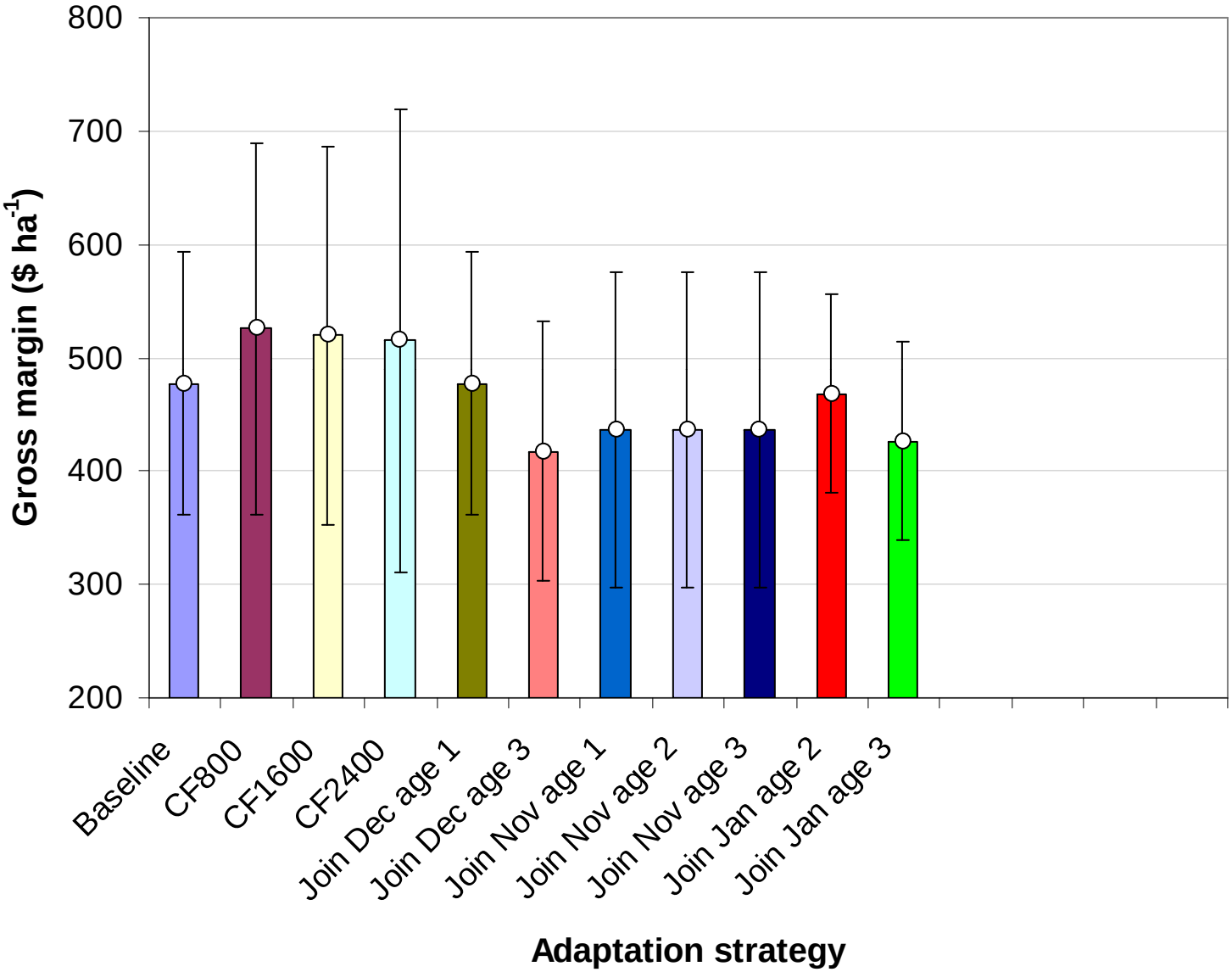

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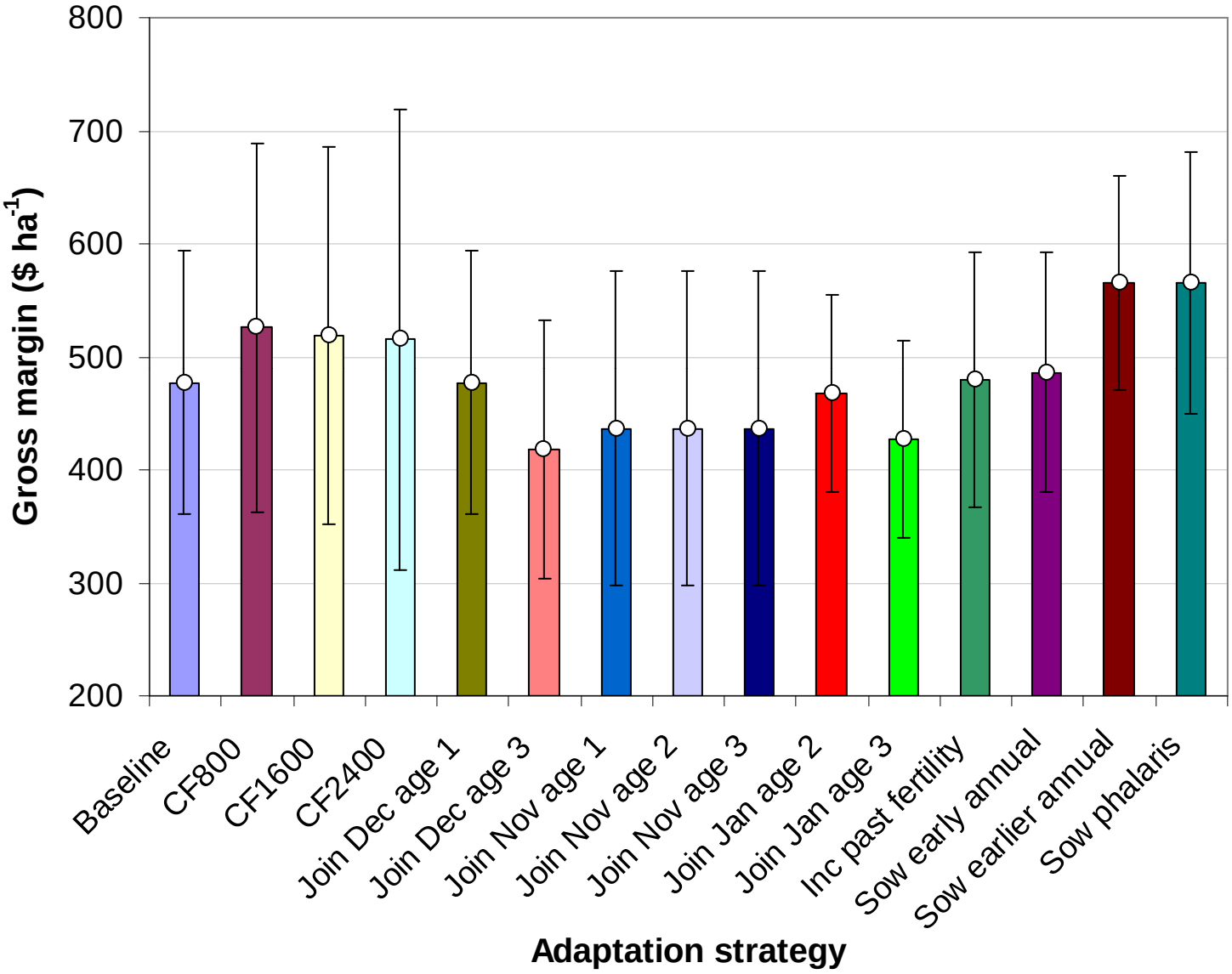

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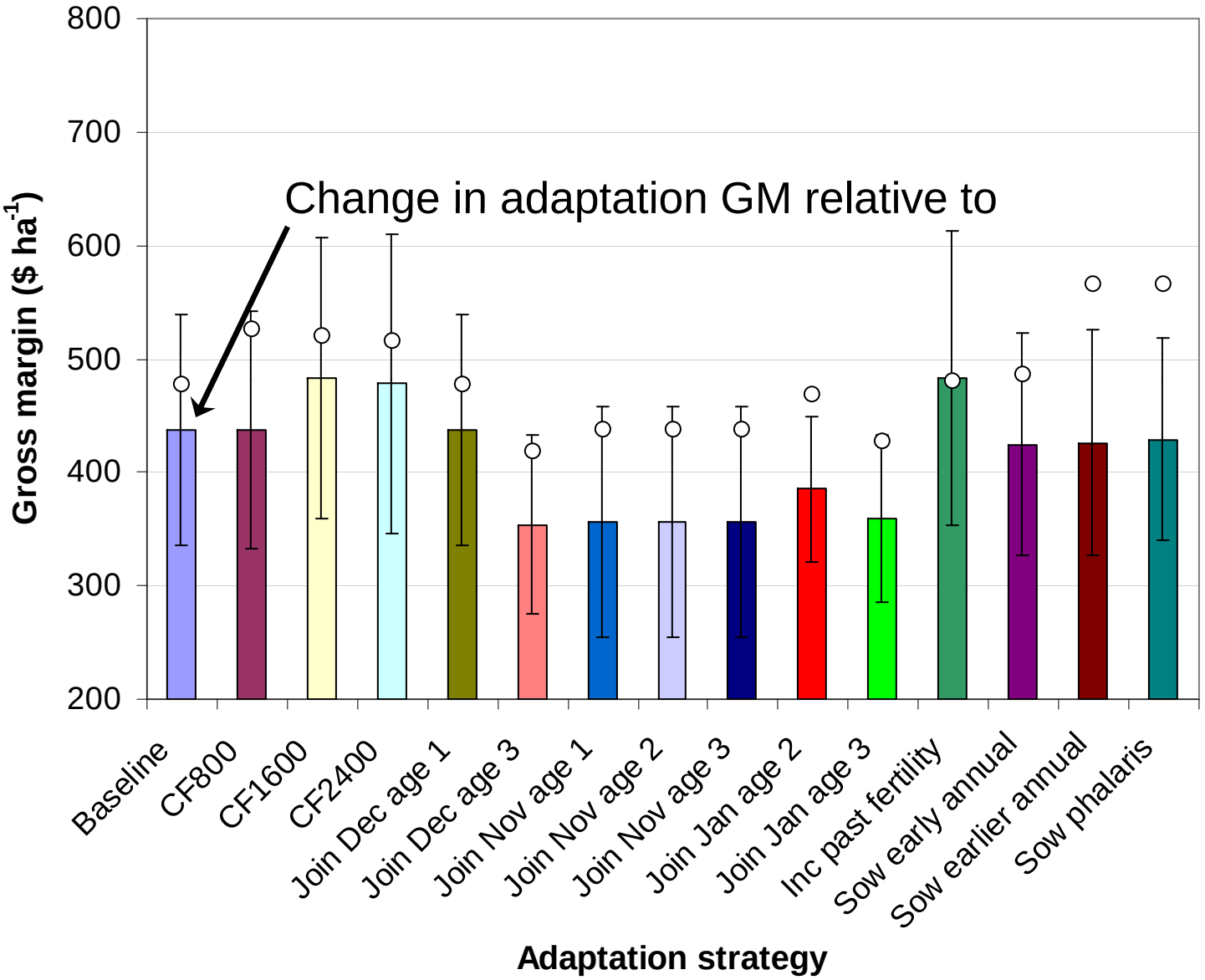
Hamilton – adaptations under shorter growing seasons



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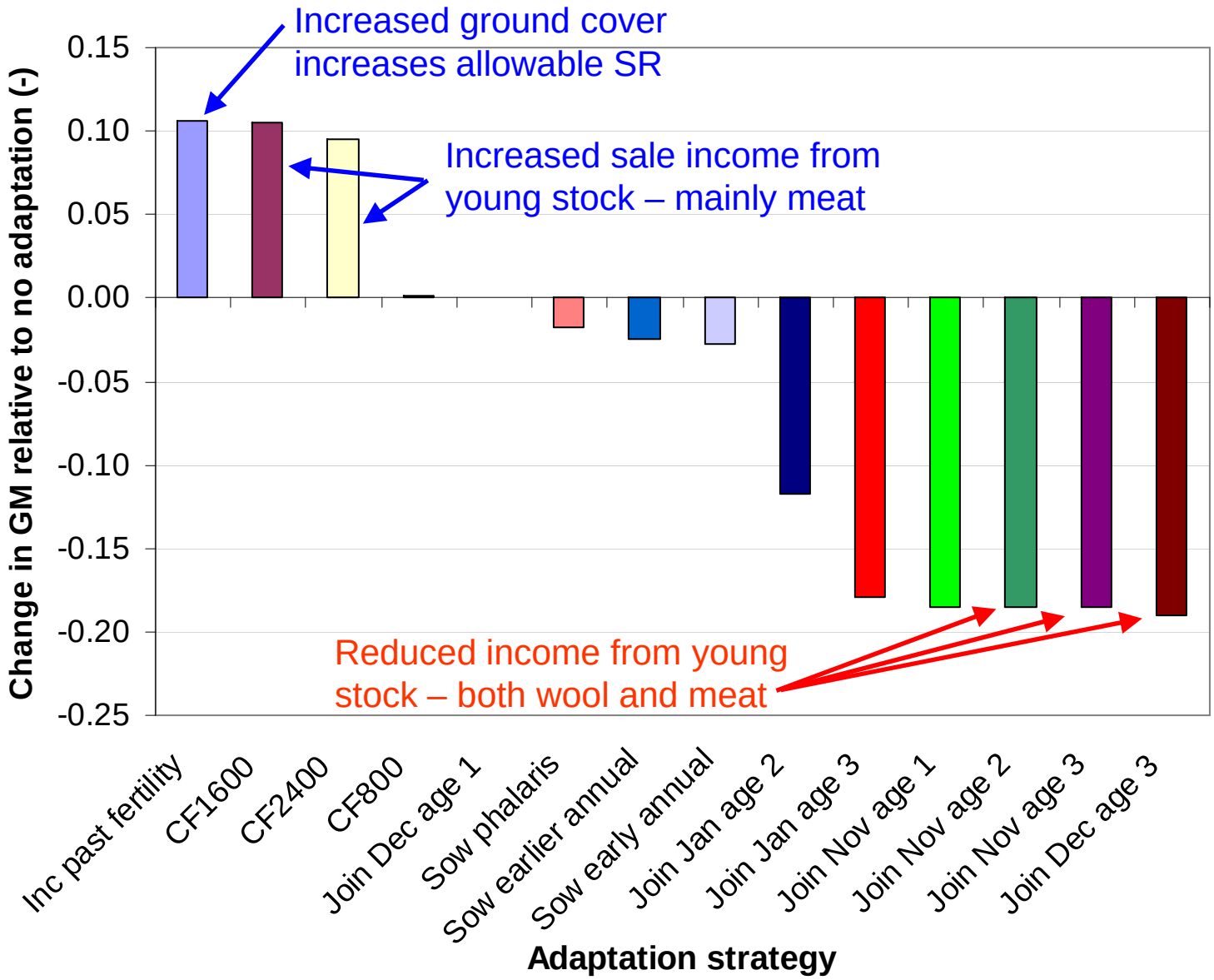
Hamilton – change in GM relative to no change in management



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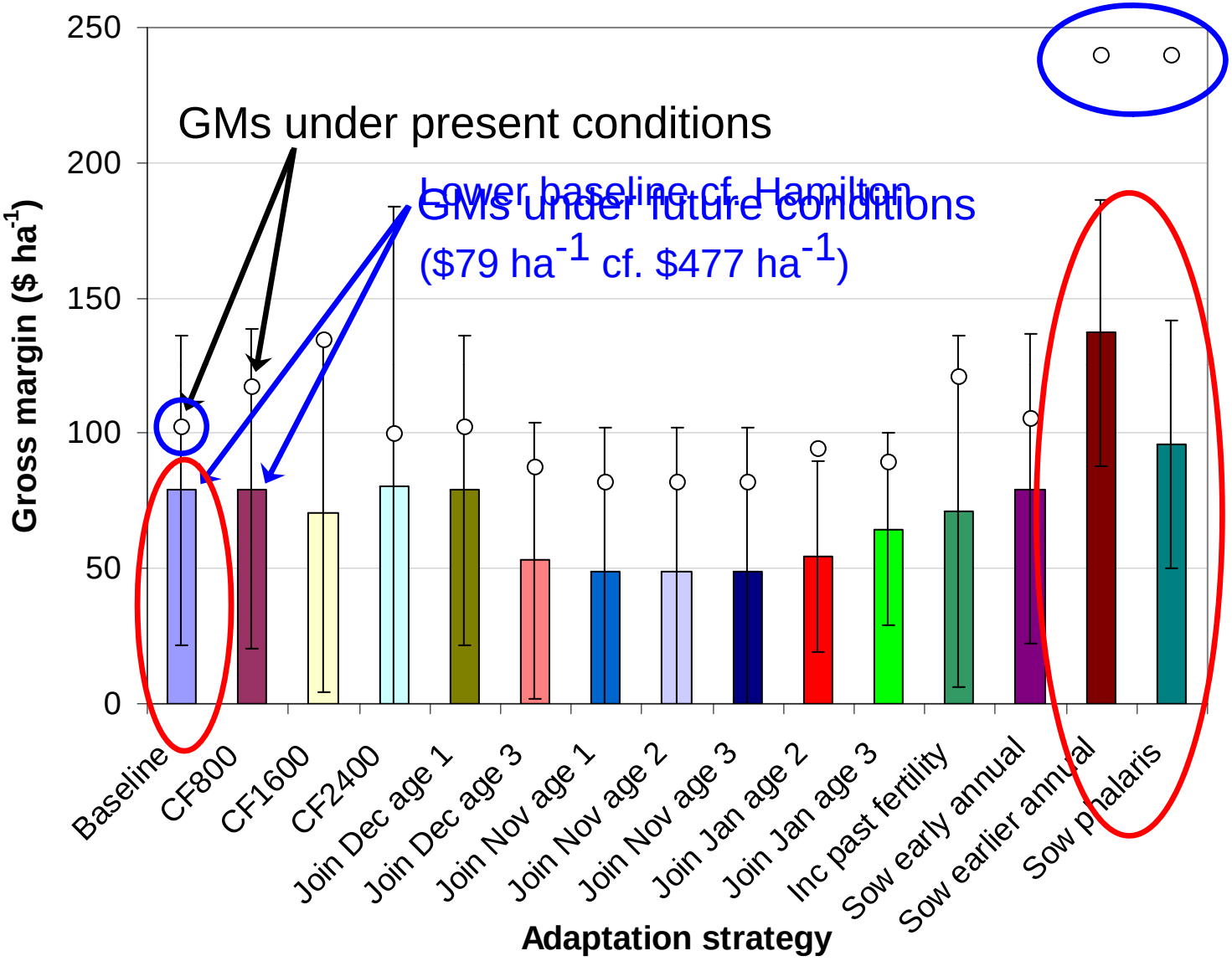
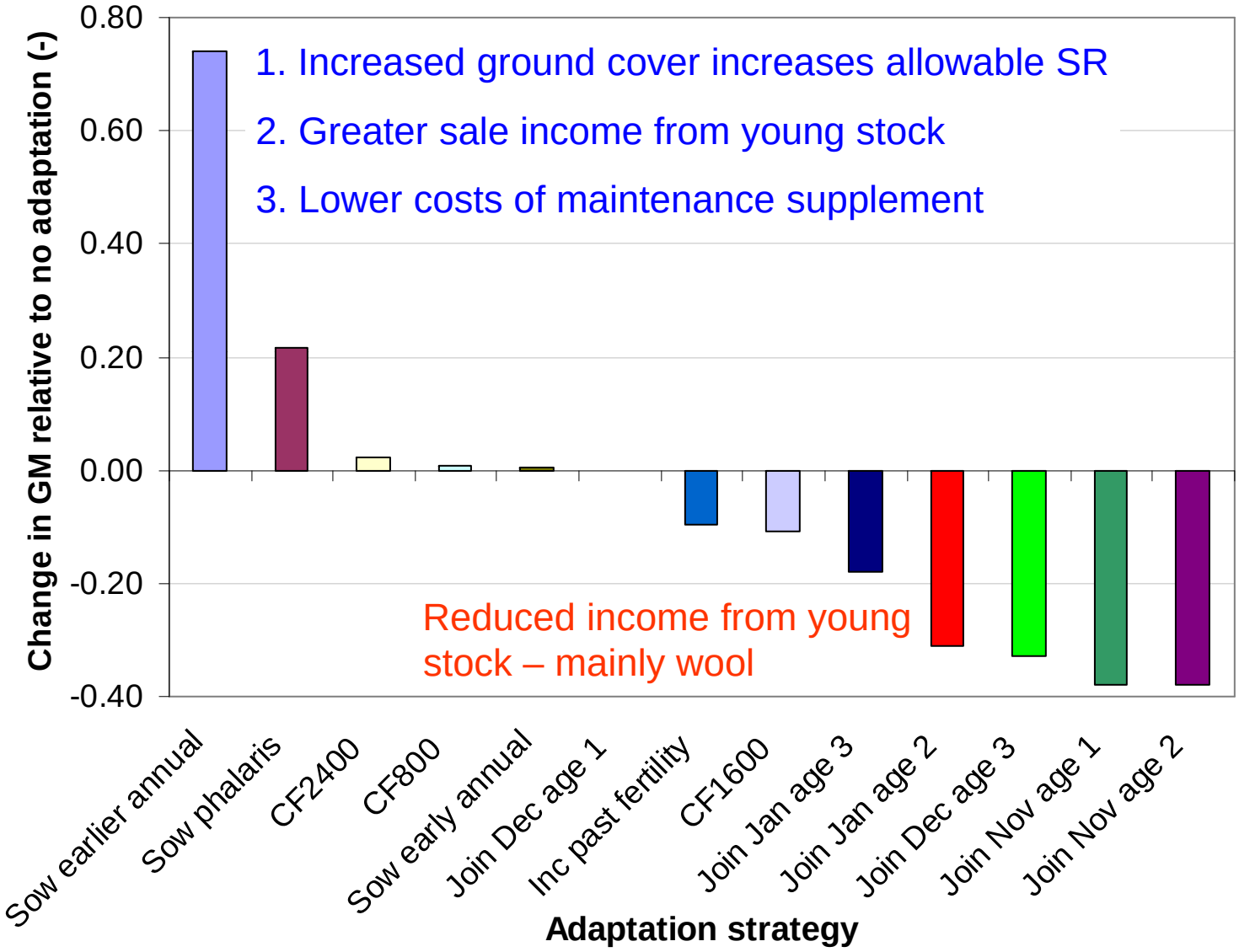
Wagga – adaptations under shorter growing seasons



Wagga – change in GM relative to no change in management



Key messages

1. **Benefits of adaptation strategies differ between long and short season sites (e.g. confinement feeding at Hamilton, sowing annual grasses with earlier phenology at Wagga)**

2. **Adaptation strategies that are beneficial to grazing systems under current conditions may also be advantageous under future climates that shorten growing seasons**

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Thanks

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Template Information

This template pack shows how different slide layouts can be used.

- Use of graphics and images
  - When using graphics they must remain inside the text margins
  - Graphics are not permitted to overlap the background graphics (ie. diagonal lines, grey and blue strips at the top, footer, Flagship logo at the bottom)
  - By staying within the margins your presentation will remain clean and tidy, and be easier for your audience to take in
- To change the Title slide image
  - Click **View**, **Master**, then **Slide Master**
  - Delete the existing image and replace with new image
  - You must now send the image to the back so it sits behind the diagonal lines. To do this **select image, right mouse click, Order, Send to Back.**
  - **Please Note: only one image should be used on the title slide.**
- How to customise the footer
  - To insert your presentation title go to the **View menu** – **Header and Footer**.
  - Do not use a font size smaller than 14pt

Tips for Template use

- The background image disappears when I print
  - Make sure your presentation has not turned off the background
  - From the **Tools** menu select **Options** then click on the **Print tab**
  - Under **printing options** ensure **Background printing** is checked
  - If the background still disappears select all slides, go to the **Format menu** – **Background**, uncheck **Omit background images from master**, and **Apply to all**
- Make file size smaller by compressing images
  - If your presentation has multiple images the file size will be large.
  - **Right-click the picture,** and then click **Format Picture** on the shortcut menu, click the **Picture tab**, then click **Compress**.
  - Under **Apply** click compress all pictures
  - Under **Options**, select the **Compress pictures** check box and the **Delete cropped areas** of pictures check box. Click **OK**.

One column layout

- Level 1, Arial Regular 20pt
  - Level 2, Arial Regular 18pt
    - Level 3, Arial Regular 16pt
      - Level 4, Arial Regular 14pt
        - Level 5, Arial Regular 14pt
- These font sizes are recommended
- You can increase font sizes providing the hierarchy of information is maintained (ie. slide heading is largest, followed by Level 1, then Level 2 and so on)
- Font size must be consistent across all slides
- Do not use font sizes smaller than displayed here. If you do not have enough room to fit your text, spread your content over multiple slides

Two column layout with pullout box

- Level 1, Arial Regular 18pt
  - Level 2, Arial Regular 16pt
    - Level 3, Arial Regular 14pt
      - Level 4, Arial Regular 12pt
        - Level 5, Arial Regular 12pt

- Level 1
  - Level 2
    - Level 3
      - Level 4
        - Level 5

- For two column layouts PowerPoint automatically reduces the font size
- You can increase the font size as stated on slide 3

Pullout Boxes

- Pullout boxes can extend to slide edge or remain inline with column text
- Pullout boxes can also be used 0% transparency with white text when needed

Font: Arial Regular 16pt
Colour: R250 G166 B52, 70% transparency

Font: Arial Regular 16pt
Colour: R153 G153 B153, 70% transparency

Font: Arial Regular 16pt
Colour: R0 G153 B204, 80% transparency

Approved colour palette for PowerPoint

- Primary colours:
  To be used first and foremost in your presentations

Apricot	Light Grey	CSIRO Blue	Black
R250 G166 B52	R226 G227 B228	R0 G153 B204	R0 G0 B0

- Secondary colours:
  Useful for complex diagrams and charts

Blue	Red	Green	Yellow
R89 G152 B200	R203 G80 B86	R116 G161 B142	R235 G171 B0