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Adapting to climate change in broad-acre irrigated farming systems

Climate Adaptation Flagship

Don Gaydon
Farming Systems Researcher
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Case Study - The Irrigated Riverina

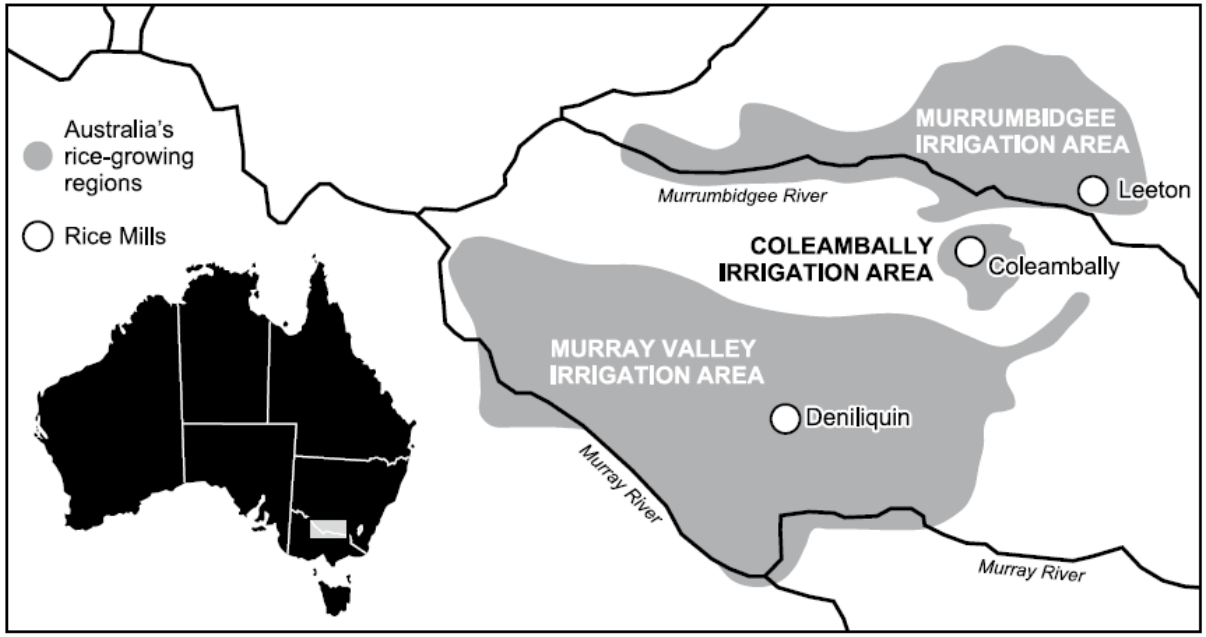

Figure 5.1: Australia's rice-growing regions (courtesy of the Ricegrowers Association of Australia).

- significant permanent plantings – vineyards, citrus, stone fruit (on **'high security'** irrigation water allocations
- This talk focuses on broad-acre irrigators – rice, cereals, oilseeds, maize (on **'low security'** water)

- irrigation water allocation priorities : -

Towns → Stock → Permanent Plantings → Broad-acre → Environment

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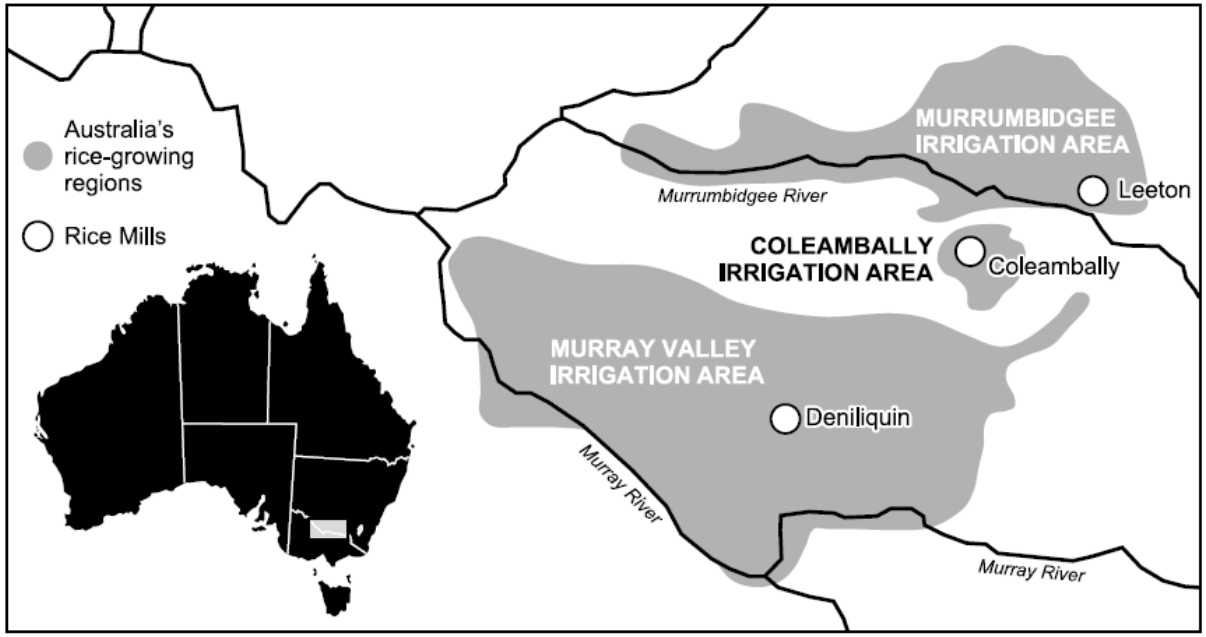
Case Study - The Irrigated Riverina



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Towns → Stock → Environment → Permanent Plantings → Broad-acre

….since mid 1990's (NSW Gov Environmental Flow Legislation)

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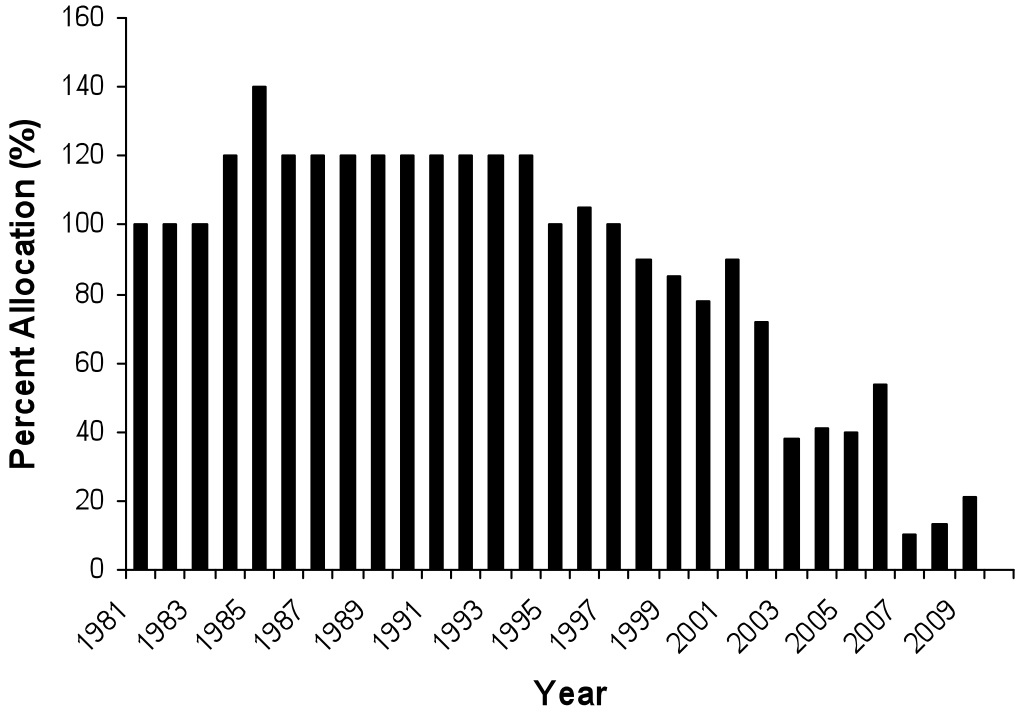
Historical trends : broad-acre water allocations

So being at the bottom of the water pecking-order, combined with the effects of climate change the last 15 years ……..



Irrigation water allocations (percentage of licensed quota) for **Murrumbidgee Irrigation Area, 1980/81 – 2009/10** seasons. The trend of 100%+ allocation extends unbroken back to 1914.

….water allocations available to broad-acre irrigators has experienced a severe downturn and a great increase in variability…..

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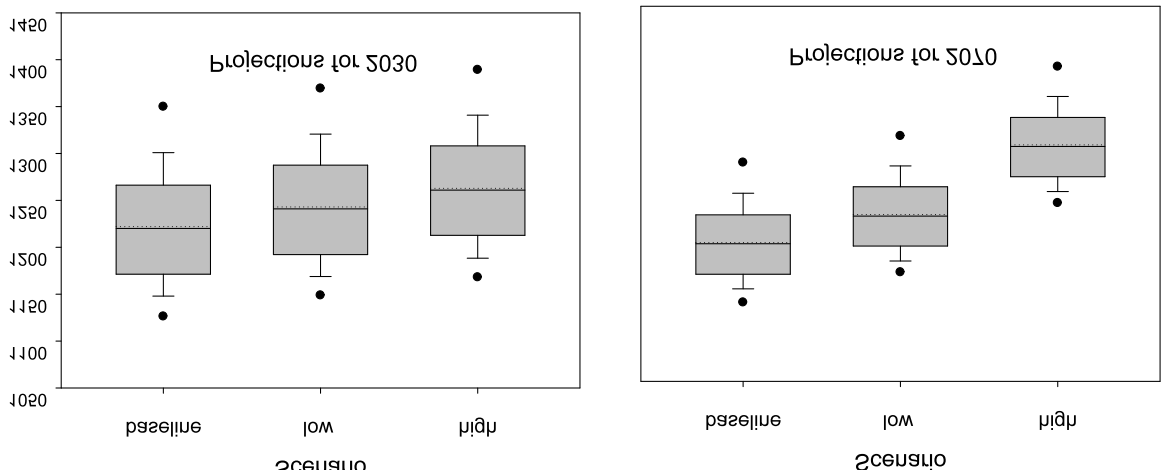
Future trends – what do the projections say?

Irrigation water supply:

- 16-25% reduction by 2030 and 16-48% reduction by 2100 (IPCC 4th Assessment report) – in **average** annual allocations
- Best estimate of 14% reduction for average irrigation allocations by 2030 – for Murray Catchment (CSIRO Murray Darling Basin Sustainable Yields Report) (most severe estimate: 37% reduction)

Irrigation water demand:



Crops will need more water in future, under current growing methods

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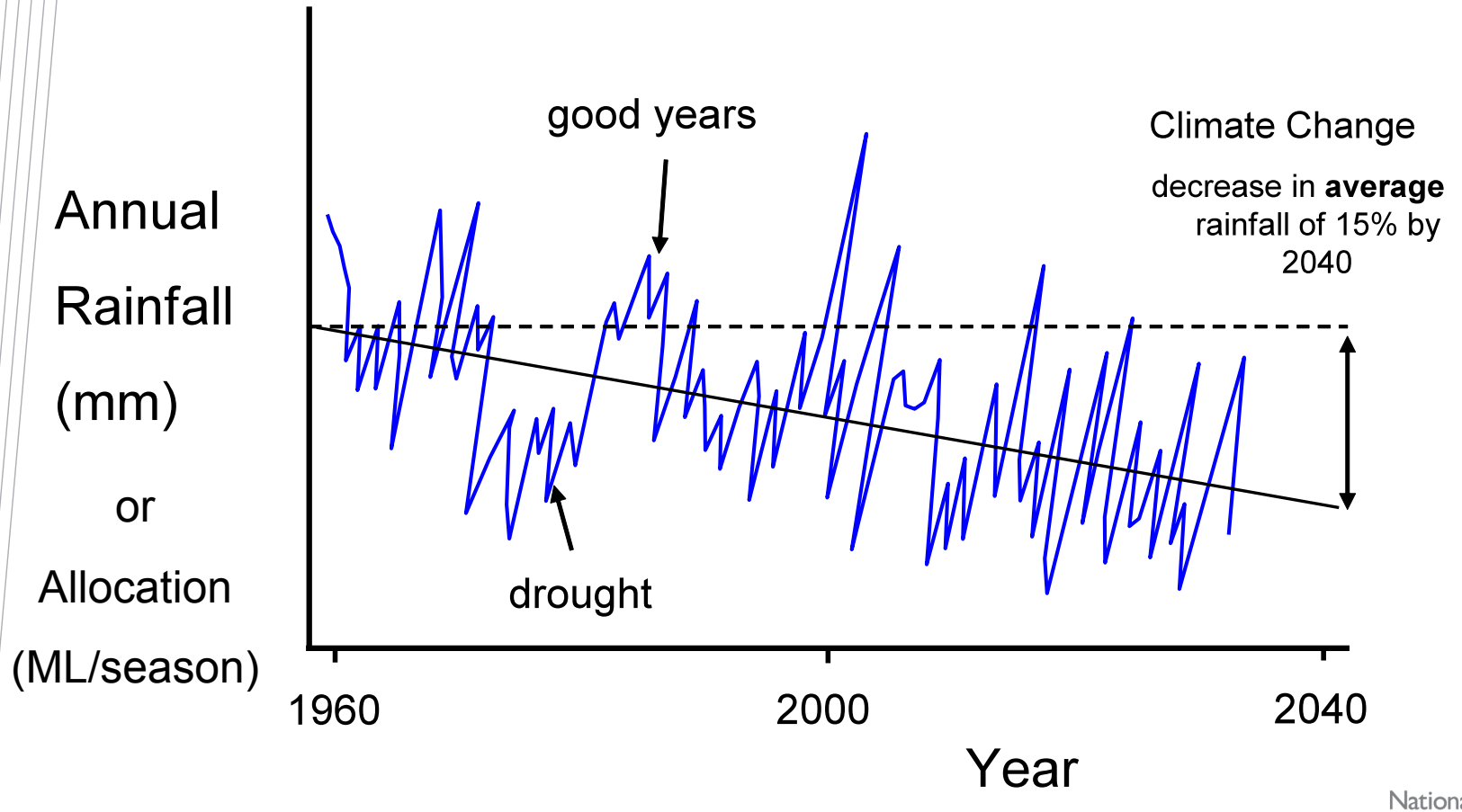
Future trends – what do the projections say?

Broad-acre growers can expect a decreased and more variable future water supply, and must strive to adapt to this new reality.



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How can broad-acre irrigators adapt?

Incremental Change

•buy up **more land** (or conversely sell up). It is likely that economies of scale will be required to remain viable in a future with less irrigation water and hotter climate.

•**Re-assess basic agronomy** – potentially change crop mixes (species), varieties, planting dates, fertiliser regimes, irrigation regimes

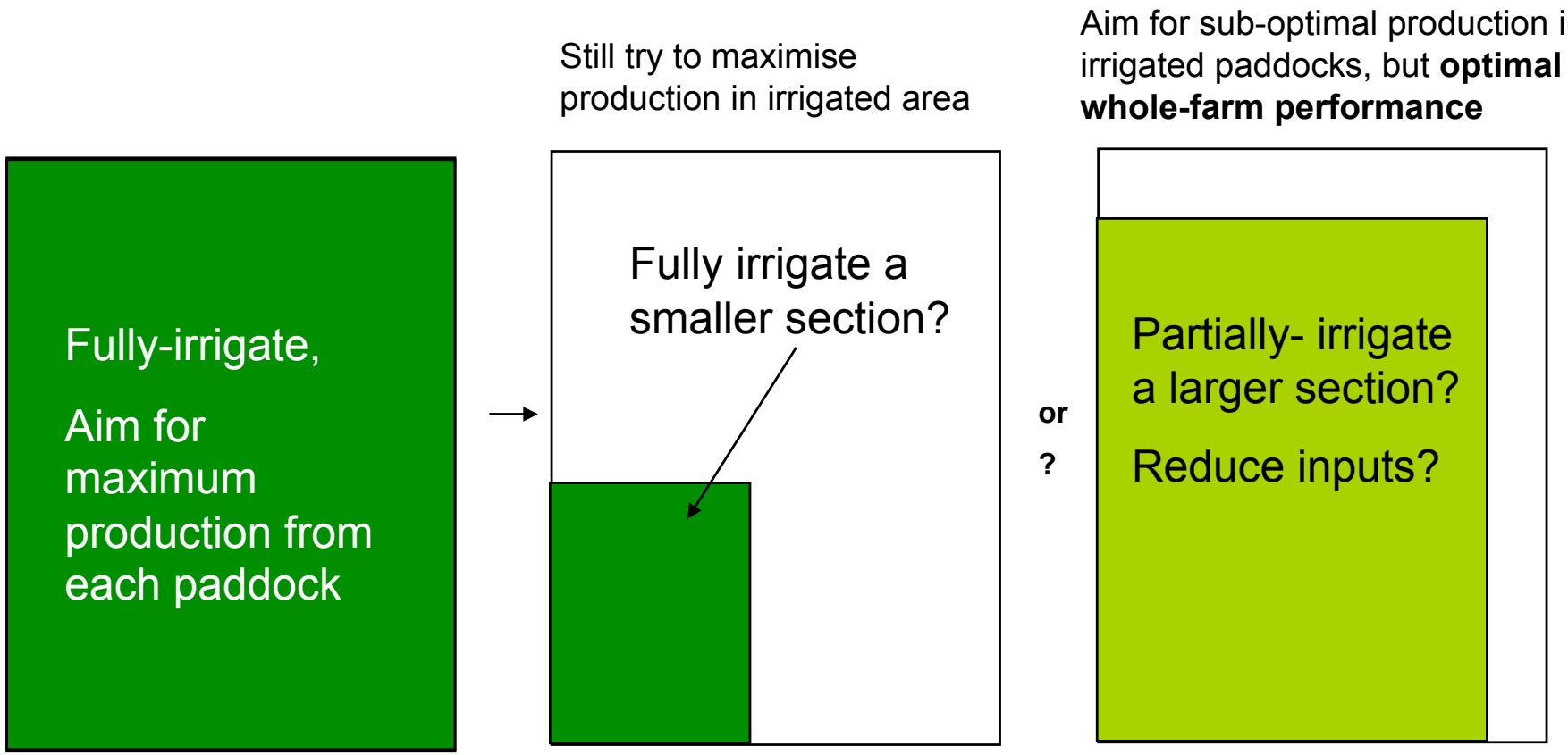
•They will also learn and **implement practices of dryland Australian farmers** (stubble retention, fallowing), because in future they are unlikely to be purely irrigated businesses like they have been in the past.

Go for *transformational change:*

- sell water rights to government, go totally dryland
- or invest in high-efficiency irrigation equipment (drippers, lateral moves) and aim for high-value crops (vegetables etc)
- relocate somewhere with more reliable water supplies?

How can broad-acre irrigators adapt?

- The first critical element is to recognise the implications of changing from a *land-limited* production system to a *water-limited* production system



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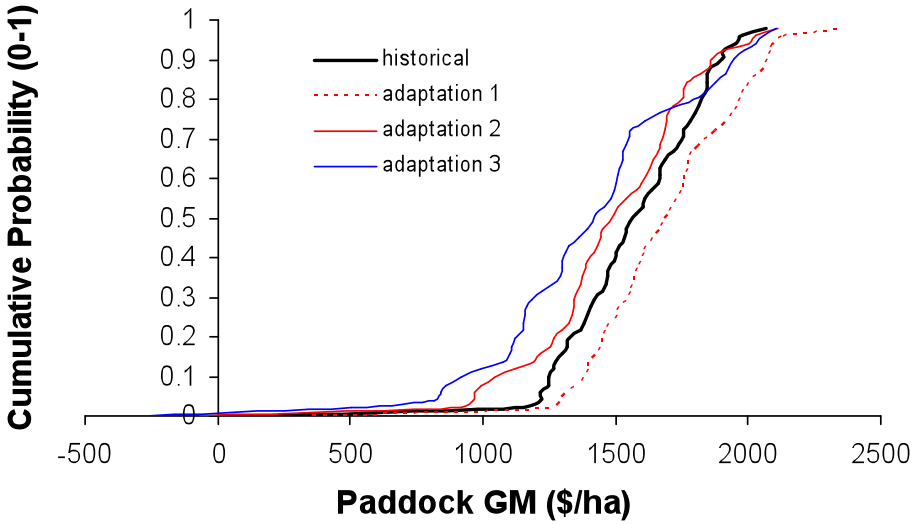
How can broad-acre irrigators adapt?

- Example Case study farm – Golgeldrie, NSW Riverina
  - Irrigated barley, soybeans, rice
  - 600 ha, 1783 Ml licensed allocation

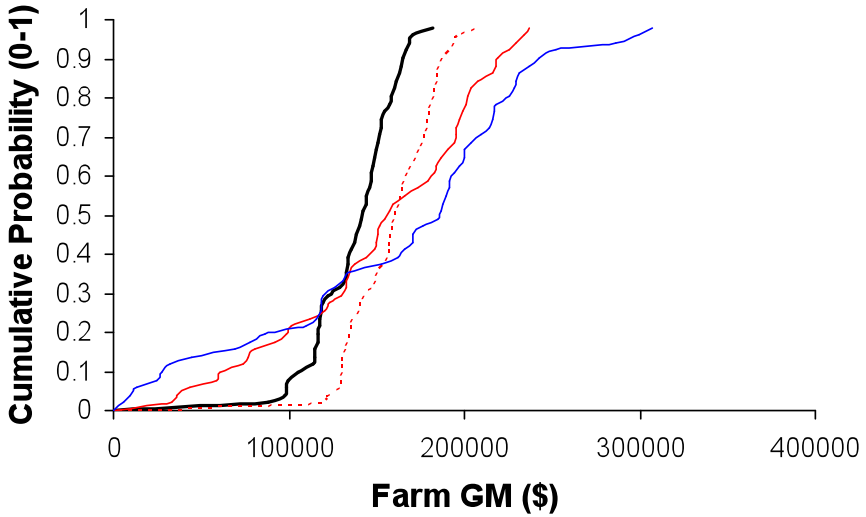
For this example, we simulated 53 years production (using APSIM model) – assuming annual allocation of 50%

  - <u>Scenarios considered using APSIM</u>
    - Historical management (barley area = 155ha; soybean area = 66ha)
      - Barley-soybean rotation, fully irrigated, clear all stubbles
    - Adaptation 1 (barley area = 162ha; soybean area = 73ha)
      - Barley-soybean rotation, increase barley row-spacing from 220-400mm, retain barley stubble through soybean
    - Adaptation 2 (barley area = 264ha; soybean area = 86ha)
      - As per Adaptation 1, but reduce inputs on barley (aim for 3t crop rather than 6t), more water available for soybean
    - Adaptation 3 (barley area = 358ha; soybean area = 91ha)
      - As per Adaptation 2, but rainfall-based sowing rule for barley rather than 'watering-up'

How can broad-acre irrigators adapt?



•The adaptations with decreased inputs had lower gross margins (GMs) in each paddock



BUT, because more area was planted in those adaptations, the whole-farm GM was increased

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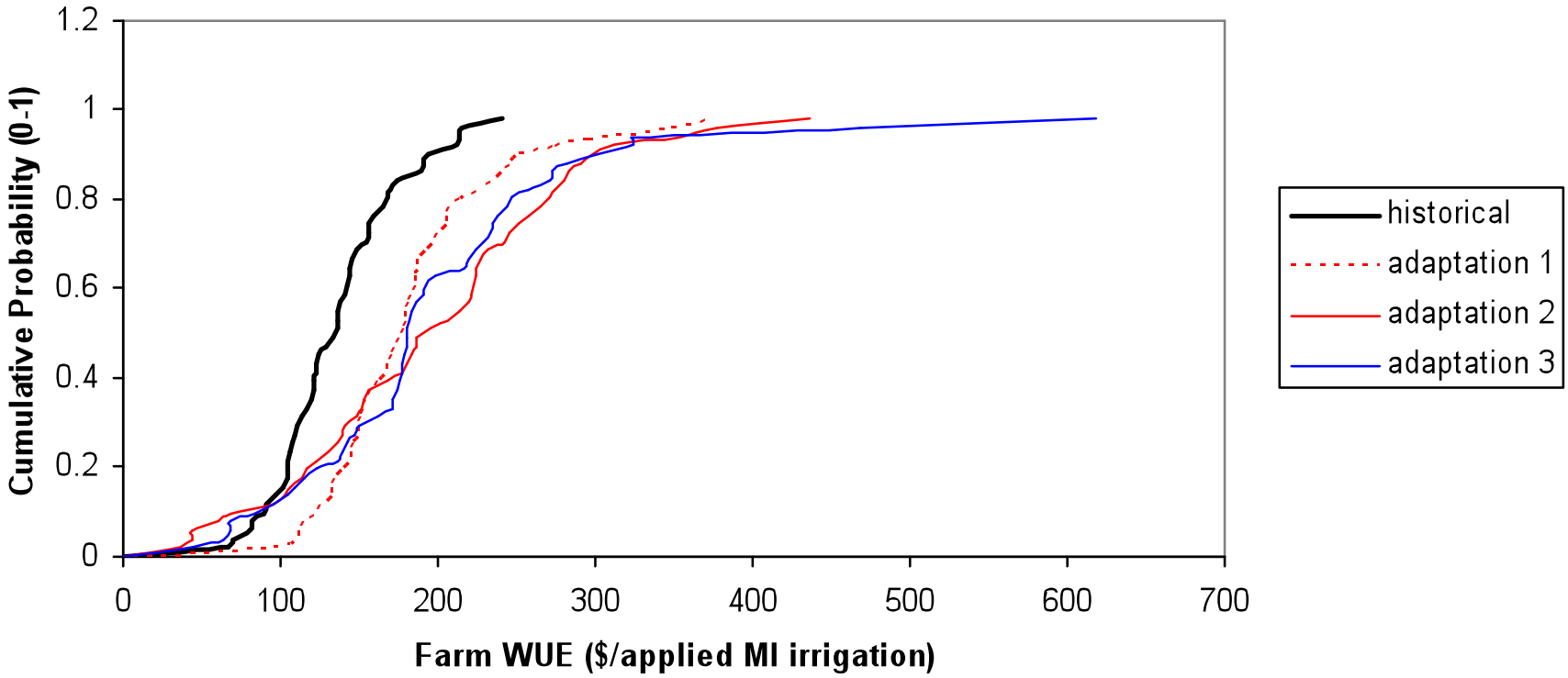
How can broad-acre irrigators adapt?

Whole-farm-scale analysis : WUE considerations



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Conclusions

The biggest future challenge will be making the best use of WATER.

The broad-acre irrigation industry will be faced with years of good production, and years of limited production. A big challenge for the industry is handling this variability and staying viable in the 'low' years

When production is water-limited, lose the idea that you need to maximise production from individual paddocks – **optimal farm performance** in irrigated systems will often be achieved from **sub-optimal paddock performance** and '*spreading the water'* when available land is in abundance.

Inherent flexibility will still be critical, because changing commodity prices/ cost structures, hence optimal crop mixes and irrigation/fertilisation strategies will vary (subject of current CSIRO/industry -funded research)

CSIRO Sustainable Ecosystems
Don Gaydon
Farming Systems Researcher

Phone: +61 7 3214 2271
Email: don.gaydon@csiro.au
Web: http://www.csiro.au/people/Don.Gaydon.html

www.csiro.au

Thank you

Contact Us
Phone: 1300 363 400 **or** +61 3 9545 2176
Email: Enquiries@csiro.au **Web:** www.csiro.au

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