

Mixed farming systems of eastern Australian wheat belt



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PROFITABLE PERENNIALS™ FOR AUSTRALIAN LANDSCAPES



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Outline

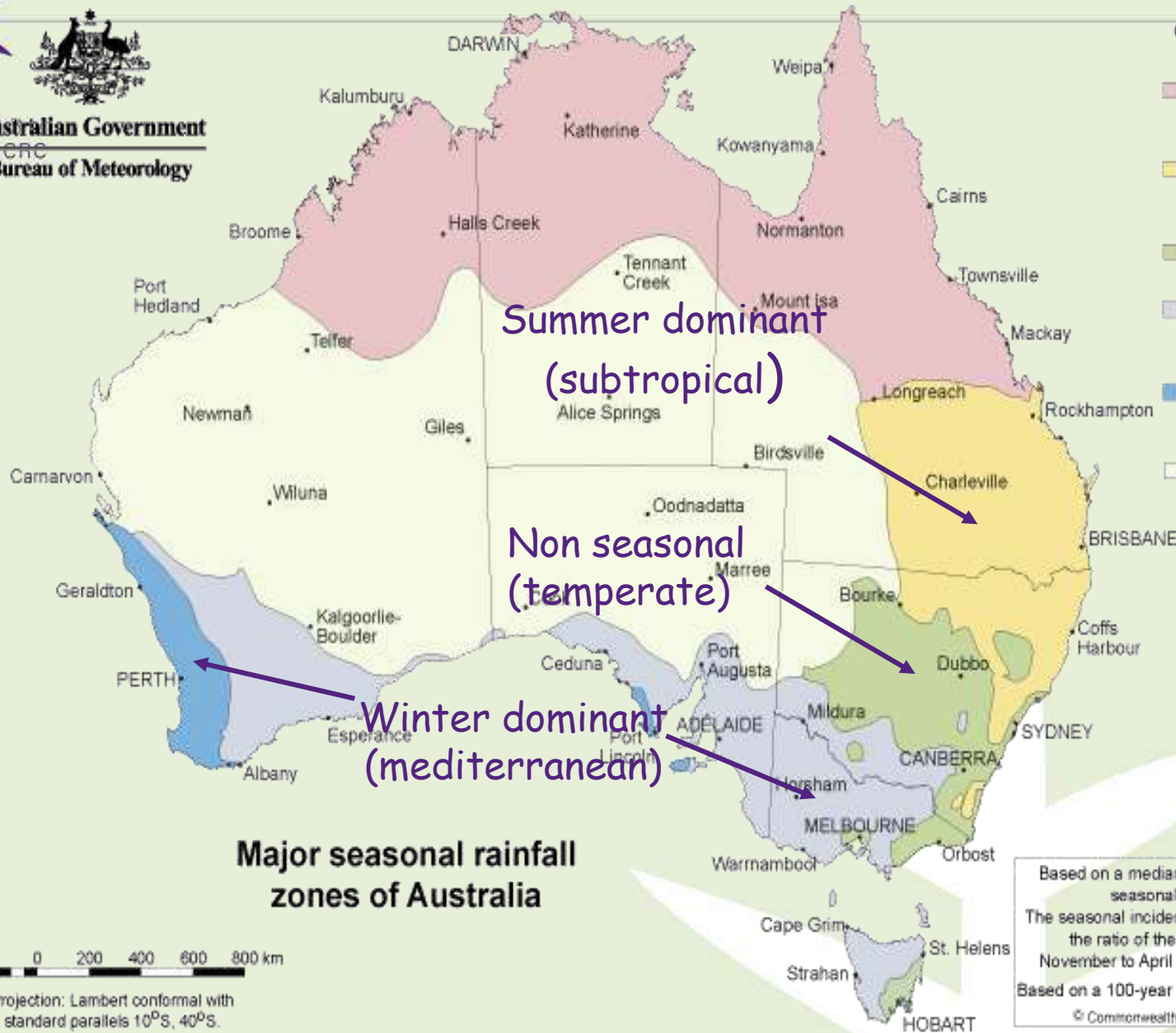
1. Climate of wheat belt
2. Current farming systems and crop rotations
3. Challenges facing perennial species and mechanisms used to achieve persistence





Climate Classes

- Summer Dominant
 - Marked wet summer and dry winter
- Summer
 - Wet summer and low winter rainfall
- Uniform
 - Uniform rainfall
- Winter
 - Wet winter and low summer rainfall
- Winter Dominant
 - Marked wet winter and dry summer
- Arid
 - Low rainfall



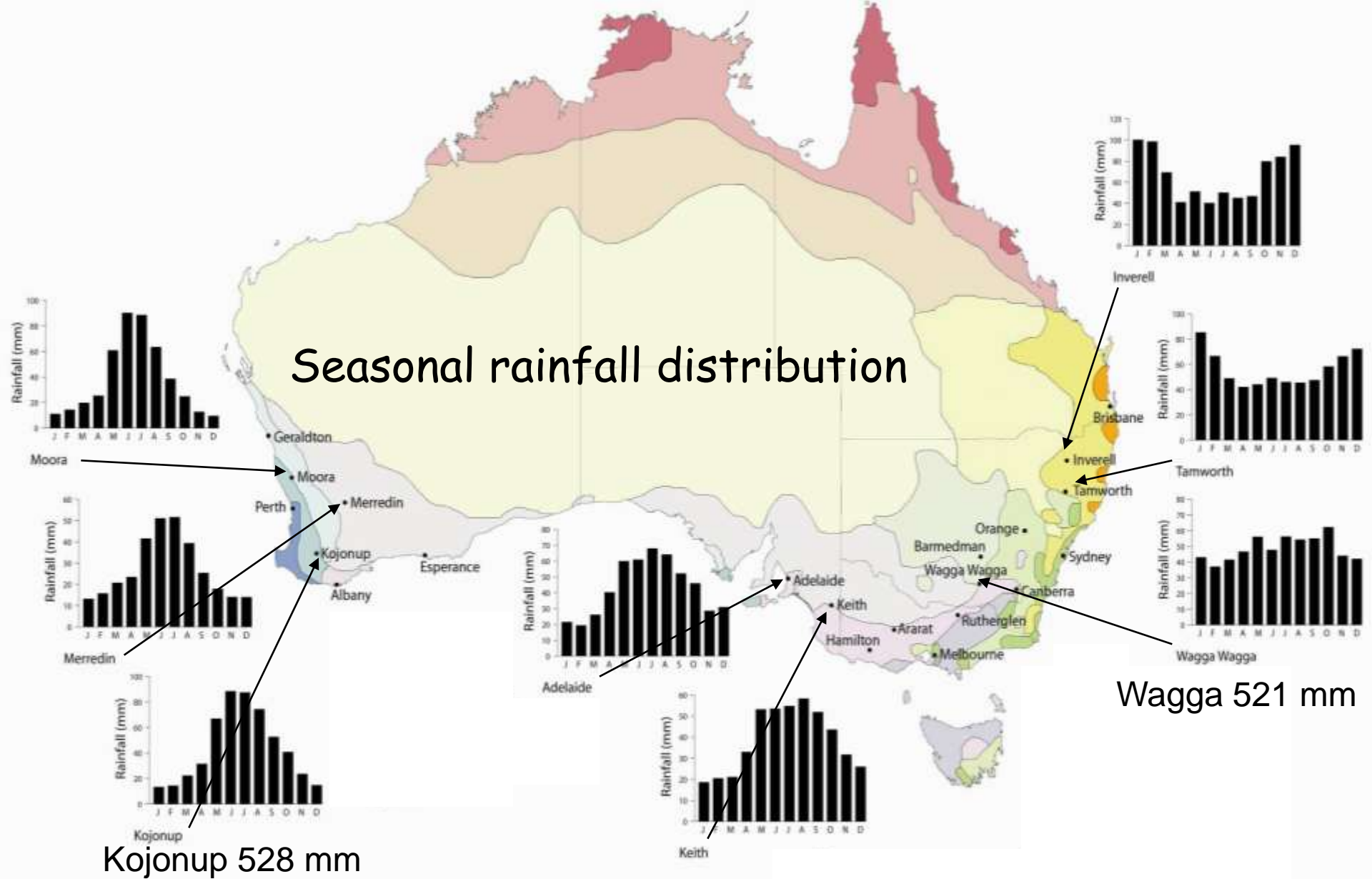
Major seasonal rainfall zones of Australia

200 0 200 400 600 800 km

Projection: Lambert conformal with standard parallels 10°S, 40°S.

Based on a median annual rainfall and seasonal incidence
 The seasonal incidence is determined from the ratio of the median rainfall:
 November to April and May to October
 Based on a 100-year period from 1900-1999
 © Commonwealth of Australia, 2015

Seasonal rainfall distribution

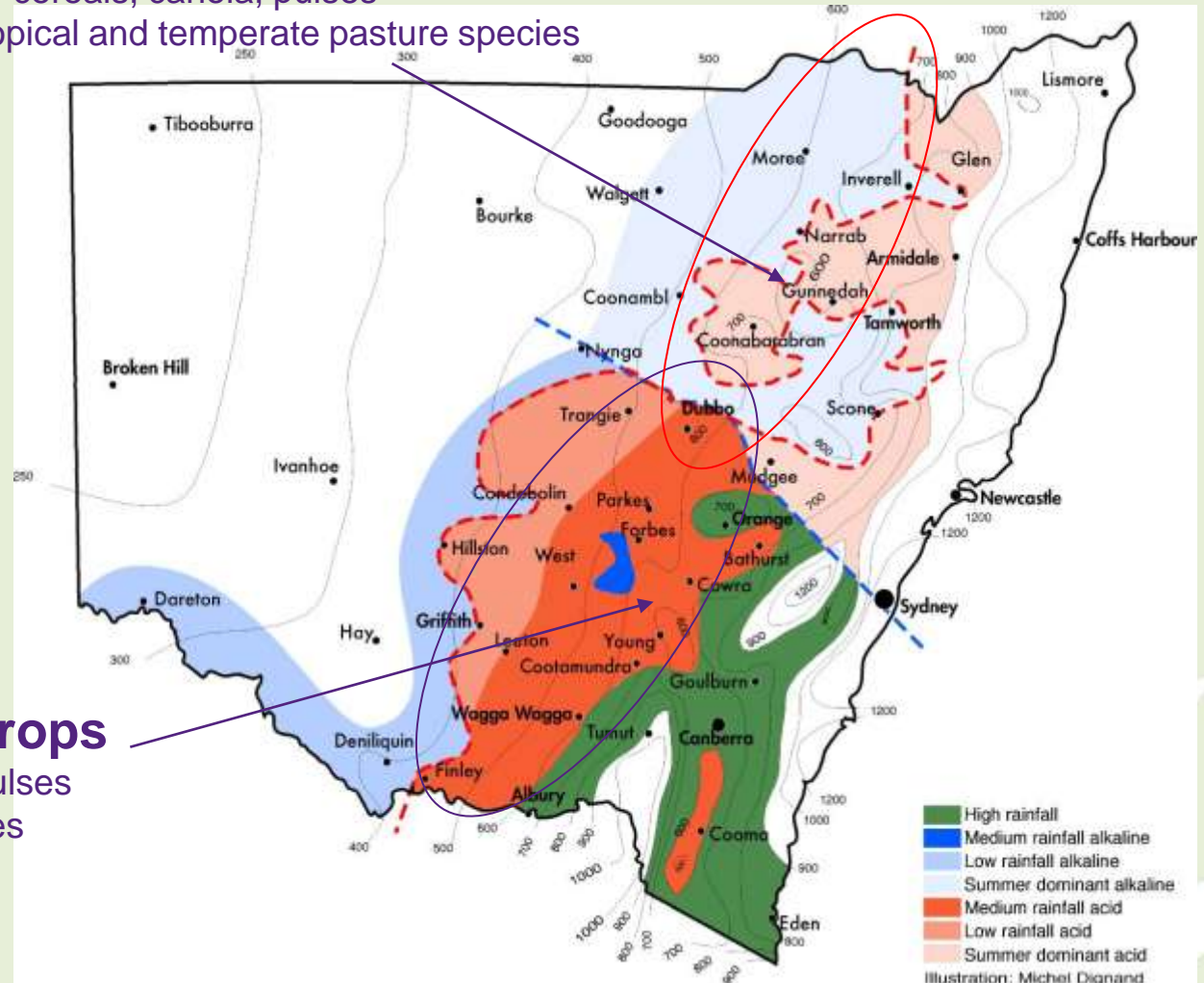




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Summer and winter crops

- Maize, sorghum, sunflowers
- Winter cereals, canola, pulses
- Subtropical and temperate pasture species



Winter growing crops

- Winter cereals, canola, pulses
- Temperate pasture species



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Change in landscape use and species

Original open forest and native perennial grasses



Cropping and grazing with annual spp





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Typical farm enterprises-south

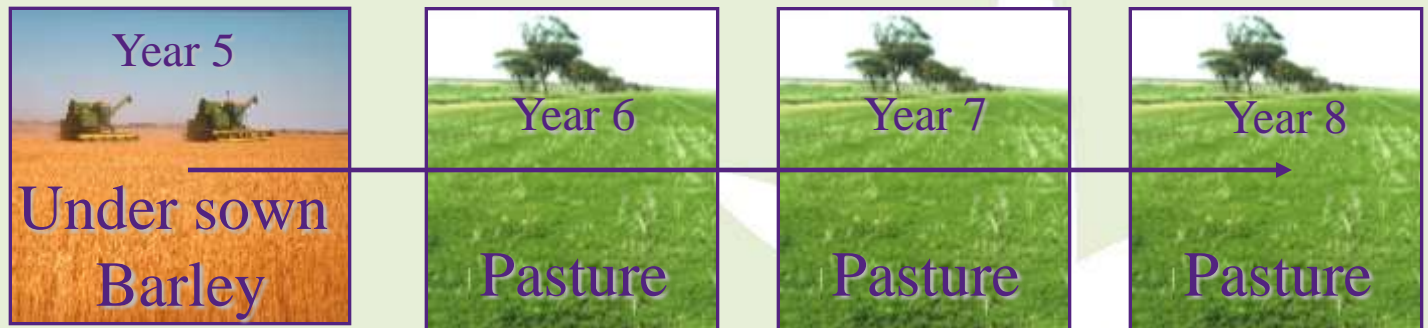
- * Mix sheep, cattle and cropping
- * Crops:
 - * Cereals; wheat, oats, barley, triticale
 - * Canola, field peas, lupins, vetches, faba beans
- * Pastures:
 - * Mainly annual legumes or lucerne
 - * Some chicory and perennial temperate grasses
- * Ratio and mix determined by soil type, weather, prices, weed control, crop diseases
- * Typically WCWCB LLLL or WCWCB AP AP AP





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Typical crop pasture sequence





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Current crop/pasture ratios in 2010

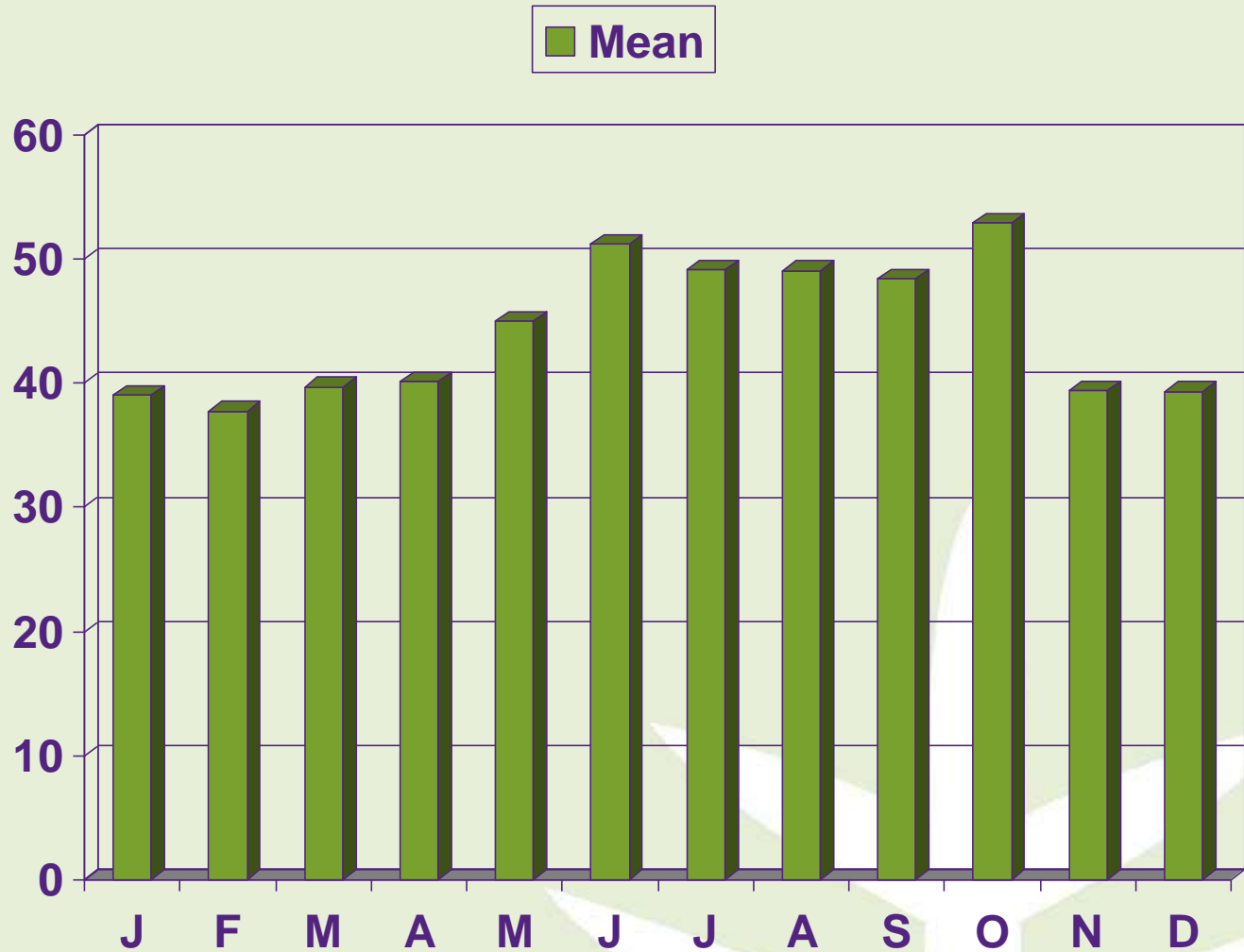
- ✿ **52% farm area sown to crop**
- ✿ 84% farmers sow lucerne
- ✿ 48% farmers sow perennial grasses
- ✿ 26% farmers sow chicory
- ✿ 31% farmers have residual native grasses





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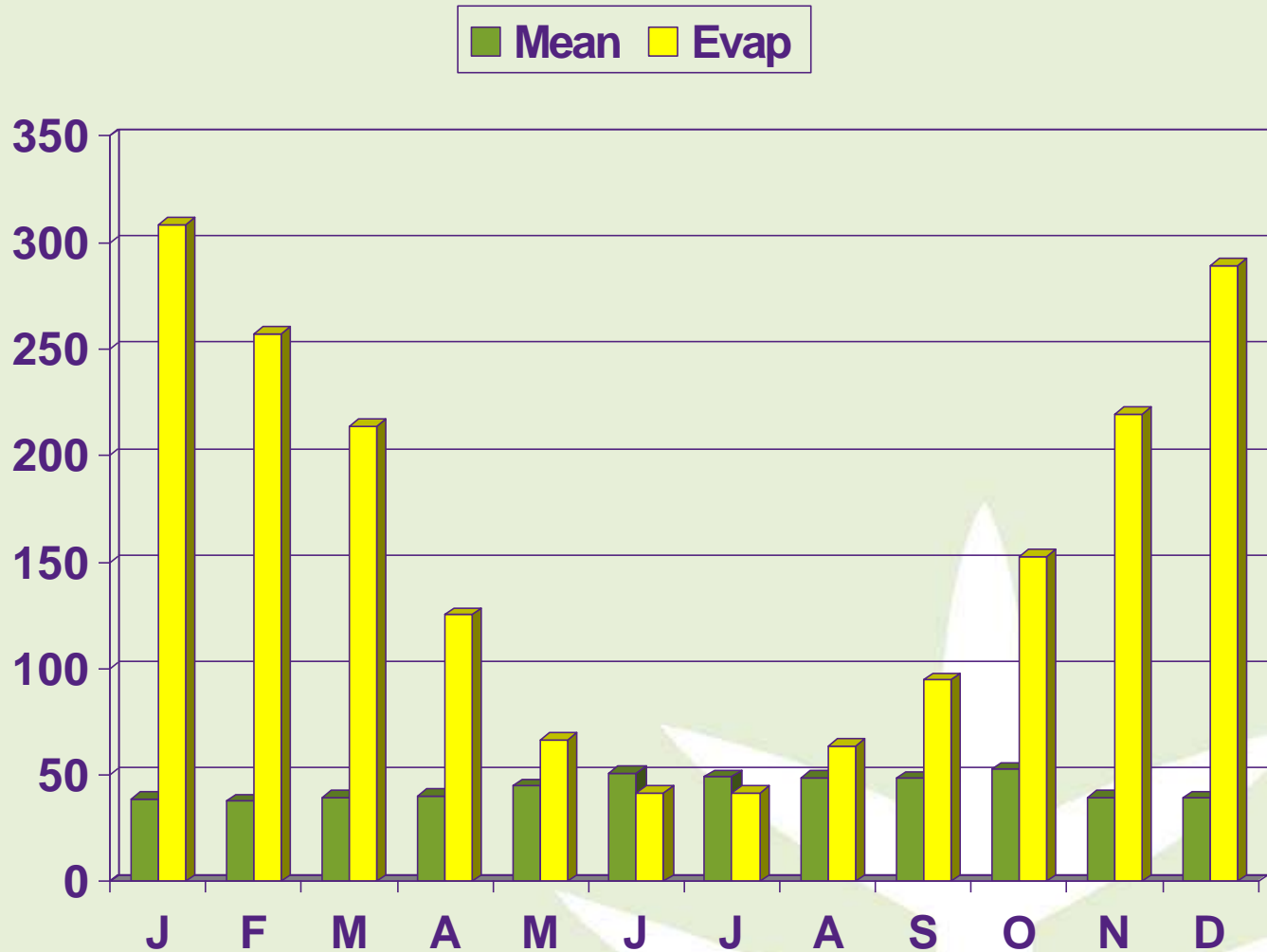
Monthly rainfall at Wagga Wagga





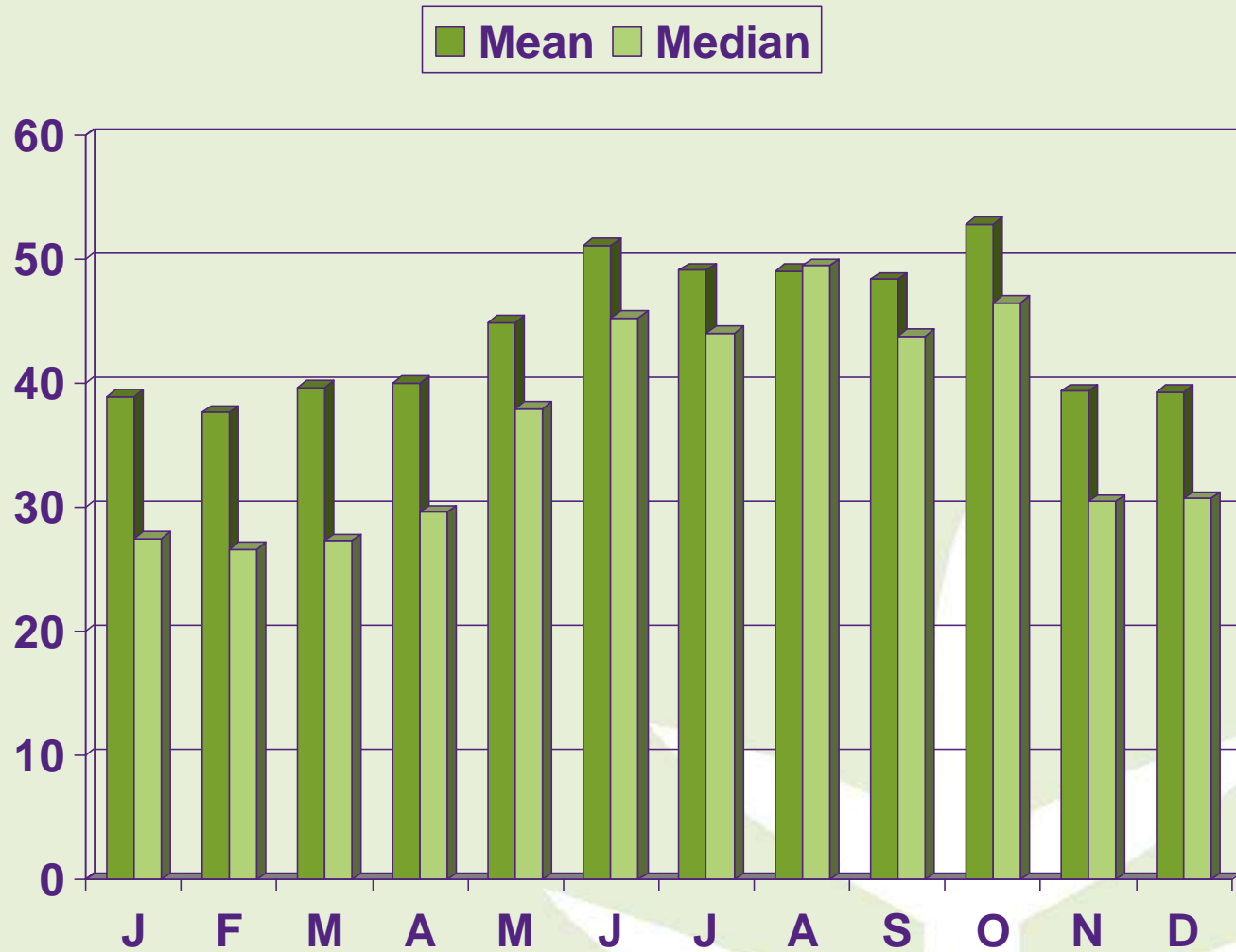
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Mean rainfall and evaporation Wagga Wagga





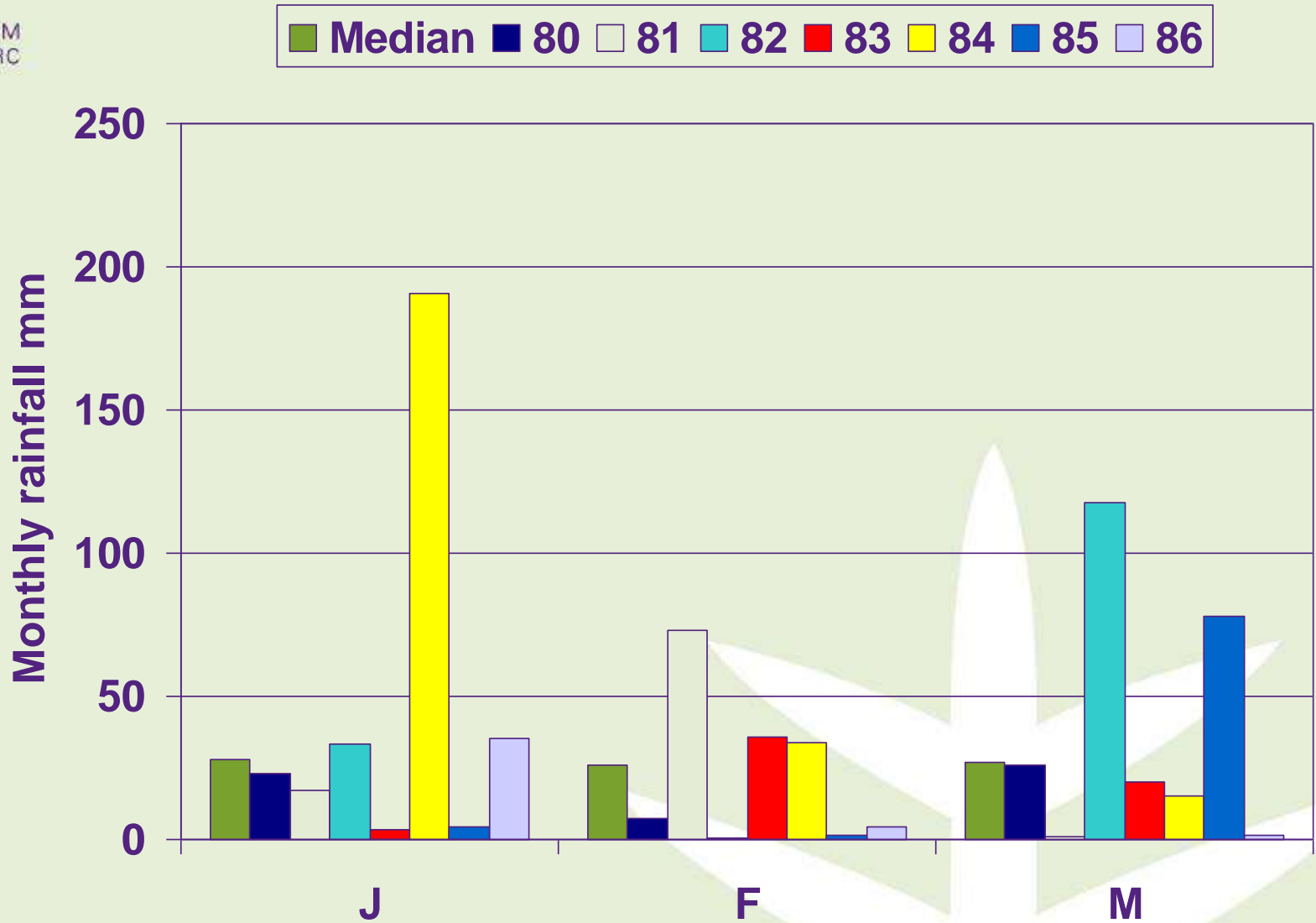
Mean vs median monthly rainfall





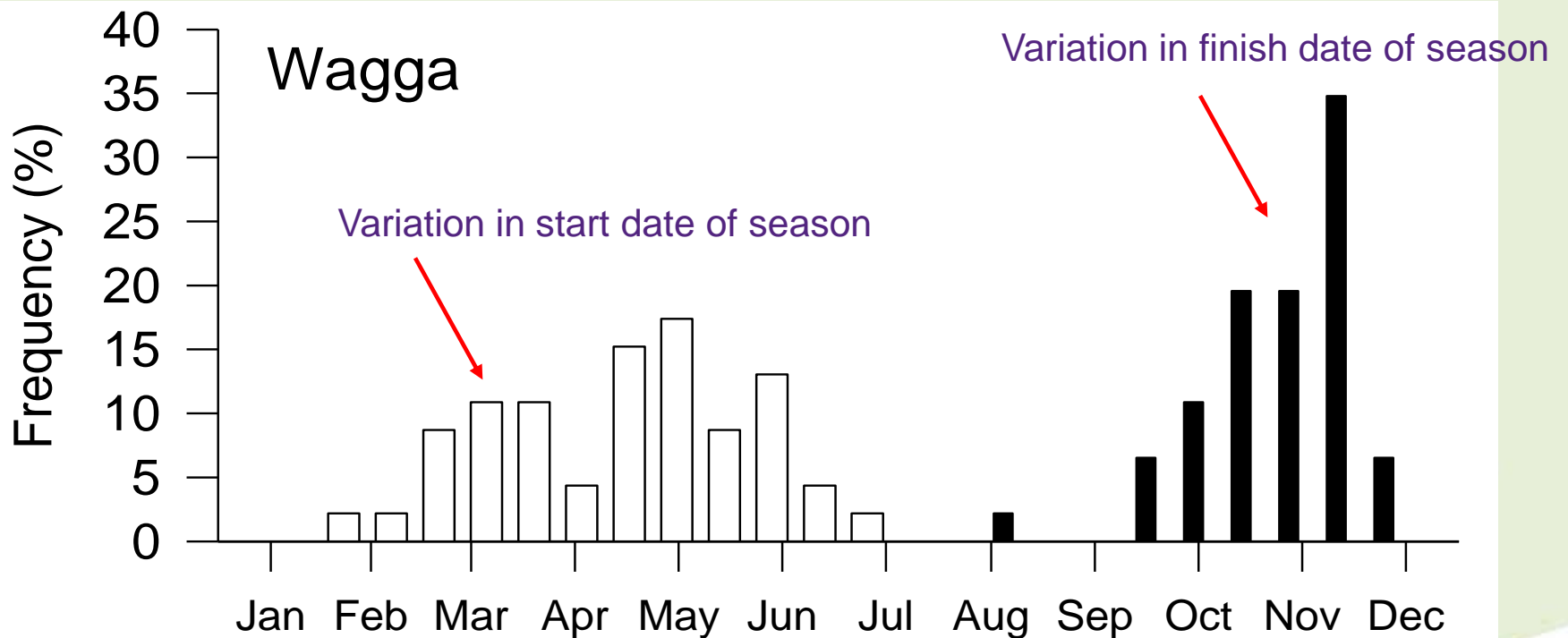
Variability in summer monthly rainfall

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Commencement of growing season for annual pastures





Implications of climate on pasture and crop species

- * High variability in monthly rainfall between years
- * High evaporation rates and temperatures over summer
- * High day and night temperatures over summer
- * Rainfall events that can stimulate dormant perennials or annuals during summer

- * Winter growing annual crops dominant in southern wheat belt
- * Long dry summer fostered use of Mediterranean annual pasture species
- * Drought tolerant perennials such as lucerne
- * Summer dormant north African perennial grasses



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Why interest in perennials?

Original open forest and native perennial grasses

Cropping and grazing with annual spp

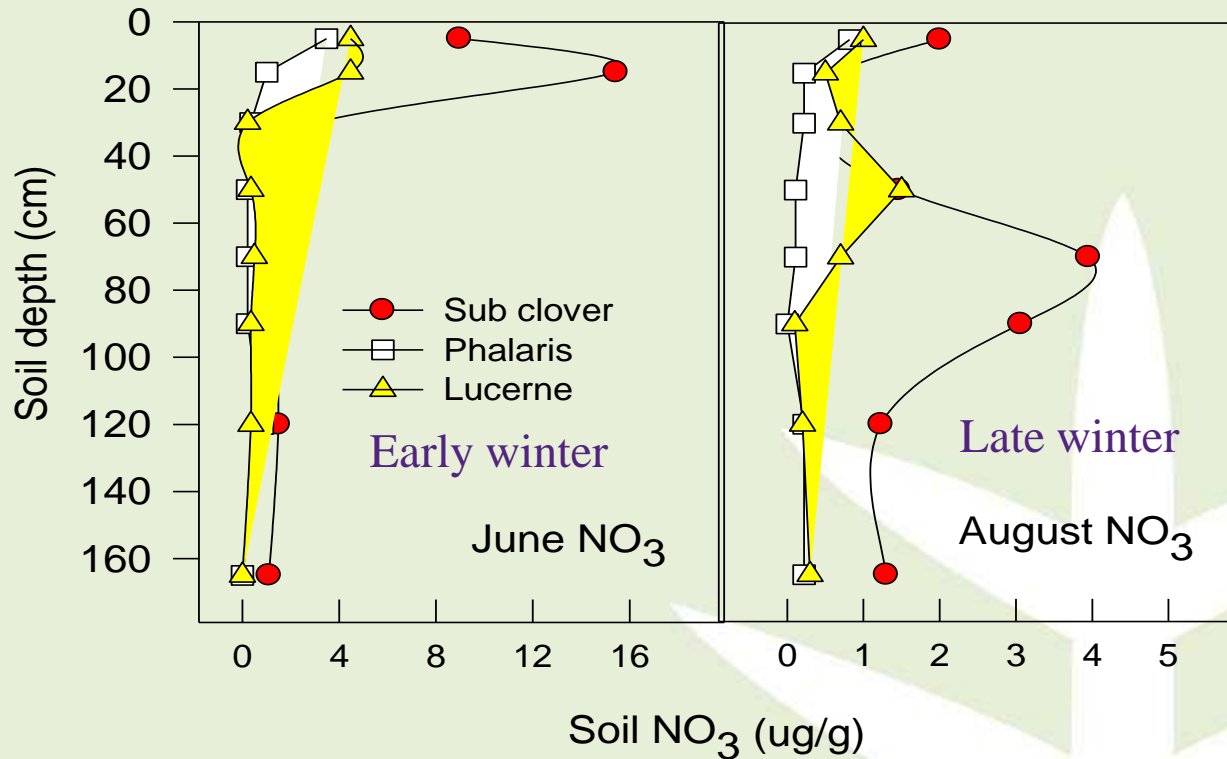
Deep drainage





Why interest in perennial species?

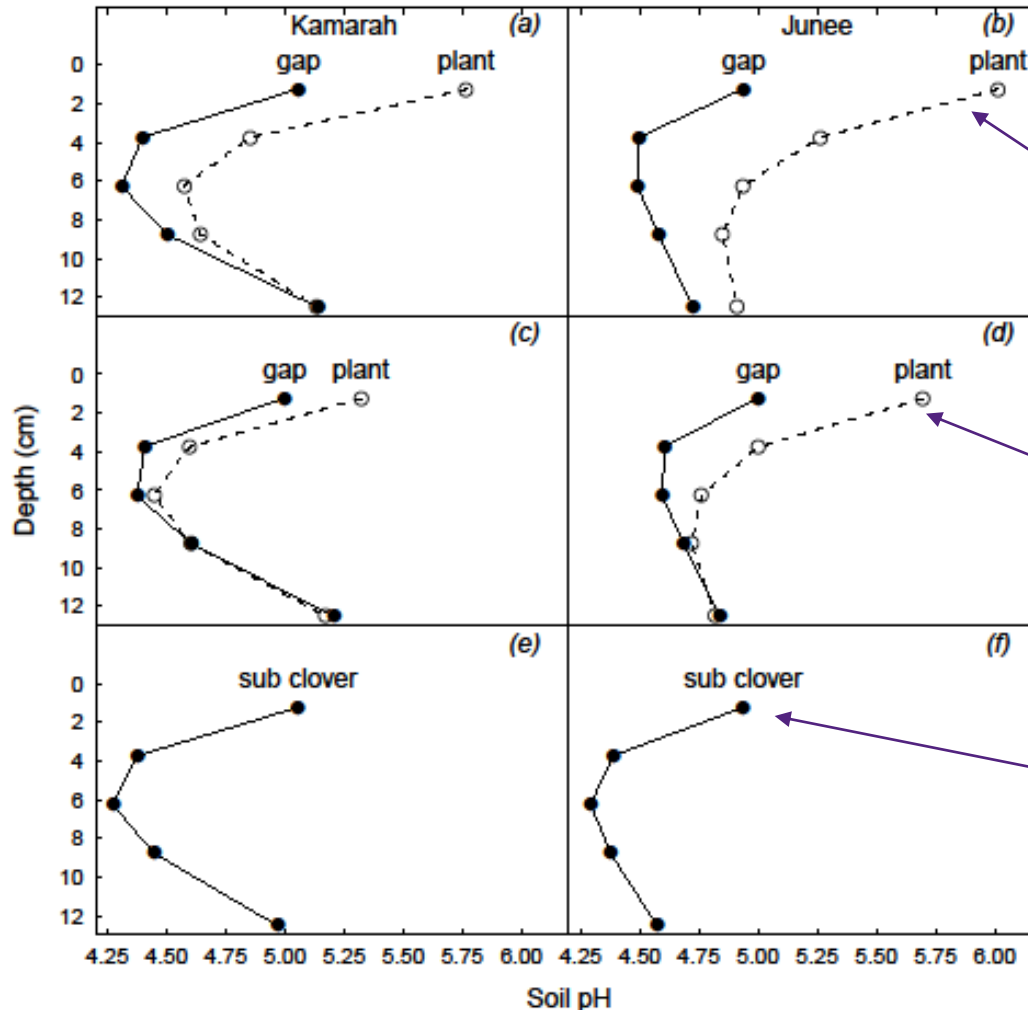
- Soils **acidify** more rapidly under annuals- N leaching





Why interest in perennial species?

- * Soils **acidify** more rapidly under annuals- N leaching



Lucerne

Phalaris

Annual only



Why interest in perennial species?

- ✦ Soils **acidify** more rapidly under annuals- N leaching
- ✦ Rising watertables and **dryland salinity** in shallow-rooted annual based systems





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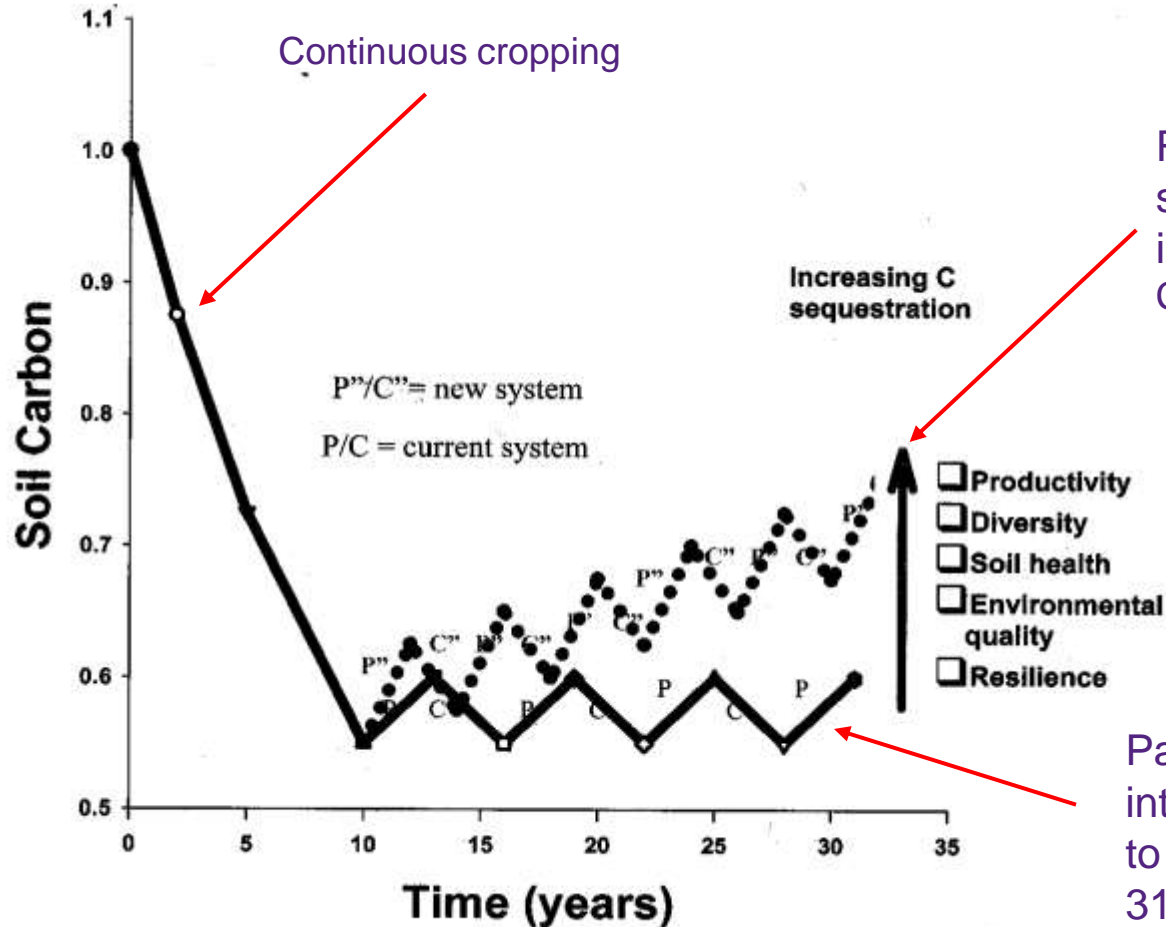
Why interest in perennial species?

- * can **respond to summer rain**
- * extend period of **feed availability** and reduce need for supplementary feeding
- * **increase stock carrying capacity**
- * **respond quicker** in Autumn
- * increase **surface cover**
- * potentially increase **soil carbon**





Perennial systems may increase soil carbon



Pasture crop rotations introduced in 1940s estimated to increase wheat yields by 31%- Leeper (1970)



Mechanisms perennials employ for surviving summer drought

- * Lucerne-
 - * deep rooted (2 m+)
 - * leaf drop to reduce water use,
 - * management systems to maximise root carbohydrate reserves
- * Phalaris
 - * summer dormancy,
 - * dormant buds and CHO reserve,
 - * maintains a small basal area green leaf & stem over summer
 - * a few deep roots access moisture for survival not growth
- * Summer active temperate fescues, cocksfoot and phalaris fail to persist below 500 mm aar (375-650mm)



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