An historical analysis of the changes in pasture production and growing season in three dairy regions of South East Australia

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Biophysical Modelling approach

- SE Vic, SW Vic and Tas dairy regions are predominantly pasture based.
- Changes in the “wetness”, “dryness” and “length of growing season” will be key drivers for adaptation.
- Why?
  - Strong influence on key management decision such as:
    - Stocking rate and calving date
    - Wintering off and implementation of infrastructure such as feedpads, herd homes etc.
    - Nitrogen usage and conservation practices
    - Drying off times and herd culling
    - Planting of forage crops, irrigation start up, scheduling and requirements
Biophysical Modelling approach

• What have we done?
  – Defined growing season
    • 14 day average growth rate > “break even” point.
      – Eg. At 2.0 cows/ha and 15 kg DMI/day = 30 kg DM/ha.day.
  – Defined wetness
    • Soil moisture > field capacity
  – Defined dryness
    • Readily Available Water (0.5PAW) removed
  – Modelled with biophysical pasture simulation model DairyMod (Johnson et al. 2008).

Are the models accurate?

Figure 1. Measured and modelled monthly mean daily net herbage accumulation rates (kg DM/ha.day), including measured variability (grey shaded). Adapted from Cullen et al. 2008.

Figure 2 The simulated commencement date and duration of the growing period, for years 1960/61 to 2008/09 at Elliott (a), Ellinbank (b) and Terang (c).
Figure 3 The simulated number of days in years, expressed as yearly percentiles that the 14 day mean pasture growth rate > 30 kg DM/ha, for years 1960/61 to 2008/09 at Elliott (a), Ellinbank (b) and Terang (c)
Figure 4 The Standardised Precipitation Index (SPI) for cumulative 12 month precipitation (1900-2010) for Ellinbank
Figure 5 The Standardised Precipitation Index (SPI) for cumulative 12 month precipitation (1900-2010) and the corresponding Z value for simulated annual pasture production for Ellinbank.
Figure 6 The 6 month Standardised Precipitation Index (SPI) for April to September (RED) and October to March (BLUE) for Ellinbank
Figure 7 The regression between simulated annual pasture yield (kg DM/ha.year) against the 6 month Standardised Precipitation Index (SPI) for April to September (RED) and October to March (BLUE) for Ellinbank.
Summary

- In recent years the number of days that feed supply > feed demand has declined at all three sites.
- There is sufficient variation in historical records to examine adaptation options.
- There is an urgent need for whole-of-farm system analysis to accurately simulate production, profitability, and risk.
- There are potentially three levels of adaptation that need to be explored:
  - Adapting within the current feed base.
  - Modifying the feed base by adopting different forage options.
  - Adapting to a new farming system.
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