NSW GOVERNMENT Department of Primary Industries

primefact

Options for mixed farming in southern NSW in 2030

August 2015, Primefact 1418, First edition
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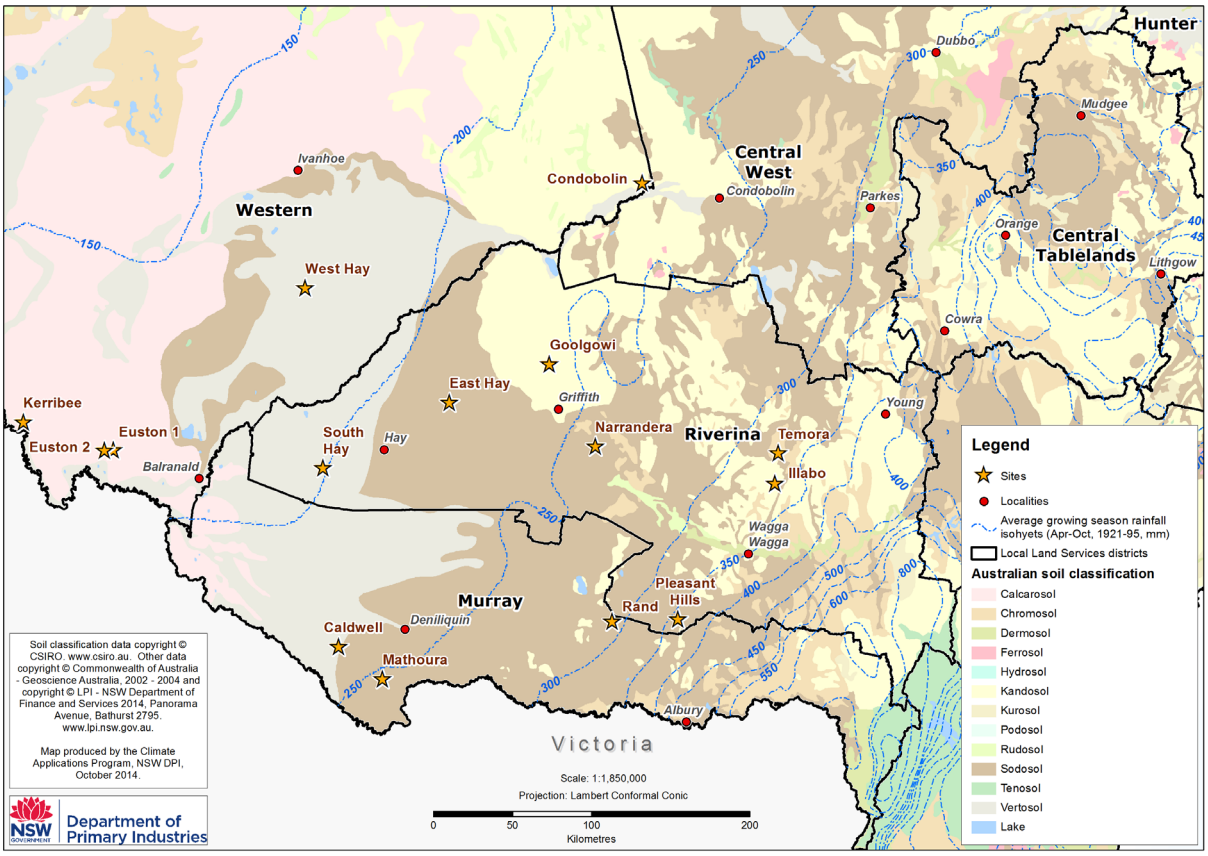
Climate in southern NSW is variable and predicted to become warmer and potentially drier in coming decades. The long term maintenance and growth in farm productivity is a major priority for the NSW Government, so NSW DPI is assisting land managers to objectively assess and explore appropriate adaptation to these changes. NSW DPI researchers have developed representative mixed farms at Goolgowi, Condobolin and Temora and used three Global Climate Models (GCMs) to assess a range of potential scenarios on mixed farms for the year 2030. These sites are part of a broader suite of sites in southern NSW on which such research has been undertaken.

Figure 1.Reference farm sites used across the Southern NSW LLS regions



Each reference farm was accurately characterised to report local farming systems including; soil type, size, production systems and associated management rules as shown in Table 1 overleaf.

Table 1. Descriptions of the three references farms used in the assessment

Site	Ha	Paddocks	Stock	Pasture	Crop
Goolgowi	4000	8	Merino ewe * Dorset ram	Lucerne, medic, sub clover	Extended fallow, canola or wheat, wheat, wheat, barley, pasture (3 years)
Condobolin	4000	8	Merino ewe * Dorset ram	Lucerne, medic, sub clover	Extended fallow, wheat, wheat, barley, wheat, pasture undersown (3 years)
Temora	2000	10	Merino ewe * Dorset ram	Lucerne, sub clover	Wheat, canola, wheat, barley, wheat, pasture undersown (5 years)

Each farm's biophysical (production and NRM) and economic performance was assessed for the baseline period 1957-2012, from which a comparison of impact could be made for the three future climate scenarios assessed at 2030 using specific criteria listed in Table 2.

Table 2 Variables used in impact assessment

Criteria	Variables analysed
Climate	Annual rainfall, maximum/minimum temperature, winter/spring frost incidence
Economic	Gross margin farm, gross margin crop/livestock
Crop production	Crop yield, harvest date
Pasture production	Dry matter, groundcover
Livestock production	Supplementary feeding, ewe weight, lamb weight

Farm impacts by 2030

Overall the modelling found that by 2030 there will be some negative impacts at the warmer, drier sites at Goolgowi and Condobolin, and slight positive impacts at the relatively cooler and wetter Temora site.

Goolgowi and Condobolin impacts

- slight to moderate decrease in economic returns
- slight decrease in crop yield partly driven by shorter growing season (except barley)
- decrease in annual pasture dry matter production and slight change in seasonality
- moderate increase in feed supplements to meet livestock requirements
- decrease in ewe body weight and condition score
- decreased number of weaned lambs and lower average condition.

Temora impacts

- slight increase in economic returns
- slight increase in crop yield, likely due to increased CO_2 levels and less waterlogging
- slightly shorter growing season
- slight increase in annual pasture dry matter production
- slight decrease in feed supplements to meet livestock requirements
- increase in ewe body weight and condition score
- increased number of weaned lambs and better average condition.

Adaptation options

Three adaptation options were assessed independently of one another at each of the sites.

- Not sowing crops in years where rainfall conditions are not met at the conclusion of multiple sowing windows.
- Enhancing terminal lamb growth rates to shorten turn off period.
- Lowering the minimum pasture cover threshold at which stock are moved to reduce livestock supplementation.

Each adaptation was assessed using the variables listed in Table 3.

Table 3. Variables used in adaptation assessment

Impact	Variables analysed
Sowing	Farm gross margin, crop gross margin, crop yield, years no crop was sown
Genetics	Farm gross margin, animal gross margin, lamb performance, average days to lamb turn off
Cover	farm gross margin, minimum farm groundcover, supplementation levels to ewes

Adaptation results

Results suggest that the negative biophysical and economic impact at the Goolgowi and Condobolin sites can in part be countered by altering triggers for sowing and improving animal genetics. The Temora site was negatively affected by altering the traditional sowing rule and only had a small positive response from improving animal genetics compared to the other sites. Lowering the minimum pasture cover threshold at which stock are moved offered no significant advantage at any of the sites.

Goolgowi

Sowing adaptation

Gross margins improved at both the farm and crop level, and the probability of lower end returns decreased, due to increases in average yield and tighter yield probabilities.

Genetics adaptation

Gross margins improved at both the farm and animal level, and the probability of higher end returns increased, due to faster finishing times from increases in lamb weight gain.

Cover adaptation

There was no notable impact on farm gross margins, seasonal pasture cover or feed supplements.

Condobolin

Sowing adaptation

Gross margins slightly improved at both the farm and crop level, and the probability of lower end returns decreased, due to slight increases in average yield.

Genetics adaptation

Gross margins slightly improved at both the farm and animal level, and probabilities of lower end returns decreased, due to slightly faster finishing times from increases in lamb weight gain.

Cover adaptation

There was no notable impact on farm gross margins, seasonal pasture cover or feed supplements.

Temora

Sowing adaptation

Average gross margins decreased at both the farm and crop level, and probability of lower end returns increased, due to decreases in average yield and broader yield probabilities.

Genetics adaptation

Gross margins slightly improved at both the farm and animal level, and probability of higher end returns increased, due to faster finishing times from increases in lamb weight gain.

Cover adaptation

There was no notable impact on farm gross margins, seasonal pasture cover or feed supplements.

Climate models used

This project used future climate scenarios derived from three GCM's:

- Met Office Hadley Centre (Hadley)
- National Centre for Atmospheric Research (CCSM)
- Max Planck Institute for Meteorology (Mon Plank)

Conclusion

This research provides a useful objective assessment of potential impacts and adaptation options for three climate scenarios and is a useful platform to engage producers in developing their own adaptations to increase their resilience to climate stresses.

Further work

Options for further modelling work could include

- rapid reassessment of biophysical and economic impact and adaptation using the Office of Environment and Heritages (OEH's) NARCLIM dataset
- assessment of applying both the 'sowing' and 'genetic' adaptations together
- assessment of increasing sire weights further for the 'genetic' adaptation to further test the sensitivity of the farming system
- broader economic assessment including balance sheet assessment
- inclusion of irrigation
- assessment of optimal enterprise mix.

More information

Cashen M, P Graham, K Broadfoot, J Finlayson & A Clark 2014. Final Report LA1948 February 2015. Part 1: Baseline and projected biophysical and economic performance of 3 mixed farms in the Riverina and Central West Local Land Services regions; Part 2: Evaluation of 3 adaptive management strategies on 3 mixed farms in the Riverina and Central West Local Land Services regions. NSW DPI Orange.

Acknowledgments

This project was funded by the Central Tablelands Local Land Services (LLS) and former Lachlan Catchment Management Authority (CMA) under NRM Planning for Climate Change-Stream 1.

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Published by the NSW Department of Primary Industries.

ISSN 1832-6668

INT15/75307 JTN 13645