



# Condobolin perennial pasture variety resilience and production modelling

## Introduction

Perennial pastures may increase the length of pasture growing season while retaining a higher level of groundcover to protect soils. Their deeper root system enables access to soil moisture which annual species cannot utilise. The use of perennials suited to a location and production system so that they persist has the potential to impact on the resilience of pasture-livestock systems to drought.

GrassGro software was used to compare the growth patterns of selected perennial pasture species to determine the effects on the resilience of an Autumn lambing, self-replacing merino farming system to drought.

The data used in the whole modelling analysis by Dr Susan Robertson analysed pasture and seasonal data from the time span of 1970–2019 for the Condobolin region.

The results do not consider establishment costs of pastures. Actual pasture costs in systems need to be considered as this will affect the interpretation of results.



Wendy Gill of Achieve Ag Consultancy looks over the control pasture.

## Long-term growth pattern of simulated pastures

The growth patterns of lucerne, cocksfoot, sub-clover and medic pastures long-term and in response to drought were modelled.

Pasture growth rates were insignificant for annual pastures between November and April in poor, average and good seasons.

Lucerne growth rates were usually above 10 kg DM/ha/day throughout the year in all seasons and extended the period of growth.

Cocksfoot had higher growth rates than lucerne during winter in all seasons but did not grow during the summer/autumn period.

During poor seasons perennial pastures provided up to 4 kg DM/ha/day higher growth than annuals, although all growth rates were low, and the growing season was short, shown in Figure 1.

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**An established lucerne pasture allowed higher sheep production than sub-clover, annual medic or cocksfoot pastures in average and good seasons due to greater summer/autumn growth** (Robertson, 2024).

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## Impact on sheep enterprise resilience to drought

### Supplementary feeding

Supplementary feeding of ewes was required in most years, although lucerne pastures required less feeding of sheep than other pasture types. Weaner lambs required supplementary feeding after October if pastures were not providing an adequate high energy and protein feed source.

Lucerne was the only pasture species which reliably produced high quality feed after October, demonstrating the advantage of lucerne to retain lambs to higher weights with less feeding. An earlier sale date may be more appropriate for farm systems without a summer-active perennial.

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**More productive pastures allow higher sheep production with lower feed costs. Lucerne may reduce the need for supplementary feeding in drought years. Financial reserves will improve resilience of a business to drought** (Robertson, 2024).

**Strategic sale of stock in response to dry seasons may reduce the impact on pasture persistence, risk of low groundcover and requirement for supplementary feeding** (Robertson, 2024).

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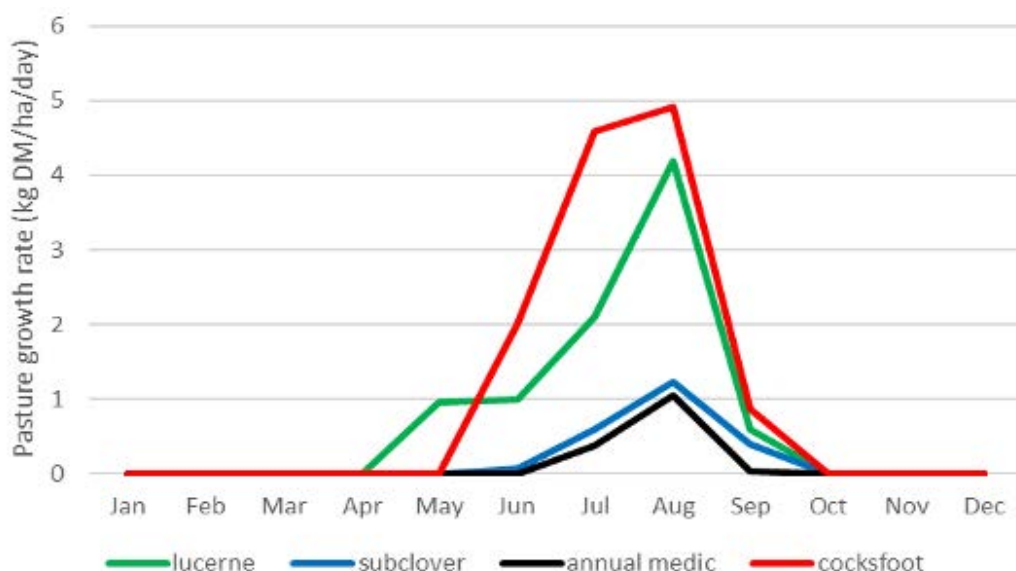


Figure 1: Average monthly pasture growth rates for lucerne, sub-clover, annual medic and cocksfoot pasture at Condobolin in poor seasonal conditions when stocked at 1.4 breeding ewes/ha.

## Condition score

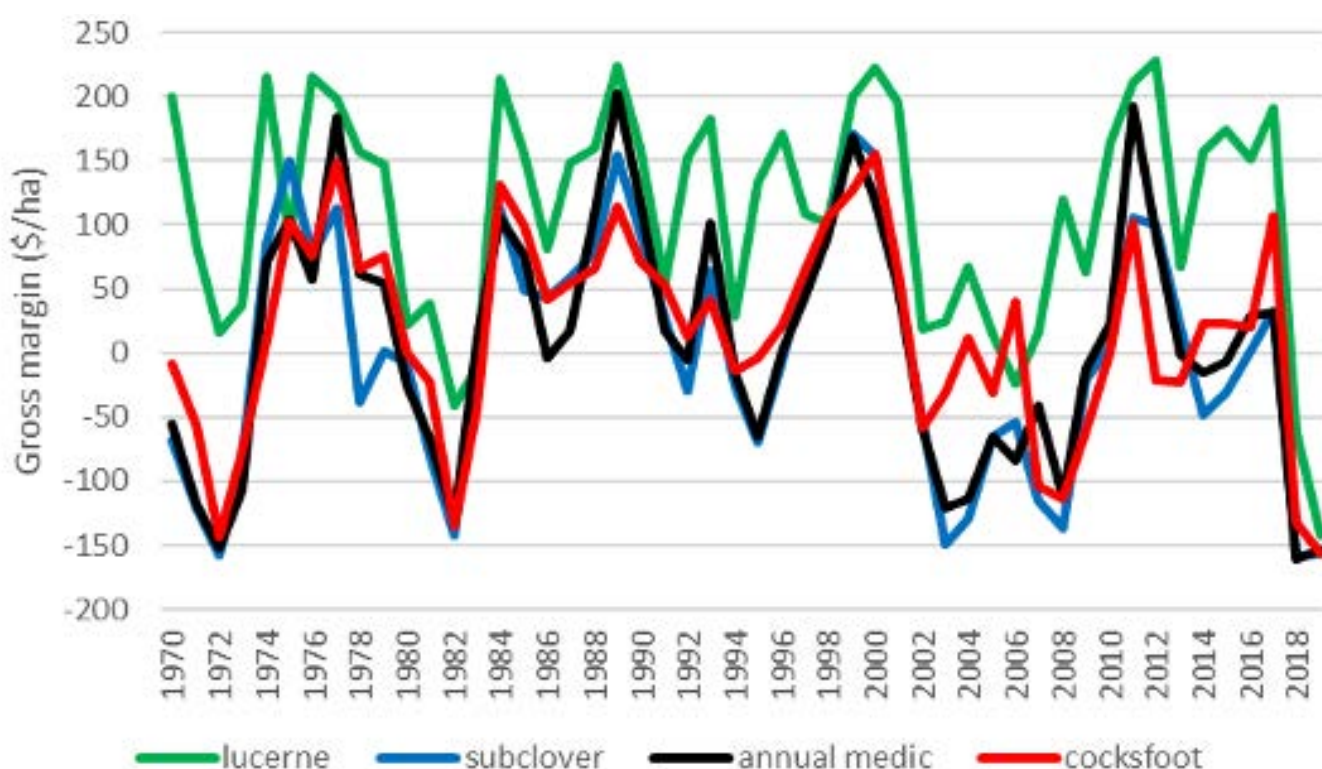
The monthly condition score of ewes in average seasons declined in late summer/autumn for all pasture types before increasing in winter/spring. The decline was more rapid in autumn for ewes grazing lucerne, but condition was regained earlier after lambing, allowing ewes to be joined in higher condition than if grazing annual pasture or cocksfoot. The percentage of lambs marked per ewe was 3% higher for those grazing lucerne, associated with the higher condition score of ewes.

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**Lucerne dominated sheep production responses because it produced a large quantity of feed, (particularly in summer/autumn) and dominated in the pasture mixes simulated (Robertson, 2024).**

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Figure 2: Annual gross margin (\$/ha) for a self-replacing Merino enterprise grazing lucerne, sub-clover, annual medic or cocksfoot pastures at 1.4 breeding ewes/ha at Condobolin in 1970–2019.



## Enterprise performance

In poor seasons only lucerne pasture achieved a positive gross margin. Lower feed costs were the key reason for the higher gross margins from lucerne in both average and poor seasons.

The gross margins show a higher long-term financial position for the enterprise grazing lucerne compared with other pastures (Figure 2). Sub-clover, medic and cocksfoot achieved a relatively similar performance, but their cumulative gross margins declined after 2001 due to a series of drought years.

Cocksfoot pastures produced higher margins than the annual species, but the lack of summer-autumn growth restricted lamb sale weights and required high levels of supplementary feed.

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**Gross margins may be increased through use of perennial rather than annual pastures if additional income produced is greater than establishment and maintenance costs. Long-term persistence is necessary to minimise costs (Robertson, 2024).**

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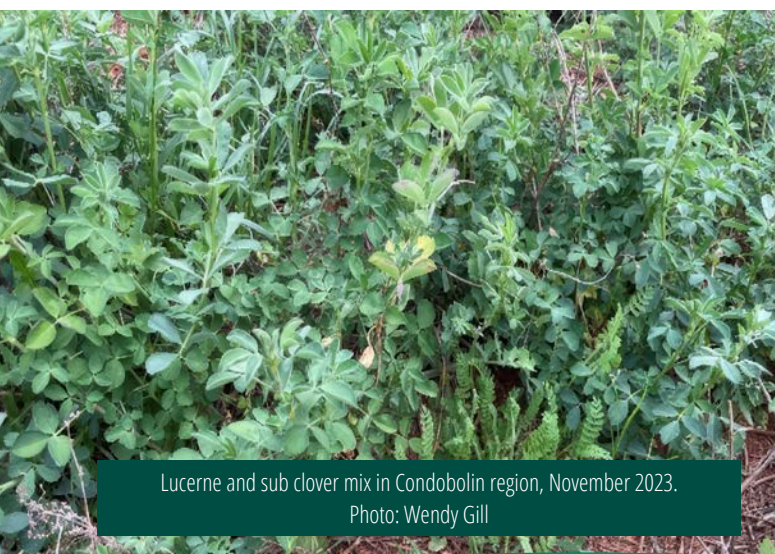
# Pasture mixtures vs. pure lucerne stands

Lucerne, sub-clover and cocksfoot as single-species pastures have different pasture growth patterns and can create a feed gap when pasture growth is reduced. Drought causes a prolonged feed gap, but the summer/autumn period of reduced pasture growth also creates feed gap. Combining species with different growth patterns potentially minimises the feed gap. The complementarity of the species mix will influence pasture persistence, plant resilience and enterprise resilience to drought.

**The addition of companion species to pasture mixes has the potential to fill feed gaps** (Robertson, 2024).

Monthly pasture growth rates were similar for lucerne and mixes with sub-clover or cocksfoot in poor, average and good seasons.

Dalkeith sub-clover and cocksfoot could not compete successfully with the established lucerne pasture. A less vigorous lucerne pasture may allow higher production from sub-clover or cocksfoot companion species.



Lucerne and sub clover mix in Condobolin region, November 2023.  
Photo: Wendy Gill

## For more information

Find out more about the CWFS Resilient Pastures Project Research Results.

[cwfs.org.au](http://cwfs.org.au)



**Competition between pasture species may limit the production or persistence of individual species. Choose species that will persist in the mix and under the management used** (Robertson, 2024).

Years classified as drought were associated with substantially lower herbage production by lucerne.

Enterprise performance was similar between pasture types in all seasons, with minimal differences in drought years. However, the lucerne/sub-clover mix reduced total costs by \$12/ha in poor seasons in comparison to lucerne through lower feed costs. The higher financial performance indicates that this pasture mix allowed the sheep enterprise to be slightly more resilient to drought.

**A sub-clover/lucerne or cocksfoot/lucerne mix improved groundcover compared to a pure lucerne pasture** (Robertson, 2024).

**A sub-clover/lucerne mix resulted in similar sheep production but allowed a small reduction in feeding in poor seasons** (Robertson, 2024).

**A cocksfoot/lucerne mix did not improve sheep production or resilience to drought compared with a pure lucerne pasture** (Robertson, 2024).

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Robertson, S. M. (2024). Final Report: *Resilient Landscapes: Simulation modelling of pasture species and practices for drought resilience*. Commissioned by Holbrook Landcare Network.