

DEVELOPMENT OF SHEEP GRAZING SYSTEMS TO UTILIZE MIXED PASTURES OF SUBTERRANEAN CLOVER, ANNUAL GRASSES AND LUCERNE

K. P. RANSOM

Dept of Food and Agriculture, PO Box 125, Bendigo, Vic. 3550.

SUMMARY

Two farm demonstrations where sheep grazed mixed pastures of sub clover, annual grasses and dryland lucerne were undertaken in northern Victoria. Pasture and sheep production were recorded over a 4-year period and were used to examine the productivity of existing sheep grazing systems. These data also served as inputs to the computer simulation model 'SHEEPO' which successfully simulated the farm observations. Simulation experiments using the program indicated that gross margins could be increased by up to 300% compared with those from existing systems.

Keywords: sheep, grazing, lucerne, computer simulation.

INTRODUCTION

On wheat-sheep farms in the north central area of Victoria, stocking rates are generally very low when compared with those that have been suggested to be optimum from grazing experiments. Stocking rates range from a high of 7 to 8 dry sheep equivalents (DSE's) per uncropped hectare in the south of the region, (average rainfall 500 mm) to a low of 2 to 3 DSE's per uncropped hectare in the north of the region (average rainfall 375–450 mm). The inclusion of lucerne as a component in a **dryland** pasture was first recommended by Whittet (1929). He suggested excellent stands of **dryland** lucerne could be obtained on average wheat country from sowing 2 to 3 lb of lucerne per acre allowing stocking rates to be increased from 1 to 4 **wethers** per acre at Trangie in western New South Wales. Since then further research has clarified the role of **dryland** lucerne. In particular, Reeve and Sharkey (1980) investigated the interactions between time of lambing, stocking rate and the inclusion of **dryland** lucerne on sheep production. They found the highest levels of production were obtained from spring lambing at high stocking rates with **dryland** lucerne as a pasture component.

The aims in this study were: (i) to demonstrate sheep production systems that will considerably increase the productivity and profitability of sheep on sheep-wheat farms; (ii) to use simulation modelling to make predictions about the effects of a range of management changes.

MATERIALS AND METHODS

Maryborough field demonstration

A 22 ha paddock was undersown with pasture in 1983. Half the paddock was undersown with sub clover (4 kg/ha) while the other half was undersown with sub clover (4 kg/ha) and lucerne (2 kg/ha). In February 1984 the paddock was divided and subjected to alternative management procedures for the next 4 years. The management of the annual pasture section followed normal district sheepfarming practices. The stocking rate was approximately 4 ewes/ha with lambing starting about 15 April each year. The annual pasture with **dryland** lucerne portion was stocked at approximately 6 ewes/ha with lambing starting on about 10 August each year. Crossbred ewes joined to Dorset rams were used in the first 2 years and Comeback ewes joined to Merino rams were used in the final 2 years of the demonstration. Ewes were removed from the plots for about 8 weeks to graze cereal stubbles each summer as this is normal farm practice.

Charlton farm observations

Farm scale observations were made on a property near Charlton in 1986 and 1987. The total farm area was 490 ha. The cropping program was typical of the district. A cereal cropping phase of 2-3 years was followed by a pasture phase of 3-5 years. Forty hectares of the total pasture area of 270 ha contained **dryland** lucerne. The pastures were grazed by a self replacing Merino flock. The flock consisted of 490 lambing ewes and their ewe weaner replacements. Lambing started on 15 May each year.

Field measurements

Sheep and **hogget** weights were taken seasonally. Lamb weights were usually taken 3 times between birth and 6 months of age in the Maryborough study and twice in the Charlton study. Wool weights were taken at shearing. Supplementary feeding records were kept. In some cases in the Maryborough study, sheep were removed from the plots, this was recorded. Pasture growth was measured using the shifting cage technique (Stockdale 1983). There were 6 cages in each treatment in the Maryborough

study and 6 cages each in 2 representative paddocks in the Charlton study. The cages were shifted at 6 week intervals so the lucerne growth rate would be measured over the same length of time as the spelling period in the rotational grazing system used for the lucerne pastures. The availability of the current seasons annual pasture during the growing season was measured by cutting **quadrats** at 6 week intervals in areas visually judged to be representative of the paddocks. Six **quadrats** were taken in each treatment in the Maryborough study and 6 **quadrats** were taken in each of the 2 representative paddocks in the Charlton study.

Computer simulation experiment

The simulation model 'Sheepo' (McLeod *et al.* 1987) was used to examine the profitability of alternative sheep management plans with, and without, **dryland** lucerne in the 2 environments. The normal farm practice of stubble grazing was accounted for by feeding a supplement called 'stubble'. Pasture production from April 1987 to March 1988 was considered to be typical of an 'average' year at both Maryborough and Charlton. Alternative management systems were compared over 2 consecutive 'average' years to allow time for the management treatments to impact on pasture production and sheep performance. The results presented here are for the second year. The enterprise was a prime lamb flock with Border **Leicester** x Merino cross ewes joined to Dorset rams. Sheep management alternatives were an early May or mid August lambing at a range of stocking rates. The pasture types examined were annual pastures only or annual pastures with **dryland** lucerne on 70% of the annual pasture area. Costs and prices were adjusted to achieve a gross margin of approximately \$A15 per dry sheep equivalent (DSE) at low stocking rates. This gross margin was similar to the real 10 year average of sheep flocks in a Department of Agriculture, Victoria Monitor Farm project.

RESULTS

Pasture production

Pasture production for 1987 is shown below. This year was considered typical and these values were used in the simulation study.

Pasture production (kg/ha)	Maryborough Study	Charlton Study
Autumn-winter annual pasture	2050	1050
Spring annual pasture	4380	1590
Annual pasture	6430	2640
Lucerne (Dec.-May)	800	1400

Maryborough field demonstrations

The April-May lambing system at the low stocking rate was under considerable feed stress in late autumn and winter. The average ewe maternal weight (fleece and conceptus free) loss between summer and mid winter was 14.9 kg. Lamb growth was slow and lambs reached an average weight of 21.8 kg by 4 months of age. The August lambing system at the higher stocking rate was under less feed stress and averaged a maternal weight loss of 7.6 kg between late summer and August. Lambs averaged 29.7 kg at 4 months of age. The autumn lambing system averaged 55 kg of supplement per ewe while the winter/spring lambing system average 13 kg. Lambs on lucerne over summer had an average gain in liveweight of 100 g/day. This is a time when lambs on annual pasture would normally lose weight.

Charlton field observations

The ewes on this property were under considerable feed stress in late autumn and winter. The average maternal weight loss was 12.2 kg between late summer and mid winter even though the start of lambing was on 15 May, a month later than the district average. Lambs continued to gain weight on the **dryland** lucerne over summer and reached an average weight of 42 kg by 9 months of age.

Sheepo simulation

'Sheepo' successfully simulated the field observations. The absolute differences between farm observations and **Sheepo** predictions were: adult ewe bodyweight (mean $\pm$ s.e.) 1.6 ± 0.3 kg lamb weight gain, 12 ± 3 g/day, pasture growth rate, 3.4 ± 0.5 kg/ha.day, current seasons pasture available, 282 ± 42 kg/ha.

Computer simulation experiment

The effects of the changes in management system on gross margin are illustrated in Fig. 1. As stocking rates increased supplementary feed increased to hold sheep at target weights. At Maryborough where the lucerne contributed 11% of the pasture production during the normal dry pasture period, increases in gross margin due to lucerne were similar to changes in time of lambing. In contrast, at

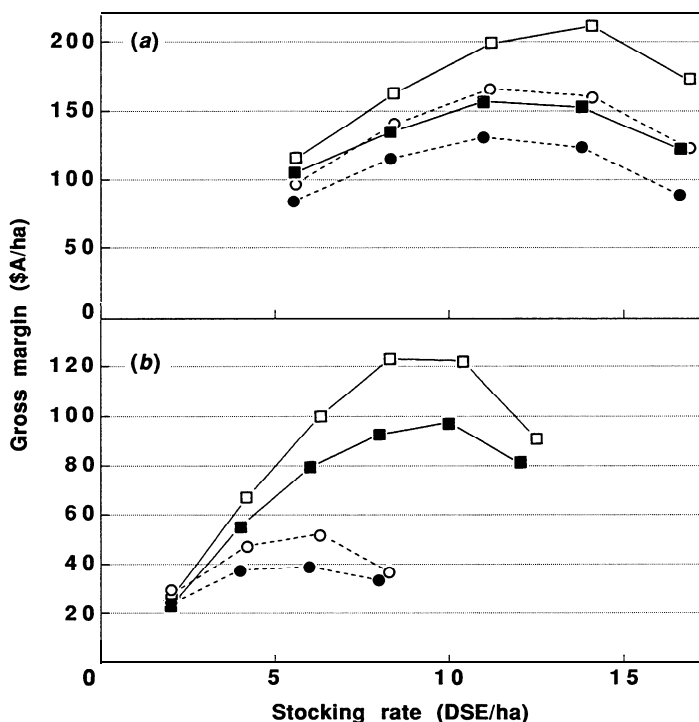


Fig. 1. Simulated gross margins for alternative pasture types and times of lambing for a Border Leicester X Merino flock joined to Dorset rams in the (a) Maryborough and (b) Charlton areas. Relationships shown are: (●) May lambing, annual pasture only; (■) May lambing, annual pasture with **dryland** lucerne; (○) August lambing, annual pasture only; and (□) August lambing, annual pasture with **dryland** lucerne.

Charlton where lucerne was 35% of the pasture production during the normal dry pasture period, lucerne was several times more important than time of lambing in increasing gross margin.

DISCUSSION

In the wheat growing areas of south east Australia the pasture ley most commonly consists of subterranean clover with one or more species of annual grass. The grasses are usually volunteers and predominantly annual ryegrass, barley grass and silver grass. Volunteer weeds are commonly capeweed and erodium. Clover establishment is often poor and the first year pasture has usually not built-up sufficient seed reserves for a dense pasture. Sheep production often is limited by poor pasture composition and the short growing periods of the annual pasture especially in areas with rainfall of under 450 mm. There are large seasonal variations in pasture growth with total annual production varying from 2 to 7 t/ha. In autumn the timing of the seasonal break influences the pasture growth in winter. Late breaks are common and as the traditional time of lambing is in autumn, stocking rates are usually conservative.

In the Maryborough area gross margins are approximately \$100/ha with the district average stocking rate of 7 DSE/ha and traditional systems of a May lambing on annual pastures. Increases in stocking rate with traditional systems will only improve gross margins by about 25%. Maximum benefits are obtained from systems with a winter-spring lambing at higher stocking rates with **dryland** lucerne. These systems offer scope to improve gross margins by about 100% in the Maryborough environment. In the Charlton area gross margins are approximately \$30/ha with the district average stocking rates of 3 DSE/ha and traditional systems of a May lambing on annual pastures. Increases in stocking rate with traditional systems will only improve gross margins by about 20%. Maximum benefits are obtained

from systems with an August lambing at higher stocking rates with **dryland** lucerne. These systems offer scope to improve gross margins by about 300% in the Charlton environment.

Simulation experiments are a valuable technique in quantifying the effects of general recommendations to particular situations. The simulation studies suggest that the profitability of lucerne systems are greatly influenced by pasture production in different environments and sheep management. This needs to be an important component of extension programs. There is currently heavy emphasis on lucerne in the salinity management strategies. Unless lucerne can be shown to be an economic alternative to the existing practices there is little scope for it gaining long term acceptance. The evidence in this report, the results of other research and the field results of a limited number of farmers who are using these systems on a farm scale, suggest **dryland** lucerne is the key to viable and sustainable sheep farming in wheat-sheep areas.

Full details of the complete study are available from the author (Ransom 1992).

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