ID # 22-43

ROTATIONAL GRAZING INCREASES WOOL AND LAMB PRODUCTION FROM PHALARIS-SUBTERRANEAN CLOVER PASTURES IN SOUTH EASTERN AUSTRALIA

A.N. Thompson, D. Borg, J.F. Graham, J. Lamb and G.R. Saul

Agriculture Victoria, Pastoral and Veterinary Institute, Private Bag 105, Hamilton, Victoria, Australia, 3300

Abstract

Wool and lamb production from different grazing systems was compared in a Mediterranean environment near Hamilton in southeastern Australia. The grazing systems were based on combinations of fertiliser inputs and grazing methods that could promote the growth and persistence of phalaris (*Phalaris aquatica*) and increase animal production compared to 'typical' unimproved pastures. In the first 2 years of this experiment, the most productive systems more than doubled ewe stocking rate and wool production, and more than trebled lamb production per hectare, compared to 'typical' unimproved pasture, low fertility, set-stocked systems. The change to a well fertilised phalaris/subterranean clover (*Trifolium subterraneum*) pasture system accounted for 50-80% of these gains in productivity per hectare, with additional benefits from applying extra phosphorus (P) fertiliser and rotational grazing. These results show the potential for producers to adopt simple changes in management practices that can significantly increase wool and lamb production in southeastern Australia.

Keywords: Grazing management, phalaris, subterranean clover, wool production, lamb production

Introduction

The benefits of improved pasture species and increased soil fertility on pasture and animal production are well documented (Cayley et al. 1999), and these technologies have been widely adopted in southern Australia by participants of technology transfer programs such as the Grasslands Productivity Program (Trompf et al. 1998) and WoolPro (McDonald 1999). By contrast, literature reports on the effects of different grazing methods on pasture and animal production are more variable (reviewed by Norton 1998), and set-stocking or some *ad hoc* system of stock movements is by far the most common grazing method used by most sheep producers. Deferred grazing, or some form of rotational grazing, of the major perennial grasses in south-eastern Australia, phalaris (*Phalaris aquatica;* Avery and Graham 1997) and ryegrass (*Lolium perenne;* Graham et al. 1997), can increase the contribution of these species to total herbage mass. There is potential then that rotational grazing of perennial grass-based pastures could increase wool and lamb production by generating a pasture inherently more productive than that under set stocking. This hypothesis was tested and preliminary animal production data from the first 2 years of an experiment comparing set-stocking and rotational grazing systems was reported.

Material and Methods

The experiment is a component of the national "Sustainable Grazing Systems Key Program" (Mason and Andrew 1998), and was located near Hamilton in southeastern Australia (37^{o}24′ S, 141^{o} 55′ E). The long term average rainfall at the site is 625 mm per year, which falls mostly from May until November, but rainfall was 477, 589 and 549 mm in 1997, 1998 and 1999, respectively. The experiment compared 5 grazing treatments (3 replicates); [A – set-stocked, low P; B – set-stocked, high P; C – 4-paddock rotation, high P;

D - variable rotation, high P; and E - variable rotation, high P, plus 100 kg N/ha/yr]. The pasture consisted of 45% ‘Australian’ phalaris and 30% ‘Trikkala’ sub-clover when the experiment commenced in autumn 1997. A further 2 treatments (unreplicated) on an unimproved pasture dominated by annual grasses [set-stocked, low P; and 4-paddock rotation, low P] were included for demonstration purposes. The low and high P treatments received 8 and 30 kg P/ha/yr, respectively.

Sheep in the 4-paddock rotations were moved every 2 weeks, except in spring when they were moved weekly. Sheep on the variable rotations were moved every 2 to 14 days, depending on pasture growth and quality, except from lambing to weaning when they were set-stocked. Merino ewes were joined to terminal sires to lamb in August, and lambs were weaned in November. Pasture growth and botanical composition were estimated monthly, as described by Quigley et al. (2000). Ewes were weighed every 4 to 6 weeks, and stocking rates adjusted periodically to achieve similar live weights for treatments A to E. Lambs were weighed at weaning. Mid-side wool samples were collected from ewes prior to shearing, and fleece weights were measured at shearing. Grazing treatments A to E were compared using standard analysis of variance procedures.

Results and Discussion

The live weights of ewes grazing phalaris/sub-clover pastures were generally as planned, although set-stocked ewes were significantly ($P < 0.05$) heavier than those rotationally grazed from lamb marking in September 1999 until shearing in April 2000. Animal production responses to grazing treatments A to E were similar in both years, so data from both years were combined (Table 1). The most productive grazing systems more than doubled ewe stocking rate and wool production, and more than trebled lamb production per hectare, compared to the ‘typical’ unimproved pasture, low fertility, set stocked system. The most productive grazing systems achieved stocking rates equivalent to 1.8 to 2.0 DSE/ha for each 25 mm of rainfall above 250 mm, which exceeds by far previous predictions of potential stocking rate based on rainfall (French 1987). These results indicate the enormous potential for pasture resowing, fertiliser application and rotational grazing to increase wool and lamb production in southeastern Australia.

Most of these gains in productivity were due to significant increases in the utilisation of the phalaris/sub-clover pasture compared to the 'unimproved' pasture. The additional effects of extra P fertiliser and rotational grazing on animal production varied between years, which is consistent with other studies (Cayley et al. 1999, Waller et al. 2000). There was no significant benefit from the more intensive rotation system compared to the simple 4-paddock system, and the animal production response to N application was relatively small and variable. The increases in animal performance in response to additional fertiliser and rotational grazing resulted from the combined effects of increases in pasture growth and or utilisation. Our preliminary estimates of pasture utilisation rates indicate that the most productive systems tested utilised more than 80% of the pasture available. Future gains in productivity may therefore depend on growing more pasture, or alternatively, changing the production system to utilise a greater proportion of higher quality spring pasture.

Grazing treatments on the improved pastures did not influence wool yield, fibre diameter, staple length and strength, or position of break along the staple. However, lamb weights at weaning were lower for the rotational grazing treatments than the set-stocked treatments. Rotational grazing resulted in increases in the percentage of phalaris in the pasture, but at the expense of clover content (Quigley et al. 2000), and these changes in composition undoubtedly contributed to the lower lamb weaning weights. The potential benefits in productivity per hectare from increasing phalaris therefore need to be balanced against the longer-term effects of declining clover content. It is obvious that no grazing method will be best for all situations, and clearly there is little point adopting more intensive grazing systems if pasture species, soil fertility and stocking rates have not already been improved and/or increased. The key is to define the best combination of grazing methods, for various environments, pasture conditions and production objectives that can be employed to achieve high levels of pasture utilisation and animal production on a whole farm basis.

Acknowledgments: The Victorian Department of Natural Resources and Environment, Meat and Livestock Australia, and Land and Water Resources Research and Development Corporation fund this experiment.

References

Avery, A.L. and Graham J.F. (1997). The effect of seasonal deferred grazing on phalaris (Phalaris aquatica) in temperate Australia. Proc. XVII Int. Grasslands Cong. **1:** 57.

Cayley, J.W.D., Kearney G.A., Saul G.R. and Lescun C.L. (1999). The long-term influence of superphosphate and stocking rate on the production of spring lambing Merino sheep in the high rainfall zone of southern Australia. Aust. J. Agric. Res. **50**: 1179.

French, R.J. (1987). Future productivity on our farmlands. Proc. 4^{th} Aust. Agron. Conf. (Melbourne, Victoria). pp 140-9.

Graham, J.F., Prance T. and Thompson R. (1997). The effects of grazing management options on the persistence of perennial ryegrass in the temperate winter rainfall zone of southern Australia. Proc. XVII Int. Grasslands Cong. **1**: 55.

Quigley, P., Lamb J. and Chapman D. (2000). Phalaris production is enhanced by rotational stocking in southwestern Victoria. Anim. Prod. Aust. (in press).

Mason, W. and Andrew M. (1998). Sustainable Grazing Systems (SGS) – developing a national experiment. Proc. 9^{th} Aust. Agron. Conf. Wagga Wagga, Aust. pp 314-17.

McDonald, C. (1999). Woolpro in Western Australia. Proceedings of the "Productive pastures: research, adoption and evaluation workshop", (Ballarat, Victoria).

Norton, B.E. (1998). The application of grazing management to increase sustainable livestock production. Anim. Prod. Aust. **22**: 15.

Trompf, J.P., Sale P.W., Saul G.R., Shovelton J. and Braetz B. (1998). Changes in practices and decisions resulting from the paired-paddock model used in the Grassland's Productivity Program. Aust. J. Agric. Res. **38**: 843-53.

Table 1 - Wool and lamb production for different grazing treatments (1998/1999 and 1999/2000 data combined).

Treatment	Stocking rate (ewes/ha)	Wool weight (kg/ewe) #	Wool weight (kg/ha) #	Weaning weight (kg)	Lamb weight (kg/ha)
A Set-stocked, low P	10.4 [a]	5.0 [a]	52[a]	30.3 [a]	382 [a]
B Set-stocked, high P	12.0 [b]	5.5 [a]	67 [b]	30.4 [a]	390 [a]
C Simple rotation, high P	14.0 [c]	5.1 [a]	72 [bc]	27.9 [ab]	461 [ab]
D Intensive rotation, high P	14.3 [cd]	5.3 [a]	74 [bc]	27.7 [ab]	492 [b]
E Intensive rotation, high P + N	15.9 [d]	5.1 [a]	80 [c]	26.2 [b]	441 [ab]
l.s.d. (P = 0.05)	1.58	0.70	11.2	2.81	97.8
F Unimproved, control	6.1	4.8	29	24.0	136
G Unimproved, simple rotation	6.5	4.7	30	23.5	168

Greasy wool weights only represent 11 months growth.
Means with a different superscript within columns are significantly different (P<0.05)