THE EFFECT OF STOCKING RATE AND GRAZING MANAGEMENT ON THE LIVEWEIGHT AND WOOL PRODUCTION OF WETHERS GRAZING DRYLAND LUCERNE PASTURES

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Summary

A stocking rate (Merino wethers at 2.0, 3.0, 4.0 and 5.0/ha) x grazing management (four treatments, viz: six paddock rotationally grazed, three paddock rotationally grazed, set stocked winter - six paddock summer rotationally grazed, continuously stocked) trial was established on a dryland lucerne pasture on deep, slightly acidic sands in the upper south east of South Australia.

At 3.0 wethers/ha, animal production was maintained with all managements except the continuous system. At 4.0 wethers/ha, animal production could only be maintained by the six paddock rotational system. At 5.0 wethers/ha, additional lucerne plants were killed during stress periods even with the six paddock system.

Animal production during stress periods appeared to be related to the number of lucerne plants retained.

I. INTRODUCTION

Little information on the potential animal production and the effects of grazing management on lucerne (Medicago sativa L.) based dryland pastures is available. Peart (1968) suggested that at least an eight paddock system was necessary to maintain grazed lucerne stands and thus animal production in the Trangie environment, but took no account of stocking rate.

A progress report on the effects of grazing management and stocking rate on the performance of wethers on a dryland lucerne (c.v. Hunter River) pasture is given in this paper.

II. MATERIALS AND METHODS

(a) General

A typical area of dryland lucerne pasture was sown in April 1964 on deep, slightly acidic sands in the upper south east of South Australia. Average annual rainfall of the area is 420 mm with a largely winter incidence. Annual species were included in the dryland lucerne pasture mixture, largely to increase winter production.

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The area was moderately grazed with sheep and cattle until September 1966 when portion of the area was subdivided into 24 paddocks each of 2.0 ha.

The major pasture components, in addition to lucerne, at the commencement of experimental grazing were Wimmera annual ryegrass (*Lolium rigidum* Gaud.), silver grass (*Vulpia myuros* L.), Geraldton subterranean clover (*Trifolium subterraneum* L.), Australian phalaris (*Phalaris rubrosa* L.) and dandelion (*Taraxacum officinale* Weber).

(b) Treatments

Grazing management and stocking rate were varied as follows:

(i) A 6 paddock system (6P)

Paddocks of 2.0 ha subdivided into six equal sub-paddocks; wethers rotated throughout the year on a six-weekly cycle, i.e. one week on and five weeks off; stocking rate 2.0, 3.0, 4.0, and 5.0 wethers/ha.

(ii) A continuous system (C)

Paddocks of 2.0 ha continuously stocked at 2.0, 3.0, 4.0 and 5.0 wethers/ha throughout the year.

(iii) A 3 paddock system (3P)

Paddocks of 2.0 ha subdivided into three equal sub-paddocks; wethers rotated throughout the year on a six-weekly cycle, i.e. two weeks on and four weeks off; stocking rate 3.0 and 4.0 wethers/ha.

(iv) A set stocked winter — six paddock summer system (SW)

Paddocks of 2.0 ha treated as for (i) in late spring, summer and autumn; subdivision fences removed and treated as for (ii) in winter early spring; stocking rates 3.0 and 4.0 wethers/ha.

Two replications of these 12 treatments were used.

The SW system was included to allow a period of set stocking when lucerne growth was expected to be relatively slow due to lower temperatures, but when growth of annual species was favoured by adequate moisture. During late spring and the summer-autumn period, when lucerne was the most responsive species, management reverted to the 6P system.

(c) Animals

Adult Merino wethers (Bungaree) were allocated by restricted randomization to treatments on the basis of greasy fleece weight and liveweight records.

(d) Data Collection

Liveweights were recorded every six weeks. Individual greasy fleece weights were obtained annually at shearing in either November or December.

Density of lucerne plants was recorded in November and May each year by counting plants in 1 m² quadrates at 24 fixed sites in each paddock.

III. RESULTS

The year 1967 (rainfall 201 mm) was a drought year resulting in low pasture production until the April 1968 break of season. In 1968, rainfall (472 mm) was above average and in 1969 rainfall has been near average up until September. Liveweight data for the wethers for all management systems at the two intermediate stocking rates are presented for this period in Figure 1.
The effects of all treatments on greasy wool yields for seasons 1967 and 1968 are presented in Figure 2, and Figure 3 summarizes the lucerne plant density data at the end of the first and second seasons.

![Graphs showing effects of varying grazing management on liveweight of wethers at two intermediate stocking rates.](image)

**Fig. 1.** — Effects of varying grazing management on liveweight of wethers at two intermediate stocking rates.

![Graphs showing effects of stocking rate and grazing management on production of greasy wool/ha over two seasons.](image)

**Fig. 2.** — Effects of stocking rate and grazing management on production of greasy wool/ha over two seasons.
Continuous stocking resulted in a rapid decline in lucerne plant numbers (Figure 3) and this was reflected in lowered liveweights during winter-spring in the first season (Figure 1) and also in slightly lowered wool production (Figure 2) except at the lowest stocking rate. In the second season, the almost complete loss of lucerne from all stocking rates except the lowest was followed by sheep deaths from malnutrition. Wethers were removed at this stage and the treatments abandoned (deaths in only one replicate at 3.0 wethers/ha and hence only one replicate abandoned). Lucerne was the only pasture component eliminated from the abandoned paddocks.

At 4.0 wethers/ha, in the first season liveweight (Figure 1) and wool production (Figure 2) were greatest with the 3P system. In the second season, however, the 6P system at 4.0 wethers/ha maintained higher liveweights and produced more wool/ha than the 3P system. The even larger differences in liveweight in autumn-winter 1969 indicate that these differences in wool production will be further accentuated in the third season.

The SW treatment at 4.0 wethers/ha resulted in larger lucerne plant losses after November 1967 than the 6P and 3P treatments (Figure 3), and this was reflected in animal production (Figure 2).

At the lower stocking rate of 3.0 wethers/ha, similar animal production was recorded from all management systems except the C system (Figures 1 and 2).

With the 6P system, wool production/ha remained constant in 1968 when stocking rate was increased from 4.0 to 5.0 wethers/ha (Figure 2). This was associated with a decline in lucerne density to approximately 8. plants/m² at 5.0 wethers/ha whereas, at lower stocking rates, density remained at 14-15 plants/m² (Figure 3).
IV. DISCUSSION

The 1967 drought probably hastened the effects of the various treatments in this trial, and it is considered that the results obtained have defined the grazing management effects at the lowest likely range of stocking rates.

The most interesting results are the apparent interactions between stocking rate and grazing management between 3.0 and 4.0 wethers/ha. At the lower stocking rate, it appeared that a less strict rotation, or a rotation for only a portion of the year, was adequate to maintain lucerne persistence and, hence, animal production. Adequate levels of production from annual pasture species (Smith 1970) ensured that any depression in lucerne production due to management was not reflected in animal production. At 4.0 wethers/ha, only the 6P system was adequate to maintain lucerne persistence and this was reflected in liveweight and wool production. These data suggest that animal performance during stress periods was proportional to the lucerne density during that period.

Geytenbeek (1963) showed that set stocking of annual pasture species produced higher fat lamb production than rotational grazing. Because of the 1967 drought, little lucerne regrowth occurred in the SW treatment when rotational grazing was recommenced (after 24 weeks of set stocking) in late October 1967, and this had a severe effect on lucerne persistence and, hence, animal production over the 1967-68 summer-autumn period. Although the period of set stocking was reduced to 18 weeks during 1968, this was insufficient to reverse the previous trend. The SW treatment may have yielded more favourably if normal spring rains had been received in 1967 to allow adequate regrowth for replenishment of root reserves, which appears necessary for lucerne survival during stress periods (Leach 1967).

Loss of lucerne plants at 5.0 wethers/ha was the result of severe digging and overgrazing which occurred during the dry summer-autumn months of 1967-68. The wethers removed all the above ground lucerne regrowth within the first two days. For the next five days, lucerne crowns were exposed by digging and either pulled up and eaten or severely damaged by chewing. Regrowth occurred slowly after chewing and, if this happened repeatedly, the plant died.

Where digging was not excessive, the five-week regrowth period was adequate for lucerne persistence. Thus, to have increased animal production at 5.0 wethers/ha, the lucerne crowns would have needed protection from digging. This could not be done simply by increasing the interval for regrowth as more severe digging would appear during the period of grazing. Increasing the number of paddocks in the rotational system would also be ineffective since the proportion of time taken to eat the regrowth would remain constant. The problem might be overcome by allowing the animals only limited access to the pastures during stress periods (for example on days one and five of the week), and holding them on a small area of scrub or other suitable land for the remainder of the week.

The results indicate that, as stocking rate is increased, there is a greater need for a strict rotational management system to maintain animal production. Although set stocking during winter-spring and a fewer paddock rotational system may initially show increased animal production, it is difficult to predict the long term damage to the lucerne stand and the ultimate reduction in animal production.
V. ACKNOWLEDGMENTS

The trial work was financed by the Wool Research Trust Fund of the Australian Wool Board. The Scottish Australian Company provided animals and pasture areas free of charge. I am also indebted to the management of this company for their ready co-operation. Field assistance from Messrs. J. A. Wurfel and M. R. Lewis is gratefully acknowledged.

VI. REFERENCES