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EFFECTS OF STOCKING RATE AND BOTANICAL COMPOSITION ON ANIMAL  
PRODUCTION FROM SOWN PASTURES IN A MEDITERRANEAN-TYPE  
ENVIRONMENT.

*A thesis presented in partial fulfilment of the requirements  
for the Degree of Master of Agricultural Science, Faculty of  
Agricultural Science, University of Adelaide.*

by

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## PLATE 1

Aerial photograph taken in September 1972, of the Kangaroo Island Research Centre located on the plateau region of Kangaroo Island. The research centre building complex can be seen ringed by pine trees and the experimental site (15 elongate paddocks on either side of a central raceway) is clearly delineated in the foreground.

The natural vegetation, dry sclerophyll scrub some of which can still be seen along the road in the foreground, was cleared and sown to permanent pasture in 1950/51.

Areas of surface flooding would normally be evident during the winter months due to the poor drainage of the soil (lateritic podzol overlying an impervious clay at 20 to 60 cm).



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## SUMMARY

A stocking rate experiment evaluating five pasture types was undertaken in a Mediterranean-type climate on the Kangaroo Island Research Centre, Parndana East, South Australia.

The hypothesis tested was that the renovation of an existing volunteer annual grass - Yarloop subterranean clover (*Trifolium subterraneum* L. cv. Yarloop) pasture by tillage, seedbed preparation and sowing of a mixture of the best available grass species and low oestrogenic subterranean clovers, would result in increased live weight and wool production from grazing wethers.

Merino wethers were continuously grazed for four years at six rates of stocking (10, 11, 13, 14, 15 and 17 sheep ha<sup>-1</sup>) on each of the following five pasture treatments.

Treatment (A) - An unrenovated, volunteer annual grass-subterranean clover pasture dominated by Yarloop subterranean clover and barley grass (*Hordeum leporinum* Link.).

Treatments B, C, D and E - Tillage, seed bed preparation and sowing of grass, together with Mt. Barker and Woogenellup subterranean clovers. Treatment grasses sown were as follows: (B) Wimmera annual ryegrass (*Lolium rigidum* Gaud. cv. Wimmera), (C) Victorian perennial ryegrass (*Lolium perenne* L. cv. Victorian), (D) Medea perennial ryegrass (*Lolium perenne* L. cv. Medea) and (E) Hybrid phalaris (*Phalaris tuberosa* x *Phalaris arundinacea* cv. Siro 1146).

Large differences between pasture treatments in both pasture and animal productivity occurred in the first year and, to a lesser extent, in the second and third years of set stocking and these could be attributed to differences in botanical composition.

Dominant ryegrass stands in treatments B, C and D following pasture renovation and first year management procedures, proved less productive<sup>†</sup> than the more subterranean clover - dominant pastures in treatments A and E. The data presented show clearly that the availability of the subterranean clover component was the dominant factor in the determination of animal production throughout the experiment.

Medea ryegrass consistently failed to demonstrate any degree of perenniality and Victorian ryegrass plants persisted over no more than three summers.

The influence of increased stocking rate in accelerating the between-year decline in density of Victorian ryegrass plants and the proportion of this species in the pasture, was clearly demonstrated. However, irrespective of stocking rate, the contribution of the three ryegrass species and sown subterranean clovers had declined to negligible proportions by the end of the experiment and this decline was associated with a concurrent increase in the pastures of Yarloop subterranean clover and other annual species, mainly of Mediterranean origin. In particular, the sowing of Mt. Barker and Woogenellup subterranean clovers proved unsuccessful in maintaining a low proportion of Yarloop in the overall legume component of the sward after a period of four to five years. This was highlighted by the level of hard seed reserves of subterranean clover measured in August 1973 in the renovated pasture treatments (mean of c. 210 kg ha<sup>-1</sup>) of which c. 90 per cent was Yarloop.

The results demonstrated the excellent adaptation of Yarloop subterranean clover to the lateritic podzolic soils of Kangaroo Island: particularly its rapid growth during the winter and early spring and its ability to set copious supplies of seed, irrespective of stocking rate.

The large seed reserves ensure a potential for germination over a number of years. Hence the volunteer annual grass-subterranean clover pastures, typical of this

<sup>†</sup>In terms of plant and animal

environment, seemed to be assured a degree of quantitative and qualitative independence of stocking rate.

The results clearly demonstrated an interaction between stocking rate and botanical composition in the determination of animal production following the renovation and early management procedures used in this experiment. However, it was further demonstrated that this was only a short-term effect, because, as the experiment progressed, there was a trend towards like-botanical composition in all pasture treatments.

The efficiency of wool production, in relation to pasture production and rainfall, was dependent on stocking rate and the experiment highlighted the biological and economical inefficiency of low stocking rates.

Most importantly, the experiment showed that, with adequate subterranean clover, changes in botanical composition arising from differences from various stocking rates had not adversely affected animal production. None of the sown species and cultivars investigated performed as well as the original volunteer annual grass-subterranean clover (cv. Yarloop) pasture.

STATEMENT

The investigations reported herein were carried out as part of my duties as a staff member of the South Australian Department of Agriculture and Fisheries and as an external student in the Department of Agronomy, Waite Agricultural Research Institute, University of Adelaide.

This thesis contains no material which has been accepted for the award of any other degree or diploma in any University and, to the best of my knowledge and belief, it contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Peter R. Gibson

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