PERFORMANCE OF STEERS IN NORTH QUEENSLAND GRAZING A TROPICAL LEGUME-GRASS PASTURE AT TWO STOCKING RATES ON TWO SOIL TYPES

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Summary

The performance of beef steers grazing a green panic - *Glycine wightii (javanica)* pasture at two stocking rates was studied over a period of three years. Mean daily bodyweight gains of 1.24 kg/ha and 1.41 kg/ha were recorded for the granitic and basaltic soils respectively, while the high stocking rate resulted in 1.58 kg/ha which was significantly less than that of the low stocking rate which was 0.99 kg/ha. Increasing the stocking rate reduced individual bodyweight gains and hot dressed weights in some drafts. Stocking rate and soil type had no significant overall effect on dressing percentage although some drafts of cattle showed differences.

The results are discussed in terms of possible change in production per hectare with variation in management.

I. INTRODUCTION

At the Kairi Research Station, Atherton Tableland, North Queensland, pasture mixtures of green panic ***(Panicum maximum*** var. ***trichoglume)*** and the legume, ***Glycine wightii (javanica)*** cv. Tinaroo have exhibited outstanding productivity under grazing (Tow 1967). Under a rotational grazing system, the pasture has persisted well for up to 12 years. However, there is a paucity of information on the performance of animals grazing these pastures.

This paper reports the results of an experiment on the performance of steers grazing green panic — glycine pasture at two levels of set stocking.

II. MATERIALS AND METHODS

The experiment was carried out from February 1966 to November 1968 at Kairi Research Station, 8 kms north-east of Atherton, North Queensland, which has an annual rainfall of 1230 mm of markedly summer incidence.

The pasture used was a stand of ***Glycine wightii (javanica)*** cv. Tinaroo into which green panic ***(Panicum maximum*** var. ***trichoglume)*** had been introduced. Two soil types were involved, a deep, red-brown clay loam derived from basalt and a light-coloured granitic soil.

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TABLE 1
Class of stock and grazing period

Draft	Breed	Age at Introduction (months)	Initial Weight (kg)	Period of Grazing
1	Shorthorn	18–24	299.6	9. ii.66 — 28.vii.66
2	Brahman cross	18–24	349.6	11.viii.66 — 20. x.66
3	Brahman cross and Shorthorn	12–24	272.4	17. xi.66 — 13. ii.67
4	Brahman cross	9–12	199.8	16. ii.67 — 7.xii.67
5	Brahman cross and Shorthorn	18–24	354.1	14. xii.67 — 26. iii.68
6	Shorthorn	24–30	272.4	26. iii.68 — 22. xi.68

Two paddocks were used on each soil type, one of 2 ha and the other of 4 ha. Stocking rates of 2.5 and 1.25 steers/ha were maintained on each soil type over the period of the experiment.

Grazing of the pastures began on February 9, 1966, at which stage all areas were carrying a heavy growth of materials. Steers were allocated to the treatments by stratified randomisation on the basis of bodyweight. During the course of the study, six drafts of steers grazed the area. Details of age, breed, initial bodyweight and period of grazing are set out in Table 1.

Initial and final weights were the mean of three weights taken without any fasting on three consecutive days using a standardised procedure. Interim bodyweights were taken at two weekly intervals using the same procedure. Animals remained on the experiment until marketable and all animals from both stocking rates were slaughtered together and replaced. At slaughter, weights of the hot carcass were obtained, and dressing percentages based on final paddock weight were calculated.

The amount of herbage present was measured in March, 1967, and March, 1968. Material from 20 x 0.4 m^2 quadrats, randomly located over each paddock, were cut to ground level, oven dried and weighed, and treatment means were calculated.

Analyses of variance were made of the bodyweight gains, carcass weights and dressing percentages of each draft and, where their variances were found homogeneous, the drafts were combined for an overall analysis.

III. RESULTS

The amounts of available herbage measured in March, 1967, and March, 1968 (Table 2) indicate that there was more material available to the animals at the lower stocking rate in both years. Soil type had very little effect on total yield of pasture but material growing on the basaltic soil contained a higher percentage of legume at the 1967 sampling.

TABLE 2
Pasture dry matter yields (kg/ha)

	1967				1968	
	2.5 steers/ha		1.25 steers/ha		2.5 steers/ha	1.25 steers/ha
	Glycine	Total	Glycine	Total	Total	Total
Soil type—						
Basaltic	1896	4218	1568	5258	6191	7225
Granitic	1184	3711	1401	5260	6013	7249

Bodyweight gains were recorded on all treatments throughout the experiment (Table 3) with the exception of two very short periods in the dry seasons of 1966 and 1968 when some short-term weight losses were recorded. Initially, each draft of animals was considered separately and the treatment effects are listed in Table 3.

Before pooling the data from these drafts, a test of the homogeneity of variance of samples equal in size was carried out on the within variance (Bartlett 1937). From this it was found that draft 2 did not have a variance which was homogeneous with the other 5 drafts. The combined analysis of the 5 drafts which did have homogeneous variances was carried out using the within variance as

TABLE 3

Effect of stocking rate and soil type on bodyweight gain and carcass data

Draft	(a) Group Mean of Main Effects				Standard Error of Means
	Granitic Soil	Basaltic Soil	2.5 steers/ha	1.25 steers/ha	
Bodyweight gain (kg/day)					
1	0.81	0.79	0.69	0.92**	0.03
2	0.52	0.77*	0.54	0.75	0.08
5	0.67	0.71	0.65	0.74	0.04
All drafts	0.66	0.75	0.63	0.79*	0.04
Hot carcass weight (kg)					
1	237.2	237.6	226.5	248.4**	4.3 (av.)
2	206.5	207.7	199.4	214.9*	3.9
3	198.1	195.7	194.1	199.7	3.8
4	237.4	251.5	234.3	254.5*	5.0
5	238.7	242.5	238.8	242.3	4.0 (av.)
All drafts (except 6)	223.6	227.0	218.6	232.0**	1.9 (av.)
Dressing percentage (%)					
1	53.6	54.7*	53.9	54.4	0.3 (av.)
2	54.2	52.8	52.7	54.4	0.6
3	56.3	55.7	55.9	56.1	0.6
5	55.8	56.7	56.2	56.3	0.4 (av.)
All drafts (except 6)	54.9	55.0	54.7	55.3	0.3 (av.)

Draft	(b) Means of Interactions				Standard Error of Means
	Granitic Soil		Basaltic Soil		
	2.5 steers/ha	1.25 steers/ha	2.5 steers/ha	1.25 steers/ha	
Bodyweight gain (kg/day)					
3	0.86^{a}	0.76^{d}	0.69^{bd}	1.00^{c}	0.06
4	0.62^{bd}	0.81^{c}	0.80^{a}	0.79^{a}	0.04
6	0.29^{d}	0.62^{c}	0.51^{bc}	0.65^{ac}	0.04
Hot carcass weight (kg)					
6	—	208.6	193.4^{b}	215.5^{a}	4.8
Dressing Percentage (%)					
4	58.5	57.4^{d}	57.9^{b}	59.5^{ac}	0.4
6	—	50.9	50.0	52.2	0.8

N.B.—Means marked with the same letter combination are not significantly different from one another.

* or $a > b$ $P < 0.05$ **or $c > d$ $P < 0.01$

error. However, from this analysis, it was found that the drafts x treatment (stocking rates x soil type) interaction was significant and should, therefore, be used as the error. A test of homogeneity of variances was then carried out on the stocking rates x soil type interaction variances of all drafts. It was found that in this case all drafts had homogeneous variances. Thus, a combined analysis using the draft x stocking rate x soil type interaction with five degrees of freedom as the error was used. The growth rate of drafts at the lower stocking rate (0.79 kg/day) was significantly greater than that of drafts at the higher stocking rate (0.63 kg/day) (Table 3). There was no overall effect of soil type although the mean gain of drafts on the basaltic soils was 0.75 kg/day and that of those on the granitic soils was 0.66 kg/day.

The hot carcass weight showed a somewhat more consistent pattern than growth rate. In drafts 1, 2, and 4, the hot dressed weight of the light stocking treatment was significantly greater ($P < 0.05$), while in drafts 2 and 5 no effect of either stocking rate or soil type was observed. Since one group was not slaughtered in draft 6, the effect of stocking rate was only determined within the basaltic soil groups, in which case there was a significant effect of stocking rate. However, when all groups, with the exception of draft 6, were pooled after similar tests for homogeneity of variances, there was no effect of either treatments.

While the basaltic soil treatments had a significantly higher dressing percentage ($P < 0.05$) in draft 1, neither soil type nor stocking rate had any effect in drafts 2, 3, 4 and 5. When drafts 1, 2, 3 and 5 which had homogeneous variances were pooled, no effect of either soil type or stocking rate was found.

IV. DISCUSSION

The amount of total forage available was of a similar order to that reported by Kyneur (1966) and Tow (1967), but amounts of legume available were much higher than those recorded by these authors.

The bodyweight production figures obtained in this study (578 kg/ha at 2.5 steers/ha and 348 kg/ha at 1.25 steers/ha) are considered quite satisfactory for a dryland pasture. They are much higher than gains obtained on green panic — lucerne (*Medicago sativa*) in south-east Queensland of 261 kg/ha at 1.25 steers/ha and 304 kg/ha at 1.9 steers/ha (Coldrake and Smith 1968). Hutton (1968) pointed out that the ratio of bodyweight gain of beef cattle to dry matter grown was of the order of 1:40 for improved tropical pastures, and that a high proportion of the dry matter grown was wasted, only about 30 per cent being eaten.

The growth pattern of the pasture in this study was such that dry matter production was far in excess of animal requirements during the summer period. P. G. Tow (personal communication) has measured dry matter production in excess of 112 kg/ha/day during the summer period. A system of set stocking would appear an inefficient method of utilizing this type of pasture with its marked seasonality of production.

The grazing pressure during the summer months is inadequate on all treatments, although the high rate of stocking during the winter months on the granitic soils would seem to be close to the optimum level as draft 6 failed to reach a desirable degree of finish in November. Blaser, Harlan and Love (1962) emphasised the need to maintain a balance between marketable product per animal

and product per hectare. Mott (1960) considers that in the humid regions of the world under intensive management livestock numbers may be adjusted frequently to maintain an equilibrium between the pasture available and the animals. It would certainly seem that, under the conditions of this experiment, there is a need to increase grazing pressure over the summer months to prevent under-grazing during that period.

During the course of the study, there was a depression in individual animal performance at the higher stocking rate which is in agreement with the observation of Riewe (1961).

The *increase in bodyweight production per unit area with increased stocking rate follows the same trend as that shown by Coaldrake and Smith (1968) and Southcott et ***al.*** (1968).

Although a marked improvement in beef production per hectare was achieved by increasing the rate of stocking, differences in carcass quality occurred between stocking rates, with a tendency for carcasses to carry excess fat at the lower stocking rate, and too little fat at the higher rate. A similar situation was described by Vivian (1968).

Soil type played a less important role in animal performance over the main part of the experiment, but the combination of heavy stocking and granitic soil caused a depression towards the end of the study. This was associated with an observed decrease in the legume component of the pasture on this treatment but, unfortunately, no measurement of the available legume was made at that time.

The original aim in this study was to attempt to straddle the optimum stocking rate but the results obtained would indicate that further information is needed to determine the optimum rate for both soil types.

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