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BEEF CATTLE LIVEWEIGHT GAINS FROM MIXED PASTURES OF SOME GUINEA GRASSES AND LEGUMES ON THE WET TROPICAL COAST OF QUEENSLAND

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SUMMARY

Liveweight gains from pastures of common guinea grass (*Panicum maximum*) and of the cultivars Hamil, Colonaio and Embu were compared from 1968 to 1971 using Brahman cross steers grazed at 4·94 beasts/ha over the wet season and 2·47 beasts/ha for the rest of the year. Each grass was grown with *Centrosema pubescens* (centro) or a mixture of centro and *Glycine wightii* cv. Tinaroo (Tinaroo glycine). With the seasonal change in stocking rate designed to take advantage of vigorous wet-season grass growth, the pastures were able to fatten almost 5 yearling steers/ha/year. Average annual liveweight gains/ha were 756 kg for common guinea (maximum 904 kg), 698 kg for Hamil (maximum 758 kg) and 633 kg for Colonaio (maximum 736 kg) over the 3 full years of grazing. Embu pastures deteriorated markedly and were not grazed after the second year. Overall the mixture of Tinaroo glycine and centro was no better than centro alone, but it regularly gave increased liveweight gains in autumn-winter.

I. INTRODUCTION

Guinea grass (*Panicum maximum*) is the major grass used in legume-based pastures in north-eastern coastal Queensland, the three distinct forms in general use being common guinea, Hamil and Colonaio. Embu, a cultivar with adscendent or creeping stems, was introduced from Kenya in 1965. It achieved some renown because of its low dense growth habit, good cool-season growth and apparently superior nutritive value (Grof and Harding 1970). Few comparative data on beef cattle liveweight gains are available for these cultivars, especially when grown with legumes.

Centro (*Centrosema pubescens*) can maintain the nitrogen and organic matter content of pasture soils cleared from rain-forest (Bruce 1965). Some data on grazing pressure and management practices with common guinea/centro pastures have shown peak annual liveweight gains of just under 560 kg/ha at an average stocking rate of 3·5 beasts/ha (Grof and Harding 1970). In the current experiment beef production from four guinea grasses, each grown with centro or with a mixture of legumes, was examined.

II. MATERIALS AND METHODS

The experiment was located at Utchee Creek, approximately 32 km west of Innisfail, north Queensland (lat. 17° 36°S.). The environment is humid tropical, with 3,200 mm mean annual rainfall and mean annual temperatures of 23°C with less than 5·6°C seasonal variation (Grof and Harding 1970). The soil was a friable, well-drained, red basaltic loam (Gn 3·11 of Northcote 1971).

Virgin land was cleared of rain-forest in 1965 and planted in 1966 with a basal application of superphosphate at 125 kg/ha. Embu was established from cuttings but all other cultivars were planted by seed. There were eight treatments in all, consisting of four guinea grasses, viz. common guinea, Hamil, Colonaio and Embu, each grown with centro and with a legume mixture. The legume mixture consisted of centro, *Glycine wightii* cv. Tinaroo, *Pueraria phaseoloides* (puero), *Vigna luteola* cv. Dalrymple and *Desmodium intortum* cv. Greenleaf. Each treatment consisted of two paddocks each of 0·81 ha.

The pastures were grazed intermittently with cattle up to the end of 1967. Experimental animals were used between February and October 1968, and then continuously from mid December 1968 until mid December 1971. No quantitative pasture measurements were taken. The only fertilizer applied after establishment was molybdenized superphosphate at 251 kg/ha in March 1971.

An intermittent grazing system of 2 weeks on and 2 weeks off was adopted. The overall stocking rate was 4·94 beasts/ha for mid December to mid April and 2·47 beasts/ha in the cooler and drier months from mid April to mid December. Liveweights were recorded at 4-weekly intervals. Spraying for the control of cattle tick (*Boophilus microplus*) and buffalo fly (*Siphona exigua*) coincided with weighings. Cattle used were commercially available Brahman cross steers introduced at around 272 kg liveweight and approximately 1½ years of age. Drafts were sold when the majority of animals had reached slaughter weight and condition, generally between 386 and 431 kg liveweight. On a number of selling dates, animals were individually rated "on the hoof" for condition and degree of finish. Assessments were made by two or three observers using a six-point scale in which 1 = poor, 2 = backward store, 3 = store, 4 = forward store, 5 = light fat and 6 = prime. The standard set for a prime beast was in accord with local trade requirements. A condition score of at least 5 and a liveweight in excess of 363 kg were required before an animal was classed as being of slaughter condition and weight. In practice, since these animals reached that stage approximately 8 months after introduction, a system of installing drafts in August (sold in April) and December (sold in July–August) was followed.

III. RESULTS

Altogether, seven different drafts of cattle were used, and with the exception of the first period of grazing in 1968 it is convenient to group results by seasons which correspond to draft replacement or stocking rate change times. Embu failed to survive after the second season of full grazing.

Average annual liveweight gains (kg/ha) rated the grasses (Table 1) in descending order of common guinea (756), Hamil (698), Colonaio (633) and Embu (628). However, with the initial draft of cattle Embu produced as well as common guinea. Colonaio was consistently inferior to Hamil, which in turn was inferior to common guinea in each year except 1971.

TABLE 1

BEEF CATTLE PRODUCTION FROM FOUR GRASS CULTIVARS

Mean of legume treatments

Period	Stocking Rate (beasts/ha)	Mean Liveweight Gain (kg/ha)			
		Common	Hamil	Colonaio	Embu
Initial Draft					
26.ii. to 7.x.68	4·94 to 22.iv. 2·47 to 7.x.	340	307	289	342
Summer Wet					
18.xii.68 to 23.iv.69 ..	4·94	532	454	442	379
17.xii.69 to 7.iv.70 ..	4·94	371	373	335	147
16.xii.70 to 19.iv.71 ..	4·94	220	246	181	..
Mean of 3 years ..	4·94	374	357	319	262*
Autumn–Winter					
23.iv. to 30.vii.69	2·47	120	80	67	73
7.iv. to 10.viii.70	2·47	188	150	103	176
19.iv. to 20.vii.71	2·47	78	114	66	..
Mean of 3 years ..	2·47	129	114	78	124*
Spring–Early Summer					
30.vii. to 17.xii.69 ..	2·47	252	225	226	244
10.viii. to 16.xii.70 ..	2·47	249	235	256	240
4.viii. to 15.xii.71	2·47	260	217	223	..
Mean of 3 years ..	2·47	253	226	235	242*
Whole Year					
18.xii.68 to 17.xii.69 ..	..	904	758	736	696
17.xii.69 to 16.xii.70 ..	..	808	758	694	562
16.xii.70 to 15.xii.71 ..	..	558	578	470	..
Mean of 3 years ..	3·28	756	698	633	628*

* Mean of 2 years only.

Seasonally, common guinea always gave the best average liveweight gain over the 3-year period though Hamil was comparable with it during two summer wet seasons and much better in the autumn-winter of 1971.

Pronounced seasonal fluctuations were recorded in the daily rate of animal liveweight gain from all four grasses (Figure 1). The general pattern was for gradually reducing rates in the first half of the year to below 0·45 kg/day in July, followed by a dramatic increase in August to above 0·64 kg/day, which was largely maintained for the rest of the year. The magnitude of the changes varied with the individual grasses.

Changes were most marked with Colonaio and Embu, least marked with common guinea.

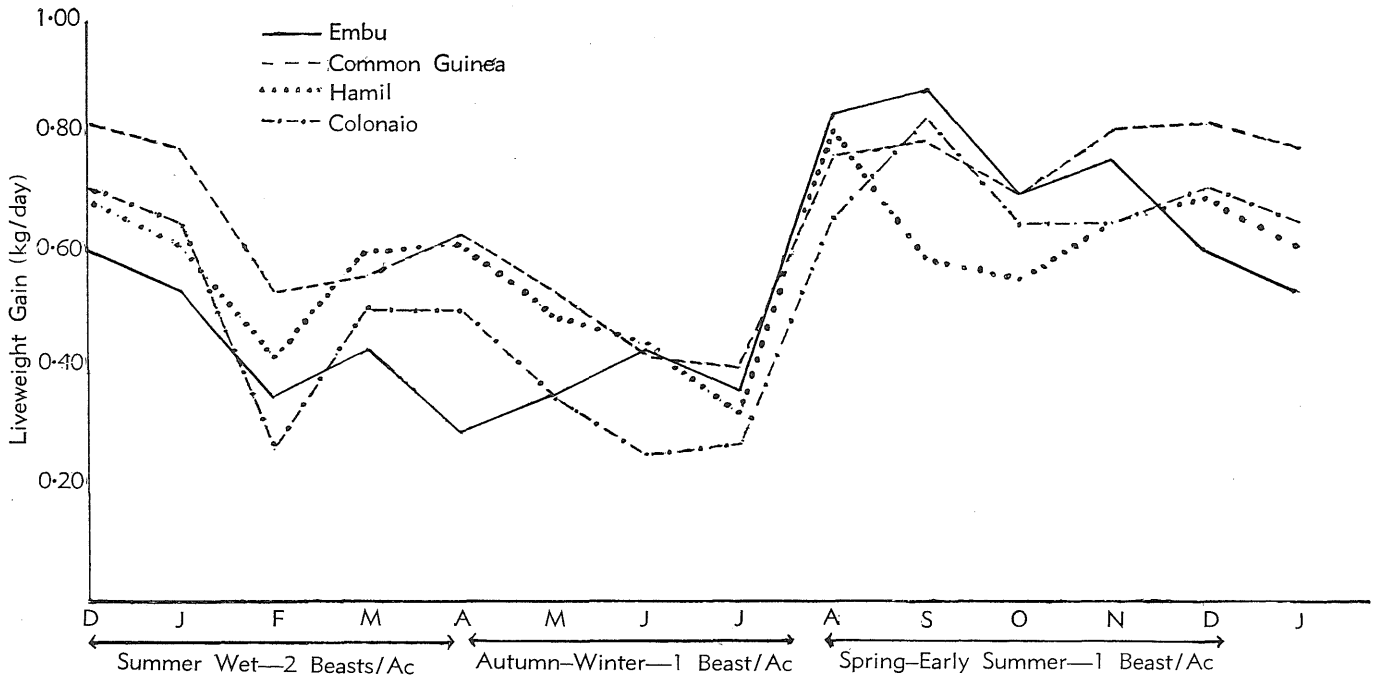

Fig. 1.—Monthly average liveweight gains per animal. (2 beasts/ac = 4·94 beasts/ha. 1 beast/ac = 2·47 beasts/ha).

TABLE 2

EFFECT OF STOCKING RATE ON AVERAGE DAILY LIVEWEIGHT GAIN
kg/animal

Stocking Rate	Common Guinea	Hamil	Colonaio	Embu*
4·94 beasts/ha ..	0·63	0·60	0·54	0·44
2·47 beasts/ha ..	0·63	0·56	0·52	0·60

* 2-year average only.

The difference between the gains per animal for the heavily stocked period (mid December to mid April) compared with the lighter stocked months (mid April to mid December) (Table 2) was negligible for common guinea, Hamil and Colonaio but —0·16 kg/day for Embu.

TABLE 3

EFFECT OF GRASS CULTIVARS ON FATTENING CATTLE

Date	Common Guinea		Hamil		Colonaio		Embu	
	A	B	A	B	A	B	A	B
23.iv.69*	5·0	8	4·6	6	4·7	7	4·3	5
30.vii.69	5·3	6	5·5	8	4·9	4	5·8	8
10.viii.70	5·5	7	5·8	8	5·3	8	6·0	8
19.iv.71*	5·0	7	5·0	6	4·8	7	..	..
20.vii.71	5·2	7	5·2	7	5·6	8	..	..
Mean	5·20	7	5·22	7	5·06	6·8	..	..

A—Average condition score (maximum possible is 6).

B—Number of animals of slaughter weight and condition (maximum possible is 8).

*—On these dates four out of eight animals were sold from each treatment, these being the ones introduced in the previous July or August.

Average condition scores of animals on each pasture (mean of the legume treatments) and the number that had reached slaughter weight and condition (total of the two legume treatments) at various draft selling times showed no important differences in the rate at which any of the grass or legume treatments fattened animals (Table 3).

All legumes established well, with satisfactory populations of centro, Tinaroo glycine and Dalrymple vigna but fewer plants of Greenleaf desmodium and puero. However, by the end of the second year no plants of Dalrymple vigna or Greenleaf desmodium remained. From visual observations the legume stand improved with time in the Hamil, Colonaio and Embu pastures, but declined in the common guinea plots.

There were no apparent overall differences in terms of liveweight change between legume treatments (Table 4). However, there were two general trends, related to Hamil and Colonaio. In association with the former, centro steadily improved its position when compared with the legume mixture, while in association with the latter, centro steadily lost its initial advantage.

TABLE 4

ANNUAL DIFFERENCES IN LIVEWEIGHT GAIN (kg/ha) BETWEEN LEGUME TREATMENTS

Cultivar	1968	1969	1970	1971	Total
Common Guinea	M (29)	M (49)	M (77)	C (78)	M (77)
Hamil	M (10)	C (20)	C (49)	C (55)	C (114)
Colonaio	C (31)	C (7)	C (2)	M (31)	C (9)
Embu	C (96)	M (47)	M (50)	..	M (1)
Average	C (22)	M (17)	M (19)	C (34)	..

C—Centro alone greater than legume mixture.
M—Mixture of legumes greater than centro alone.

Seasonal differences in the productivity of the legume treatments were apparent (Table 5), with the legume mixture generally giving better animal gains in the summer wet and autumn-winter periods but with centro reversing the position in spring and early summer.

TABLE 5

TIMES IN FOUR YEARS* THE SEASONAL PERFORMANCE OF CENTRO OR THE LEGUME MIXTURE WAS SUPERIOR

Grass	Summer-Wet		Autumn-Winter		Spring-Early Summer	
	Centro	Mixture	Centro	Mixture	Centro	Mixture
Common Guinea	1	3	0	4	3	1
Hamil	2	2	2	2	4	0
Colonaio	1	3	1	3	4	0
Embu	2	1	1	2	2	1
Total	6	9	4	11	13	2

* In 1968 grazing was for only 8 weeks in the summer wet season, and for only 9 weeks in the spring and early summer. Embu was not grazed in 1971.

IV. DISCUSSION

In this experiment Colonaio was not as productive as common guinea and Hamil and cannot be recommended for general use in the wet tropics of Queensland when these cultivars are available. However, the performance of the other cultivars needs to be interpreted in the light of the management imposed and the particular seasonal conditions experienced.

The high stocking rate in the summer wet seasons was destructive in the case of Embu, with the severe defoliation thinning the stand and allowing the ingress of weed species. A more lenient grazing pressure at that time of the year may have resulted in the maintenance of a dense pasture, and perhaps in better annual liveweight gains being produced by this cultivar. Common guinea was adversely affected by prolonged heavy rain between March and May 1971 when at South Johnstone 2,184 mm were measured in 63 consecutive wet days. The superior performance of Hamil during and immediately following that period

supports its reputation for being able to tolerate very wet conditions better than common guinea (Teitzel and Mortiss 1971). It is probable that the reduced production from common guinea in autumn-winter 1971 was also partly the result of insufficient legume content in the pasture. This was apparently associated with the extremely vigorous growth of common guinea in the early years as evidenced by the liveweight gains in 1969, together with a molybdenum deficiency since recognized in this soil type (Teitzel and Bruce 1972). Lack of phosphorus may also have contributed to the general decline in productivity. There was a high degree of utilization of feed during the experiment, and 5 years elapsed between the low initial application of superphosphate and the subsequent dressing. The application of molybdenized superphosphate in 1971 was too late to have an appreciable effect on the legume population before the experiment concluded.

Seasonal fluctuations in the rate of liveweight gains from the grasses were similar to those recorded from the same property with another experiment managed in the same way (Mellor, Hibberd and Grof 1973). The lower gains shown for February are coincidental with the onset of heavy monsoon rains, while the reduction in October probably reflects a feed shortage due to lack of soil moisture. The dramatic increase in daily liveweight gains in August may in part be due to a flush of nutritious feed brought about by rising temperatures and increased sunshine, and in part to the replacement of animals weighing around 409 kg with animals weighing only 272 kg.

The mixture of legumes can be regarded as comprising centro and Tinaroo glycine, for puero was never more than a minor component. The persistence of Tinaroo glycine was contrary to previous experience with that legume in other north Queensland areas of very high rainfall (Teitzel 1969), though Teitzel and Mortiss (1971) did report some favourable attributes and suggested it may have a place in a slightly drier environment. Differences in the seasonal productivity of the legume treatments reflect the different seasonal growth patterns of centro and Tinaroo glycine. The latter was visibly more vigorous in the cooler months when centro was flowering and seeding, while centro was more prominent in spring and early summer. The better performance of the mixture over centro alone with common guinea and Embu in spring-early summer of 1969 may have been due to abnormally good rainfall (432 mm for July compared with a mean of 91 mm and 230 mm in October-November). As well, below average minimum temperatures occurred in September, October and November.

The liveweight gains recorded from guinea grass/legume pastures in this experiment are higher than have previously been reported from this area (Grof and Harding 1970). A seasonal change in stocking rate to take advantage of extra wet season growth was feasible in practical terms, and enabled just under five yearling steers per hectare to be fattened annually. The preferred guinea grasses under the management practised were common guinea and Hamil. There were no overall advantages from growing a mixture of legumes with the grasses as compared with centro alone, though the inclusion of Tinaroo glycine with centro regularly resulted in increased liveweight gains in autumn and winter.

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