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THE EFFECT OF SHEEP AND CATTLE GRAZING ON A MIXED RYEGRASS/KIKUYU/WHITE CLOVER PASTURE IN NORTHLAND

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SUMMARY

Mixed pastures, kikuyu dominant during summer and autumn and perennial ryegrass dominant during winter and spring with some annual grasses and white clover, were subjected to high grazing intensity by young sheep and cattle over the 5 year period 1970-5.

Pastures grazed with cattle (at mean annual stocking rates of 9 and 6/ha) became kikuyu dominant and higher yielding over the summer and autumn than equivalent sheep grazed pastures (stocked at 45 and 30/ha) with a mean annual yield advantage of 18%. The sheep pastures contained more ryegrass and annual grasses in the spring and less kikuyu than cattle grazed pastures.

The higher stocked treatments of sheep and cattle resulted in significantly lower pasture yields in all seasons except summer. The kikuyu content of pastures in the spring increased and ryegrass content was reduced at the higher stocking level.

Liveweight gains of cattle and sheep were reduced at the higher stocking level and indications were that production per hectare was also reduced with the cattle, although sheep production slightly increased.

Sheep stocked at the higher level produced 10% less wool/hd than the lower stocked sheep.

The stability of these animal and pasture systems are discussed in relation to local farm practice.

INTRODUCTION

High pasture yields have been recorded from mixed pastures of kikuyu *Pennisetum clandestinum* Hochst.), perennial ryegrass (*Lolium perenne* L.) and white clover (*Trifolium repens* L). in Northland (Lambert *et al.*, 1977; Goold, 1979). However, the combination is frequently disliked by farmers because of the problems associated with the control of species dominance and the belief that the nutritive value of kikuyu is low (Joyce, 1974).

To obtain quantitive data on the performance of these pastures under both cattle and sheep grazing, an experiment was commenced at the Dargaville Experiment Farm in the spring of 1970 and concluded in the summer of 1975.

METHODS

Pastures of kikuyu, perennial ryegrass and white clover with some annual poa (*Poa annua* L.) and paspalum (*Paspalum dilatatum* Poir.), were divided into 24 paddocks and stocked with either Romney wether hoggets or Angus yearling steers. The sheep and cattle were stocked at 2 levels throughout the year (Table 1) and were maintained on an 18-day rotation in 4 treatment groups. No supplements were fed and the treatment groups were replaced each spring. The animals were weighed monthly and the sheep shorn twice yearly with individual fleece weights recorded.

Dry matter (DM) yields were estimated from 2 pasture frame cuts within each paddock according to the 'rate of growth' technique (Lynch, 1966).

Botanical composition of the pastures was assessed each spring by point analysis along permanently sited line transects in each paddock.

TABLE 1: EXPERIMENTAL STOCKING RATES (ANIMALS/HA)

	Stocking Intensity	*Oct-May*	*June-Sept*	*Annual Mean*
Cattle	High	12	4	9
	Medium	8	3	6
Sheep	High	60	20	45
	Medium	40	15	30

RESULTS

Pasture Production

Pastures grazed by steers were higher yielding than those grazed by wethers over the 5 year period having a mean annual yield advantage of 18% (Table 2). The seasonal advantage occurred over the summer and autumn periods when kikuyu growth was active. Yields in winter and spring were similar for cattle and sheep grazed treatments although stocking rate had a greater influence on winter yield of sheep grazed pastures than those grazed by cattle.

The effect of higher stocking rates was to reduce pasture yield in all seasons except summer, annual yield being reduced by some 25%.

TABLE 2: THE SEASONAL AND ANNUAL YIELDS OF RYEGRASS/KIKUYU PASTURES GRAZED BY SHEEP AND CATTLE (MEANS OF 5 YEARS DATA)

	Stocking Intensity	*Spring*	*Summer*	*Autumn*	*Winter*	*Year*
				(DM t/ha)		
Cattle	High	2.9	3.5	2.0	1.2	9.6
	Medium	3.9	3.5	2.4	1.6	11.5
Sheep	High	2.8	2.8	1.1	1.0	7.7
	Medium	4.1	2.5	1.6	2.0	10.2
SE of Diff.		0.2	0.3	0.2	0.2	0.6

Pasture Composition

The botanical composition of the pastures in the spring was greatly influenced by the grazing treatment imposed. Sheep grazing resulted in pastures with a higher content of perennial ryegrass and annual Poa and lower content of kikuyu than cattle grazing. The botanical changes occurred within the first year in the ryegrass component and less rapidly in kikuyu and annual Poa components. Annual Poa increased in all spring pastures throughout the experiment and probably resulted from the winter management of an 18-day rotation without any supplementary feeding. The ingress of annual Poa could be expected to be reduced with a less intensive winter management. White clover content of the swards was variable between years. In general high stocking only influenced the ryegrass and kikuyu components with kikuyu increasing and ryegrass decreasing. The botanical changes are indicated by the values obtained in the final spring, 1975 (Table 3).

TABLE 3: BOTANICAL COMPOSITION OF PASTURES IN FINAL SPRING (1975) OF EXPERIMENT (% COVER HITS)

	Stocking Intensity	*Ryegrass*	*Kikuyu*	*Poa annua*	*White Clover*
Cattle	High	4.4	24.1	42.0	13.4
	Medium	12.5	10.0	45.0	19.2
Sheep	High	6.8	12.0	57.3	12.3
	Medium	22.3	4.5	47.6	13.4
SE of Diff.		3.7	4.4	5.4	4.0

Animal Production

The production of meat and wool is shown in Table 4. Because of the seasonal stocking rate changes, data on production per hectare

are estimates only, based on the per head performance of animals retained on the experiment throughout the whole year. Animal performance was sharply reduced at the higher stocking level. High stocked cattle gained 115.3 kg/head and lower stocked cattle 209.6 kg/head. Sheep production was also reduced at the higher stocking level from 25.8 kg/head to 18.6 kg/head and the reduction was less marked than that for the cattle (40% reduction with sheep v 80% reduction with cattle). Wool production was also reduced by increased stocking rate although again the effect was less marked than for liveweight gain. High-stocked sheep produced 5.0 kg wool/head and less intensively stocked sheep 5.5 kg/head. Estimates of liveweight-gain per hectare suggested that at the higher stocking level cattle gains were lower and sheep gains slightly greater than at the lower stocking level.

TABLE 4: ANIMAL PRODUCTION FROM SHEEP AND CATTLE GRAZED ON PASTURES OF RYEGRASS/KIKUYU (MEAN OF 5 YEARS)

	Stocking Rate (animals/ha)	*Wool kg/ha*	*Gross Meat (kg LWG/ha)*	*Growth Rate (kg LWG/head)*
Cattle	9	—	1038	115.3
	6	—	1258	209.6
SE of Diff.				13.2
Sheep	45	225	837	18.6
	30	175	774	25.8
SE of Diff.				1.84

DISCUSSION

The results of this experiment have shown that the balance of a perennial ryegrass, kikuyu and white clover pasture mixture can be altered by the type and stocking level of animal grazing. Under cattle grazing the kikuyu and white clover components were encouraged and ryegrass content declined, especially at higher stocking rates. This swing in pasture balance resulted in swards with a seasonal advantage during summer and autumn and an overall pasture yield advantage of 18%. Joyce (1970) found that Waikato pastures grazed by cattle yielded 15% more annual DM than those grazed by sheep, noting that annual grasses replaced perennial ryegrass in the higher stocked sheep pastures. Monteath *et al.*, (1977) also found large changes in the botanical composition of temperate swards grazed by sheep and cattle with cocksfoot (*Dactylis glomerata* L.) becoming a co-dominant with ryegrass in swards grazed by cattle

compared with those grazed by sheep. Without the subtropical grass component, swards grazed by sheep produced 28% more DM yield than those grazed by cattle and the response was attributed to denser pastures with less soil compaction and more efficient cycling of nutrient returns in dung and urine (Scott, 1977). With kikuyu present in the pastures over the period of the year when temperate grass growth is restricted, cattle grazing proved more productive in terms of pasture and gross meat yield than sheep. However, to maximise the yield advantage of the kikuyu dominant pastures under cattle grazing, it is probable that management strategies such as later calving would be desirable. The seasonal pattern of pasture production of the sheep grazed pastures with their swing towards winter and spring production relative to summer and autumn does not seriously conflict with present sheep management practices, although there is an apparent need to increase total herbage yields under sheep grazing systems. Some strategies have been suggested by Rumball and Boyd (1980).

Stocking rate was shown to have little effect over summer when kikuyu growth was active and on some occasions herbage yield was actually increased at the higher stocking levels. This effect is thought to be due to increased nutrient recycling, particularly of nitrogen, and the use of nitrogen fertiliser on kikuyu pastures over the summer months may well be warranted (Goold, 1979).

The high carrying capacity of kikuyu pastures has been confirmed and relatively high levels of animal performance have been achieved. In Joyce's (1970) experiment, gross meat production from dairy beef cattle was 910 kg LWG/ha, some 25% greater than that recorded from wethers. Similar levels of meat production from wethers have been estimated in the experiment reported here although gross meat production from the cattle and wool production from the sheep appear higher than that recorded by Joyce (loc. cit.). That animal production per hectare from the sheep treatments increased at the higher stocking level in conjunction with lower pasture yields suggests that the sheep were able to exert greater grazing pressure on the mixed pastures than were the cattle.

It is concluded that high levels of sheep and beef production can be obtained from mixed pastures of perennial ryegrass/kikuyu/white clover although some animal systems are likely to induce pasture balance differences which would need complementary management adjustments to sustain the level of production.

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