ANIMAL PRODUCTION ON CROPS VERSUS PASTURE IN THE AUTUMN. II FINISHING BEEF WEANERS

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ABSTRACT

Seventeen month old beef cattle were grazed in the autumn on pasture and kale in 1975, 1976 and 1977, and on maize in the latter 2 years. The grazing periods began in late February/early March and continued for 72, 28 and 77 days in the 3 years respectively.

Liveweight gains on kale and maize were generally higher than on pasture but at low and high degrees of utilisation of kale in 1977 the gains were equivalent and poorer respectively. In each treatment in each year the gains varied between the 2 grazing periods but those on pasture were more variable than on crops.

Substitution of 20% of the maize ration with lucerne hay gave similar gains over the whole grazing period to those obtained on maize alone.

INTRODUCTION

Poor growth rates in 16-20 month old cattle often occur on pasture for varying periods during the late summer and autumn (Reardon 1975, Scott *et al.*, 1976). This "ill-thrift" has occurred even though pasture quality and quantity appear adequate and is usually preceded and followed by periods of higher liveweight gains.

As a means of overcoming this "ill-thrift", concentrates have been used (Joblin *et al.*, 1970) but the use of crops as an alternative to pasture in the autumn does not appear to have been studied. Crops, especially brassicas, have usually been grazed by cattle only during the winter and Scott and Barry (1972) reported gains on steers of 0.39 kg/day on **ad. lib.** kale and hay and 0.32 kg/day on **ad. lib.** swedes and hay.

This paper reports the results of 3 trials in which the liveweight gains of cattle grazed on kale and maize in the autumn are compared with those on pasture.

EXPERIMENTAL

The trials were carried out on a Wingatui silt loam soil in the autumn of 1975, 1976 and 1977 and the crops compared were medium-stemmed marrowstem kale and PX610 maize. In 1977 a maize treatment with 20% of the diet as lucerne hay was included because of reports (Reardon *et al.*, 1976) that maize silage was deficient in minerals and nitrogen and the lucerne hay was expected to overcome possible deficiencies in the forage maize. Details of times of sowing, seeding rates, fertilizer application etc., of the crops are shown in Table 1. The crops were sown in 15 cm rows and the breaks were delineated by a single electric wire..

Seventeen month old beef cattle were used each year and consisted of Friesian x Angus (FxA) steers in 1975, mixed FxA steers and heifers in 1976 and mixed Friesian x Hereford and Angus steers in 1977. The animals were given a 'settling-in' period on the various treatments consisting of 9 days in 1975 and 7 days in the next 2 years.

Details of the experiments including starting dates, periods of grazing, treatments compared, area available, grazing methods and the numbers of animals per treatment are given in Table 2. All weighings were carried out after an overnight fast; the first weighing was made immediately before the experimental grazing periods started and subsequent weighings were made at the end of each of the 2 grazing periods in each year (Table 2).

Immediately after the trials in 1975 and 1977 the steers were slaughtered and dressing out percentage (Table 4) calculated (i.e. Hot carcass wt x 100/fasted liveweight).

Herbage sampling

Four samples, each 1.5 m x 0.61 m in size, were taken (5 cm above soil level) from each crop at the beginning of each break in 1975 and 1976 and every 2 weeks in 1977 to determine dry matter yields. Four similar-sized residue samples were taken from each crop after grazing 1 break in 1975, 3 kale and 1 maize break in 1976 and every 2 weeks in 1977, to enable the degree of crop utilisation to be calculated. Pasture available above 3 cm (mower height) was measured before and after grazing in each break in 1975 but was not measured in 1976; in 1977 samples of pasture were taken prior to the grazing of the second of the 2 blocks.

The nitrogen content in the herbage dry matter was determined on the crop samples taken in the first 2 years.

TABLE 1: Crop Production Methods

Year and Crop	Sowing date	Sowing rate (kg/ha)	Number of previous crops	Fertilizer kgP/ha*	Applications kgN/ha** (date applied)	Weed Control (date applied)
1975						
Kale	15.11.74	4	1	12	–	–
1976						
Kale	31.10.75	4	0	20	–	Semeron (7. 1.76)
Maize	10.11.75	188	0	22	–	–
1977						
Kale	7.10.76	9	4	16	62 (13.10.76)	Semeron (7.12.76)
Maize (alone)	29.10.76	176	3	28	86 (15.11.76)	Atrazine (21.12.76)
Maize (+ Luc)	8.11.76	148	4	29	65 (15.11.76)	Atrazine (21.12.76)

* P as superphosphate with maize and reverted super with kale.

** N as sulphate of ammonia.

TABLE 2: Experimental details

Year	Starting date	Periods of grazing (days) 1	2	Treatments	Area available (ha)	Grazing Management	No. animals/ treatment
1975	Mar 9	1-20	21-72	Pasture	3.0	0.5 ha blocks rotationally grazed 3 times	10
				Kale	1.6	fed in 4 breaks	
1976	Feb 24	1-14	15-28	Pasture	3.0	0.5 ha blocks rotationally grazed	10
				Kale	0.6	fed in 4 breaks	
				Maize	0.6	weekly breaks (14 days only)	
1977	Feb 22	1-35	36-77	Pasture	1.6	0.8 ha blocks rotationally grazed very lightly, then set stocked	8
				Kale HU*	0.8	5-7 day breaks	
				Kale LU*	1.3	5-7 day breaks	
				Maize	1.2	3-5 day breaks	
				Maize + lucerne hay	0.9	3-5 day breaks, hay in portable feeders	

* High (HU) and low (LU) degrees of utilisation achieved by offering larger breaks to the LU group.

RESULTS

Herbage production, utilisation and N content

An adequate quantity of pasture was considered to be available at all times during the 3 trials. In 1975, the average pasture on offer was 1100 kg/ha of which 63% was utilised and in 1977 pasture available on the one block sampled was 5000 kg/ha.

The average dry matter yields and percentage utilisations of the kale and maize in each year are given in Table 3.

The average yield of kale was much higher in 1975 compared with 1976 but there was a higher degree of utilisation in the latter year which, coupled with the inclusion of additional dry matter as weeds, tended to increase the level of utilised DM/ha. The highest overall yields of kale were obtained in 1977 although in the LU kale treatment (Table 3) in the first period the utilised DM/ha was similar to previous years whereas in the HU kale treatment (Table 3) in the same period the utilisation within each of the LU and HU treatments remained the same in both grazing

TABLE 3: Average yields (kg DM/ha) and utilisations (%) of kale and maize (values for weeds in parentheses)

	Treatment	Yield		Utilisation	
1975	Kale	10000		50	
1976	Kale	6200 (1900)		70 (85)	
	Maize	4000 (3000)		90 (70)	
1977		Days		Days	
		1-35	36-77	1-35	36-77
	Kale HU*	9400	13100	78	73
	Kale LU	9400	13600	56	53
	Maize	7900	13400	85	67
	Maize + Lucerne	7000	14500	85	69

* High (HU) and low (LU) degrees of utilisation

TABLE 4: Mean liveweight and carcase gains per treatment

Year	Treatment /days	Liveweight gains (kg/day) 1-20	21-72	Mean	Dressing out (%)	Carcase gain (kg/day)
1975	Pasture	0.20 b*	0.58 a	0.48 b	55.1 a	0.26 b
	Kale	0.50 a	0.75 a	0.68 a	53.6 b	0.36 a
	s.e.m. %	26.8	8.2	8.3	0.8	8.4
	/days	1-14	15-28			
1976	Pasture	0.30 b	0.07 b	0.19 b		
	Kale	1.35 a	0.97 a	1.16 a		
	Maize	1.09 a	-			
	s.e.m. %	16.6	22.6	15.9		
	/days	1-35	36-77			
1977	Pasture	1.12 a	− 0.16 d	0.42 b	53.1 a	0.22 b
	Kale HU	0.31 d	0.05 c	0.17 c	56.1 a	0.10 c
	Kale LU	0.60 c	0.33 b	0.45 b	54.9 a	0.25 b
	Maize	0.90 b	0.64 a	0.76 a	53.3 a	0.41 a
	Maize + Lucerne Hay	0.94 b	0.40 b	0.64 a	54.5 a	0.35 a
	s.e.m. %	8.2	24.4	9.2	2.2	9.0

* Letters are LSD comparisons ($P<0.05$) within columns for each year

periods but the level of utilisation was approximately 20% higher in the HU treatment.

Maize yields were lower than those from kale in 1976 but its degree of utilisation was higher. When the additional dry matter as weeds was included the DM utilised/ha from maize was similar to that of kale in the first 2 years. The overall yields of maize in 1977 were higher and similar to the kale production in that year. The degree of utilisation of the maize decreased from the first to the second period but overall was similar to that in the HU kale treatment.

The mean N contents of kale in 1975 and 1976 were 2.6 and 3.0% respectively and of maize in 1976 was 2.3%.

Animal performance

Liveweight and carcass gains are shown in Table 4. Although the dressing out percentage of animals

grazed on kale was 1.5% lower than in those grazed on pasture in 1975 liveweight and carcass gains on kale were significantly higher than those on pasture in the first and whole grazing period. In 1976, the liveweight gains on kale were considerably higher than on pasture in each period as were the gains on maize, which was only grazed for 14 days in that year.

In 1977, the liveweight gains/treatment were higher in the first 5 week period compared with the following 6 weeks. Whilst the liveweight gains over the whole period of 77 days were highest on the 2 maize treatments and lowest on the HU kale, the gains on pasture and LU kale were similar and intermediate. However the performances on the various treatments relative to each other differed in the 2 periods. In the first period gains on pasture were highest but in the second period the animals on pasture lost weight and gave the poorest performance. The liveweight gains on maize and maize + lucerne were more consistent in giving the second highest performance in the first period and the highest and second highest performances in the second period. The 2 kale treatments gave the lowest gains in the first 5 weeks and were better only than pasture in the next 6 weeks. Growth rates on the HU kale were 0.29 and 0.28 kg/day less than on the LU kale in the first and second periods respectively.

There were no significant differences between the dressing out percentages obtained in each treatment in 1977 and consequently the carcass gains followed a similar trend to the liveweight gains obtained over the whole 77 days.

DISCUSSION

The overall growth rates of the animals grazed on kale in the first 2 years and on maize in the second and third year were higher than those grazed on pasture.

There was considered to be adequate pasture available in 1975 and 1976 and therefore the lower liveweights obtained may have been a manifestation of the "ill-thrift" syndrome. During the first 5 week period in the final year, however, liveweight gains on pasture of over 1 kg/day were achieved when the cattle were permitted to "skim-over" the high-yielding pasture consuming probably only the most digestible herbage. In the second period the animals lost weight due in part perhaps to the lower digestibility of the pasture remaining although this explanation seems insufficient to account for the poor performance. Since there appeared to be adequate pasture available in this latter period, albeit of somewhat lower digestibility, the poor performance may have been due to the "ill-thrift" problem as in previous years.

The relatively high liveweight gains on maize were in contrast to the report (Reardon *et al.*, 1976) that maize silage was only a maintenance ration for beef cattle unless supplemented by minerals and urea. Using lucerne hay to substitute for 20% of the maize ration in an attempt to overcome possible mineral deficiencies in the maize apparently had no effect on the liveweight gains obtained over the whole 77 days grazing; in fact there was a tendency towards lower gains on the maize + lucerne treatment in the second period. Therefore if there were any mineral deficiencies in the maize these might have been overcome by weed and/or soil ingestion.

Maize has the advantage over kale because of the much higher utilisation that can be obtained with maize whilst still achieving high liveweight gains. Maize yields were variable however, the lower yield in 1976 probably resulting from below average summer temperatures in that year. The use of English hybrids, which are better adapted to a cooler climate may improve the reliability of maize yields from year to year, and should be the subject of further research.

The liveweight gains obtained on kale were variable and in 1977 were lower than in previous years. It is possible that these lower gains may have been a consequence of the sowing rate which, in error, was 2-3 times more than the recommended rate. The resulting crop contained dense, thin fibrous-appearing stems which may have been much less digestible than those of kale sown at normal rates.

The adverse effects of a higher degree of kale utilisation on liveweight gains were clearly evident in the 1977 trial. Since the lower part of the stem is less digestible than the upper part of the stem (Stephen, 1976), an increase in the degree of utilisation at the same stage in crop maturity will involve the consumption of a greater proportion of the lower stem and will probably reduce the voluntary intake thereby resulting in lower liveweight gains. Lower liveweight gains on pasture resulting from reduced voluntary intake as a consequence of increased pasture utilisation have been reported (Scott *et al.*, 1976).

The apparent inconsistency of higher liveweight gains associated with a higher degree of utilisation in 1976 as compared with 1975 (Tables 3 and 4) might be explained in terms of a difference in crop maturity. The early growth of the 1976 kale was depressed by the growth of weeds and hence, at the start of grazing, this crop was both lower yielding and less mature compared with the kale in the first year. It seems reasonable to suggest that digestibility of a younger crop may be higher than that in a more mature one and therefore higher liveweight gains might be achieved on the former despite a higher degree of utilisation.

The trials demonstrated that crops such as maize and kale can give comparable or higher liveweight gains of beef cattle in the autumn to those achieved on pasture. In addition, the crops produced more dry matter/ha than did pasture and hence would permit higher stocking rates.

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