BEEF PRODUCTION FROM FORAGE CROPS IN THE BRIGALOW REGION OF CENTRAL QUEENSLAND
2. WINTER FORAGE CROPS

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ABSTRACT

*Six winter forage crops, oats (*Avena *spp. cvv. Benton and Camelia), barley (*Hordeum vulgare *cvv. Cape and Clipper), safflower (*Carthamus tinctorius *cv. Horowitz) and rape (*Brassica napus *var.* napus *cv. Dwarf Essex), were planted on a predominantly uniform textured, cracking clay brigalow soil in 1972-74. Winter wheat (*Tricticum aestivum *cv. Windebri) replaced Clipper barley in 1972. They were grazed at 2 beasts/ha in 1972 and 1974, and 1.5 beasts/ha in 1973, in a 6 × 2 randomised block design.*

Plantings had failed in the previous 3 years due to dry weather, and the crops were only marginally better in 1972 and 1973. Only the 1974 sowings gave satisfactory crops and these were planted in May which was later than normal. The crops provided 80 days grazing in both 1972 and 1973 and 112 days grazing in 1974. The highest average daily gains (> 1 kg/head/day) were obtained from Benton oats and Windebri wheat in 1972, despite the poorly grown crop that year. Rape gave consistently inferior livestock performance, possibly due to poor initial acceptance by the cattle. Carcase weights and dressing percentages did not differ between the crops within years. The cattle were satisfactorily finished only in 1974 when dressing percentages averaged 53.2%.

RESUMEN

Entre 1972-74, fueron sembrados seis cultivos de forraje invernal, avena (Avena *spp., cvv. Benton y Camelia*), *cebada* (Hordeum vulgare *cvv. Cape y Clipper*), (Carthamus tinctorius *cv. Horowitz*) *y Nabo forrajero* (Brassica napus *var.* napus *cv. Dwarf Essex*), *en un suelo de brigalow de textura predominantemente uniforme de arcilla quebradiza. El trigo de invierno* (Triticum aestivum *cv. Windebri*) *reemplazó a la cebada Clipper en 1972. Estos cultivos fueron pastoreados con 2 cabezas/ha en 1972 y 1974, y 1.5 cabezas/ha en 1973, en diseño de bloques al azar de 6 × 2.*

Las siembras de los tres años previos fallaron debido al tiempo seco y los cultivos durante 1972 y 1973 fueron sólo ligeramente mejores. Solamente las siembras de 1974 lograron cultivos satisfactorios, sembrándose en mayo, más tarde de lo normal. Los cultivos proveyeron 80 días de pastoreo en 1972 y 1973 y 112 días en 1974. Las más altas ganancias de peso diarias (> 1kg/cabeza/día) se lograron en la avena Benton y en el trigo Windebri en 1972, a pesar del crecimiento pobre de ese año. El Nabo forrajero dio consistentemente inferior producción animal, posiblemente debido a la pobre aceptación inicial del ganado. Los pesos de carcasa y porcentajes de rendimiento en canal no difieren entre los cultivos dentro de esos años. El ganado sólo fue acabado satisfactoriamente en 1974 cuando los porcentajes de rendimiento en canal alcanzaron 53.2%.

INTRODUCTION

Oats (*Avena* spp.) is the traditional winter forage crop in Queensland and has been widely planted in the mixed cereal growing/beef grazing districts. It is especially useful as a high quality forage for finishing animals for market at a time when tropical and sub-tropical pastures are dormant (Hendricksen 1966).

Alternative crops include various barley (*Hordeum vulgare*) and grazing wheat

(*Triticum aestivum*) cultivars, but the animal production from these crops has not been compared.

Winter cereals require reasonable rainfall after planting to establish the secondary root system (Brauns and Rudder 1963; French 1969), or the plants are readily pulled out of the ground by grazing cattle. Strongly taprooted plants such as safflower (*Carthamus tinctorius*) and rape (*Brassica napus* var. *napus*) can be safely grazed as soon as animals can bite the plant.

In the brigalow areas of central Queensland forage cropping could play a major role in the cultural control of brigalow (*Acacia harpophylla*) regrowth (French *et al.* 1988) and in finishing animals for market over winter and spring. To investigate this possibility, we compared alternative winter forage crops under grazing.

MATERIALS AND METHODS

This study was located on 48 ha at Brigalow Research Station. The predominant soil was a uniform textured cracking clay (Ug 5.2; Northcote 1971) with small areas of Dr, Dy and Db soils (Webb 1971) interspersed. The original vegetation had been cleared in 1965 and the area prepared for cultivation, including the erection of graded banks for erosion control. The area was divided into twelve 4 ha paddocks. From 1969 to 1974, 2 replicates each of Camelia oats, Benton oats, Cape barley, Windebri winter wheat or Clipper barley, Horowitz safflower, and Dwarf Essex rape were intended to be planted in late summer-autumn in a randomised block design.

The planting rates were 35 kg/ha except for Horowitz (8 kg/ha) and Dwarf Essex (5 kg/ha). Clipper barley was used in 1973 instead of the winter wheat because of the lateness of the planting that year, and was retained in 1974.

Yields of oven-dry forage on offer at the commencement of grazing each year were determined by cutting four 0.84 × 0.84 m quadrats to ground level in each paddock, and drying samples at 95°C for 24 hours.

Grazing was possible in only 3 years and 8 (6 in 1973) 24 to 30 month old Hereford steers were introduced to each paddock when most crops were ready for grazing. The stocking rate used was 2 beast/ha (1.5 in 1973).

Steers were randomly allocated to treatments after stratification on liveweight, and had initial liveweights (± SD) of 330 ± 9.1 (1972), 392 ± 7.7 (1973) and 316 ± 2.7 kg (1974). They were weighed unfasted every 14 to 28 days until the forage was exhausted. The cattle from individual paddocks were then slaughtered and hot carcase weights recorded.

Data were compared by analysis of variance using a randomised block design and pairwise testing of means by the LSD procedure.

RESULTS

Crop production

Planting dates, dates of commencement of grazing and initial DM yields are shown in Table 1.

TABLE 1

Dates of planting and commencement of grazing, stocking rates and mean forage on offer at the commencement of grazing

Date planted	Date grazing commenced	Stocking rate	Dry matter on offer						
			Camelia oats	Benton oats	Cape barley	Clipper barley	Horowitz safflower	Dw. Essex rape	SE
		(beasts/ha)				(kg/ha)			
June 28-29, 1969	Not Grazed	—	—	—	—	—[1]	—	—	
Not Planted 1970		—	—	—	—	—	—	—	
Not Planted 1971		—	—	—	—	—	—	—	
May 14-16, 1972	Aug 1	2.0	1160ab[2]	1700a	1690a	810[1]b	540b	1000b	180
Aug 1-3, 1973	Sept 26	1.5	1920a	2330a	1840a	1980a	1300a	1430a	180
May 7-8, 1974	July 17	2.0	1500a	2110ab	2280b	3750c	2170ab	1980ab	190

[1]Winter wheat cv. Windebri planted in 1969 and 1972.

[2]Means within rows with a letter in common do not differ significantly ($P > 0.05$).

Forage on offer at the commencement of grazing ranged from 540 kg/ha for Horowitz safflower in 1972 to 3750 kg/ha for Clipper barley in 1974.

Duration of grazing

Grazing of Windebri winter wheat and Horowitz safflower was delayed 2 weeks in 1972 because their potential growth was inadequate. In 1972 one replicate of Horowitz safflower provided only 36 days grazing. Camelia and Benton oats provided only 49 days grazing, whereas the other 3 crops lasted for about 80 days. In 1973 all crops were grazed for 77 days but stock on Camelia oats, both barleys and rape lost weight in the last 2 weeks. In 1974, when seasonal conditions were better, all crops except Clipper barley were grazed for 112 days. Initially, Clipper had by far the highest forage on offer and cattle performed very well for 40 days, but the feed was exhausted after 85 days (Figure 1).

Liveweight gains

The highest average daily gains (ADG) were obtained from the cattle on the poorly-grown and late-grazed 1972 crop, but ADG's were significantly lower ($P < 0.05$) on Horowitz and Dwarf Essex rape (Table 2).

ADG's in 1973 were lower than in other years, with Cape Barley and Dwarf Essex rape giving ADG's which were significantly ($P < 0.05$) less than for the other crops. There were no significant differences ($P > 0.05$) between the crops in 1974 (Table 2).

TABLE 2

Average daily gains, and dressed carcase weights of Hereford steers grazing various winter forage crops at Brigalow Research Station 1972-1974

		1972	1973	1974
			(kg/head/day)	
Average daily gain	Camelia	0.80ab[2]	0.73a	0.67a
	Benton	1.05a	0.70ab	0.83a
	Cape	0.97ac	0.49bc	0.75a
	Clipper[1]	1.10a	0.51ac	—
	Horowitz	0.60bc	0.52ac	0.75a
	Dwarf Essex	0.52b	0.34c	0.49a
	SE	0.104	0.062	0.065
			(kg)	
Carcase weight	Camelia	192ab	223a	210a
	Benton	194a	219a	219a
	Cape	197a	215a	209a
	Clipper[1]	192ab	211a	191a
	Horowitz	165c	212a	209a
	Dwarf Essex	183b	212a	199a
	SE	2.8	5.3	4.5

[1]Windebri winter wheat in 1972.

[2]Means within columns with a letter in common do not differ significantly ($P > 0.05$).

Carcase details

Dressing percentages were not affected by the crops. Significant differences in carcase weight only occurred in 1972 when the carcases from Horowitz safflower were lighter than all others, and those from rape were lighter than those from Benton oats and Cape Barley ($P < 0.05$) (Table 2). Mean carcase weights on the 4 cereal crops were 194, 217 and 207 kg in 1972, 1973 and 1974 respectively. Corresponding mean dressing percentages ($\pm$ SE) were 49.0 $\pm$ 0.32, 49.6 $\pm$ 0.36, and 53.2 $\pm$ 0.20 respectively.

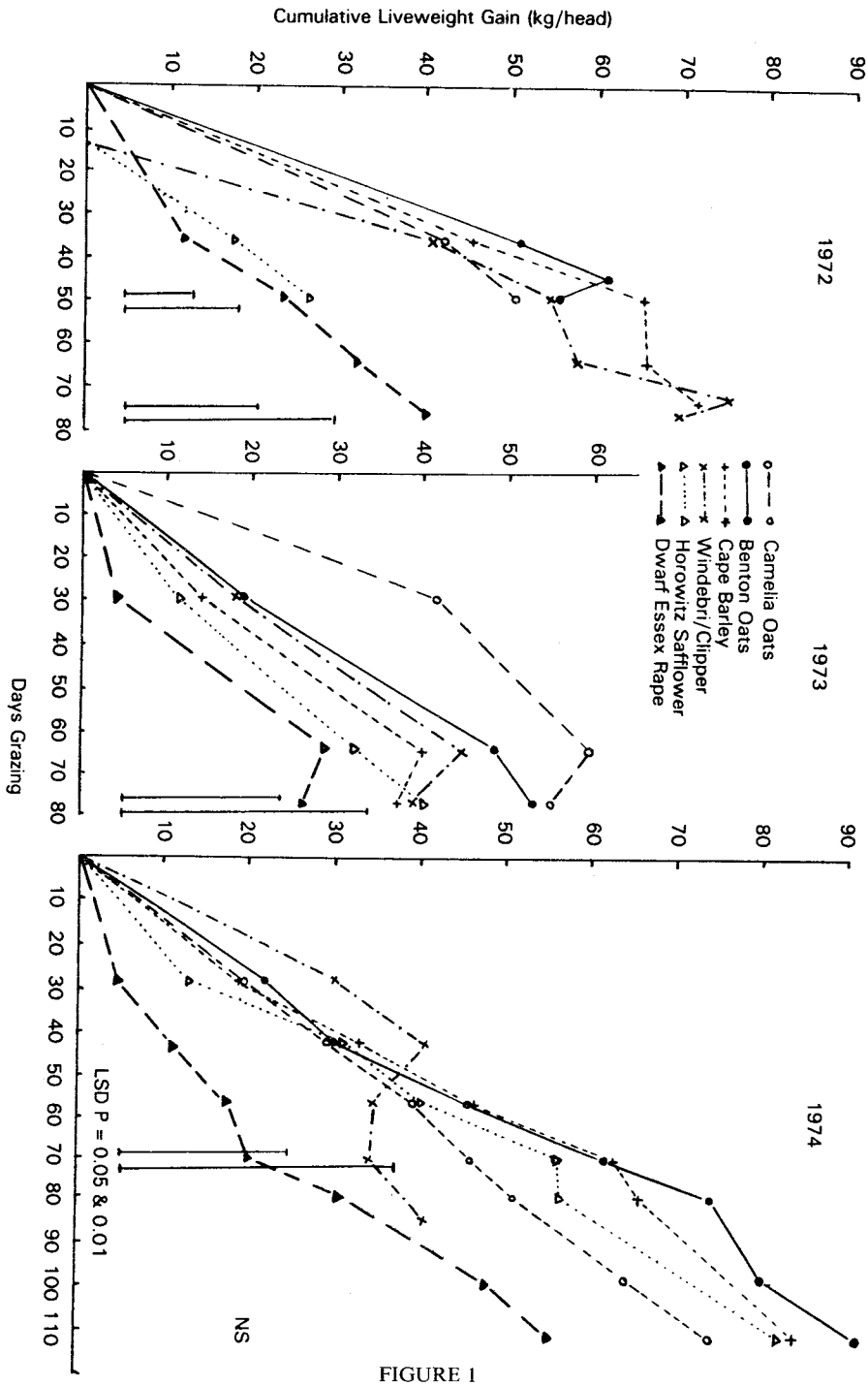

FIGURE 1
Cumulative liveweight gains of animals and duration of grazing for the 6 winter forages during 1972, 1973 and 1974.

DISCUSSION

Rudder (1977), quoting from a Bureau of Agricultural Economics survey of 24 oat crops in Central Queensland over the period 1958 to 1962, found that 21 crops had been grazed and there were 3 failures. Mean duration of grazing was 98 days from June 4 start at a mean stocking rate of 2.1 beasts/ha giving 80 kg/ha liveweight gain (LWG) (ADG 0.82 kg/head/day). This is much better than was achieved in the present study which commenced during a severe drought. Grazing was not possible in 1969 and crops were not planted in 1970 and 1971, i.e. 3 years grazing out of 6 attempts. In the following 3 years, plantings were later than recommended (French 1969). The earliest that grazing commenced was July 17 in 1974.

Using Emerald daily weather data for 89 years, Clewett *et al.* (1985) simulated oat production and obtained a 26% crop failure (no planting rain, no follow up rain or failure to support 1 beast/ha for 100 days). At Gayndah the figure was 10% over an unindicated time span. Sufficient growth of oats at Emerald to support 2 beasts/ha for 100 days could only be expected in 25% of years and at Gayndah in 37% of years. Brigalow Research Station is located approximately midway between these 2 centres and only one of our 6 attempts (16%) met the criterion of 2 beasts/ha for 100 days. It is apparent that a most unsatisfactory period for winter forage cropping was experienced by the present study.

Not only is the initial rain necessary to get the crop planted but, for the winter cereals, follow up rain is also required to stimulate secondary root development before grazing can commence. Although not encountered in this study (Table 3), failure of follow-up rain is a frequent handicap to winter cereal production in Central Queensland and a major reason for considering the tap rooted safflower and rape.

TABLE 3

Monthly rainfall (mm) at Brigalow Research Station, Theodore 1969-74

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
						(mm)							
1969	33	73	60	7	48	21	6	10	7	117	73	84	539
1970	155	37	24	12	0	22	0	11	37	45	68	162	573
1971	145	297	3	17	19	2	9	82	20	68	31	115	808
1972	111	132	13	13	39	39	0	3	13	102	94	55	614
1973	137	100	28	2	19	40	116	35	51	49	136	239	952
1974	157	58	9	77	26	3	20	66	102	60	104	84	766
Mean (1968-82)	109	117	40	26	39	26	31	27	32	55	82	113	697

Benton appeared to be only slightly superior to Camelia oats and Cape Barley, while Dwarf Essex rape and Horowitz safflower generally gave poorer results than the other forages. Stock were consistently slow to begin grazing safflower and rape, and steers on rape suffered severe, early weight losses. They did not recover from these losses, despite making gains similar to those on the other crops later in the season (Figure 1). In 1974, however, when the season was most favourable, Horowitz safflower performed as well as most other crops.

The poor performance of Clipper barley in 1974 is difficult to explain. One possible reason is that it grew well early, with more than 50% greater DM yield on offer than any other forage at the commencement of grazing in mid July. June and July were dry months, with only 3 and 20 mm rainfall respectively. During this time the heavy Clipper crop may have exhausted stored soil moisture, and despite 66 mm in late August, the crop was not able to recover adequately to keep ahead of the animals' demands.

This study suggests that the type of crop or cultivar planted was less important than cultural practices such as storage of soil moisture, seedbed preparation and evenness of the stand attained. Apart from Dwarf Essex rape and Horowitz safflower, the crops tested performed similarly. However, the study suggests that winter forage

crops are unreliable in this environment. It is noted that Rudder (1977) also considered that success in forage crop production in Central Queensland is dependent on the application of good crop husbandry techniques on suitable soils.

ACKNOWLEDGEMENTS

The assistance of officers of Beef Cattle Husbandry Branch, particularly Messrs P. B. Hodge and S. J. Wood in the selection and weighing of the cattle, is gratefully acknowledged, as is the Australian Meat Research Committee for the provision of finance.

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(Received for publication June 19, 1987; accepted February 1, 1988)