A comparison of spring and autumn calving for beef cattle production

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ABSTRACT

Production from Angus and Friesian beef cattle calving in spring or autumn was measured over 4 years. Patterns of liveweight change were similar throughout the year, but liveweight change was very different in relation to calving and mating. In the spring herd the post-partum anoestrous intervals were long, the calving pattern was poor, and levels of barrennes and calf mortality were high, although calves grew relatively fast. In contrast in the autumn herd, the post-partum intervals were short and the calving was concentrated. However, barrenness was high particularly in some years and there was evidence that cows became anoestrous during winter. Calf mortality was low, but calf growth rates were reduced. The results suggest that neither calving time was optimal in this environment for maximum productivity.

Keywords Cows; reproduction; season; fertility; management; live weight; calf growth; production.

INTRODUCTION

Profitability from a beef herd is determined by the average weight of calf weaned for every cow joined in the herd and depends on the weaning percentage and calf weaning weight. In addition, the calving pattern must be concentrated to minimise variation in calf age and enable a high standard of feeding management. The aim is to have more than 80% of the herd calving in the first 42 d of the calving period.

Evidence has accumulated in the last 10 years to show that season has important effects on reproduction in beef cattle (Hauser, 1984; Montgomery, 1985). Short days in late winter, especially when combined with poor nutrition, result in a long delay between late winter calving and the resumption of regular oestrous cycles (Montgomery *et al.*, 1985), and it is not possible to maintain a concentrated calving pattern and a high weaning percentage in herds calving in late winter.

Shorter post-partum anoestrous intervals can be achieved by calving at other times in the year. For example intervals to first ovulation or first oestrus are shorter in autumn-calving than in spring-calving beef cows (Montgomery *et al.*, 1980; Peters and Riley, 1982; King and Macleod, 1984) resulting in a more concentrated calving (Montgomery *et al.*, 1980). However there is little information on the weaning percentage and calf growth rate from different calving times under New Zealand pasture conditions. This paper summarises reproductive performance and calf growth in a spring- and autumn-calving beef herd.

MATERIALS AND METHODS

An autumn-calving herd comprising 17 Angus and 16 Friesian mixed-age cows was established at Invermay Agricultural Research Centre (latitude 45°51' S) in 1974 and maintained until 1978. A spring-calving herd comprising 40 Angus and 18 Friesian mixed-age cows was also maintained. The herds were run separately throughout the year.

The herds were set-stocked on pasture during calving and joining, and rotationally grazed on pasture through the remainder of the year. Supplements of meadow hay were fed to the cows during winter at approximately 5.5 kg dry matter (DM)/head/d to the spring-calving cows and 7 kg DM/head/d to the autumn-calving cows. Additional supplements of oats, lucerne hay, swedes or silage were fed to the autumn-calving herd during winter in 1974 and 1975.

TABLE 1 Mating, calving and weaning times for the spring- and autumn-calving herds.

Event	Spring herd	Autumn herd
Joining	November-January	May-July
Calving	August-October	March-May
Weaning	March	December

The times of joining and calving are shown in Table 1. Vasectomized bulls were run with the herds from the commencement of calving and replaced by entire bulls for the 60 d of joining. At joining, Angus and Friesian cows were run separately with 2 Angus or Friesian bulls respectively. All bulls were fitted with chinball mating harnesses and mating marks were recorded 3 times per week. The cows were weighed each month. All calves were tagged, weighed and male calves castrated at birth. Calves were weighed each month from birth until weaning. In

1978, the autumn herd was not joined with entire bulls. Instead, 2 harnessed vasectomized bulls continued to run with the herd and mating marks were recorded until August.

Differences between seasons of calving include the differences in management and nutrition between the herds. Data are reported for 4 years of observations for the 2 herds without statistical comparisons as there is no valid replication to use to test for differences between seasons of calving. Differences between breeds within seasons of calving were tested using Students *t*-test. Calving patterns were calculated as the number of cows calving in successive 21 d periods as a percentage of the total number of cows calving. Productivity was calculated as the mean weight of calf weaned (180 d) per cow joined, taking account of calf weaning percentage, birth weight and calf growth rate.

RESULTS

The 2 herds had similar patterns of liveweight change throughout the year. Cows gained weight during spring and summer to reach maximum live weights in March and then lost weight during winter to reach minimum live weights in September. Since the seasonal change in live weight for the 2 herds was similar, liveweight change in relation to calving and joining was very different (Fig. 1). The spring herd reached its minimum live weight after calving and then gained weight rapidly during joining with gains of +0.8 and +0.9 kg/d respectively for Angus and Friesian cows during joining. The autumn herd reached maximum live weight at about calving time and then lost weight before and during joining with losses of −0.6 and −0.8 kg/d for Angus and Friesian cows respectively during joining.

The mean duration of calving was 69 d for the spring herd compared with 52 d for the autumn herd. The pattern of calving in the spring herd was typical for such herds when the joining period is restricted to 60 d (Fig. 2). Only 47% of the cows calved during the first 21 d. In contrast, the calving pattern in the autumn herd was concentrated with 74% of cows calving in the first 21 d (Fig. 2).

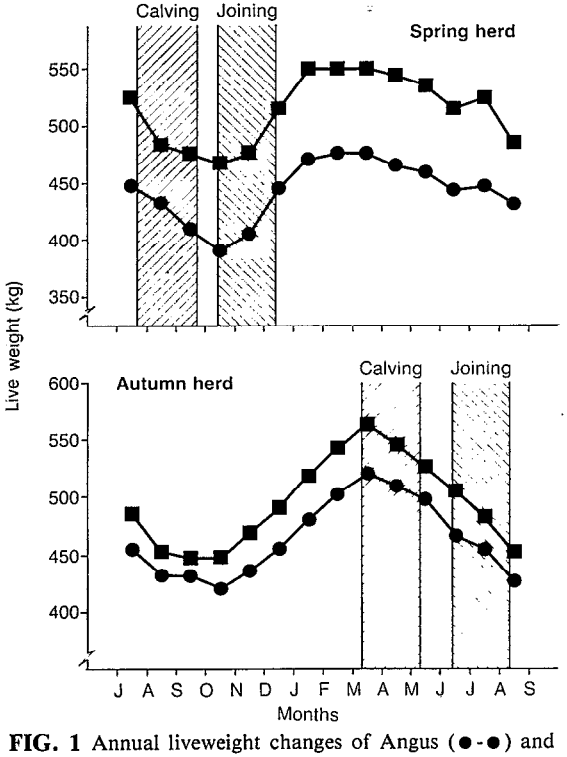

FIG. 1 Annual liveweight changes of Angus (●-●) and Friesian (■-■) cows calving in spring or autumn.

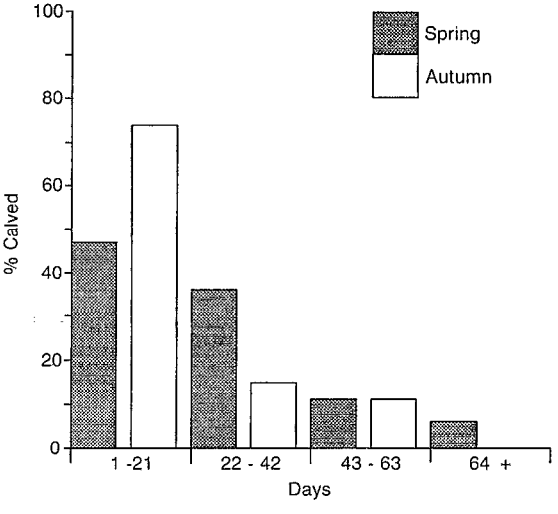

FIG. 2 Percentage of cows calving during successive 21 d periods in spring or autumn.

TABLE 2 Production from the spring- and autumn-calving herds.

Parameter	Spring		Autumn	
	Angus	Friesian	Angus	Friesian
Number of records	151	50	54	57
Calf birth weights (kg)	29	38	33	41
Barren cows (%)	12	11	12	30
Calf mortality (%)	13	10	4	4
Calves weaned (%)	77	73	82	61
Calf growth rate (kg/d)	0.84	0.98	0.66	0.79
Productivity[1]	138	157	124	111

[1]Average weight of calf weaned per cow joined.

Barrenness was similar (11-12%) with the exception of Friesian cows in the autumn herd (Table 2). The high result in this group was due to a single year when only 3 of the 13 Friesian cows conceived. Excluding the result for that year the barrenness for

the autumn-calving Friesian cows was 7%. Calf mortality (expressed as a percentage of calves born, Table 2) was lower in both breeds in the autumn herd than in the spring herd. The weaning percentage ranged from 61% for the Friesian cows to 82% for autumn-calving Angus cows, with intermediate values for the spring-calving cows. Excluding the year when 3 of the 13 Friesian cows calved the weaning percentage for autumn-calving Friesian cows was 81%.

An important result was the pattern of mating marks recorded in the winter of 1978 in non-pregnant autumn-calving cows. Mean calving date was 25 March. The cows returned to oestrus rapidly after calving and by 1 June, 85% of cows had been marked by the vasectomized bulls on at least 1 occasion. However, regular oestrous cycles ceased during winter, with no cows observed in oestrus during a period in June and July (Fig. 3). Oestrus cycles resumed in August.

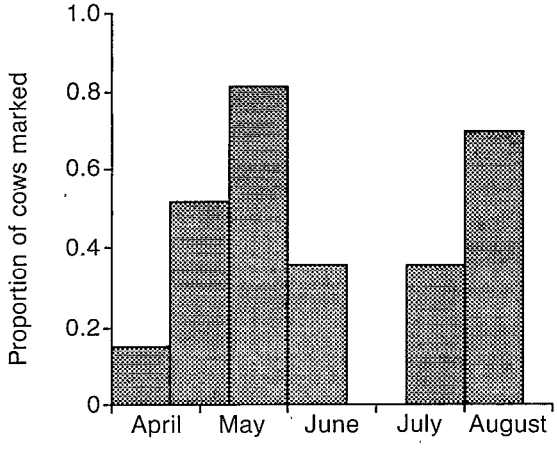

FIG. 3 Proportion of cows marked in successive 21 d periods following calving in autumn.

Within seasons of calving, Friesian calves grew faster and were heavier at weaning ($P<0.05$) than Angus calves. On average, the calves born in the autumn herd grew 20 % slower than spring-born calves. Growth rates in the spring-calving herd were similar over the years of the study, but there was considerable variation in the growth rates of the autumn-born calves. Lower growth rates were recorded when meadow hay was the only supplement fed to the cows in winter. Average daily gain was only 0.53 kg/d in the drought year 1976. When weaning percentage and weaning weight were combined into an estimate of productivity, the average weight of calf weaned per cow joined was lower for both breeds in the autumn herd than in the spring herd. The lower weaning percentage in the autumn-calving Friesian cows was a major factor in the large difference in this breed.

DISCUSSION

Calving and joining for the 2 herds occurred approximately 6 months apart and despite the different timing of demands for pregnancy and lactation, the patterns of liveweight change through the year were similar. This clearly shows the dependence of pasture based livestock production in this environment on the marked seasonal change in feed supply.

There were major differences in reproduction between the 2 herds. The autumn herd had a highly concentrated pattern of calving as a result of the much shorter post-partum anoestrous intervals previously reported from this herd (Montgomery *et al.*, 1980). Most of the cows were cycling at the start of joining and conceived during the first 21 d after the introduction of the entire bulls. However, inspite of the concentrated mating, the proportion of barren cows in the autumn herd was relatively high. In 1976 only 3 of 13 cows became pregnant. This disastrous result was probably caused by a severe drought in 1976 when the Friesian cows lost approximately 110 kg between March and June compared with a loss of 30 kg over the same period in 1975. The cows were marked early in the joining period and the high number of barren cows could have resulted from a low conception rate or a high embryonic mortality. Increased embryonic mortality has been reported in autumn calving cows fed low planes of nutrition during winter (Macfarlane *et al.*, 1978).

Results from the study of oestrous activity in the autumn herd during the winter of 1978 showed that the lactating cows resumed oestrous cycles soon after calving, but during the winter, all cows ceased cycling. Season influences reproduction in cattle (for review see Montgomery, 1985) and a major practical consideration is that the effects of season are more likely to be expressed when factors such as nutrition, age or lactation limit reproduction (Montgomery *et al.*, 1985; Knight and Nicoll, 1978; Hansen and Hauser, 1983). Thus, anoestrus recorded in the lactating cows during the winter was probably caused by the combined effects of season, poor nutrition and lactation. This result may explain why the Friesian cows that failed to conceive following the drought in 1976 were not observed in oestrus later in the joining period. If autumn-calving cows fail to conceive early during the joining period, they may become anoestrus during winter, particularly when nutrition is poor.

Barren cows averaged 12% in the spring-calving herd, similar to other published results for beef herds (see Montgomery 1978). The long post-partum anoestrous intervals reported for spring-calving herds (Morris *et al.*, 1978; Knight and Nicoll, 1978;

Montgomery *et al.*, 1980) mean that few cows are cycling at the start of joining. Therefore, during a 60 d joining period most cows have less than 3 opportunities to mate and become pregnant, resulting in a proportion of barren cows. Maintaining the same calving date and extending the joining period would reduce barreness, but cause a wide calving spread with the associated problems of feed management for the herd.

Calf birth weights in the autumn herd were higher than for Angus and Friesian calves born in spring in this and other studies (Barry, 1970; Davis, 1972, Hight *et al.*, 1971) reflecting the higher pre-calving nutrition in the autumn herd. There was no evidence of increased calving difficulty, and calf mortality was lower for both breeds in the autumn. Calves grew more slowly in the autumn herd particularly in years when meadow hay was the only supplement during winter. Calves may partially compensate for the lower milk production by increasing grazing time (Nicol and Sharafeldin, 1975), but there would be little opportunity for autumn-born calves to compensate because of limited pasture availability during winter. Since most breeding herds are run in conjunction with sheep, the increased feed requirement in autumn places autumn-calving cows in competition with breeding ewes at a time of limited pasture growth. The high winter feed requirements for autumn-calving cows could not be justified unless higher returns were achieved from the sale of calves to specialised markets.

The results suggest that neither calving time was optimal in this environment. The performance of both herds was influenced by seasonal effects on reproduction in winter, especially when combined with poor nutrition. In the spring herd the post-partum anoestrous intervals were long, the calving pattern was poor, levels of barreness and calf mortality were high, although the calves grew relatively fast. In contrast in the autumn-calving herd, the post-partum anoestrous intervals were short, the calving was concentrated and calf mortality was low. However, barreness was high particularly in some years and calf growth rates were reduced. Calving in late spring rather than late winter should ensure short post-partum anoestrous intervals (Montgomery *et al.*, 1985) that would allow cows the maximum number of opportunities to conceive in a limited joining period and result in a concentrated calving, while avoiding the problems associated with mating in winter.

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