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THE INFLUENCE OF PRE- AND POST-CALVING NUTRITION ON BEEF COW AND CALF PERFORMANCE

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SUMMARY

Three experiments were conducted with pregnant mixed-aged beef cows in a high country environment from 1973 to 1975. The 1973 experiment compared three rates of liveweight gain in winter (high, medium and low) and two rates of gain in spring (high and medium). Although different levels of winter nutrition had little effect on cow or calf performance, a high plane of spring nutrition increased weaning weights by up to 25 kg ($P < 0.01$) relative to medium plane cows. Conception rates and the proportion of cows diagnosed pregnant were also increased but differences failed to attain significance. The 1974 and 1975 experiments compared high-low and low-high systems of wintering when followed by a high level of spring nutrition. Satisfactory cow and calf performance was obtained under both systems.

INTRODUCTION

The nutrition of the beef cow before and after calving has been shown to markedly affect cow fertility and calf growth rates (Hight, 1966, 1968a). Restricting energy intakes to half N.R.C. recommended allowances after calving can substantially reduce pregnancy rates (Wiltbank *et al.*, 1962), especially if cows are in poor condition at calving (Wiltbank *et al.*, 1962; Hight, 1968a).

The objective of this study was to compare the reproductive performance and calf growth rates of cows fed varying levels of nutrition during winter and spring in an effort to establish optimum liveweight changes for beef cows in the South Island high country environment.

EXPERIMENTAL

Three experiments were conducted at Tara Hills High Country Research Station, North Otago, during 1973 to 1975. The mean annual rainfall is 500 mm and an average of 155 ground frosts are recorded during winter.

1973 EXPERIMENT

After weaning in mid-April, 147 mixed-aged Hereford, Angus and Friesian cows weighing approximately 430 kg were randomly allocated to three winter nutrition groups. One group (high plane) was fed to gain weight, while the other groups (medium and low plane) were fed to lose 5% and 10% of their weights, respectively, in the first two months after weaning. Both the medium and low groups were transferred to a rising plane of nutrition six weeks prior to calving. After calving in late September, half the cows from each treatment were randomly allocated to either a high or medium plane spring treatment.

Vasectomized bulls were joined on October 6 and replaced with entire Friesian bulls (1:37) on November 27 for a 53-day mating period. After mating, both groups were joined and managed on irrigated ryegrass/clover pastures until weaning on March 29. All weighings were preceded by an overnight fast.

1974 EXPERIMENT

One hundred and forty-two mixed-aged Hereford, Angus and Friesian cows weighing approximately 440 kg were restrictively randomized on the basis of their previous year's treatment into three groups. A high plane group was fed to gain weight until mid-winter and decline thereafter until calving. The medium and low plane groups were managed in a similar manner to the 1973 experiment. After calving, all groups were joined and managed under a high plane of nutrition. Mating and weaning dates were similar to the 1973 experiment.

1975 EXPERIMENT

In mid-April, 100 pregnant mixed-aged Hereford and Friesian \times Hereford cows weighing approximately 450 kg were divided into two groups. One group (high-low) was fed to gain live-weight during the first half of winter and lose thereafter until calving. The other group (low-high) was fed to lose weight initially but recover this weight during the last two months of pregnancy. After calving, both groups were joined and managed on a high plane of nutrition on irrigated pastures. Teaser bulls were joined on October 9 and replaced with entire Friesian bulls on November 20 for a 42-day mating period. Calves were weaned on April 7.

RESULTS AND DISCUSSION

1973 EXPERIMENT

High plane cows gained 52 kg (12% of their weaning weight) by calving (Fig. 1), while medium and low plane cows lost 5 and 10.6%, respectively, during the first 10 weeks after weaning. However, an improved level of nutrition six weeks prior to calving resulted in full recovery of medium plane cows (2.5% heavier at calving) and partial recovery in low plane cows (0.7% lighter at calving). Immediately before calving, high plane cows were 56 kg heavier than low plane cows. Cows fed a high plane of nutrition during spring gained 1.0 kg/head/day compared with 0.4 kg/head/day in medium plane cows.

The effect of winter and spring nutrition on cow and calf performance is shown in Table 1. While levels of winter nutrition had no significant effect on calf growth rates, high levels of nutrition in spring resulted in 25 kg heavier calves at weaning ($P < 0.01$). The importance of optimum spring nutrition was also demonstrated by Hight (1968a), especially when inadequate spring nutrition was preceded by poor winter nutrition.

Cows fed a high plane of nutrition in winter came into oestrus earlier than medium or low plane cows ($P < 0.01$), although conception rates and the proportion of cows diagnosed pregnant at weaning were little different. A high level of nutrition during spring failed to advance the onset of oestrus but did

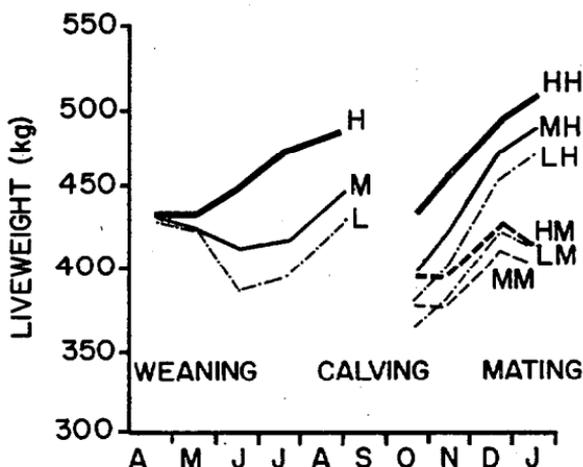


FIG. 1: Effect of winter and spring nutrition on mean cow liveweight changes, 1973.

TABLE 1: EFFECT OF WINTER AND SPRING NUTRITION ON COW AND CALF PERFORMANCE 1973

Plane of Nutrition	Birth Weight (kg)	200-day Adj. WW (kg)	Onset of Oestrus (days)	Cows in Oestrus (cycle 1) (%)	Cows Conceived (cycle 1) (%)	Cows Pregnant (%)
Winter:						
High	35 a	211 a	52 a	90.5 a	57.8 a	85.7 a
Medium	35 a	203 a	59 b	74.4 a	75.0 a	79.1 a
Low	35 a	201 a	67 c	78.0 a	75.0 a	87.8 a
Spring:						
High	35 a	219 a	61 a	87.4 a	76.3 a	88.9 a
Medium	36 a	194 b	58 a	74.6 a	59.5 a	79.4 a

abc $P < 0.05$

increase the proportion of cows pregnant at first service ($P < 0.05$). By the end of mating, however, the advantage failed to attain significance. Mean calving dates in 1974 were similar for all treatments.

The data suggest that, provided a high level of nutrition is maintained in spring, economies in winter feeding can be made by restricting liveweights in mid-pregnancy. It would appear essential, however, to lift the level of nutrition at least six weeks prior to calving, since each 10 kg increase in post-calving liveweight was associated with a 0.84 day (± 0.39) earlier onset of oestrus and 1.7 kg (± 0.7) increase in calf weaning weight.

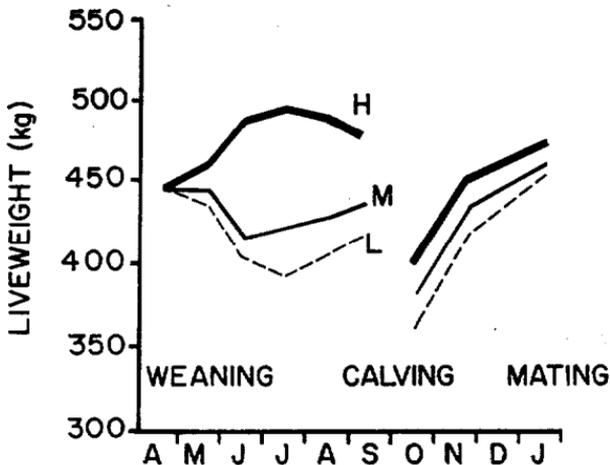


FIG. 2: Effect of winter nutrition on mean cow liveweight changes, 1974.

1974 EXPERIMENT

During the first 86 days after weaning, high plane cows increased liveweights by 11.1%, but declined thereafter and by calving were only 6.8% heavier than at weaning (Fig. 2). Medium plane cows lost 5.2% during the first 86 days after weaning, but recovered most of this weight by calving. Low plane cows lost 12.2% initially, but by calving were only 6.1% lighter than at weaning. From calving until the end of mating in mid-January, all groups gained approximately 0.85 kg/head/day.

TABLE 2: EFFECT OF WINTER NUTRITION ON COW AND CALF PERFORMANCE 1974

<i>Plane of Nutrition</i>	<i>Birth Weight (kg)</i>	<i>200-day Adj. WW (kg)</i>	<i>Onset of Oestrus (days)</i>	<i>Cows in Oestrus (cycle 1) (%)</i>	<i>Cows Conceived (cycle 1) (%)</i>	<i>Cows Pregnant (%)</i>
High	35 a	193 a	59 a	97.4 a	81.0 a	92.1 a
Medium	35 a	197 a	60 a	94.8 a	86.4 a	100.0 a
Low	34 a	198 a	63 a	94.7 a	77.7 a	92.1 a

There was little effect of winter treatment on calf growth rates or on oestrus and conception rates (Table 2). However, there were more cow deaths in the high plane treatment (6.3%) than either the medium (4.2%) or low plane treatments (0%). As these deaths were associated with metabolic upsets it would appear important to have a reasonable level of nutrition during or near calving if cow mortality is to be avoided.

The finding that high plane cows were able to tolerate a live-weight loss six weeks prior to calving without significant detriment to either reproductive capacity or calf growth rates appears to be at variance with the results of Hight (1968a). However, high plane cows in this experiment were up to 90 kg heavier in mid-winter than Angus cows in the Whatawhata experiments and lost only half the amount of liveweight in the last eight weeks of pregnancy.

1975 EXPERIMENT

High-low plane cows gained 53 kg or 9.5% during the first nine weeks after weaning (Fig. 3) but were fed to lose weight thereafter and by calving were only 1.5% heavier than at weaning. Low-high plane cows lost 16 kg (3.5%) within 9 weeks of weaning, but recovered practically all of this deficit during the

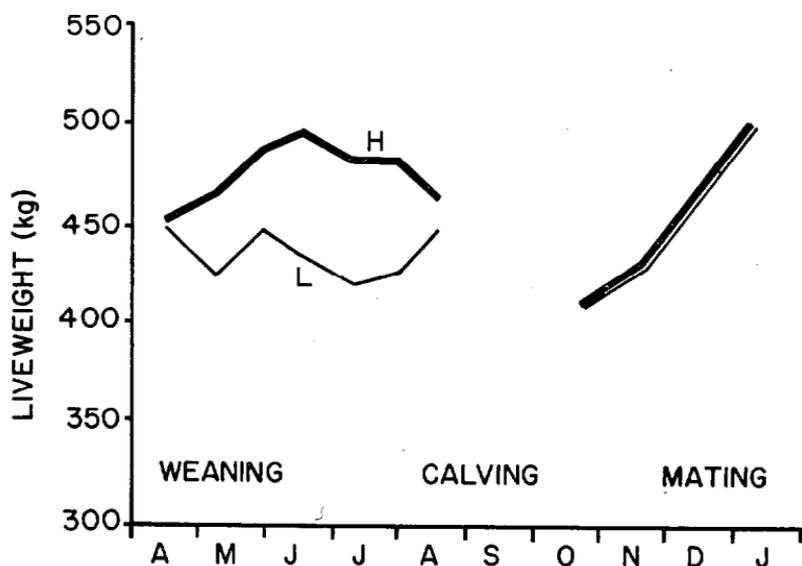


FIG. 3: Effect of winter nutrition on mean cow liveweight changes, 1975.

last eight weeks of pregnancy. Mean liveweight gains from calving until the end of mating in mid-January were 1.2 kg/head/day for both groups.

There was little consistent effect of winter nutrition on calf or cow performance (Table 3). As with the 1974 experiment, it would appear that, provided cows are well fed in early winter and spring, a decline in liveweight prior to calving can be tolerated. This system (high-low) may be preferable to that of post-weaning liveweight restriction followed by recovery prior to calving (low-high), since the low-high system requires a carry-over of autumn herbage to the late winter with associated loss of digestible dry matter (Allen *et al.*, 1976).

TABLE 3: EFFECT OF WINTER NUTRITION ON COW AND CALF PERFORMANCE 1975

Plane of Nutrition	Birth Weight (kg)	200-day Adj. WW (kg)	Onset of Oestrus (days)	Cows in Oestrus (cycle 1) (%)	Cows Conceived (cycle 1) (%)	Cows Pregnant (%)
High-Low	33 a	217 a	71 a	83 a	64 a	87 a
Low-High	36 b	216 a	67 a	94 a	73 a	90 a

In order to avoid tussock damage associated with feeding cows to lose liveweight in the high country environment, it may be more acceptable to allow cows to enter the winter in good condition and attempt to hold them in this condition until calving. This would involve minimal supplementation and less risk of cow mortality associated with inclement weather.

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