

WINTER-SPRING NUTRITION AND MANAGEMENT EFFECTS ON EWE AND LAMB PERFORMANCE

D.C.SMEATON and P.V.RATTRAY
*Whatawhata Hill Country Research Station,
MAF, Hamilton.*

Abstract

Aspects of the above theme were investigated in 5 trials. Trial 1 compared the effects of high and low nutrition during pregnancy and lactation on ewe and lamb production. Ewe live weight was substantially affected by nutrition treatment during pregnancy but carry-over effects on live weight at weaning were small. Nutrition during lactation strongly affected both lamb and ewe weaning weights. Ewe and lamb losses were not affected by nutrition at any stage. The results implied that ewes can be quite severely restricted on pasture during pregnancy in order to save feed for the much more important lactation period.

Trials 2 and 3 investigated the management of ewes fed at maintenance levels in mid-pregnancy. The treatments consisted of various grazing durations where the ewes were shifted from one pasture break to another after a specific grazing duration, as defined by their treatment. These treatments consisted of grazing durations ranging from 3 to 56 days. Liveweight differences occurred during the 56-day trial period but at the end there was only 2.5kg difference between extreme treatments. This suggests that where ewes are on restricted feeding during pregnancy to conserve pasture reserves, grazing duration has little consistent impact on final ewe live weight and performance. However, for several reasons, a shorter duration (3-7 days) is preferred.

Trials 4 and 5 compared several winter-spring management treatments. Ewes on a 35day (short) rotation during pregnancy versus those on a 70day (long) rotation had less pasture on their farm|et at lambing (930 v. 1030 kg/ha). As a consequence the short rotation ewes were 1.5 kg lighter at weaning. Their lambs were 2.3 kg lighter. In another comparison, set-stocking ewes 4 weeks before lambing compared with at lambing disadvantaged the ewes and lambs by 2-3 kg at weaning. The ewes set-stocked 4 weeks before lambing had consumed most of their winter reserves by lambing. In Trial 5, rotational grazing after lambing until weaning *versus* set-stocking, disadvantaged the ewes and lambs by 4 and 3 kg respectively at weaning. This was probably because the rotation length of 21 days in the rotational group was too long.

Management implications from these results are discussed.

Keywords: winter, spring, nutrition, grazing management, ewes, lambs, pregnancy, lactation, grazing duration, rotational grazing, set stocking.

INTRODUCTION

Seasonal changes in both pasture growth and the feed requirements of the breeding ewe are the basis for adopting lambing dates that attempt to match the increasing feed requirements of the ewe at lambing time with the onset of spring pasture growth (Rattray, 1978). However, the onset of spring pasture growth is quite variable. Furthermore, farmers may be forced to lamb their ewes before spring pasture growth commences in order that their lambs are well grown before the onset of the drier summer period. Hence, the need to first, carefully identify the "marginal returns" to feeding the ewe during pregnancy and lactation and secondly, identify the responses to management strategies which endeavour to allocate and transfer pasture reserves into deficit periods. Results of Coop (1950), Monteath (1971), Rattray *et al.* (1982a, b) and Rattray & Jagusch (1978) all suggest that responses to nutrition in terms of ewe and lamb weaning weights are much greater during lactation than they are during pregnancy. Most farmers

restrict their ewes for one reason or another at some time during pregnancy. However the type of management required, levels of restriction that can be tolerated, and the influence of ewe weight on responses require further elucidation. Responses to the allocation of pasture reserves in the 3-4 weeks before and after lambing are also unknown. This paper describes 5 trials which investigated aspects of these questions.

METHODS AND MATERIALS

During the winter-spring period of 1980, 1981 and 1982, mixed-age, pregnant Romney and Coopworth ewes ($n = 40-50$ per treatment) were involved in the following trials.

Trial 1 was a $2 \times 2 \times 2$ factorial design in which the ewes ($n = 400$) were randomly allocated to either high or low feeding levels (Table 1) during mid-, late-pregnancy and lactation. That is, the ewes followed one of eight different feeding pathways during the trial. The trial started on May 25 (mean liveweight 49 kg) and finished at weaning on November 13, 1981.

Trials 2 (1980) and 3 (1982) each comprised 4 treatments replicated twice ($n = 300$). Each treatment was a different grazing duration (number of days per break, Table 2). The trials were designed to investigate the effects of frequency of shifting ewes restricted during mid-pregnancy. All treatments were offered the same average pasture allowance (approximately maintenance) and included adjustments made for pasture growth.

Trials 4 (1981) and 5 (1982) investigated the differences between several grazing management treatments before and after lambing at stocking rates of 12, 18 and 20 ewes per ha. The ewes were allocated to their treatments in mid-pregnancy and were run in self-contained farmlets until weaning. The treatments were (1) rotationally grazing the ewes on a long rotation (70 days) to within a day or two of lambing, when they were set stocked until weaning; (2) the same as (1) except that set-stocking commenced 4 weeks before lambing; (3) the same as (1) except that the rotation length was 35 days instead of 70; and (4) the same as (1) except that the ewes were rotationally grazed with their lambs after lambing. Trial 4 contained treatments (1) and (2) with each treatment run at 12 or 20 ewes/ha. Trial 5 contained Treatments 1, 2, 3 and 4 run at 18 ewes/ha.

In all the above trials, pasture mass was measured (when appropriate) by a double sampling technique incorporating pasture cuts with visual assessment (Smeaton *et al.*, 1983a). Live weights and survival of ewes, and lambs, were recorded throughout the trials. Docking and weaning occurred approximately 6 and 12 weeks after lambing, respectively.

Trials 1 and 4 have been briefly described by Smeaton *et al.* (1983b).

RESULTS AND DISCUSSION

Trial 1: Effects of nutrition on ewes during pregnancy and lactation

At the end of the mid-pregnancy treatment (Table 1) ewe live weight had been substantially affected, such that the low nutrition ewes were 12.2 kg lighter than the high nutrition group. This effect, although much smaller (3.3 kg), was still significant at weaning. The nutrition treatments in late-pregnancy were less extreme (Table 1) but they still generated a difference of 6.8 kg at lambing which had a significant carry-over effect of 2.2 kg at weaning. Weaning weight, however,

Table 1: RESIDUAL HERBAGE LEVELS (kg DM/ha) AND EFFECTS OF NUTRITION ON EWE AND LAMB LIVEWEIGHTS (TRIAL 1)

Nutrition treatment	Period when nutrition treatment applied								SED
	Pregnancy		Late-		Lactation				
	Low	High	Low	High	Low	High	Low	High	
Residual herbage (kg)	250	1000	300	800	450	600			
Ewe LW (kg)									
— day 100 of pregnancy	44.0	***	56.2	—	—	—	—	—	0.2
— at lambing	53.6	***	59.1	52.9	***	59.7	—	—	0.3
— at docking ²	43.6	***	46.5	44.0	***	46.1	42.4	***	47.6
— at weaning	45.2	***	48.5	45.7	***	47.9	44.5	***	49.2
Lamb LW (kg)³									
— at lambing	5.1	**	6.0	5.6	***	6.1	—	—	0.1
— at docking	14.0	**	16.0	14.7	NS	15.3	13.7	***	16.3
— at weaning	21.5	**	23.7	22.3	NS	23.0	20.6	***	24.6

¹ Herbage mass under set-stocking: low nutrition, 20 ewes/ha; high, 16 ewes/ha.

² End of lactation nutrition treatments.

³ Litter weights; adjusted to 1.25 lambs/ewe.

NS non-significant

, * significant at P<0.01 and P<0.001 respectively.

was affected most (difference = 5.7 kg) by nutrition during lactation; though the differences between the nutrition treatments, as indicated by herbage mass at docking, were the least extreme of all the three treatment periods (Table 1). Even more striking, were the effects on lamb litter weights. Nutrition during mid-pregnancy had small effects on litter birth weights (similar to Davis *et al.*, 1981) and weaning weights but again, the effects were smaller than those caused by nutrition during lactation (confirming the results of Coop, 1950; and Rattray *et al.*, 1982 a, b).

Table 2: EFFECTS OF GRAZING DURATION IN MID-PREGNANCY ON SUBSEQUENT EWE PERFORMANCE (TRIALS 2 and 3)

	Trial 2				Trial 3			
	3	9	27	54	3.5	14	28	56
Grazing duration (days)								
Lambs born/ewes lambing (%)	131	132	136	123	130	130	123	136
Lambs weaned/lambs born (%)	91	75	90	94	86	89	90	89
Ewes lambing/ewes present (%)	84	92	92	94	78	75	79	84

Table 3: INTERACTION OF NUTRITION TREATMENTS DURING MID-, LATE-PREGNANCY AND LACTATION ON EWE AND LAMB WEANING WEIGHTS (TRIAL 1)

Nutrition Treatment	Weaning Weight	
	Ewe	Litter ¹
LLH ²	46.2	25.2
LHH	48.4	24.7
HLH	49.2	25.6
LLL	42.1	20.3
HHH	54.0	28.5
SED	1.1	1.3
Significance of interaction	*	*

¹ 1.25 lambs *per ewe*

² Nutrition treatments during mid-, late-pregnancy and lactation respectively; L = low, H = high nutrition (see Table 1).

* P<0.05

Provided the ewes and lambs were well fed in lactation, various combinations of nutrition during pregnancy had little effect on either ewe or lamb weaning weights (Table 3). Ewes in poor condition (LLH 44.0 kg) at day 100 of pregnancy had similar weaning weights to those in good condition (HLH — 56.2 kg). The only exceptions were where nutrition was high (or low) through pregnancy and lactation — situations unlikely to occur in practice except in extreme conditions. So, even ewes in poor condition and restricted during pregnancy would still perform well if they were fed well in lactation.

At no stage did any of the treatments affect ewe or lamb losses or lambing percentage (averages for the trial were 2, 10 and 125% respectively). This was despite the fact that one group (LL-) had an average live weight of only 49.5 kg at lambing equivalent to a conceptus-free weight of about 41 kg.

Not tested in this trial, however, was the situation farmers can be faced with where twinning ewes are suffering from pregnancy toxaemia in the last month of pregnancy. Under these circumstances these ewes should probably be fed pasture reserves immediately with some shortfall accepted in early lactation. Furthermore, ewes at very light weights in mid-pregnancy (say <40 kg average, conceptus-free) may require more favourable treatment during pregnancy to avoid catastrophic outbreaks of metabolic diseases. These situations require further research.

Trials 2 and 3: Effects of grazing duration on ewes during pregnancy

Grazing duration had no consistent effect on final live weight at the end of the treatment period (similar to Jagusch *et al.*, 1981), or on subsequent ewe performance in either trial (Table 2). However, live weight during the trial (Fig. 1) was affected ($P < 0.05$). The ewes on the long durations consumed the bulk of their pasture in the early part of their grazing period and gained weight which they subsequently lost in the latter part of their grazing period (Fig. 1). In the

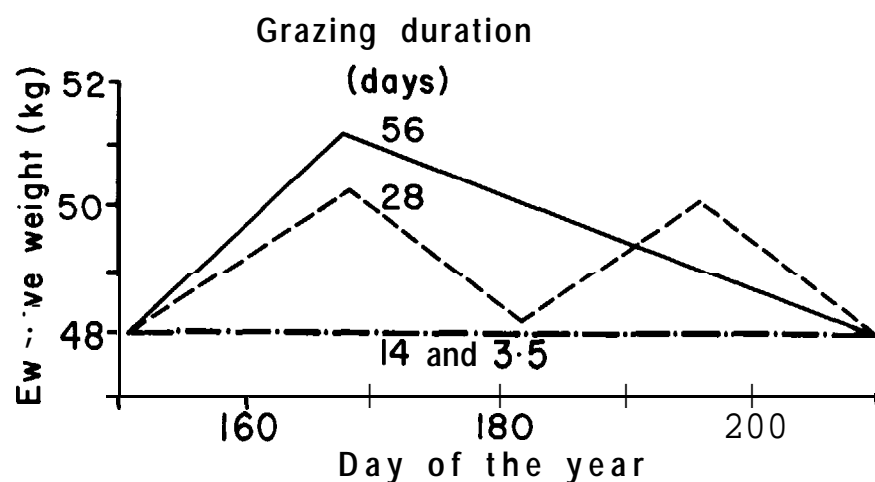


Figure 1: Effects of grazing duration during mid-pregnancy on ewe liveweight (Trial 3 stylised).

latter stages their intake must have comprised mostly pasture regrowth. Sheath (1982) demonstrated that the longer the grazing duration, the more rapidly

(relative to the total duration) the final paddock residual was approached. Hence, the longer the grazing duration, the greater the proportion of time that the sheep would be grazing at close to their final residual herbage mass. As described by Sheath and Bircham (1983) and Smeaton (1983), the tendency for the manager under these circumstances would be to shift the ewes sooner than desired. The end result; loss of control of winter rationing and no pasture reserves saved for lambing. The ewes, fed better than necessary in early to mid-pregnancy, run out of feed just prior to lambing. On this basis grazing durations of less than 7 days seem desirable.

Trials 4 and 5: Grazing management effects during pregnancy and lactation

At 20 ewes/ha (Trial 4, Table 4) the ewes set-stocked 4 weeks before lambing had consumed their pasture reserves by lambing compared with the other ewes. There was a stocking rate by management interaction at lambing ($P < 0.001$) and weaning ($P < 0.01$). Apparently, management was important only at high stocking rates. Lamb live weights were affected in the same fashion (Table 4).

In Trial 5 (Table 5) comparison of the first two treatments shows a very similar effect to that seen at the high stocking rate in Trial 4. The ewes set-stocked 4 weeks before lambing had consumed most of their pasture reserves by lambing. Although they were heavier at lambing they and their lambs were lighter (2 kg) at weaning, compared with the ewes set-stocked at lambing. These results confirmed those of Trial 1 where nutrition level during lactation was of greater importance than that before lambing.

Table 4: THE EFFECTS OF TIME OF SET-STOCKING PRIOR TO LAMBING ON HERBAGE MASS AND WEANING WEIGHTS (TRIAL 4)

Stocking rate	Time of set-stocking	Herbage mass at lambing (kg/ha)	Liveweight (kg)		
			-lambing	-weaning	Litter ¹ -weaning
20	4 weeks pre-lamb	310	62.2	51.4	22.1
	At lambing	820	59.2	54.0	25.2
12	4 weeks pre-lamb	610	62.1	58.8	25.8
	At lambing	690	62.3	58.8	26.4
SED			0.6	0.8	0.8

¹ 1.25 lambs/ewe.

Contrasting the long and short rotations (Table 5) demonstrated the need to have a winter rotation that was long enough to ensure pasture reserves were transferred through to lambing. In fact comparisons of the first three management treatments supports results of Bircham (1983), who reported a positive relationship between herbage mass at lambing and subsequent weaning weights of both ewes and lambs.

Comparison of treatments 3 and 4 in Table 5 shows rotational grazing during lactation (as practised in this trial) to be disadvantageous. It produced a very high herbage mass at weaning but the ewes and lambs were lighter than in any of

Table 5: EFFECTS OF MANAGEMENT TREATMENT (AT 18 EWES/HA) DURING PREGNANCY AND LACTATION ON AVERAGE HERBAGE MASS (PER FARMLET), AND EWE AND LAMB LIVEWEIGHTS (TRIAL 5)

Management treatment ¹	Average herbage mass (kg DM/ha)			Ewe liveweight (kg)		Lamb liveweight ² (kg)	
	4 wks pre-L	At L	At weaning	At L	Weaning	At L	Weaning
70-day rotation pre-L; SS 4 weeks pre-L.	940	490	1220	67.2	58.4	6.8	32.2
70-day rotation pre-L; SS at L	860	1030	1930	61.3	60.0	6.5	34.3
35-day rotation pre-L; SS at L	870	930	700	65.6	59.4	6.7	33.0
70-day rotation pre-L; RG post-L.	840	1030	3300	62.4	57.4	6.5	30.4
SED	140	120	350	0.5	0.9	0.2	1.2

¹ L = lambing; SS = set stock; RG = rotationally grazed.

² Litter weights; 1.50 lambs per ewe.

the other management treatments. The pasture surplus developed probably because they were not shifted into fresh paddocks soon enough, or because the pasture became less palatable. The rotation length of 21 days may not have been fast enough to encourage maximum animal intake when pasture growth rate was rapid. Milligan (1981) recommended a rotation length of 20 days with the rotation starting as soon as possible after lambing to build up herbage levels as rapidly as possible. He cited an advantage to rotational grazing over set-stocking during lactation of 3 kg in ewe weaning weight and a marginal improvement in lamb weights. However, Trial 5 demonstrated that care would be required to ensure that the rotation length was short enough once the pastures were growing rapidly. Sheath and Bircham (1983) suggested a 15-20 day rotation as an option which might allow pasture cover and production to increase in early lactation if average herbage mass levels were low (<1000 kg DM/ha).

CONCLUSIONS

The results from Trial 1 demonstrated that although nutrition during pregnancy can have carry-over effects on ewe and lamb weaning weights, these effects are smaller than the effects of nutrition during lactation. The performance of the ewes following the mid-pregnancy treatments indicated that regardless of body condition over a wide range, ewes could be fed at low levels during pregnancy with little ill effect on subsequent performance. The implications were that it would be desirable to conserve feed reserves by restricting ewes during pregnancy through the adoption of long rotations during winter.

Trials 2 and 2 demonstrated that ewes restricted to a maintenance level of feeding during pregnancy — necessary to achieve the objectives of the above implications — could be rotationally grazed with grazing durations per paddock of 3-50 days without any ill effects on subsequent performance. This is provided the correct grazing durations (especially on long grazings) could be determined and adhered to. Because this would be increasingly difficult with increasing duration length, a practical limit of 7 days is suggested. Paddock subdivision should be adequate to enable this limit to be adhered to. As a cautionary note, these results were not tested in late pregnancy.

Trials 4 and 5 demonstrated the importance **first** of delaying set-stocking for lambing until as close to lambing as possible. Identification of correct lambing times would assist this to ensure that only those ewes immediately about to lamb were set-stocked. This has been already achieved in practice by some farmers by the use of mating harnesses with frequent (weekly) colour changes — at least in the first mating cycle. **Secondly**, that the winter rotation should be long enough to ensure adequate reserves are carried through to lambing. **Thirdly**, that rotational grazing might be advantageous if feed was very short in early lactation but set-stocking would probably otherwise be better as it should (a) maximise pasture intake by the ewes and lambs, and (b) make the avoidance of developing pasture surpluses simpler. Trial 4 indicated that the above management effects were likely to occur only at high stocking rates, as has been observed elsewhere in other grazing management studies (McMeekan and Walshe, 1963). That management effects occurred at all as in these trials, is in contrast to the summer period where concurrent animal responses to variation in grazing management (e.g. hard or lax grazing during the summer and subsequent mating performance) have been small (Smeaton, 1983; Sheath & Bircham, 1983) although carry-over effects have occurred (Sheath *et al*, 1984).

Finally, these trials have also demonstrated that winter grazing management can influence ewe and lamb weaning weight. This in turn can affect ewe live weight at the following mating (Smeaton *et al.*, 1983a). These carry-over effects require careful consideration in animal management decisions.

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