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LAMB GROWTH RATE ON PASTURE : EFFECT OF GRAZING MANAGEMENT, SWARD TYPE AND SUPPLEMENTATION

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Research Centre, Athenry, Co. Galway

Lamb Growth Rate On Pasture : Effect Of Grazing Management, Sward Type And Supplementation

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SUMMARY

In spring-lambing flocks an important objective is to achieve high lamb growth rate on pasture so that most lambs are drafted for slaughter by September. Lamb growth rate can vary greatly depending on the type of pasture being grazed. A series of grazing trials was carried out to assess the effect of pasture type, sward height, herbage allowance and concentrate supplementation on lamb growth rate pre and post weaning.

Sward height was a useful indicator of the suitability of pasture for sheep grazing. A height of about 6 cm was near optimum for set stocking until late May. A decline in lamb growth rate frequently experienced in the month pre-weaning in June can largely be prevented if sward height is increased to 6 to 8 cm, or the flock grazed on aftergrass at a similar height.

With rotational grazing, tight grazing to a residual sward height of 4 cm was beneficial in preventing the pasture becoming stemmy in June but reduced lamb weaning weight. Tight grazing in April when pasture is leafy is less restrictive on lamb growth than in June when the base of the sward is more stemmy. Post grazing heights of 4, 5 and 6 cm for April, May and June respectively, are suggested as a guide in order to achieve high lamb growth.

There was a response to creep-feeding lambs. When concentrates were offered at 250 g/lamb/day from age 5 to 14 weeks the extra liveweight at weaning was associated with feed conversion ratios of 4.4 to 6.3

Creep grazing increased lamb weaning weight by over 2 kg and facilitated grazing the pastures tightly in June without penalising lamb growth.
Lamb growth to weaning was better on pasture not grazed by sheep in the previous year and this benefit was at least partly attributable to lower level of parasites on the pasture.

Lamb growth rate on pasture post-weaning varied greatly, from under 100 to over 200 g/day depending on the type of pasture grazed. For set stocking a sward height of 8 to 9 cm was required to maximise lamb growth. For rotational grazing, swards should be grazed down to about 6 cm. However the effect of sward height is modified by previous grazing management, in that tight grazing pre-weaning results in a more leafy pasture and higher lamb growth at comparable sward heights post-weaning.

Pasture type also affected lamb growth. There was little difference between old permanent pasture and a mainly perennial ryegrass pasture when grazed at similar sward heights, or when lambs were given similar herbage allowances. However growth rates were considerably higher on grass/clover swards at equivalent allowances or similar sward heights.

There was a close relationship between herbage allowance and lamb growth, with highest growth rate achieved at an allowance of about 5 kg of dry matter per lamb per day. Concentrate supplementation of weaned lambs on pasture (at 250 to 550 g/lamb/day) increased liveweight, carcass weight and kill-out proportion. Response to concentrates was slightly better on short grass. Feed conversion ratio for carcass gain ranged from 7 to 12 on short grass, 7 to 20 on long grass and was 14 when concentrates were offered *ad libitum*. Concentrate supplementation resulted in a higher proportion of lambs being drafted off pasture by late September (90 to 100 %) compared with 60 to 65% for lambs on grass only.

INTRODUCTION

The majority of lowland flocks in Ireland are lambed in spring to coincide with the onset of grass growth. The objective with mid-season lamb production is to achieve high lamb growth rate on grazed grass and to produce finished lamb for sale from June through to October/November. Remaining lambs may be finished over winter on a variety of diets. Many factors affect the growth rate of lambs on pasture and the resulting drafting pattern of lambs over the season. These include stocking rate and fertiliser N use, type of pasture, clover content, sward height, herbage allowance, grazing system and supplementation with concentrates. Low lamb growth rates may occur at any time during the season: in early spring due to grass scarcity; pre-weaning in June due to changes in pasture quality, and quite frequently post weaning due to pasture supply or quality.

A series of grazing trials was carried out to provide information in relation to these aspects of grazing management for sheep throughout the season. The objectives were to develop improved guidelines for grazing management for both set stocking and rotational grazing, and to define the sward conditions that would give predictable lamb growth rates.

LAMB GROWTH PRE-WEANING

Effect of sward height, pasture type and lamb dosing

The objective of this study was to determine the effect of sward height, pasture type and lamb dosing frequency on lamb growth rate from birth to weaning in a set-stocking system. Ewes with a mean lambing date of 19 March were put out to pasture within a few days of lambing. There were 18 groups with 9 ewes and 14 or 15 lamb per group. The treatments compared were;

Pasture types: an old pasture, previously grazed by sheep (old pasture): a reseeded pasture, also grazed by sheep in the previous year (new pasture); and old pasture previously grazed by cattle only (cattle pasture).

Pasture height: Each pasture type was maintained at 3 different heights, 3 to 4 cm, 5 to 6 cm and 8 to 9 cm.

Lamb dosing: Lambs in one replicate received standard anthelmintic dosing at 5 and 10 weeks of age, while lambs in the second replicate received extra doses at 7½ and 12 weeks.

Mean pasture heights (cm), measured weekly, were 3.7, 5.9 and 9.5 in year 1 and 3.5, 5.6 and 7.8 in year 2. Soil temperatures in April of year 2 were about 2°C lower than in year 1 and this delayed the attainment of target heights.

Pasture type had a significant effect on lamb growth (Table 1). Weaning weight was about 10% higher on cattle pasture in year 1 with the improved lamb growth occurring in the 5- to 14-week age interval. Differences between pastures were less clear-cut in year 2 but growth rates were somewhat lower on the new pasture. Faecal egg counts in lambs, total worm counts in tracer lambs and pasture larval counts indicated a lower level of parasite challenge on the cattle pasture in April to June of year 1. This may largely account for the higher lamb growth rate on this pasture at that time. However intensive dosing of lambs gave no significant response in lamb growth compared with the normal dosing at 5 and 10 weeks.

Pasture height also had a significant effect on lamb growth on all pastures and in both years (Table 2). A height of about 6 cm was near optimum for set stocking until late May when lambs were 10 weeks of age. Growth rates from 10 to 14 weeks were much lower on all swards and there was a response to increasing sward height in year 2 only. It is

evident that there was a difficulty in optimising sward height in late May and June in order to prevent a decline in lamb growth rate in the month pre-weaning. In particular, if pastures are under-grazed in May they become stemmy in June with a consequent reduction in lamb growth rate.

In conclusion, a sward height of about 6 cm was near optimum in April/May. Some adjustment in sward height is required in June to prevent a decline in lamb growth pre-weaning. Lamb growth rate to weaning was higher on old pasture not previously grazed by sheep and this is likely to be due largely to a reduced parasite challenge on this pasture. Intensive dosing of lambs pre-weaning gave no response over normal dosing.

Table 1: Effect of pasture type on lamb weaning weight (kg) and growth rate (ADG; g/day)

Year	Trait	Pasture type		
		Old pasture	**New pasture**	**Cattle pasture**
1	Weaning weight	30.6	30.8	33.8
	ADG 0 to 5 weeks	294	284	300
	ADG 5 to 10 weeks	266	265	315
	ADG 10 to 14 weeks	232	252	270
2	Weaning weight	33.1	32.0	33.4
	ADG 0 to 5 weeks	300	300	307
	ADG 5 to 10 weeks	316	306	327
	ADG 10 to 14 weeks	260	240	251

Table 2: Effect of pasture height on lamb weaning weight (kg) and growth rate (ADG; g/day)

		Pasture height		
Year	**Trait**	**Low**	**Medium**	**High**
1	Weaning weight	29.5	32.6	33.2
	ADG 0 to 5 weeks	273	297	308
	ADG 5 to 10 weeks	237	299	310
	ADG 10 to 14 weeks	254	251	249
2	Weaning weight	31.0	33.1	34.4
	ADG 0 to 5 weeks	278	313	315
	ADG 5 to 10 weeks	297	322	329
	ADG 10 to 14 weeks	239	242	270

Effect of post-grazing sward height and supplementation

This factorial trial, repeated over 2 years, was undertaken to determine the effect of post-grazing sward height and concentrate supplementation on lamb growth rate to weaning at 14 weeks. Lambs born to yearling mothers in March/April and reared as singles grazed rotationally around 4 paddocks. Stocking rates were 30, 25 and 20 ewes/ha and post grazing heights were <3.5, 4.5 and 6.0 cm respectively. A concentrate supplement (250 g/day) was offered to the ewes in one replicate during the first 5 weeks of lactation. Between 5 and 14 weeks a similar amount was offered to their lambs.

Very tight grazing restricted lamb growth. The effect was evident at 5 and 10 weeks but was most pronounced at weaning (Table 3). This suggests that tight grazing in April/May, when pastures are leafy, is less restrictive on lamb growth than in June when pastures tend to be more stemmy. Tight grazing was beneficial in terms of pasture quality, as digestibility values decreased with increasing post-grazing sward height.

Concentrate supplementation to the lambs increased weaning weight, particularly with tight grazing to 3.5 or 4.5 cm but there was no significant response at the 6 cm height (Table 3).

Sward height had a significant effect on ewe liveweight and condition score up to 10 weeks of lactation, but differences at weaning were not significant. Supplementation of the ewe affected neither bodyweight nor condition score.

Table 3: Effect of post-grazing sward height (cm) and concentrate supplementation (g/day) on lamb liveweight

	Lamb Age (weeks)		
	5	**10**	**14**
Sward height			
<3.5	12.5	21.2	26.3
4.5	12.6	21.3	27.0
6.0	13.2	22.7	29.2
Concentrate level			
0	12.6	21.4	26.7
250	12.9	22.1	28.1

In conclusion a rotational grazing system with very tight grazing restricted lamb growth rate to weaning, and ewe bodyweight and condition up to 10 weeks of lactation, but was beneficial in terms of higher pasture digestibility. Concentrate supplementation of lambs increased weaning weight with tight grazing to 3.5 or 4.5 cm.

Effect of grazing management on lamb growth in June

The growth rate of spring born lambs, between 10 and 14 weeks of age (late May to early July) is often much lower than in the period up to 10 weeks of age. Typically the decline is from about 295 to 220 g/day, but rates of the order of 175 g/day have been recorded at this time. This results in reduced weaning weight, fewer lambs drafted at weaning and

delays the mean sale date by 2 to 3 weeks. A series of grazing trials was carried out (over 4 years) with the objective of improving lamb growth rate pre-weaning. The trials were for periods of 24 to 36 days from late May to mid July.

Experiment 1: The effects of 3 perennial ryegrass pasture types and 2 sward heights on lamb growth from 27 May to 20 June were evaluated. Pasture 1 was grazed continually and maintained at a height of about 6 cm until late May and subsequently grazed at 2 heights in June. Pasture 2 was treated similarly, except that it was grazed down to about 4 cm in May in an attempt to reduce stemminess. Pasture 3 was a silage aftermath where the silage had been cut in mid-May.

Pasture type had no significant effect on lamb growth, but pasture height had a significant effect. High lamb growth rates were maintained on previously grazed pasture at 8 to 9 cm and also on the aftergrass at 6 to 9 cm (Table 4).

Experiment 2: This involved comparisons of sward type and height on old permanent pastures from 3 June to 1 July. Three groups of ewes and lambs were set stocked at sward heights of 5 to 6 cm until late May. In June two groups grazed these same pastures at mean heights of 5 or 6 cm. The third group grazed silage aftermath at a mean sward height of 7.7 cm.

Lamb growth rate on old pasture increased with increasing sward height, with highest growth rate on the aftergrass (Table 4).

Experiment 3: Three groups of March-born lambs grazed on 3 pastures in the period 9 June to 15 July. Pasture 1 was old pasture, grazed until early June at a height of about 6 cm and subsequently at a mean height of 6.3 cm. Pasture 2 was similar, but rested from 19 May and grazed at a mean height of 8.7 cm. Group 3 grazed silage aftermath at a mean height of 7.5 cm.
Growth rates on the short grass and on aftergrass followed the trend of the previous experiment (Table 4). However the growth rate of 211 g/day on old pasture (8.7 cm height) was lower than expected and may be due to the pasture becoming stemmy in June.

Experiment 4: The following treatments were compared for March born lambs in the period 1 June to 4 July : Pasture 1 was old pasture, set-stocked at a sward height of about 6 cm until the end of May and grazed subsequently at a mean height of 5.8 cm; Pasture 2 was similar, but grazed down to 4 cm on May 23, rested, N applied and grazed in June at a mean sward height of 7.4 cm; Pasture 3 was silage aftermath at a mean sward height of 7.7 cm.

Lamb growth rates closely followed the pattern in experiment 2 with a difference of over 100 g/day between the short grass and aftergrass (Table 4).

It is evident that high lamb growth rates can be achieved in the pre-weaning period on leafy swards of suitable height. Grazing old pasture too tightly depressed lamb growth rate to 200 g/day or less. While previous results indicated that a sward height of about 6 cm was suitable for continuous grazing in April/May, an increase in sward height appears necessary in June. In paddock grazing systems it is likely that lambs should graze less tightly in June than in April/May if high growth rates are to be maintained pre-weaning. Undergrazing must also be avoided in May to prevent pasture becoming stemmy, as results in Experiment 3 indicated that this is also likely to depress lamb growth pre weaning in June/July.

Table 4: Effect of pasture type and sward height on lamb growth pre-weaning (June)

Experiment	Pasture type	Sward height (cm)	Lamb growth (g/day)

1	Ryegrass	6.2	279
	Ryegrass	8.4	329
	Ryegrass	6.0	264
	Ryegrass	8.5	309
	Aftergrass	5.9	306
	Aftergrass	8.8	315
2	Old pasture	5.0	195
	Old pasture	6.0	256
	Aftergrass	7.7	292
3	Old pasture	6.3	202
	Old pasture	8.7	211
	Aftergrass	7.5	271
4	Old pasture	5.8	178
	Old pasture	7.4	241
	Aftergrass	7.7	295

Effect of creep feeding and creep grazing

In a previous study it was shown that in a rotational grazing system (residual sward heights of 3.5, 4.5 or 6.0 cm) tight grazing depressed lamb growth rate, but was beneficial in maintaining pasture digestibility at a higher level in mid season. This improved pasture can result in higher growth rate in weaned lambs. Creep feeding the lambs also improved growth rate with tight grazing to 3.5 or 4.5 cm. Further trials were carried out with the objective of achieving high lamb growth rate to weaning while grazing pastures tightly to maintain quality.

Groups of March lambing ewes (n = 15) and their lambs were assigned to treatments within a few days of lambing and grazed rotationally around 4 paddocks to residual target sward heights of 4.0 or 5 to 6 cm. Pastures used were perennial ryegrass dominant and had been grazed by sheep in previous years. Treatments compared were : control, creep feeding (CF), creep grazing (CG), or combined creep feeding and creep grazing (CF/CG) at each post-grazing sward height. Creep feed, introduced at about 3 weeks, was offered to lambs at 250 g/day from 5 weeks to weaning at 14 weeks (total 17 kg creep/lamb). The facility to creep graze was available from about 5 weeks post turnout. Yearling ewes were used in year 1 while mature ewe were used in subsequent years. At the 4 cm residual sward height the effect of treatments was monitored over 6 years, while at the 5 to 6 cm height, creep grazing was monitored over 4 years, creep feeding for 2 years and the combined creep feeding and creep grazing treatment for 1 year only.

The post-grazing sward heights achieved in year 1 with yearling ewes were 4.1 and 6.0 cm. As in the previous trial, very tight grazing severely reduced lamb growth rate. There was a response to creep feeding and creep grazing, with an added response to the combined treatment. Acceptable weaning weights were achieved with the combination of lenient grazing and creep grazing, or with the combined creep feeding/creep grazing with tight grazing (Table 5).

In subsequent years, with mature ewes, the post grazing heights achieved averaged 4.2 and 5.1 cm. This relatively small difference in post grazing height resulted in a difference in weaning weight of 1.1 kg. There was a response to creep feeding and creep grazing at each sward height. At the 4.2 cm height weaning weights averaged 28.7, 32.2, 31.3 and 32.8 kg for control, CF, CG and CF/CG respectively. The response of 3.5 kg for CF gave a feed conversion ratio (FCR) for liveweight of 4.8. Creep grazing gave a response of 2.6 kg, with a small added advantage for the combined CF/CG treatment. At the 5.2 cm height the response over 2 years to CF was 2.7 kg giving a FCR of 6.3, while the response over three years to CG was 2.7 kg. The combined CF/CG was somewhat better than CF alone (34.7 vs 35.5) in the one season where this treatment was employed at a sward height of 5.2 cm.

In conclusion, rotational grazing with tight grazing to a residual sward height of 4 cm in contrast to 5 or 6 cm, restricted lamb growth rate to weaning. This could largely be overcome by creep feeding or creep grazing the lambs. Feeding 17 kg of creep to lambs pre-weaning gave feed conversion ratios for liveweight of 4.8 and 6.3 for tight and lenient grazing, respectively. The response to creep grazing ranged from 2.2 to 3.6 kg at weaning, depending on post grazing sward height and year. The combined CF/CG treatment gave higher weaning weights than CF or CG alone.

Table 5: Effect of residual sward height, creep feed (CF) and creep grazing (CG) on the growth of the progeny of yearling ewes

Residual sward height	Growth to weaning (g/day)	Weaning weight (kg)
4.1 cm control	193	22.5
+ CF	235	26.9
+ CG	227	26.1
+ CF/CG	277	31.0
6.0 cm control	236	27.1
+ CG	263	29.3

Response to creep feeding lambs set stocked at two sward heights

In previous grazing trials it was shown that, in a set-stocking system, lamb growth rate to weaning was affected by sward height. A height of about 6 cm in April/May and 6 to 8 cm in June was near optimum for lamb growth. The objective of this experiment was to assess the response to creep feeding lambs when set stocked on pasture at two sward heights from birth to weaning.

Grazing trials were carried out over 3 years with March lambing ewes. Four core groups of 15 ewes and 25 lambs were set stocked on pasture from birth to weaning at 14 weeks. This stocking rate was intended to maintain a sward height of 6 to 7 cm. Extra dry ewes were added to two groups to maintain a sward height of 4 to 5 cm. Creep feed was offered to one group of lambs at each sward height. It was introduced at about 3 weeks of age and offered at 250 g/day from 5 to 14 weeks (total 17 kg).

Average sward heights achieved over 3 years were 6.1 and 4.8 cm for the high and low swards respectively. This resulted in weaning weights being some 2 kg lower on the low swards. The average weaning weights (kg), with and without creep feed, were 34.4 and 30.5 on the high sward and 32.5 and 28.6 on the low sward. The extra liveweight at weaning gave a feed conversion ratio of 4.4.

In conclusion, in a set stocking system, lamb growth rate to weaning was reduced when sward height was below optimum. There was a response to creep feeding lambs at each sward height.

LAMB GROWTH POST WEANING

Effect of herbage allowance (July to September)

Grazing trials were carried out over 3 years to determine the effect of herbage allowance on lamb growth rate. March born lambs, weaned at 14 weeks of age (late June), were used. Herbage allowances of 1.5, 3.0 or 5.0 kg dry matter (DM) per lamb per day were offered with fresh herbage being provided on a weekly basis. Herbage yield was measured by cutting to ground level. Pre-grazing yields were generally in the range 2500 to 3500 kg DM/ha. In experiment 1, replicated groups of 18 lambs (mean weight 32 kg) were offered these allowances on old permanent pasture from 19 July to 9 September. Similar old permanent pasture was used in experiment 2, when replicated groups of 15 lambs (28 kg) were grazed from 16 July to 3 September. Three pasture types, old permanent pasture, a mainly perennial ryegrass pasture and a perennial ryegrass/white clover pasture were used in experiment 3. Replicated groups of 10 lambs (29 kg) grazed from 28 July to 17 September. Lambs were weighed at the start and finish of the grazing trials and all received routine cobalt and anthelmintic treatment.

Table 6: Effect of herbage allowance on lamb growth (g/day) in July to September

	Pasture type	**Herbage allowance (kg DM/day)**		
		1.5	3.0	5.0
Exp. 1	Old pasture	95	123	156
Exp. 2	Old pasture	107	159	175
Exp. 3	Old pasture	96	140	152
	Ryegrass pasture	90	139	153
	Ryegrass/clover	117	173	222

There was a response to increasing herbage allowance each year and on each pasture type (Table 6). Growth rates were similar on the old and reseeded pastures with highest growth rates achieved being in the range 152 to 175 g/day. Growth rates were better on the grass/clover sward with average growth rates on the grass swards ranging from 70 to 80 percent of those on the grass/clover swards.

Table 7: Effect of herbage allowance on lamb growth in the September to November period

	Pasture type	**Herbage allowance (kg DM/day)**		
	period	1.5	3.0	5.0
Exp. 1	Old pasture	62	92	131
Exp. 2	Old pasture	73	106	142
	Day 0 to 28	118	160	189
	Day 28 to 56	30	54	96
Exp. 3	Old pasture	66	134	162
	Ryegrass pasture	89	132	146
	Ryegrass/clover	111	167	197
Exp. 4	Sheep pasture	34	85	107
	Cattle pasture	51	97	132

Effect of herbage allowance (September to November)

Similar grazing trials of 6 to 8 weeks duration were carried out over 4 years to determine the effect of herbage allowance on lamb growth in autumn. Pre-grazing yields, estimated by cutting to ground level, were in the range of 2000 to 3000 kg DM/ha. Allowances of 1.5, 3.0 or 5.0 kg DM/lamb/day were offered with fresh herbage provided on a weekly basis. In experiment 1, unreplicated groups of 12 lambs (weight 34.5 kg) were offered these allowances on old permanent pasture from 26 September to 11 November. Similar old pasture was used in experiment 2 when replicated groups of 9 lambs (weight 34.0 kg) grazed from 10 September to 5 November. A mid-term weight was taken after 4 weeks to monitor weight gains. In experiment 3 unreplicated groups of 13 lambs (weight 32.6 kg) were offered these

allowances on three pasture types, old pasture, a perennial ryegrass pasture, and a ryegrass/white clover pasture, from 2 October to 13 November. In experiment 4 replicated groups of 13 lambs (weight 32.4 kg) grazed two old permanent pastures, a sheep pasture and a cattle pasture, from 28 September to 9 November.

Lamb growth rate varied greatly depending on the pasture type and herbage allowance offered (Table 7). Growth rates increased with increasing herbage allowances on each pasture in each year. There was little difference in growth rate on the two grass swards but growth rates were best on the grass/clover sward. In experiment 2, growth rate in the period 0 to 28 days was much higher than in the period 28 to 56 days. Rainfall in the first period totalled 34 mm compared with 156 in the second period and this wet weather may account for the lower lamb growth rate achieved at this time.

In conclusion lamb growth rate on pasture in summer and autumn is affected by both herbage allowance and pasture type. Growth rates were similar on old pasture and a ryegrass dominant pasture, but were higher on grass-clover swards. Growth rates tended to be lower in autumn than in summer but good growth rates were achieved in autumn when medium or high allowances were offered on the grass clover swards.

Effect of sward height and pasture type in a set-stocking system

Four grazing trials were carried out to determine the effect of sward height and pasture type on lamb growth rate post weaning. The pastures used had been grazed by ewes and lambs up to weaning. Lambs were treated with anthelmintic and cobalt at 3-week intervals. In experiment 1 replicated groups of 10 lambs (weight 29.4 kg) were set-stocked on three pasture types from 26 July to 20 September. The pastures were : old permanent sheep pasture (old pasture); a mainly ryegrass pasture (new pasture); and old permanent pasture grazed by cattle only in previous years (cattle pasture). In experiment 2, replicated groups of 20 lambs (weight 29.2 kg) were set-stocked on old permanent sheep pasture from 23 August to 18 October. Plot sizes for grazing were adjusted to give stocking rates of 20, 33 and 50 lambs/ha (aimed at achieving sward heights of about 9, 7 and 5 cm respectively).

Lamb growth rates increased on each pasture with increasing sward height with highest growth rates on swards of 8 to 9 cm (Table 8). Swards of 5 to 6 cm resulted in low growth rates in autumn while earlier results indicated that swards of similar height supported high growth rates in April/May. This is attributed to the fact that there is often more stem and dead vegetation at the base of the sward in autumn and tight grazing forces lambs to consume herbage of lower digestibility. Therefore both sward height and quality will affect lamb growth rate on pasture post weaning.

Table 8: Effect of sward height on lamb growth rate (g/day) post-weaning

	Pasture type	Sward height[1] (cm)		
		4.7	6.5	9.2
Exp. 1	Old	108	146	161
	New	61	130	161
	Cattle	38	101	140
Exp. 2	Old	61	106	143

[1]Heights in year 2 were 4.9, 6.6 and 7.9, respectively.

In the third experiment groups of 30 lambs, (weight 29.3 kg), were set-stocked on 4 pasture types from 11 July to 12 September. The pastures used were; (1) old pasture grazed by sheep up to late June; (2) a similar old pasture cut for silage in late May and grazed by sheep in June; (3) a ryegrass pasture, cut in late May and grazed in June; and (4) a ryegrass/clover sward, grazed up to late June and containing about 34% clover in July. Average sward height achieved

on pastures 1 to 4 were 7.7, 7.5, 7.5 and 7.3 cm and the corresponding lamb growth rates were 145, 153, 153 and 217 g/day respectively.

In a short-term trial (experiment 4), lamb growth rates on ryegrass and ryegrass/clover swards were compared in the period 1 to 26 September. Lambs (20 per group) were set-stocked at 40/ha and mean sward heights were 9.3 and 8.9 cm. Lamb growth rates were 131 g/day on the grass and 247 g/day on the grass/clover sward, which contained 40% clover at the start of grazing. While this experiment was of a short-term duration, the results of these two trials highlight the value of clover in improving the growth rate of weaned lambs on pasture, while growth rates on the three grass swards were similar when grazed at similar sward heights.

Effect of grazing management pre-weaning on lamb growth post-weaning

The objective of this experiment, carried out over 2 years, was to determine the effect of post-grazing sward height in the pre-weaning period on lamb growth post weaning. The pastures were grazed by ewes and lambs to residual sward heights of 3.0, 4.5 or 6.0 cm from April to early July in a rotational grazing system. Groups of 20 weaned lambs (weight 30.7 kg) were set-stocked on each of these pastures for 9 weeks, mid July to late September. Four stocking rates, 30, 40, 50 and 60 lambs/ha, were used on each site to give average sward heights in the range 4.5 to 9 cm on each site. Two groups of lambs were also set stocked on aftergrass at average sward heights of 4.9 and 7.7 cm. Two anthelmintic dosing treatments were used; half the lambs in each group were treated at either 1½ or 3 week intervals. Sward heights were recorded weekly and the percentage of green leaf, in herbage samples cut to ground level, was measured.

Tight grazing pre-weaning improved pasture quality in the post-weaning period. The percentage green leaf in the herbage averaged 78, 69 and 66 for the swards grazed to 3.0, 4.5 and 6.0 cm, respectively. Lamb growth rate increased with increasing sward height on each site. There was a significant difference between sites, with highest growth rates on pastures grazed tightly in the first half of the year. However growth rates were similar when each site was grazed at a sward height of about 9 cm. Growth rate on aftergrass at 7.7 cm was higher than on any of the three grazed sites at the same sward height. There was no significant difference between dosing treatments.

It is concluded that tight grazing pre-weaning improves pasture quality and lamb growth rate post weaning. The optimum sward height for weaned lambs will depend on how tightly the sward was grazed in the first half of the year, especially in June, and the resulting proportion of green leaf in the sward.

Table 9: Effect of sward height pre and post weaning on growth rate of weaned lambs

Residual sward height pre-weaning (cm)	Sward height post weaning (cm)			
	4.7	6.1	7.7	9.0
3.0	106	120	149	159
4.5	87	109	134	168
6.0	81	108	123	159
Aftergrass	107	-	177	-

Effect of concentrate supplementation of lambs on pasture post weaning Concentrate supplements may be offered to weaned lambs on pasture to sustain lamb growth where grass is scarce, to finish lambs earlier in the season or to finish light lambs, that would not finish on pasture only, in autumn. Grazing trials were carried out to assess the response of weaned lambs to concentrate supplementation at pasture from July to November. Spring-born lambs, weaned in late June, were used and received cobalt and anthelmintic treatments at about 3 week intervals while on the trials.

Experiment 1: Six groups of 27 lambs grazed pastures at mean sward heights of 8.4 or 6.2 cm from 18 August to 28 October. A pelleted concentrate supplement was offered at rates of 0 or 500 g/lamb/day and contained either 15 or 24% crude protein, at each sward height. Each group of lambs contained two sub-groups, mean weight 36 and 30 kg, which were drafted for slaughter after 6 and 10 weeks, respectively.

Table 10: Effect of sward height, concentrates and protein level on lamb performance

Sward height (cm)	Concentrates g/lamb/day	Liveweight (kg)	Carcass weight (kg)	Kill-out %
8.4	0	44.0	19.0	43.2
	500[a]	45.6	20.4	44.7
	500[b]	45.5	20.2	44.5
6.2	0	42.6	18.5	43.5
	500[a]	45.7	20.9	45.9
	500[b]	43.8	20.5	46.9

[a]15% crude protein, [b]24% crude protein

There was a response to concentrate supplementation at each sward height (Table 10). Concentrate supplementation increased liveweight, carcass weight and kill-out proportion, but there was no difference between the two levels of protein. Light and heavy lambs had similar responses to concentrate supplementation in terms of feed conversion ratio per unit carcass gain. Pasture height had no significant effect on carcass weight. Final live-weight was higher but kill-out proportion was lower on the high grass, probably due to higher gut-fill in lambs on the high grass. The response to concentrates was better ($P<0.05$) on the short grass. The extra carcass gain was associated with a feed conversion ratio of 12 on the short grass compared with 20 on the long grass. It is concluded that concentrate supplementation increases the carcass weight of weaned lambs, particularly on short grass.

Experiment 2: Six groups of 25 lambs grazed pastures at mean sward heights of 8.6 or 5.9 cm from 30 August to 11 November. A pelleted concentrate supplement (16% crude protein) was offered at rates of 0, 250 or 500 g/lamb/day at each sward height. A seventh group was offered concentrate supplement *ad libitum* (1200 g/lamb/day for 0 to 3 weeks and 1500 g from 3 to 10 weeks) on pasture of mean sward heights 7.5 cm. Each group of lambs contained three subgroups, mean weight 41, 37 and 31 kg which were drafted after 3, 6 and 10 weeks respectively. Trace element treatments were also used: 8 lambs in each group received either a standard cobalt drench (at 3 week intervals) or a commercial bullet (supplying cobalt, copper and selenium), while the remaining 9 lambs were untreated.

Concentrate supplementation increased the liveweight, carcass weight and kill-out proportion on each pasture (Table 11). Pasture height had no significant effect on carcass weight, and the response to concentrates was similar at each sward height. The extra carcass gain was associated with feed conversion ratios of 6.7 and 8.6 for the 250 and 500 g of concentrates, and 13.7 for concentrates offered *ad libitum.* Trace element supplementation had no effect on lamb growth or carcass weight.

Table 11: Effect of sward height and concentrates on lamb

performance

Sward height (cm)	Concentrates g/lamb/day	Liveweight (kg)	Carcass weight (kg)	Kill-out %
8.6	0	43.4	17.3	39.8
	250	45.7	19.1	41.9
	500	47.2	20.0	42.5
5.9	0	41.6	17.1	41.0
	250	44.8	19.1	42.6
	500	46.6	20.3	43.7
7.5	Ad-libitum*	48.8	22.2	45.7

*1200 g/lamb/day for 0 to 3 weeks and 1500 g from 3 to 10 weeks.

Experiment 3: Two groups of 25 lambs were offered concentrate supplement (16% crude protein) at rates of 250 or 500 g/lamb/day from 11 July to 19 September with pasture available *ad libitum* (mean sward height 8.1 cm). Each group of lambs contained two subgroups, mean weight 36 and 28 kg, which were drafted after 37 and 70 days respectively.

There was a response in liveweight and carcass weight to the higher level of supplementation. The extra carcass gain was associated with feed conversion ratios of 13.4 and 10.8 for the heavy and light groups respectively with an average value of 11.7 for all lambs.

Experiment 4: Two groups of 23 lambs grazed pasture *ad libitum* from 10 October to 30 November. Pastures were grazed down from about 9 cm to 6 cm in a rotational grazing system. A concentrate supplement (16% crude protein) was offered at rates of 250 or 550 g/lamb/day. Each group of lambs contained two subgroups, mean weight 41 and 36 kg, which were drafted after 23 and 51 days respectively.

The higher level of supplementation increased lamb liveweight and carcass weight. The extra carcass gain resulted in feed conversion ratios of 12.8 and 13.1 for the heavy and light subgroups respectively with a mean value of 13 for all lambs.

Experiment 5: Replicated groups of 17 lambs were set-stocked on pasture from 1 September to 20 November. Pelleted concentrate supplement (16% crude protein) was offered at 0 or 400 g/lamb/day. Each group of lambs contained three subgroups, mean weight 40, 36 and 32 kg which were drafted after 26, 49 and 81 days respectively.

Sward height decreased from 8.3 cm at the commencement of the trial to 5.5 cm at the end, with an average sward height of 6.4 cm. There was a response to concentrate supplementation in terms of lamb liveweight, carcass weight and kill-out proportion. The extra carcass gain resulted in a feed conversion ratio of 9.8 for all lambs.

In conclusion, the results show that concentrate supplementation increases the liveweight, carcass weight and kill-out proportion of weaned lambs on pasture in the July to November period. Response to supplementation was slightly better on short grass in one experiment. Concentrates containing ether 15 or 24% crude protein gave similar responses. Feed conversion ratios ranged from 7 to 12 on short grass, 7 to 20 on long grass and was 14 when concentrates were offered *ad libitum* on pasture. Feed conversion ratios tend to be better with lower rates of supplementation probably due to different rates of substitution of grass for concentrate in the diet. Concentrate supplementation also resulted in a higher proportion of lambs being drafted off pasture. When concentrates supplement was offered to lambs at 0 or 250

g/lamb/day both pre and post weaning, the proportion of lambs drafted was 60% and 90% by 18 September in year one and 65% and 100% by 10 October in year two.

CONCLUSIONS

- Lamb growth rate on pasture pre and post weaning is mainly determined by grass supply, as indicated by sward height in a set-stocking system, or post-grazing sward height in a rotational grazing system.

- A decline in lamb growth frequently encountered in the month pre-weaning can largely be prevented by grazing leafy swards at 6 to 8 cm height.

- There is a response to creep-feeding or creep-grazing lambs pre-weaning. Creep feeding, at 250 g/lamb/day, increased weaning weight by 2.7 to 3.8 kg, depending on pasture and year, while the response to creep grazing was over 2 kg.

- Concentrate supplementation of weaned lambs on pasture increases carcass weight and leads to earlier drafting of lambs.

- Tight grazing in May/June improves pasture quality and results in higher lamb growth in the post weaning period on the same pasture.

- Lamb growth on grass swards post weaning is 70 to 80% of that achieved on grass-clover swards grazed at similar sward heights or herbage allowances.

- There was no indication that intensive anthelmintic dosing of lambs improved lamb growth compared with standard dosing routines.

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