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Early Lamb Production Systems

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by

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CONTENTS

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SUMMARY

1. A number of feeding and management options for early lambing flocks were evaluated at the Knockbeg Sheep Unit, Carlow. Results and recommendations for on-farm adoption are summarised in this report. The ultimate objective was to develop cost-effective early lamb production systems in synchrony with the high price season from late March to early May.

2. Studies were focused on the two main phases of lamb growth. Firstly, the period from birth to 6 weeks of age which coincides with the critical period of lamb survival and peak lactation in the ewe and, secondly, the finishing stage from 6 weeks until slaughter. Flock size was 230 to 250 ewes sponged in July/August for lambing in January and managed on 12.6 ha of grass and forage.

3. Autumn-sown Italian ryegrass was shown to have a high ewe carrying capacity for short term grazing in early spring. When ewes were turned out in mid February at 3 weeks post-lambing the grazing capacity of I. ryegrass proved to be 990 ewe grazing days (EGD) per ha, equivalent to a stocking rate of 23 ewes per ha for 6 weeks. Lamb growth rate to 8 weeks of age was 312 g/day. When grazing of I. ryegrass was commenced in late January at about 10 days post-lambing, ewe grazing capacity was 664 EGD per ha, equivalent to 16 ewes per ha for 6 weeks. Later in spring, perennial ryegrass-based permanent pasture also had a high ewe carrying capacity for short term grazing (24 ewes per ha for 4 weeks) in March/April before lambs were weaned. After weaning, lambs were grazed rotationally in a 3-paddock system with creep feed supplied. Lamb growth rate in this finishing system was 345 g/day and lambs were finished at 92 to 102 days of age. These results can be used for planning early lamb enterprises on grassland farms.

4. A second option for overcoming grass deficits in winter and which is directly relevant to tillage farming areas is fodder beet. An indoor

management system for feeding chopped fodder beet to lactating ewes was developed. Results showed that ewes consume over 2 kg root DM/head/day and that the resulting lamb growth rate is predictable, i.e. almost 300 g/day from birth to 5 weeks.

5. At 5 weeks post-lambing, lambs for finishing may either be turned out with their dams to early grass or early weaned onto all-concentrate diets. Results showed that lambs turned out to grass plus creep feed were finished at carcass weights of 17 to 18 kg at around 100 days. However in the years 1991-94 there were prolonged spells of wet weather in spring leading to poor grazing conditions which in turn resulted in poor lamb growth rates and late sale dates. Such weather related difficulties can be overcome by early weaning and finishing lambs indoor on all-concentrate diets.

6. The performance of early weaned lambs on commercially available concentrate formulations was compared with a standard cereal-based loose mix of rolled barley/beet pulp/soyabean meal 40:40:20. Finishing on the commercial compounds resulted in lamb growth rates of 325 to 335 g/day and carcass weights of 17 to over 18 kg at about 100 days of age.

7. As an alternative to autumn sown forage crops or main crop roots, high quality silage offers a third option for overcoming grass deficits in winter/early spring. A controlled management system based on housing and silage feeding during early lactation followed by turnout to pastures rested for winter and fertilised with N, was developed. When ewes were offered high quality silage supplemented with concentrates the resulting lamb growth rate to 5 weeks of age was 296 g/day. When lambs were turned out with their dams at 6 weeks of age and finished on permanent pasture plus creep feed, lamb growth rate was 345 g/day, carcass weight 18.3 kg and age at slaughter 101 days.

8. In comparisons between two terminal sire breeds, Suffolk and Texel, the carcasses of Texel progeny were 0.4 kg heavier than the Suffolk progeny

but this advantage was nullified by a longer feeding period required for attaining suitable finish.

9. Early lamb production incurs high costs relative to mid season, due to the need for especially sown forage crops, extra concentrate supplements, creep feed and hormonal treatments. The cost of producing 1 kg of early lamb carcass varied from 134p to 166p, compared with 77p for mid season lamb. As a consequence, early season prices must be sufficiently high not only to cover the extra costs but also to generate profit margins that are attractive and consistent from year to year so that sheep producers can plan their early lamb enterprises on a systematic basis. Presently, such planning is problematical due to the wide fluctuations in prices from year to year.

10. The results provide options in feeding and management for programmed lamb production in synchrony with early season prices. The production technologies are effective, e.g. out-of-season breeding, grass utilisation, planned schedules for achieving high levels of feed intake and lamb performance, drafting procedures for selecting high quality lambs (Fat class 3, Conformation classes U and R). On-farm planning for feeding, housing and labour is essential.

INTRODUCTION

The Knockbeg Sheep Unit, Carlow was established to provide a focal point for sheep producers to see and discuss the components of sheep production systems, to obtain information on the technical and economic aspects of sheep production, the problems involved and how to overcome them. Accordingly, it was decided to establish a mid season lamb production flock composed of prolific ewe types and managed in a self-contained paddock grazing/silage conservation system. In attempting to change to a market driven industry instead of the traditional production-oriented approach, the seasonality of lamb production as a constraint to progressive development was obvious. In particular, in order for exporters to command large volumes of carcass exports during summer and autumn, continuity of supply of high quality lamb for their overseas customers during the early part of the year is essential for successful marketing. Hence, an early lambing flock was established for the evaluation and demonstration of cost effective feeding systems for the production of high quality lambs in the early part of the year.

A series of trials on feeding and management options for early lambing flocks were undertaken at Knockbeg. Detailed information on management schedules, ewe and lamb performance and production targets has been reported previously (Flanagan, 1998)

BREEDING AND MANAGEMENT PROCEDURES

Studies were focussed on the two main phases of lamb growth, namely, from birth to 6 weeks of age and from 6 weeks until drafting for slaughter. Before summarising the results, it is of interest to describe briefly a number of breeding and management procedures which were standard practice in all the trials. Flock size was 230 to 250 ewes consisting of Bluefaced Leicester x Cheviot, Bluefaced Leicester x Scottish Blackface, Suffolk x Cheviot and Belclare x Cheviot crossbreeds. The ewes were mated with Suffolk rams except for the years 1991 and 1992 when both Suffolk and Texel rams were used to provide comparative data on the progeny of these two sire breeds.

The ewes were sponged in July or early August, injected with 750 i.u. PMSG at time of sponge removal and compact mated for lambing in January. They were grazed during autumn on permanent ryegrass pasture (20 ewes per ha) and were scanned for pregnancy on Day 50. For practical reasons the ewes were mated at the induced oestrus only. Rams were introduced to the flock in October for mating with repeat breeders and these were subsequently managed for lambing in spring. Results on ewe lambing performance showed that the percentage of ewes lambing to the induced oestrus was 65%. More recent results show that this fertility rate can be increased to 85% by allowing the ewes to mate at the first repeat oestrus.

The early lambing ewes were housed in early December and offered silage *ad libitum* plus concentrate supplements, commencing at the rate of 250 g/ewe/day and increasing to 700 g in the last 2 weeks before lambing. After lambing, ewes and lambs were retained indoor for 1 to 2 weeks for mothering up, after which they were either turned out for early grazing or they were housed until 5 to 6 weeks post-lambing, depending on objectives. Lambs were creep fed concentrates from 1 week of age. Lambs sold at or before 12 weeks of age were drafted directly off their dams; the remainder were weaned, dosed against worm parasites and managed in a rotational grazing system until finished. Early weaned lambs were finished indoor either on fodder beet + concentrates or on all-concentrate diets.

Early weaned ewes were retained indoor and offered a maintenance ration of 1 kg of silage dry matter/head/day until April when they were turned out to join the ewes weaned at grass. From April until early July the ewes were grazed tightly on grass, e.g. 40 ewes per ha. In early July the ewes were moved to good pasture reserved during summer for increasing their body condition for a new production cycle.

For drafting, lambs were weighed unfasted and handled for a standard degree of body finish. Sale weights were generally in the range 34 to 44 kg. Flock performance records included lamb birth weight, 5 week weight, sale weight, carcass weight and age at slaughter.

FORAGE CROPS AND EARLY GRASS

Two trials on the grazing of autumn sown forage crops were conducted and the objectives were to measure lamb performance when January lambing ewes were grazed on Italian ryegrass or forage rape from late January to March, followed by finishing the lambs on permanent pasture in April/May. Also, comparable groups of ewes were housed after lambing for 8 weeks and offered silage or fodder beet *ad libitum* supplemented with concentrates. Their lambs were early weaned and finished indoor on all-concentrates or on chopped fodder beet supplemented with concentrates.

Results on lamb performance are shown in Table 1. Lamb growth rates from birth to 5 weeks were similar in all groups but from 5 to 8 weeks, growth rate was significantly lower in the silage fed group. This difference may have been associated with limitations in silage intake by the ewes during the extended housing period. Creep feed intake to 8 weeks was about 6 kg per lamb. The carrying capacity of the I. ryegrass including the second and third grazings was 990 ewe grazing days (EGD) per ha when turnout was in mid-February. The carrying capacity of rape was lower, 800 EGD per ha, because it can be grazed only once. When the turnout date was earlier, i.e. in late January, the carrying capacity of I. ryegrass was 624 EGD per ha including second and third grazings taken in March/April.

Table 1: Comparative performance of early lambs produced under grazing and indoor feeding conditions

Period 1: 0-8 weeks	I. ryegrass	Rape	Silage	Fodder beet
No. ewes	123	60	20	32
No. lambs	180	79	28	48
Growth rate (g/day)				
0 to 5 weeks	305	311	314	300
Weeks 5 to 8	315	316	261	-
Period 2: 8 weeks to slaughter	Permanent pasture		Early weaned	
			Diet[1]	Diet[2]
No. lambs	259		28	48
Growth rate (g/day)	345		355	322
Carcass wt. (kg)	17.4		15.7	18.4

Age at slaughter (days)	97	104	113

[1]All-concentrates [2]Chopped fodder beet + concentrates

Lamb growth rate from 8 weeks to slaughter was high both on permanent pasture and on all-concentrates and lambs were drafted for slaughter at a young age (about 100 days). The low carcass weight recorded on the all-concentrate diet was due to earlier than normal drafting. The consumption of concentrates during the finishing period amounted to 22 kg per lamb when offered as creep feed at pasture and 49 kg per lamb when offered as the sole diet after early weaning.

For short term grazing in March/April the permanent pasture had a feeding capacity of 670 EGD per ha; this is equivalent to a stocking rate of 24 ewes per ha for 4 weeks until lambs were weaned. However, this stocking rate was not supported solely on the permanent pasture, as whenever the I. ryegrass had recovered sufficiently, second and third grazings were taken. To provide for summer cuts of silage, the I. ryegrass was closed in early April. From then until July, the flock was grazed exclusively on the permanent pasture.

Lamb growth rate on the indoor diet of fodder beet + concentrates was lower than on grazed grass but the difference was not significant. Lambs on the fodder beet diet produced heavier carcasses because they were allowed a longer feeding period (9 to 16 days). In the context of maximising financial returns, a balance must be struck between sale weight and sale date because the early lamb market is characterised by falling prices as the early season progresses.

The results can be used for planning early lamb production on all-grass farms. I. ryegrass provides a very useful option for strategic grazing in January/February/March on all farms which carry early lamb enterprises. For short term grazing in April/May, suitably managed permanent pasture has a high feeding capacity (670 EGD per ha) also. During summer, the dry flock can be stocked at 40 ewes per ha while the I. ryegrass is used for

silage conservation. Grazing of I. ryegrass can be resumed in July when ewes are being flushed for a new production cycle. The period of flushing, hormone treatment, post-mating management and also the mating of repeat ewes in October for lambing in spring, extends from late July to late November. During this period, the ewe carrying capacity of the fertilised I. ryegrass and permanent pastures at Knockbeg proved to be 20 ewes per ha. Thus, stocking rate varies widely during the extended grazing season, depending on the requirements of the flock.

FODDER BEET ROOTS FOR INDOOR FEEDING

Many early lambing flocks are managed on farms with mixed livestock and tillage enterprises including sugar beet and fodder beet. Amongst the choice of forage and root crops grown for winter feeding, fodder beet produces the highest yield, 13 t DM per ha (Fitzgerald, 1983). In feeding trials with sheep its replacement value relative to concentrates ranged from 81% to 91% (Fitzgerald, 1979). Also, developments on the design of harvesters, fodder feeders and diet wagons by the Irish Sugar Company and by R. Keenan & Company overcame the technical problems of handling root crops. It was therefore decided to evaluate fodder beet as the main diet for ewes post-lambing. There was also the practical consideration that weather hazards for young lambs in January/February are avoided by housing the flock.

During the years 1990 to 1994 ewes lambing in January were housed for 6 weeks post-lambing and fed chopped fodder beet *ad libitum* (cv. Abondo, 155 g DM/kg). The objectives were: (1) to evaluate the performance of early born lambs reared on ewes that are housed and offered a fodder beet diet during early lactation; (2) to compare the performance of lambs finished either on grazed pasture or early weaned indoor onto fodder beet and concentrates.

The flock was trough fed in pens with 23 ewes plus their lambs per pen and stocked at a floor space of 1.8 m^2 per ewe. The intake of fodder beet was estimated once weekly on a pen basis. Due to the low protein content of fodder beet soyabean was offered as a protein supplement. A mineral supplement of 50 g/ewe/day was included (18% Ca, 10% P).

At 6 weeks post-lambing the lambs were allocated to two finishing systems as follows:

Grazed pasture: Ewes and their lambs were turned out to spring pasture (2 ha Italian ryegrass + 7.7 ha perennial ryegrass) and grazed rotationally over 3 paddocks. Stock were moved when the sward was grazed down to a height of 4 cm. Lambs were weaned at 12 weeks of age, managed in a 3-paddock grazing system and creep fed until drafted for slaughter.

Early weaning: Lambs were early weaned and finished indoor. They were offered chopped fodder beet *ad libitum*, with concentrates offered *ad libitum* initially but limited to 500 g/lamb/day after 3 weeks in order to encourage a higher intake of fodder beet.

The voluntary intake of chopped fodder beet was higher than expected. It increased rapidly to 2.17 kg DM/ewe/day at 2 weeks post-lambing and remained at this level thereafter. Thus, with a metabolizable energy value of 12.5 MJ/kg DM (Fitzgerald, 1983) fodder beet has the potential to supply most or all of the energy requirements of 70 kg ewes in early lactation. Evidence for this potential was provided by results which showed that ewe liveweight increased between mid pregnancy and 5 weeks post-lambing.

Relative to energy intake, the initial level of protein supplementation was lower than intended due to the unexpectedly high intake of fodder beet. From the intake measurements and from published reports on the chemical composition and nutritive values of fodder beet and soyabean meal, the protein to metabolizable energy ratio was estimated to be about 11:1. Sheehan and Hanrahan (1989) reported a clear increase in lamb growth rate as the protein to metabolizable energy ratio in the diet of lactating ewes is increased from 11:1 to 16:1. Hence, the protein supplement offered with fodder beet in subsequent years during early lactation was increased to 0.75 kg soyabean meal/ewe/day.

In a further trial, comparative results on lamb growth rate arising from the feeding of 0.75 or 1.0 kg soyabean/ewe/day provided no evidence in favour of the higher level.

Lamb growth rates to 5 weeks of age are shown in Table 2. These growth rates were consistent from year to year and are higher than those generally reported for flocks managed in winter on roots grazed *in situ*, e.g. 228 to 269 g/day (Fitzgerald and Flanagan, 1981) and 233 to 265 g/day (Flanagan, 1983). This consistency in growth rate is attributed to better control in feeding management achieved by housing the flock for early lactation.

Weather hazards which may interfere with the grazing of roots *in situ* are avoided, a high intake of high quality feed by lactating ewes is assured and the growth rate of lambs to 5 weeks of age is predictable.

Table 2: Lamb growth rate from birth to 5 weeks of age

	1990	1991	1992	1993	1994
No. ewes lambing	185	177	139	207	159
No. lambs	298	297	226	337	242
Growth rate (g/day)	288	284	295	309	290
Creep feed (kg/lamb)	4.4	5.0	4.6	6.1	4.5

Results on lamb performance in the two finishing systems are shown in Table 3. There were significant differences between the two finishing systems in lamb growth rate and age at slaughter. In 1990 lamb growth rate at pasture was relatively high, the average age at slaughter was 104 days and 88% of lambs were drafted by May 8. Thus, the 1990 results show that by housing the flock for 5 to 6 weeks after lambing and by feeding a fodder beet diet followed by turnout and finishing on grazed pasture, lambs were finished for slaughter at a young age.

Early weaned lambs had a relatively low growth rate and they were generally about 120 days of age at slaughter. These effects may have been associated with the low protein content of fodder beet (63 g/kg DM, CAB International 1993).

The growth rate of lambs finished at pasture in the years 1991, 1993 and 1994 was significantly lower than 1990 resulting in late sale dates. The system of grazing management was similar to 1990 but high rainfall resulted in management difficulties. Such difficulties can be avoided by early weaning and indoor finishing as discussed later.

Table 3: Performance of lambs finished on pasture or early weaned onto fodder beet and concentrates

		No. lambs	Growth rate (g/day)	Carcass wt. (kg)	Age at slaughter (days)
1990	Pasture	144	323	17.3	104
	Early weaned	127	269	16.7	123
1991	Pasture	208	261	17.5	132
	Early weaned	88	277	17.2	125
1992	Pasture	151	293	19.2	122
	Early weaned	72	301	18.1	120
1993	Pasture	243	238	18.0	142
	Early weaned	106	267	17.2	118
1994	Pasture	204	242	18.0	124
	Early weaned	34	287	17.0	106

ALL-CONCENTRATE DIETS FOR EARLY WEANING

It was evident from the results that the performance of lambs early weaned and finished on a diet of chopped fodder beet and concentrates did not meet the targets set for early drafting. For the purpose of increasing the growth rate of early weaned lambs, it was considered that all-concentrate diets offered the best option. A trial was conducted with the following objectives: (1) to compare the performance of lambs on two finishing systems : grazed grass or early weaned onto all-concentrate diets; (2) to compare the intake and performance of early weaned lambs finished on either of two concentrate formulations, a commercially available intensive lamb pelleted compound or a standard loose mix of rolled barley/beet pulp/soyabean meal in the ratios 40:40:20.

At 8 weeks of age, lambs were assigned to two finishing systems as follows:
Grazed pasture: Lambs were turned out with their dams to perennial ryegrass-based permanent pasture that had been rested since the previous October. The lambs were creep fed and finished on grass as described earlier.
Early weaning: Lambs were early weaned and allocated at random to each concentrate. Minerals/vitamins were added to the loose mix at the rate of 10 g/head/day. Both concentrates were offered *ad libitum* on a daily basis until drafting for sale.

Comparative results on lamb performance and feed costs in the two finishing systems are shown in Table 4. Growth rate was highest in lambs early weaned and finished on pelleted concentrates. Although the difference was not significant, average carcass weight on the pelleted diet was 0.8 kg heavier than on the loose mix. These differences in growth rate and carcass weight were associated with a difference in feed intake in favour of pelleted concentrates. Such advantages, however, must be assessed in the light of higher feed costs. The pelleted and loose mix concentrates cost £200 and £152 per tonne respectively, resulting in feed costs per lamb of £14.05 and £8.28 respectively. The higher carcass weight on the pelleted diet was not

significant to cover the extra feed cost.

Table 4: Performance of lambs finished on grazed grass or on all-concentrate diets

Finishing systems	Grazed pasture	All-concentrates	
		Pelleted[1]	Loose Mix[2]
No. lambs	170	30	30
Growth rate (g/day)	281	325	291
Carcass wt. (kg)	18.0	18.3	17.5
Age at slaughter (days)	125	109	113
Concentrate intake (kg/lamb)	38.0	70.3	54.4
No. days on feed	75	58	57
Feed cost (£/lamb)	5.78	14.05	8.28
F.C.R. (kg feed/kg livewt.gain)	-	3.7	3.3
No. lambs drafted by May 2	89	27	28

[1]Intensive lamb pelleted compound (16% crude protein content) £200/tonne
[2]Rolled barley/beet pulp/soyabean meal (40:40:20) £152/tonne

The data in Table 4 also show that of the two diets, the loose mix had the better feed conversion rate (FCR), i.e. 3.3 kg of the loose mix were consumed per kg of liveweight gain compared with an average of 3.7 kg of the pelleted diet. This result was unexpected.

The growth rate of lambs on pasture was significantly lower than those early weaned onto pelleted concentrates and, consequently, they were 11 to 16 days older at slaughter. Almost 90% of early weaned lambs were drafted by May 2 compared with 70% of those on grazed grass. This effect was associated with high rainfall leading to difficulties in grazing management as already stated.

HIGH QUALITY SILAGE

Technical advances in earlier cutting dates, harvesting equipment and ensiling procedures have resulted in silages of higher quality than in the past. The replacement of flail type harvesters with precision choppers has led to the production of silages with much reduced particle size and, as a result, potential for improved silage intake by sheep (Fitzgerald, 1986). Chestnutt and Kilpatrick (1988/89) reported that precision-chop harvesting resulted in increases of 28% to 37% in silage intake by ewes during late pregnancy and early lactation.

In the context of these developments, high quality silage as the main bulk diet for ewes during early lactation was evaluated. In conjunction with this evaluation, studies on the comparative performance of lambs finished either on grazed pastures or early weaned onto all-concentrate diets were continued. The objectives were: (1) to measure ewe liveweight changes and lamb performance when early lambing ewes are offered high quality silage *ad libitum* during late pregnancy and early lactation; (2) to compare the performance of lambs on two finishing systems, grazed pasture or early weaned onto all-concentrate diets; (3) to compare the intake and performance of early weaned lambs finished on either of two concentrate formulations.

Ewes lambing in early January were housed for 6 weeks after lambing, at a floor space allowance of 1.8 m^2 per ewe with 25 ewes plus their lambs per pen. Silage was offered *ad libitum* and voluntary intake was measured on a pen basis on 1 day per week. The concentrate supplement was fed at the rate of 1.25 kg/ewe/day and lambs were creep fed from 1 week of age.

At 6 weeks post-lambing, the lambs were allocated to two finishing systems:
Grazed pasture: Lambs were turned out with their dams to perennial ryegrass pasture that had been rested since the previous October. The lambs were managed on pasture as described previously.
Early weaning: Lambs were early weaned and finished indoor on either of two all-concentrate diets, a commercially available ewe-and-lamb pelleted compound or a loose mix of rolled barley/beet pulp/soyabean meal 40:40:20.

Results on the chemical composition of the silage showed that: dry matter content was average for unwilted clamp silage (19.3 g DM/kg), pH was normal and preservation was good. Quality, as defined by digestibility (DMD), was good (756 g/kg DM), the usual range of results for unwilted silage being 650 to 730 g/kg DM. Crude protein content was 156 g/kg DM.

Silage intake during early lactation was relatively high in all weeks but varied from week to week e.g. from 1.47 g to 1.76 kg/ewe/day. With the concentrate supplement, total feed intake was generally in the range 2.60 to 2.80 kg DM/ewe/day. By combining the silage analyses results with standard chemical values for the compound concentrate, estimated intakes of energy and protein were calculated. The concentrate supplement increased ME intakes, ranging from 29.1 MJ/ewe/day in week 3 to 32.2 MJ in week 6. These feeding levels are consistent with the energy requirements of 70 kg ewes producing 3 kg milk/day (CAB International, 1993 p.96). The estimated intake of crude protein varied from 441 to 488 g/ewe/day during weeks 2 to 6. The crude protein requirement of a 70 kg ewe producing 3 kg milk/day is about 420 g/day (Meat & Livestock Commission, 1983). Although total intake of crude protein exceeded this requirement the ratio of protein to metabolizable energy from weeks 2 to 6 was estimated at 15:1.

Table 5: Ewe liveweight and lamb performance in an early lambing flock offered high quality silage as the main diet during late pregnancy and early lactation

	No. ewes	Liveweight (kg)	
Mating	338	73.7	
Mid pregnancy	338	77.7	
5 Weeks post-lambing	325	76.4	
		Birth type	
	1	2	3
No. lambs	144	251	57
Birth wt. (kg)	6.1	5.1	4.0
Growth rate 0-5 weeks (g/day)	338	279	248

A more important assessment of the adequacy of feeding may be obtained from flock performance data shown in Table 5 (2 years results). The average loss in ewe liveweight between mid pregnancy and 5 weeks post-lambing was small. Lamb birthweights were higher than expected, especially in the case of single lambs. The growth rates were similar to the previous results recorded in flocks offered fodder beet diets. By housing the flock during early lactation and by offering high quality silage *ad libitum* supplemented with 1.25 kg concentrates/ewe/day, a high degree of management control was achieved, resulting in an average lamb growth rate of almost 300 g/day on a whole flock basis. This is the target growth rate required for this stage of the production cycle.

Lamb performance results in the two finishing systems are shown in Table 6. Lamb growth rate and age at slaughter in the two systems were similar. The average age of all lambs at slaughter was 101 days and the majority of lambs were drafted by May 3. The carcass weight of early-weaned lambs was over 1 kg lighter than those on grazed pasture and repeated a trend that was already evident in earlier trials. Two alternative reasons for this trend are that either the drafting procedures were imprecise or that lambs intensively fed on concentrates tend to finish at lighter weights compared with lambs on grazed pasture. Further investigations in 1998 provided evidence in support of the latter alternative.

Table 6: Lamb performance on grazed grass and on all-concentrate diets

Finishing systems	Grazed pasture	All-concentrates	
		Pelleted[1]	Loose Mix[2]
No. lambs	128	58	57
Growth rate (g/day)	345	335	332
Carcass wt. (kg)	18.3	17.2	17.0
Age at slaughter (days)	101	102	99
Concentrate intake (kg/lamb)	37.0	67.0	63.0
No. days on feed	57	58	55
Feed cost (£/lamb)	5.81	10.52	8.82
F.C.R. (kg feed/kg livewt gain)	-	3.1	3.2
No. lambs drafted by May 3	121	51	50

[1]Ewe and lamb pelleted compound (16% crude protein content) £157/tonne
[2]Rolled barley/beet pulp/soyabean meal 40:40:20 £140/tonne,

COMPARATIVE PERFORMANCE OF TERMINAL SIRE BREEDS

In common with mid-season production, the Suffolk is the principle sire breed chosen for early lamb enterprises. There was, however, very limited information on its performance relative to other breeds for early season production. Trials was therefore undertaken in which rams from the two terminal sire breeds, Suffolk and Texel, were compared for the economically important components of lamb performance. These trials were undertaken in conjunction with the evaluation of chopped fodder beet. The ewes were compact mated with Suffolk and Texel rams and the progeny of these Suffolk and Texel rams were equally represented in the two finishing groups.

Comparative results on lamb performance are shown in Table 7. The difference in growth rate from 5 weeks of age until slaughter was significant. This result confirms previous evidence that Texel-cross lambs have a lower growth rate than Suffolk crosses, except when the dams are themselves Suffolk crosses (Hanrahan, 1994).

Table 7: Performance of January-born lambs sired by Suffolk or Texel rams

	Suffolk	Texel
No. lambs	279	147
Birth wt. (kg)	4.5	4.6
Growth rate (g/day):		
0-5 weeks	280	276
5 weeks-sale	298	268
Carcass wt. (kg)	17.9	18.3
Age at slaughter (days)	119	132

The differences in carcass weight and age at slaughter were also significant. The carcasses of Texel progeny were 0.4 kg heavier than the Suffolk progeny but this advantage was nullified by the extra feeding period, i.e. 13 days extra to reach a suitable finish compared with Suffolk progeny.

The higher carcass weight of Texel progeny was not translated into financial advantage. This was due mainly to the longer feeding period required to finish Texel progeny at a time when prices are declining rapidly. While the Texel crosses scored marginally better in terms of fatness and conformation, the absence of price differentials for quality means that this advantage was not translated into financial gain. The overall conclusion is that using Texel rams did not confer any overall advantage for early lamb production.

CONCLUSIONS

- Export sales outlets must be found for 75 out of every 100 lambs produced on Irish farms. These sales outlets are in Europe, mainly France and to a lesser extent in Germany, U.K., Spain and Portugal. Continuity in the supplies of high quality lambs to these export outlets is essential for maintaining and expanding market share. A larger volume of lamb exports in the early part of the year would enable exporters to command a greater share of the market in summer and autumn. It is considered, therefore, that in common with dairy milk and livestock production generally, the seasonality of lamb production needs to be reduced while at the same time maintaining most of the benefits of lower cost grass and forage based production systems.

- There are high quality lamb markets to be exploited in the spring and early summer centred around the Easter season. These markets command peak prices relative to summer/autumn. The basic requirement for high quality are a carcass weight of 17 to 18 kg with light to medium fat cover (Fat class 3) and good conformation (Confirmation class U or R).

- The early season is relatively short and top prices prevail from late March to early May only. This means that the production and marketing of early lambs must be programmed to meet sale date deadlines at this time. For January born lambs, therefore, the production target is a carcass weight of 18 kg at about 100 days of age.

- For cost effective and profitable early production, there are two principal constraints in management and breeding which must be overcome:

(a) The lack of grass growth in winter when the feed requirements of the flock are at a maximum, that is, when ewes are rearing lambs. To rectify grass deficits, it is necessary to provide specially sown forage crops for winter grazing or to feed extra concentrates. Either option

results in considerably increased feed costs compared with mid season production.

(b) Flock productivity in early lambing is reduced due to the ewe's seasonal cycle of reproduction. Hence it is necessary to use hormone treatments for induction of oestrus and response. These treatments incur added costs.

- Early lamb enterprises are accommodated most readily on mixed sheep/tillage farms where competing demands for labour in spring are avoided by lambing in winter. Grass/tillage rotations facilitate reseeding of grass varieties with special characteristics for early growth in spring. Arable by-products can be utilised for feeding in winter at low cost.

- Autumn-sown Italian ryegrass has a high ewe carrying capacity for short term grazing in early spring (664 to 990 ewe grazing days per ha). Due to its early growth, I. ryegrass provides a cost-effective option for : (1) strategic grazing before permanent pastures become plentiful and, (2) minimising the use of concentrates, the current costs of which range from 14 to 20p per kg DM. In contrast, I. ryegrass costs only 4.5 p/kg DM per ha when sown as a 2-year temporary ley.

- After lambs are finished and drafted in April/May the dry ewes can be stocked at 40 head per ha during summer while I. ryegrass is used for silage conservation. Grazing of I. ryegrass can be resumed in July when ewes are being flushed for a new production cycle. The period of hormone treatment, post-mating management and mid pregnancy extends from July to November. During this period, the ewe carrying capacity of fertilised pastures at Knockbeg proved to be 20 ewes per ha. Stocking rate varies widely during the extended grazing season depending on the requirements of the flock.

- A second option for overcoming grass deficits in winter and which is directly relevant to tillage farming areas is fodder beet. An indoor management system for feeding chopped fodder beet to lactating ewes

facilitates better control in feeding management compared with conventional systems based on roots grazed in situ. High intakes of high quality feed are assured. Good housing facilities and a fodder feeder are essential.

- As an alternative to autumn sown forage crops or roots, high quality silage offers a third option for overcoming grass deficits in winter/early spring. Indoor feeding of high quality silage to ewes during early lactation provides: (a) a solution to the problem of the low grazing capacity of permanent pastures during winter and, (b) a suitable bulk diet when supplemented with concentrates resulting in a consistent lamb growth rate to 5 weeks of age.

- At 5 weeks post-lambing, lambs may either be turned out with their dams to early grass for finishing or early weaned and finished indoor on all-concentrate diets. Results showed that lambs turned out to grass plus creep feed were finished at about 100 days. But in years with high rainfall lamb growth rate was relatively poor due to adverse grazing conditions. Such weather related problems can be avoided by early weaning and finishing indoor on all-concentrate diets.

- Finishing on commercially available concentrate compounds result in lamb growth rates of 325 to 335 g/day and carcass weights of over 17 to 18 kg at 102 to 109 days of age. Although cereal based loose mixes resulted in a lower carcass weight than intensive lamb pelleted concentrates, this was more than compensated for by the lower feed cost.

- Gross margins per ewe and per ha in early lamb enterprises are the main determinants of enterprise competitiveness relative to mid season production. In recent years gross margin per ewe in early lamb production was lower than in mid season. In terms of land use, however, gross margin per ha was higher in the early systems than in mid season, i.e. the higher rate of stocking more than compensated for the lower profit per ewe.

- The cost of direct inputs per kg of carcass is another measure of enterprise competitiveness. The cost of producing 1 kg of early lamb carcass varied from 134p to 166p, compared with 77p for mid season lamb. The cost of early lamb was lowest in systems based on grass/forage/concentrates and highest when early weaning and finishing on all-concentrate diets was practised.

- Low prices recorded in some years were associated with the practice of extended feeding of over-wintered hoggets and also with ewe hogget retention. For example, in 1995 a combination of over-finished hoggets retained by finishers expecting the high prices of 1994 combined with an influx to the market of under-finished ewe hoggets retained for claiming ewe premia, adversely affected early season prices. Clearly, the requirements of the market in terms of quality and seasonality should be the central focus.

REFERENCES

CAB International (1993). Energy and Protein Requirements of Ruminants p.96.Wallingford, U.K.

Chestnutt, D.M.B and Kilpatrick, D.J. (1988/89). Effect of silage type and concentrate supplementation on the intake and performance of breeding ewes. 62nd Annual Report, Agricultural Research Institute, N. Ireland, Hillsborough, Co. Down.

Fitzgerald, S. (1979). Replacement of concentrates with roots in the diet of early weaned lambs. BSAP 72nd Meeting, Harrogate, March 19-21.

Fitzgerald, S. (1983). The use of forage crops for store lamb fattening. In: "Sheep Production" edited by W. Haresign, published by Butterworths, London pp 239-286.

Fitzgerald, J.J. (1986). Finishing of store lambs on silage based diets. Irish Journal of Agricultural Research **25**: 327-345.

Fitzgerald, S. and Flanagan, S. (1981). Early lamb production based on fodder beet and pasture. An Foras Taluntais Animal Production Research Report pp 82-83.

Flanagan, S. (1983). Early lamb production. An Foras Taluntais Animal Production Research Report p 72.

Flanagan, S. (1998). Studies on Early Lamb Production : Technical Report for Project No. 3326 (42pp) Teagasc, Research Centre, Athenry, Co. Galway, September 1998.

Hanrahan, J.P. (1994). Breed evaluation for growth and carcass traits. Sheep Conference for Advisors, Athenry, April 12-13.

Meat & Livestock Commission (1983). Feeding The Ewe. P.O Box 44, Queensway House, Bletchley, MK2 2EF, U.K.

Sheehan, W and Hanrahan, J.P (1989). A comparison of soyabean meal and fish meal as protein supplements for the lactating ewe. Irish Journal of Agricultural Research **28** : 133-140.

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