Finishing lambs from grazed pasture – The options and the facts

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To put the current state of the sheep industry into context there are 2.4 million breeding ewes in Ireland, the ewe population having declined from 4.79 million in 1992. However, most of the decline in sheep numbers occurred during the last 5 years when the national ewe flock has declined by 36%. During the same period the real price of lamb (nominal price divided by cost of production index) has declined by 11% and there has been no improvement of technical efficiency at farm level. Using data from the National Farm Survey, during the last 6 years weaning rate has marginally improved from an extremely low base level. However, stocking rate, which is a key measure of productivity at farm level has declined by 0.7 ewes/ha, to 7.9 ewes/ha, during the last 6 years. Consequently, to maintain a margin from sheep production it is essential to improve efficiency whilst reducing the costs of production.

Whilst grazed grass is an expensive forage to produce, it is the cheapest feed available to the ewe flock for majority of the year. In intensive systems of mid-season prime lamb production grazed grass accounts for 86% of total dry matter intake. Consequently, it is essential to optimise lamb performance from grazed pasture to improve margins from sheep production. This is achieved by continuously supplying high feed value pasture for the duration of the grazing season. Feed value is a combination of nutritive value (i.e., digestibility) and intake characteristics (combination of herbage supply and digestibility). One of the benefits of the temperate climate which prevails in Ireland is the fact that grass grows for most of the year.

The aim of this paper is to present information based on recent research studies undertaken at the Sheep Research Department at Athenry, on the optimum lamb performance from grazed pasture and the management necessary to achieve this optimum. Furthermore, alternatives to grazed grass for finishing lambs are discussed including the use of concentrate feeding and alternative forages during the grazing season.

Lamb performance from grazed pasture offered as the sole diet

The achievable potential level of lamb performance both pre- and post-weaning, which is influenced by litter size, is presented in Table 1. Studies at Athenry have clearly shown that high daily liveweight gains of lambs reared as singles and twins are achievable from grazed grass offered as the sole diet. Lambs reared as triplets were offered up to a maximum of 300 g concentrate daily until weaning whilst their dams received 0.5 kg daily for the first 5 weeks post- lambing. Therefore, using the data presented in Table 1, flocks which are weaning 1.3, 1.5, 1.7 and 1.9 lambs per ewe joined to the ram, and thus

rearing 1.37, 1.58, 1.79 and 2.0 lambs/ewe lambed, target flock lamb liveweight gains from birth to weaning (at 14 weeks of age) are 322, 312, 303 and 293 g/day respectively. This clearly illustrates that flock target lamb performance must take account of weaning rate. Therefore, when discussing lamb performance at pasture, flock litter size must be considered.

Table 1. Target lamb daily liveweight gain (g/day) from grazed pasture

	Rearing type		
	1	2	3*
Pre-weaning	340	295	290
Post-weaning to slaughter	210	195	190

* Lambs reared as triplets received up to 300g concentrate per head daily up to weaning.

Factors contributing to lamb performance from pasture

1. Grassland management

Effective grassland management involves matching grass supply and feed value with animal requirements. Grass growth varies throughout the grazing season. For example, typical daily grass dry matter growth rates for March, April, May, June, July, August, September and October are 10, 30, 70, 60, 50, 60, 40 and 30 kg/ha, respectively. Meanwhile, the demand of the ewe flock increases reaching a peak prior to weaning and declines thereafter as the requirements of dry ewes decline and lambs are being drafted for sale.

The main objective of grassland management is to have a plentiful supply of highly digestible grass available to the animals for the duration of the grazing season. However, as the grazing season progresses grass matures and goes from vegetative to reproductive state consequently increasing the proportion of stem and reducing digestibility and intake potential. Therefore, to achieve optimum levels of lamb performance from grazed grass, pasture must be managed to maximise the proportion of leaf in the sward canopy, thus maintaining herbage digestibility and intake potential. This is achieved by grazing swards to different residual heights during the grazing season. Sward height measurement is the easiest and most effective way of managing pasture. For ewes and their lambs target post-grazing sward heights, which differ for rotational and set stocked grazing systems, based on many studies undertaken at Athenry are summarised in Table 2. Similar levels of lamb performance are achievable from well-managed set stocked and rotational-grazing systems. The main advantage of the rotational grazing system is that it simplifies the removal of excess herbage (paddocks) from the system during periods of rapid grass growth (e.g., early May), for forage conservation and enables the inclusion of extra herbage (e.g., aftergrass) when grass growth slows down in mid-summer. Also the rotational grazing system facilitates higher grass utilisation consequently reducing costs of production.

Table 2. Recommended sward heights for target lamb performance (cm)

Month	Grazing system	
	Rotational – post grazing	Set stocked
March	3.5 – 4	5
April	3.5 – 4	5 – 6
May	4.5 – 5	6
June	5.5 – 6	6 – 7
July	6	7 – 8
August	6	7 – 8
September	6	8

The lamb growth rates achieved to weaning at Athenry on old permanent pastures in 2008 and 2009 are presented in Table 3. At Athenry, ewes rearing singles or twins and their lambs receive no concentrate supplementation whilst at pasture. Ewes rearing triplets are offered 0.5 kg concentrate daily for the first five weeks post-lambing and their lambs have access to up to 300 g concentrate daily to weaning.

Table 3. Daily liveweight gain to weaning at Athenry in 2008 and 2009 (g/day)

Year	Birth type		
	1	2	3*
2008	336	292	296
2009	338	279	284

* Lambs reared as triplets received up to 300 g concentrate per head daily.

At Athenry, from 1 April to 30 June, total rainfall was 225 mm and 350 mm in 2008 and 2009, respectively. In 2008, grass supply was scarce due to low temperatures in mid-April, with the post grazing sward height being as low as 2.6 cm at times. However, no concentrate was offered to either the ewes or their lambs. For April, May and June 2008 mean post grazing sward heights were 3.5, 4.8 and 5.5 cm and mean pre-grazing sward heights were 6.4, 8.6 and 7.9 cm respectively. Managing the sward as described above resulted in mean daily liveweight gains from birth to weaning of 336, 292 and 296 g daily for singles, twins and triplets respectively.

April and May in 2009 were characterised as extremely wet with total monthly rainfall of 150 mm and 131 mm, respectively. For April, May and June mean post grazing sward heights were 3.8, 3.8 and 4.0 cm and pre-grazing sward heights were 5.8, 7.0 and 6.6 cm respectively. Pre-weaning lamb daily liveweight gains were 338, 279 and 284 g for singles, twins and triplets, respectively.

The data presented for 2008 show that even when there was grass shortage in April and May, due to low temperatures, and for 2009 which was extremely wet that high levels of lamb performance can be achieved consistently when grazed grass is the sole diet offered to ewes and their lambs.

The data presented in this paper, based on many years of research at Athenry clearly illustrate that high levels of lamb performance, both pre- and post-weaning, are achievable for grazed grass offered as the sole diet. The key to achieving high levels of lamb performance from pasture is the provision of adequate quantities of high digestibility herbage. The easiest way to manage grassland for the flock is to use sward height when deciding on flock movement to new pasture, and the removal of paddocks for forage conservation.

2 .Lamb birth weight

Lamb birth weight, which is influenced by plane of nutrition throughout pregnancy and whether ewes are shorn or not when housed, influences subsequent growth rate and weaning weight. Shearing ewes at housing increases lamb birth weight by approximately 0.6 kg. Previous studies at Athenry have shown (Table 4) that each 0.5 kg increase in lamb birth weight increases subsequent weaning weight by 1.7 kg. The increased weaning weight is due to a combination of increase in birth weight per-se and increased growth rate. Increased birth weight per-se and higher growth rates of lambs from birth to weaning account for 58% and 42% of the increased response in weaning weight respectively.

Table 4. Influence of lamb birth weight on subsequent weaning weight

Increased weaning weight (kg) per 0.5 kg increase in birth weight	Source
1.6	*Keady et al (2007)*
1.7	*Keady & Hanrahan (2009a)*
1.7	*Keady & Hanrahan (2009b)*

3. Male lamb management

Many producers castrate male lambs because this has always been custom and practice, worries about behaviour and performance post-weaning and due to the perception that it improves subsequent eating quality. The effect of castrating male lambs on subsequent lamb performance is presented in Table 5. Castrating male lambs reduced lamb weaning weight by 1.8 kg whilst increasing the age at slaughter by 16 days consequently reducing the price received per kilogram carcass as carcass price normally declines as the season progresses in Ireland. Meanwhile, for the loss of revenue the producer has not produced a product of superior meat quality. Hanrahan (2010) concluded from a review of the literature that “where male lambs are reared on an all-grass diet and slaughtered by the end of the grazing season, leaving male lambs entire has no negative effect on meat quality, whether assessment is laboratory based or through in-home consumer tasting”.

Table 5. Effects of castration of male lambs on subsequent performance

	Sex category	
	Entire	Castrate
Weaning weight (kg)	31.7	29.9
Sale date	8th August	24th August
Carcass weight (kg)	18.1	18.2

(*Hanrahan, 1999)*

Feeding concentrate to lambs at pasture

Many producers feed concentrate to lambs at pasture from approximately 3 weeks of age until slaughter with the intention of increasing lamb growth rate subsequently reducing age at slaughter and achieving higher price per kilogram lamb carcass. The lamb performance response to concentrate feeding depends on grass supply and digestibility and on the level of concentrate offered. Previous studies at Athenry have clearly shown that higher responses to creep feeding occur when lambs are forced to graze pasture to a very low residual sward height up to weaning, whilst little response is obtained where there is an adequate supply of highly digestible grass. For example, pre-weaning the response to creep feeding has varied from 210 g to 88 g lamb liveweight gain per 1 kg concentrate when lambs grazed to a residual sward height of 4.2 cm or had access to creep grazing respectively. Subsequently, at Athenry in two consecutive years when lambs were offered 14 kg concentrate from weeks 5 to 14, the response to creep feeding was 78 g and 0 g liveweight gain per 1 kg concentrate in years 1 and 2 respectively.

A four year study at Athenry involved evaluating the effect of grass supply and concentrate feed level on lamb performance response to creep feed. The ewes used in the study were predominantly rearing twins as the number of lambs reared per ewe ranged from 1.7 to 1.9 during the 4 years of the study. The effects of the level of concentrate offered and grass availability, as determined by residual sward height in a set-stocked grazing system, are presented in Table 6. The data clearly show that high levels of lamb performance were achieved from grass as the sole diet in a set-stocked grazing system. Increasing concentrate feed level increased lamb performance and reduced the age at slaughter, regardless of sward height.

Table 6. The effects of concentrate feed levels and grass availability on lamb performance from birth to slaughter

	Creep feed (g/lamb per day)					
	Low sward height (5cm)			High sward height (6 cm)		
	0	300	600	0	300	600
Weaning weight (kg)	31.4	34.3	36.9	33.7	36.7	37.5
Drafted at weaning (%)	7.3	20.7	42.8	20.4	41.2	53.7
Age at sale (days)	167	140	125	154	126	118
Creep intake (kg)	0	32.5	52.9	0	27.5	46.0

(Grennan & McNamara, 2005)

Lambs offered a maximum of 300 g or 600 g creep/day consumed 30 kg and 50 kg concentrate respectively from birth to slaughter. Feeding 300 g concentrate per lamb daily on the low sward resulted in the same level of lamb performance pre-weaning as lambs grazing the high sward without concentrate supplementation. Therefore, concentrate feeding replaced good grassland management. Concentrate feeding reduced the age to slaughter by 28 days. However, increasing grass height from 5 cm to 6 cm reduced the age at slaughter by 13 days, equivalent to feeding 16.3 kg concentrate per lamb from birth to slaughter. Previous studies (Keady and Hanrahan 2009, and Keady et al 2007) at Athenry have shown that shearing ewes at housing increased subsequent lamb birth and weaning weights by 0.6 and 2.2 kg respectively which is equivalent to the response to feeding 22 kg concentrate per lamb from birth to weaning.

The data from Athenry clearly show that creep feeding concentrate increases lamb performance, and that effect varies with grass supply. Furthermore, age at slaughter is reduced by 28 days. However, does concentrate feeding increase financial returns in a mid-season prime lamb production system as in Ireland most ewes lamb within a 6 week period from mid-February?

To determine the potential financial implication of feeding concentrate it is essential to include the drafting information and individual carcass weight data for all lambs for the entire flock. The drafting data from flocks at Athenry and from a commercial flock for 2008 and 2009 are presented in Table 7 (the flock at Athenry in 2009 were reared on old permanent pasture and did not have access to aftergrass post weaning). These flocks did not offer concentrate to lambs reared as singles or twins whilst lambs reared as triplets received up to 300 g concentrate daily until weaning. Carcass value received and estimated carcass value had the lambs being offered concentrates (as determined by selling 4 weeks earlier) are also presented in Table 7 to estimate the effect of creep feeding on financial returns. The mean carcass weights for the Athenry flock were 19.0 kg and 19.1 kg and for the commercial flock were 21.8 kg and 21.1 kg respectively for 2008 and 2009. The data presented in Table 7 clearly show that feeding concentrate dramatically increased the price received per kilogram of lamb carcass for the first lamb draft. However, when the increased price which would have been received due to earlier drafting as a result of concentrate feeding is calculated for the whole flock the increase in average carcass price was 17, 9, 2 at 10 c per kilogram for the Athenry flock in 2008 and 2009 and the commercial flock in 2008 and 2009 respectively. This clearly illustrates that whilst concentrate feeding reduced the age of slaughter by 28 days it had relatively marginal effects on the average price received per kilogram of lamb carcass for the whole flock. Lambs which are offered 300 g concentrate daily consume 30 kg of concentrate prior to slaughter. The value of concentrate consumed by lambs prior to slaughter is €4.50, €6.00 or €7.50 when concentrate costs €150, €200 and €250/t respectively. To recover the cost of concentrate, the concentrate would need to have been purchased for €108/t, €57/t, €15/t and €70/t for the Athenry flock in 2008 and 2009 and the commercial flock in 2008 and 2009 respectively. In

the costing exercise no economic value was attributed to the grass which is not consumed due to earlier sale of lambs offered concentrate because the opportunity value of the grass on a sheep farm in the summer is relatively low. However no cost has been included for the price of the feeders or the labour to feed the concentrate daily.

Table 7. The effects of concentrate feeding (300g / lamb daily) on lamb carcass value (concentrate feeding reduced drafting age by 28 days) for the Athenry Flock and a commercial flock in 2008 and 2009

Flock	No concentrate		Price (€/kg) at sale		
	Date	% Sold	No conc. offered	If offered conc. (killed 4 weeks earlier)	Difference (c/kg carcass)
Athenry 2008	25th June	21	4.28	4.54	+26
	25th July	44	3.80	4.28	+46
	8th Sept	69	3.66	3.60	-6
	6th Oct	87	3.50	3.66	+16
	4th Nov	100	3.50	3.59	+9
		Average	***3.73***	***3.90***	***+17***
Athenry 2009	22nd June	11	3.95	4.67	+72
	29th July	24	3.58	3.85	+27
	18th Aug	34	3.69	3.67	-2
	8th Sept	61	3.69	3.65	-4
	29th Sept	75	3.45	3.54	+9
	29th Oct	89	3.44	3.45	+1
	26th Nov	100	3.68	3.44	-24
		Average	***3.63***	***3.72***	***+9***
Commercial producer 2008	3rd July	6	3.95	4.27	+32
	22nd Aug	29	3.66	3.66	0
	12th Sept	45	3.66	3.60	-6
	21st Oct	70	3.48	3.55	+7
	11th Nov	90	3.50	3.48	-2
	4th Dec	100	3.50	3.50	0
		Average	***3.60***	***3.62***	***+2***
Commercial producer 2009	9th July	12	3.72	4.51	+79
	17th Aug	38	3.69	3.67	-2
	10th Sept	69	3.69	3.67	-2
	12th Oct	83	3.43	3.61	+18
	27th Nov	100	3.44	3.45	+1
		Average	***3.62***	***3.72***	***+10***

The data in Table 7 show that under market conditions which prevailed in 2008 and 2009, the extra carcass value received due to creep feeding in mid season prime lamb producing flocks did not even come close to covering the cost of concentrate offered. Therefore, to improve financial margins the

majority of producers should focus on improving grassland management which is low cost, rather than trying to replace poor grassland management with concentrate which is an expensive solution and guaranteed to reduce margins.

Have alternative forages a role in finishing lambs?

On many commercial units, lamb growth post-weaning is mediocre. As already discussed in this paper, whilst concentrate supplementation increases lamb performance it is not financially justifiable. In recent years there has been interest in the industry to including tyfon or chicory, as part of a grass seed mixture to enable lambs be finished off pasture. This involves re-seeding pasture in May at the time of peak grass demand (grazing plus forage conservation) to ensure that the new crop is available for grazing post-weaning from mid-June onwards. However, whilst many producers reported benefits from the use of tyfon or chicory to finish weaned lambs, they were not able to quantify if a positive response was obtained, the size of the response obtained, and whether any perceived response was due to the new grass re-seed or to the inclusion of the alternative forage in the seed mixture.

Tyfon is a brassica, a cross between stubble turnip and chinese cabbage. It only survives for one season and provides up to 4 grazings with most of the forage produced in the first rotation.

Chicory is a perennial forage crop with a deep tap root that is tolerant of drought. There is evidence that it may have anthelmintic properties, consequently reducing internal parasites in sheep. Chicory has a persistency of up to 5 years depending on sward management.

As there is a paucity of information on the affects of re-seeding and the use of alternative forages on lamb performance post-weaning a study was undertaken at Athenry to evaluate the effects of reseeding and the use of alternative forages, namely tyfon and chicory, on lamb performance post-weaning.

<u>Grazing Study</u>
The effects of tyfon and chicory, grazed either as pure stands or in combination with perennial ryegrass, on lamb performance post-weaning were evaluated in a grazing study at Athenry in 2009. The performance of lambs grazing old permanent pasture was the bench mark to determine the benefits from reseeding. Paddocks were ploughed and seeded on 29 May (delayed by 3 weeks due to prevailing weather conditicions) to give the following treatments:

(i) Perennial ryegrass (PRG)
(ii) Chicory plus PRG
(iii) Tyfon plus PRG
(iv) Chicory
(v) Tyfon

A sixth treatment consisted of old permanent pasture.

The perennial ryegrass mixture was based on intermediate heading varieties consisting of Aberdart, Aberstar, Greengold and Dunluce at 2.5, 9.9, 7.4 and 7.4 kg/ha, respectively. In addition Chieftain and Crusader varieties of clover were included at 1.2 kg and 1.2 kg/ha, respectively in the seed mixture. When chicory or tyfon was included they displaced 3.7 kg/ha of the grass seed mixture. When grown as pure stands, chicory and tyfon were seeded at 6.2 kg/ha.

The old permanent pasture had been grazed only by ewes and lambs for the previous 10 years, and had been used recently for extended grazing. Its botanical composition was: meadow grass 39%, perennial ryegrass 27%, cocksfoot 11%, clover 8%, timothy 8% and weed species 7%. Furthermore the old permanent pasture was not topped during the grazing season in question.

Weaned lambs commenced grazing the experimental treatments from 7 July and were drafted for slaughter every 3 weeks. Lamb performance is shown in Table 8. High levels of lamb performance were achieved, the average daily live-weight gain being 217 g/day overall. Lambs grazing the old permanent pasture produced essentially the same daily live-weight gain as the lambs on the new perennial ryegrass sward or the other treatments. Relative to the new perennial ryegrass sward, including chicory in the seed mixture reduced live-weight gain by 36 g/day, consequently increasing the number of days to reach slaughter weight. However, kill-out percentage was increased by 1.2% units. Including tyfon in the seed mixture had no effect on lamb performance. Grazing pure stands of either tyfon or chicory did not affect performance relative to lambs grazing the new perennial ryegrass pasture or the old permanent pasture. Lambs which grazed either the old permanent pasture, the new perennial ryegrass sward, and the tyfon plus perennial ryegrass swards had similar drafting patterns.

Table 8. Effect of sward type on lamb performance

	Sward type					
	Perennial Ryegrass (PRG)	Tyfon + PRG	Tyfon only	Chicory + PRG	Chicory only	Old permanent pasture
Live weight gain(g/day)	226	220	213	190	226	219
Kill out (%)	42.1	42.6	42.9	43.2	43.4	42.1

(Keady and Hanrahan 2010)

The distribution of herbage yield during the grazing season was greatly influenced by the re-seeding treatment. For example, the new perennial ryegrass sward and the swards which included either chicory or tyfon produced the same total dry matter yield during the grazing season. However, the swards containing tyfon produced higher yields during the first rotation but

lower herbage yields during the subsequent rotations. For example, the sward containing tyfon produced 200%, 62%, 55% and 69% of the forage produced in the perennial ryegrass sward during rotations 1, 2, 3 and 4, respectively. This is similar to results from a study undertaken on one of the Better Sheep farms (Ciaran Lynch- personnel communication). The corresponding values for the sward containing chicory were 129%, 101%, 83% and 90% respectively. Tyfon grown as a pure stand produced a heavy yield in the first rotation, but much lower yield in subsequent rotations. The pure stand of chicory produced consistently low yields throughout the study, producing 74%, 41%, 55% and 63% of the forage produced in the perennial ryegrass sward during rotations 1, 2, 3 and 4, respectively.

Herbage utilisation is one of the major factors affecting the real cost of forage. In the current study, to maintain reasonable herbage utilisation, it was essential to graze the swards containing tyfon tight to reduce the quantity of leaf remaining on the ground surface. Also, it was noted that including tyfon in the grass seed mixture resulted in open swards, subsequently reducing herbage production later in the season with a possible negative impact on long-term sward botanical composition.

Sward type had a major impact on stock carrying capacity, and therefore on live-weight gain per hectare (Table 9). In the reseeded pastures, relative to perennial ryegrass, including either chicory or tyfon in the seed mixture did not increase lamb live-weight gain per hectare. Whilst use of chicory as a pure stand resulted in the same lamb daily live-weight gain as perennial ryegrass (Table 9), live-weight gain per hectare was reduced by 42% due to the much lower herbage production.

Table 9. Effect of sward type on lamb output per hectare (relative to PRG)

	Sward type				
	Perennial ryegrass (PRG)	Tyfon + PRG	Tyfon only	Chicory + PRG	Chicory only
Lamb grazing days	100	94	92	99	56
Live-weight gain (kg/ha)	100	90	87	93	58

(Keady and Hanrahan 2010)

The results of this study show that there was no benefit from re-seeding, or from the inclusion of either tyfon or chicory in the seed mixture, on lamb performance post-weaning. Currently tyfon and chicory seed is 4 to 5 times more expensive than grass seed consequently increasing re-seeding cost. Also re-seeding with the objective of producing tyfon for lambs post-weaning involves removing paddocks for the grazing cycle at the time of peak herbage demand one month prior to weaning. At this time of the year the objective should be to conserve winter forage supplies whilst at the same time maintaining lamb growth rate during the last 4 to 6 weeks period prior to weaning by providing a continuous supply of high feed value grass to the

flock. Finally, use of alternative forages reduces stock carrying capacity and alters the distribution of herbage production through the grazing season.

Whilst re-seeding showed no benefit in lamb performance, new re-seeded pastures have been shown to increase herbage production, particularly at the beginning and end of the grazing season. On moderately stocked farms improving grassland management provides a cheaper alternative to improving lamb performance from pasture than reseeding. If re-seeding is to be undertaken, the ideal time is late July or August (when grass demand is reduced) subsequently providing high feed value grass for finishing lambs in September and for preparing the ewe flock for the breeding season.

Adoption at farm level

Lamb growth rate varies dramatically between farms. For example on 40 commercial sheep units from 2001 to 2003 and on 6 commercial sheep units in 2009, pre-weaning growth rates of twin lambs varied by 100 g/day (Hanrahan 2004) of 35 g/day (Hanrahan and Lynch, 2010) respectively. Consequently, weaning weights differed by 10 and 3.5 kg respectively which has a major knock-on effect on the age at slaughter and subsequently carcass price and cost of production. A major proportion of the reduction in pre-weaning performance is due to grassland management. So why is good grassland management not being adopted on commercial farms?

1. Lack of attention to developing and implementing a grazing plan, as indicated by poor grass supply particularly early in the season (post lambing).

2. Little or no measurement of grass availability on which to base subsequently management decisions re allocation of fresh pasture.

3. On a large proportion of farms sheep is not the primary enterprise.

4. Inadequate farm structure due to little or no investment in farm infrastructure including sheep housing, sheep handling facilities or sheep fencing thus reducing the ability to control livestock and increasing labour requirement.

5. During times of poor lamb price, the perception by producers that improved performance gives a small return for the extra management input.

6. Many sheep producers had off-farm employment.

7. Many sheep producers farmed for subsidy pre-decoupling and consequently did not focus on technology to improve efficiency but instead increased stocking rate.

8. Poor adoption due to the level of experience / knowledge of well-managed grassland systems, and a tendency to over complicate them during the knowledge transfer process.

Conclusions

1. High levels of lamb performance can be obtained from grazed pasture offered as the sole diet. For twin lambs target daily liveweight gain pre- and post-weaning are 295 g/day and 195 g/day respectively.

2. To achieve high levels and lamb performance from grazed pasture:

   (a) have a grazing plan which ensures adequate grass at turn-out, i.e., start to remove stock from paddocks the previous November in rotation with post grazing sward heights of 4 cm.

   (b) Graze pasture tight early in the season. For a rotational grazing system target post-grazing sward heights are 3.5, 4.5, 5.0 and 6cm for April, May, June and July respectively.

   (c) Remove paddocks from the grazing system in late April / early May when there is an estimated 15 days grass supply ahead of the flock.

   (d) Allocate the highest feed value pasture to lambs post-weaning, i.e., aftergrass or graze lambs in a leader-follower system – the lambs as leaders and the dry ewes as followers.

   (e) When grass supply is scarce in April, grazing to post grazing sward heights of <3 cm for 2 weeks does not require concentrate supplementation for the ewes.

   (f) Increase lamb birth weight. Each 0.5 kg increase in lamb birth weight increases weaning weight by 1.7 kg and reduces days to slaughter by about 2 weeks.

   (g) Leave male lambs entire. The benefit of higher growth rates from entire male lambs, relative to castrates, increases as lambs get older.

3. Concentrate feeding lambs at pasture:

   (a) Increases lamb performance and reduces the age of slaughter.

   (b) The response to concentrate feeding depends on grass supply and concentrate feed level. As grass supply and concentre feed level increase, response to concentrate, as determined by lamb liveweight gain per kilogram concentrate, decreases.

(c) For the majority of mid-season prime lamb producers feeding concentrate is not economically justifiable.

(d) Sheep producers should invest in good grassland management, rather than concentrates to increase financial margins and reduce labour requirements.

4. Alternative Forages:

(a) Do not increase animal performance relative to well-managed, old permanent pasture.

(b) When growing alternative forages the emphasis of the producer may change from increasing flock productivity to growing the alternative forage crop.

(c) Tyfon increases forage production for the first grazing cycle, but reduces forage availability for the second, third and fourth rotations.

(d) Utilisation of tyfon can be as low as 60%.

(e) Tyfon results in open swards during the first grazing season.

(f) Chicory produces low herbage yield, and consequently a much reduced stocking rate.

(g) On moderately stocked farms (i.e., < 9 ewes/ha) emphasis should be managing existing swards rather than re-seeding.

(h) On a sheep farm re-seeding should occur in early autumn when herbage demand is relatively low as the lambs are weaned / sold and winter forage has been conserved.

(i) Re-seeding in early autumn provides high feed value herbage to finish remaining lambs in autumn. Prepare the flock for the breeding season whilst ensuring early grass for the subsequent lambing season.

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