Extended grazing – its potentials and limitations

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Ewe numbers peaked in Ireland in 1992 at 4.79 million and have since declined by 39% to 2.93 million in 2006. However sheep production is still an important farm enterprise with output equivalent to €191 million in 2006 accounting for 3.6% of the Gross Agricultural Output. Prior to 31 December 2004, in the subsidy systems of sheep production which prevailed, it was essential to keep ewes to claim the ewe premium. However since decoupling, premia are now received in the form of the Single Farm Payment. In recent years the price received by producers for lamb meat has not improved whilst the cost of production has increased considerably. Furthermore in the "Celtic Tiger" economy an increasing proportion of producers have off farm employment. Currently it is estimated that 48% of sheep producers obtain a second income by working off farm. To maintain margins sheep producers have a number of options including the following. Firstly, increase lamb carcass output per hectare which is achievable by improving efficiencies within the farm gate. Secondly avail of environmental schemes (e.g. REPS) which previously involved reducing stocking rate and consequently necessitated a reduction in production costs to maintain margins. However it should be noted that in REPS 4, producers will be eligible even when using high stocking rates within their systems, provided they comply with the Nitrates Directive, consequently doing away with the necessity to reduce stocking rate.

One of the main benefits of the temperate climate which prevails in Ireland is the ability to grow grass for most of the year. The aim of this paper is to present information on increasing the use of grazed grass in sheep production by extended grazing based primarily on recent research studies undertaken at Knockbeg and Athenry.

Herbage for extended grazing

Grass growth in Ireland varies widely throughout the grazing season. Typical grass dry matter growth for March, May, July, October and December is 10, 90, 60, 20 and 5 kg/ha/day respectively. Grass dry matter growth of 5 kg/ha/day in December, and assuming utilisation rate of 60%, produces adequate forage to maintain only two ewes. Consequently to extend the grazing season between December and March, grass must be "built up" in late summer/early autumn. The quantity of grass which must be accumulated

for extended grazing depends on date of sward closure, level of nitrogen (N) fertilizer appliced and date of grazing.

The effects of date of pasture closure and subsequent grazing on herbage yield and proportion of dead material in the sward are presented in Table 1. The earlier the closing date, the higher the yield regardless of grazing date. However it should be noted that regardless of closing date, once the swards reached peak yield, subsequent herbage yield declined. For example, for swards which were closed on 28 July, 9 August and 30 August peak yield occurred around 1 November and yield declined subsequently by up to 28%, 23% and 21% respectively. The reduction in yield is due to senescence (leaf decay) exceeding leaf production from November onwards. Date of closure and date of grazing also impact on the proportion of dead material in the sward which is negatively correlated with feed value as determined by digestibility and intake characteristics. Earlier closing together with later grazing increased the proportion of dead herbage in the sward. Thus, for swards which were closed on 28 July, 9 August, 30 August and 20 September, the proportion of dead material on 1 December was 0.51, 0.44, 0.33 and 0.34 whilst on 1 March the proportion of dead material had increased to 0.79, 0.56, 0.50 and 0.37 respectively (Table 2). Early December and mid March would be considered to be the extremes of the extended grazing season.

Table 1. Effect of autumn closing date on herbage yield and sward morphology at each of five harvests

	Autumn closing date			
	28 July	9 Aug	30 Aug	20 Sep
Herbage dry matter yield (t/ha) on:				
1 October	3.78	1.66	0.84	0.26
1 November	4.10	2.60	1.90	0.70
1 December	3.86	2.28	1.56	0.95
1 February	2.96	1.99	1.50	1.12
1 March	3.12	1.88	1.66	1.05
Proportion of dead material on:				
1 October	0.25	0.18	0.19	0.24
1 November	0.42	0.38	0.31	0.40
1 December	0.51	0.44	0.33	0.34
1 February	0.59	0.50	0.41	0.31
1 March	0.79	0.56	0.50	0.37

(Binnie et al. 2001)

As the date of extended grazing is delayed the feed value of the herbage declines. The effects of date of grazing of swards closed on 1 September on herbage yield and DMD (dry matter digestibility) are presented in Table 2. As stated earlier, once peak yield was achieved, delaying grazing date reduced herbage yield due to an accumulation of dead herbage. Furthermore, DMD declined significantly in January and February, due primarily to the accumulation of dead herbage and to a lesser extent stem. Consequently the feed value of extended grazed herbage was equivalent to medium and low feed value grass silages after 7 December and 11 January respectively.

Table 2. Effect of date of grazing on herbage yield (above 4cm) and feed value (sward closed on 1 September)

	Date of harvest				
	7 Dec	14 Dec	21 Dec	11 Jan	2 Feb
Herbage DM yield (t/ha)	2.06	1.86	1.84	1.65	1.50
Proportion of dead material	0.13	0.16	0.21	0.34	0.29
Dry matter digestibility (g/kg DM)	717	706	719	668	611

(O'Riordan, 1995)

The data presented in Tables 1 and 2 clearly illustrate that whilst closing paddocks early for extended grazing increases herbage yield, the proportion of dead herbage increases, leading to a decline in forage feed value. However closing paddocks after mid September substantially reduces the peak herbage yield and as a consequence, requires a greater area of the farm to be closed if adequate herbage is to be available to graze the flock during the conventional winter indoor feeding period. Also, to comply with the Nitrates Directive fertilizer must be applied by 15 September. Closing swards early in the autumn subsequently produce open swards due to reduced tiller density. Initiation of new tillers in heavy sward covers in late autumn is inhibited as light is prevented from penetrating the sward canopy to the base of the shoot, consequently carbohydrate reserves are diverted from tiller bud formation to plant respiration.

Year round grazing – the Knockbeg system

Lamb carcass output per ewe and per hectare and the cost of producing each 1 kg of carcass are major factors affecting profit margins from sheep production. Grass, either grazed or conserved, accounts for over 95% of the annual feed budget in mid-season

prime lamb production. A major study was undertaken at Knockbeg for four successive years to develop and evaluate a system of mid-season prime lamb production involving year-round grazing, removing the requirement for winter housing and forage conservation. The study consisted of two systems as follows:

A. Grazing, silage and housing (GSH). This system involved housing the ewes unshorn and offering grass silage *ad-libitum* for 100 days during the winter. During the conventional grazing season ewes were grazed on grass/clover swards. The mean lambing date was 20 March. For the last 6 weeks prior to lambing the ewes received 21.5 kg concentrate. Ewes were stocked at 14.1ewes/ha and annual fertiliser N input was 79 kg/ha.

B. Year round grazing (YRG): This system involved no housing or forage conservation. The ewes were extended grazed from early December until lambing. During extended grazing the ewes received a grass dry matter allowance of 1 kg daily until early February and 1.3 kg daily from early February until 2 weeks prior to lambing. Subsequently the ewes were spread out for lambing and received grass *ad-lib* supplemented with concentrate. The mean lambing date was 30 March. For the last 6 weeks prior to lambing ewes received 23.1 kg concentrate. Ewes were stocked at 10.4 ewes/ha and annual fertiliser N input was 92 kg /ha.

In both systems the lambs received creep feed at a rate of 300 g/day from 8 weeks until slaughter. Lambs were weaned at 14 weeks of age. The effects of the system on ewe body condition are presented in Table 3. Ewes on both systems had similar body condition at mid pregnancy and at weaning. However the ewes which were housed (unshorn) on the GSH system lost 0.3 of a condition score between mid pregnancy and lambing. The ewes on the YRG system maintained condition from mid pregnancy to lambing, indicating adequate nutrient intake. Other studies have shown that housed unshorn ewes have lower food intake during the housing period due to heat stress. In two years of extended grazing in the YRG system, the ewes were supplemented for a period with 0.4 kg/day of sugar beet pulp nuts whilst daily herbage dry matter allowance was reduced by 0.2 kg/ewe, thus increasing total dry matter intake. Supplementation during the extended grazing period was necessary to maintain grass supply for the duration of the season. In one year supplementation in mid pregnancy was equivalent to 15 days extended grazing herbage allowance.

The effects of system on litter size and lamb performance are presented in Table 3. System had no effect on litter size or the numbers of lambs reared per ewe put to the ram. Lambs from the YRG system were 0.7 and 2.9 kg heavier at birth and weaning, respectively. Whilst lambs from the YRG had higher birth and weaning weights, and were younger at slaughter, they were marketed at similar dates to those from the GSH system, as they were born later.

Table 3. Effects of system of lamb production on animal performance

	System	
	Conventional	Year round grazing
Stocking rate (ewes/ha)	14.1	10.4
Silage DM requirement (kg/ewe)	100	0
Duration of housing(days)	100	0
Mean lambing date	20 March	30 March
Ewe condition at:		
Mid pregnancy	3.45	3.49
Lambing	3.19	3.40
Weaning	3.22	3.25
Litter size	2.17	2.24
Number of lambs reared/ewe to ram	1.77	1.78
Lamb		
Birth weight (kg)	3.97	4.67
Weaning weight (kg)	27.9	30.8
Growth rate (birth to weaning g/day)	245	267

(Flanagan, 2005)

It can be concluded from the Knockbeg systems study that year round grazing increased lamb birthweight and subsequent lamb performance. However, to facilitate year round grazing stocking rate had to be reduced by 26% consequently dramatically reducing lamb carcass output by 26%, which is equivalent to 116 kg/ha. The system also raised the following issues in relation to extended grazing:

1. What is the feed value of extended grazed herbage?
2. Why does extended grazing increase lamb birth weight?
3. What is the effect of herbage allowance in mid and late pregnancy on subsequent performance?
4. Does frequency of grass allocation affect ewe performance?
5. Is the response in terms of increased lamb birth weight and subsequent performance related to stage of pregnancy at which extended grazing takes place?

6. Can concentrate feeding in late pregnancy be omitted in an extended grazing system?
7. What is the effect of extended grazing on rearing ewe replacements?
8. What is the impact of extended grazing management on subsequent herbage yield?

Each of these issues have to been subsequently addressed at Athenry and are discussed subsequently.

1. What is the feed value of extended grazed herbage?

The big difference between the two systems at Knockbeg was that the year-round grazing system increased lamb birth weight by 0.7 kg. Was the increase in lamb birthweight due to extended grazed herbage having a higher feed value relative to silage? The feeding value of extended grazed herbage was evaluated in three studies at Athenry, two relative to grass silage and one relative to concentrate. In terms of lamb weaning weight (which takes into consideration both lamb birth weight and subsequent growth rate) an allowance of 1.3 kg of extended grazed herbage dry matter in mid pregnancy had the same feed value as 0.92 kg of low and medium feed value grass silages (Table 4). Throughout pregnancy 0.8 kg silage DM intake offered to housed shorn ewes had the same feed value as 1.8 kg extended grazed herbage allowance (Table 5). For over wintering ewe replacements, an extended grazed herbage dry matter allowance of 1 kg had the same feed value as 0.5 kg concentrate (Table 6). These data clearly illustrate that the feed value of extended grazed herbage was no better than low or medium feed value grass silage and consequently the improvement in lamb birth and subsequent weaning weights observed in the Knockbeg system study was not due to the feed value of extended grazed herbage. This is in agreement with the data presented previously which clearly illustrated that the proportion of dead herbage in the sward increases (Tables 1 and 2), and DMD declines (Table 2) as the duration of sward closure, and the extended grazing period, increases.

Table 4. The effects of herbage allowance for extended grazing and grass silage feed value in mid pregnancy on animal performance

	Herbage DM allowance (kg/day)		Silage feed value	
	1.0	1.8	Low	Medium
Forage intake (kg DM/day)	0.46	0.65	0.93	0.91
Herbage utilisation (%)	44	34	-	-
Ewe condition at lambing	2.83	3.07	3.14	3.07
Litter size	1.91	1.85	1.84	2.15
Lamb birthweight (kg)	4.47	4.93	4.52	4.51
Lamb growth rate (g/day to weaning)	294	311	312	315
Lamb weaning weight (kg)	33.6	35.6	34.2	34.7

(Keady and Hanrahan, 2007a)

Table 5. The effects of extended grazing throughout pregnancy, shearing at housing and silage feed value on animal performance

	Extended grazing allowance in mid pregnancy		Housed			
			Shorn		Unshorn	
	Low	High	LFVS[1]	MFVS[2]	LFVS	MFVS
Litter size	1.70	1.62	1.77	1.87	1.75	1.93
Birth weight (kg)	4.31	4.48	4.54	4.46	4.08	3.79
Growth rate (g/day to weaning)	295	298	298	299	281	287
Weaning weight (kg)	33.2	33.7	33.8	33.6	31.6	31.8

(Keady and Hanrahan, 2007b)

LFVS[1] = Low feed value silage, LFVS[2] = Medium feed value silage

Table 6. Effects of herbage allowance and concentrate supplementation on the performance of replacement ewe lambs

	Herbage dry matter allowance (kg/day)			
	0.75	0.75	1.25	1.75
Concentrate feed level (kg/day)	0.0	0.5	0.0	0.0
Herbage DM intake (kg /day)	0.61	0.57	0.92	1.24
Herbage utilisation (%)	82	73	73	68
Live weight (kg) at end of:				
extended grazing	35.8	42.2	39.8	42.3
grazing season	52.5	55.8	53.4	56.2
Growth rate during extended grazing (g/day)	-1.0	84	52	84

(Keady and Hanrahan, 2007c)

2. <u>Why does extended grazing increase lamb birth weight?</u>

Winter conditions in Ireland are relatively mild. Consequently, ewes that are housed unshorn may have difficulty in dissipating body heat due to the unique insulating properties of the fleece, leading to ineffective heat regulation and heat stress, particularly in late pregnancy. Ewes managed on extended grazing are less likely to be affected by heat stress relative to housed unshorn ewes. Shearing ewes at housing increases lamb birth weight, relative to housed unshorn ewes, similar to the weight of lambs from ewes extended grazed throughout pregnancy (Tables 5 and 7). Consequently the increased lamb birth weight due to extended grazing is most likely due to reduced heat stress, as evident by the longer gestation length (Table 7) rather than by extended grazed herbage having higher feed value. The data presented in Tables 5 and 7 clearly show that the improvement in lamb birth weight and subsequent growth rate from extended grazed ewes relative to housed unshorn ewes can be achieved indoors by shearing ewes at the point of housing.

Table 7. The effects of extended grazing in mid, late and throughout pregnancy on subsequent lamb performance

	Management in mid and late pregnancy				
	Housed		Extended grazed/ housed	Housed/ extended grazed	Extended grazed
	Unshorn	Shorn			
Litter size	2.25	2.24	2.18	2.10	2.12
Birth weight (kg)	4.2	4.8	4.4	4.5	4.9
Growth rate to weaning (g/day)	288	307	299	303	312
Weaning weight (kg)	32.4	34.8	33.6	34.1	35.2
Gestation length (days)	145.8	147.5	146.6	146.9	147.2

(Keady et al. 2006)

3. <u>What is the effect of herbage allowance in mid and late pregnancy on subsequent performance?</u>

One of the major factors determining the proportion of the farm that needs to be closed in September for extended grazing is the daily grass allowance which will be offered to the ewes in mid and late pregnancy. The effects of herbage allowance offered in mid pregnancy from early December to four weeks prior to lambing on herbage intake and animal performance (Table 4) were evaluated in a study at Athenry. Increasing herbage dry matter allowance by 0.8 kg/day increased forage dry matter intake by 0.19 kg/ewe daily. However, utilisation rate was reduced from 44 to 34%. Increasing herbage allowance increased ewe condition score by 0.24 units at lambing. Lambs from ewes on the higher grass allowance were heavier at birth (+0.46 kg) and at weaning (+2 kg) and grew faster from birth to weaning (+17 g/day). It was also noted that increasing herbage allowance in mid pregnancy tended to reduce assistance required at lambing. Furthermore, increased herbage allowance resulted in less damage to the paddocks and increased subsequent herbage regrowth (discussed later).

Altering herbage allowance in late pregnancy influences potential concentrate supplementation requirement as well as the area of the farm which must be closed in October for extended grazing in February and March. The nutrient requirement of the ewe increases dramatically in late pregnancy due to the rapidly growing foetuses. The weight of the foetus increases by 85, 50 and 20% respectively during the last 8, 4 and 2 weeks of pregnancy. During the last six weeks of pregnancy the energy requirements of single and twin bearing ewes increase by 40 and 60%, respectively. The effects of grass allocation in late pregnancy on performance of single and twin bearing ewes are presented in Table 8. With single bearing ewes increasing daily herbage dry matter allowance by 0.3 and 0.4

kg/ewe during weeks 4 and 3, and 2 and 1 prior to lambing maintained ewe body condition score and increased lamb birthweight by 0.9 kg. With twin bearing ewes, increasing herbage dry matter allowance by 0.2 and 0.7 kg/ewe daily respectively during weeks 4 and 3, and 2 and 1 prior to lambing, or supplementing with a total of 8.5 kg concentrate prior to lambing, increased lamb birth weight by 0.8 kg. Furthermore concentrate supplementation increased ewe condition score by 0.5 of a unit at lambing.

Table 8. Effect of daily grass dry matter allowance (kg/ewe) in late pregnancy on ewe and lamb performance

	Litter size				
Weeks pre lambing	Single		Twin		
6 – 5	1.3	1.5	1.6	1.6	1.6
4 – 3	1.3	1.6	1.6	1.8	1.6 + 200g conc.
2 – 1	1.3	1.7	2.5	3.2	2.5 + 400g conc.
Ewe condition at lambing	3.0	2.9	2.4	2.5	2.9
Lamb birth weight (kg)	4.8	5.7	3.8	4.6	4.6

(Flanagan 2002-unpublished data)

4. <u>Does frequency of grass allocation affect ewe performance?</u>

One of the advantages often quoted for extended grazing is the reduced labour requirement relative to feeding ewes which are housed. Normally herbage is allocated daily which can be time consuming (particularly for large flocks) as fences (Flexinet) need to be erected ahead of the ewes and the back fences have to be moved. In order to evaluate if labour input can be reduced the effect of frequency of herbage allocation on forage intake and animal performance has been evaluated in recent studies at Athenry (Table 9). In these studies the ewes were extended grazed from mid December to four weeks prior to lambing at which stage they were housed and received a total of 19 kg concentrate prior to lambing. During extended grazing the ewes were allocated herbage either daily or twice weekly. Frequency of herbage allocation did not alter forage intake or utilisation. Furthermore frequency of herbage allocation had no effect on lamb birth or weaning weights, or lamb growth rate from birth to weaning.

Table 9. The effects of frequency of herbage allocation in mid pregnancy on herbage utilisation and animal performance

	Frequency of herbage allocation	
	Daily	Twice weekly
Herbage DM allowance (kg/day)	1.4	1.4
Herbage DM intake (kg/day)	0.52	0.60
Herbage utilisation rate (%)	38	41
Ewe condition score at lambing	3.0	2.9
Lamb birth weight (kg)	4.69	4.71
Lamb growth rate (g/day to weaning)	300	304
Weaning weight (kg)	34.4	34.8

(Keady and Hanrahan, 2007a)

The national average weaning rate is about 1.3 lambs per ewe put to the ram. Consequently, most flocks are comprised of ewes which produce only singles and twins. As many sheep producers scan their flocks for litter size in mid pregnancy they can group ewes accordingly. An on-farm study was undertaken by Teagasc to evaluate the effects of allocating herbage daily to single and twin bearing ewes in late pregnancy, either grouped separately (according to litter size) or in a leader-follower system (twin-bearing ewes were leaders followed by the single bearing ewes). The daily herbage dry matter allowances per ewe for weeks 7 to 6, 5 to 4, 3 to 2 and prior to “spread out” for lambing were as follows: 1.3, 1.4, 1.6 and 1.6 kg for single bearing ewes grazed separately; 1.4, 1.6, 1.9 and 2.7 for twin bearing ewes grazed separately; 2.7, 3.0, 3.5 and 4.3 for the twin bearing ewes followed by single bearing ewes in the leader-follower system. Allocating grass daily to the single- and twin-bearing ewes separately or in the leader-follower system did not affect lamb birth weight, lambing assistance, growth rate or weaning weight (Table 10). However single bearing ewes in the leader-follower system had a lower condition score at lambing. The leader-follower system reduced labour requirements by decreasing the number of fences required to be erected by 50% in a flock of predominantly single and twin bearing ewes.

Table 10. Effect of grass allocation management in late pregnancy on animal performance

	Grassland system			
	Leader-follower		Separate	
Litter size	twin	single	twin	single
Ewe condition at lambing	3.12	2.93	3.00	2.93
Lamb birth weight (kg)	4.95	5.80	4.80	5.97
Lamb growth rate (g/day)	228	269	224	266
Weaning weight (kg)	27.6	32.4	27.1	32.4

(Keady and Hanrahan, 2007d)

5. Is the response in terms of increased lamb birth weight and subsequent performance related to stage of pregnancy in which extended grazing takes place?

On many sheep units where extended grazing is practiced, there is only sufficient herbage available for part of the extended grazing season. Consequently, many producers ask whether they should extend graze ewes either in mid or late pregnancy. A study was undertaken in which ewes were either housed for mid, late or throughout pregnancy, and extended grazed in either mid, late or throughout pregnancy (Table 7). Ewes which were housed and extended grazed received 19 and 15 kg concentrate/head daily during the last six weeks prior to lambing. Relative to housed unshorn ewes extended grazing in mid, late or throughout pregnancy increased lamb weight by 0.1, 0.3 and 0.7 kg and increased weaning weight by 1.2, 1.7 and 2.8 kg, respectively. Consequently, if only limited grass supplies are available for extended grazing, extended grazing in late pregnancy gives the greater response in terms of lamb birth and weaning weights relative to extending grazing in mid pregnancy.

6. Can concentrate feeding in late pregnancy be omitted in an extended grazing system?

In extended grazing, omitting concentrate supplementation reduces feed cost whilst also increasing grazed grass requirements which subsequently puts pressure on the stock carrying capacity (stocking rate) of the system. A study undertaken at Knockbeg (Table 8) evaluated the effect of grass allowance in late pregnancy on single- and twin-bearing ewes. Increasing herbage allowance of single-bearing ewes during the last six weeks prior to lambing increased lamb birth weight. Furthermore, increasing herbage allowance to twin bearing ewes increased lamb birth weight whilst maintaining ewe condition score. When assessed by lamb birth weight, each 1 kg concentrate supplementation in late pregnancy had the same feed value as 1.5 kg herbage dry matter allowance. Concentrate supplementation also increased ewe condition score by 0.4 of a unit. In an on-farm study

undertaken by Teagasc in which the ewes were turned out to pasture in late pregnancy, single and twin bearing ewes produced heavy lambs (5.9 and 4.9 kg birth weight, respectively) in the absence of concentrate supplementation (Table 6).

7. What is the effect of extended grazing when rearing ewe replacements?

Rearing ewe replacements is a major cost in lamb production. Reducing the cost of rearing replacements by €20/head, either by reducing the replacement rate or feed cost, is equivalent to 18.5 c/kg of lamb carcass produced by the ewe during her life time production cycle. An on-farm study was undertaken by Teagasc in 2006 to evaluate the effects of grass allowance and concentrate supplementation on ewe lamb performance during extended grazing and the subsequent grazing season (Table 6). Increasing herbage allowance increased growth rate during extended grazing by 85 g/day. When assessed by ewe replacement weight at the end of the extended grazing season, offering 0.5 kg concentrate daily had the same feed value as increasing herbage dry matter allowance by 1 kg daily. Even when assessed by the weight of the replacement ewes in mid August, 0.5 kg concentrate during the previous extended grazing season had the same feed value as 0.9 kg of extended grazed herbage dry matter allowance.

8. What is the impact of extended grazing management on subsequent herbage yield?

In an all year round grazing system grass supply will be most limiting in autumn. Grass supply is also a major concern for the first two months after lambing. Consequently, the effects of extended grazing management on herbage yield during the early part of the subsequent grazing season impacts on potential stocking rate. The effect of extended grazing management on herbage yield early during the subsequent grazing season was evaluated at Athenry. In that study swards were grazed either between 6 and 12 December, 27 December and 3 January or 17 and 23 January. During each grazing period ewes were allocated herbage dry matter at either 1.0 or 1.8 kg/ewe/day and the allocation was made either daily or twice weekly. Increasing daily herbage dry matter allowance from 1.0 to 1.8 kg/ewe at grazing increased subsequent herbage dry matter yield by 1.14 t/ha (Table 11). Frequency of herbage allocation during extended grazing did not affect subsequent herbage yield (Table 11). However, each 1 day delay in grazing date reduced herbage dry matter yield by 54.2 kg/ha (Figure 1) which is equivalent to 18 ewe grazing days. The data from this study clearly illustrated that delayed grazing had a major effect on subsequent herbage yield. A subsequent study undertaken at Athenry in 2007 showed that, in extended grazed pastures which had been grazed between mid December and late January, grazing date and herbage allocation at grazing had a big

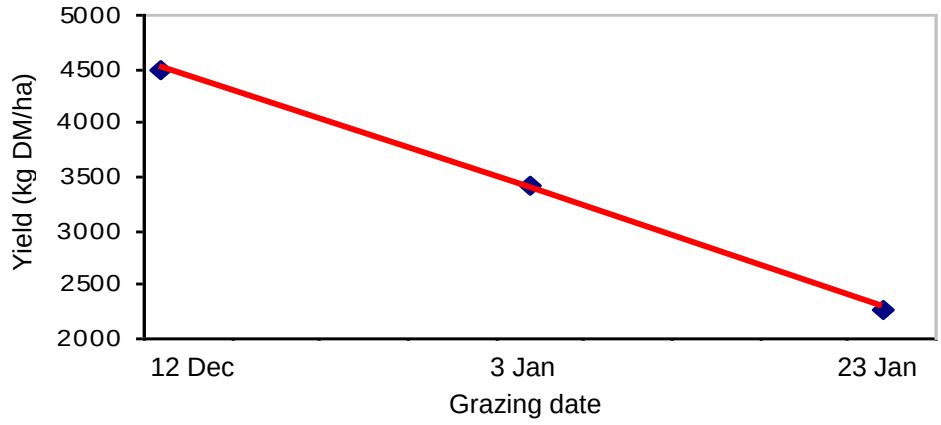
impact on pasture damage. When assessed in early April the percentage of the sward which was categorised as bare ground varied from 3% to 22% for pastures grazed at high (1.8 kg/ewe daily) and low (1.0 kg /ewe daily) herbage dry matter allowances the previous winter. However by mid May the percentage of bare ground was reduced to 5.5 and 8.8%, respectively.

Table 12. Effects of extended grazing management of autumn saved pasture on dry matter yield in spring

	Herbage DM allowance (kg/day)		Frequency of allocation	
	1.0	1.8	Daily	Twice weekly
Dry matter yield (t/ha)	2.79	3.93	3.24	3.43

(Keady and Hanrahan, 2007e)

Figure 1. The effects of grazing date on herbage yield early during the subsequent season.



Potentials of extended grazing

Extended grazing offers a number of "potentials" for mid season prime lamb production as follows:

1. A sheep production system can be established without the need for winter housing and specialised feeding facilities as the ewes are at pasture year round. As a consequence, fixed costs are reduced substantially. However to comply with the Nitrates Directive adequate slurry and/or farmyard manure storage facilities for a 6 week period are required.
2. Year round grazing facilitates the management of "flying flocks" and thus the opportunity to enter sheep production when lamb prices are high and exit rapidly at low cost for a number of seasons when lamb prices are low.

3. The cost of producing each 1 kg of lamb carcass is reduced due to a reduction in fixed costs. However, some herbage needs to be harvested to control grass growth and maintain grass quality for the grazing flock. Whilst the gross margin per ewe is increased, gross margin per hectare (a key measure of profitability) is reduced.
4. Lambing ewes at pasture reduces labour requirement, particularly in flocks predominantly of single and twin bearing ewes, as ewes only need to be moved short distances to paddocks and lambing pens are not required. However, ewes which need to be handled are more difficult to capture.
5. Extended grazing provides a cheap system for rearing replacements, particularly where pasture is allocated twice weekly rather than daily.
6. Extended grazing can represent an alternative system for producers which operate at a low stocking rate.

Limitations of extended grazing systems

Whilst year round grazing has potentials, it also has various limitations. The limitations are as follows:

1. Stocking rate is limited to a maximum of around 10 ewes/ha, consequently reducing potential lamb carcass output by up to 26%. In year-round grazing the grass requirements peak in September due to the following. Firstly, approximately 50% of the grazing area needs to be closed in September and early October to accumulate grass for grazing from mid December to lambing in early April. Secondly, ewes need to be prepared for mating which impacts on the next lamb crop. Previous studies have shown at Athenry that each one unit increase in condition score at mating increases weaning rate by 0.1 lambs/ewe put to the ram. Thirdly, any lambs remaining in September and October require high quality pasture to finish.
2. Year round grazing is an inefficient system for utilising herbage. As discussed previously, during extended grazing up to 28% of accumulated herbage may be lost, utilisation of remaining herbage may be as low as 40% and feed value declines steadily (due to sensence of leaf being greater than green leaf production) during the extended grazing period.
3. There is evidence to show that herbage management during extended grazing impacts on sward quality. Recent studies at Athenry have shown that in the April and May following extended grazing the proportion of the sward which is categorised as “bare ground” was as high as 22 %.
4. The success of extended grazing is very dependent on weather and ground conditions. For example at Athenry and Oakpark mean annual rain fall during the last 30 years

was 1162 and 789 mm, respectively. This difference can have a major impact on herbage utilisation and potential sward damage.

5. Good grassland management is essential in early summer in a year-round-grazing system as grass availability will exceed demand. Consequently paddocks need to be removed for ensiling. Furthermore there is evidence from the Knockbeg systems study that from weeks 10-14 lamb growth rate was similar for lambs from the YRG and GSH systems with growth rates of 220 and 228 g/day respectively. Consequently the potential benefit of the higher lamb birth weight on age at slaughter is not fully exploited.
6. Even at a low stocking rate (10 ewes/ha) strategic concentrate supplementation (equivalent to approximately 2 weeks herbage supply) was required in Knockbeg to ration herbage supply for extended grazing in two out of four seasons.
7. With outdoor lambing, lambing date is delayed in order to reduce the risk of severe weather. Consequently most of the major annual prices fall for lamb carcass have occurred prior to the lambs being drafted for sale.
8. On a 50 ha farm year round grazing reduces gross margin by up to €10,150.

Other considerations

1. Currently 48% of sheep producers have an off-farm income. Consequently, during the winter, having the ewes housed maybe more suitable for part-time farmers, as they can be fed at night. Using modern equipment, during the housing period, large numbers of sheep can be fed in a short period of time.
2. Whilst extending grazing ewes throughout pregnancy increases lamb birth weight relative to lambs from unshorn housed ewes, lambs from shorn housed ewes are of a similar weight at birth, weaning and age at slaughter. Consequently, the benefits in lamb performance from extended grazing can be obtained indoors by shearing the ewes at housing.
3. With the new proposed REPS 4 scheme, intensive systems of lamb production comply (provided they comply with the Nitrates Directive), consequently there is no need to reduce stocking rate, as is required for year round grazing.

Financial analysis of the systems

Calculations designed to show the effect of system of mid season prime lamb production on income, costs and margins (excluding labour and machinery costs), based on the Knockbeg systems study are presented in Table 12. Lamb carcass weight and price were assumed to be 19.5 kg and €3.50/kg respectively. Concentrate was costed at €240/tonne. Silage was harvested using the big bale system. In costing sheep housing it was assumed that a 50% grant was available and that depreciation was over a 30-year period. In the year round grazing system excess herbage was ensiled and sold as big bale silage.

Margins per ewe were higher on the year-round grazing system. However, margin per hectare, which is the major factor affecting income, was higher for the grass-silage-housing system. The grass-silage-housing system increased gross margin by €203/ha. On a 50 ha farm year round grazing decreased gross margin by €10,150/annum. As lamb price increases, the difference in gross margin per hectare between the two systems increases in favour of the grass-silage-housing system relative to the year-round-grazing system.

Conclusions

1. It is concluded that an effective year round grazing system can be practiced successfully. However, stocking rate is reduced significantly consequently dramatically reducing lamb carcass output/ha and gross margin/ha. However to comply with the Nitrates Directive adequate slurry and/or farmyard manure storage facilities for a 6 week period is required.
2. Extended grazing
    a. increases lamb birth weight relative to lambs from housed unshorn ewes.
    b. limits stocking rate to a maximum of 10 ewes/ha.
    c. requires excellent grassland management to be successful.
    d. provides a low cost system, particularly for flying flocks.
    e. is a relatively inefficient system of utilising herbage
3. Allocating herbage twice weekly rather than daily has no effect on animal performance or subsequent herbage growth.
4. Concentrate supplementation is still required to enable the year round grazing system to succeed.
5. The improvement in lamb birth and weaning weights due to extended grazing can be achieved indoors by shearing ewes at housing.

6. On a 50 ha farm year round grazing reduces gross margin by up to €10,150

Table 12. Example of income, costs and margins from the systems per ewe*

	System	
	Year round grazing	Grass silage housing
Income (€/ewe)		
Lamb carcass (€3.50/kg)	121.1	121.1
Wool	2.2	2.2
Silage (8 bales/ha)	12.0	-
Replacement cost	-13	-13
Variable costs (€/ewe)		
Fertiliser	6.4	4.1
Concentrate	14.6	13.0
Shearing	2.5	2.5
Veterinary	8.1	8.1
Miscellaneous	4.0	4.0
Silage harvesting	8.0	6.4
Gross margin (€)		
per ewe	78.6	72.3
per ha	817	1020
Gross margin per ha at lamb carcass price of		
€3.70/kg	889	1117
€3.90/kg	961	1215
€4.10/kg	1033	1313
Other costs (€/ewe)		
Flexinet and fencer	1.2	-
Housing (includes 50% grant)	-	3.5
Gross margin (including wintering costs)		
per ewe	77.4	68.9
per ha	805	972

* based on the information and performance recorded at Knockbeg

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