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Prime lamb production from ewes offered grazed grass, as the sole forage, throughout the year



Key external stakeholders:

Sheep producers, ruminant nutritionists, agricultural consultants, extension officers, Department of Agriculture, Food and the Marine

Practical implications for stakeholders:

A mid-season prime lamb production system producing a lamb carcass output of 364 kg/ha, without winter housing or forage conservation, is sustainable.

- Stocking rate is limited to around 10 ewes/ha, consequently reducing potential lamb carcass output by 26%.
- Deferred (extended) grazing is an inefficient system for utilising herbage. Up to 28% of accumulated herbage for winter grazing may be lost due to senescence, and the utilisation of the remaining herbage can be as low as 35%.
- Deferred grazing impacts negatively on sward botanical composition by reducing the proportion of perennial ryegrass.
- Herbage requirement peaks in September due to the need to close approximately 50% of the grazing area in order to accumulate herbage for deferred grazing whilst at the same time providing herbage to prepare ewes for mating and to finish lambs.
- Lambs born from ewes on deferred grazing during pregnancy are heavier at birth and weaning relative to lambs from ewes that are housed unshorn. However, these benefits in lamb performance from deferred grazing can be obtained indoors by shearing the ewes at housing.

Main results:

- Lamb carcass output of up to 501 kg/ha was achieved from a mid-season prime lamb production system receiving 85 kg N per hectare, stocked at 14.4 prolific ewes/ha (Belclare) and involving winter housing and forage conservation.
- Deferred grazing ewes during pregnancy increased lamb birth weight probably due to reduced heat stress associated with the outdoor environment
- Deferred grazing is an inefficient system of utilizing herbage and reduces the proportion of *L. perenne* in the sward.
- Allocating herbage twice weekly rather than daily did not influence animal performance whilst reducing labour requirement
- Each 1 day delay in grazing herbage under deferred grazing reduced herbage DM yield the following spring by up to 54.2 kg/ha

Opportunity / Benefit:

The project results demonstrate that a year-round grazing system of mid season prime lamb production is capable of producing up to 365 kg of lamb carcass per hectare. Further component studies provided greater precision as to the quantity of herbage required per ewe during mid and late pregnancy. Labour input can be reduced by allocating herbage during deferred grazing twice weekly rather than once daily. Limitations of the system include the potential stocking rate, risks from adverse prevailing weather conditions, poor herbage utilization, herbage demand variation throughout the year and deteriorating sward botanical composition. Whilst deferred grazing increased lamb birth and weaning weights, this can be achieved indoors by shearing the ewes at housing.

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1. Project background:

Prime lamb production in Ireland is seasonal and grass based; lambing is normally targeted to coincide with grass growth in spring. Grass growth is seasonal, consequently, during the winter period pregnant ewes are either housed and offered predominantly grass-silage-based diets or kept outdoors often on deferred grazed paddocks. The main factors that affect the cost of grass production are herbage DM yield and utilisation rate. Low herbage production and/or poor utilisation increase the cost of grass production to a level similar to or greater than that of grass silage when expressed per kilogram of DM consumed by grazing animals.

Year-round grazing, which involves deferred grazing during the winter period, reduces fixed costs (absence of ewe housing facilities). Year-round grazing limits stocking rate. As many sheep units currently operate at a low stocking rate (average stocking rate of lowland sheep farms being 9.0 ewes/ha) opportunities exist to extend the grazing season without impacting negatively on overall farm stocking rate.

2. Questions addressed in the project:

- Can a system of mid season prime lamb production be developed involving year-round grazing?
- What is the effect of ewe prolificacy on lamb carcass output in contrasting production systems?
- What is the feed value of deferred grazed herbage?
- What is the impact of deferred grazing on ewe performance and on lamb birth and weaning weights?
- What is the effect of deferred herbage allowance in mid and late pregnancy on subsequent performance?
- Does frequency of deferred herbage allocation affect ewe performance?
- Is the response in terms of increased lamb birth weight related to when deferred grazing occurs?
- Can concentrate feeding in late pregnancy be omitted in a deferred-grazing system?
- What is the effect of deferred grazing on rearing ewe replacements?
- What is the impact of deferred grazing management on subsequent herbage yield?
- What is the impact of deferred grazing on botanical composition of the sward

3. The experimental studies:

Experiment 1. *An evaluation of two-grassland-based systems of mid season prime lamb production using prolific ewes of two genotypes.* A 4-year systems study was undertaken to evaluate the effects of two contrasting management systems [year-round grazing (YRG) - stocking rate of 10.5 ewes/ha, N application of 92 kg/ha; normal seasonal grazing followed by indoor feeding during winter (GWF) – stocking rate 14.4 ewes/ha, N application 85 kg/ha] on the performance of mid-season lambing ewes.

Experiment 2. *Effects of deferred grazing during mid, late or throughout pregnancy, and winter shearing of housed ewes, on ewe and lamb performance.* Ewes (n=265) were allocated at random to five treatments: housed shorn (HS), housed unshorn (HU), grazing throughout pregnancy (EG), grazing to 20 January followed by housing (EGH), housed to 20 January followed by grazing (HEG). Ewes on the EG and HEG treatments lambed outdoors.

Experiment 3. *Effects of shearing at housing, grass silage feed value and deferred grazing herbage allowance on ewe and subsequent lamb performance.* Ewes (n=120) were assigned to one of 6 treatments from day 63 of pregnancy to lambing in March: two shearing treatments (shorn, unshorn) X two silage feed values (low, medium) and two deferred grazed herbage DM allowances (1.0 and 1.8 kg/day)

Experiment 4. *The effects of allowance and frequency of allocation of deferred herbage, and grass silage feed value, when offered to ewes in mid-gestation, on ewe and lamb performance.* From day 63 to 120 of gestation ewes (n=120) were assigned to a factorial study consisting of 2 herbage DM allowances (1.0, 1.8 kg/day) X 2 frequencies of herbage allocation (daily, twice weekly) and 2 grass silage feed values (low, medium). From day 120 of gestation to lambing all ewes were housed and offered the same diet

Experiment 5. *The effects of allowance and frequency of allocation of autumn-saved pasture, when offered to spring lambing ewes in mid pregnancy, on ewe and lamb performance.* From day 41 to 104 of gestation 72 ewes were assigned to a factorial study consisting of 2 herbage DM allowances (1.0 or 1.8 kg/day) X 2 frequencies of allocation (daily, twice weekly). The ewes were housed from day 105 of gestation until lambing and offered grass silage ad libitum plus concentrate supplement (total of 19 kg/ewe).

Experiment 6. *Effects of system of herbage allocation for single- and twin-bearing ewes during late pregnancy on ewe and subsequent lamb performance.* This study was undertaken in a commercial flock of 152 ewes (which had been housed in mid pregnancy) during the last 6 weeks prior to lambing. The four treatments were (i) fresh herbage offered daily to single-bearing ewes, (ii) fresh herbage offered daily to twin-bearing ewes, (iii) fresh herbage offered daily to twin-bearing ewes as leaders in a leader-follower system, (iv) pasture offered daily to single-bearing ewes as followers in the leader-follower system.

Experiment 7. *Effects of herbage allocation and concentrate supplementation on the performance of ewe lambs on deferred grazing during the winter.* This study was undertaken in a commercial flock of 248 ewe lambs that were allocated to 4 treatments: deferred grazed herbage at three DM allowances (0.75, 1.25 and 1.75 kg/head daily) and deferred grazed herbage (DM allowance of 0.75 kg/head daily) supplemented with 0.5 kg concentrate per head daily. The ewe lambs were on the treatments from 16 December to 3 March and residual effects were measured during the subsequent grazing season (4 March to 11 August).

Experiment 8. *Effects of sward grazing date and management of autumn pasture on subsequent herbage yield.* A split-plot design study (72 plots) was undertaken to evaluate the effects of deferred herbage DM allowance (1.0 and 1.8 kg/ewe/d), frequency of allocation (daily, twice weekly) and grazing date (6-12 Dec, 27 Dec to 3 January or 17-23 January) on herbage yield at two harvest dates (27 April or 25 May).

Experiment 9. *Effects of grazing date and system of autumn pasture management on herbage yield and composition in spring.* A split-plot study (128 plots) was undertaken to evaluate the effects of herbage DM allowance (1.0, 1.8 kg/ewe), frequency of allocation (daily, twice weekly), grazing date (28 Nov to 4 Dec, 12 to 18 Dec, 2 to 8 Jan or 23 to 29 Jan) and harvest date (4 Apr, 18 Apr, 2 May or 25 May) on herbage yield.

Experiment 10. *Effects of deferred grazing pasture with ewe lambs on sward botanical composition.* A split-plot study was undertaken to evaluate the effects of date of herbage removal (early December or at grazing), daily herbage DM allowance (0.75 and 1.75 kg/lamb) and date of grazing (12-18 December, 16-22 January or 20-26 February) on sward botanical composition.

4. Main results:

Experiment 1

- A YRG system of prime lamb production was sustainable but at a reduced stocking rate (-26%) and had greater lamb mortality relative to the GWF system.
- Ewe genotypes with a mean litter size of up to 2.34 lambs were suitable for both systems.
- Lamb carcass output of 501 kg/ha was achieved from a primarily grass-based system using prolific ewes (Belclare) and involving winter housing and forage conservation.

Experiment 2

- Deferred grazing in mid and late pregnancy yielded 35% and 65%, respectively, of the increase in lamb birth weight associated with deferred grazing throughout pregnancy.
- Treatment effects on lamb birth weight were associated with those of weaning weight.
- Shearing ewes at housing gave the same increase in lamb birth and weaning weight as deferred grazing.
- The increased lamb birth weight from deferred grazing in mid pregnancy was probably due to improved utilization of protein from the grazed herbage whilst the increased lamb birth weight from grazing in late and throughout pregnancy, and shearing at housing was probably due to reduced heat stress associated with the outdoor environment and removal of the fleece, respectively.

Experiment 3

- Herbage allowance in mid-pregnancy did not alter lamb birth weight or subsequent growth rate.
- Based on the difference in lamb weight at weaning, 0.8 kg of grass silage DM intake had the same feed value as a daily deferred herbage DM allowance of 1.8 kg/ewe throughout the study.

Experiment 4

- Increasing herbage allowance in mid gestation increased lamb birth and weaning weights and reduced herbage utilisation to as low as 34%.
- Frequency of herbage allocation did not alter ewe or subsequent lamb performance.
- Based on lamb weaning weight, 1.3 kg of deferred grazed herbage DM allowance had the same feed value as 1.0 kg of low feed-value grass silage DM.

Experiment 5

- Reducing the frequency of herbage allocation increased lamb birth weight.
- To reduce labour requirement and increase stock carrying capacity a daily allowance of 1 kg of herbage DM, allocated twice weekly, is sufficient for ewes on deferred-grazed pasture in mid pregnancy.

Experiment 6

- System of herbage allocation to ewes in late pregnancy did not alter subsequent lamb performance.
- The leader-follower system increased herbage utilisation, which could increase stock-carrying capacity whilst reducing labour requirement for moving fences, without altering subsequent lamb performance

Experiment 7

- Increasing herbage allowance increased herbage intake and lamb live weight.
- The high plane of nutrition offered during deferred grazing still maintained up to 57% of the performance benefit after 155 days grazing during the subsequent grazing season.
- Each 1 kg concentrate DM had the same feed value as 2.4 kg DM of deferred grazed herbage allocation.

Experiment 8

- Frequency of herbage allocation did not alter herbage yield.
- Each 1-day delay in grazing date reduced herbage DM yield by 54.2 kg/ha.

Experiment 9

- Frequency of herbage allocation did not alter herbage yield during the subsequent grazing season.
- Increasing herbage allocation increased subsequent herbage yield and reduced bare ground.
- Delaying grazing date reduced herbage yield and increased herbage feed value.
- Delaying harvest date increased herbage yield and the proportion of bare ground.

Experiment 10

- Delaying defoliation either by clipping or grazing reduced the proportion of *L. perenne* in the sward, primarily due to the effect of herbage mass rather than poaching during deferred grazing.

5. Opportunity/Benefit:

- Greater precision can now be exercised during year-round grazing in relation to grassland management, herbage build up for deferred grazing, herbage allowance, and deferred grazing management.
- The benefits obtained from deferred grazing ewes, in terms of lamb birth and weaning weights can be gained indoors by shearing the ewes at housing.
- A year-round grazing system was developed. Potential limitations were identified including stock rate and deterioration in sward botanical composition due to heavy sward covers during the winter months.

6. Dissemination:

Main publications:

- Keady, T.W.J. and Hanrahan, J.P. (2006) 'Efficient sheep production in a subsidy free environment – Research from Athenry.' *Irish Grassland Association Journal* 40: 15-27.
- Keady, T.W.J. and Hanrahan, J.P. (2007) 'Extended grazing – its potentials and limitations.' *Irish Grassland Association Journal* 41: 81-96.
- Keady, T.W.J., Hanrahan, J.P. (2009) 'Effects of shearing at housing, grass silage feed value and extended grazing herbage allowance on ewe and subsequent lamb performance.' *Animal* 3: 143-151.
- Keady, T.W.J. and Hanrahan, J.P. (2009) 'The effects of allowance and frequency of allocation of deferred herbage and grass silage feed value, when offered to ewes in mid gestation on ewe and lamb performance and subsequent herbage yield.' *Animal* 3: 879-890.
- Keady, T.W.J. and Hanrahan, J.P. (2010) 'The effects of allowance of deferred herbage and concentrate supplementation when offered to ewes in late gestation, on animal performance.' *Grass and Forage Science* 65: 227-236.
- Keady, T.W.J. and Hanrahan, J.P. (2012) 'The effects of allowance and frequency of allocation of autumn-saved pasture, when offered to spring lambing ewes in mid-pregnancy, on ewe and lamb performance and subsequent herbage yield.' *Livestock Science* 143: 15-23.
- Keady, T.W.J., Hanrahan, J.P. and Flanagan S. (2007) 'The effects of extended grazing during mid, late or throughout pregnancy, and winter shearing indoors, on ewe performance and subsequent lamb growth rate.' *Irish Journal of Agricultural Research* 46: 169-180.
- Keady, T.W.J., Moran, J. and Hanrahan, J.P. (2010) 'An evaluation of the effects of extended grazing pasture with ewe lambs on sward botanical composition.' *Proceedings of the British Society of Animal Science* p211.

Popular publications:

- Keady, T.W.J. (2011) 'Grassland management for high lamb performance.' *Irish Independent, Farming*, 7 June, pp 18-19.
- Keady, T.W.J. and Hanrahan, J.P. (2008) 'Extended grazing of the ewe flock – the current thinking.' *TRResearch* 3(1): 16-18.
- Keady, T.W.J. and Hanrahan J.P. (2010) 'Optimising lamb performance during the grazing season.' *Irish Farmers Journal* 10 June, pp26-27.

7. Compiled by: Dr. TWJ Keady