Late pregnancy nutrition – the key to flock profitability

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Introduction

The plane of nutrition during late pregnancy has a major influence on lamb birth weight, lamb vigor and survival, colostrum production, and ewe body reserves; all of which impact on lamb weaning rate and weaning weight. Consequently, appropriate nutrition and management during late pregnancy is one of the keys to profitable mid-season lamb production. Optimum plane of nutrition in late pregnancy should result in the birth weight of single, twin and triplet lambs of 6.0, 5.0 and 4.0 kg, respectively. Previous studies at Athenry have clearly shown that each 1 kg increase in lamb birth weight increases weaning weight by 3.2 kg.

The price of concentrate has increased by approximately €60 in the last 12 months. Therefore it is essential to maximise the return to concentrate feeding by feeding the optimum level, which is dependant on forage quality and the expected litter size.

The aim of this paper is to summarise results from recent studies at Athenry on the effects of late pregnancy feeding on lamb birth weight and subsequent growth rate.

Foetal development

At 8 weeks prior to lambing, whilst the placenta is fully developed, the foetus is only approximately 15% of its ultimate birth weight. The weight of the foetus increases by 70, 50 and 20 % during the last 6, 4 and 2 weeks prior to lambing, respectively. At the point of lambing the lamb(s) account for approximately 60% of the weight of the uterine contents. Consequently, a ewe which produces twin lambs, each weighing 5 kg, looses approximately 17 kg weight at lambing.

Nutrient requirements

Due to the rapidly growing foetuses and udder development (for colostrum production) the metabolisable energy (ME) requirement of ewes carrying singles,

twins and triplets increases by 40, 60 and 70 %, respectively, over the final 6 weeks of pregnancy. Thus, for example, the ME requirement of a twin-bearing ewes weighing 75 kg increases from 12 to 19 MJ daily. Considering that each 1 kg of barley (14 % moisture) contains only 11.5 MJ of ME, ewes need to be well supplemented in late pregnancy. Whilst ewes in good condition in late pregnancy can mobilize some body condition those which are in poor condition must be fed to ensure that they maintain adequate body reserves for early lactation. Ewes which are in poor condition at lambing partition a greater proportion of food energy intake post lambing to replenishing body reserves, consequently, reducing milk energy production and consequently lamb growth rate.

As the demands for nutrients increase in late pregnancy supplementation should be stepped up weekly over the weeks immediately prior to lambing. Whilst excessive supplementation is wasteful it is essential to supplement with adequate levels of concentrate to meet requirements to ensure that lamb birth weight and lamb viability are not compromised, and that adequate supplies of colostrum are produced, whilst at the same time reducing labour requirement at lambing. Silage type, silage feed value and litter size are the main factors which impact on concentrate requirements during pregnancy.

Impact of silage feed value

The majority of ewes that are housed are offered grass silage as the sole forage whilst indoors. The major factors that affect the feed value of grass silage for sheep are digestibility and chop length.

Digestibility: Digestibility is the most important factor in grass silage affecting animal performance as it is positively correlated with energy concentration and intake characteristics. Previous studies clearly show that each 5 percentage-unit increase in digestibility increases milk yield of dairy cows by 1.85 kg/day, carcass gain of finishing beef cattle by 21 kg over a 150-day finishing period, and the carcass gain of finishing lambs by 1.9 kg over a 50-day finishing period . A study was undertaken at Athenry to evaluate the impact of silage digestibility on the performance of pregnant ewes, and of their progeny until weaning at 14 weeks. The results are presented in Table 1. Increasing silage digestibility, when offered at similar levels of concentrate, increased ewe live weight post lambing by 12.2 kg, lamb birth weight by 0.55 kg and

lamb weaning weight by 1.8 kg. The increase in lamb weaning weight reduced age at slaughter by about 2 weeks, consequently the price received per kilogram of carcass was higher, as carcass price declines as the season progresses. An alternative way to evaluate silage feed value is to determine how much concentrate supplementation is required to yield lambs of a similar birth weight. In the current study, ewes offered the high feed value (high DMD) grass silage and supplemented with 5 kg concentrate (soya bean meal plus minerals and vitamins) produced lambs that were heavier than the lambs from ewes offered the medium feed value silage supplemented with 20 kg concentrate. Therefore the high feed value grass silage enabled concentrate supplementation to be reduced by at least 75 %.

Chop length: Unlike for beef and dairy cattle, chop length has a major impact on silage intake by sheep. In Ireland today approximately 55 % of silage on sheep farms is ensiled in big bales. A study was undertaken at Athenry to evaluate the impact of harvest system (precision chop or big bale) on ewe and subsequent lamb performance, the results of which are presented in Table 2. Ewes offered silage, during mid and late pregnancy, which was precision chopped produced lambs that were 1.8 kg heavier at weaning.

Silage type

In recent years the area of maize grown for ensiling has increased dramatically. Previous studies have shown that the use of maize silage increases milk yield of dairy cows and carcass gain of beef cattle by 2.1 kg per cow per day (8%) and 0.11 kg per head per day (19%), respectively. Maize can be sown in the open (sown in early May using early maturing varieties) or under the complete cover plastic mulch system (sown early April using later maturing varieties). Results from Athenry, over 3 consecutive years, have shown that the average increase in dry matter yield was 40% due to the use of the complete cover plastic mulch system relative to growing the same variety of maize in the open.

Currently there is interest in feeding maize silage to pregnant ewes. Two studies have been completed at Athenry to compare grass silage with maize silage. Maize silage is lower in crude protein relative to grass silage. In both studies, some ewes received either 0 or 200 g soyabean daily from housing to lambing. In addition all ewes were offered 16 kg concentrate during the last 6 weeks of pregnancy. The results of are

summarised in Table 3. Relative to high feed value grass silage, maize silage offered without soyabean supplementation did not alter ewe condition at lambing or lamb birth or weaning weights. Supplementation with soyabean meal increased ewe condition at lambing and tended to improve lamb birth weight. However provision of a supplement of soyabean meal throughout the housing period did not alter lamb weaning weight.

The effect of maturity of maize at harvest was evaluated in two studies, the results of which are presented in Table 4. The low and high dry matter maize silages were ensiled at dry matter concentrations of 200 and 293 g/kg, respectively. Increasing maturity of the maize silage at harvest tended to increase ewe condition at lambing and increase lamb weaning weight by 1.1 kg.

Since maize silage has lower mineral and vitamin concentrations relative to grass silage ewes offered maize silage as the sole forage should receive 50 % extra sheep mineral and vitamin mixture relative to ewes offered grass silage to avoid risk of any deficiency.

Concentrate feed level

Silage feed value (as determined by digestibility, chop length and intake characteristics) and litter size are the major factors affecting the amount of concentrate supplementation required by ewes in late pregnancy. When supplementing ewes the objective is to produce heavy lambs (which will be delivered unassisted) and ewes with adequate supplies of colostrum.

With good quality silage there is no benefit from feeding excess concentrate to ewes in late pregnancy (Table 1). However with medium feed value silage increasing the amount of concentrate offered to ewes in late pregnancy increased lamb birth weight and subsequent weaning weight (Table 2).

The effects of silage feed value on concentrate requirements of twin-bearing ewes in late pregnancy are presented in Table 5. Concentrate requirements are influenced by both silage digestibility and harvest system (chop length). The rate of increase in the level of concentrate supplementation required increases as silage digestibility (DMD) decreases. Furthermore as silage chop length increases, the quantity of additional concentrate required increases because digestibility declines. For example, for silages at 79 and 65 % DMD an additional 4 and 10 kg concentrate are required for long chop length silages, relative to precision chop silages, respectively. For ewes carrying

singles, concentrate supplementation can be reduced by 5 kg/ewe, whilst for ewes carrying triplets concentrate supplementation should be increased by 8 kg .

For prolific flocks the concentrate should be formulated to contain 190 g of crude protein per kilogram (ie 19% crude protein) as grass silages on many sheep farms have low protein concentration. Soyabean meal is probably the best quality vegetable protein source and is widely available; consequently it should contribute a large proportion of the protein in concentrate offered to ewes in late pregnancy. As the quantity of concentrate offered to ewes in late pregnancy is modest (depending on silage quality) it should contain high quality energy (barley, maize meal, wheat) digestible fibre (sugar beet pulp, citrus pulp, soya hulls) and protein (soybean, rape meal, distillers) sources.

The current cost, and the relative values of straights, relative to rolled barley at €240 /t and soybean at €400/t are presented in Table 6. The current costs used in this paper are based on average price, when collected from merchant yards, in the east and south west. Currently, straights that are value for money include barley, corn gluten, maize meal, distillers, soya hulls and rape seed meal. However as soybean is probably the best source of protein available it should be included so as to provide a large proportion of the protein in rations to be offered to ewes in late pregnancy.

Examples of simple, high quality rations are presented in Table 7. When purchasing a ration it is important to purchase on known ingredients as well as price.

Concentrate feeding management

Whilst the price of concentrate has increased dramatically this year it is essential to feed adequate levels to meet the ewe requirements in late pregnancy. Consequently, to optimise the use of concentrate ewes should be penned according to predicted litter size (base on ultrasonic scanning) and expected lambing date (penned according to raddle colour). The feed schedule required to offer ewes different concentrate feed levels varying from 10 to 45 kg per ewe in late pregnancy is shown in Table 8. During the week prior to lambing ewes receive up to 1 kg/ewe daily, clearly illustrating the benefits of penning ewes according to expected lambing date as well as expected litter size.

Conclusions

1. Correct nutrition during late pregnancy is a key foundation to flock profitability.
2. Grass silage feed value, as determined by digestibility and intake characteristics, is the major factor affecting ewe performance and subsequently efficiency of production, during the housing period.
3. Reducing silage chop length increases ewe and subsequent lamb performance.
4. High feed value grass silage can reduce concentrate requirement by at least 75 %, whilst maintaining animal performance.
5. Level of supplementation offered to ewes in late pregnancy should be based on lambing date, forage quality and expected litter size.
6. Supplement with a concentrate containing 19% crude protein and where soyabean meal accounts for a high proportion of the protein.
7. Maize silage can replace grass silage. However extra mineral and vitamin supplementation is required. Also feed a concentrate with higher protein concentration (22%) in late pregnancy.
8. Pen ewes according to expected litter size and lambing date to minimise concentrate usage.

Table 1. The affects of grass silage feed value and concentrate feed level in late pregnancy on ewe and subsequent lamb performance

	Silage DMD (%)		
	73	79	
Concentrate (kg/ewe in late pregnancy)	20	5	20
Ewe weight post lambing (kg)	61.4	70.4	73.6
Lamb - birth weight (kg)	4.6	4.9	5.1
- weaning weight (kg)	32.9	34.0	34.7
- gain – birth to weaning (g/d)	292	301	306

(Keady and Hanrahan 2009)

Table 2. The effects of silage system on ewe and subsequent lamb performance

	Silage harvest system			
	Precision chop		Big bale	
Concentrate (kg in last 6 weeks of pregnancy)	18	27	18	27
Ewe condition at lambing	4.1	4.1	4.0	4.1
Lamb - birth weight (kg)	4.7	4.9	4.5	4.9
- weaning weight (kg)	33.7	34.8	32.1	32.8

(Keady and Hanrahan 2008)

Table 3. The effects of maize silage during late pregnancy on ewe and subsequent lamb performance

	Silage type		
	Grass	Maize	
Soyabean meal (g/day)	0	0	200
Ewe condition at lambing	3.8	3.5	4.0
Lamb – birth weight (kg)	4.7	4.5	4.9
- weaning weight (kg)	33.4	33.6	33.3

(Keady and Hanrahan 2008, 2009)

Table 4. The effects of maturity of maize at harvest on ewe and subsequent lamb performance

	Maize silage dry matter at harvest (g/kg)	
	200	293
Ewe condition at lambing	3.7	3.8
Lamb – birth weight (kg)	4.7	4.7
- weaning weight (kg)	32.7	33.8

(Keady and Hanrahan 2008, 2009)

Table 5. Effects of silage quality on concentrate requirements of twin-bearing ewes in late pregnancy

	Silage DMD (%)		
	79	72	64
Precision chopped (kg/ewe)	8	12	20
Big bale/Single chop (kg/ewe)	12	20	30

Table 6. Value of feedstuffs (comparative to barley for energy and soyabean for protein)

	Cost (€/t)	Value (€/t)
Energy Sources		
Rolled barley	**240**	**240**
Rolled wheat	255	240
Maize meal	290	295
Maize gluten	230	256
Citrus pulp	230	211
Molasses	190	157
Soya hulls	230	244
Protein Sources		
Soybean meal	**400**	**400**
Maize distillers	245	314
Rape seed	275	343

Table 7. Sample concentrate mixes for ewes in late pregnancy (kg/t)

1. 355 barley, 140 citrus pulp, 200 soya hulls, 280 soya,
   25 minerals & vitamins (19.0 % protein)
2. 200 barley, 175 maize meal, 200 citrus pulp, 100 soya hulls, 300 soya,
   25 minerals & vitamins (19.3 % protein)
3. 285 barley, 180 maize meal, 200 soya hulls, 190 soya, 120 rape seed,
   25 minerals & vitamins (18.9 % protein)
4. 375 barley, 190 soya hulls, 200 maize gluten, 210 soya,
   25 minerals & vitamins (19.0 % protein)

Table 8. **Daily concentrate allowance (kg/ewe daily) required for different total concentrate inputs prior to lambing**

Week prior to lambing	Desired total concentrate input prior to lambing (kg/ewe)					
	10	15	20	25	35	45
8						0.4
7					0.4	0.6
6		0.2	0.3	0.4	0.5	0.6
5		0.2	0.3	0.4	0.6	0.8
4	0.2	0.2	0.4	0.6	0.7	0.9
3	0.2	0.3	0.5	0.6	0.8	1.0
2	0.4	0.5	0.6	0.7	1.0	1.0
1	0.6	0.75	0.8	0.9	1.0	1.1