Feeding ewes during late pregnancy: 1 – Forage quality

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Introduction

The plane of nutrition offered to ewes during late pregnancy has a major influence on the birth weight, vigour and survival of lambs, colostrum production, and ewe body reserves; all of which impact labour requirements around lambing, weaning rate and weaning weight. Consequently, appropriate nutrition and management during late pregnancy is one of the key factors influencing the productivity, and thus profitability, of mid-season prime lamb production.

My objective in this article is to summarise results from recent studies at Athenry on the effects of forage type and feed value offered during late pregnancy on ewe performance, and on lamb mortality, birth weight and subsequent growth rate. In a subsequent article concentrate feeding management during late pregnancy and its impact on ewe and progeny performance will be discussed.

Foetal development

Whilst the placenta is fully developed by 8 weeks prior to lambing, the foetus has only reached 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 that produces twin lambs, each weighing 5 kg, looses approximately 17 kg of live weight at lambing.

Nutrient requirements

The metabolizable energy (ME) requirement of ewes increases rapidly during late pregnancy due to the rapidly growing foetuses and udder development (for colostrum

production). The 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 ewe weighing 75 kg increases from 12 to 19 MJ daily. Considering that each 1 kg of barley (14 % moisture) contains only 11.4 MJ of ME, ewes need to be well supplemented in late pregnancy. Whilst ewes in good condition in late pregnancy can mobilize some body reserves those that are in poor condition must be fed to ensure that have adequate body reserves for early lactation

Lamb birth weight

Birth weight is a major factor influencing lamb viability. The effect of lamb birth weight on lamb mortality is shown in Figure 1. Optimum lamb birth weight is influenced by litter size. Regardless of litter size, as lamb weight increases mortality declines initially but reaches a plateau at the optimum birth weight, which varies by litter size. Subsequently, as birth weight increases above the optimum, lamb mortality increases again – probably reflecting difficulties immediately prior to and at delivery. The optimum birth weight, based on lamb mortality, for lambs born as singles, twins and triplets is 6.0, 5.6 and 4.7 kg, respectively. Thus the optimum birth weight for lambs born as twins and triplets is 0.93 and 0.78 times that of singles.

For the flock at the Athenry Research Farm (mean litter size of 2 lambs per ewe) that is used for nutrition studies mean lamb mortality to weaning for the past 7 years (regardless of late pregnancy dietary treatment) has been 10%. Lamb mortality is also influenced by litter size. For lambs born as singles, twins and triplets mean lamb mortality is 6, 7 and 21% respectively. Consequently as flock prolificacy increases lamb mortality increases.

The birth weight of lambs influences subsequent growth rate and consequently weaning weight. Previous studies at Athenry have shown that for each 0.5 kg increase in lamb birth weight subsequent weaning weight increases by 1.7 kg. The increased weaning weight is due to a combination of the increase in birth weight *per se* and increased growth rate.

Lamb birth weight is influenced by many factors including ewe genotype, nutrition during mid and late pregnancy, and other management factors. Studies at Athenry have shown that shearing ewes at housing (mid December) increased lamb birth weight by 0.6 kg.

Variability in the feed value of grass silage

There is a perception among some industry commentators that the feed value of silages produced in 2013 is higher than normal. Whilst this is true that silages produced in 2013 are better than those produced in 2012 the mean feed value of silage produced in 2013 is no better than that for the years prior to 2012. For example, the mean dry matter digestibility (DMD) for silage produced in 2013, 2011 and 2010 is 673, 703 and 687 g/kg DM, (67.3, 70.3 and 68.7 % units) respectively.

The composition of silage produced on farms in Ireland varies dramatically in terms of feed value and chemical composition. The variation in feed value is dependent on the composition of the herbage harvested, regrowth interval, sward type, harvest date, harvest number, wilting period, prevailing weather conditions, additive treatment and management at ensiling. The chemical composition of silage produced in Ireland and offered to livestock in the winter of 2013-2014, as analysed by the Hillsborough Feeding Information System is summarised in Table 1. Silage composition is extremely variable as indicated by the data for concentrations of dry matter, crude protein and DMD. Silages with low digestibility have low intake characteristics. The poorer quality silages would not even support animal maintenance whilst the best silages, when offered as the sole diet, would sustain 23 litres of milk per cow daily, a daily live-weight gain of 1.1 kg per finishing steer daily, a daily live-weight gain of 173g/day per finishing lamb.

Impact of grass 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-point increase in digestibility increases milk yield of dairy cows by 1.65 kg/day, carcass gain of finishing beef cattle by 18 kg over a 150-day finishing period, and the carcass gain of finishing lambs by 2.3 kg over a 50-day finishing period .

Whilst the mean DMD for silage produced in Ireland in 2013 was 673 g/kg DM, the DMD of the best and worst silages were 560 and 820 g/kg DM, respectively. Consequently, when developing a nutritional plan for ewes in late pregnancy it is essential to know the feed value of the silage that will be offered to the ewes.

Studies were 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 main results are presented in Table 2. Increasing silage digestibility, when offered at similar levels of concentrate, increased ewe live weight post lambing by 8 kg, lamb birth weight by 0.35 kg and lamb weaning weight by 1.2 kg. The increase in lamb weaning weight reduced age at slaughter; consequently, the price received per kilogram of carcass was higher, since carcass price declines as the season progresses. In one of these studies, in which silage feed value was increased (through increased digestibility and intake characteristics), lamb birth and weaning weights were increased by 0.55 kg and 1.8 kg respectively (Table 3).

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. This can be demonstrated by results from a study at Athenry (Table 3) designed to evaluate the effects of silage feed value and concentrate feed level on the performance of pregnant ewes and their progeny. Ewes that were 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 grass silage intake by sheep. Approximately 55 % of silage on sheep farms in Ireland is

ensiled in big bales. The effect of harvest system (precision chop or big bale) on ewe and subsequent lamb performance was evaluated at Athenry and the results are presented in Table 4. Ewes offered silage (during mid and late pregnancy) that was precision chopped produced lambs that were 1.8 kg heavier at weaning than lambs from ewes that were offered big bale silage.

Silage feed value and concentrate requirement

The effects of silage feed value on the concentrate requirement of twin-bearing ewes in late pregnancy are presented in Table 5. Concentrate requirement is influenced by both silage digestibility and harvest system (chop length). The rate of increase in the required level of concentrate supplementation increases as silage digestibility (DMD) decreases. Furthermore, as silage chop length increases the quantity of additional concentrate required increases because intake 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. The concentrate requirements presented in Table 5 can be reduced by 5 kg/ewe in the case of single-bearing ewes, whilst concentrate supplementation should be increased by 8 kg for ewes carrying triplets.

The results of these studies undertaken at Athenry clearly show the impact of silage feed value, when offered during mid and late pregnancy, on ewe performance and the level of concentrate supplementation required.

Maize silage

In recent years the area of maize which has been grown for ensiling has increased dramatically. Previous studies have shown that partially replacing grass silage with 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.

Two studies have been completed at Athenry in which grass silage was compared with maize silage when offered (as the sole forage) to ewes during mid and late pregnancy. Maize is lower in crude protein than grass silage. In both studies, some ewes received either 0 or 200 g soya-bean meal daily from housing to lambing. The results of are summarised in Table 6. Relative to high feed-value grass silage, maize

silage offered without soya-bean meal supplementation did not alter ewe condition at lambing, or lamb birth or weaning weights. Supplementation with soya-bean meal increased ewe condition at lambing and tended to improve lamb birth weight. However supplementation with soya-bean 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 7. 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.

Note that maize silage has lower mineral and vitamin concentrations than grass silage. Consequently, ewes offered maize silage as the sole forage should receive approximately 50 % extra sheep mineral and vitamin mixture supplement relative to that offered to ewes on grass silage to avoid risk of a deficiency.

Conclusions

1. Plane of nutrition during late pregnancy is a key issue impacting on flock productivity and profitability.
2. Birth weigh is a major factor influencing lamb mortality, growth rate and weaning weight.
3. The mean feed value of grass silage produced on Irish farms in 2013 is no better than that produced in previous years (with the exception of 2012)
4. 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.
5. To develop an appropriate nutritional plan for pregnant ewes it is critical to know the feed value of the silage been offered.
6. High feed-value grass silage can reduce concentrate requirement by at least 75 % whilst maintaining animal performance.
7. The level of supplementation offered to ewes in late pregnancy should be based on lambing date, forage quality and expected litter size.

Table 1. Chemical composition of silages ensiled on Irish farms in 2013

	Minimum	Maximum	Average
Predicted silage DM intake (g/kg $W^{0.75}$ per day)	60	115	93
Dry matter (g/kg)	133	657	294
Crude protein (g/kg DM)	80	193	121
Dry matter digestibility (DMD)(g/kg DM)	560	820	673

(Hillsborough Feeding Information System 2013)

Table 2. The effects of grass silage feed value in late pregnancy on ewe and subsequent lamb performance

	Silage feed value	
	Medium	High
Dry matter (%)	23.0	25.9
DMD (%)	70.2	76.5
Animal performance		
Ewe weight post lambing (kg)	58.7	66.7
Lamb – birth weight (kg)	4.4	4.7
- weaning weight (kg)	30.5	31.7

(Keady and Hanrahan 2009, 2010, 2012a)

Table 3. The effects of grass silage feed value and concentrate feed level in late pregnancy on ewe and subsequent lamb performance

	Silage feed value		
	Medium	High	
Concentrate (kg/ewe in late pregnancy)	20	5	20
Silage DMD (%)	73	79	79
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 4. 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 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	17	25
Big bale/Single chop (kg/ewe)	12	24	35

Table 6. The effects of maize silage during late pregnancy on ewe and subsequent lamb performance

	Silage Type		
	Grass	Maize	
Soya-bean 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

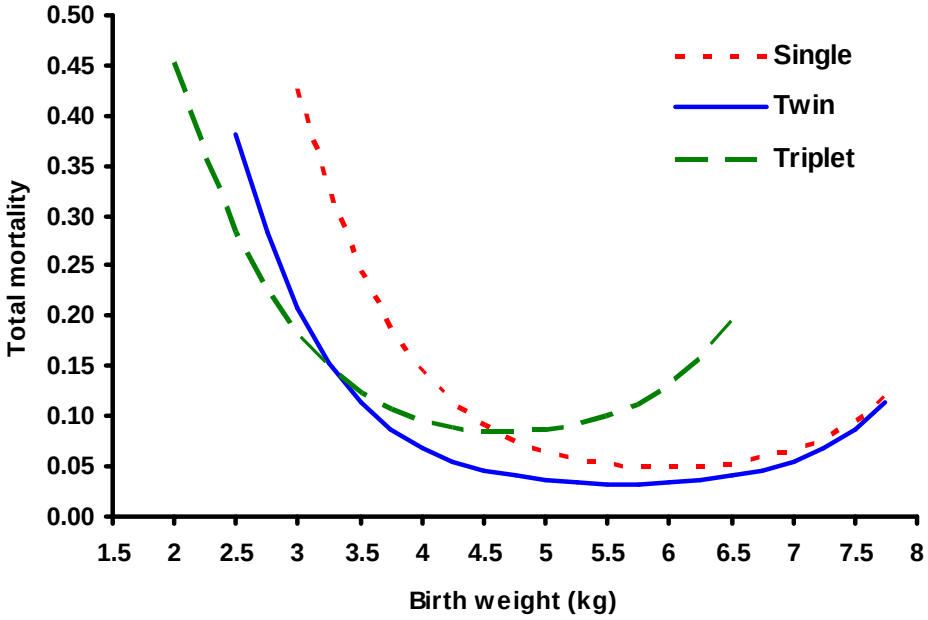
(Keady and Hanrahan 2008, 2009)

Table 7. 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)

Figure 1. Relationship between lamb birth weight and total mortality



(Hanrahan and Keady, 2013)