Each five percentage point increase in silage DMD increases ewe weight post-lambing by 6.5kg and increases lamb birth weight by 0.25kg.

Nutrition during late pregnancy

– the foundation for profitable prime lamb production

Tim Keady
Animal and Grassland Research and Innovation Centre, Teagasc, Athenry, Co Galway

> Birth weight is a major factor influencing lamb viability

Ewes which receive optimum nutrition during mid and late pregnancy will produce vigorous lambs which are close to, or at, the optimum birth weight. Having given birth, the ewes will have adequate colostrum. The result? Lower lamb mortality and increased performance which in turn reduces the workload around lambing. The outcome? Higher productivity and greater profit for the farmer.

My objective in this article is to summarise results from recent studies at Teagasc Athenry on the effects of the plane of nutrition offered to ewes during late pregnancy on their performance and that of their lambs.

Birth weight

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

Birth weight is a major factor influencing lamb viability. The effect of lamb birth weight on lamb mortality is shown in Figure 1 (page 24).

Optimum lamb birth weight is influenced by litter size (single, twin, triplet, etc). 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. As birth weight increases above the optimum, lamb mortality increases again – probably reflecting difficulties immediately prior to and during 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.

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. As flock prolificacy (average number of lambs/ewe) increases, lamb mortality will increase.

Continued on next page

»From page 23

Variability in feed value of silage

The chemical composition of silage produced in Ireland and offered to livestock in the winter of 2015-2016, as analysed by the Hillsborough Feeding Information System, is summarised in Table 1. Silage composition is extremely variable as indicated by the data for concentration of crude protein and DMD. Silages with low digestibility (DMD) result in lower intake. The poorer quality silages would not even support animal maintenance.

Digestibility (DMD) is the most important characteristic of grass silage because it is positively correlated with energy concentration and intake. While the mean DMD for silage produced in Ireland in 2015 was 69.2% DM, the DMD of the best and worst silages were 82%and 52% DM, respectively. Consequently, when developing a nutritional plan for ewes in late pregnancy, it is essential to know the feed value of your silage.

Studies were undertaken at Teagasc Athenry to evaluate the effect 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. The results of these and other studies show that when silage is offered to ewes during mid and late pregnancy, each five percentage point increase in silage DMD increases ewe weight post-lambing by 6.5kg and increases lamb birth weight by 0.25kg.

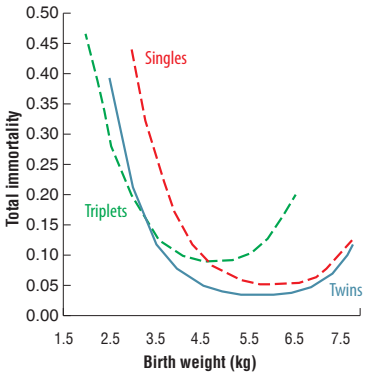
Another way to evaluate silage feed value is to determine how much concentrate is required to yield lambs of a similar birth weight. In a study at Teagasc Athenry (Table 3) ewes that were offered a high feed value (high DMD) grass silage and supplemented with 5kg concentrate (soya bean meal, plus minerals and vitamins) produced lambs that were heavier than the lambs from ewes offered a medium feed value silage supplemented with 20kg concentrate. The high feed value grass silage enabled concentrate supplementation to be reduced by at least 75 %.

Concentrate requirement

The effects of concentrate feed level and silage feed value on lamb birth weight and ewe condition score at lambing are presented in Table 4. For ewes offered the 70% and 75% DMD silages, increasing concentrate feed level above 15kg and 25kg, respectively, had no effect on lamb birth weight but increased the ewe condition score.

The effects of silage feed value on the concentrate requirement of twin-bearing ewes in late pregnancy are presented in Table 5. Concentrate

Figure 1: Relationship between lamb birth weight and mortality



requirement is influenced by both silage digestibility and the harvest system (chop length). Silage DMD has a greater effect on concentrate requirement than chop length per se. The rate of increase in the required level of concentrate supplementation rises 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 4kg and 10kg concentrate are required respectively for long chop-length silages, compared with precision chop silages. The concentrate requirements presented in Table 5 can be reduced by 5kg/ewe in the case of single-bearing ewes, while concentrate supplementation should be increased by 8kg for ewes carrying triplets.

Concentrate protein

For prolific flocks, the concentrate should be formulated to contain 190g of crude protein per kilogramme (i.e. 19% crude protein) as the grass silage on many sheep farms has a low protein concentration. Some commentators within the industry suggest formulating low- and high-protein concentrates for feeding to ewes during the second last and last three-week periods of pregnancy, respectively.

However, considering the size of most sheep flocks in Ireland and the fact that ewes are offered low levels of concentrate during the first two to three weeks of supplementation, together with the low protein concentration of grass silage on most sheep farms, the savings from using two different concentrates is, at best, marginal.

Where maize silage is offered as the forage, concentrate crude protein should be increased to 23%. Also, as maize silage normally has lower concentrations of minerals and vitamins, mineral and vitamin supplementation

should be increased by approximately 50% during late pregnancy.

In a recent study at Teagasc Athenry, the effect of concentrate protein source offered during late pregnancy on the performance of ewes and their progeny was examined. Two concentrates were formulated to have the same metabolisable energy (12.4 MJ/kg DM) and protein concentrations (18% as fed). The protein sources in the concentrates were either soya bean meal or a mixture of by-products (rapeseed, maize distillers and maize gluten).

Lambs born to ewes that had been offered the soya bean-based concentrate were 0.3kg and 0.9kg heavier at birth and weaning, respectively, than lambs born to ewes offered concentrate that contained by-products as the protein source. The increase in the weaning weight of lambs from ewes offered the soya bean-based concentrate in late pregnancy (extra cost ~ €0.50/ewe) is similar to the response obtained from offering each lamb 6kg of creep concentrate until weaning (cost ~ €3/ewe per set of twins).

Concentrate offered to ewes in late pregnancy should be formulated using ingredients that are good sources of protein, energy and fibre.

The ingredient composition of the concentrate which will be offered to ewes during late pregnancy at Teagasc Athenry is presented in Table 6.

The concentrate was formulated to contain 19 % protein using good

Ewes which receive optimum nutrition during mid and late pregnancy will produce lambs close to, or at, the optimum birth weight.

protein (soya, rapeseed), energy (maize, barley) and fibre (beet pulp, soya hulls) sources. While concentrate price is important, it's worth bearing in mind that when offering similar levels of concentrate to ewes during late pregnancy as is offered at Teagasc Athenry, a reduction in concentrate price of €20/t equates to a saving equivalent of only 40c per ewe.

Concentrate feeding management

To optimise the use of concentrate, ewes should be penned according to predicted litter size (based on ultrasonic scanning) and expected lambing date (mating date – raddle colour).

As the demand for nutrients increases in late pregnancy, supplementation should be stepped up weekly over the weeks immediately prior to lambing. When supplementing ewes, the objective is to produce lambs at the optimum birth weight (which will be delivered unassisted) and ewes with adequate supplies of colostrum.

The feed schedules required to deliver different concentrate feed levels, varying from 10kg to 45kg per ewe in late pregnancy, are shown in Table 7. During the week prior to lambing ewes receive up to 1kg daily, clearly illustrating the benefits of penning ewes according to expected lambing date as well as expected litter size. For example, for each extra week ewes are on the high level of concentrate supplementation, they would consume approximately 7kg concentrate, dramatically increasing concentrate usage.

Table 1: Chemical composition of silages ensiled on Irish farms in 2015

	Minimum	Maximum	Average
Predicted silage DM intake (g/kg $W^{0.75}$ per day)	50	105	79
Crude protein (g/kg DM)	8.0	19.3	11.2
Dry matter digestibility (DMD)(g/kg DM)	52.0	82.0	69.2

(Hillsborough Feeding Information System 2015)

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 concentrate feed level in late pregnancy on lamb birth weight and ewe condition score (CS)

Concentrate offered during late pregnancy (kg/ewe)	Silage DMD	
	70 (CS)	75 (CS)
5	-	4.8 (3.4)
15	4.7 (3.1)	5.0 (3.7)
25	5.2 (3.3)	5.1 (3.8)
35	5.4 (3.5)	-
45	5.3 (3.8)	-

(Keady and Hanrahan 2010)

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: Ingredient composition of the concentrate that will be offered to ewes at Athenry

Ingredient	kg/t
Soyabean meal	200
Maize meal	190
Barley	170
Soya hulls	145
Beet pulp	100
Rapeseed	80
Maize distillers	40
Molasses	50
Minerals and vitamins	25

Table 7: Daily concentrate allowance (kg/ewe) required for different total concentrate inputs prior to lambing

Week prior	Desired total concentrate input prior to lambing (kg/ewe) to lambing					
	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

Note

- Each 0.5kg increase in birth weight increases weaning weight by 1.7kg.
- To develop an appropriate nutritional plan for pregnant ewes, it is critical to know the feed value of the silage being offered.
- The level of supplementation offered to ewes in late pregnancy should be based on lambing date, forage quality and expected litter size.
- Supplement with a concentrate containing 19% crude protein formulate using good protein (e.g. soya bean meal), energy (e.g. maize, barley) and fibre (e.g. beet pulp, soya hulls).
- Pen ewes according to expected litter size and lambing date to minimise concentrate usage.