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Nutrition during late pregnancy – the corner stone of prime lamb production

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Introduction

Ewes which are offered the correct plane of nutrition during mid and late pregnancy will have an adequate supply of colostrum post lambing and produce lambs close to optimum birth weight and with increased vigor; thus reducing mortality and increasing performance - all of which impact labour requirements around lambing. Consequently, appropriate nutrition and management during late pregnancy is one of the key factors influencing the productivity, and thus profitability, and is therefore one of the corner stones of prime lamb production.

My objective of this article is to summarise results from recent studies at Athenry on the effects of plane of nutrition offered to ewes during late pregnancy on ewe and lamb performance.

Lamb birth weight

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 around 1.7 kg. The increased weaning weight is due to a combination of the increase in birth weight *per se* and 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. 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 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. Consequently as flock prolificacy increases lamb mortality will increase.

Variability in the feed value of grass 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 concentrations of dry matter, crude protein and dry matter digestibility (DMD). Silages with low digestibility have low intake characteristics. The poorer quality silages would not even support animal maintenance whilst the best silages would considerably increase ewe live weight gain and reduce concentrate requirements during late pregnancy.

Impact of grass silage feed value

Digestibility (DMD) is the most important characteristic of grass silage in the context of its influence on animal performance because it is positively correlated with energy concentration and intake. Whilst the mean DMD for silage produced in Ireland in 2015 was 69.2 %, the DMD of the best and worst silages were 52 and 82 %, respectively. Consequently, when developing a nutritional plan for housed ewes in late pregnancy it is essential to know the feed value of the silage (forage) 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. The data presented in Table 2 shows that increasing silage DMD increased ewe weight at lambing and increased lamb birth and weaning weights by 0.3 and 1.3 kg, respectively. The results of these (Table 2) and other studies show that when silage is offered to ewes during mid and late pregnancy

each 5 percentage point increase in silage DMD increases ewe weight post lambing by 6.5 kg and increases lamb birth weight by 0.25 kg.

An alternative 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 Athenry (Table 3) ewes that were offered a 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 a 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 %.

Silage feed value and concentrate requirement

The effects of concentrate feed level and silage feed value on lamb birth weight and ewe body condition score (BCS) at lambing are presented in Table 4. For ewes offered the 70 and 75% DMD silages increasing concentrate feed level offered during late pregnancy above 15 and 25 kg, respectively, had no effect on lamb birth weight but increased ewe body condition score. Therefore the increased energy intake from feeding excess concentrate to ewes during late pregnancy is converted to body fat.

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 (DMD) and harvest system (chop length). However, the main factor influencing concentrate requirement during late pregnancy is silage digestibility. 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, compared 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 show the impact of silage feed value, when offered to ewes during mid and late pregnancy, on ewe performance and the level of concentrate supplementation required.

Concentrate protein

For prolific flocks the concentrate should be formulated to contain 19% crude protein (i.e., 190 g of crude protein per kilogram as fed) 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 3 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 2 to 3 weeks of supplementation, together with the low protein concentration of grass silage on most sheep farms the savings from using 2 different concentrates is at best marginal. For example, whilst relative to a 19% crude protein concentrate (containing 200 kg soyabean meal per tonne), the reduction in the cost of formulating a 14% crude protein concentrate is reduced by approximately €30/t, this equates to only 1 cent per ewe daily during the first few weeks of supplementation, when ewes are offered between 0.2 and 0.4 kg/ewe daily. For every 100 ewes in a flock 1 tonne of concentrate will last for 50 and 25 days, respectively, when ewes receive a daily concentrate allowance of 0.2 and 0.4 kg/head. Therefore, for most farms there is no benefit to animal production, logistics or financial outcome from offering a low protein concentrate during the first weeks of concentrate supplementation.

Where maize silage is offered as the forage then concentrate crude protein concentration 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 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 metabolizable energy (12.4 MJ/kg DM) and protein concentrations (18% as fed). The protein sources in the concentrates were either soyabean meal or a mixture of by-products (rapeseed, maize distillers and

maize gluten). The results of this study are presented in Table 6. Lambs born to ewes that had been offered the soyabean-based concentrate were 0.3 kg and 0.9 kg 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 soyabean-based concentrate in late pregnancy (extra cost ~ €0.50/ewe) is similar to the response obtained from offering each lamb 6 kg 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 this year at Athenry is presented in Table 7. The concentrate was formulated to contain 19 % protein using good protein (soya, rapeseed), energy (maize, barley) and fibre (beet pulp, soya hulls) sources. When offering similar levels of concentrate to ewes during late pregnancy as is offered at Athenry, a reduction in concentrate price of €20/t equates to a saving equivalent of only €0.40 cents per ewe. Therefore when purchasing concentrate it is important to be aware of its ingredient composition rather than basing the decision on which concentrate to purchase solely on price alone.

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 10 to 45 kg per ewe in late pregnancy, are shown in Table 7. During the week prior to lambing ewes receive up to 1 kg 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 ~7 kg concentrate - thus dramatically increasing concentrate usage.

Theory to practice

1. Each 5 percentage point increase in silage DMD increases ewe weight post lambing by 6.5 kg and increases lamb birth weight by 0.25 kg.
2. Each 0.5 kg increase in birth weight increases weaning weight by 1.7 kg.
3. To develop an appropriate nutritional plan for pregnant ewes it is critical to know the feed value of the silage been offered.
4. The level of supplementation offered to ewes in late pregnancy should be based on lambing date, forage quality and expected litter size.
5. Pen ewes according to expected litter size and lambing date to minimise concentrate usage.
6. As the demand for nutrients increases in late pregnancy supplementation should be stepped up weekly over the weeks immediately prior to lambing.
7. When purchasing concentrate select on its ingredient composition and not solely on price.
8. Supplement with a concentrate containing 19% crude protein and which is formulated primarily using good protein (eg soyabean meal), energy (eg maize, barley) and fibre (eg beet pulp, soya hulls) ingredients.

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
Dry matter (%)	12.2	76.2	29.0
Crude protein (%)	8.0	19.3	11.2
Dry matter digestibility (DMD)(%)	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 body condition score (BCS)

Concentrate offered during late pregnancy (kg/ewe)	Silage DMD (%)	
	70 (BCS)	75 (BCS)
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. The effects of concentrate protein source on ewe and subsequent lamb performance

	Protein source	
	Soyabean meal	By-products
Ewe weight post lambing (kg)	53.2	51.4
Lamb – birth weight (kg)	4.0	3.7
- weaning weight (kg)	30.9	30.0

(Keady and Hanrahan 2012)

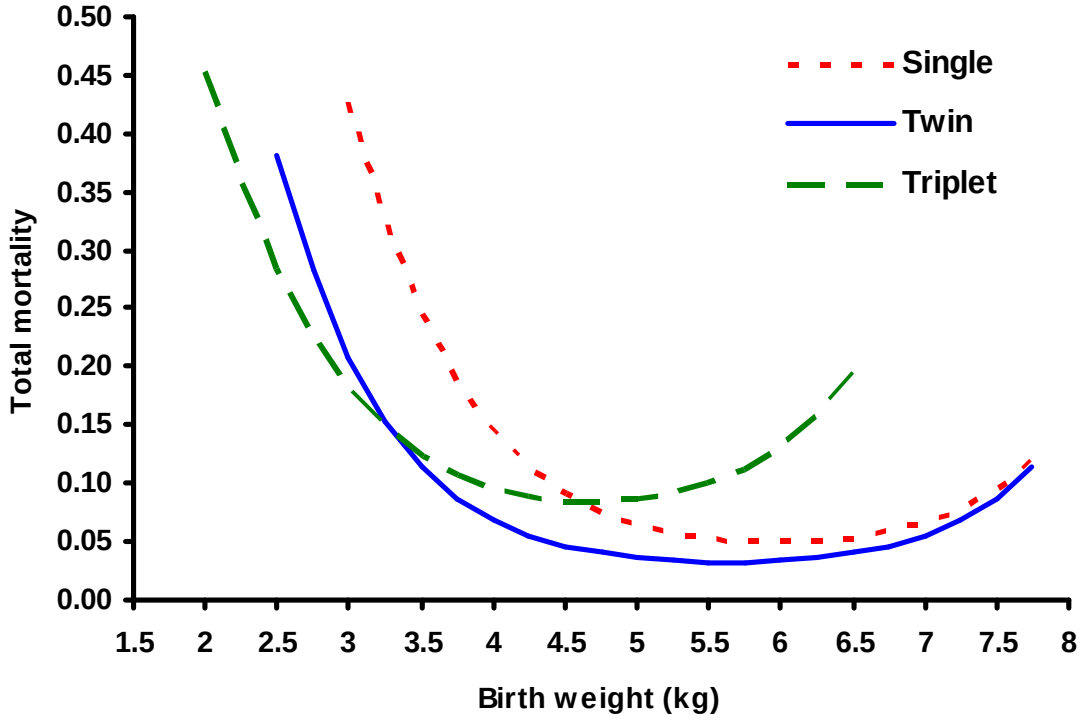
Table 7. **Ingredient composition of the concentrate that will be offered to ewes at Athenry this year.**

Ingedient	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 8. **Daily concentrate allowance (kg/ewe) 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

Figure 1. Relationship between lamb birth weight and total mortality for lambs born as singles, twins and triplets



(Hanrahan and Keady, 2013)