Teagasc

Animal & Grassland Research and Innovation Programme

National Sheep Conferences 2017

The Landmark Hotel, Carrick on Shannon, Co. Leitrim.
Tuesday 31st January 2017
&
The Woodford Dolmen Hotel, Carlow, Co. Carlow.
Thursday 2nd February 2017

teagasc
Agriculture and Food Development Authority

National Sheep Conferences 2017

Teagasc National Sheep Conferences 2017

Programme

Venue: The Landmark Hotel, Carrick on Shannon, Co. Leitrim.

Date: Tuesday 31st January 2017.

Conference Outline

17:30 **KT Sign-in**
Chairman: Ben Wilkinson,
Regional Manager, Sligo/Leitrim/Donegal Advisory Region.

18.00 **Conference Opening**
Dr Frank O'Mara,
Director of Research, Teagasc.

18:15 **Why are you here today? Focus on Take-Home Messages**
Tom Coll,
Teagasc, Mohill, Co. Leitrim.

18.25 **A Descriptive Study of Mortality in 33 Irish Sheep Flocks**
Seamus Fagan,
Department of Agriculture, Food and Marine, Regional Veterinary Laboratories.

18.55 **Key Flock Management Decisions to Optimise Lambing Performance**
Dr Frank Campion,
Teagasc, Athenry, Co. Galway.

19.25 **Strategies for Dealing with Orphan Lambs in High Litter Size Flocks**
Michael Gottstein,
Sheep Specialist, Teagasc, Macroom, Co. Cork.

19:55 **Making the Most of My Farming Resource – A Farmer's Experience**
John Doyle,
BETTER Farmer, Bunclody, Co. Wexford.
and
Martina Harrington,
Teagasc Advisor, Enniscorthy, Co. Wexford.

20:25 **Close Conference**
Professor Michael Diskin,
Teagasc, Athenry, Co. Galway.

20:30 *Refreshments served.*

Teagasc National Sheep Conferences 2017

Programme

Venue: The Woodford Dolmen Hotel, Carlow, Co. Carlow.

Date: Thursday 2nd February 2017.

Conference Outline

17:30 **KT Sign-in**
Chairperson: Dr Siobhan Kavanagh,
Regional Manager, Wicklow / Carlow / Wexford Advisory Region.

18.00 **Conference Opening**
Dr Tom Kelly,
Director of Knowledge Transfer, Teagasc.

18:15 **Why are you here today? Focus on Take-Home Messages**
Hugh Mahon,
Teagasc, Oak Park, Carlow.

18.25 **A Descriptive Study of Mortality in 33 Irish Sheep Flocks**
Maresa Sheehan,
Department of Agriculture, Food and Marine, Regional Veterinary Laboratories.

18.55 **Key Flock Management Decisions to Optimise Lambing Performance**
Dr Frank Campion,
Teagasc, Athenry. Co. Galway.

19.25 **Strategies for Dealing with Orphan Lambs in High Litter Size Flocks**
Michael Gottstein,
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John Doyle,
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Martina Harrington,
Teagasc Adviser, Enniscorthy, Co. Wexford.

20:25 **Close Conference**
Andrew Doyle, TD.
Minister of State for Food, Forestry and Horticulture.

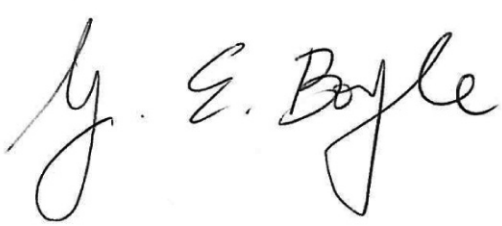
20:30 *Refreshments served.*

Foreword

Sheep production is a significant contributor to the agricultural and national economy with an output value of €240 million in 2016. This is an increase of 4% on 2015 with volume of meat output having increased 3%. The 34,000 flocks produce a high quality product, with about 75-80% of this exported. Significant employment is provided in both the primary production and processing sectors. The improvement in lamb prices in recent years combined with reduced feed costs, would all suggest that 2017 could be a good year for the sheep industry. I welcome the recently introduced Sheep Welfare Scheme. This scheme will not only give a boast to improving productivity at farm level but will also boost returns from sheep production. However, there is no room for complacency. Brexit is creating currency uncertainty. About 25% of Irish lamb is sold into the UK market. Weaker sterling is also putting pressure on Irish high lamb prices in continental Europe. Technical performance in terms of ewe productivity, grassland management, stocking rate and flock health are all important drivers of profitability and must be the sustained focus of all sheep producers and particularly in times of uncertainty. This is the clear message from today's conference.

In the Teagasc 2015 National Farm Survey an average gross margin of €515/ha for lowland mid-season lambing flocks. However, the top one third of flocks generated a gross margin of €912/ha compared to €162 for the bottom one third of flocks. Due to higher weaning and stocking rates, output on the Top farms was more than double the output of the Bottom farms and total direct costs were lower despite the significantly larger output. Gross margin per hectare is more than five times higher on the Top farms compared to the Bottom. This indicates that there is significant scope to increase income by improving technical efficiency on many farms. This is also evident from the significant productivity and gross margin gains achieved on the Teagasc Research and Demonstration Flock in Athenry and on the Teagasc BETTER Sheep Farms. Modest improvements in a number of key technologies have very significant impacts on productivity and profitability. I would strongly encourage sheep producers and Discussion Groups to visit the Teagasc BETTER farms. Active participation in such Discussion Groups has been shown to be a most effective way of getting new technology adopted on farms which subsequently translates into increased productivity and increased farm income.

I welcome the increased focus on relevant take home messages. Farmers should focus on implementing on their farms a number of the messages from today's conference. This is now the 5th year of the Teagasc National Sheep Conferences and they play a very important role in technology transfer to the sheep industry. This booklet collates and summarises a significant body of knowledge on technical issues in sheep production and should prove an invaluable reference to sheep producers. I would like to thank the Speakers and the Teagasc Staff who assisted in with the organisation of the National Sheep Conferences and especially the organising committee without whose efforts we would not be here today – they are; Michael Diskin, Frank Hynes, Phil Creighton, Ciaran Lynch, Fiona McGovern, Frank Campion, Martin Mulkerrins and Michael Gottstein. I also acknowledge the help and input of local Teagasc advisory staff.



Director, Teagasc.

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A Descriptive Study of Mortality in 33 Irish Sheep Flocks

Seamus Fagan[1] & Maresa Sheehan[2]
[1]DAFM Laboratories, Regional Veterinary Laboratory, Coosan, Athlone, Co Westmeath
[2]DAFM Laboratories, Regional Veterinary Laboratory, Kilkenny

- *Toxoplasma gondii* and *Chlamydophila abortus* (EAE) were the most common abortion agents identified.
- The first forty-eight hours of life are the most critical to prevent losses.
- It is very important for sheep farmers to record the details of all deaths on farm, and to identify the causes of death.
- Farmers should put in place a good flock health plan to minimise losses and maximise profitability and flock welfare.

Introduction

Very little data exists on the rates and causes of mortality in Irish sheep flocks. A vision, as outlined in the Ireland Food Harvest 2020 report, is that the value of sheep meat output will increase by 20% by 2020. One potential constraint to achieving this target is the prevailing low weaning rate nationally, influenced by lamb and ewe mortality, which subsequently impacts on lamb carcass output per ewe. This study aimed to:

1. Determine the causes of mortality on commercial sheep farms in Ireland.
2. Assess the seroprevalence of abortion agents in ewes.
3. Document abortion rates and causes.
4. Maintain an effective disease surveillance relationship with sheep producers.

Materials and methods

A total of 33 flocks with a median size of 195 ewes were enrolled in the study. All aborted foetuses and sheep which died on farm during 2016 were submitted to the nearest Regional Veterinary Laboratory (RVL). Blood samples were taken from a representative sample of ewes on each farm in January for abortion agent serology. A standard protocol for post-mortem examination of foetuses was used. Tissue mineral analysis was carried out on animals submitted over 2 months of age. A combination of carcass collection and delivery was used to try to ensure that all ewe and lamb mortality cases were submitted.

Results

An average 7.9 carcases (ewes and lambs combined) were submitted per 100 adult females on the farms in the study. The foetus submission rate was 7.6 per 100 adult female on the farms. Abortion agents serology results are presented in Table 1. The abortion agents identified at post mortem are summarised in Table 2. Disparity exists between what farms are vaccinating against and the apparent exposure of these flocks to abortions agents. We are basing our estimate on a small sample bleed – nevertheless with EAE only 5 flocks are vaccinating but 17 have exposure to the agent.

Table 1. Abortion agents serology results

Abortion agent	Pos	Neg	Seroprevalence	Vacc. Freq.
Toxoplasma Antibody (Agglutination)	5	22	18.50%	54.50%
C. *abortus (EAE)* ELISA	17	10	63.00%	15.20%
Salmonella OH titre	3	27	10.00%	—
Border disease Antibody ELISA	2	12	14.30%	—
Schmallenberg virus Antibody	5	22	18.50%	—
Q fever Antibody	3	27	10.00%	—

Table 2. Abortion agents identified at post mortem

Agent	Foetuses (n=324)	Flocks (n=27)	Flock prevalence
Toxoplasma gondii	39	16	59.30%
Escherichia coli	13	7	25.90%
Chlamydophila abortus	12	5	18.50%
Bacillus licheniformis	3	3	11.10%
Campylobacter spp	4	2	7.40%
Trueperella pyogenes	3	2	7.40%
Streptococcus uberis	3	1	3.70%
Bibersteinia trehalosi	1	1	3.70%
Listeria monocytogenes	1	1	3.70%
Mannheimia haemolytica	1	1	3.70%
Staphylococcus aureus	1	1	3.70%
Streptococcus spp	1	1	3.70%

The causes of perinatal deaths in lambs (n=254) are summarised in Fig 1. Perinatal deaths were defined as all lambs which were less than two days old when they died. This includes lambs which were carried to full term and born dead. Most of these cases would not normally be submitted, however this is the age that most losses occur at.

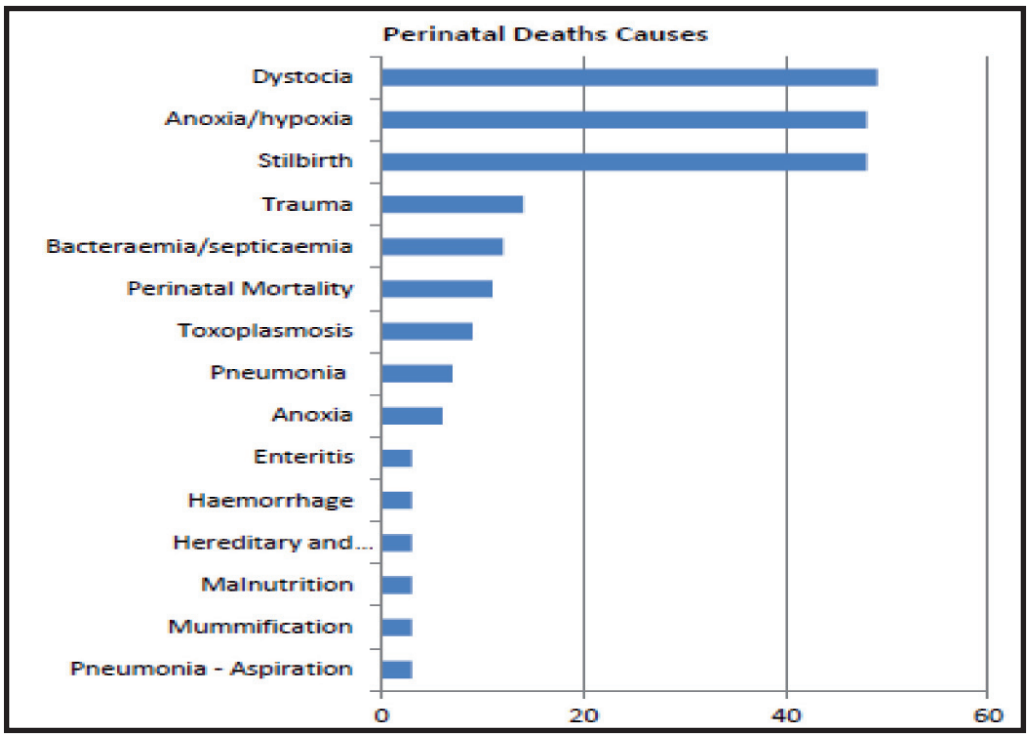

Figure 1. The causes of perinatal deaths in lambs

The major causes of death in perinates were dystocia, anoxia/hypoxia and stillbirths.

In lambs less than one month old bacteraemia/septicaemia was the most common cause of death. The most likely routes of infection are via the mouth and navel in the first few hours following birth. Good hygiene precautions and ensuring all new-born lambs receive adequate colostrum is essential to prevent these losses, which can also show up as navel-ill, joint-ill and liver/kidney abscesses.

Figure 2. Kidney of a two week old lamb with bacteraemia/septicaemia.

In lambs older than one month and in adults, pneumonia was the most common cause of death. *Mannheimia haemolytica* and *Pasteurella multocida* were the most commonly isolated pathogens. Liver copper and kidney selenium levels were generally in the normal range. Approximately a third of livers examined for cobalt showed levels below the normal range (0.7 umol/kg).

Conclusions:

The study should be very useful in providing baseline data on mortality in Irish sheep flocks and thus enable more targeted interventions on Irish sheep farms to improve profitability and welfare. It is very important for sheep farmers to record the details of all deaths on farm, and to identify the causes in order to put in place a good flock health plan to minimise losses and maximise profitability and welfare.

Acknowledgements

Participant farmers and their Private Veterinary Practitioners.
Frank Hynes, Teagasc Athenry, and local Teagasc Sheep Advisors
The Staff of Athlone, Kilkenny and Sligo Regional Veterinary Laboratories.
Analytical support provided by Virology and Pathology Divisions, Central Vet Research Lab, Backweston

Key Flock Management Decisions to Optimise Lambing Performance

Frank Campion,
Teagasc, Animal & Grassland Research and Innovation Centre, Athenry, Co. Galway.

Take Home Messages

- Poor ewe BCS at lambing can lead to inhibited ewe maternal instincts and poor mothering
- Late pregnancy nutrition will influence lamb birth weight, lamb viability and lamb vigour
- Lamb colostrum intake should be monitored to ensure requirements are being met
- Ewes need access to high quality grass as soon as possible post-lambing

Introduction

Adoption of new technologies, genetic indexes and management techniques are providing the sheep industry with an enormous opportunity to increase output from the sector through increased stocking rates, weaning rates and better genetics. This opportunity is further enhanced by the results coming from the Teagasc BETTER farm programme which is demonstrating how high levels of flock performance can be achieved and maintained over time. However, with increased output comes a higher level of attention to detail in flock management practices throughout the production cycle. This is particularly the case at lambing time as in order to achieve a high weaning rate the scanned litter size must first increase, bringing the performance of the flock at lambing time into sharp focus. In order for the ewe to give birth to healthy, live lambs and rear them to weaning detailed attention needs to be given to ewe body reserve mobilisation, nutrition during late pregnancy, colostrum management and the availability of grass at lambing time. Furthermore, research to-date has shown that the performance of the flock at lambing time has a major bearing on the performance of both the ewe and the lamb up to weaning. Management decisions taken at mating can influence the performance of the flock at lambing. Other aspects such as the breed profile of the flock, lambing time and farming system will all influence how the flock is managed. These factors need to be taken into account and best practices must be adopted to suit each scenario although the key messages and principles of managing the flock in order to optimise performance at lambing will remain relatively constant throughout. This paper will attempt to assess the important aspects of each of these management aspects with the view to optimising the lambing performance of the flock.

Ewe body reserves

The aim of assessing flock body reserve mobilisation is to manage flock nutrition so that food supplies are used efficiently. Body reserve mobilisation is commonly assessed using body condition scoring (BCS) which requires no equipment bar the producer's hands and judgement and removes potential biases created by breed type and physiological status from only using live weight alone. Target flock BCS at lambing time is 3.0, and will quickly drop in the first weeks after lambing. Although the 'absolute' BCS at particular times of the production cycle is often discussed by researchers and producers alike it is perhaps more important to focus instead on changes in BCS. Changes in ewe BCS provide the ewe with either a sink or a source of energy depending on demand leading some authors to recommend nutrient requirements based on the amount of body reserve mobilisation taking place (Jarrige, 1989). The highest level of BCS change during the production cycle is from mid-pregnancy to mid-lactation with lambing falling in the middle of this period (Figure 1).

Importance of mobilising ewe body reserves

In order for the ewe to perform to her optimum at lambing time and into early lactation she needs to be in the correct BCS for a number of reasons not least the requirement for her to mobilise body reserves immediately after lambing. During the period from immediately post-lambing to approximately four weeks into lactation the ewes' energy and protein demands are at their highest of the entire production cycle while her feed intake potential

does not peak until approximately six weeks post-partum. As a result the ewe needs to be able to mobilise body reserves to ensure milk production is sufficient to maintain high lamb growth rates. Ewes that are below target BCS at lambing are more likely to suffer pregnancy toxaemia in the hours post-lambing, have a reduced rate of colostrum production and be less attentive mothers. Managing ewe body reserve mobilisation should begin six to eight weeks pre-mating so corrective action can be taken prior to pregnancy. Where ewes are in good BCS at mating the management of their body reserve mobilisation to lambing is simplified.

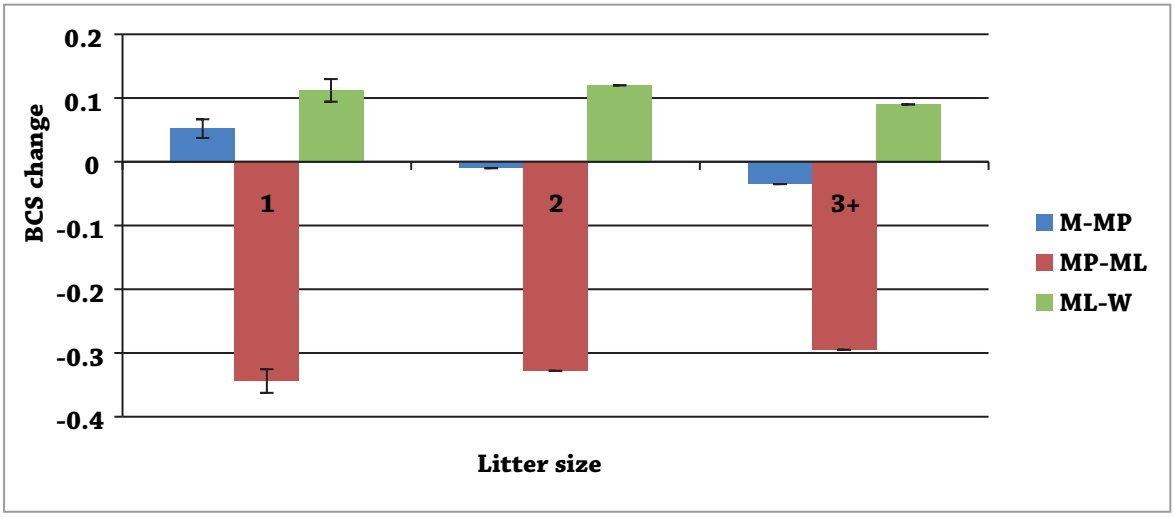

Figure 1. The effect of litter size at parturition on BCS change from M to MP, MP to ML and ML to W (least square means ± SEM). 1 M = Mating, MP = mid-pregnancy, ML = mid-lactation and W = weaning (Campion, 2016a)

Ewe BCS at lambing has also been shown previously to influence lamb survival, with lamb survival decreasing by 5 % per 0.5 of a BCS unit lost in the month before lambing. Lamb survival has also been reported to drop by 5 % for every 0.5 of a BCS unit below BCS 3.0 the ewe is at lambing time (BLNZ, 2013). Poor ewe BCS at lambing has also been shown to increase the length of time it takes for the lamb to stand after lambing. Lambs that are slow to stand and suckle have lower survival rate to weaning and studies have shown that ewes that lose less BCS during pregnancy produce more vigorous lambs compared to lambs from ewes losing more BCS (Dwyer et al., 2003). One of the biggest influences on the survival of the new born lamb though is access to adequate quantities of quality colostrum as will be discussed later in this paper. The effects of body reserve mobilisation ewe colostrum production are somewhat unclear in the literature at present. However, what can be concluded is that poor ewe BCS at lambing is an indication of inadequate pre-lambing nutrition which will negatively influence ewe colostrum production.

Late pregnancy nutrition

One of the potentially biggest causes of poor flock performance at lambing is the management of ewe nutrition during late pregnancy. Nutrition during late gestation has been shown to influence ewe body reserve mobilisation, colostrum production, lamb birth weight, lamb vigour and lamb survival. Where any of the aforementioned are negatively affected, the performance of the flock at lambing will be below its potential. Under or over feeding will potentially increase dystocia but where feeding is managed correctly an 0.5 kg increase in lamb birth weight will also lead to 1.7 kg increase in weaning weight (Keady, 2016). Late pregnancy is typically defined as the last six to eight weeks pre-lambing during which time approximately 80% of foetal growth takes place. Dietary formulation during this time is challenging as the rapid growth of the foetus reduces feed intake potential leading to the necessity to use concentrate supplementation.

Energy requirements

The first limiting nutrient to the ewe during late pregnancy is energy with requirements increasing above maintenance from eight weeks pre-lambing. Energy requirements will be influenced by ewe live weight, scanned litter size, target litter weight and predicted lambing date. Typically ewe energy requirements are discussed in terms of either metabolisable or net energy requirements. In the net energy system energy is described in terms of UFL's, where one UFL being the equivalent of the energy content found 1 kg of standard air dried barley with all

other energy values are given relative to this. Energy requirememtns for the pregnant ewe are determined by first calculating the ewes' maintenance energy requirement, which is the energy the ewe requires just to maintain her own body weight. For every 5 kg increase in live weight above 70 kg the maintenance energy requirement of the ewe increases by 0.04 UFL. This is then added to the energy required for pregnancy. As presented in Table 1 the total energy requirement of the ewe increases rapidly during the final six weeks pre-lambing.

Table 1. Net energy requirements of ewes during late gestation given as UFL units.

Ewe live weight (kg)	Litter weight (kg)	Litter size	Wk[1] -6 and -5	Wk[1] -4 and -3	Wk[1] -2 and -1
70	5	1	0.88	1.02	1.22
70	9	2	0.93	1.14	1.50
70	11	3	0.96	1.24	1.63

[1] Weeks before parturition. Adopted from Jarrige, (1989)

Protein requirements

Protein requirement, like energy requirements, is influenced by factors such as stage of pregnancy and litter size with metabolisable protein requirements increasing 35% in the final six weeks before lambing. However, for the final two to three weeks of pregnancy rumen undegradable protein, or by-pass protein, is particularly important during the final weeks of pregnancy in order to sustain mammary gland development and the process of colostrum production. Soya bean meal is an excellent source of rumen undegradable protein and has been shown in the past to improve subsequent lamb performance over other protein sources (Keady 2016). It is important that the supplementation of energy and protein are considered together as low level protein supplementation can also reduce the utilisation of starch from energy supplements and negatively affect colostrum production. This essentially means that in order to ensure adequate colostrum production both energy and protein requirements need to be met not one or the other.

Colostrum production

The new born lamb requires colostrum during the first hours of life for nutrients, antibodies and as a laxative. Lambs are born hypo-immunocompetent which means the lamb has virtually no immunity to disease and infection. Therefore, lambs rely on the intake of colostrum to obtain the necessary immunoglobulins to gain passive immunity from their dam. Failure to provide the lamb with sufficient colostrum during the first hours after birth will reduce the rate of lamb survival amongst the flock as well as impacting upon future lamb performance. There are a number of factors that can affect the volume and quality of colostrum produced by the ewe such as breed, gestation length, pre-partum, age and nutrition. Environment, lamb weight and the energy concentration of the colostrum all influence the level of colostrum required by the lamb.

Lamb colostrum requirements

Colostrum requirements for lambs born indoors, over the first 24 hours of life are in the range of 143 to 175 ml/kg birth weight. Where lambs are born outdoors or in colder air temperatures the energy requirement of the lamb increases with colostrum requirement increasing as a result. Generally, the amount of colostrum required to meet lamb energy requirements will be higher than the amount required to meet the immunoglobulin requirement of the lamb.

Table 2. Total colostrum volume, total volume/kg ewe live weight and total volume/kg lamb birth weight to 18 hours post-partum for Belclare, Leicester, Suffolk and Terminal type ewes.

Variables	Belclare X	Leicester X[1]	Suffolk X	Terminal X[2]
Volume (ml)	1872	1584	1989	1784
Volume/kg ewe live weight (ml)	26.4	24.6	26.6	26.4
Volume/kg lamb birth weight (ml)	195	171	208	185

[1] Leicester X ewes category contains Mules, Greyface and Half-bred ewes. [2]Terminal breed category contains ewes classified as Charollais (20 ewes; 4.9% of all ewes), Texel (19 ewes; 4.7% of all ewes) and Vendeen (22 ewes; 5.4% of all ewes). (Campion et al., 2017)

The typical colostrum production of different ewe breeds during the first 18 hours post-partum is shown in Table 2. As shown, clear differences exist between breeds, but where nutrition is correct all breeds should be able to at least meet the requirements of a lamb born indoors. Where ewe colostrum production drops below 60-80ml/kg birth weight during the first 18 hours of life for lambs born indoors, between 2 and 10°C, then substitute colostrum should be provided.

Grassland management

The final string to optimising the performance of the lambing flock is getting the ewe and her lambs on to the next stage, which in Ireland is typically out to grass as soon as possible after lambing. For most March lambing flocks the aim will be to have sufficient grass available for ewes and their lambs immediately after lambing. However, this requires planning during the previous autumn to ensure rams are let out at the correct time and paddocks grazed out and closed up in time for the following spring. Spring grass growth will vary across the country and from year to year so it is important that each farm needs to be considered separately. Presented in Figure 2 is the grass growth and ewe demand for two different scenarios – lambing too early and at the correct time to match grass supplies. The data for this is simulated using data from the BETTER sheep farms.

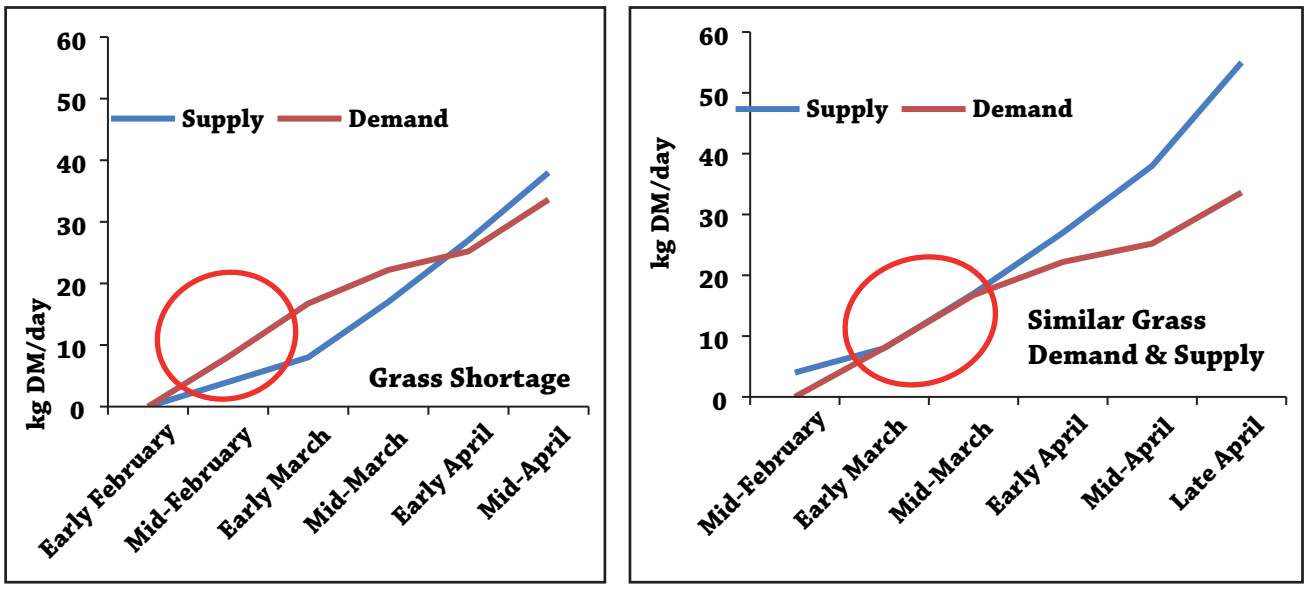

Figure 2. Grass supply and demand curve for a flock lambing at a time to match grass supply and a flock lambing too early to match grass supply (Campion, 2016b)

As shown, lambing too early when there is insufficient grass to match demands will mean that concentrate supplementation will be necessary in order to meet ewe demands and increase the management of the flock potentially impacting on time available in the lambing shed. Insufficient grass available will also potentially mean having to keep ewes indoors for longer post-lambing making flock management more difficult and potentially negatively impacting the performance of the flock. Application of nitrogen pre-lambing when soil temperatures (>6 °C) and ground conditions allow is vital as time during lambing will be better spent in the lambing shed than attending to fertilizer application. Early application of fertiliser also ensures that nitrogen is available to the grass once growth begins and there is time lag between growth and fertilizer availability.

A winter closing plan begins in autumn so that grazing is planned to allow paddocks to be closed in order of their requirement during the spring i.e. close off sheltered paddocks first. Paddocks should be closed for a minimum of 120 days prior to the intended spring turn out in order to allow grass cover build up for the following spring. For a flock lambing from mid-March onwards this would mean closing paddocks in rotation from late October onwards. Grass growth will be lower than grass demand initially in the spring so grass covers need to be built from the previous autumn. Grass growth should match and exceed demand from approximately one month after lambing, at which point paddocks can be dropped from the rotation and saved for silage.

Conclusions

Flock management at lambing time will influence lamb weaning weights and weaning rates and ultimately the performance of the flock for the production year. Planning and management decisions from as far back as mating will influence the performance of the flock at lambing and particular care is needed to ensure ewes are lambing down in correct BCS, following an appropriate late gestation nutrition plan to ensure adequate quantities of colostrum are available to the lamb. Where colostrum supply is below requirement then action needs to be taken very quickly. Having grass supplies available at lambing time will reduce stress and work load at lambing while ensuring there are no checks in flock performance through inadequate nutrition or extended periods indoors post-lambing.

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Strategies for Dealing with Orphan Lambs in High Litter Size Flocks.

Michael Gottstein,
Knowledge Transfer Drystock Programme, Teagasc, Macroom, Co. Cork

Take Home Messages

- High litter sizes result in higher levels of profit.
- There are labour saving strategies that can effectively manage surplus/orphan lambs
- Critical to the success of rearing surplus / orphan lambs is:
  - Appropriate pre-lambing nutrition for ewes carrying 3 or more lambs
  - Removing surplus lambs from dam 24hours after birth
  - Grouping lambs according to size and age to facilitate weaning at five weeks
  - Managing these lambs on a predominantly grass based diet is the most profitable option where rearing them on their dam is not a feasible or desired option.

Introduction

Increasing litter size has long been recognized as one of the key factors driving profitability in Irish Sheep Flocks. Data from both the national farm survey and Teagasc profit monitors clearly demonstrate that high litter size flocks achieve greater profit margins annually. Despite this, the average litter size of lowland sheep flocks in Ireland has not increased significantly in the last forty years even with advances in animal breeding and nutrition which are key factors affecting fecundity in breeding ewes.

The increased levels of triplet bearing ewes and associated work load of dealing with surplus lambs is often sighted by farmers as being one of the obstacles preventing the uptake of more prolific maternal breeds such as the Belclare, Bluefaced Leicester and Lleyn. The purpose of this paper is to outline the management options for high litter size flocks to successful rear surplus lambs and to reduce the labour input required in dealing with these animals.

Prolificacy and multiple births

The data presented in Figure 1 below clearly outlines that for flocks of medium prolificacy (litter size of 1.5 to 1.8) there should be very few orphan/surplus lambs outside of what cannot be cross fostered to single bearing ewes. It is only when the scan litter size exceeds 2.0 that the number of high multiple births (>2) exceeds the number of single bearing ewes, and that need to artificially rear significant numbers of surplus lambs arise at farm level.

Lamb survival and viability

In addition to having a significant percentage of ewes delivering three or more lambs, the challenge is to achieve low levels of lamb mortality in triplet and quad lambs. One of the biggest factors influencing lamb survival is birth weight. While heavy birth weights (>7kg) are associated with increased lamb mortality (Hanrahan & Keady (2013), Thomson et. al (2004), low birth weights, in particular lambs weighing below 3.5kg at birth, are associated with very high levels of mortality. Consequently, appropriate feeding strategies are critical if multiple bearing ewes are to meet late pregnancy nutrient demands. For triplet bearing ewes the target is to deliver lambs with a birth weight of 4 kg or a litter weight of 12 kg to maximise the chances of lamb survival. From a practical point of view this will mean beginning supplementation shortly after pregnancy scanning is completed, and commencing about 8 to 10 weeks before expected lambing date.

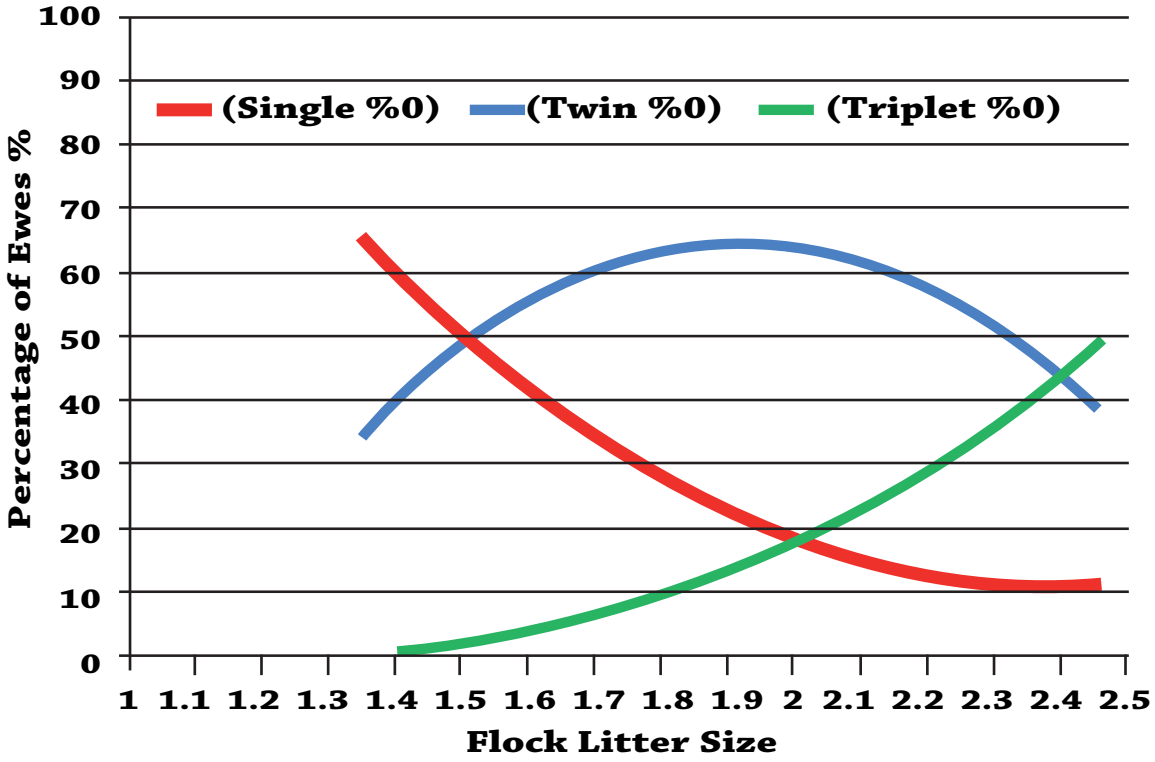

Figure 1. The percentage of single, twin and triplet bearing ewes for varying average litter size. Source; Lynch C, unpublished

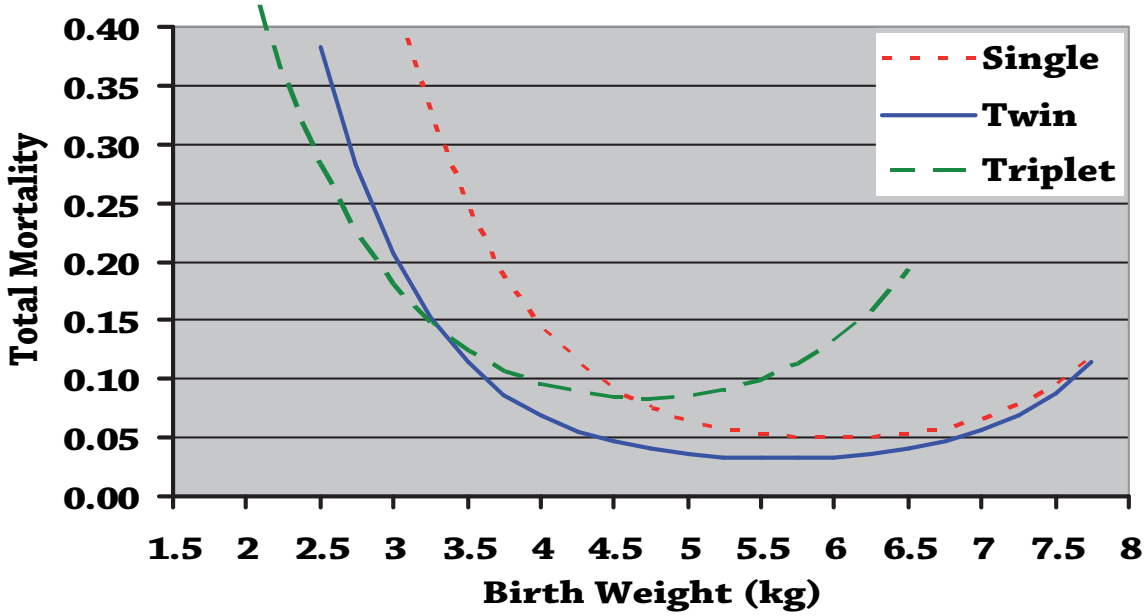

Figure 2. Relation of total mortality to birth weight (kg) (Hanrahan & Keady, 2013)

Colostrum

Colostrum plays a vital role in lamb survival acting as a source of nutrition, as a laxative and providing the new-born lamb with passive immunity to disease in early life. The provision of 20% of the new-borns lamb's bodyweight as colostrum in the first 24 hours of life is widely regarded as best practice in facilitating intestinal transmission of immunoglobulins and providing the lamb with adequate immunity. For this reason all lambs should be suckled by their dams (supplemented if required) for the first 24hours after birth. This practice should ensure that the immune system of the new-born lamb is equipped with antibodies to fight disease in later life.

Options for dealing with surplus lambs

In general even on moderately prolific flock there will be a small number of lambs that for one reason or another are not reared by a ewe. Where the numbers are small then often these lambs are bottle-reared which is a labour intensive task. In high litter size flocks (>2.1) the number of surplus lambs can be significant. The options available to farmers in this situation are as follows;

1. Sell surplus lambs

Over the last number of years the development of internet advertising (e.g. **www.donedeal.ie)** has enable real time advertising and a significant market has been developed for surplus lambs with returns varying depending on stage of the season and region (i.e. availability). However, it should be noted that all lambs sold need to be tagged and accompanied with correctly completed dispatch documentation.

2. Rear the lambs as triplets on their dam.

Work carried out at Teagasc has shown that if suitably fed, many ewes are capable of rearing three lambs. In order to be successful, ewes rearing three lambs must have evenly sized offspring, be good milkers and must be managed as a separate flock. To achieve this, ewes should be supplemented with 0.5kg of a high quality concentrate daily in addition to good grass for the first five weeks of lactation. In addition lambs should be offered concentrates up to a maximum of 300grams per head per day. However, it should be noted that there will be a number of ewes that will fail to successful rear three lambs and this may only become apparent a few weeks into lactation when it is clear that one of the lambs is underfed. Where this happens it can be very difficult to 'train' these lambs to drink milk replacer once they have been taken in from the field.

3. Artificially rear surplus lambs

There are a number of options for artificially rearing surplus lambs. There are a number of labour saving devices which can significantly reduce the labour input required to rear surplus lambs, including:

i) **Multi feeder buckets with four or six nipples or bottle racks** which are filled three to four times daily for small numbers of lambs. These are cheap to purchase and other than replacing worn teats do not incur any running/maintenance costs. These systems have no facility for keeping milk warm and hence need to be filled three to four times daily and do not provide lambs with ad libitum access to milk.

ii) **Ad Libitum feeding using simple lamb feeding devices** are effectively thermostatically controlled containers which hold between 20 & 50 litres of premixed milk replacer and can feed 20 – 25 lambs per unit. These devices cost between €270 and €400 per unit and require mains electricity to operate.

iii) **Automated lamb feeders which automatically mix milk replacer** powder with warm water in small quantities as the lambs drink. The machines are plumped into a water supply and require mains electricity and one unit can feed up to 240 lambs via 16 teats. These units can cost several thousand euros but eliminate most of the labour associated with feeding lambs and are suitable for flocks which have large numbers of surplus lambs annually. All that is required is that the machine is cleaned periodically and that powdered milk replacer is added as required.

Table 1. Positives and negatives associated with different artificial feeding systems

Feeding System	Buckets / bottles	Ad Libitum feeding	Automated feeding
Positives	Cheap Less milk replacer used (9-10kg) Less risk of digestive upsets	Moderate cost Limited labour (cleaning, mixing and refilling daily) Less risk of digestive upsets Faster lamb growth rates	Lowest labour input Fastest lamb growth rate Less risk of digestive upsets
Negatives	High labour demand Lower lamb growth Increased risk of digestive upsets	Requires mains power source Higher milk replacer requirement (11-12kg)	High set up cost Highest milk replacer requirement (12-13kg)

Source Volac lambing advice booklet

Artificial rearing guidelines

- Ensure lambs receive adequate colostrum
- Remove surplus lambs from dam at 24 hours (max 48hours) after birth.
- Supervise suckling for the first 1-3 days until lambs are trained to feeding
- Feed warm milk initially and reduce temperature of milk as the lambs get older
- Pen in groups of maximum 25 similar sized lambs
- Allow a floor space of 0.6 m^2 per lamb.
- Teat height should be 30 – 38cm from the ground
- Ideally have a slatted area around the feeding area to allow for better drainage
- Feed ad-libitum cold milk until weaning (mix powder with cold water. Do not mix with warm water and allow to cool)
- Wean lambs abruptly once they reach each of the following criteria
  - Reached minimum of 9kg liveweight or 2.5 times birth weight whichever is greater.
  - 35 days of age (five weeks)
  - Consuming 250grams of creep daily on three consecutive days.

Feed costs for rearing surplus lambs

1) Rear lambs as triplets on ewe (where successful)

Meal input for ewe post lambing (35 days x 0.5kg)	=	€4.55
Meal input for 3 lambs (70 days x 300g x 3)	=	€17.64
Cost from weaning to sale (8 weeks @ €0.10/ day)	=	€ 5.60
	Total =	**€27.79**

2) Rear surplus lamb ad –libitum milk replacer and turn out to grass at 8 weeks of age

Milk Replacer (12.5kg @ €2.60/kg)	=	€32.50
Meal input for lamb (70 days @ av 700g/day)	=	€13.72
Cost from weaning to sale (7 weeks @ €0.10/ day)	=	€ 4.90
Miscellaneous costs (straw, electricity etc.)	=	€ 2.00
	Total =	**€53.12**

3) Rear surplus lamb ad –libitum milk replacer and finish intensively indoors

Milk Replacer (12.5kg @ €2.60/kg)	=	€32.50
Meal input to sale (110 days x 1.1kg/day)	=	€33.88
Miscellaneous costs (straw, electricity etc.)	=	€4.00
	Total =	**€70.38**

Assumptions

All lambs to marketed at 44kg (42kg for intensively finished indoors) liveweight.
Concentrate is costed at €280/tonne and milk replacer at €65 per25kg bag.

Avoiding pitfalls

Rearing three lambs on ewe is a possible option for many ewes where there is the facility to run them as a separate management group. However, this is not a suitable option for all ewes and there needs to be a strategy for dealing with surplus lambs on all farms.

For artificially reared lambs a high level of animal and feed management is required to maintain lamb thrive, animal health and to control costs when lambs are intensively fed. In particular care must be taken to have lambs group according to size and age so that weaning can take place promptly at five weeks of age. Delaying weaning can result in lambs consuming additional milk replacer (~€7/week) which will give additional weight gain but not at an economic cost. Feeding warm milk to lambs after one week of age will result in high levels of intake, and possible digestive upsets. The approach to feeding lambs should be little and often and this can be achieved in an ad libitum access system by offering the milk cold. When mixing milk replacer with water it should be noted that the milk replacer should be added to cold water, this is preferable to using warm water and letting it cool before feeding. Hygiene in the rearing pen is important to avoid the build-up of disease. Regular thorough cleaning of all feeding equipment is advised.

Summary

Litter size is a key driver of profitability on sheep farms. To maximise profitability flock owners should aim to wean >1.7 lambs per ewe joined to the ram. In practice to achieve this, a scan litter size of > 2.0 is required. The average net profit per ewe for sheep farmers who carried out an e-Profit Monitor Analysis in 2015 (Teagasc, 2015) was €17/ewe where the average lamb price achieved was €101/lamb. Cost effective rearing of surplus lambs has the potential to significantly improve profit margins. Even allowing for a pre rearing value of €15 per orphan/surplus lamb the rearing costs of €28, €53 & €70 clearly demonstrate that orphan/surplus lambs have the potential to significantly increase margins leaving a net margin ranging from €16 to €58 each. Flock owners need to maximise the output from their ewe flocks by putting in place a systems that delivers;

1. High litter size
2. Late pregnancy feeding that ensures new-born lambs achieve birth weight targets
3. Labour efficient systems to deal with surplus/orphan lambs from the beginning of lambing annually
4. A rearing option that suits their farming system and is cost effective

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Making the Most of My Farming Resource – A Farmer's Experience

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Take Home Messages

- Tackling soil fertility is the first step to growing more grass
- To utilise this grass paddocks are essential
- Move lambs to fresh grass every 3-4 days
- A targeted breeding policy is essential

Introduction

I am farming 66 hectares in Ballinacoola, near Bunclody, Co. Wexford with my wife Hannah and five children, Peter, Michael, Jonathon, Niamh and Ciara. The farm is in three separate blocks approximately two miles apart. I run sheep, cattle and tillage enterprises. There are 16 hectares in tillage, with 14 hectares in barley and the remaining 2 hectares under turnips. The remaining 50ha is in grass. The tillage enterprise is rotated as fields require reseeding. The beef enterprise is made up of 19 suckler cows, mostly Charolais cross and everything is finished off the farm. Cows are bred using 100% A.I with the aim being to have the cows calving in February/March. I want to have most of the cows calved before the mid-season flock begins to lamb down in mid-March. There were 440 ewes put to the ram this year, divided into three flocks, early lambing, mid-season lambing and a yearling ewe flock. The stocking rate for the ewe flock is around 12 ewes per ha presently.

Sheep system

The early lambing flock consists of approximately 100 ewes which lamb down from Christmas time onwards. These ewes are synchronised for breeding using sponges and the rams get one mating cycle with the ewes, resulting in very compact lambing. Ewes that fail to go in lamb in the early flock join with the mid-season flock once they are pregnancy scanned in October. The majority of the ewes (around 240 ewes) are in the mid-season lambing flock which lambs in March. These ewes are mated from the first week of October onwards. The yearling ewes are then mated three weeks after the rams are joined with the mature ewes to allow the majority of mature ewes to lamb before having to lamb the yearlings. The target is to join 90-100 ewe lambs each October to facilitate a replacement rate in the region of 20-25%.

Joining the BETTER Farm Programme

I joined the BETTER farm Sheep Programme in 2012. When I joined the programme I had 250 ewes all lambing in January/February. My replacements at the time were mated at 18 months old and I was using Texel-Suffolk cross ewes. These ewes were mated using Suffolk and Texel rams with Charollais rams used on the hogget ewes. All the lambs were finished using meal which was introduced two weeks after turnout until weaning in May when most of the lambs were sold.

During the initial months after joining the programme soil samples were taken and I began electronically tagging and recording all the sheep on the farm. Once the performance levels of the flock were established and the Teagasc team and I got to know one and other a full plan was drawn up for the farm centred on increasing farm output and profit. The main focus areas of the plan to achieve this were

1. Implement a changed breeding policy
2. Address soil fertility issues
3. Implement a grassland management plan

Breeding Policy

When I joined the programme I was scanning approximately 1.7 lambs per ewe to the ram and was weaning 1.5 lambs. In order to increase output I had to increase ewe numbers, however I was not in a position to build news sheds or add to my facilities. Therefore I choose to split the flock in to early and mid-season flocks to make better use of the available land, labour and sheds. My target is to have 400 ewe + 100 replacement yearlings lambing each year. I aim to wean over 1.7 lambs per ewe joined from the ewe flock and wean 1.0 lambs per ewe joined from the yearling flock. My ewe type was primarily Suffolk cross Texel in 2012 with Texel and Suffolk rams being used on the mature ewes. A key change in my breeding policy has been to change to a Belclare x Suffolk type ewe to increase the prolificacy of the flock. In 2013 I purchased three Belclare rams and ran them with Suffolk type ewes. The remaining ewes are joined to Suffolk rams. I am mating the mid-season flock with approximately half the ewes being mated to a Belclare ram and half to a Suffolk ram. All replacement ewe lambs are selected from this cross and the remainder finished off grass only until October when meals are introduced to any remaining lambs.

Early Lambing Flock

The early lambing flock is still mated using Texel and Suffolk rams this is now an all in all out system, whereby no lambs from the early flock remain on as replacement ewes. As part of this system I usually sponge 130-150 ewes in the hope of getting 100 ewes in lamb following one cycle with the ram.

Table 1. Performance of early lambing flock in 2016

Litter Size	Birth weight (kg)	Week 8 (Weaning) Weight (kg)	ADG to weaning (g/da)
1	6.7	22.3	281
2	5.6	19.7	251
3+	4.8	16.0	200

Lambs in the early lambing flock are weaned at 8 weeks.

These ewes are scanned in October and anything scanned not in lamb gets a second chance going to the ram with the mid-season flock. Grass is saved up for early flock from the 10th of October and the lambs are weaned after eight weeks with access to creep feed until slaughter. This removes the 100 ewes from the system and saves grass and shed space for the mid-season flock. Following weaning the early ewes are used to graze out paddocks until 8-10 weeks pre-mating when they are moved on to good grass to flush and correct BCS problems.

Breeding Ewe Lambs

Before the programme, I did not put ewe lambs to the ram. I felt they were too young and it would affect their growth and mature size. However, I am a closed flock and to build numbers faster I joined 120 ewe lambs in October 2013. I found it a great success and have continued to lamb 100 ewe lambs every year since. Contrary to what I thought, the mature weight has not been affected and it means as hoggets' they are better mothers. It is a practice I would recommend. It does however need careful management. The ewe lamb needs to be at least 45 kg going to the ram and an easy lambing sire should be used. I use a Charollais ram. They are treated as a separate flock and supplemented for 3 weeks after lambing, while the their lambs are supplemented for 8 weeks. The ewe lambs are joined for three weeks from late October. I try to retain ewe lambs from twin and triplet bearing ewes where possible. These lambs are marked at birth using coloured discs that are inserted with the tags. No replacements are retained from the yearling flock.

Importance of Ewe Body Condition Score

I have also placed more attention on the body condition score of the ewes at mating. For a good scan it is critical that ewes are around a BCS of 3.5. I go through the early lambing flock in May to check their condition and pull aside thin ewes and these are offered better grass to improve condition. If a ewe is in poor condition it will take 8-10 weeks to build it, so it's important to leave yourself enough time. The same applies to the mid-season flock, they are checked in mid-August. The breeding policy changes implemented have made a big change to my flock

performance. As is presented in Table 2 my scanned litter size has increased over the past three years. However, flock health issues have affected my weaning rate which I hope to improve on this year. Since 2012 I have managed to increase the amount of lambs being weaned on the farm from the same land area while also reducing the amount of meal required.

Table 2. Performance of the mid-season flock in 2014, 2015 and 2016

	Year		
	2014	2015	2016
Litter size	1.77	2.01	2.05
Ewes lambed (%)	98.1	90.2	91.7
Lambs reared per ewe joined	1.61	1.62	1.62

Soil Fertility

In order to facilitate the increase in stock numbers on my farm and reduce meal feeding costs, it was crucial to grow more grass. One of the corner stones to growing more grass, I believe, is to get the soil fertility right. In 2012 a full set of soil samples were taken and the results analysed, this was then repeated in 2015 and the results are presented in Figure 1. Based on these results a fertiliser plan was drawn up to address soil fertility issues so as to maximise grass growth. However, there is still a lot of work to be done to get the soil fertility right on the farm.
The first area tackled was soil pH. Two thirds of the samples had readings below 6.2 (the optimum pH to grow grass). To remedy this, I started to apply five tonnes of lime per hectare (2t/ac). I now do this on a rotational basis covering 20% of the farm every year. This ensures that soil pH levels stay up while spreading the cost. The second area I looked at was the phosphorous levels. These were a mixed bag ranging from Index 1 to Index 4. I had been using a lot of straight nitrogen. In order to help rectify this I now use 18-6-12 in combination with CAN and Sulpha CAN. Nitrogen, in form of urea, is applied in late January / early February when the soil temperature have risen to 5 or 6°C and ground conditions permit. Most of the farm is covered at this time with ½ bag of urea per acre (28 kg Nitrogen per hectare), this gets nitrogen into the plant and primes it for growth. For my second round of fertiliser I use 1.5 bags of 18-6-12 per acre (33 kg Nitrogen per hectare) across the whole farm. This replaces the phosphorous the ewes take off. On the index 2 soils I apply a further 1.5 bags of 18-6-12, (33 kg nitrogen per hectare) in mid-June while the index 1 soils require a further bag of 18-6-12 (22 kg Nitrogen per hectare) in September. Depending on grass growth and weather conditions I apply further fertiliser in the form of CAN and Sulpha CAN. Slurry and farmyard manure are targeted for the silage fields mainly and the fields with the lowest phosphorous levels. Bringing up the levels of Phosphorous in the soils has been a challenge and requires constant work and attention.

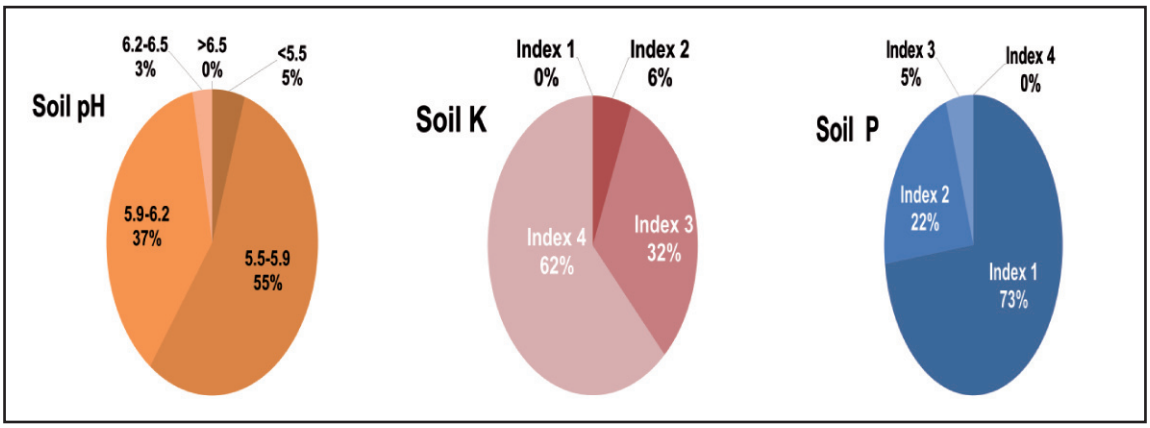

Figure 1. Results from soil testing carried out in 2015

Grassland Management

This is a key area of the programme and one that I hadn't concentrated on before joining the programme. Prior to joining the programme, ewes and lambs could remain in the same field for up to a fortnight. During the first year that I participated in the BETTER farm programme a grassland management plan was drawn up and one of the key measures in this plan was to create more paddocks. The ideal paddock is one that will give your sheep three days grazing at most and then they are moved on. On my farm this meant I needed paddocks of 1.2-1.6 Ha. Luckily for me many of my fields were already this size so it was just the larger fields that were divided. In year one I added 10 additional paddocks and today I have 45 paddocks in total making management much simpler. Some of these divides were set up using permanent fences while I also used, and continue to use a lot of temporary fences to give me even more control over the grass when grass growth is highest. The temporary fencing also allows me to spilt paddocks even further and remove surpluses or slow down the rotation. Once I had the paddocks in place I needed to learn how to use them to allow me to take advantage of the extra grass I was growing. To do this I began to measure and record grass growth on the farm using the Teagasc PastureBase Ireland programme. It seems a lot more complicated than it actually is. The farm was mapped (Figure 2) and the field names and their sizes entered into the computer programme.

Figure 2. Map of part of Doyle's farm used to set up Teagasc PastureBase account.

Following this I began to measure the grass height in each field using a plate meter. My wife, Hannah, usually takes the measurements and enters them into the PastureBase Programme.

Figure 3. Improving soil fertility increases grass output thus allowing an increase in stocking rate.

Once the readings are in PastureBase, I am able to look at my grass wedge, grass growth rates and days ahead. Using all this information along with the weather forecast and what fertiliser I have spread, I can tell if I am going to have too much grass and will be able to take out paddocks, or worse if I am running into a situation where I will have not enough grass and need to take action. While to a certain degree you will be able to gauge grass performance yourself, from experience using PastureBase gives me the confidence and figures to act, whereas before I may not have had that confidence. As shown in Figures 3 and 4 the changes implemented allow me to keep grass growth in line with or ahead of grass demand throughout the summer.

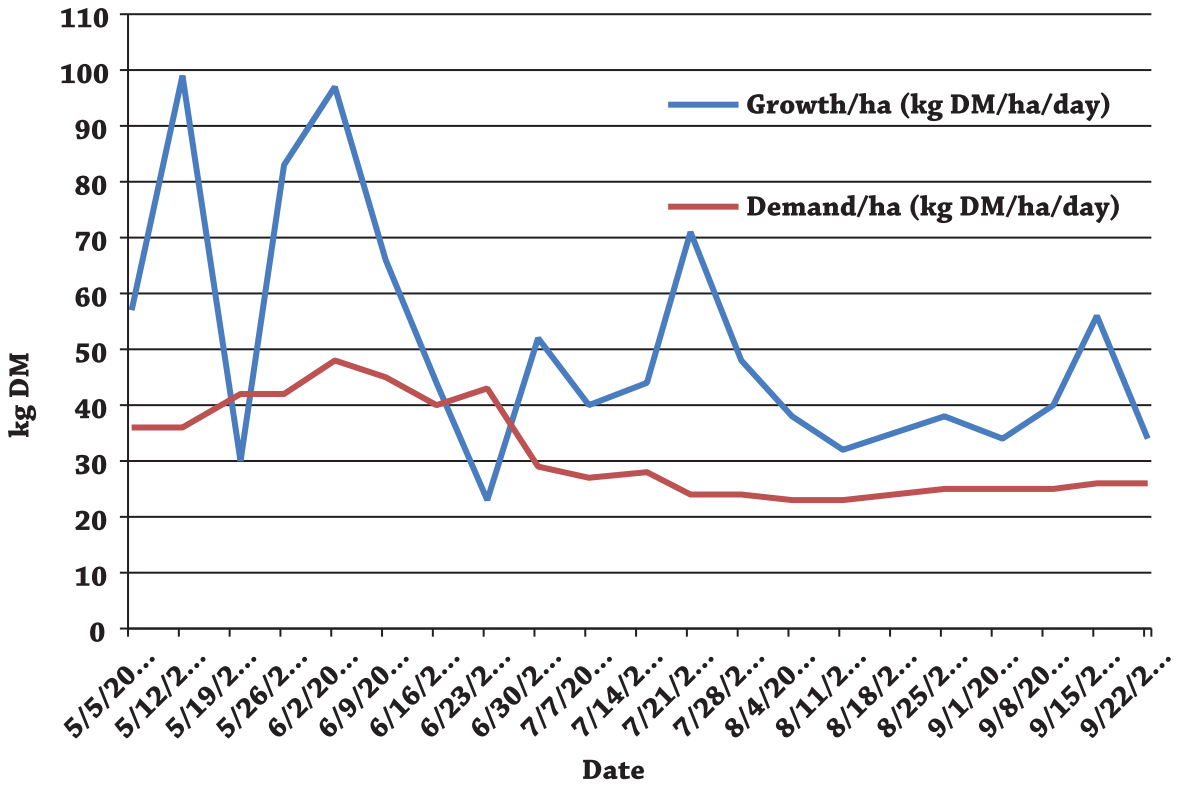

Figure 4. Grass growth rates and flock grass demand on Doyle's farm from May to September 2016

As part of my grassland management plan I started to plan to have grass all year for my ewes. As grass doesn't start growing until February all grass available for the early flock had to be grown by late November. This meant starting to plan my next years' grazing season in October. I now start to close 10 ha (25 acres) of sheltered, dry ground from the 10th of October every year, to have grass in January for the early lambing flock. From this date once a field is grazed off, it is closed and is not grazed again until the following spring. When the grass runs out, the ewes are moved onto turnips or cover crops and the cattle are housed.

Financial Performance

Since joining the BETTER farm programme I have managed to increase my gross margin per ha as shown in Table 3. Although it dipped initially this was associated with the cost of increasing ewe numbers, improving soil fertility and investment in new grazing infrastructure.

Table 3. Summary of increase in ewe numbers and gross margin per hectare on the Doyle farm since 2012

	Ewe Numbers	Gross Margin per hectare (€)
2012	250	335
2013	330	156
2014	310	879
2015	380	887

Conclusion

While still very much a work in progress the changes on the farm over the past four years have helped me to almost double my lamb output from the same land base while finishing most of my lambs from grass. The relatively simple and straight forward changes which I adopted through the programme such as:

- improving soil fertility
- increasing paddock numbers
- better grassland management
- and increasing the prolificacy of the breeding flock by introducing Belclare genetics.

Have all increased my output per hectare while maintaining my costs. This has led to more money in my pocket.

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