Teagasc

National Sheep Conferences 2019

Tullamore Court Hotel, Tullamore, Co. Offaly.
Tuesday, 29th January, 2019
&
Clanree Hotel, Letterkenny, Co. Donegal.
Thursday, 31st January, 2019
National Sheep Conferences 2019
Teagasc National Sheep Conference 2019

Venue: Tullamore Court Hotel, Tullamore, Co. Offaly.

Date: Tuesday, 29th January 2019.

Conference Outline

17:30 KT Sign-in.  
Chairman: Con Feighery, Regional Manager, Westmeath/Offaly/Cavan/Monaghan Advisory Region.

18.00 Conference Opening. 
Professor Gerry Boyle, Director, Teagasc.

18:10 Developing key performance indicators – how useful is body condition score? 
Lesley Stubbings, LSSC Ltd, Aldwincle, Kettering, NN14 3UU

18:40 Mineral nutrition of grazing sheep – problems and solutions. 
Nigel R. Kendall, Daniel Hession, Tim Keady, School of Veterinary Medicine and Science, University of Nottingham, UK. 
Teagasc, Mellows Campus, Athenry, Co. Galway.

19.10 SheepNet: Improving sheep productivity – lessons from stakeholders. 
Tim Keady and Alan Bohan, Teagasc, Mellows Campus, Athenry, Co. Galway.

19.40 Taking the complexities out of farm transfers. 
Declan McEvoy, IFAC House, Old Naas Road, Bluebell, Dublin 12.

20:10 Close Conference. 

20:20 Tea/Coffee, Sandwiches & finger food served.

Teagasc National Sheep Conference 2018

Venue: Clanree Hotel, Letterkenny, Co. Donegal.

Date: Thursday, 31st January 2019.

Conference Outline

17:30  
KT Sign-in.  
Chairman John Cannon, Teagasc, Letterkenny, Co. Donegal.

18:00  
Conference Opening.  
Michael G Diskin, Sheep Enterprise Leader, Teagasc, Mellows Campus, Athenry, Co. Galway.

18:10  
Developing key performance indicators – how useful is body condition score?  
Lesley Stubbings, LSSC Ltd, Aldwincle, Kettering, NN14 3UU

18:40  
Mineral nutrition of grazing sheep – problems and solutions.  
Nigel R Kendall, Daniel Hession and Tim Keady, School of Veterinary Medicine and Science, University of Nottingham, UK.  
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SheepNet: Improving sheep productivity – lessons from stakeholders.  
Tim Keady and Alan Bohan Teagasc, Mellows Campus, Athenry, Co Galway.

19:40  
Taking the complexities out of farm transfers.  
Declan McEvoy, IFAC House, Old Naas Road, Bluebell, Dublin 1.

20:10  
Close Conference.  
Damian Costello, Sheep Specialist. Teagasc, Mellows Campus, Athenry, Co. Galway.

20:20  
Tea/Coffee, sandwiches & finger food served.

Foreword

The latest published sheep census statistics (Dec 2017) shows that there were 35,777 flocks in Ireland a decrease of 536 or 1.5%. The 2.65 million breeding ewes produce a high quality product of which about 81% is exported. In 2018 almost 3.23 million sheep were processed in Irish lamb processing plants, producing 69,000 tonnes of sheep meat valued at ~ €390 million. A total of 55,800 tonnes of sheep meat, valued at €315 million, were exported representing a 15% increase in the value of exports over 2017 values. Over the past decade we have seen greater market diversification occurring, with over 50% of sheep meat shipments, by value, destined for markets other than France and the UK in 2018, an increase from 47% in 2017. Diversified, high value markets such as Belgium, Germany and Sweden, which now account for 29% of export values, (up 3% on 2017) continue to outperform other markets both in value and volume growth. New markets, particularly in Canada and Switzerland continue to be developed, though currently small, are welcome. Overall, this is an excellent performance, notwithstanding weaker sterling and the pressure it is putting on Irish lamb on both the British and Continental Europe market. The increase in the value of output and the continuing development of new export markets for Irish sheep meat is most welcome. These markets will become increasingly important in the context of Brexit.

Significant employment is provided in both the primary production and processing sectors. The improvement in lamb prices in recent years combined with the development of new export markets would all suggest that 2019 could be a good year for the sheep industry. However, there is never room for complacency. Brexit is creating currency and many other uncertainties. About 25% of Irish lamb is sold into the UK market. 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 Teagasc to the Sheep Industry.

The Teagasc 2017 National Farm Survey results show an average gross margin of €713/ha for lowland mid-season lambing flocks. However, the top one third of flocks generated a gross margin of €1,195/ha compared to €284 for the bottom one third of flocks. Due to higher weaning (1.46 vs 1.29 lambs per ewe) and stocking rates (10.05 v 6.79 ewes/ha), output on the Top farms (€1,767/ha) was more than double the output of the Bottom farms (€756/ha) and total direct costs were only marginally higher (€571/ha vs €472/ha) despite the significantly higher output. Most interestingly, the cost of concentrates used, expressed on a per hectare basis, was similar for Top (€238) and Bottom (€232) flocks. 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.

Over the years significant amounts of new information is presented at the Teagasc National Sheep Conferences and this year is no different. Continuous generation of new information is critically important and the incorporation and application of this information into on-farm production systems must be the on-going aim of sheep farmers. There are a number of important take home messages from each of the papers. Farmers should focus on implementing a number of these technologies on their farms. This is now the 7th 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 new knowledge on technical issues in sheep production and should prove an invaluable reference to sheep producers. I would like to thank all the speakers, 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, Damian Costello, Phil Creighton, Ciaran Lynch, Fiona McGovern, Frank Campion and Michael Gottstein. I also acknowledge the help and input of local Teagasc advisory staff.

Y. E. Boyle

Director, Teagasc.
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Developing key performance indicators – how useful is body condition score?

Lesley Stubbings OBE, FRAgS
LSSC Ltd, 3 Fullers Close, Aldwincle, Kettering, NN14 3UU

Take Home Messages

- Key Performance Indicators (KPIs) allow us to identify weaknesses, implement solutions and measure their impact.
- Nutrition and, in particular the optimization of the forage contribution, is a crucial element in profitable sheep production.
- The impact of nutrition, manifested in body condition (BCS), is longer term than previously recognized.
- We need to set tighter, and in some cases higher, targets for BCS and aim to keep the flock within this range at all stages.
- The wide-ranging influence of BCS means it can be used as an overarching KPI in flock management.

Introduction

Sheep production must become more efficient if it is to be profitable. In common with any other sector, within agriculture or elsewhere, it is crucial to understand and measure the Key Performance Indicators (KPIs) that drive efficiency. KPIs are important in guiding decisions, indicating where improvements can be made and in monitoring the cost effectiveness of management changes. KPIs also allow sheep producers to benchmark performance compared with previous years and other similar flocks. For example, commonly used KPIs in sheep production are lambs reared/ewe, Kgs carcase sold per ewe or cost to produce a Kg of carcase. The difficulty producers face in improving their KPIs, is deciding which technical solutions to adopt, given the plethora of options available. These might include health issues such as vaccinations, lameness control, or ice-berg diseases, a change of genetics, or new forage varieties. Good nutrition is fundamental in optimising ewe performance, but it is often marginalised in favour of more “attractive” solutions such as a mineral deficiency. The most cost-effective way to meet the nutrient requirements of the ewe is to maximise the contribution of forage, including grazed and conserved grass and brassicas. This paper seeks to discuss the development of simple measurable KPIs linked to ewe nutrition and particularly Body Condition Score (BCS), exploring its value as the framework on which to select and instigate appropriate interventions.

Ewe Nutrition – Two Components

Nutrition influences ewe productivity and lamb performance at all levels and stages of production. Nutrient requirements change through the year. We can set against these changes, targets for body condition that have been shown over many years to have an effect on performance. The recently updated ‘Feeding the Ewe’ AHDB 2017 provides practical recommendations based on standards agreed by industry experts.

The most cost-effective way to meet the nutrient requirements of the ewe is to maximise the contribution from forage, including grazed and conserved grass and other forage crops. For example, the comparative cost of one unit of metabolisable energy (ME) is a difference of a factor of 5 between grazed grass and a compound supplement (see Figure 1). The optimisation of forage is also important to the healthy functioning of the rumen. Sheep have evolved to harness the power of the rumen flora to provide the majority of both energy and protein needs, and many of the avoidable problems associated with feeding are linked to overlooking this crucial relationship. For example, acidosis linked to large quantities of concentrate supplement or indeed simply a change of diet without a period of adaption.


**Component 1 - Current Nutrition**

It is normal to consider nutritional requirements at set points in the production cycle (see figure 2) and to provide those needs on a day to day basis according to need. Late pregnancy is the period given the most attention because it is a critical period when the demands of the growing conceptus increase exponentially, and failure to provide adequate energy and protein will have disastrous effects on ewe and lamb performance. A common problem with low quality forages is a shortage of rumen degradable protein relative to fermentable energy supply. The net result is poor rumen function and low microbial protein output, which is corrected by ensuring the diet is supplemented with a non-protein nitrogen source. For example, a well-balanced ration (such as spring grass) can supply >100g of microbial protein/day, representing two thirds of total protein required in late pregnancy, the balance easily being met by Digestible Undegradable Protein (DUP) contained in grass. In our zeal to satisfy and isolate ‘current’ requirements without considering how the rumen has adapted, can lie our nemesis. Again using late pregnancy as an example, just consider the ‘myth’ that has been peddled for years. This assumes that because the rumen is under pressure (i.e. had less space) as pregnancy progresses, the ewe can eat less bulk and, therefore, has to be fed large amounts of concentrate to satisfy her needs. In fact, the reality is that as a successful species the sheep has evolved a strategy to cope with this by making the rumen work faster to maintain nutrient intake! So, rumen outflow rates increase in the well balanced and respected rumen such that in high quality TMR diets we do not see any appreciable dip in dry matter intake even in the latter stages of pregnancy.
Component 2 – long term ‘historic’ nutrition

It is consideration of how the ewe has adapted and evolved that leads us to the second component. While we have acknowledged that ewe body condition score (BCS) has a role to play, it has tended to be in terms of its influence on response at a set point in time, for example BCS score at tupping and its effect on litter size. We also know that body condition has a direct effect on current nutrient requirements. For example, a lean ewe has an enhanced dry matter appetite. In terms of requirements in late pregnancy, we now think that the variable response to additional DUP in ewes is related to BCS, with thin ewes responding, while fit ones to do not. What body condition is indicating is the extent the ewe has accumulated energy reserves which she can use to buffer demand. This is strongly linked to forage utilisation because the sheep has evolved a reliance on body reserves so she can store forage energy and draw on it when availability is limited. So, while the idea that BCS is an important feature of ewe nutrition is not new, the extent and usefulness of its influence is far greater than previously thought. The Lifetime Wool project involving Merinos in Australia has clearly demonstrated the effect of BCS not only on conception rates and litter size, but also the lifetime productivity of ewes. These producers now use BCS as the main driver for management, all efforts focussed on hitting higher BCS targets with lower weight losses throughout the ewes productive life. The resulting improvement in output is significant and more recent work in the UK suggests that the influence of BCS here is similar.

Agriculture and Horticulture Development Board (AHDB) KPI Project – preliminary findings

In 2012/13 a project was set up on 3 English farms with a total of just over 3,000 ewes to look at the effects of BCS and to test whether we could develop meaningful ewe KPIs for commercial sheep farms. The advent of EID and the ability to capture individual data over time, quickly and relatively easily facilitated this study. This meant, that for the first time, we could look at a dataset that allowed us to follow the BCS/weight changes of ewes longitudinally and compare this with the performance of the lambs from the individual ewes on a large scale. Ewes were scored and weighed at:

- Weaning (90 days post-lambing)
- Pre-tupping
- Scanning (one farm also at ram removal)
- Lambing (again some 4-6 weeks pre-lambing)
- 56 days after lambing

Lamb performance was also recorded at 8 weeks of age (adjusted to 56 days) and 90 days, again adjusted to date of birth (DOB). Indeed, the value of the 56 days weight was quickly established as key, as was the number of lambs failing to meet 85% of the target of 20kgs (equates to a DLWG of 300g/day). Those lambs that did not perform well to 56 days did not recover and continued to perform poorly.

So what sort of questions were we asking?

Convention says that if a ewe carrying twins is in BCS 3/3.5 at lambing then she will be able to provide optimum nutrition for her lambs. Similarly, if she hit her target score at tupping, she will have an optimum litter size. But what influence does her previous BCS 3, 6, 12 months or even longer before have on the performance of her lambs to 56 days? Does it matter how her BCS has changed over time? What time points are most critical? This work is still subject to analysis, but there are some clear observations we can make that are applicable to our everyday interpretation of the importance of BCS and which concur with the Lifetimewool project result including:

- There is a long-term negative impact of allowing ewes to become thin which is not simply negated by a return to the target range BCS.
- BCS and weight changes in the period from weaning to scanning not only affect litter size, but also impact on subsequent lamb 56 days weights.
- Ewes that lose weight/BCS from mating to scanning do not perform as well as those who gain BCS weight, even those in good BCS at the start.
- Young ewes (shearlings) are particularly vulnerable and their need to hit weight targets initially is critical.
I have continued to employ this approach in my work and would now venture to hypothesise that we can use it as an overarching KPI in commercial flocks. If the one thing we measure is ewe BCS and we line all our management interventions into maintaining that within a narrow target range throughout the animal’s productive life, then the priorities present themselves. For example:

- Pasture management and allocation to achieve BCS goals.
- Culling and weaning date decisions – ewe needs driving weaning date where necessary
- Lameness management – the lame ewes are thin, these present themselves.
- Liver fluke and/or haemonchus control
- Ice-berg diseases – even these are clearer where ‘thinness’ is not tolerated.

**Future Developments?**

BCS is highly repeatable and relatively easy technique to learn. For a significant proportion of sheep farmers this will provide the KPI they need. However, for the progressive farmer, we need to look ahead and harnessing weight change is the next step to explore. Huge individual variation in weights means that this can only be on an individual basis, but the ability to use the change around a standard, for a ewe set when she is BCS 3 each season, would allow scope to avoid recording BCS per se for the rest of the year. Group weight changes on pasture is also a potential whereby we can monitor response to dry matter allocation over periods which are too short to be reflected in BCS change.

Also emerging from this work has been the AHDB ‘Challenge Sheep’ project which aims to look at replacement management over 7 years. The KPI project has given us an insight into how important it is that replacements hit weight targets if they are to fulfil their potential and the need to give preferential treatment and maintain BCS is clear.

**References**


Literature Review Feeding the Ewe [AHDB website link](http://beefandlamb.ahdb.org.uk)

Mineral nutrition of grazing sheep – problems and solutions

Nigel R Kendall¹, Daniel Hession¹ ² and Tim Keady²

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Introduction
Grass (both grazed and conserved) can provide up to 95% of annual feed requirements in sheep production systems such as those practiced in Ireland and the United Kingdom. The aim in grass based systems of prime lamb production is to finish all lambs from grazed grass, as the sole diet, prior to the end of the grazing season. While this is consistently achievable, a majority of producers appear unable to achieve this target as indicated by increasing concentrate inputs and a large number of lambs being slaughtered in the period from January to April. Although this inability may be due to many factors including poor grassland management, inadequate parasite control strategies and anthelmintic resistance, mineral deficiency may also be a problem. As well as increasing the efficiency and profitability from sheep production, optimisation of production is likely to reduce greenhouse gas emissions from the sector. The aim of this paper is to explore some of the problems and solutions of mineral nutrition especially in the grazing sheep.

A recent survey investigated Irish farmer’s mineral supplementation and delivery strategies (Hession et al., 2018a). It found that 69% of farmers supplemented their flock with minerals/vitamins in addition to that received from concentrate feed. Only 22% of those who supplement their flock do so based on results from laboratory analysis (i.e. soil, herbage, blood or tissue analysis). Supplementation based on veterinary advice is only undertaken by 13% of respondents with only 30% of these reporting that the veterinary advice was based on laboratory analysis. Supplementation for reasons other than the laboratory analysis/veterinary advice was carried out by 65% of respondents but the exact reason was only stated by 32% of respondents. Of those, 51% were due to tradition/previous experience. Live weight gain (32%) and fertility (14%) were identified as the main health/production problems associated with mineral/vitamin deficiencies. Mineral buckets are the most common method reported of supplementing ewes while oral drenching is the most common method reported for supplementing lambs. Ease of use and labour requirements was ranked by 36% of respondents as the most important factor influencing their choice of supplementation method. Cost was also identified as an important factor.

The biggest problem with mineral nutrition is that it is often not actually a mineral issue and no matter how much mineral is thrown at a sheep it won’t make one drop of difference. Before considering that minerals could be the issue, there needs to be a problem, usually a lack in growth rate, “poor doers” or compromised reproductive performance, all fairly generic signs. This highlights the importance of good on-farm records and recording production parameters as this enables performance to be compared to previous years and also to be benchmarked against other farms across Ireland. If there is no issue with performance, then there is likely no issue with mineral status at that time. Therefore, once we have a performance issue identified we need to first check we have enough of the primary nutrient, namely, food! In the case of most sheep this is grazing and is the basic availability of grass or alternate forage/fodder dry

Take Home Messages
- Mineral issues can be seasonal and different between farms and even within a farm
- Different sheep can have different requirements
- Need to determine risk windows for each element
- Supplementation is not always required, if it is it should be targeted
- Not all supplements actually work as they suggest
- Data is key - animal performance, mineral inputs, mineral status
matter. Then we need to consider if there is adequate energy and protein within the food to support the production expected. The next nutrient we need to consider (it is the first one to cause major deficiency issues i.e. death) is water. Sheep need a clean potable source of water with an adequate supply to meet the demands on a hot dry day. Only once these have been considered should we move onto the 3 other major causes of poor production: parasites, animal health and minerals. These we do not order as they are often interrelated. Poor mineral status has often been shown to increase worm burdens and lower immune function. The veterinarian and flock health plans are especially useful at this stage.

Mineral issues are often not a simple deficiency and it must be remembered that minerals can be detrimental when oversupplied. Copper is an element where we know that animals can be deficient but also that we need to be wary of toxicity and in sheep this is often related to breed types. In general hill breeds are more susceptible to deficiency and interaction issues whilst lowland breeds are often more susceptible to toxicity. Housing also increases the risk of copper toxicity. In Ireland, the most recent survey of the national breeding flock (Kealy et al 2019) reported that Suffolk (and Suffolk crosses) are still the predominant breed (48.5%). Other significant breeds included Texel (10.5%) and Belclare (8.2%) which are likely to be more susceptible to copper toxicity whilst unspecified hill breeds (17.5%) and Charollais (6.2%) are less likely to be susceptible to toxicity and more likely to suffer from deficiency type issues e.g. swayback.

It all looks fairly simple (See Figure 1), if we have too little then we are likely to suffer a performance loss from a lack of the nutrient and too much then performance may be compromised. Interestingly, with minerals often both sides can have similar clinical signs. For example, retained foetal membranes (RFM) in cattle where a low selenium status herd may respond to selenium supplementation by decreasing the RFM and selenium supplementation of an already adequate selenium herd will increase the incidence of RFM. Often people see a clinical sign (e.g. RFM) and assume they are deficient in an element, unless they have tested they might not be and supplementation can actually make the issue worse not better. This simple too little, too much scenario as is shown in Figure 1 is not what we get for every element in real life! Interactions with other elements will often make things much more complicated. Potential issues can be undersupply, oversupply and/or interactions and therefore, we use the term “mineral imbalance”. We also prefer the term optimum for mineral status rather than adequate as adequate suggests that we have enough but more would be better and this is not the case. Oversupply of minerals can be a significant issue. In cattle in the UK we have found >50% of cull cattle (predominantly dairy and some beef) to have liver copper concentrations in excess of the normal range and, therefore, at risk of toxicity. However, a similar study with finishing lambs found 60% to have a normal liver copper concentration, with only 9.1% above normal and the remaining lambs below normal, the situation could be different for cull ewes. A major cause of overfeeding copper is due to the poor understanding of the interactions involving copper. Copper has significant interactions with iron and sulphur and with molybdenum and sulphur. High molybdenum per se does not necessarily cause copper imbalance, as sulphur is required predominantly in the sulphide form. The decision to supplement with copper because pasture is known to be “tart” (high molybdenum) without detailed analysis could result in copper toxicity, especially in the susceptible breeds as discussed previously. Sulphur fertilisation is often recommended for grass growth, but be aware of the potential effect on copper interactions. Iron varies seasonally in a very similar pattern to cobalt (Figure 4, shown later) with higher iron in grass in early and late season, although the iron-sulphur-copper interaction does not induce clinical signs itself it will potentially reduce the copper available to detoxify thiomolybdates produced in the rumen from the molybdenum and sulphur.

**Figure 1.** The dose response curve for nutrients. Every nutrient and even total dietary intake will give a curve similar to this. Reproductive parameters tend to be inside of curves for other functions. Minerals can generally be above or below optimum, hence the term adequate is not used as adequate implies more won’t hurt but we can oversupply minerals.
**How can I tell?**

Once a production issue is identified then we need to investigate. The investigation should involve determination of inputs and ideally animal status. If sheep are grazing then we may need to carry out analysis of grass to determine the mineral composition, this as well as determining need gives us knowledge which we may find useful later for some clever management. If animals are housed and/or fed then forages (silage/hay) may need mineral determination. Mineral analysis of conserved forages can be done at harvest (not energy and protein). For straights (e.g. barley, maize, soya bean meal, distillers grains etc.) book values can be used unless it is a major inclusion and/or single source (e.g. home grown). Purchased compound will have limited information on the bag label but the supplier is obliged to let you have the full mineral specification. However there are two points to make here: 1) you need to know whether the specification is added minerals only or whether it includes the background mineral in the feed (e.g. within the barley, wheat, rapeseed meal etc.); 2 the actual analysis may differ from the specification and in some cases it is worth analysing actual compound feed or trying to get the company to supply a batch analysis to you. Water may need to be analysed, especially if not a mains source (e.g. borehole). Animal status is best assessed in collaboration with your veterinary surgeon. Exactly what needs to be analysed depends on the element(s) under suspicion. There are often multiple options in terms of tests done and tissues used, each may indicate to you a slightly different thing so often you will get more information than the sum of the parts using multi-test analysis. For example, selenium status can be assessed using plasma selenium, erythrocyte glutathione peroxidase (GSHPx) and liver selenium. Plasma selenium indicates a ~3 day intake, GSHPx reflects the previous 6-8 weeks and liver selenium maybe longer and certainly is of use for accumulation (identification of over feeding). If the plasma selenium and GSHPx results are compared then it can be determined if you are on a rising or falling selenium status. If the GSHPx is low and plasma selenium high, then that suggests recently increased selenium intakes and supplementation may not be needed. If the GSHPx is high and plasma selenium concentration is low that would suggest the sheep will be ok functionally now, but if the low Se continues then the GSHPx will fall to levels which would compromise production. In terms of sample numbers, from work we have previously undertaken we would recommend, for diagnostic purposes, 4 animals per management group (ewes and lambs in same field would be 2 management groups, different fields would construe different management groups). Urine is very useful to test the highly regulated macro-minerals (Ca, Mg, P, K, Na, Cl) as this indicates dietary supply whereas blood measurement means that a low value confirms the animal is likely to already have a clinical problem. Urine is also useful for iodine supply. Urine can easily be collected in sheep using prolapse harnesses and plastic bags. Liver is especially useful to look at long term status and accumulation (especially Cu and Se).

Once you have determined you have a production issue and have identified the cause then options to treat can be looked at. The issue with “I have a problem, let’s investigate” and then get a result is that everything has already happened and what is about to happen could correct the issue. However, continued analyse will build up a picture over the year and between seasons and even within different parts of the farm (e.g. fields) so that there is an idea of which elements are at risk of imbalance at what times of the year, with this knowledge, targeted prevention strategies can be undertaken and prevent any loss in production.

**What can I do?**

To correct/prevent the identified imbalance/risk there are multiple strategies available which include direct and indirect supplementation, as well as changing management, and even doing nothing. The important thing to remember in supplementation is that we do not require the supplement to fulfil the entire daily requirement, we just need to “mind the gap”! The gap is the difference between the background feed/grazing and the requirement. Many supplements try to out compete each other with “mine has more than yours”. A more appropriate approach would be supplements which address the majority of gaps. In-feed supplementation is usually the cheapest and potentially most flexible form of supplementation. Minerals should be able to be changed for different groups of animals and different risks but often we are at the mercy of the compound supplier rather than being able to get bespoke or near bespoke minerals to address identified risks. The other issue with in feed supplementation is the fact that we are often trying to use as little feed as possible and gain maximum product from forage and especially grazing- in these cases other supplement types need to be considered.

Direct supplementation is where a drench, bolus or injection is administered to the individual. Every animal should have received the supplement (there is no guarantee it has retained it, watch for spitting out drenches and boluses).
These supplements should be able to cover the appropriate risk period, either due to the long term nature of the supplement release or due to the dosing strategy employed. The supplement also needs to deliver to the right place in the correct form. For example cobalt is only required by the rumen microbes to synthesise vitamin B12 which is then absorbed and utilised by the animal as well as utilisation by the rumen flora for propionate production. We, therefore, require rumen available, rumen soluble cobalt supplements and not supplements that just contain cobalt which becomes available after the abomasum when it has been through the very acidic environment. Supplements such as chelates are usually sold on rumen bypass properties and this would mean that poorly soluble cobalt sources and cobalt chelates would not be the most appropriate cobalt source. There is no published evidence of cobalt recycling into the rumen and, therefore, a regular consistent supply is required.

Figure 2 shows the effect of a single oral drench over subsequent 13 days. Although plasma cobalt concentrations are increased and remain increased (approximately 5 day half-life) there is no significant increase in vitamin B12 concentrations from the cobalt drench alone. The vitamin B12 effect from the vitamin B12 containing drenches was about 6 days which is a similar duration of efficacy to simple injectable vitamin B12. However, selenium drenching did elevate plasma selenium concentrations which can be used for incorporation into GSHPx beyond the time of this trial. From this study we concluded that a single oral drench was able to effectively supply vitamin B12 for 6 days, and selenium for beyond the two week duration (work required to confirm exactly how long), whilst the cobalt drench was ineffective. Work by Keady et al (2017) at Teagasc, Athenry, dosing lambs every fortnight from weaning with a cobalt only drench and combined cobalt, vitamin B12 and selenium drench reported production responses (Figure 3, Table 1) to cobalt supplementation especially across the autumn time-period.

**Figure 2.** The logged plasma cobalt concentrations (a) and plasma vitamin B12 concentrations (b) following dosing with 3 different doses of cobalt (increasing darkness with increasing dose, plus vitamin B12=dotted whilst no B12=solid) against no drench (black line). All of the drenches contained selenium and all 6 drench groups are combined (grey) to show the effect on plasma selenium concentration (c) and subsequent utilisation for glutathione peroxidase activity (d) against no drench (black line). Reference lines are deficient and marginal plasma cobalt, vitamin B12 concentrations and erythrocyte GSHPx activity, whilst plasma selenium concentration is showing the marginal status and the target status to maintain GSHPx activity (Williams et al. 2017).
Figure 3. Growth rates in lambs for 3 treatments (control-blue; cobalt (sulphate) only drench – orange; ‘Vitmin’ = cobalt (acetate), vitamin B12 and selenium drench –grey) dosed fortnightly from weaning (12/7) by date. The error bar shows the sem. Adapted from (Keady et al., 2017)

Table 1. Effect of mineral supplementation on lamb performance post weaning

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Control</th>
<th>Cobalt only</th>
<th>Vitamin¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slaughter weight (kg)</td>
<td>45.5</td>
<td>47.4</td>
<td>47.8</td>
</tr>
<tr>
<td>Carcass weight (kg)</td>
<td>19.1</td>
<td>20.4</td>
<td>20.6</td>
</tr>
</tbody>
</table>

¹ cobalt, vitamin B12, selenium (Keady et al., 2017)

The drench work has continued with a trial recently undertaken recently at Teagasc, Athenry, to evaluate the differences between weekly, fortnightly, three-weekly and 6 weekly drenching with vitamin B12 or cobalt (sulphate) with no treatment and a cobalt (sulphate) bolus as negative and positive controls, respectively and the results of this will be available soon once the analysis is complete.

Interestingly, working with ewes on the same fields at Athenry (Hession et al, 2018b), supplementing cobalt by drench and bolus (both sulphate) from 7 weeks pre-joining has shown no effect on ewe reproductive performance, or the performance of the progeny up to weaning. Dosing ewes grazing fields in which lambs have been found to have production issues from cobalt is widespread. However, there are a couple issues with this continued assumption: ewes have a lower cobalt requirement than lambs (0.1 c/w 0.2 mg/kg DM, NRC 2007) and the cobalt concentration in grazing is seasonal. Figure 4 shows the cobalt concentration of grazing from predominantly perennial ryegrass fields in Leicestershire analysed as part of a DEFRA-SIP study. There is a clear mid-season depression in grazing cobalt concentration which corresponds with when lamb requirements are highest due to potential maximum growth rates. It also shows a rise in herbage cobalt concentration through the mid to late autumn back to the concentrations found in the spring. The much drier spring of 2015 (~85% of average rainfall) has a lower cobalt concentration than that found in 2016 (~110% average rainfall) indicating the effect of moisture on cobalt status. The only other element found to give a similar pattern was iron and this is useful in explaining increased risks of copper imbalance in the autumn period. Work in Northumberland showed long term effective supplementation of cobalt from soluble glass, indicating this is rumen available and over a shorter term 1-2 months decent results from a long acting vitamin B12 injection.

The problem with mineral supplementation is that it is an unregulated industry and just because a supplement contains an element it does not mean it is included in a form that works. Farmers need to ask for evidence that the supplements are working, with proper controlled trials including product comparison trials. We have had many trials that did not work due to supplement products that don’t do what they are supposed to. This is especially pertinent in terms of cobalt, which as you remember needs to be rumen available and we have also found the rising autumn
concentration in grazing eliminate any supplement effectiveness as the sheep reaches normal status naturally (as shown by unsupplemented controls).

Other supplementation strategies include the provision of free access lick/buckets. Animals do not have any general nutritional wisdom until they reach deficient stages for some elements when picas (depraved appetites) can be exhibited (gate/soil licking etc.) which are classically for cobalt and phosphorous although they have be observed for other elements including zinc. Free access systems are plagued by variable intakes with some taking none and some way too much. Similarly, unless you have sheep restricted to a contained water system (no access to additional streams etc.) intakes from water supplements are also likely to be variable – even more so for sheep than dairy cows as dairy cows will consume ~100 litres of drunk water, whereas a sheep on a wet day (not many of them in Ireland) may be able to fulfil its water intake from low dry matter grass covered in rain, or utilise small surface puddles.

![Figure 4. Seasonality of cobalt concentration (mg/kg DM) in predominantly perennial ryegrass swards for 2015 (red) and 2016 (blue) with reference lines for ewe (0.1) and lamb (0.2) requirements. (Kendall et al 2017)](image)

There are fertiliser options, but grass doesn’t determine its mineral composition to suit sheep requirements – it takes up the mineral it needs actively although sometimes there is some passive uptake often reflecting soil availability. Grass has very limited if any need for cobalt and selenium.

Doing nothing is a valid option, especially if it is properly thought through. If the potential production loss is of a lower monetary value than the cost of supplementing, it may make economic sense not to do anything. Remember the true cost of a supplement includes the administration time (~30 secs per sheep for drench and ~90 secs per sheep for bolus). Clever management using data from laboratory analysis can also be useful. An example of this is a farmer on an AHDB funded project, who after determining low cobalt status fields and some with just adequate cobalt changed his use. He grazed the higher cobalt status fields and conserved lower cobalt status fields, which would be fed out when sheep were housed as part of a mineralised TMR. If the low cobalt status fields did need to be grazed then sheep which were going to receive concentrate (creep fed) grazed this ground. Other potential management strategies of use include incorporation of other plants into the sward. In swards containing a high proportion of clover the decline in cobalt during the summer to autumn as seen for the predominant perennial ryegrass swards (Figure 4) is not observed. Deeper rooting herbs such as chicory within the pasture may enhance the elemental concentrations have also been used.
Has it worked? / Do I need it?

We need to determine if supplements work and/or are required. Therefore we may want to utilise confirmatory test strategies. These include full, fair, on farm trials and the use of sentinel groups. Full trials require the flock to be split equally between treatment groups (e.g. product A v product B or product v untreated) and the production to be recorded and this can be augmented with laboratory analysis of a proportion of each group. The allocation of the sheep to these groups is key to make it fair; do not take the first half through the race for one group and the second half for the other group as usually the poorer sheep come through later, alternate sheep is an acceptable strategy. Sentinels are a smaller group of sheep (6-10, or 10% of flock) which have the alternate treatment to confirm strategies. For example, if the decision is to bolus the flock, some are left deliberately unbolused and are monitored to check that the bolus actually gives a positive effect (growth rates, laboratory mineral status etc.). You may need to be prepared take a loss on these sheep but if you find no difference then it should raise the question as to whether the supplement is actually required. They can be used the other way around just treating a few.

Summary

Mineral issues can be seasonal and different between farms and even within a farm, different sheep can have different requirements and there is a need to determine risk windows for each element. Supplementation is not always required and if it is it should be targeted in response to determined (laboratory analysis, previous history) risk windows. Not all supplements actually work as they suggest, some are non-effective and some do not last the claimed time, which is key for some treatments especially where the risk window ends abruptly continued supplementation becomes dangerous (copper at housing). The final point is that DATA is key whether this is animal performance, mineral inputs or mineral status.

References


SheepNet: Improving sheep productivity – lessons from stakeholders

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

Take Home Messages

- Ewe productivity could be increased by 0.3 lambs per ewe joined if the knowledge and technology currently available was implemented.
- Many of the needs/challenges to improving ewe productivity are similar across the EU.
- When communicating information it is important to know the target audience to decide on the communication channels to use.
- SheepNet has compiled many solutions to the needs/challenges to improving ewe productivity and tips and tricks to aid their implementation.
- The information presented in this paper is only a ‘taste’ of the information compiled by SheepNet. All solutions, ‘tips and tricks’ and fact sheets are presented on the SheepNet website.
- Join SheepNet (www.sheepnet.network) today and stay informed (see last page of this paper for details).

Introduction

The EU is only 85% self-sufficient in sheep meat. Currently, the EU is the second largest importer of sheep meat in the world. An increase in ewe productivity of 0.1 lambs reared per ewe joined across the EU would increase meat supply by 64 thousand tonnes and self-sufficiency to 92%. It is estimated that there are 85 million sheep in the EU and this population has declined by 15% in the last 15 years. This decline in sheep production may be due to a number of factors including profitability, part-time farmers, reduced labour availability, lack of uptake of technology and innovation, ewe genotype etc. In Ireland ewe productivity has not improved over the last 30+ years even though the ratio of lowland to hill ewes has increased during this period. The objective of this paper is to present information, from SheepNet on relevant best practices and innovations to improve ewe productivity.

What is SheepNet?

SheepNet is a 3-year project, initiated in November 2016, funded by the European Union’s Horizon 2020 research and innovation programme. SheepNet is about practice-driven innovation to improve the productivity of meat sheep (the number of lambs reared per ewe joined) and milk sheep (the number of milking ewes per ewe joined). The aim is to improve flock productivity which will in turn improve farmers’ income and, therefore, the sustainability and attractiveness of sheep production. SheepNet focuses on the 3 key factors that affect ewe productivity, namely, pregnancy rate (reduce barrenness), pregnancy success (maintain pregnancy to lambing) and improved lamb survivability thus increasing the number of lambs reared per ewe joined. SheepNet is an innovative thematic network which has brought together a wide range of stakeholders from the six main sheep producing countries in Europe (Ireland, France, Italy, Romania, Spain and UK) which account for approximately 80% of the EU sheep flocks, and from Turkey (Figure 1).

Figure 1. SheepNet partners
**How does SheepNet work?**

SheepNet uses a multi-actor approach that engages farmers, farmer organisations, scientists, advisors/consultants, veterinarians etc. involved in the value chain (Figure 2) encompassing the sheep industry. In each of the SheepNet countries there is a Network Facilitator who encourages the exchange of information and knowledge between the stakeholders and standardises methodologies used in each country. Using a top-down: bottom-up approach, SheepNet aims to promote the implementation and dissemination of innovative technologies and practices that impact ewe productivity.

![Connections between the thematic network from Ireland to the other partners](image)

*Figure 2. Connections between the thematic network from Ireland to the other partners*

**Where do stakeholders obtain information on ewe productivity?**

Successful transfer of findings and technology from research to stakeholders, and their successful adoption by industry is critical to improving efficiency within any farm enterprise. The adoption of technology by producers is influenced by many factors including effective communication. The low adoption of technologies could be due to many reasons including stakeholders being un-aware of the existence of relevant technology.

A survey was undertaken in the SheepNet participating countries to assess/identify the main information sources that stakeholders use to obtain information on ewe productivity. The main sources identified are presented in Table 1. Whilst Irish farmers identified discussion groups as the most important source of information, Irish-other (Irish stakeholders which are not farmers) and Europe (the other SheepNet countries) ranked it as relatively unimportant (ranked 8th and 10th, respectively). Meanwhile Europe identified veterinarians as the most important source of information whilst Irish respondents rank them lower (ranked 6th and 9th by Irish farmers and Irish-other, respectively). Whilst Irish-other ranked congress/seminars/workshops as the most important source of information Europe and Irish farmers ranked them as the 6th and 8th most important source, respectively. However, all groups ranked technical advisors/consultants and the farming press as important sources. There was general agreement among the 3 categories of respondents on which were the least important sources of information on ewe productivity, namely technical sales personnel and social media. It was concluded that to achieve successful communication the best choice of media depends on the target audience.
Table 1. Ranking of the main sources used to obtain information on sheep productivity

<table>
<thead>
<tr>
<th>Source</th>
<th>Europe</th>
<th>Irish - farmer</th>
<th>Irish - other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Veterinarians</td>
<td>1</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Technical advisors/consultants</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Farming press</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Peer to peer (e.g. farmer to farmer)</td>
<td>4</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>Professional learning</td>
<td>5</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Congress/seminars/workshops</td>
<td>6</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Scientific articles</td>
<td>7</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>Open days on farm</td>
<td>8</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Farming websites</td>
<td>9</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Discussion groups</td>
<td>10</td>
<td>1</td>
<td>8</td>
</tr>
<tr>
<td>Social media (e.g. Facebook, YouTube etc)</td>
<td>11</td>
<td>11</td>
<td>10</td>
</tr>
<tr>
<td>Technical sales personnel</td>
<td>12</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>Other</td>
<td>13</td>
<td>12</td>
<td>-</td>
</tr>
</tbody>
</table>

¹France, Italy, Romania, Spain, Turkey, UK. ²1 = most important to 13 = least important (Keady et al. 2018a)

What are the main challenges to improving ewe productivity?

Before providing solutions it is necessary to identify the perceived challenges to increasing ewe productivity. In each of the SheepNet countries stakeholders were asked to identify the main challenges/needs around improving pregnancy rate and pregnancy success (maintaining pregnancy to lambing), and the main management and animal issues related to reducing lamb mortality.

Table 2. Main challenges/needs to improve pregnancy rate

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Europe</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body condition score</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Nutrition/grassland management</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Flock health status</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Ewe lamb management</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Ram management/ewe: ram ratio</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Ewe genotype</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

(Keady et al., 2018b)

The main challenges and needs identified, from 16 options, to improve pregnancy rate are presented in Table 2. The Irish and Europeans agreed on four of the five main challenges to improving pregnancy rate.

Table 3. Main challenges/needs to improve pregnancy success

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Europe</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrition/minerals/grassland management</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Abortion: control and prevention</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Pregnancy scanning benefits</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Internal parasite control</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>How to assess a pregnancy nutrition plan</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Body condition score</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

(Keady et al., 2018b)
### Table 4. Main management issues to reducing lamb mortality

<table>
<thead>
<tr>
<th>Management Issues</th>
<th>Europe</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced preparation for lambing</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Sheep shed (ventilation, hygiene etc.)</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Nutrition/grassland management</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Labour availability/organisation</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Hygiene (e.g. naval disinfection)</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

The main management issues identified, from 11 options, to achieve low lamb mortality are presented in Table 4. The Irish and Europeans identified the same five issues, but ranked their importance differently. (Keady et al., 2018b)

### Table 5. Main animal issues to reducing lamb mortality

<table>
<thead>
<tr>
<th>Animal Issues</th>
<th>Europe</th>
<th>Ireland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colostrum issues</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Lamb vigour at birth</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Lamb birth weight/dystocia</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Lamb health</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Mis-mothering (ewe-lamb bond)</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Litter size</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Vaccinations</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

The main animal issues related, from 11 options, to achieving low lamb mortality are presented in Table 5. The Irish and Europeans identified, and ranked in same order, the three main animal issues relating to reducing lamb mortality. The Irish identified litter size and vaccinations as major issues whilst the Europeans identified lamb health and mis-mothering as major issues. (Keady et al., 2018b)

It was concluded that there are similar challenges to improving sheep productivity across Europe but the order of importance may differ by region. Consequently, solutions to problems of one country/region may be available in other regions. Sourcing these solutions can be facilitated by the multi-actor approach adopted by SheepNet.

### Solutions to needs and challenges to improving ewe productivity

All SheepNet countries identified solutions to address needs/challenges to improve ewe productivity which were identified either in their own country or other SheepNet countries and/or regions. The following are solutions/recommendations to needs/challenges identified by Irish stakeholders:

**Body condition score (BCS)**
- BCS is a measure of the body reserves and is determined on a scale of 1 (emaciated) to 5 (fat)
- Target BCS at mating is between 3.5 to 4.0
- Each one unit increase in BCS at mating increases:
  a) litter size by 0.13 lambs per ewe
  b) number of lambs reared/ewe joined by 0.10
- Mating ewes at a BCS less than 2.5 increases the risk of barrenness
- Repeat from weaning to joining
- One unit increase in BCS is equal to approximately 12 kg live weight
- Ewes on good autumn pasture should gain 1kg/week

**The ram effect**
- Used to induce the onset of oestrous cyclicity in adolescent (<1 year of age) and mature ewes through the effect of pheromones released from sexually mature rams, once they are sufficiently close to the onset of normal cyclicity
- Approximately 75% and 90% of ewes will lamb within a 2 and 3 week period, respectively
- Ewes must be out of sight and smell of rams for ~4 weeks prior to exploiting the ram effect and in anoestrus at the time of ram introduction

**Feeding according to expected litter size**
- Ultrasonic pregnancy scanning accurately predicts litter size of each ewe
- The energy requirement of single, twin and triplet bearing ewes increases by 40, 60 and 70% respectively, during the final 6 weeks of pregnancy
- Supplement in late pregnancy according to expected litter size and expected lambing date
- Targeting concentrate supplementation to ewes with larger litters ensures ewes have adequate colostrum, lambs are born at optimum weight which reduces lamb mortality
- Soya concentrates with 19% crude protein and containing soya bean meal as the main protein source
- Soya bean meal, maize meal, barley should be the main ingredients; followed by rapeseed, soya hulls, beet pulp, maize distillers and maize gluten

**Effects of grass silage feed value on concentrate requirements during late pregnancy**
- Dry matter digestibility (DMD) is the main factor affecting silage feed value
- Silage chop length affects silage intake by sheep
- Each 5 percentage unit increase in silage digestibility increases:
  a) ewe weight post lambing by 6.5 kg
  b) lamb birth weight by 262 g
- Enables optimum use of concentrate supplementation thus reducing costs
- Silage feed value must be determined (laboratory analysis) to develop a feed plan
- The effects of silage feed value and chop length on concentrate requirement during late pregnancy for twin bearing ewes are presented in Table 6 (reduce by 5 kg for single bearing ewes and increase by 8 kg for triplet bearing ewes)

**Table 6.** Effects of silage quality on total concentrate requirements (kg/ewe) of twin bearing ewes during late pregnancy

<table>
<thead>
<tr>
<th>Silage DMD (%)</th>
<th>79</th>
<th>72</th>
<th>64</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precision chopped</td>
<td>10</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>Single chopped</td>
<td>13</td>
<td>24</td>
<td>35</td>
</tr>
</tbody>
</table>

**Options for artificially rearing surplus lambs**
- Flocks with mean litter sizes of 1.8, 2.0, 2.2 and 2.5 the incidence of multiple litters (triplets/quads/quins) is expected to be 8%, 15%, 25% and 55%, respectively
- Excess lambs can be either cross fostered, sold, reared as triplets or artificially reared on milk replacer. The three main methods of artificially rearing lambs are as follows:
  1. Bottle rearing which has low set up costs, is labour intensive and may result in digestive upsets due to large milk intakes at each feed
2. Ad lib feeders which can rear 20 to 25 lambs, requires mains electricity, have limited labour requirement and reduces stomach upsets as milk is available ad libitum.

3. Automated feeders supply fresh milk replacer as required, can rear up to 250 lambs, has a low labour requirement but has high set up costs (approx. €3,500)

**Effect of lamb birth weight on mortality**

- Lamb birth weight effects lamb mortality as small and large lambs are more likely to die.
- Each 0.5 kg increase in lamb birth weight increases weaning weight (at 14 weeks) by 1.7 kg.
- The optimum birth weight is the weight at which lamb mortality is minimised, i.e. 6.0 kg for singles.
- Optimum birth weight for twins and triplets is 93% and 78% that of singles.
- Achieving the optimum birth weight reduces labour associated with lambing difficulty and very small lambs, reduces lamb mortality and improves flock productivity.

**Lambing inventory**

- Advanced preparation can improve flock productivity and reduce stress.
- One method of advanced preparation is the use of a lambing inventory (see video on SheepNet website).
- An inventory includes all equipment and supplies needed during lambing (Table 7).

**Table 7. Example of items in a lambing inventory**

<table>
<thead>
<tr>
<th><strong>Lambing</strong></th>
<th><strong>Lamb health</strong></th>
<th><strong>Veterinary</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable gloves</td>
<td>Iodine for navel disinfection</td>
<td>Prolapse harness/retainer</td>
</tr>
<tr>
<td>Lubricant for difficult lambing</td>
<td>Thermometer to measure lamb temperature</td>
<td>Syringes and needles</td>
</tr>
<tr>
<td>Lambing aid to align the head during the birth process</td>
<td>Frozen ewe/cow colostrum</td>
<td>Antibiotics (under veterinary advice)</td>
</tr>
<tr>
<td>Fostering crate to adopt surplus lambs</td>
<td>Artificial colostrum</td>
<td>Oxytocin to assist milk let down</td>
</tr>
<tr>
<td>Basin for wet fostering lambs to a surrogate mother</td>
<td>Stomach tubes to administer colostrum to weak lambs</td>
<td>- Energy boost (glucose/glycerine) for ewes (twin lamb disease)</td>
</tr>
<tr>
<td></td>
<td>- Lamb weighing scales</td>
<td>- Injectable calcium to treat milk fever</td>
</tr>
<tr>
<td></td>
<td>- Feeding bottles and teats</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Heat lamp/heat box to warm hypothermic lambs</td>
<td><strong>Miscellaneous</strong></td>
</tr>
<tr>
<td></td>
<td>- Milk replacer</td>
<td>- Elastic tail and castration rings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Tail ring applicator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Marker spray for ewe and lamb identification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Management tags for ewe and lamb identification</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Taggers</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Disinfectant for lambing equipment (bottles, teats, lambing aid ... etc.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Bedding for lambing pens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Disinfectant for lambing pens (e.g. lime)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Salt</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Phone number for veterinary surgeon</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Adequate number of individual lambing pens</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Plans for additional labour during peak lambing season</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Nutrition plan for ewes in late pregnancy and post lambing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Concentrates/feed supplements</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Clean water supply</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Facilities to transport ewes and lambs to field</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Lamb protection from predators</td>
</tr>
</tbody>
</table>

**Veterinary**

- Prolapse harness/retainer
- Syringes and needles
- Antibiotics (under veterinary advice)
- Oxytocin to assist milk let down

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Effect of litter size on lamb mortality

- Approximately 6%, 7% and 21% of lambs born as singles, twins and triplets die
- Regardless of litter size, low and high birth weights are linked to increased mortality
- The mortality of lambs born as singles is primarily due to large lambs (>7kg)
- The higher mortality in larger litters (triplets & quadruplets) is associated with lambs of lower birth weight and difficulties in lamb delivery
- Optimum birth weight of lambs born as twins and triplets is approximately 93% and 78% that of singles
- Awareness of the effect of litter size on lamb mortality enables producers implement appropriate nutrition and management protocols to minimise lamb mortality

Body condition scoring toolkit.

- Enables the demonstration of BCS of ewes where use of live animals is not practical or possible
- The toolkit includes five models each representing BCS’s of 1 to 5
- Models are taxidermy ewe vertebrae & ribs with varying levels of padding to represent the 5 BCS’s
- The tool kit includes a guide on what one should be feeling to differentiate between BCS’s

Health control and management of abortion

- Focused on the management and control of abortion in the form of a smartphone App
- Advice on the best management practises to reduce abortion e.g. quarantine new animals, control stray animals, isolate infected animals etc.
- Advice on how the disease is contracted and spread
- Advice on the vaccinations that are available for control

Paper tally of lamb mortality

- Many farmers do not know the level of lamb mortality on their farms
- This solution accurately records all lamb mortality including abortions
- A sheet to record the number, potential cause/symptoms and date of mortality
- The sheet is kept next to lamb disposal area and completed by all lambing staff
- The record sheet is reviewed
  - during lambing to identify requirements for curative measures
  - at the end of lambing to inform preventative strategies/plans for the next year
- Understanding the causes of lamb mortality will help reduce lamb mortality in the future

Testing colostrum quality

- Colostrum with high IgG concentrations is vital for transfer of passive immunity to lambs
- Colostrum from other ewes and/or cows often stored to feed to new born lambs
- Enables the farmer to measure the IgG concentration in colostrum
- Can be performed using a brix refractometer or a colostrometer.
- Provides instructions to evaluate colostrum to enable the storage of high quality colostrum
- Selection of good quality colostrum for storage and feeding to lambs will reduce lamb mortality
Changing breed composition of ewe flock

- Suffolk-X is the dominant ewe breed type (55% of lowland ewes) in Ireland - terminal sire breeds constitute 75% of lowland ewes
- Changing flock breed composition takes up to 5 years to achieve but provides a permanent solution to increasing ewe productivity
- Relative to Suffolk ewes (>75% Suffolk), Belclare x Suffolk ewes rear an additional 0.35 lambs per ewe joined each year of her lifetime

Neonatal lamb mortality – causes and when does it occur

- Each 1% change in lamb mortality nationally is worth €2.5 annually
- Most lamb mortality occurs prior to, at or within 24 hours of birth (Table 8)
- Main causes of lamb mortality are infection and dystocia (Table 8) - both are potentially preventable
- 23% of farmers do not clean and disinfect lambing pens
- Only 68% of farmers scan and only 58% raddle their ewes – therefore many cannot and do not feed according to expected litter size and lambing date

Table 8. Ultimate causes of neonatal (0-7 days) mortality in 172 lambs (% of lambs that died)

<table>
<thead>
<tr>
<th>Cause of death</th>
<th>Time of death</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Birth</td>
<td>Day 1</td>
<td>Day 2-7</td>
<td>Total</td>
</tr>
<tr>
<td>Accident</td>
<td>1.7</td>
<td>2.9</td>
<td>3.5</td>
<td>8.1</td>
</tr>
<tr>
<td>Congenital defect</td>
<td>1.2</td>
<td>0.6</td>
<td>1.2</td>
<td>3</td>
</tr>
<tr>
<td>Dystocia</td>
<td>11</td>
<td>3.5</td>
<td>0.6</td>
<td>15.1</td>
</tr>
<tr>
<td>Infection</td>
<td>16.8</td>
<td>5.2</td>
<td>15.7</td>
<td>37.7</td>
</tr>
<tr>
<td>Other</td>
<td>1.7</td>
<td>4.1</td>
<td>1.7</td>
<td>7.5</td>
</tr>
<tr>
<td>Diagnosis not reached (DNR)</td>
<td>19.2</td>
<td>5.2</td>
<td>4.1</td>
<td>28.5</td>
</tr>
<tr>
<td>Total</td>
<td>51.6</td>
<td>21.5</td>
<td>26.8</td>
<td>100</td>
</tr>
</tbody>
</table>

(Shiels et al., 2018)

Tips and tricks

The aim of the solutions was to provide information to improve flock productivity while the aim of the tips and tricks is to aid the implementation of the solutions. The tips and tricks are provided by farmers, for farmers, so are highly practical and proven to work on farm. The following is a selection of tips and tricks that we believe are relevant to Irish farmers.

Feeding the ewe for optimum lamb birth weight

- Group ewes according to litter size (scanning) and expected date of lambing (raddle colour)
- Change raddle colour frequently (e.g. weekly) during the breeding season thus enabling grouping in late gestation by expected lambing date
- Step-up concentrate feed levels in late pregnancy
- Base concentrate feed level on silage feed value, litter size and expected lambing date (Table 9)

Table 9: Concentrate feed levels to achieve target total feed inputs

<table>
<thead>
<tr>
<th>Week pre lambing</th>
<th>Concentrate (kg/ewe/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td>7</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.2</td>
</tr>
<tr>
<td>5</td>
<td>0.2</td>
</tr>
<tr>
<td>4</td>
<td>0.2</td>
</tr>
<tr>
<td>3</td>
<td>0.3</td>
</tr>
<tr>
<td>2</td>
<td>0.5</td>
</tr>
<tr>
<td>1</td>
<td>0.75</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>
**Wet Fostering protocol**
- Ensure ewe has adequate milk to rear the extra lamb
- When the ewe starts to lamb collect some birth fluids
- Wash foster lamb in warm salty water especially head, neck and tail
- Dry the lamb
- Wash lamb in the birth fluids especially head, neck and tail
- Tie the lambs legs together to mimic a new born lamb
- Handle the ewe to mimic the birth of a second lamb
- Allow the ewe to lick the fostered lamb first
- Ensure ewes lamb gets colostrum, then unbind legs of foster lamb

**Fostering bucket**
- Use of a bucket provides a cheap method of fostering lambs
- Cut base out of plastic bucket approximately 8cm form the edge
- Place the bucket over ewes head so she can’t see/smell the lambs
- Ensure bucket is resting on the wool and not irritating the neck
- The ewe will not know which lamb is sucking
- The bucket will not affect the ewes ability to eat or drink
- Remove the bucket when ewe accepts lambs

**Implementing the ram effect**
- Place an apron on the ram to prevent unwanted matings
- After the introduction of rams, the majority of ewes that have not cycled will have a silent heat within 36 hours and some will have a second silent heat after 6 days
- Ewes cycle approximately 17 days after their silent heat resulting in peaks in ovulation at approximately 18 and 23 days post ram introduction (Table 10)
- Introduce fertile rams after14 days to allow for variation in cycle length and ewes already cycling when aproned rams introduced

| Table 10: Time table for use of the ram effect |
|----------|-----------------------------------------------|
| Day  | Event                                      |
| 1    | Introduce aproned rams                      |
| 3    | Remove aproned rams                         |
| 14   | Introduce fertile rams                      |
| 18   | 1st peak in matings                         |
| 23   | 2nd peak in matings                         |

**Hock bar**
- The use of a hock bar is an effective way to stop ewes reversing in a sheep race
- The sheep step over the bar on entering the race but are not inclined to reverse back
Water supply for individual lambing pens

- Individual drinking bowls are expensive
- Water buckets are labour intensive, risk of spillage etc.
- A water pipe (15 cm diameter) with holes cut in it for each pen reduces labour, reduces cost and supplies water to many pens from one source

Dealing with large teats

- Some ewes have an excessively large teat that lambs will not suckle
- The large teat gets larger as the udder fills with milk
- The teat could be hand milked - may have to be done several times
- Denying the lambs access to the preferred teat (left teat in photo) encourages them to suck the large (rejected) teat
- The large teat returns to normal size as milk is not allowed to accumulate

Producing high feed value silage

- Target 75% DMD
- Ensile leafy herbage to produce high DMD silage
- Spread the grass to achieve a rapid wilt
- Wilt to approximately 25-30% DM
- Ensile approximately 24 to 36 hours after mowing
- Ensile rapidly to ensure anaerobic conditions

How to condition score ewes

- Assessed by hand along the ewes back
- Assess the condition along the spine and transverse processes
- Diagrams below show BCS of 1, 3 and 5 and the characteristics of each
**Lameness treatment tube**
- Lameness is a problem on many sheep farms
- Placing the sheep’s foot into a plastic tube enables treatment solution to be remain in contact with the infected area
- Secure the tube with cable ties
- Place 30ml of the treatment solution in the tube
- Remove the tube after 24-36 hours

**Creep grazing gate**
- Creep grazing allows lambs access next paddock and ewes to graze current paddock to lower sward height
- Creep grazing increases lamb weaning weight by up to 2 kg
- Place the creep gate in an existing gate way
- Spaces are 23 cm to enable the lambs pass through
- Creep gate can be moved from paddock to paddock

**Lambing pen construction**
- Moveable brackets for lambing pens
- The movable bracket can be attached to an existing barrier, gate etc.
- Provides a bracket on which to secure a lambing pen

**Data collection equipment holder**
- Useful for data collection at lambing time
- The ‘tool box’ holds tags, taggers, tail rings, marker sprays, data collection equipment etc. and can be carried from lambing pen to lambing pen

**Forcing pen**
- Round forcing pens are common in sheep handling units
- It can be difficult to get the forcing gate back behind the next group of sheep
- A forcing gate which rotates around a central pillar and rises up enables it to swing back over the next group of sheep
Smart phone recording tool

- Data collection is becoming an important management tool
- Using a smart phone with data collection software is a cost-effective way to collect and use data
- The smart phone is linked by Bluetooth to the stick reader
- The EID tag is recorded on the Smart phone along with whatever management task being performed e.g. weighing

Conclusions

There are many opportunities to improve sheep productivity using knowledge and technologies that are currently available for more information join SheepNet at www.sheepnet.network (see below).

References


Taking the complexities out of farm transfers

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Take Home Messages

- Tax considerations should facilitate and not drive a succession plan.
- It is important to seek professional advice from a trained tax advisor.
- Having a Will gives a defined level of reassurance to the transfer process.
- To make succession and transfer easier for all involved maximise tax reliefs

Introduction

In looking to take the complexities out of farm transfers, one needs to look at the following topics:

- Estate planning
- Core elements of same

Estate planning refers to the tax efficient transfer of assets to the next generation. It covers both gifts and inheritances. Gifts are a lifetime transfer, while inheritances are transfers upon death. The core elements around both of the above are:

- Legal effectiveness
- Tax efficiency
- Practicality

When looking at the tax efficiency, don’t let tax considerations drive the transfer. Look at the transfer from a practical point of view and then from a tax point of view. It may take some ‘tweaking’ from a tax point of view but don’t let it drive the overall transfer.

Forgotten Issues

When looking at transfers and succession, one is looking at an asset that is worth a lot of money. When one is looking at the transfer of this asset, one could say, ‘how do I have a tax liability?’ but when you are looking at land at €8/10,000 an acre, you need to look at the overall cost of same. However there are a number of forgotten issues to be taken into consideration and they are as follows:

1) Looking after oneself income wise to make sure one is secure from an income point of view
2) Is there an income tax effect from cessation?
3) What about the successor? Have they off farm income and will this affect his/her income tax liability? In most transfers I have come across, this is an area that most have not looked at and particularly if the successor has an off farm income, they could end up paying at the high rate of tax whereas the parents pay the low rate of tax.

A relatively current problem is the Fair Deal Nursing home scheme. This effects the transfer as it is a contingent liability on the asset. New legislation is awaited that will limit to 3 years the charge on a trading asset. If you value the trading asset at €1,000,000 and you have a 7.5% charge on it, it means there is a potential €75,000 charge against it per year. Beware of same! Also make sure that all assets are included in the Will and include if possible BPS. This is not as important to be included in the Will as it was previously as the BPS will go to the person who is getting the land. If it is included in the Will, make sure it is not left to one of the other family members.
Succession Act - Will v’s No Will

The Succession Act of 1965 is one of the most important pieces of legislation brought in to cover succession in Ireland. Prior to that, there were no rights for spouses etc. and now they are covered in detail. The succession Act covers two primary areas:

1. Transfer via a Will – where it is transferred by Will. In this case there is control over the assets and where they fall. It can facilitate proper tax planning.
2. Where there is no Will – This is also referred to as Intestate Estate. In this case, the law lays out where the assets fall. While tax planning can take place, it is extremely complex.

Taking the complexities out of transfer

When looking at transfers, one needs to look at minimizing the complexities. When looking at the complexities, one needs to look at the following:

- Maximise the reliefs
- Minimise the tax
- Minimise the cost to the farm, thus leaving the maximum amount of funds in the farm
- Protecting ones’ own security
- Looking after other family members

In looking after other family members a very simple example of this is a site. For example it is often said that the farm is left to a son or a daughter and then give a site to one of the siblings. A site from a parent to a child attracts no capital gains tax where a site from a sibling to another can attract Capital Gains Tax.

Capital Acquisition Tax (CAT) issues and planning

When looking at CAT issues, one must look at the following taxes:

- Gift and inheritance tax
- Capital gains tax
- Stamp Duty
- Income Tax

In looking at the taxes and the transfer who is liable to tax cost? Lifetime transfers which are regarded as a Succession, there are three taxes:

- Capital Acquisitions tax which is due by the transferee
- Capital Gains tax, which is due by the transferor
- Stamp Duty, due by the transferee

However, upon death, one needs to look at the difference and the fact that there is no Capital Gains Tax, no Stamp Duty tax and only Capital Acquisition tax, which is payable, if any, by the transferee. If one looks at the rate of Capital Acquisition tax it is 33% on the amount over the threshold.

Thresholds are as follows:

- **Class A** – parent to child /Favourite Nephew - €320,000
- **Class B** – blood relative - €32,500
- **Non relative** - €16,275

All gifts and inheritances are aggregated since the 5th December 1991. As I pointed out earlier, there are a number of complexities around the relief. The complexities are as follows:
There is an annual allowance of €3,000.

There are various reliefs available i.e. Agricultural Relief, Business Relief, Favourite Nephew/Niece reliefs.

Everything since the 5th December 1991 within the same class i.e. Parent to child etc is aggregated.

One can give a conditional gift of cash to a transferee and have a condition that they invest in property and avail of Agricultural Relief. In addition, land leasing has become extremely popular.

**Capital Acquisition Tax**

Under this tax there are two tests, the first test is the farmer test, which is 80% of your assets on the date of acquisition must be agricultural property. It now must also include the Active Farmer Test. To be an active farmer you must have:

- An Agricultural qualification
- Or spend 50% of your time farming
- Or lease to an Active Farmer
- Or lease to someone who is carrying out the business of solar panels

**Business Relief**

If you cannot get Agricultural relief, you can look at Business Relief. In order to get this, the business of farming must be carried on. For a lifetime transfer, the business of farming must be carried on for 5 years and upon death must be carried on for another 2 years. You must continue the business for 6 years and the main benefit of Agricultural relief and business relief is that the values of the assets are reduced by 90%.

The business must be transferred, not just the asset!

**Capital Acquisition Tax - Favourite Nephew/Favourite Niece Relief**

In order to avail of this, one can be treated the same as a son/daughter or a child. To avail of this, you must help in the business for up to 5 years prior to the transfer, up to 15 hours per week.

The benefit of this is you are treated the same as a son/daughter and are entitled to the class A threshold. You are only entitled to Class A threshold on business assets, i.e. Land, machinery, stock, buildings etc. You are not entitled to it on cash assets.

**Capital Acquisition Tax**

This is the tax for the person receiving the property. It is currently 33% and the amount one can get tax free is €320,000. Included in the presentation are two examples showing the difference between getting the relief and not getting the relief. My main advice in this area would be:

- Try and get the reliefs
- Reliefs will reduce the tax to the minimum
- Then look at planning around same. Planning can include:
  - If you still have a liability why not take out an insurance policy
  - Beware of the free use of land over the years
  - Beware of free use of money or loans
  - Ensure all planning points are brought into play
  - When you consider the success tax credit of €5,000
Capital Gains Tax
Even though the asset is transferring one is making a disposal of an asset, in a lot of cases no money is transferring, one is liable to Capital Gains Tax. This is a tax on the uplift in value of the assets. However, various reliefs exist and with proper use of these reliefs, no liability can arise. There are two types of reliefs:
- Within the family
- Outside the family

Stamp Duty
The new and big tax issue arising now is Stamp Duty. Stamp Duty for Young Trained Farmer(s) is zero provided certain conditions are met.
- Stamp Duty for a Blood Relative is at 1%.
- Stamp Duty for leases are at 1%
- Stamp Duty on share is 1%
There is also a new consolidation relief for a limited number of years whereby if you sell land and buy land near you, you can avail of the relief.

Finance Act/Budget 2018
Finance Act/Budget 2018 extended the finance relief to Young Trained Farmers for 3 years for 2019, 2020 and 2021, however, the consanquanuity relief for Blood Relative ends in 2020. The problem with the new Stamp Duty relief is as follows:
- It is from a start-up situation
- There must be a business plan
- The business plan must be as wide as possible and include future transfers
- If one does not get the Young Trained Farmer on a second transfer, one will be liable to Stamp Duty on it. There are a lot of clarifications required on this stamp duty and at the time of writing a lot of considerations are being questioned and answers are awaited.

Most importantly with Stamp duty:
- There is a limit of €70,000 that interacts with the Succession credit and Young Trained Farmers Stock relief
- It could inhibit the purchase of land by a Young Trained Farmer where he has already got stamp duty relief
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