

**Animal &
Grassland Research
and Innovation
Programme**

Teagasc
Virtual
Hill Sheep Conference

17 February
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2021



Teagasc National Hill Sheep Conference 2021

As a WEBINAR on
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Foreword

Data from DAFM 2019 census show that hill sheep account for 31% of the females in the national ewe flock. Hill sheep also play an important role in the environmental sustainability of many areas, particularly along the western seaboard and parts of Wicklow and the Cooley mountains, which are unsuited to other agricultural enterprises. In these areas, income is generated from the sales of lambs directly for slaughter, or for the finishing of lambs on the lowlands, and in special sales of females as lowland flock replacements. Data derived from the Teagasc National Farm Survey (NFS) show that 25% of lamb carcass output produced nationally originates from hill progeny. Teagasc has an ongoing research programme evaluating strategies of finishing hill lambs at lighter carcass weights of between 12-16 kg.

Hill sheep that graze on the mountains play an important role in maintaining a diverse botanical composition on the hills, thus maintaining the landscape and the visual amenity for tourism and recreation and thus providing a potential additional source of income in these areas. From 2021 the Teagasc Agricultural Economics and Farm survey Department will produce a factsheet on the Hill sheep enterprise that will provide the data that allow farmers and the industry to benchmark their economic and technical performance.

The year 2020 will be remembered particularly for the disruption and 'lockdown' caused by Covid-19 pandemic and the uncertainty of a 'no deal' Brexit until the EU-UK Trade and Cooperation Agreement was negotiated just prior to Christmas. Whilst these challenges initially had negative consequences for farm gate prices, as 2020 progressed prospects improved in the sheep sector. Prices received from processors increased, with the price per kg of lamb carcass increasing on average by 57c/kg (12%) relative to the average price received in 2019; there was a strong demand for breeding stock, which reflects a renewed interest in sheep production by Irish farmers.

Data from the Teagasc NFS (2019) show that for hill sheep enterprises, gross margin increased by 55% to €35/ewe when compared to 2018. Also the top third of hill sheep producers had a gross margin of €551/ha (compared to €24/ha for the bottom third). The difference in profitability between the top and bottom producers is due to many reasons, including the adoption of proven technologies which are known to increase farm profitability. The mean number of lambs reared per ewe joined was 1.11 which was an increase of 19% on the previous year. The optimum litter size for individual producers in hill sheep production depends on the hill environment and availability of "greenland".

In 2020 sheep meat, valued at €357m was exported, making Ireland the largest net exporter of sheep meat in Europe and the fourth largest sheep meat exporter worldwide. The main markets for Irish sheep meat are EU27 and the UK, which accounted for 72% and 18% of exports respectively in 2020. Exports to other markets accounted for 10% of export value. China is becoming a major importer of sheep meat, consequently New Zealand exports to the EU in 2020 were almost 13% lower than in 2019. These trade developments have had a positive impact on the price received by Irish sheep producers. Six Irish sheepmeat processing plants are now eligible to export to China.

In this conference there are four papers, each of which have important take home messages. David and Linda McLaughlin farm near Geeencastle in Co Donegal and have been a member of the Teagasc Better Sheep Programme since it began in 2008. David together with his Teagasc advisor, John Cannon, discusses his farm progress during this time that has resulted in the number of lambs reared per ewe joined increasing by 0.3 whilst gross margin improved by €38/ewe. Kevin McDermott from Sheep Ireland discusses the technologies available to record parentage and develop flockbooks for hill sheep. Dr. Annetta Zintl from UCD discusses tick borne diseases that affect sheep and cattle, and Lyme disease which affects humans. Finally Dr Liz Genever, a private consultant from Lincolnshire, UK, presents information on the importance of monitoring ewe body condition score at different times of the year, its impact on animal performance and management required for animals which are below target.

I would like to thank all the speakers, the Editor of the proceedings and the Teagasc Sheep Team for organising this conference.



Director, Teagasc.



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Organising Committee: Teagasc Sheep Programme Team

Sustainable hill flock management – balancing a high output flock with hill grazing management

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Take home messages

- The use of a two flock system to simplify sustainable hill land management improves gross margin per ewe.
- The number of lambs reared per ewe joined is increased through improving ewe body condition score and live weight at joining (mating).
- There is potential for genetic gain through a defined breeding policy
- Clearly defined plan for managing and grazing a hill flock throughout the year is necessary

Introduction

Drystock farming predominates in the West and North West of Ireland. Sheep is a very important component with hill sheep breeds comprising 31% of the sheep population in Ireland (DAFM National Sheep and Goat Survey 2019). The Teagasc BETTER Farm Sheep Programme consists of both hill and lowland farms spread throughout Ireland. The objective of the programme is to establish focal points for the on-farm implementation, development and evaluation of technology that is relevant to the sheep sector (<https://www.teagasc.ie/animals/sheep/better-farm-sheep/>). One of the farms involved in the programme has been that of David and Linda McLaughlin in Greencastle, Co Donegal. The aim of this paper is to present the progress of David & Linda McLaughlin's hill sheep enterprise during the last ten years through their participation in the Teagasc BETTER Farm Sheep Programme.

Hill Sheep Numbers

Donegal is part of the Sligo/Leitrim/Donegal Teagasc Region and sheep farming is a very important enterprise therein. The ewe numbers in the region and for Ireland in 2019 are summarised in Table 1. The data in Table 1 shows the importance of hill ewe breed types to the national sheep flock. Nationally, the average flock size is 74 ewes and 109 sheep whilst the mean flock size in Donegal is 59 ewes and 74 sheep (DAFM 2019).

Overall, hill breeds make up 31% of the national flock while hill breed crosses make up a further 18%. Donegal, Mayo and Kerry each account for approximately 16% of all hill or hill cross sheep breeds in Ireland (DAFM 2019). Donegal is the county with the largest sheep flock in Ireland, and there has been a steady increase over the past decade with approximately 900 additional flocks and a slight increase in flock size during that period (Carty 2018). It is recognised that not all hill breeds are kept on the hill or mountain so there is less than 139,240 hill ewes currently grazing predominantly hill areas. Because the majority of sheep farmers have small flocks the impact of improvements may seem small in the overall context. Conversely, this would also indicate the need to maximise return from smaller flocks. This is an important consideration when implementing knowledge transfer programmes.

Table 1. Breeding ewe numbers over 12 months of age by breed type category

Location	Hill	Hill cross	Lowland	Lowland cross	Total ewes
Donegal	139,240	73,847	42,615	98,356	354,058
Sligo	34,401	23,082	15,626	28,341	101,350
Leitrim	25,717	37,729	7,006	12,499	82,451
Region	199,358	134,658	65,247	139,196	537,859
National	809,052	452,815	475,776	833,227	2,570,870

(DAFM Sheep and Goat Census 2019)

Environment and Climate Change

The role of agriculture on climate change has come more into focus over the last ten years. How issues such as over and under-grazing of hill vegetation can affect water quality and the risk of ‘wildfires’ has also become more appreciated in recent years (Casey & Nugent, 2014). One way of reducing or managing this risk is by sustainable grazing management of these upland areas (McCloskey, 2016).

It is fair to say that farmers understand the importance of the hill environment as a product that they can be rewarded for. The emphasis now is for them to view the role of sheep grazing as a management tool. Direct payments for maintaining land in good environmental and agricultural condition must be continued and used to reward farmers for their work. The main focus for hill sheep farmers should be keeping costs low, aiming for production targets linked to the amount of improved ‘greenland’ farmed and using their sheep flock to manage the hill vegetation.

The Teagasc BETTER Farm Sheep Programme in Donegal

The McLaughlin’s have two separate sheep systems on their farm. The home farm (182 ha adjusted to 40.2 ha) currently grazes a 250 ewe hill flock while a separate lowland out-farm (17 adjusted ha) is used to graze a 120 ewe lowland flock and 17 suckler cows. The home farm is also used to produce silage to feed the suckler herd and the lowland ewes during the winter. The hill flock is comprised of purebred Lanark ewes and also produces replacement hoggets for the lowland flock by using a Belclare ram on 60 hill ewes annually. Thirty last crop ewes from the hill flock are given one year in the lowland flock where they are bred to a Blue Leicester ram to produce mules as part of the Donegal Mule group. This has allowed an increased return from these ewes over and above cull value and contributed to an increased overall farm profit. Over the last number of years the McLaughlin’s have consistently demonstrated that the targets set for both hill and lowland farms are consistently achievable. A summary of the performance of the McLaughlin hill flock during the course of their time in the programme is shown in Table 2. The improvements in output from the flock are as a result of adopting better management practices namely; having a clearly defined breeding policy, managing ewe body condition score (BCS) (particularly at joining [mating]) and managing hill and ‘greenland’ grazing areas throughout the year.

Table 2. Summary of flock performance on McLaughlin’s hill sheep enterprise since 2008/09.

	2008/09	2014/15	2019/20
Ewes joined	223	245	248
Litter size	1.15	1.39	1.5
Ewes lambed/ewe joined (%)	86.5	94.8	88.0
Lamb mortality (%)	15.4	9.7	14.7
Lambs reared/ewe joined	0.92	1.18	1.13

These impressive performance figures demonstrate the importance for hill farmers having a definite breeding policy, managing ewes correctly, and also a grazing management plan for their farms which is the approach used on the McLaughlin farm.

Breeding policy

David and Linda's breeding policy for their hill flock is presented in Figure 1. This breeding policy has been in place for a number of years and works very well. As presented in Table 2, the number of lambs reared per ewe joined (weaning rate) is consistently ≥ 1.1 . Weaning weights for the lambs have also been very good with single reared lambs growing at 234 g/day from birth to weaning in 2020, which is very similar to the performance achieved on the farm over the last number of years.

Since the beginning of the BETTER Farm Sheep Programme all sheep have been EID recorded. David and Linda have been undertaking a high level of data recording on their flock over the years and have a practical system in place to suit their farm. Once a day during lambing, lambing ewes and their lambs are moved from the lambing fields to an adjoining field where lambing ewes are grouped. While moving the ewe and her progeny lambing difficulty, lamb birth weight and lamb sex are recorded. Lambs are then weighed at 7 and 14 weeks post-lambing. The McLaughlin's have been using this data to identify the best performing ewes and lambs within the flock and to track the performance of the rams used on the farm. Within each breed there are individual animals that are capable of outperforming their counterparts. The progeny of some rams are faster growing while some ewes are more productive than others and are better able to survive in their environment. In this regard hill sheep are certainly no different as shown in Table 3 using data from the McLaughlin's flock collected during four consecutive years where difference in the performance of progeny from different rams were observed. Some of these differences are due to the environment (farm, feeding, management) while others are due to their genetic makeup.

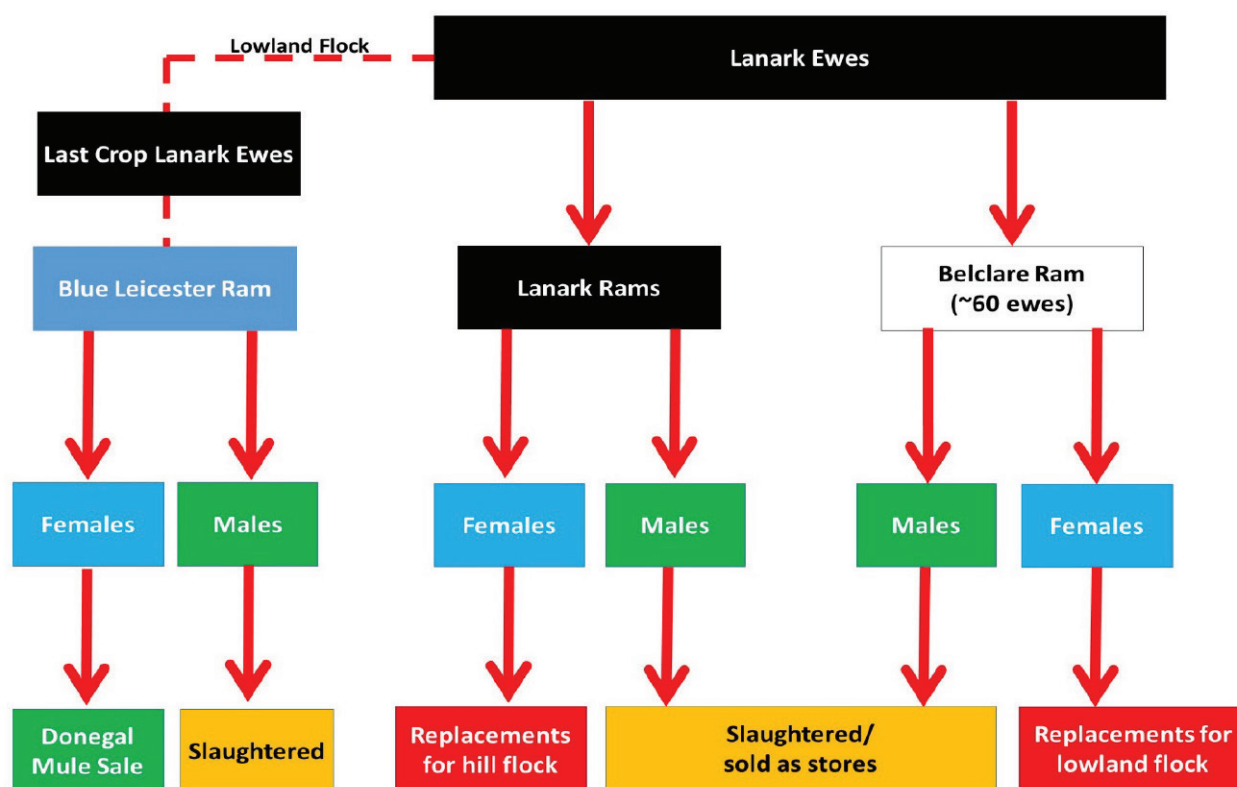


Figure 1. Diagrammatic representation of McLaughlin's breeding plan.

From a breeding perspective the challenge is to identify the ewes and rams that are genetically superior (possess genes that are responsible for the desirable traits) to their flock mates. The concept of genetic improvement or breeding better sheep is not new. However, through Sheep Ireland the potential to record and evaluate breeding sheep is now becoming a reality for hill sheep breeders and there are potential benefits available for hill sheep farmers to exploit. However, one of the major limiting factors facing the genetic improvement of hill sheep is the absence of flock-books with parentage records. The practical limitations with collecting this type of information have been a major constraint but the McLaughlin's have demonstrated that it is possible to collect this data with good planing and organisation.

Table 3. Progeny performance during the 2014, 2015, 2016 and 2017 production year from four rams

Ram	No. of progeny	Birth weight (kg)	Weaning weight (kg)	Mortality ¹ (%)
Lanark 1	161	4.13	25.6	8.1
Lanark 2	141	3.99	25.5	11.3
Lanark 3	130	4.31	26.0	14.6

¹ Combination of mortality at birth and lambs not presented at weighing's

Managing hill ewes for improved performance

The BETTER Farm Sheep Programme has highlighted the importance of ewe body conditions score (BCS) as both a management tool and as a determinant of hill ewe performance within each flock. While mature ewe weight is influenced by breed and environmental factors (hill or lowland grazing) it is important to keep hill ewes at or above a BCS of 3.0 at joining and try to maintain this BCS until lambing. Ewe BCS at joining will influence both the number of twins and the number of barren ewes in the flock the following year at lambing time. Hill flocks grazed solely on hill land might have a target of 0.9 lambs reared per ewe joined whilst those with access to a significant area of 'greenland' might have a target of 1.2 lambs reared per ewe joined.

The McLaughlin's handle their ewes regularly. During some years BCS has dipped due to weather conditions or flock health issues, but they have demonstrated that it is possible to have a ewe flock BCS of 3.0+ at joining. The flock only dipped below this BCS at joining twice in the last eight years. Regular handling ewes when they are in for other routine tasks enables thinner ewes to be identified and managed correctly. This might involve keeping them on 'greenland,' or giving some concentrate feed.



Ewes and lambs being gathered by David and Linda McLaughlin for lamb 7 week weights

Hill Land Management Plan

A map showing the 'Hill' unit grazing blocks on McLaughlin's farm is presented in Figure 2. The McLaughlin hill management plan is based on rotating the sheep groups around the farm in a pre-planned manner that does not vary much from year to year. The benefits of having a clearly defined plan allows for maximum benefit from the hill grazing plots while not compromising ewe performance unduly. It should be noted

here that the hill flock is not housed (except in exceptional individual cases – illness, mis-mothering, very thin sheep etc.) and that the improved hill and ‘greenland’ areas are rested from December 18th until lambing in April. The best way to describe and demonstrate how the McLaughlin’s manage the hill and the ewes on it is to go through the plan they have for the hill from just after weaning when ewes are beginning to be prepared for joining.

Weaning to joining

The flock is weaned in mid-August and following weaning the ‘stronger’ ewes go back to the hill while replacement ewe lambs and thin ewes graze the improved areas of the hill. Depending on the prevailing store lamb price decisions are made as to whether to sell the hill ram lambs as store lambs or graze and finish them using concentrates. In recent years the majority of hill lambs have been finished on concentrates and sold before Christmas at French market weights (>18kg) with lambs being moved down to the ‘lowland’ grazing block once grass supplies on the hill become too tight as the grass in this area is prioritised for joining time.

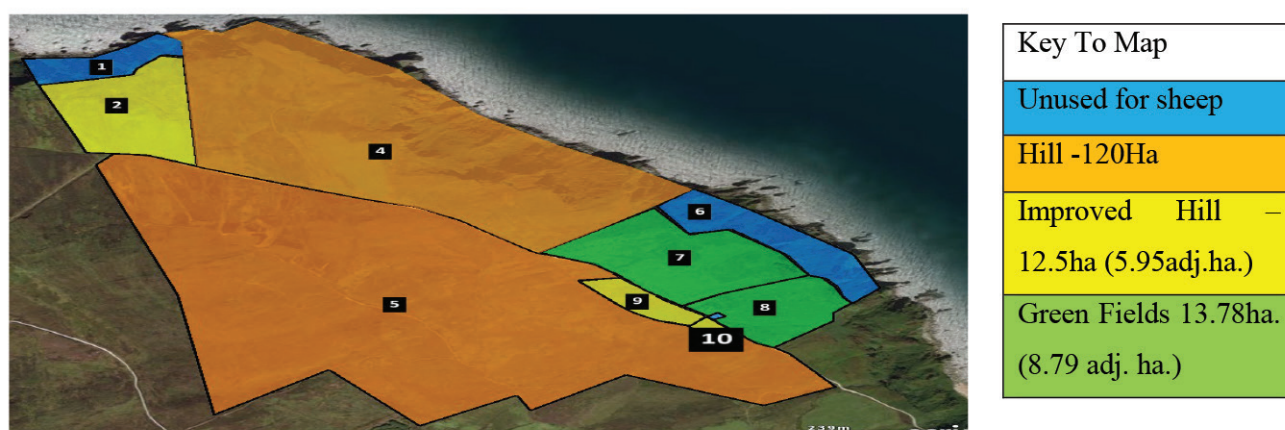


Figure 2. Map showing the ‘Hill’ unit grazing blocks on McLaughlin’s farm

Joining to Lambing

Joining occurs from November 10th to December 18th on the improved hill and green fields with single sire mating undertaken for the first 17 days at which point rams are either swapped around or single sire groups collapsed to ensure if any rams were not working correctly ewes are mated on the repeat cycle. From December 18th until pregnancy scanning on February 10th the ewes are grazed on the hill and given access to high energy feed buckets. The McLaughlin’s use feed buckets at this time for convenience and labour saving reasons as accessing the hill every day is not possible. After scanning the twin ewes remain on some improved hill land and are fed every day with concentrates until lambing at the rate of 0.2 kg/head/day building up to 0.75 kg/day at lambing. The single bearing ewes go back to the hill and receive 0.2 kg of ‘Cob’ nuts, fed on the ground, every second day until lambing. They are checked regularly and any thin ewes are removed for additional feeding. During this period the replacement ewe lambs continue to graze part of the hill.

Lambing to weaning

Lambing occurs from April 5th onwards. All ewes scanned are brought to confined paddocks on April 1st five days before lambing commences. Single and twin rearing ewes are kept in separate groups throughout

lactation. Ewes with single lambs go back to the hill in mid-May allowing some 'greenland' to be closed for silage while ewes with twin lambs remain on the 'greenland' plots or improved hill areas until weaning in mid-August. This completes the cycle and another sheep year has begun

Profit monitor performance

The e-Profit Monitor has been a key marker of how the improvements made on McLaughlin's farm has impacted the gross margin achieved and ultimately if the changes to the farming system were working. As part of the programme, McLaughlin's e-Profit monitor has assessed the whole farm performance and provides separate figures for the lowland and hill flocks and these figures are presented in Table 4. Gross margin from the lowland flock has increased from €35.1/ewe (€272.0/ha) to €78.0/ewe (€799.5/ha) while the gross margin per ewe from the hill flock has increased from €13.0 to €48.0 per ewe. This is excellent financial performance from both flocks. While improved prices have played a part in this improvement the main driver has been the improved flock performance.

Table 4. Summary of financial performance on McLaughlin's farm from 2009 and 2019 (€/ewe).

	Lowland		Hill	
	2009	2020	2009	2020
Gross output	119.6	151.7	40.0	101.9
Total variable costs	84.5	73.7	27.0	53.9
Gross margin	35.1	78.0	13.0	48.0

Conclusion

Hill sheep farmers have an important role to play in Irish agriculture and in maintaining our hills and their environments. David and Linda McLaughlin have clearly demonstrated during the last 10 years, through improved technical efficiencies (i.e. having a clearly defined breeding policy, managing ewe BCS and managing hill and 'greenland' grazing areas throughout the year), that sustainable improvements in output from hill flocks are possible.

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Hill flockbooks: providing a foundation to protect and progress hill breeds and the sector

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Take home messages

- Hill flockbooks can deliver in many areas including
 - ▶ protection from breed dilution from other strains and inbreeding
 - ▶ a foundation for systematic breed improvement
 - ▶ a great platform to help promote the breed
- Technology such as smart phone apps and EID readers are becoming more accessible. This technology has the potential to dramatically reduce the paperwork associated with parentage recording.
- There are different levels of intensity that hill flocks/flockbooks can decide to record to. Some require very little change to current practices. Contact Sheep Ireland to discuss the right solution for your flock.

Introduction

Hill sheep and hill farmers are a vital part of the Irish sheep sector and the Irish landscape, especially along the western seaboard. For generations, hill sheep have been used for grazing hills and mountains where no other alternative type of agriculture existed, and in doing so, performed three vital roles as follows:

1. Providing a source of income from land with limited potential for other use
2. Helping to maintain the flora and fauna that has developed over 1000's of years
3. Providing valuable maternal genetics to the lowland sector

According to the 2019 Sheep census published by the Department of Agriculture, Forestry and the Marine (DAFM), there were 82,055 breeding rams in Ireland, of which 19% (15,656) were hill rams (Table 1). The percentage of breeding ewes recorded as hill or hill cross accounted for 49% of the national ewe flock. This higher percentage of hill and hill cross ewes than those types of rams is no surprise to the Irish sheep farmers. These hill breeds and their crosses have long been sought after by lowland flocks as replacement females. These hill genetics have proven to bring maternal and easy-care characteristics to the lowland flocks, who then cross them back to another lowland breed. If we assume that the average hill ram has 4.5 breeding seasons, then 3,479 hill rams enter as breeding rams each year. These 3,479 rams are arguably the most significant cohort of rams in the country each year, given the percentage of their offspring retained for breeding in the national flock.



Table 1. The number of hill, hill cross, lowland, and lowland cross breeding rams and ewes in Ireland (DAFM 2019 National Sheep & Goat Census)

	Hill	Hill Cross	Lowland	Lowland Cross
Breeding rams	15,656 (19%)	7,528 (9%)	44,568 (54%)	14,303 (17%)
Breeding ewes	809,052 (31%)	452,815 (18%)	475,776 (19%)	833,227 (32%)

To protect and progress this cohort of animals, we must begin to collect ancestry information on them. Over the generations, these rams have all been bred to best suit their regional environments. Recording parentage information is the first step in protecting these bloodlines from being diluted down from different genetics from different breeds and from inbreeding, which is the primary goal of any sheep society flockbook. While the vast majority of the lowland breeds in Ireland have long-established flockbooks, this is not the case for the mountain breeds. There are currently only two hill flockbooks set up in Ireland, both of which were established in the last 12 months (The Donegal Wicklow Cheviot and the Mayo-Connemara Blackface Sheep Societies). With this ancestry, breeders and farmers can make more informed decisions on a sale day. They can be confident of the breed make-up of the ram and cross-check the rams ancestry information against the previous rams used in their flock to avoid potential inbreeding problems. There are other attributes that farmers would like to select their rams on other than breed type and inbreeding. For example, how long will the ram retain a full mouth? How milky will his daughters be? How fertile will his daughters be? However, in the absence of ancestry information, predicting a rams future performance in these traits is impossible. The only way to predict these traits with a certain level of reliability is to collect data on their known ancestors and combine this into a central database for the breed where they can be analysed. A prediction on the future performance of the progeny can then be made.

Why now?

There have been attempts in the past to start flockbooks for Hill breeds. Since then, several considerable developments have helped make a hill flockbook a more viable option.

Genomics

Genomics is the study of an individual animals DNA profile. The DNA is usually collected by inserting a tissue tag ordered from Sheep Ireland into the animal's ear. When the lab analyses the DNA from this tissue sample, Sheep Ireland can interpret some significant results from this analysis. This service was launched in 2019 after 5 years of research and development, making Ireland one of the leaders in this field. One of the genomic services primary benefits is that breeders can get several results from the same sample, as follows:

- *Parentage verification and predictions:* When an animal and its parents have been genotyped, Sheep Ireland can verify that the parentage was recorded correctly. If the parentage was recorded incorrectly or not recorded at all, Sheep Ireland could tell who the correct parent is if that parent is also genotyped. Eight percent of purebred lowland animals genotyped have had an incorrect sire recorded, and 8.5% of dams have been recorded incorrectly. This is expected, as there are many occasions when errors with parentage recording can occur on a sheep farm. The important thing is that we can now correct these errors. In 40% of cases where Sheep Ireland finds a parentage error, the correct parent can be identified via genomic predictions. As more and more animals within a breed get genotyped, this figure should increase.

- *Scrapie (DAFM approved)*: All genotyped animals get a scrapie genotype result. Breeders can then decide if they want to use this information as part of a breeding policy, or as an extra selling point for their animals. The scrapie result is also DAFM approved for export where the animal is also parentage verified. Based on the number of hill animals genotyped in the previous 2 years, there appears to be a much more significant percentage of scrapie type '3' than observed in the lowland breeds (Table 2).

Table 2. The percentage of sheep in each scrapie category according to breed type.

	Scrapie Type*				
	1	2	3	4	5
Purebred Lowland animals (No. = 7254)	66.4%	28.1%	4.8%	0.5%	0.2%
Purebred Hill animals (No. = 129)	19.4%	45.0%	32.6%	1.6%	1.6%

* 1 = ARR/ARR; 2 = ARR/AHQ, ARR/ARH, ARR/ARQ; 3 = AHQ/AHQ, AHQ/ARH, AHQ/ARQ, ARH/ARH, ARH/ARQ, ARQ/ARQ; 4 = ARR/VRQ; 5 = AHQ/VRQ, ARH/VRQ, ARQ/VRQ, VRQ/VRQ

- *The animals breed profile*: For breeds with a sufficient number of genotyped purebred animals, breed profiling is now possible. Breed profiling determines the animal's exact breed based solely on the genotype result. This helps to give flockbooks confidence when an animal has unknown ancestry and wants to enter the flockbook, that the animal is indeed purebred. The more animals that are genotyped for a breed, the better the predictions become.
- *Genomic inbreeding*: It is well known that inbreeding should be avoided as it leads to inbreeding depression. Inbreeding depression is the loss of production due to inbreeding within the animal itself. Recent research based on dairy cattle in Ireland has shown that for every 1% increase in inbreeding, milk production dropped by 0.5%. The range of genomic inbreeding typically ranges from 0-13% in the sheep genotyped to date. Therefore, both breeders and farmers need to be aware of and avoid it. Currently, the most common method of avoiding inbreeding amongst hill farmers is to purchase from different breeders each time, but this cannot guarantee that inbreeding is avoided. Ancestry information, combined with genomic inbreeding, can provide more information to help remove the chance of breeding animals with high inbreeding levels, reducing the flocks potential for lamb and ewe performance.
- *Genomic evaluations*: Genomic evaluations increase the accuracy of estimated breeding values (EBV's; EuroStars), by comparing the DNA of the newly genotyped animal to that of all the other well-recorded animals in the database. If their DNA is similar to that of other top performing animals, we can predict that they will perform to a similar level. Traditionally, the EuroStars of a new stock ram was heavily based on how his ancestry performed, and how he performed as a lamb himself. Breeding the ram and recording how his progeny performed was the only way to find out more about the rams breeding potential. To see how his daughters perform in the maternal traits, a farmer would have to wait years for those daughters to grow and have their own lambs. If it becomes apparent that the rams maternal genetics is lacking at this stage, years have passed, and he now is the sire of a significant percentage of the ewes in the flock. Genomic evaluations increase the accuracy of a rams EuroStar evaluations at a much younger age, reducing the risk of poor genetics entering the flock, resulting in a more profitable and easier to manage flock. When genomic evaluations were launched in 2020, the average accuracy of the genotyped animals increased by 17%.

Technology

EID tagging for all sheep has added an extra cost to the production system. One way to combat this is to harness the ability it gives to quickly record lots of information with an EID reader that can then be used



to make more informed management decisions. Sheep Ireland released a free recording app in 2018 that connects to EID readers via Bluetooth. The app can record matings, pregnancies, lambing, weights and health, all in real-time, removing all paper for flocks that choose this option. The app also works while the phone is not connected to the internet, an essential feature for many hill flocks in more remote areas. The Sheep Ireland recording website has continuously improved since its inception, with new features and reports added every year. There are now 850 pedigree flocks signed up to the LambPlus performance recording programme, of which only three breeders submit their data on paper. This demonstrates how user friendly the website has become. The Sheep Ireland team are also available to guide people through the process for those who are less confident using a computer/app.

Options for flocks or flockbooks who want to start

There are several levels at which a flockbook can be established (Table 3). Level one requires minimal additional resources compared to Level 3, which could significantly change some flocks farming systems. There is a solution for all flocks and flockbooks, by contacting Sheep Ireland and discussing the options, you can find the best level for your needs.



Table 3: A example of three different entry points for a flockbook to be established, beginning with the most basic level one, to the most advanced level three.

Level 1: Genotyping all stock rams No change to the farming system required	All stock rams are genotyped. This allows for monitoring of inbreeding, breed purity and scrapie resistance. It also means that every new stock ram entering the flockbook should have a sire assigned based on genomic parentage predictions.
Level 2: Single sire mating (SSM) Some additional tasks to be completed. Ewes split into mating groups, and lambs tagged at birth	Building from Level 1, all the purebred ewes in the flock are added to the flockbook and their mating information recorded. At lambing, lambs are tagged, and their mother and sires details are recorded. This will result in both the sire and dam ancestry information building up.
Level 3: Full performance recording Requires the greatest level of input. However, it also gives the greatest results	This is one step on from Level 2. Breeders record additional information that is important to them, such as lamb weight gain, survivability, or health traits. The data collected on each flock leads to better management decisions within the farm via LambPlus reports, as well as providing genetic evaluations for the customers who wish to select based on EuroStars

Green Shoots

As already mentioned, two hill flockbooks have been established in the last 12 months with almost 30 flocks between them. The aim is to build a strong core with several breeders who are dedicated to the breed and ancestry recording. These flockbooks were set up with the combined effort of the breeders, Teagasc and Sheep Ireland.

The first step that each flock joining each flockbook must complete is to genotype every stock ram in the flock. This means that if any lamb from the group is genotyped in the future, we can be confident that the correct sire is identified. The stock rams are also the most influential animals in the group. Therefore they are the most important animals to genotype to help fine-tune genomic evaluations and breed predictions in the future.

The second step in setting up the flockbook is to set up all the animals in each flock. There are two ways to set up a flock. First, the breeder can send Sheep Ireland a list of all the ewes in the flock and their estimated age and any other recorded data over the years. The second option is that a Sheep Ireland, Teagasc or flockbook representative visit the flock and read all the ewes with an EID reader and which ram they were mated to.

Single sire mating (SSM) is critical to developing a robust hill flockbook. Single sire mating means that only one ram can mate with the ewe per cycle, combined with the lambing date allows the lambs sire to be easily determined. While parentage can easily be assigned via genomics, it is currently not feasible to genotype entire hill flocks given the cost of genotyping versus the animal's value. The current cost of genotyping for the genotyping service is €24.50 per animal (LambPlus flocks can avail of a subsidised rate of €15 per animal). The cost of genotyping has decreased 10 fold in the last 20 years, and we expect that it to reduce further in the next five to ten years.

A number of these flocks (not all) have also decided to performance record their flock in 2021. They see performance recording as the best way of identifying the underperforming animals (ewes or rams) in the flock. Having EuroStars available for the sheep can also help them promote and sell their animals in the future.

How can farmers support this initiative?

The number one way farmers can support this initiative is to support these breeders when purchasing your next stock ram. These breeders have invested more time and money so that their customers can make the most informed breeding decision. The only way these breeders can sustain this effort in the long-term is if they see support from their customers.

Take-Home

The infrastructure and technology is now in place to make parentage recording possible in hill flocks. The flocks that stand to gain the most from parentage recording are those wishing to sell breeding rams. To ensure they maximise the benefit, they (along with Teagasc and Sheep Ireland) must explain why it is essential to buy a ram with known ancestry to their customers. The breeder or farmer can then record the rams sold between the pair in the past, allowing the farmer to potentially return to the same breeder the following year and select a ram from a different bloodline without fear of inbreeding.



Flockbooks will deliver:

- Protection from breed dilution from other strains and inbreeding
- A foundation for systematic breed improvement
- A great platform to help promote the breed



Ticks and tickborne diseases in Ireland

Annetta Zintl,

UCD School of Veterinary Medicine, University College Dublin, Ireland.

Take home messages

- The sheep tick, *Ixodes ricinus* is mostly found in woodland areas and in the thick leaf layer of rough pasture
- Tick-borne fever (Anaplasmosis), redwater fever (Babesiosis), louping ill, tick pyaemia and Lyme borreliosis are all associated with tick infestations
- In addition to acaricides, stable flock management and restricting access to tick-prone areas are effective control measure against ticks

Distribution and biology of the sheep tick, *Ixodes ricinus*

By far the most common tick in Ireland is *Ixodes ricinus*. Also known as the ‘Castor bean’ or ‘sheep tick’, *I. ricinus* actually parasitises a very broad range of hosts including birds, mammals and even reptiles. Although it readily engorges on sheep its preferred hosts are deer. As a matter of fact, sheep are unusual in that they are able to develop resistance to tick bite following an infestation. Ticks that engorge on resistant hosts detach prematurely and die, and adult females may produce less offspring. Though generally hardy and resistant to most adverse environmental conditions, *I. ricinus* cannot withstand dry conditions for extended periods of time. Therefore, ticks are mostly present in areas with good vegetation cover and a thick layer of leaf litter. In drier locations in continental Europe only woodland and forests provide suitable habitat. However, due to the mild and humid Irish climate, ticks in Ireland are also frequently found in open hill- and rough grazing land, particularly along the western seaboard and the Shannon catchment region (Zintl et al 2020). Ticks generally become active and set out to locate a new host once air temperatures rise above 7 to 10°C. Interestingly the exact temperature threshold at which *I. ricinus* becomes active depends on the origin of the tick population, i.e. ticks that are established in cooler climates become active at 7 to 8°C while ticks from warmer regions only emerge to search a new host at approximately 10 to 11°C.

Ticks feed exclusively on blood. Even though they can live for up to 5 years (the average life span is 3 years), they take just three blood meals during their life time, one as larvae, one as nymphs and one as adults. Engorgement takes between 2 to 8 days for larvae, 4 to 10 days for nymphs and up to 13 days for adult females (adult males apparently do not engorge). Between feeds ticks shelter from adverse conditions in the vegetation and leaf litter where they digest their blood meal and moult to the next stage, or, in the case of the adult female, lay their eggs.



Ixodes ricinus female
in search of a host

Clinical significance of ticks in sheep and cattle

While the bite may cause some local irritation and very heavy infestations, particularly with adult female ticks, may cause anaemia in the host, ticks by themselves usually do not cause serious disease to livestock. However, serious problems can arise in young lambs (between 2 to 12 weeks of age) where *I. ricinus* infestations may give rise to tick pyaemia. Tick pyaemia is caused by *Staphylococcus aureus*, a bacterium that occurs naturally on the skin and nasal mucosa of the animal. The bacterium gains access through the bite wound and gives rise to abscesses in various parts of the body, such as the tendons, joint muscles and brain, causing severe lameness, paralysis of the backend, ill thrift and, frequently, death (Rocchi & Sargison 2015). In some cases up to 30% of the lambs in the group can be affected.

In addition, *I. ricinus* itself can inject pathogens into the wound during engorgement. Because each life cycle stage (i.e. larva, nymph and adult) feeds only once, a disease agent must be able to persist in the tick during the long periods between feeds and through the moult, in order to be passed on to a new host during the next feed. Between feeds the microorganism disseminates throughout the tick's organs and multiply, usually without affecting the fitness of the tick. In Ireland, there are four important tickborne pathogens:

1. *Anaplasma phagocytophilum*, the causative agent of tickborne fever,
2. Louping ill virus,
3. *Babesia divergens*, the cause of redwater fever in cattle and
4. The bacterium that causes Lyme borreliosis in humans.

Although no actual surveillance information is currently available, *A. phagocytophilum*, the tickborne fever agent, is thought to be the most common tick-transmitted pathogen in livestock in Ireland. *A. phagocytophilum* is a bacterium that invades and multiplies inside the host's immune cells (i.e. the white blood cells). The first indication of infection is a high fever in naïve livestock that have been moved to a tick-infested pasture (Woldehiwet 2020). The fever usually develops within a week of exposure to an infectious tick bite and lasts for about two weeks. While older animals typically make an uneventful recovery after which they are protected against reinfection, young lambs may fail to maintain contact with their dam during this time, resulting in high rates of morbidity and mortality. Pregnant animals that are newly introduced into endemic areas may be more likely to abort. In dairy cows the most notable sign is a significant and sudden drop in milk yield. In addition to the transient fever, *A. phagocytophilum* also causes immunosuppression, making the infected animal more susceptible to other diseases such as tick pyaemia, respiratory infections and louping ill (Woldehiwet 2020).

Louping ill is an acute viral disease also transmitted by the tick *I. ricinus*. Primarily associated with sheep, louping ill virus also infects other domestic animals including cattle, goats, pigs, horses and dogs. Moreover, it is thought that infections in red grouse are partially to blame for the decline of the bird species (Rocchi and Sargison 2015). Following infection the virus first multiplies in the lymph nodes and other tissues before being released into the blood stream. During this time infected animals often show unspecific signs such as fever, depression and lack of appetite. Many animals make an uneventful recovery, and are subsequently immune to reinfection. However, some develop severe disease as the virus invades the brain and spinal cord, resulting in muscle tremors, incoordination, circling, ataxia, paralysis and death.

Another tickborne pathogen which does not infect sheep but is an important parasite of cattle in Ireland is *Babesia divergens*, the causative agent of bovine babesiosis or redwater fever. Infections in cattle are characterised by sudden onset of high fever, anorexia, thirst and diarrhoea. Widespread destruction of red blood cells causes severe anaemia and gives rise to the typical red colouration of the urine (whence the name of the disease). If left untreated animals infected with redwater fever become comatose and die. There is some evidence that redwater fever has declined in recent decades probably as a result of pasture improvement and the avoidance of tick infested land for pasturing cattle (Zintl et al 2014).



Treatment and control of ticks and tickborne diseases

Short-acting antibiotics are effective against tickborne fever, but there are no treatment options for sheep affected by tick pyaemia or louping ill. The best strategies for managing tick-transmitted diseases in high-risk areas are tick control and stable flock management. Chemical tick control plans can be drawn up for individual farms with the help of the veterinary practitioner as part of the flock health plan. Product data sheets should always be consulted for details of application, meat withdrawal periods and duration of protection. Plunge dipping provides immediate and effective treatment not just against ticks, but also sheep scab, blowfly, lice and keds. However, dips are harmful to humans and the environment and require appropriate personal protective equipment and correct application and disposal (Gottstein, 2007). Pour-on treatments are easier to administer but do not kill ticks immediately. As ticks often have a highly localised distribution it may also be possible to restrict access to tick hot spots on farms by judicious fencing or by allowing only the least susceptible animals in the flock to graze on tick-prone pastures.

Because local sheep in affected areas are usually resistant to tickborne disease, stable flock management is also a highly effective control measure. Where possible replacement animals should be bred on farm or sourced locally.

Finally on farms with ongoing problems, treatment with long-acting antibiotics may be used as a prophylactic measure against tickborne fever, while vaccination provides effective protection against louping ill. The added advantage of the louping ill vaccine is that it also provides protection for red grouse where present.

Lyme borreliosis

Although not a pathogen of livestock, we want to briefly address Lyme borreliosis because, like other outdoor workers, farmers are considered to be at increased risk from Lyme disease. The disease, which is named after Lyme, a small town in Connecticut where it was first described in 1975, is caused by tick-transmitted bacteria in the *Borrelia burgdorferi* species complex. Most people who become infected experience non-specific flu-like symptoms, often associated with a characteristic bull's eye-like skin rash, which resolve following antibiotic treatment. However, in some cases infections are associated with dermatological, arthritic, cardiac and neurological symptoms. Because of the multisystem presentation and the broad range of unspecific symptoms that have been reported, an unequivocal diagnosis of Lyme borreliosis can be difficult and estimates of its true prevalence in the population vary widely. In the popular media it is often claimed that the incidence of Lyme borreliosis has been increasing in recent years. However, a study in our laboratory found that tick infection rates with *B. burgdorferi* have not changed since the 1990s (Zintl et al 2020). Similarly, concerns that climate change may cause an increase in tick numbers in Ireland (as has happened elsewhere) have so far proven unfounded. However, continued vigilance by farmers, veterinarians and scientists can provide an early warning system of changes in endemic ticks and tickborne diseases and introduction of exotic ones.

New project on tick-borne fever

In collaboration with Tim Keady and John Mee, Teagasc; and Seamus Fagan, Shane Gettrick and Maresa Sheehan, the Regional Veterinary Laboratories in the Department of Agriculture, Food and the Marine; and John Gilmore FARMLAB diagnostics; we have recently commenced a new project on the prevalence of tick-borne fever and its contribution to lamb mortality in Ireland. Results from this study will start to become available in 2022.

We would like to thank MSD, Teagasc and VectorNet for their financial support of ticks and tickborne diseases research in UCD

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Asking the right questions for your farm

Dr Liz Genever

Independent sheep and beef consultant, Lincolnshire, UK.

Take home messages

- Make sure any records that are being collected are being used to help you address the questions
- Body condition score drives sheep production, and it needs to be monitored regularly
- Action is needed for ewes that are below the BCS targets at various stages and they should be managed separately if possible
- If dry ewes do not gain weight after one month of access to good grass or forage, veterinary investigations will be needed as it could indicate underlying issues, such as poor teeth or iceberg diseases, like Johnes
- Develop an understanding of your feed demand and appreciate the best way to meet most of it from home-grown grasses and forages
- Young ewes need to be prioritised to ensure their weight targets are met and their future breeding potential is reached

Introduction

We are on the cusp of radical change for farming, with unprecedented levels of opportunities and threats to the sheep sector. We need to see it as the start of a new movement, where farmers are at the very heart of the solutions for a sustainable red meat sector.

We cannot carry on doing what we do and ignore the challenges that are being aimed at farming. We all have a responsibility to question what we do and understand if we can make changes to improve performance and profitability, as well as reduce the impact of farming on the environment. Don't think that the movement is about "someone telling me how to farm" - it is an opportunity to make your farm more profitable and your time more rewarding.

Each year, sheep farms must deal with a different set of factors, such as grass growth, rainfall, health challenges, lamb performance and market prices. We need to focus on the ones that we can control.

Creating an action plan

We need to focus our determination, as we can't change everything all at once. It is very common for farms to be get focused on the day-to-day jobs and forget to step away and get an overview of the business. A clear vision for what you and your business is aiming to achieve will help to challenge decisions that won't help you achieve that vision. For example, the vision for the business is to be grass and forage-based, so is lambing happening too early?

The decision about the focus areas could be based on information from your farm records, benchmarking services, comments from processor group, high inputs connected with certain areas, a nagging feeling, a common frustration or a group decision from a local discussion group. It is impossible to target everything at the same time, so keep it simple and go for the ones that are generating the most stress - economically, environmentally or socially.

Remember that the most sustainable farms are the ones that match their production to their resources with the aim of the simplest system. This process is best started within a group, e.g. discussion group, or with a group of people connected to the business, e.g. with family members, vet, advisers or local reps.

Record keeping could be an area of focus, by prioritising your actions it means that it helps to highlight the most important records and how they can be used to assess progress. This means that time can be saved by not collecting records that won't be used.

1) Gather ideas for your farm (see template below with examples)

Action	How important? (A = very, B = fairly, C = not)
1 Lamb losses too high before eight weeks of age	A
2 Need to improve growth rates of lambs	A
3 Want to understand soil carbon levels	B
4 Want to reduce nitrogen fertiliser usage	B

2) Gather the best ideas into an action plan with timescales - this will help break down jobs into manageable chunks. Example for April lambing outdoor system

Action	Timing
<i>Short term (within one month)</i>	
1 Assess how much grass is on lambing fields	Feb
2 Assess body condition score of ewes at scanning	Feb
<i>Medium term (next two to three months)</i>	
1 Identify fields for pre-lambing rotation to avoid condition score loss	Mar
2 Ensure ewes are up to date on clostridial and Pasteurella vaccinations	Mar
<i>Longer term (next four to six months)</i>	
1 Monitor grass in lambing fields	Apr
2 Track lamb losses over risk period and record cause if known	May

There are certain actions that can only happen at certain times of the year, it could be good to map them out on a wall planner or in a diary. Set aside some time to review the figures and update your objectives. The key is that you identify quickly if that is the main problem or is it just a symptom of something else. For example, too many lean ewes at scanning could be the query, but it is linked to poor growth rates in lambs so more are about in the autumn, so you have less grass available for the ewes. If it turns out to not be a priority, then you think about another one.

Focus on body condition score

The factor that links most aspects of sheep farming is body condition of ewes, as it reflects how well the nutrition of the ewes is being managed. Body condition score should be assessed when the ewes are being handled for other jobs, and the most important element is to separate and manage the thin ones differently. Body condition score targets are well-established (see Table 1). Condition is assessed by placing a hand over and around the backbone and loin area behind the last rib to feel the amount of fat cover and muscle mass. Basically you are feeling for the sharpness of the spinous and transverse processes



coming out from the spine. For score 2, the spinous processes are prominent but smooth, individual processes being felt only as corrugations. The transverse processes are smooth and rounded, but it is still possible to press fingers underneath. The loin muscle is a moderate depth but with little fat cover.

Table 1: Body condition scores for range of breed types

Time of year	Hill breeds	Upland breeds	Lowland breeds
Tupping	2.5	3.0	3.5
Scanning	2.0	2.5	3.0
Lambing	2.0	2.5	3.0
Eight weeks into lactation	2.0	2-2.5	2.5-3.0
Weaning	2.0	2.0	2.5

The balance is important for hill breeds as more condition can mean more lambs, which has impact on availability of good grazing for twins. Optimum scanning percentage will vary for each farm depending on the resources available. Also hill breeds can tend to carry more fat internally, which can't be felt through the standard body condition technique.

Recent work has shown that condition score during lactation will affect the next year's fertility, which will not be corrected by getting condition on ewes after weaning. So priority needs to be given to grass quality and quantity during lactation to ensure they don't lose too much condition.

For ewes that are thinner than target, they need to be allocated to good quality feed (sward height between 4 and 8 cm) and monitored after a month. If they have not put on any condition they need to have veterinary investigations for teeth problems or blood or faeces tests for iceberg diseases, such as Johnes or Maedi Visna.

Track grass and forage availability

Farming systems are a balance between supply (grass, forage crops, bought-in feed or forage) and demand (number of animals, types, weight and production status). Body condition score is an indicator of how good these two are being managed. In hill systems, it can be challenging to monitor grass using compressed sward sticks or plate meter due to the range in grass types, so that activity should be focussed on improved land. During the main growing season, a monthly check of grass availability will help to understand if demand is being met by supply.

The pinch point of most sheep systems is the winter and availability of grass and other feeds to support the animals through the winter. Consideration is needed on how to reduce the autumn and winter demand to make sure that as much grass as possible is taken through to the spring to ensure good growth rates once the soil temperatures and day length increases. The ambition is that fields need at least 90 days of rest over the winter to give them the best chance to support the lactation of the ewes.

Prioritise young ewes

Another area of focus could be the management of young ewes as poor management during the rearing phase will affect lifetime performance. It is important to manage young ewes separately for as long as possible. Some systems are aiming to keep them separate until they have weaned their first lambs as shearlings (lambing at two years of age). This means that they can be prioritised in terms of feed quality. Most hill systems won't be mating as ewe lambs (lambing at one year of age) but there is quite a lot of

evidence that getting them to mating weight (65% of mature weight) and hitting puberty even if they are not exposed to rams is important for their future fertility. Growth rates to the autumn are important and then if they are not being mated until the following autumn, then their growth rate targets can be reduced once they have got up to weight. This means that they don't need priority feed during their first winter and that can be allocated to the females that were joined with rams.



Meet the Speakers

Wednesday, 17th February | 8pm

Hill Sheep Performance on a Better Farm

David McLaughlin, Hill Sheep Farmer, Donegal with John Cannon, Teagasc Advisor

David McLaughlin farms with his wife Linda and their family in Greencastle, Co. Donegal. The McLaughlin's run sheep and suckler cow enterprises on the farm with the sheep flock divided into hill and lowland flocks. They have been participants in the BETTER farm Sheep Programme since 2008 and have demonstrated clearly over the years that the targets set for both hill and lowland farms are consistently achievable through application of appropriate technologies and management strategies.



Currently a Teagasc Business and Technology adviser in Letterkenny, John is originally from a Sheep farm in West Donegal. He graduated from UCD in 1978 with a B. Agr. Sc. Degree and has worked as a drystock adviser in Donegal since then. Since graduating he has added a M. Agr. Sc. in Environmental Science and an MBA to his credentials and availed of a study trip to New Zealand. While many of his clients have both sheep and sucklers John has been leading the Teagasc sheep advisory team in Donegal for the last 12 years. John does a lot his advisory work via discussion groups. He set up his first discussion group in 1999 and is currently working with five sheep groups and one suckler group. He has been sheep adviser to David and Linda McLaughlin during their period in the Teagasc Sheep BETTER farm Programme.



Generating flock books for hill flocks

Kevin McDermott, Sheep Ireland

Kevin McDermott is the Sheep Ireland manager. Sheep Ireland is the national body responsible for improving the rate of genetic gain in the Irish Sheep Industry. Growing up on a sheep and beef farm near Moville, Co. Donegal, Kevin pursued a career in agriculture by graduating from UCD in 2011 with a degree in Animal & Crop Production. Following this, he completed a research Masters in ewe and lamb nutrition in late pregnancy at the UCD Lyons Research Farm.

Since joining Sheep Ireland in 2013, Kevin has focused on improving the rate of genetic gain in Ireland via improved genetic evaluations, better performance recording infrastructure, and farmer education. Significant strides have been made, and lessons learnt in each of these areas to date, specifically in the lowland sector.

The hill sector is currently under-represented in the national breed improvement programme as there is less of an underlying breeding structure compared to the lowland sector. This is something he would like to see change, and some new initiatives and technologies have recently started to do just that. These will serve as examples of what can be achieved via parentage recording and genotyping in pedigree hill flocks.



Meet the Speakers

Thursday, 18th February | 8pm

Ticks & tickborne diseases in Ireland

Annetta Zintl, University College Dublin (UCD)

Annetta is a zoology graduate of Trinity College Dublin, Ireland, where she also completed her PhD at the Departments of Zoology and Biochemistry. Following this, she worked for several years as a post-doctoral and Newman fellow in the Veterinary Sciences Centre, University College Dublin. Annetta currently teaches veterinary immunology and parasitology to veterinary medicine and veterinary nursing students as a lecturer in Parasitology and Immunology at the UCD School of Veterinary Sciences in University College Dublin. Her research interests focus on the epidemiology, detection, transmission and control of various parasites with the chief aim of investigating their importance for animal and/or human health in Ireland. Her long-term research interests are common and emerging parasites of livestock and ticks and tick-borne diseases.



The Importance of monitoring body condition in pregnant ewes

Liz Genever, Independent Beef and Sheep Consultant, UK

Liz Genever has a strong technical background and works with beef and sheep farmers across the UK. Her knowledge covers livestock production, grazing systems and sustainable farming techniques. She works with farmers who want to challenge their current practices, particularly on grass and forage utilisation. She is one of the founders of Carbon Calling, which has the aim of building a community of farmers who support and learn from one another to make their farm and themselves healthier and happier.

She is a farmer on a mixed farm in south Lincolnshire and has an Australian Cattle Dog called Scout.







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