Signet
BREEDING SERVICES

THE NATIONAL HILL SHEEP BREEDING EVALUATION

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INTRODUCTION

ACHIEVEMENTS THROUGH SELECTIVE BREEDING

Hill flocks in the UK have been involved in weight recording programmes for over 50 years. The reason breeders were interested in flock recording back then are the same today. Breeders need an unbiased way to find those rams and ewes in the flock with the best genetic potential.

It is difficult to identify the best sheep by eye alone, particularly for maternal traits. For this reason, new approaches have been developed to analyse the data collected on individual animals to get a fuller picture of the flock's performance and that of the individual sheep within it.

In the last 50 years massive advances in flock identification, record keeping, ultrasound scanning, handling systems, computing power and more recently, genomics have transformed our ability to use this basic information to identify and breed from sheep with superior genetics.

The value of genetic improvement to the UK sheep industry already exceeds £10.7 million per annum (Abacus Review, 2015) and at the farm gate, the value of lambs sired by high index sires can easily exceed £3–£4 per lamb. There are even greater gains in maternal breeds where genetic gains are expressed year after year.

This booklet explains how hill sheep producers can get involved with performance recording services and take their flock forward.

WELSH MOUNTAIN RAMS BELONGING TO SIMON AND RHODRI LLOYD-WILLIAMS. SELECTIVE BREEDING IN THEIR FLOCK HAS REDUCED THE NUMBER OF SINGLE BORN LAMBS BY APPROXIMATELY 15%, WHILE SIMULTANEOUSLY LIFTING WEANING WEIGHTS

THE BENEFIT OF RECORDING HILL SHEEP

Performance recording gives ram breeders and commercial ram buyers an objective way to assess the genetic potential of rams selected for breeding.

Performance records add value to the sheep enterprise in two ways:

1. Adding value to ram sales.
2. Increasing flock productivity.

ADDING VALUE TO RAM SALES

Performance records can add value to sales directly by:

- Achieving a higher average sale value
- Selling more rams, with better clearance rates

Performance records enable buyers to purchase rams with confidence, compare rams between flocks and buy better quality stock. Buyers are now seeking rams with records, so it pays to record.

INCREASING FLOCK PRODUCTIVITY

Both the flocks that performance record and those flocks buying rams from them will benefit from any genetic improvement that is made, this both lifts flock productivity and enhances overall profitability.

Access to breeding values not only enables the retention of the best ram lambs for breeding; they are also an invaluable aid in the selection of ewe lamb replacements.

Rams with high Breeding Indexes will:

- Sire heavier lambs with better conformation, capable of being finished more quickly
- Generate productive ewes with excellent maternal performance

WHAT'S NEW IN HILL SHEEP RECORDING?

Research completed as part of the Welsh Sheep Breeding Project enabled a major review and relaunch of the recording services delivered to hill sheep producers.

In 2020, a new multi-breed approach was launched: the National Hill Sheep Breeding Evaluation.

A series of enhancements were made, including:

- Updating existing Estimated Breeding Values (EBVs) to make them more accurate and commercially focused
- The development of new EBVs for maternal traits
- More regular analyses, with results produced every month
- Providing new, unrecorded breeding lines with a fairer starting point

The following EBVs are produced as part of the National Hill Sheep Breeding Evaluation:

Influencing the number of lambs successfully reared by the ewe

- Birth Weight
- Lambing Ease
- Lamb Survival (under development)
- Litter Size Born
- Litter Size Reared
- Maternal Ability

Lifetime productivity and efficiency of the hill ewe

- Mature Size
- Ewe Longevity (under development)

Weight and quality of lambs sold from hill flocks

- Eight-week Weight
- Scan Weight
- Muscle Depth
- Fat Depth

The overall impact of new evaluation is a set of breeding values that are more relevant and easier to interpret by commercial ram buyers.

A NEW BREEDING INDEX FOR HILL SHEEP

Independent Sheep Geneticist, Janet Roden has developed a new hill sheep Breeding Index. The Index aims to increase the overall productivity of the hill ewe. More information on page 7.

HOW DO I GET STARTED?

Most hill breeds in the UK performance record through Signet Breeding Services and it is simple to get started.

1. Fill in a Signet contract indicating the breed and size of your flock.
2. Decide whether you would rather supply data online or via on-farm software. Paper based services do exist, but usually incur an extra charge.
3. Using paper records or the output from on-farm software, provide Signet with details of the ewes and rams in your flock.
   - Provide a one- or two-generation pedigree where known

DATA SUBMISSION

The main ways to supply data are:

- Spreadsheets – often generated from on-farm software
- Online at **www.signetdata.com**, where clients can enter lambing records and weights

Accurate and timely on-farm data collection is at the heart of any recording system.

These are the key times when data is needed:

At lambing. For each lamb provide details of sire, dam, sex and date of birth. Fostering information and records of dead lambs are important. The provision of birth weights and lambing ease scores is optional and clearly of less relevance on the hill, than in terminal sire flocks.

Weigh lambs between 6 and 12 weeks of age to get an adjusted 8-week weight. Remember to record if lambs have been in different management groups.

Contact a technician to scan lambs at around 20 weeks of age to weigh lambs and measure ultrasound muscle and fat depth.

Prior to mating, weigh the shearling ewes that are going to the ram.

Breeders can also supply weights and body condition score data for mature ewes if convenient and of interest to them.

WHAT DO I RECEIVE FROM SIGNET?

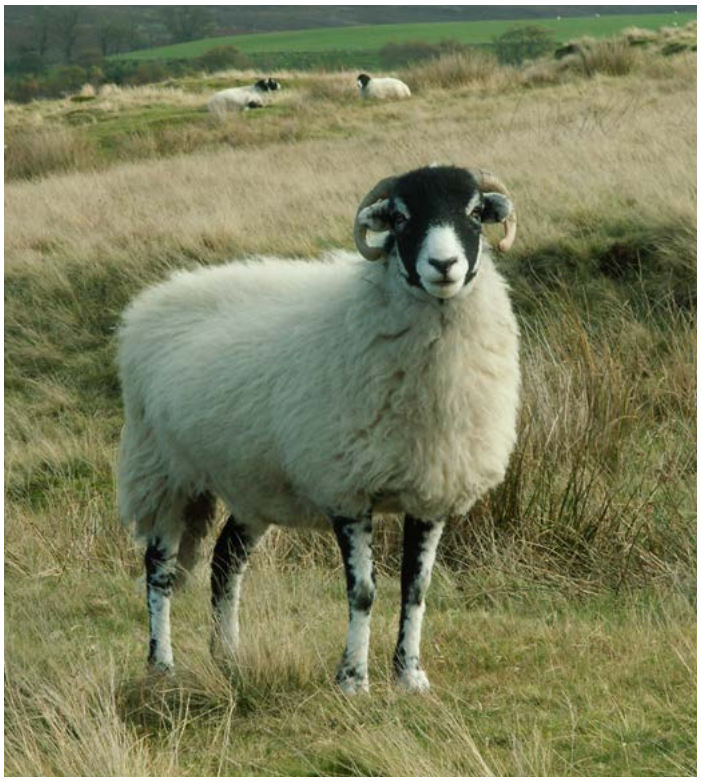
The principle of performance recording is to convert pedigree information (family relationships) and performance records (physical measurements) into breeding values to enable animals to be ranked based on their genetic merit.

A statistical analysis is used to determine how much of each animal's performance is due to their genetics and how much is due to environmental influences, including the farm of origin, their sex, age and rear type.

In each analysis, three types of breeding information are produced:

- Estimated Breeding Values (EBVs)
- Accuracy values
- Breeding Indexes

EBVs predict an animal's breeding potential for a specific trait, whilst accuracy values indicate how good of an estimate this is likely to be, given how much is known about the animal and its relatives.



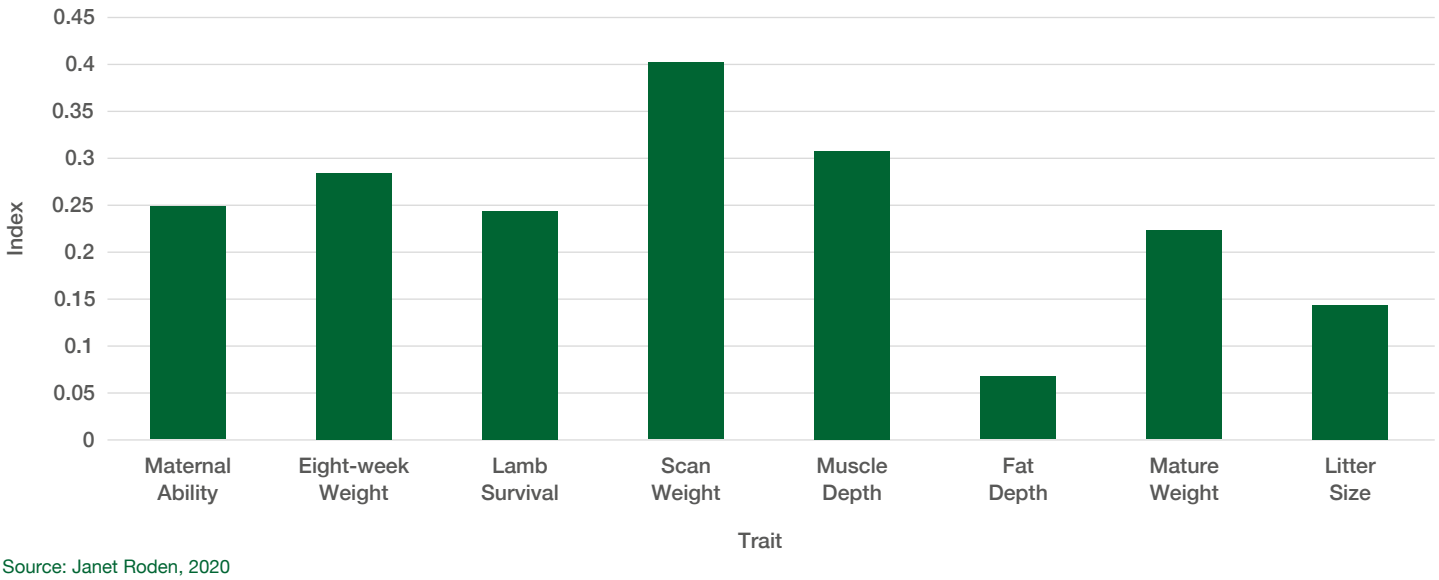
A NEW HILL SHEEP BREEDING INDEX

EBVs help breeders to select breeding stock for specific traits, but they can also be combined into Breeding Indexes. Each trait is weighted within the index according to its economic importance in meeting a specific breeding objective or objectives.

The Breeding Index used in hill flocks has recently been updated using a bio economic model that takes into account flock performance over a range of hill-farming systems. Independent Sheep Geneticist, Janet Roden developed the Index to optimise the performance of hill sheep. Index weightings take into account both the value of lambs sold, the benefits of increasing ewe longevity and lamb survival and the costs associated with increasing ewe mature size.

INDEX CUSTOMISATION – A NEW WAY FOR BREEDERS TO LEARN ABOUT INDEXES

For breeders that are interested in Index weightings and wish to test their own ideas, a new online service is available from Signet that enables 'Index customisation'. Funded by HCC and AHDB, this new breeding tool shows breeders how animals in the flock would rank if index weightings were changed and allows them to create Indexes to meet their specific needs.



Source: Janet Roden, 2020

Figure 1. Relative change using the new breeding index for hill flock (standard units)

WHERE CAN I FIND INFORMATION?

All of the breeding values generated in Signet's sheep breeding programmes are available online at **www.signetdata.com**

A simple search function provides open access to the breeding values of millions of animals. In addition to this, lists of leading sires, ram lambs and shearling rams are also publicly available.

On the Signet website, commercial ram buyers can also find:

- EBV Search – enabling potential buyers to find rams that meet their specific breeding objectives
- Flock Finder – a list of recording breeders
- Sheep for Sale – a list of recorded sheep that are for sale

INDIVIDUAL FLOCK REPORTS

Breeders are sent electronic reports containing breeding values once scanning data has been submitted for analysis. These reports contain updated breeding values for all of the lambs, shearlings, stock ewes and rams within the flock.

WHEN DO I GET REPORTS?

Signet currently produces a monthly analysis and the latest breeding values will always be found online at **www.signetdata.com** Reports are sent out after new lamb weights have been submitted.

Breeders can also generate their own reports directly from the database.

WHAT SHOULD I DO WHEN I GET MY REPORT?

1. Check the information is correct and inform the service provider of any amendments.
2. Consider your breeding objectives. Which traits do you wish to improve through selection?
3. Identify ewe lambs/shearlings with high genetic merit and good physical assessments to be retained in the flock. Identify those with low genetic merit to be sold.
4. Identify stock sires that have performed well in previous years and consider retaining homebred ram lambs with good breeding values.
5. When purchasing a new stock ram always check its current EBVs.
6. Review your genetic progress over time. The Signet website provides breeders with the opportunity to see the progress they are making for a given trait.

REMEMBER

EBVs and Breeding Indexes are an important guide to aid selection decisions, but you still need to use your shepherding skills to ensure the retention of good quality, structurally sound and functional sheep.

RECORDING A LARGE HILL FLOCK

Breeders with large flocks stand to gain the most by improving the genetic merit of their sheep, particularly when it comes to maternal characteristics which are nearly impossible to enhance without records.

Understandably, many breeders are daunted by the task of collecting and recording the data, but these tips may help.

TIPS FOR SUCCESS

- **Create a breeding nucleus** – you don't have to record your entire flock. The key to a successful nucleus is selecting the right foundation animals. Don't do it on the appearance of older ewes, you may overlook hard-working ewes in poorer condition.
  Better approaches might be to select ewes that reared twins the previous year or the heaviest ewe lambs within a group
- **Adjust lambing dates** – enthusiasm for recording tends to drop over time. Consider lambing the nucleus flock earlier or later than the main flock and keep the lambing period tight
- **Recording birth weight and lambing ease is not essential** – this data is useful, but not crucial within hill breeding evaluations
- **Not every lamb needs to be ultrasound scanned** – if you are interested in maternal characteristics and growth, consider just scanning a sub-group of your lambs. If you don't scan all your lambs, please do weigh the rest at scanning time
- **Collect weight data around other tasks** – e.g. weaning or drenching
- **Use labour saving devices that make recording easier** – these range from distance readable tags, to more complex EID, farm software and handling systems
- **Involve your shepherd** – whoever is involved in collecting data needs to understand the importance of accurate data. Take time to explain why rams are selected using their EBVs and how it will improve flock performance

ULTRASOUND SCANNING

Ultrasound scanning provides breeders with the opportunity to assess the carcase quality of their sheep.

WHY USE ULTRASOUND TO ASSESS MUSCLING?

Unlike growth rate, it isn't easy to identify sheep with superior muscling across the loin. Ultrasound images enable breeders to select animals with superior loins and avoid those with a high level of carcase fat. While this measurement simply reflects muscle depth across the loin, research indicates that selective breeding for muscle depth can greatly enhance total meat yield.

RAW DATA OR ESTIMATED BREEDING VALUES (EBVS)?

As with any raw performance data, muscle and fat depth measurements are affected by non-genetic factors such as age at scanning and flock nutrition. It is important that breeders select based on muscle and fat depth EBVs, rather than on the raw data alone.

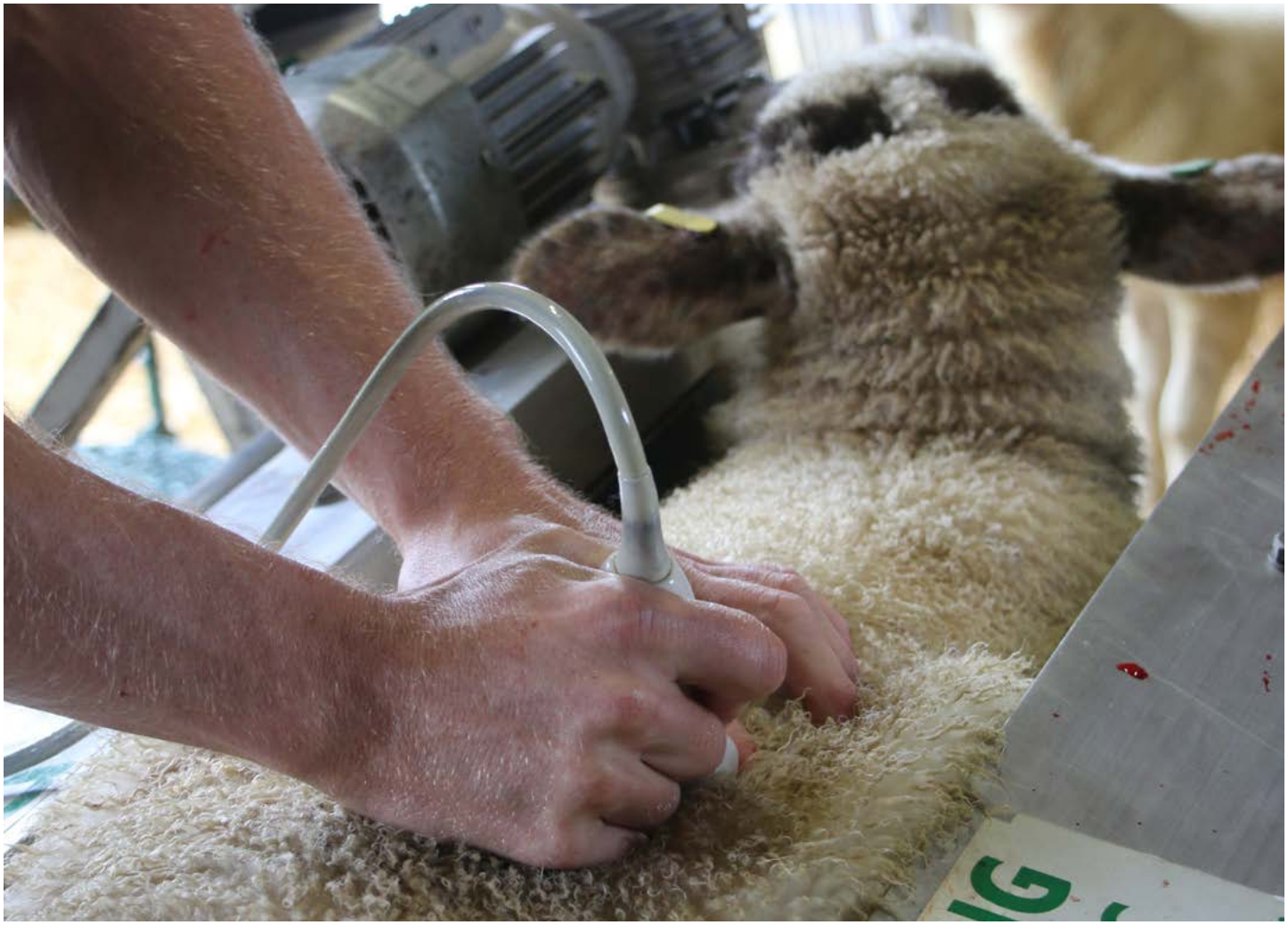
WHAT IS INVOLVED?

The technique involves parting the wool and applying liquid paraffin at the third lumbar vertebra at 90 degrees to the backbone. The transducer is adjusted until a clear image of the eye muscle and fat layers can be seen on the machine's screen. A single measurement is taken of muscle depth at the deepest point and three measures of fat depth are taken at 1 cm intervals. These measurements are then submitted to Signet for inclusion in the forthcoming breeding evaluation.

WHEN DO I SCAN?

In the past, Signet recorded flocks have been scanned at around 21 weeks of age onwards. However, in recent years, Signet changed their guidance to focus on the weight of lambs at scanning rather than their age. It is recognised that adjusting for the weight of the lamb is more commercially relevant and breeders now aim to scan lambs as they approach 40 kg, though for hill flocks it is recognised they will often be lighter.

Flocks can opt to scan a sub-sample of their lambs, but as a minimum we recommend that all potential male and female replacements are scanned – as well as any breeding sheep being sold to other flocks.



ASSESSING MUSCLE AND FAT DEPTH ON A WEIGHT-ADJUSTED BASIS

The UK sheep industry were pioneers in the use of ultrasound scanning technology to assess muscle and fat levels across the loin. Historically, traits like muscle depth have been adjusted for age within the analysis to identify those lambs that will lay down the most muscle at a certain age, regardless of weight.

Sheep with high Muscle Depth EBVs, might achieve them in two ways:

- Being big, as genetically bigger sheep tend to have more muscle
- Having a high muscle depth relative to their weight

However, breeders can already select for growth rate using the Scan Weight EBV and a better approach is needed to assess muscling independently from growth, i.e. the ability to compare levels of muscling at a fixed weight, rather than a fixed age.

Within Signet's breeding evaluations, this new approach has been widely implemented to help breeders to select more muscular lambs at a fixed liveweight.

COMMERCIAL CONTEXT

The new approach is advantageous for commercial producers as lambs tend to be drawn on their weight (and finish), not their age. Commercial producers want lambs with the right amount of muscle and fat (finish) at a set weight, say 38 kg liveweight – not a set age and the new EBVs help achieve this.

In maternal breeding lines where female replacements are retained, it enables producers to breed lambs with a better yield of meat in their carcase without generating large increases in ewe mature size. This is an important consideration in breeding programmes where the efficiency of the ewe is important, particularly when farming in the hills and uplands.

IMPLICATIONS FOR BREEDERS

Work completed by Janet Roden, Independent Sheep Geneticist, has shown the new approach will result in faster genetic gain in muscling at a fixed weight.

Breeders benefit from the fact that weight-adjusted traits tend to be more heritable than age-adjusted traits. However, they also tend to show less genetic variation and the scale of any EBVs produced on a weight-adjusted basis will be smaller.

When selecting for weight-adjusted traits, breeders should be aware there can be a negative relationship between the amount of muscle and fat within the carcase. With weight-adjusted traits, the size of the animal is assumed to be 'fixed' so if it has more muscle, it tends to have less fat and vice versa. This explains why some of the gains made in the amount of muscle in the carcase in recent years has resulted in a reduction in the amount of fat in the carcase.

NEW HILL FLOCKS

The establishment of a new flock recording programme takes time. Many of the ewes in the flock are only being assessed on the basis of a couple of lamb records and early culling decisions should be made with care.

In the first year, focus on the differences that can be seen between the sires (as they will have the most accurate breeding values).

REMEMBER

A ram's genetic merit for maternal traits can only be assessed through female relatives. For a brand new stock ram, it will take a couple of years for these to be assessed through daughter records, unless his female ancestors have been recorded. This is where accuracy values can prove useful in helping to make breeding decisions.

Take care in making comparisons between the EBVs for your flock with those in other flocks unless there is good genetic linkage between both flocks.

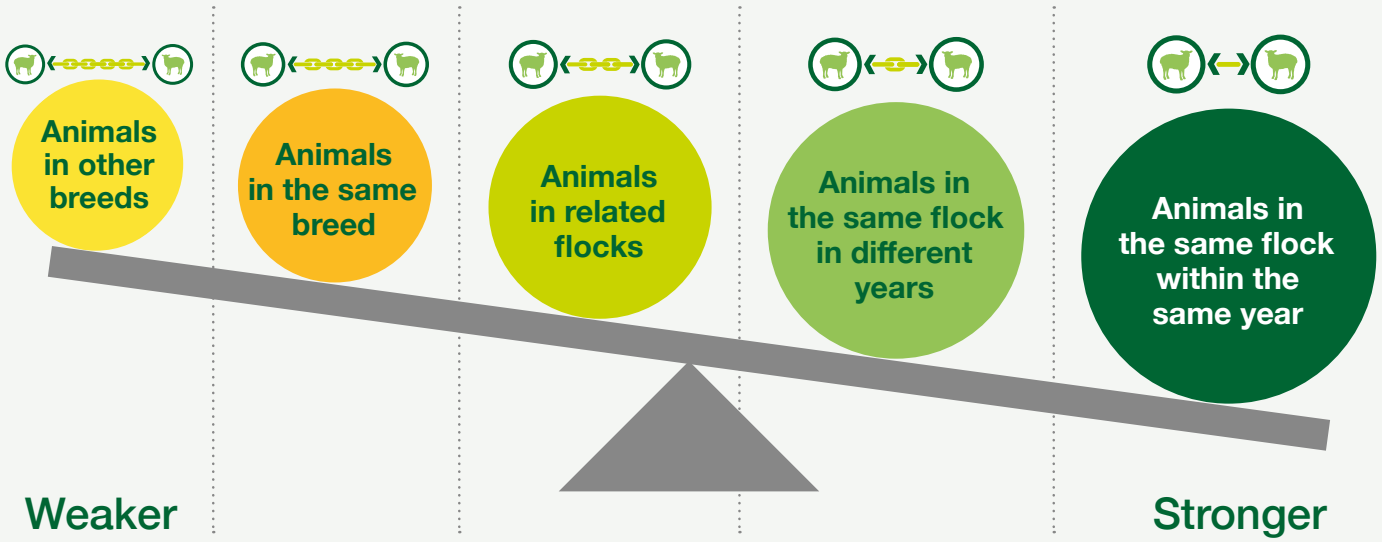
COMPARING SHEEP REARED IN DIFFERENT FLOCKS

Although all flocks are analysed within a multi-flock evaluation, to enable accurate comparisons to be made between flocks there needs to be some genetic linkage between them, in other words some common genetics used between the flocks through shared or related rams.

Whilst it is a challenge maintaining genetic linkage between flocks, by working together breeders can enable robust comparisons to be made. To build linkage, breeders are advised to exchange or share some Signet recorded rams of known genetic merit. Older stock rams, with progeny on the ground create particularly good linkage.

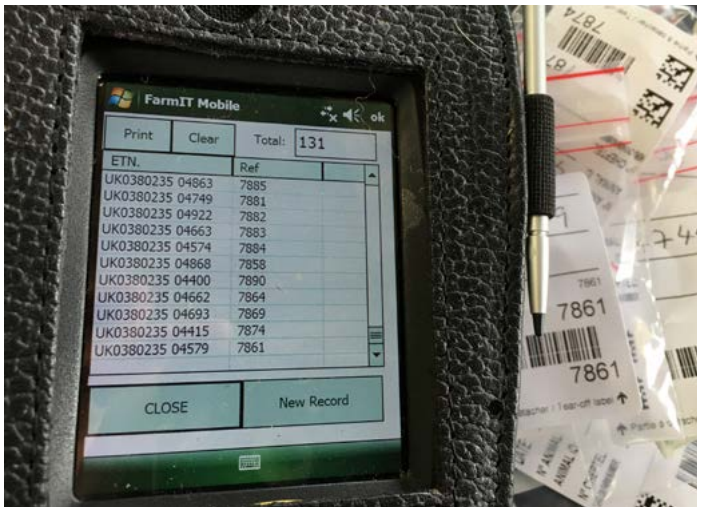
A new online tool to report the degree of genetic linkage that exists between flocks is being developed, visit **signetdata.com** for the latest news and updates.

STRENGTH OF COMPARISON



HILL FLOCKS USING DNA PARENTAGE

In recent years, a number of flocks have opted to use ‘DNA parentage’, using tissue samples taken from sheep within the flock, to determine the parentage of lambs.



The use of this ‘genomic information’ can be a highly effective way to accurately assign parentage without the need and cost associated with extra labour/housing at lambing time – or direct contact with the ewe. This approach also enables breeders to mob mate the flock, thus reducing the risk associated with single-sire mating/ram infertility.

When mob mating, care needs to be taken to match suitable individuals together, taking into account the genetic attributes and breed type that you wish to combine in their offspring.

Greater thought is also required to avoid increases in inbreeding when flocks are mob mated. Signet can provide breeders with free access to inbreeding software to make these decisions easier.

TIPS FOR SUCCESS

1. In large flocks, create a nucleus of elite ewes – those from whom male and female replacements are most likely to be kept.
2. Get all of these selected ewes and the stock rams they are mated with, tissue sampled in advance of lambing.
3. Record which rams were run with a given group of ewes.
4. Avoid running closely related rams together with a mob of ewes, such as full brothers – as this may make it harder to assign paternity to the correct sire.
5. It is still important that a date of birth is recorded. Approaches to recording dates of birth include:
   - Age of the foetus at pregnancy scanning
   - Drift lamb ewes, batching them together based on the date they lambed
   - Record lambing dates using distance readable tags/numbers sprayed onto the side of ewes

AN INVESTMENT IN GENOMICS

The major challenge with genomic technology is obviously the cost. This investment has to be returned to the breeder through an increase in flock performance, ram sale revenue or a saving to the enterprise, for example in the labour used at lambing time.

A significant outlay is required in the first year, with both parents and lambs needing to be genotyped. In successive years, the overall costs are lower, with only the lamb crop needing to be genotyped. Breeders should bear in mind, this is a rapidly changing area of technology and genotyping prices have reduced considerably over the decade. For some ram breeders, these developments are starting to bring this once expensive and unaffordable technology within reach.

FIT FOR PURPOSE HILL RAMS

Selling rams is what sheep breeding is all about. However, to ensure future success breeders need to produce rams that producers want to buy repeatedly.

For a commercial buyer, rams are costly to purchase and therefore must last at least three or four mating seasons. However, too many die or have to be culled after just one or two years.

OVERFEEDING

There have been concerns for many years that some breeding rams are overfed and that this may limit their working life and the number of ewes they will cover. Overfeeding can also mask a ram's genetic merit for traits such as grazing ability and parasite resistance.

In recent years, ram buyers have been increasingly active in looking for rams that have been performance tested under forage-based conditions.

HEALTH STATUS

The introduction of a new ram into the flock brings with it the risk of introducing disease. Help your customers by knowing the status of your flock for diseases like Maedi Visna, Border disease, OPA, CLA and Ovine Johne's disease.

Ensure rams are not carrying resistant parasites or foot infections that could be spread within the flock.

A JUDGEMENT CALL

Every breeder will need to reach a balance where rams have been tested and recorded under commercial farming conditions, but also look the part when presented for sale. Extreme rams, overfed or badly presented, are not likely to find a buyer.

By producing what the market wants and needs, ram buyers can be encouraged to invest with confidence in rams with superior genetics – reassured they will have a long and productive working life.

MARKETING RECORDED RAMS

Ram buyers do not make their decisions solely based on a ram's genetic merit and appearance – other features such as the health status, after-sales service and breeder reputation all play their part.

There are many ways sellers can influence ram purchasing decisions; thinking more about their 'product', their customers and how they communicate with them.

With so much effort going into producing high-quality breeding stock, it is a pity not to maximise returns by poor or non-existent marketing.

FIVE MARKETING IDEAS

1. Consider what are the unique selling points for your ram and farming business? Do your customers understand the benefits they bring?
2. Remember different things motivate farmers. Some will rate your expertise, some value the rewards obtained from investing in your genetics, while others simply buy because of the self-satisfaction it brings.
3. Make your breeding information accessible:
   - Send promotional mailings/emails to potential and existing customers
   - Report EBVs in sales catalogues
   - Print EBV sale charts for animals directly from the Signet website
   - Use social media to reach out to potential customers
4. Develop a database of past and present customers with details of previous purchases and current contact details
5. Think about your marketplace: prepare and present your rams accordingly. The appearance of a ram is still important. EBVs explain a great deal about an animal's genetic potential, but at a multi-vendor sale, poorly presented rams are unlikely to sell.

BUILDING A RELATIONSHIP

Post-sale engagement with buyers is just as vital as pre-sale engagement. Getting to know your buyers and allowing them to get to know you, through newsletters, emails or social media posts, is a great way to drive repeat custom.

Signet BREEDING SERVICES

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