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# Preliminary feasibility study for a sheep efficiency data tool

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An output from SRUC's Underpinning National Capacity – Support for Policy as part of the Scottish Government Environment, Natural Resources and Agriculture 2022-2027 Strategic Research Programme

Ann McLaren & Nicola Lambe

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SRUC
Hill & Mountain Research Centre
Kirkton Farm
Crianlarich

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# 1 Introduction

To help deliver the aims of the *Vision for Agriculture* and the Scottish Government's commitment in the *Climate Change Plan*, there is a need to improve the environmental and economic efficiency of the livestock sector. Steps towards this have been made in the cattle sector with the development of the MyHerdStats tool (developed by SAOS/ScotEID). The tool provides keepers with basic statistics relating to their herds, from which they can assess performance and make informed management decisions. However, to date, there is not a similar tool available for sheep. Although some data are already being collected from sheep flocks, through the ScotEID system, for the development of a future "MyFlockStats" tool, additional data collection may be beneficial.

Flock keepers will often be collecting additional information and recording data, whether it be to aid their own flock management decision-making or for the purpose of specific schemes or initiatives (for example, those associated with Quality Meat Scotland (QMS) Cattle and Sheep Assurance Scheme Standards). There may therefore be opportunities to incorporate or combine some of this additional information into a future "MyFlockStats" tool but, at the moment, the availability of any additional information and the logistics of collecting, coordinating, analysing and sharing it is unclear.

## 1.1 Objective

The objective of this work is to determine what additional data would be beneficial, alongside the existing statutory data currently recorded through ScotEID, to incorporate into a "MyFlockStats" decision-making tool to help drive efficiency in the sheep sector.

This report is intended to be a preliminary feasibility study to inform any future development, commissioning and operation of a "MyFlockStats" system to assist in the improvement of efficient sheep production in Scotland as part of the aims of the *Vision for Agriculture*.

## 1.2 Methodology

Available information was collated and reviewed, through on-line and literature searches and discussions with a small number of key government, industry and academic stakeholders, to determine what data are currently collected through ScotEID and what other potential data sources are available to collect additional data relating to efficiency of sheep production. Reference is made to MyHerdStats to understand if a sheep tool could align with what is successfully recorded in cattle.

Additional data requirements from sheep that would support on-farm decisions were reviewed and the availability and feasibility of collecting these data assessed, as well as their potential for central collation.

# 2 Current data collected/available through ScotEID

As described in the "ScotEID – *making data work for the Scottish livestock industry*" document, the ScotEID database allows the real-time traceability of livestock from the farm of origin, through the supply chain, until they enter the food chain (ScotEIDBookletFinal.pdf). The system uses the County Parish Holding (CPH) numbers, allocated to each farm/holding, auction mart and abattoir, to follow the movements of individual livestock. In addition to data recorded on farm, and between farms, a series of EID tag readers have been installed at Critical Control Points (CCP's), which include auction marts and abattoirs, to read each sheep tag as they pass through. The information collected is then fed directly through to ScotEID.

## 2.1 Keeper details

The keeper registration summary in the ScotEID system includes the CPH number for the holding (for both sheep and cattle), the address of the holding and the name of the keeper. The UK-number herd/flock mark associated with the holding, the type of production (meat, wool or hobby) and the main sheep breeds on the holding are also displayed. Additional information, including the flock/herd assurance number can also be provided.

## 2.2 Sheep movements

When animals pass through CCP locations, their EID tag information is read, and the information is passed on to the ScotEID database. If the CCP is not the final destination of the animal, for example a movement through an auction mart sale, the auction mart read location and the destination details (of the buyer) will also be included. In addition to the individual tag numbers, the time and date of the tag reading, and batch information, if applicable, are also collected.

## 2.3 Sheep holding register

Under the Sheep section of the ScotEID homepage, there is a section titled "Holding register" which presents an inventory table for the current year and the previous year. There is the option to use this register, voluntarily, to maintain stock counts throughout the year. Data can be added for the overall inventory number at the beginning of the year (1st January), the number of additional animals tagged during the year (e.g. lambs), deaths and black loss (unexplained/unaccountable losses). Use of the ScotEID sheep holding register is optional at the moment, but farms will already have this information recorded elsewhere (paper records or on farm

management software) to meet farm assurance criteria (for example as part of QMS standard 1.5) and to comply with legislation.

Data automatically added to the inventory includes the number of animals (or EID tags) read at various CCP's. These numbers are broken down to those moved on/off from an auction mart or to an abattoir. Private moves, directly between two different holdings, can be uploaded using a .txt. or .csv file. Alternatively, data can be uploaded using the ScotEID desktop application (supported by a number of different EID tag readers) or through an integrated farm software package. According to the ScotEID website, 6 different providers are integrated with the ScotEID webservices (AgriWebb, SHEEPdata, FarmIT 3000, NLMD-LT, Gallagher Dashboard & FarmWorks by Shearwell Data Ltd).

Moves registered by paper, through SAMU (Scottish Animal Movement Unit) can also be shown on the same screen as the automatically added data (by selecting this option) and will appear highlighted in yellow. Paper moves may not have all EID tags listed but will have an overall number of animals and the departing and destination CPH details.

# 3 Current data collected from sheep farming systems in Scotland

## 3.1 Sheep and Goat Inventory & Agricultural Census Data

The completion of the inventory survey is a mandatory requirement for all sheep and goat keepers. In recent years, letters have been circulated to all registered keepers, providing them with instructions for completing the survey online (www.scoteid.com/survey). Information relating to all animals owned by the keeper, should be correct as of the 1st of December each year. (Guidance can be found at: Microsoft Word - DD eidts FINAL SGAI QA and Guidance 2023.docx (scoteid.com))

The sheep numbers required for the December inventory are broken down into 4 different categories:

- ewe lambs born that year that have been put to the ram that autumn.
    - *For example, all ewe lambs born in 2023 that were put to the ram in autumn 2023.*
- all other lambs born that year.
    - *For example, all additional lambs born in 2023 (including ram lambs, ewe lambs being kept for future breeding, wether lambs, store lambs and fattening lambs).*
- ewes put to the ram that autumn.
    - *Including yearlings and anything older.*
- and all other sheep born before that year.
    - *For example, all other sheep born before 2023.*

Note – a 5th category is also available for the total number of goats.

There is then the June Agricultural Census, which is contains 13 different sections relating to the overall farming system on the 1st of June each year. (Guidance can be found at: Agricultural+Statistics+-+June+Survey+2024+-+Form+0675+-+Guidance.docx (live.com)). Unlike the December inventory, the census can be completed online or on paper.

The sheep categories, in section 5 of the overall census, ask for:

- ewes that were used for breeding previously that year – and still on the farm on the 1st June.
- rams to be used/expected to be used for service in the autumn.
- other sheep 1 year and over and used for breeding.
- other sheep 1 year and over and not used for breeding.
- lambs (an estimate of lamb numbers is allowed if they have not been counted yet).
- An overall total (combining the counts from each of the 5 categories above).

Note, for both the inventory and census documents, farmers do not need to provide cattle information as this has already been collected, previously by the British Cattle Movement Service (BCMS), or more recently by ScotEID.

## 3.2 Animal health and medicine usage

The maintenance of medicinal purchases and treatment records is a legal requirement and mandatory for farm assurance schemes (for example QMS Cattle & Sheep Assurance Scheme - QMS | Cattle & Sheep Standards (qmscotland.co.uk)). The QMS cattle and sheep standards cover 11 different themes, based on animal welfare, environmental impact and food safety, plus those that form part of current legislation and overall good agricultural practice. As part of QMS standard 4.2, the owner or keeper of food producing animals must keep medicine records updated regularly and maintain these records for five years. The requirements cover medicine purchases (product name, batch number, date bought, quantity bought and details of supplier) and administration (reason for treatment, product name, date of administration, quantity administered, withdrawal period and identity of animals treated – group name or individual tag numbers). Information on any additional medicines administered directly by a vet should also be kept. Details of animal health issues and suspected causes of deaths should also be recorded (as part of QMS standard 3.2) and reviewed each year as part of a farm health planning process, in consultation with the local veterinary practice.

## 3.3 Farm Software Information

There is a range of farm software providers on the market, including the companies listed earlier who are integrated with the ScotEID web services. All provide tools to help farmers record data for their own management needs and to satisfy legislative

requirements and farm assurance schemes. Information associated with individual animal records (based on EID tag information), such as lambing information, pregnancy scan results, live weights, health treatments, tagging information, within or between farm movements, sales/death information, to name a few examples, can be stored on the software. In addition to being integrated with the ScotEID web service for registering movements, some software providers can also provide output files specifically designed for members of performance recording breeding schemes, allowing them to submit data directly from their software package to the breeding scheme in the correct format.

## 3.4 Breeding programmes

Flocks involved in performance recording schemes, provide flock data to genetic evaluation providers such as AHDB's Signet Breeding Services, Innovis or iTexel. The data used for these evaluations is based on individual animal performance records. The traits, influenced by the breed-type being recorded, often include those relating to both ewe and lamb performance. The core information that these schemes rely on is the individual animal's identification number, plus that of their sire and dam. Birth records for the lamb when they are born (including date of birth, sex, birth rank, breed and live weight) plus live weights recorded at approximately 8- and 21-weeks after birth. Reasons for death or exiting the flock are also now being collected (for all animals). Mature weights for ewes in the flock (recorded at pre-mating) are also often required. Previously only shearling ewe weights were required (approx. 1.5 years old), but this has now been expanded by some evaluation providers to include older ewes as well. The collection of ewe live weights when their lambs are 8-weeks old and at lamb weaning are also now being encouraged, as are body condition scores at each of these events.

## 3.5 Pregnancy scanning

As highlighted in the Scottish Government's "*Codes of Practice for the Welfare of Sheep*" the use of pregnancy scanning can be a valuable tool to aid management (Codes Of Practice For The Welfare Of Sheep). Animals can be split into management groups, based on their scan result, to help ensure they receive the correct nutrition and management throughout the later stages of pregnancy. The scanning results provide a starting number of lambs (or foetuses) present in each flock or management group. By monitoring lamb numbers from this point forward (by flock, by management group or by individual animal), farmers can build up information that will allow the assessment of any lamb losses. The QMS standard 3.2 includes scanning % as an optional performance figure to record (as not all flocks will pregnancy scan).

## 3.6 Fallen stock information

In many areas of Scotland, fallen stock (any animal that has died of natural causes or disease on a farm, or that has been killed on a farm for reasons other than human consumption) must be collected and removed from the farm, as soon as possible. Regulations make it illegal to bury or burn fallen stock on-farm. There are three main options for disposal available to farmers: they can make their own arrangements with an approved disposal operator; they can install their own approved incineration unit on farm; or they can join the National Fallen Stock Company (NFSCo), which provides a collection and disposal service. Members of the NFSCo receive a monthly statement summarising the categories and quantities of fallen stock collected. In addition, the recent development of the KoLeCt digital system allows farmers to use an App to help facilitate fallen stock collection and record individual tag numbers of the animals being disposed of. This will allow the individual animal tag numbers to be provided on invoices and annual compliance statements. It should be noted, however, that areas of Scotland that are classed as "remote areas" (most of the Highlands and Islands and Argyll) fall under a derogation from the ban of on-farm burning or burials of sheep.

# 4 MyHerdStats overview

Before looking in more detail at potential information/traits that could be beneficial for a future "MyFlockStats" tool, it is useful to give a brief overview of the information currently available to farmers through the MyHerdStats tool for cattle.

## 4.1 Performance indicators and trend information

The system is operated by ScotEID, on behalf of the Scottish government and the livestock industry. The platform brings together existing statutory traceability data to provide farmers with additional information relating to their herd. Currently, farmers have access to the following herd performance indicators and trends:

- **Calving performance**
  - Cows retained percentage
    - Based on repeat breeder information (or the proportion of cows that also calved the previous year).
  - Calves registered
    - Number of calves born and registered on farm
  - Cows calved
    - Number of cows calved on farm
  - Calving spread
    - Number of registered births by month of calving

- **Values of cow and heifer efficiency**
  - Cow calving interval
    - Number of days between consecutive calvings, plus overall average.

        - Number of cows with a 400-day calving interval or more.
    - Heifer age at first calving
        - Average age (months) to first calving, plus the overall average.
        - Percentage of heifers that calved between 22-26 months of age.

- **Cow and calf mortalities**
    - Summary of calf information (by breed)
        - Number born and registered on farm
        - Number of deaths
            - Of calves born on farm
            - Of all calves (born on farm or purchased)
    - Youngstock death profile information
        - The number of deaths of all male and female cattle (born on farm or purchased) that have not had a registered calf (split by month). This will also include any first-time calvers that had an unregistered dead calf.
    - All cows death profile information
        - All cow deaths on farm (split by month)

- **Sale data profile for breeding and youngstock**
    - Summary of numbers sold
        - Sales of cows
        - Sales of youngstock born on farm (male & female).
        - Sales of youngstock, born on farm or purchased (male & female).
        - Average age at sale of all youngstock (male & female)
    - Youngstock sale profile
        - Age of cattle when moved off the farm and the month of sale
    - Cow sale profile (numbers sold each month)

For all sections highlighted above, data are presented for the past year, plus an overall average for the previous 3 years, in a mix of data tables, histograms and histograms with trendlines added. The key areas of interest, for the system overall, include improving fertility, improving growth rates, reducing the number of unproductive stock and lowering morbidity and mortalities.

# 5 Summary of information/traits useful for assessing economic and environmental efficiency

## 5.1 System/management information

Data and information relating to efficiency should be considered within the context of the sheep sub-sector and management system. Useful information includes:

- Farm type (hill / upland / lowland)
- Farm enterprise information (target markets / products; sheep only / sheep and beef / sheep and arable / other mix)
- Farm size (land areas - of different categories; sheep numbers – of different categories)
- Stocking rates

- Sheep breed(s)
- Routine management (indoor / outdoor at key times; feeding regime)

## 5.2 Key performance indicators (KPIs)

Key performance indicators (KPIs) and benchmarks for lamb production have been given previously, for example by the Agriculture and Horticulture Development Board (AHDB) (Key performance indicators (KPIs) for lamb sector | AHDB) and the Farming Advisory Service (FAS) (fas.scot/downloads/an-introduction-to-benchmarking-sheep/; fas.scot/downloads/practical-guide-improving-ewe-efficiency-1/). These guidelines focus on several areas of production, with metrics either summarised at an individual level, or more commonly using averages across the flock. These can be summarised as:

- **Flock maintenance and animal numbers**
  - Ewe mortality rate
  - Ewes sold
  - Ewe replacement rate
  - Lamb mortality rate

- **Breeding ram information**
  - Number of ewes to the ram
  - Number of ewe lambs to the ram
  - Ram:ewe ratio – within groups and across the flock
  - Date rams joined ewes / lambing start date

- **Ewe maternal performance**
  - Scanning %
  - Barren %
  - Abortion %
  - Lambing %
  - Lambing intervention %
  - Lambs reared %
  - Lamb losses % (e.g. scanning to weaning)
  - Ewe condition score

- **Lamb performance**
  - 8-week live weight
  - Weaning live weight
  - Daily live weight gain
  - Age at weaning
  - Daily live weight gain post-weaning
  - Days to slaughter
  - Carcass weight output

- **Sale & slaughter information**
  - Date sold
  - Number sold
  - Stock type sold
  - Animal group weights at the market
  - Carcass weights & grades at the abattoir

- **Calculated efficiency measures (at flock / individual level)**
  - Kg lamb produced per ewe mated
  - % of ewe live weight weaned
  - Kg concentrates fed per ewe / lamb / kg lamb
  - Kg of live weight per hectare

- **Full economic cost of production**
  - Per lamb reared
  - Per Kg lamb live weight
  - Per Kg lamb carcass weight

- **Health traits**
  - Ewe lameness
  - Veterinary input

However, it should be noted that the difficulty with calculated ratio traits is that they can be influenced by the different component traits, which can confuse the understanding of the efficiency of the flock / individuals. For example, flocks could be awarded similar efficiency scores if they have large ewes producing many, heavy lambs, or relatively small ewes producing less and/or lighter lambs. There is an argument for considering outputs per unit of land, for example, to further understand comparisons.

Some benchmarking figures are given in these publications, sometimes splitting into different levels of success (e.g. performing well / room to improve / review performance; AHBD). In the FAS publications, some of the KPIs are given separately for hill, upland and lowland flocks, although this is not the case for the AHDB publication. Although the initial focus of these KPI publications is on economic performance of flocks, many of the KPIs listed are also important in terms of environmental impact and would be required for carbon footprinting.

The QMS Cattle and Sheep Assurance Scheme does not provide benchmarking figures but some of the above information is required as part of standard 3.2, and must include as a minimum: numbers born, numbers culled, numbers dying and suspected reasons for death (plus pregnancy scanning information if available). Whilst not a requirement, there are also recommendations to keep a record of: weights of livestock sold, weights of livestock during the growing and finishing periods, grading of livestock (where applicable) and market or abattoir feedback.

## 5.3 Ewe & Lamb losses

Animal losses are a major economic cost to lamb producers. Ewe and lamb losses within the flock are important to monitor, in order to understand some of the KPIs described above, but also in terms of animal welfare and environmental impact of the flock. Increased ewe mortality and reduced ewe productivity and longevity, resulting in increased replacement rates, will lead to an increase in the number of unproductive

animals in the flock per year, increasing GHG emissions per lamb or kg lamb product produced. Similarly, any lamb losses prior to slaughter will increase the average GHG emissions per unit of product from the flock. Depending on management and system, the timing and period covered for some of these specific KPIs may vary. For example, in some extensive hill systems, they may not have lambing data but will have data from the traditional “marking” gathers (often around 6-8-weeks after lambing).

## 5.4 Breeding ram information

Collecting information or data on mating practices could be desirable to understand any effects on flock efficiency linked to breeding strategies. Useful information to collect could include: number of ewes to the ram; ram to ewe ratio within groups and across the flock; ram breed; date rams joined ewes/lambing start date.

## 5.5 Lamb weights

Lamb weights are an extremely useful measure of efficiency that can be assessed alongside other farm and flock information. Although not routinely collected by a large proportion of sheep farmers on-farm, there are farmers who regularly record lamb weights, for example through farm management software, or as part of performance recording for breeding programmes. Within breeding programmes, individual lamb weights are generally measured at 8 weeks old and weaning.

Weights of groups of lambs are routinely measured at some markets prior to lambs entering the ring for sale, whereas individual carcass weights and grades are recorded for every lamb sold to an abattoir for slaughter.

## 5.6 Ewe weights

Ewe weight records allow relationships with lamb production to be assessed in efficiency metrics. Ewe weights could also be related to available land area and feeding levels of the flock in other efficiency calculations. Throughout Scotland, ewe size is likely to differ markedly due to breed, system, environmental conditions etc. Therefore, being able to account for ewe size or weight would have a large impact on accuracy of efficiency assessments.

## 5.7 Sales and slaughter

Information on sales of animals from the flock could provide useful information to assess production efficiency, particularly if on-farm data on ewe and lamb performance is scarce. Useful information to be collected could include: category of sale; date sold; number sold; stock type sold (e.g. breeding cast ewes, feeder/cull ewes, spare ewe hoggs, store lambs, fat lambs, etc.). Potentially also animal group weights taken at the market, or carcass weights and grades at the abattoir. There

may then be potential to link these data to other information on animal numbers on the home farms from farm surveys etc., to estimate efficiency metrics.

### 5.8 Animal health

Animal health is also an important area to consider in terms of animal welfare, flock productivity and efficiency. Although only ewe lameness and overall veterinary inputs were mentioned in the KPIs listed by AHDB and FAS (summarised above), other health issues are likely to impact on flock efficiency, for example mastitis and gastrointestinal parasites. However, efficiency metrics often concentrate on effects on productivity, rather than the underlying causes, such as health, genetics or nutrition. Further data recorded on potential underlying causes of changes in productivity would make it easier for farmers to identify causes and possible solutions to any reductions in production efficiency. However, these traits may be more difficult to record accurately in a way that can be related to productivity. The records to be kept for QMS Standards 3.2 and 4.2 provide an opportunity for farmers and their vets to review the health and performance of their flocks during their annual review (20230327-Annual-Livestock-Health-and-Performance-Review-Final-v03-EM.docx). More detailed recording systems such as Scottish Animal Health Planning System (SAHPS) and HerdPlus have attempted to try to help address this. The Scottish Governments "Evidence for the Hill, Upland & Crofting Farmer-Led Climate Change Group" report (2021), also highlights the relationship between animal health and methane emissions, with healthier animals achieving productive gains.

## 6 Feasibility of collecting data (flock level & individually)

### 6.1 Example scoring system

The feasibility of collecting the data summarised previously will differ depending on several different aspects. As an example, to break down some of these differences, Tables 1, 2 & 3 use a scoring system based on the level of ease to collect the relevant data required, across hill, upland and lowland flocks.

The scores are:

1 = Available for all without additional data collection.
2 = Available for all.
Requires basic count records / collation of farm information / routine data from 3rd parties (basic data collection, no on-farm technology necessarily required).
3 = Available for those with some technology.
For example, farm software, weigh crate, pregnancy scanning etc.
4 = Available as part of a more extensive performance recording programme.
For example, within an established breeding scheme.
5 = Not available.

## 6.2 System / management information data

As highlighted previously, considering data and information relating to sheep efficiency in the context of different systems of management would be beneficial. Sheep farms across Scotland are very diverse, therefore some initial information on type of system the data collected relates to would be useful. The information presented in Table 1 shows that most of this information can already be accessed through the annual inventory returns (those allocated a score 1). The additional data regarding breeds and routine management information would be available for all but would require additional data to be submitted (allocated a score 2).

Table 1 Ease of data collection scores relating to system and management information.

| System / management info | Lowland | Upland | Hill | Comment |
|---|---|---|---|---|
| **Farm type** | 1 | 1 | 1 | e.g. hill, upland, lowland |
| **Farm enterprise information** | 1 | 1 | 1 | e.g. target markets / products; sheep only / sheep & beef / sheep & arable / other mix. |
| **Farm size** | 1 | 1 | 1 | Land area – of different categories; stock numbers of different categories. |
| **Sheep numbers** | 1 | 1 | 1 | |
| **Sheep breed(s)** | 2 | 2 | 2 | |
| **Routine management** | 2 | 2 | 2 | e.g. indoor / outdoor at key times; feeding regime. |

**1 = Available for all, without additional data collection. 2 = Available for all – basic count records / collation of farm information / routine data from 3rd parties (basic – no on-farm technology necessarily required). 3 = available for those with some technology (farm software, weigh crate, pregnancy scanning etc.). 4 = Available as part of more extensive performance recording programmes, e.g. within an established breeding scheme. 5 = Not available.**

## 6.3 Key performance indicators (KPIs) data

The data presented in Tables 2 and 3 summarise many of the KPI's suggested by AHDB and FAS as useful to consider. Table 2 considers indicators generally associated with ewe and lamb performance and flock structure. Table 3 considers indicators associated with lamb sales, efficiency calculations, economic information and health. Both tables cover a very broad range of data types, with some easier to collect or calculate than others.

Data given in Table 2 relating to ewe replacement rate and the number of mature ewes and ewe lambs to the ram each year is already accessible from data submitted in the inventory. Data relating to mortality (ewe and lamb) and information associated with the mating period would be available for all farms but would require additional data to be submitted. Information associated with both maternal and lamb performance may involve some additional technology or equipment. Scanning %, barren %, abortion % and lamb losses have been allocated a score 3, since a pregnancy scanner is required for the initial scan data and to calculate abortions or lamb losses later on. The other traits associated with lambing (including lambing %, and intervention %) don't necessarily require any additional technology and can be collected using basic count data. However, in systems where lambing is more extensive and there is less intervention involved, the data may only be available for those participating in performance recording schemes. Ewe live weights, lamb live weights and live weight gains would require the use of a weigh crate and have therefore all have been allocated a score 3. The data collected could potentially be stored on a farm management software system. This may also involve an EID tag reader if collecting data for individual animal performance rather than average group performance.

Table 2 Ease of data collection scores relating to flock maintenance, breeding, maternal and lamb performance.

| Key Performance Indicator | Lowland | Upland | Hill | Comment |
|---|---|---|---|---|
| **Flock maintenance** | | | | |
| **Ewe mortality rate** | 2 | 2 | 2 | Included in the QMS Health and Performance Figures - Standard 3.2 – as part of the overall on farm deaths & culls sections |
| **Ewes sold** | 2 | 2 | 2 | |
| **Ewe replacement rate** | 1 | 1 | 1 | |
| **Lamb mortality rate** | 2 | 2 | 2 | Included in the QMS Health and Performance Figures - Standard 3.2 – as part of the overall on farm deaths & culls sections |
| **Breeding & rams** | | | | |
| **No. of mature ewes for breeding** | 1 | 1 | 1 | |
| **No. of ewe lambs for breeding** | 1 | 1 | 1 | |
| **Ram to ewe ratio** | 2 | 2 | 2 | Within groups and across the flock |
| **Ram breeds** | 2 | 2 | 2 | |
| **Date rams joined ewes** | 2 | 2 | 2 | Or lambing start date |
| **Maternal performance** | | | | |
| **Scanning %** | 3 | 3 | 3 | Optional in the QMS Health and Performance Figures - Standard 3.2 |
| **Barren %** | 3 | 3 | 3 | |
| **Abortion %** | 3 | 3 | 3 | |
| **Lambing %** | 2 | 2 or 4 | 4 | Included in the QMS Health and Performance Figures - Standard 3.2 |
| **Lambing intervention %** | 2 | 2 | 2 | |
| **Lambs reared %** | 2 | 2 | 2 | |
| **Lamb losses % (scan to wean)** | 3 | 3 | 3 | Lambing to weaning or marking to weaning losses could be a score = 2 |
| **Ewe live weight** | 3 | 3 | 3 | |
| **Ewe condition score** | 3 | 3 | 3 | |
| **Lamb performance** | | | | |
| **8-week live weight** | 3 | 3 | 3 | |
| **Weaning live weight** | 3 | 3 | 3 | |
| **Daily live weight gain to weaning** | 4 | 4 | 4 | unless only average lambing and weaning dates are used (then all = 3) |
| **Age at weaning** | 2 | 2 | 2 | if average lambing and weaning dates are used |
| **Daily live weight gain post-weaning** | 3 | 3 | 3 | |
| **Days to slaughter** | 2 | 2 or 5 | 5 | average lambing dates. assume hill lambs sold store |
| **Carcass weight output** | 2 | 2 or 5 | 5 | using carcass data supplied by abattoir |

**1 = Available for all, without additional data collection. 2 = Available for all – basic count records / collation of farm information / routine data from 3rd parties (basic – no on-farm technology necessarily required). 3 = available for those with some technology (farm software, weigh crate, pregnancy scanning etc.). 4 = Available as part of more extensive performance recording programmes, e.g. within an established breeding scheme. 5 = Not available.**

Some of the data summarised in Table 3, associated with sale and slaughter information, can already be found on the ScotEID system (sale dates and the number sold) but, at the moment, it's not clear what type of stock was sold. It is currently not possible to identify which of the individual tag numbers listed on the system are mature cull ewes, correct breeding ewes, breeding ewe hoggs, store lambs, finishing lambs, rams etc. This information would be available from the farms, and potentially from the markets, but it would require additional data to be submitted. Live weight information will not always be available directly from markets, particularly for animals leaving hill flocks as store lambs.

The traits associated with efficiency calculations, as highlighted previously, should be considered with some caution due to the different component traits involved. Most are at the group level, but still require some technology to collect data involved, particularly in terms of weight information. For more specific efficiency ratios of individual ewes, additional information, including which lambs belong to which ewe, would need to be recorded. The economic indicators are a mainly a mix of scores 2 or 3, depending on the methods used to collect the data, but some information may not be available for groups of animals such as store lambs.

Finally, although only two health indicators were highlighted in the documents summarised, there is potentially a lot more information available in farm records. Information will be available from basic counts and records stored in the farm medicine records (or additionally in farm software systems). To satisfy QMS standard 4.2, records must be kept for the administration of all medicines (and these records should be retained for 5 years). The information that must be recorded includes the reason for treatment, the medicine administered and the animal's tag number/or group details.

Table 3 Ease of data collection scores relating sales and slaughter information, efficiency measures, costs of production and animal health.

| Key Performance Indicator | Lowland | Upland | Hill | Comment |
|---|---|---|---|---|
| **Sale & slaughter info** | | | | |
| **Date sold** | 1 | 1 | 1 | Available from ScotEID |
| **Number sold** | 1 | 1 | 1 | Available from ScotEID |
| **Stock type sold** | 2 | 2 | 2 | |
| **Animal group weights** | 2 or 5 | 2 or 5 | 2 or 5 | Not all markets weigh groups of lambs – e.g. some store sales |
| **Carcass weights** | 2 | 2 or 5 | 5 | Assuming hill lambs are sold store for finishing elsewhere |
| **Calculated efficiency measures** | | | | |
| **Kg lamb produced per ewe mated** | 3 | 3 | 3 | If live weights at weaning or sale used, if carcass weights then upland and hill may be 5 |
| **% of ewe live weight weaned** | 4 | 4 | 4 | Requires matching the ewe ID to lambs she rears |
| **Kg concentrates fed per ewe / lamb** | 2 | 2 | 2 | At a group / flock level |
| **Kg concentrates fed per Kg lamb** | 3 | 3 | 3 | At group / flock level, assume using lamb live weights at weaning / sale |
| **Kg of live weight per hectare** | 3 | 3 | 3 | |
| **Full economic cost of production** | | | | |
| **Per lamb reared** | 2 | 2 | 2 | |
| **Per Kg lamb live weight** | 3 | 3 | 3 | |
| **Per Kg lamb carcass weight** | 3 | 3 or 5 | 5 | Assume hill lambs are sold store |
| **Health traits** | | | | |
| **Ewe lameness** | 2 | 2 | 2 | |
| **Veterinary input** | 2 | 2 | 2 | |

**Key: 1 = Available for all, without additional data collection. 2 = Available for all – basic count records / collation of farm information / routine data from 3rd parties (basic – no on-farm technology necessarily required). 3 = available for those with some technology (farm software, weigh crate, pregnancy scanning etc.). 4 = Available as part of more extensive performance recording programmes, e.g. within an established breeding scheme. 5 = Not available.**

# 7 Summary, opportunities & challenges

Overall, from the detailed list of data and KPIs listed in this document, there are numerous options available in terms of building a data efficiency tool in the future. However, the list is very broad and further consideration should be given as to which options would answer the overall aim in a relatively simple and achievable way. For example, the key areas of interest in the MyHerdStats system were to improve fertility, improve growth rates, reduce the number of unproductive stock and lower morbidity and mortalities. Although the key interests for a sheep equivalent would be similar, there would potentially be a lot more work involved to collect data that could help to monitor and improve these key areas, depending on the level of detail required (by group or by individual).

For much of the information covered across Tables 1, 2 & 3, utilising EID readers would be beneficial to collect data and then store within a farm management software package. There may be the potential to link these systems further with ScotEID to upload and centrally collate data suitable for producing some key efficiency data and trends, similar to that currently available from MyHerdStats. Benefits of central collation of these data would include the potential for benchmarking across years and/or across similar Scottish sheep systems, and comparisons could be made that could be valuable for individual farmers to understand where their flock lies, in terms of different efficiency indicators, and where there is room for improvement.

The use of additional equipment or technologies have been shown to be beneficial for several of the KPIs listed above. Although the uptake of tools such as weigh crates and EID readers has perhaps been slow, there have been several initiatives run recently to try to improve uptake. Knowledge exchange activities have tried to improve awareness, understanding and confidence in using some of these tools by providing hands-on training sessions, farm demonstration days and accessible learning materials (e.g. events held by FAS - Home - Farm Advisory Service | Helping farmers in Scotland | Farm Advisory Service (fas.scot), QMS Monitor Farm Scotland - Monitor Farms | Monitor Farms Scotland & the EU-Horizon 2020 Sm@RT project Sm@rt | Sm@ll Ruminant Technologies Platform (smartplatform.network)).

The MyHerdStats system benefits from the statutory requirement that all calves must be tagged and registered at birth and their individual movements (and future calving performance) can be followed throughout their lifetime. To have the same level of detail across the Scottish sheep industry, would be extremely difficult. In many situations, it would not be possible to tag every lamb at birth. In fact, the age at which lambs are tagged can vary from those that tag at birth (often mainly as part of a performance/pedigree recording scheme) to those that tag their lambs shortly before they leave the farm heading to sale or to another farm. Additionally, the data associated with individual ewe performance, for example in terms of rearing performance, is often not available. This would potentially require intensive recording at lambing time or the use of DNA information (collected using a small tissue sample or a nasal swab), and early tagging of lambs, to be able to match ewes to their lambs and monitor their progress throughout the year.

However, for some of the KPIs listed above, it may be that overall group information is suitable and provides a good overview of how individual flocks are performing year on year. By building upon the simple count data already collected through the likes of the December farm inventory, June census and the QMS Cattle and Sheep Assurance Scheme, a picture of the overall flock performance could be built and areas for potential improvement could be highlighted.

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