Revised Meat Yield Module

SIL Technical Note

Subject:	**Meat Traits**
Relates to:	Meat yield merit, Lean yield, carcass weight
Date:	Revised September 2018.

Summary

- The revised Meat Yield module is based on updated genetic parameters (heritability and correlations), ultrasound scan, VIAscan, CT-scan and processor information. It reflects current processing weights (18.6kg), carcass composition and breeds.
- The carcass weight breeding value is now calculated in the Meat Yield module and uses live weight AND available meat data to predict the breeding value more accurately. Previously, it was only based on live weights.
- The Meat Yield sub-index rewards individuals with above average yield of lean tissue and is adjusted for carcass weight. The way carcass weight is calculated, this also changes the Lean and Fat Yield BVs (shoulder, loin, hindquarter and fat).
- The new Meat Yield module can use a range of meat data, ultra-sound, VIAscan, CT-scan and some processor cutting information. In time, other company systems can be added, when calibrated relative to CT-scan information.
- The Maternal Meat Yield sub-index only uses the Lean Yield components.
- The Terminal Meat Yield sub-index uses Lean and Fat Yield components. The penalty on fat is designed to slow the deposition of fat with increasing growth rates.

The revised Meat Yield module results in changes in meat yield traits but more accurately predicts merit for carcass weight and yields.

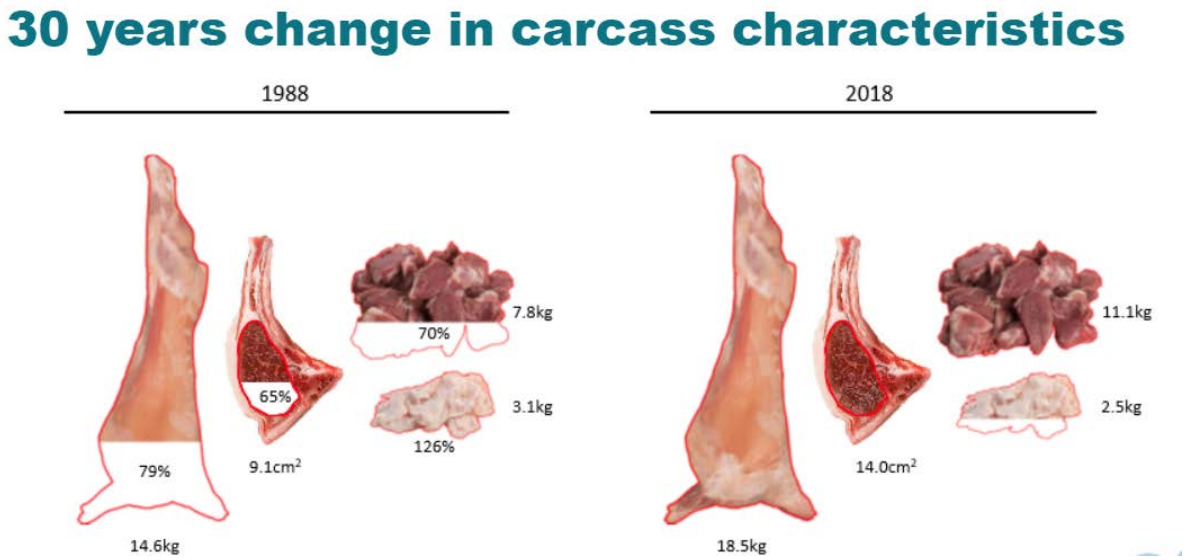
Background

The previous Meat module was based on experiments in the late 1980s using 14.6kg carcass weight Romney lambs. The parameters had been scaled over time to reflect the heavier average carcass weights that are now typical and to include additional measures of carcass information, such as VIAscan and CT-scan (Computer Tomography).

Over five years, a comprehensive study of the progeny of current industry sires – reflecting the current mix of breed types, carcass weight and composition typical of the current industry – has been completed. Progeny have been assessed across multiple measurement systems, using spiral CT as the gold standard to calibrate the other systems.

There has been considerable change in carcass composition in 30 years. Current carcasses (18.5kg) have about 60% of carcass weight as lean muscle and 13.5% fat, compared to 53% lean and 21% fat for the smaller 14.6kg carcass. See Figure 1.

Fig 1. Change in commercial carcass characteristics in 30 years



Carcasses are now heavier, with proportionally more lean tissue and less fat than in 1988.

Carcass Weight breeding value (CWBV)

Previously the Carcass Weight BV was derived only from growth information. Now, live weights and all available meat information are used to predict carcass weight merit with greater accuracy. With the increased number of progeny test flocks, there is more information on actual carcass weights and other meat traits. The CWBV is a component of the growth sub-indexes, Terminal Sire Growth (TSG) and Dual Purpose Growth (DPG).

SIL Meat Yield sub-index

SIL characterises carcass merit overall as the SIL Meat Yield sub-index. This uses the breeding values for Lean Yields – shoulder (SHLY), loin (LNLY) and hindquarter (HQLY) – and Fat Yield (FATY), but not the eye muscle area BV. Lean Yields are a more accurate indicator of merit than the eye muscle EMAceBV. The units for yield are kilogram lean (muscle) or fat per kilogram of carcass weight.

Yields are adjusted for carcass weight to identify animals above or below average at a given carcass weight.

The Terminal Sire Meat Yield sub-index consists of both Lean Yields and Fat Yield components. A negative weighting on Fat Yield is designed to reduce the rate of associated

fat gain with increasing lean tissue gain. It identifies animals that have a higher yield of lean tissue relative to fat for its size.

In dual purpose breeds, over-fatness is not currently seen as an issue and a degree of fatness is considered an important buffer for females, smoothing feed and demand requirements. The Dual Purpose Yield sub-index consists only of the Lean (muscle) Yield component. There is no FATYBV in the DPM sub-index.

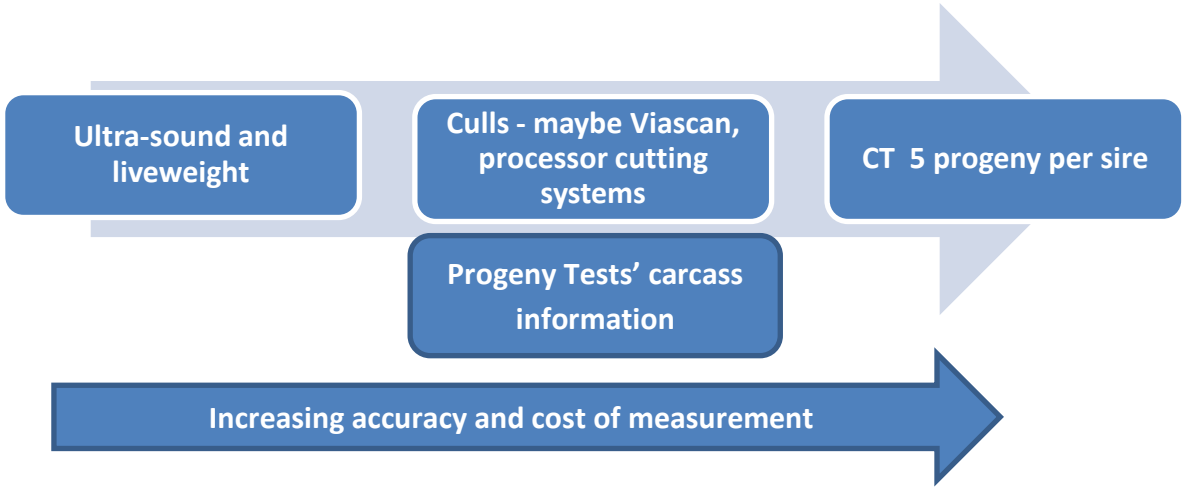
If dual purpose sheep breeders are concerned about low fat levels, they can ultra-sound muscle scan young animals and body condition score (BCS) ewes. The Body Condition Score sub-index uses the muscle scan information as an early predictor of body condition score, as well as using adult ewe body condition scores.

Recording Meat Yield information

Ultra-sound is the most cost-effective way of capturing yield information on the largest numbers of animals. It is recommended that a weight of all lambs is taken at ultra-sound scanning. If sufficient numbers of ram lambs per sire are available (20-25 minimum), it may be sufficient to only scan ram lambs. If there are insufficient progeny per sire (e.g. small flocks, small sire progeny group sizes), SIL recommends measuring both ewe and ram lambs to increase the accuracy of the meat yield prediction. Record eye muscle width, depth and fat depth – in both terminal and maternal breeds. Ultra-sound information on young animals is also used to inform body condition score, if recorded in maternal flocks.

Complete weaning weight data is important as it takes into account that not all animals have later measurements. This is important because it removes bias in estimates of genetic merit caused by earlier culling of smaller animals.

Fig 2. Increasing accuracy and cost of meat yield measurements



Additional information from VIAscan and processor cutting systems (calibrated within SIL) can provide additional information on culls or in progeny test situations where all lambs are

processed. More processor cutting or measurement systems (e.g. Dexa) will be added in time.

For CT scanning, it is recommended that animals are pre-screened on ultra-sound based merit and five progeny per sire selected for CT scanning. There are different levels of CT scanning, depending on the number of images across the carcass. Basic CT gives information on total lean, total fat and bone; more advanced CT gives information on the distribution of the lean and fat across the shoulder, loin and hindquarter regions.

Genetic evaluation

Heritabilities for carcass traits are moderate (c. 30%). There is a positive genetic correlation between fat and lean weights. This means animals that genetically have more lean (muscle), will generally have more fat. Consequently, if only muscle dimensions were measured, or if selection decisions were made on the basis of Lean BV (disregarding Fat BV), selection over time would lead to fat increasing with lean.

There is more variation in fat than lean muscle in carcasses.

The Maternal Meat Yield sub-index has no penalty on fat.

Reporting Meat Yield breeding values and sub-index

SIL recommends using the Meat Yield sub-index on reports, in conjunction with the Growth sub-index – because part of the variation in Meat Yield is reported in the CWBV, which is in the Growth sub-index.

Terminal Sire Meat Yield (TSM) consists of both lean and fat yields. Dual Purpose or Maternal Meat Yield (DPM) consists only of the lean yield components.

SIL does NOT recommend reporting actual measurements, as they have not been adjusted for non-genetic effects (e.g. size at measurement) or the performance of relatives.

Terminal sires can report Terminal Sire Lean Yield (TSLY) and Terminal Sire Fat Yield (TSFY) if they want to break the TSM into Lean (muscle) and Fat components. TSM = TSFY + TSLY

Meat Yield is not included in the New Zealand Maternal Worth index, although it does include CWBV in the Growth sub-index (which incorporates some meat information, when available).

Meat Yield is included in the New Zealand Terminal (NZTW) and Maternal Worth with Meat (MW+M) indexes.

Breeding values	Abbreviation	Comment	Units
Carcass weight	CW BV	Includes growth and meat yield information	Kg
Lean Yield	LEANYBV	Overall score of meat yield merit. Recommend to use this BV if not doing Viascan or CT	Kg yield/per kg carcass weight
Shoulder Lean Yield	SHLYBV	These can be useful to report if you have higher level CT which informs on how the lean tissue is distributed across the 3 regions otherwise a standardised breakdown is used.	Kg yield/per kg carcass weight
Loin Lean Yield	LNLYBV	As above	
Hindquarter Lean Yield	HQLYBV	As above	
Fat Yield	FATYBV	For Terminal breeds reporting LEANY and FATY BVs can show how an individuals meat yield merit is comprised.	Kg yield/per kg carcass weight
Eye Muscle Area	EMAc BV	The index does not use this BV – it is more accurate to use the LEANYBV but some breeders report it as commercial buyers can envision the trait.	

Using the SIL Meat Yield sub-index in selection

SIL recommends using the Meat Yield sub-index to improve carcass merit, in combination with using the Growth sub-index to increase growth. This will allow a breeder to identify genetically fast-growing animals with above average saleable meat yield.

It will increase carcass lean yield (Dual Purpose and Terminal) while keeping a governor on associated fat increases (Terminal sire breeds only).

Recording meat yield information

When to ultra-sound muscle scan?

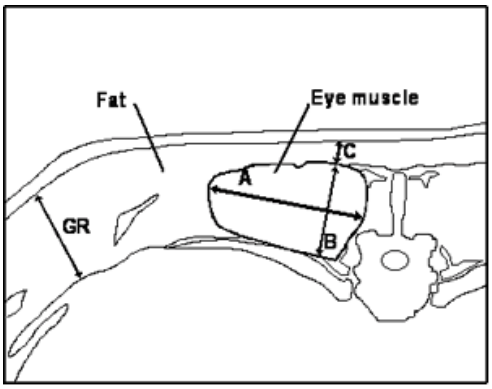
Scanning is usually done in the autumn, around 6-8 months of age. Where practical, it is best to collect live weights (LW6 or LW8) the same day as scanning – for both scanned and non-scanned animals.

Scanning at this age allows animals to express their genetic potential for growth and reduces bias due to other factors. Scanning earlier risks poor discrimination between animals (i.e. they aren't very different from each other at this point), while scanning later risks other effects influencing how animals rank (e.g. the effects of puberty, winter nutrition or health can differentially affect animals).

What is the best position on the animal to scan?

SIL estimation of genetic merit for carcass traits is based on scanning in the loin. The aim is to obtain a good image of the eye muscle (*M. longissimus dorsi* – see diagram below) from which tissue dimensions can be measured. SIL does not recommend a specific place (anatomical location) to scan. Some scanners scan in the region of the last rib, while some scan a few vertebrae further back. The most important thing is **CONSISTENCY**. The scan operator must scan in the same place for all animals in a mob within a year.

Differences between operators, including the site they scan at, will be accounted for by SIL when making adjustments between groups of animals, so that these do not cause bias in the rankings. For this reason, SIL needs to know if there were two operators scanning a large mob of sheep in a year (and which sheep were scanned by each operator). Similarly, where some animals were scanned at different times, the different mobs need to be identified. SIL bureaus can provide advice on what information you should collect in your situation.



What to measure at ultrasound scanning?

- Eye Muscle Width – EMW (A)
- Eye Muscle Depth – EMD (B)
- Fat Depth above eye muscle - FDM (C)
  (All measured in mm)
- Autumn liveweight (at time of scanning) – LW6 or LW8 or LW10 (*measured in kg*)

It is important to measure both muscle AND fat dimensions. Carcass lean weight is predicted from all scan dimensions, including fat depth.

Fat depth does not have to be measured directly above muscle depth. Some operators prefer to measure more laterally, nearer the outer edge of the muscle where the fat is thicker. This has the advantage of providing more discrimination between animals and measurement errors are smaller, relatively. The important thing is to be consistent about where the measurement is taken.

Dual purpose breeds should still be scanned for fat depth, even though it is not in the index – as it is required to work out the proportion of lean and fat in the carcass.

Which animals should be scanned?

SIL recommends that a flock scans a minimum of 25-30 progeny per sire per year. Smaller flocks may need to scan both ram and ewe lambs to achieve these numbers. In larger flocks, scanning only ram lambs is fine, if there are enough progeny per sire.

Getting good data

Assessing merit for carcass traits relies on obtaining good images at scanning. Animal handling should aim to maximise image quality by ensuring things run smoothly. Animals that will not stand still or in the same position are less likely to give good images. Experienced scan operators can advise how to set up your facilities to run smoothly.

CT vs Ultra-sound

CT scanning is a very accurate way of measuring carcass tissue size, as it obtains images in more carcass regions and uses whole carcass cross-sections to assess tissue areas.

However, CT scanning is expensive. The most efficient way to make use of it is to select the top 10-15% of animals based on genetic evaluation of ultrasound scan data and having these CT scanned. Generally, the value of CT scanning is best captured by large breeding populations, such as very large flocks or large-scale collaborative breeding groups.

Best practice for meat scanning

There are several things you can do at scanning to maximise accuracy of the genetic evaluation for carcass merit:

- **Scan in autumn at 6-8 months of age**
- **Good scanning facilities and set up**
- **Consistency**
- **Note and record different mobs**
- **Weigh lambs on the same day as scanning**
- **Scan enough progeny per sire**

Need more information?

- Contact your SIL bureau, local SIL adviser or call 0800-745-435 (0800-SIL-HELP).