Meat Scanning – best practice and how it is used to estimate carcass merit

SIL Technical Note

Relates to: Improving carcass merit
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Date: 22 May 2006

Summary

- The SIL Meat sub-index is used to predict carcass merit from ultrasound measurements of fat and muscle dimensions together with liveweights (weaning and autumn)
- Merit is estimated in terms of carcass lean weight (positive weighting) and carcass fat weight (negative weighting)
- It is important to weigh lambs the same day as they are scanned
- SIL recommends a minimum of 25-30 progeny be scanned per sire used each year
- **SIL does not recommend using actual scan measurements for selecting or purchasing rams. Indexes based on breeding values are better estimates of genetic merit**

Background

Historically, selection programmes for carcass merit in New Zealand aimed to promote lean growth. The aim was to increase carcass weights, primarily through increases in lean tissue. A Lean Tissue Growth index was developed to promote increases in lean while holding fat increases to a minimum. This index is incorporated into SIL indexes as a sub-index.

Meat companies currently base their payments on carcass weight, fat depth (GR) and age. A number of companies are working on methods of carcass quality payments related to the value of saleable meat yield.

Genetics of carcass merit

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), 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 would lead to fat increasing with lean.

Recording Information

When to scan?

Scanning is usually done in the autumn, around 6-8 months of age. Where practical, it is best to collect liveweights (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 (they aren't very different) while scanning later risks other effects influencing how animals rank (e.g. the effects of puberty, winter nutrition or health can differentially affect animals).

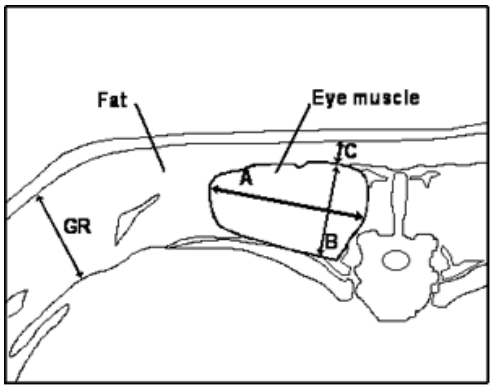
What is the best position on the animal to scan?

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, 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 above measures 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 relatively smaller. The important thing is to be consistent for where the measurement is taken.

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 OK 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 maximize 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 ensure facilities are set up to run smoothly.

<u>CT vs Ultrasound</u>

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.

Genetic evaluation

SIL predicts genetic merit for carcass traits from eye muscle width (EMW) and depth (EMD), fat depth (FDM), liveweight at scanning and weaning weight (WWT).

Weaning weight is important as it takes into account the animals that were weighed at weaning but do not have later measurements. This is important to remove bias in estimates of genetic merit caused by earlier culling of smaller animals.

Autumn liveweight is an important predictor of carcass tissue size. For two animals of similar LW, the animal with a higher fat depth has more fat. Conversely, for two animals of similar fat depth, the smaller animal is "fatter". SIL assumes that the autumn LW with the most data (LW6, LW8 or LW10) is that collected at scanning. This is usually the case for most flocks.

Eye muscle area (EMA) is not recommended for predicting genetic merit of carcass traits. This is because it is better to use two predictors (EMD & EMW) than one. The SIL evaluation will be most accurate if it uses EMD and EMW for prediction rather than one EMA figure.

Scan measurements are corrected for non-genetic effects such as mob, birth-rearing rank, age of dam and date of birth. Adjustments are made to estimates of genetic merit to take account of the performance of relatives. Animals not scanned themselves can be rated for carcass traits. However, estimates of genetic merit are more reliable when the animal is scanned itself.

SIL uses scan and liveweight measurements for individuals and their relatives to calculate genetic merit (breeding values) for **Lean weight** (muscle), **Fat weight** and **Eye muscle area**.

SIL Meat sub-index

SIL characterizes carcass merit overall as the SIL Meat sub-index. This uses the breeding values for Lean weight and Fat weight but not for EMA. Lean has a positive weighting while fat has a negative weighting. Being above average for lean will increase the index and being below average for fat will increase the index.

The SIL Meat sub-index is designed to work against the positive genetic relationship between lean and fat. It will identify animals that have more lean tissue relative to fat. The weightings used in the index are expected to lead to increases in lean tissue weight with only small gains in fat weight. The negative weighting on fat weight used in the index is NOT designed to lead to reductions in fat weight but rather to act as a governor on increases in fat.

Growth *versus* Meat – the SIL sub-indexes

Lean (muscle) and fat weights contribute to the overall weight of an animal - the more lean and fat an animal has, the heavier it will be. The SIL Growth sub-index is based on body weight breeding values. Therefore it will be related to the breeding values for lean and fat weight. If this is not taken into account when rating animals for both Growth and Meat, some genes may be "double counted" and have undue influence on the overall index.

For this reason SIL has two versions of the Growth sub-index, which vary in the weightings put on breeding values. When Growth and Meat are in the evaluation, the sub-indexes are named Growth with meat and Meat with growth. When only Growth is in the evaluation (e.g. a flock is not ultrasound scanning) the appropriate sub-index to use is named Growth (implicitly "without" Meat in the evaluation).

NB: Growth and Growth with meat sub-indexes have different index weightings.

SIL will automatically check the Growth and Meat sub-indexes on your reports are the appropriate ones based on what data were in the evaluation.

Reporting

SIL recommends using the Meat sub-index on reports. Breeding values for lean weight, fat weight or eye muscle area can be reported to see whether animals are better for lean or for fat.

SIL does NOT recommend reporting actual measurements as they have not been adjusted for non-genetic effects or the performance of relatives.

Using the SIL Meat sub-index in selection

SIL recommends using the Meat 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 high carcass value. It will increase carcass lean growth while keeping a governor on fat increases.

It is not recommended to use the Meat sub-index on its own as this could favour genetically smaller animals. SIL can refer you to an animal breeding specialist advice if you have specific requirements that mean standard SIL indexes might not suit your breeding objective.

Overall SIL indexes are unlikely to favour extremely low fat animals. This is because an animal that genetically has low levels of fat will rarely have high genetic merit for carcass weight and muscle weight. So animals with high Meat sub-indexes because they have extremely low breeding values for fat, are very unlikely to have high breeding values for growth traits (e.g. weaning weight or carcass weight) because they will be genetically smaller.

Future Developments

Carcass merit is simply defined in the SIL Meat sub-index. This definition was based on a carcass weight and fatness payment schedule. More sophisticated ways of assessing carcass value are near to implementation commercially. SIL will consider how these might be incorporated into selection indexes and determine how best they can be used by New Zealand sheep breeders. At present, practical, cost-effective and objective measures that can be used on-farm are still not available for traits such as muscularity and carcass meat yield.

Best practice for meat scanning

There are a number of things you can do at scanning to maximize accuracy of the genetic evaluation for carcass merit.

- **Scan in the 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).