Fat, muscle, reproduction, efficiency, resilience and survival

KEY MESSAGES

- The largest rate of genetic gain in the number of lambs born per ewe is achieved by measuring reproduction directly.
- Yfat ASBVs explain only a small portion of the variation in number of lambs weaned. There are many other factors influencing reproductive performance of ewes.
- Ultrasound carcass traits and fleece weight within Merino types were negatively correlated and ranged from -0.13 to -0.42, meaning that fatter and more muscled animals had lighter fleece weight genetically. This is only a low to moderate correlation. Some breeders are breeding rams for both higher fleece weight and higher fat.
- The heritability of reproduction is low, therefore besides decisions on ram purchases, it is important to manage ram and ewe health and nutrition - see Ramping Up Repro (www.wool.com/rur) and Lifetime Ewe Management (www.wool.com/LTEM).

For many woolgrowers, ewe lifetime reproduction is of critical importance to their flock productivity and profitability. Despite its value, reproduction is one of the more complex and costly traits to measure.

This has led to breeders looking for alternatives to genetically improve reproduction using indirect but correlated traits. These indirect traits include:

- Higher sire scrotal circumference
- Lower wrinkle
- Lower face cover and crutch cover
- Higher body weight and
- Moderate fleece weight.

More recently, fat and muscle measures on young animals at post weaning, yearling and hogget stages have gained popularity as an indirect means of improving reproduction.

An analysis using MERINOSELECT across flock data, that met a range of analysis criteria, looking across all Merino types from superfine, fine and medium wool, showed that **ewes** with an additional 1mm of Yfat ASBV (genetic fat) weaned 6% extra lambs (Brown and Swan 2016[1]). It also showed, in contrast, analyses conducted **within-flock** suggest a lower relationship of 2% extra lambs per mm of genetic fat. At this level, fat and muscle have a similar influence on reproduction as the above listed correlated traits. The research also showed that **results have been variable across analyses and populations in different environments, and that genetic fatness may be more important in some years than others.**

The analysis of Brown & Swan (2016) showed that measuring reproduction directly increased the rate of gain in weaning percentage by between 4.3% and 6.0%, compared with the increase from using fat and eye muscle depth of between 0.8% and 1.1%. If fat and eye muscle were measured and included, the rate of gain increased by a further 1.1%. **This points to the rule of thumb for genetic improvement, "that if a trait is important enough to be in an index, then it is important to directly assess that trait".**

Once all the Merino Lifetime Productivity (MLP) data collection is completed in 2024, a full analysis will be undertaken to further explore the genetic drivers of lifetime reproduction. This will also include a cost benefit analysis of how best to select for reproduction outcomes.

The MERINOSELECT Weaning Rate ASBV is made up of three component traits: Conception, Litter Size and Ewe Rearing Ability. The correlations with body weight, fat and muscle are included in the MERINOSELECT analysis of the three component traits, and there are plans to include wrinkle in the near future. Producers can select for the individual traits or more simply the Weaning Rate trait which combines the components into a single ASBV. While it is expensive for ram sellers to collect and present this data well (this includes roll calls at joining, pregnancy testing, lambing (mothering up via by lambing rounds or DNA) and weaning), genomic information is contributing to increased accuracies for reproduction ASBVs. Nearly half of all MERINOSELECT animals have a reportable weaning rate ASBV.

In the absence of the weaning rate ASBV there is value in:

- culling ewes that fail to rear at their first or fail to rear thereafter (they can miss once in their life but not twice); and
- selecting for a combination of the indirect traits such as, higher scrotal circumference, body weight (within limits), fat, muscle and lower wrinkle and cover.

Improving reproduction within flock is slow. While it has a low heritability, there is variation that exists between ram selling flocks that can be exploited and progress can be achieved with determination and sticking to the core selection program over time.

Separate to reproduction, it is also important to recognise that there are other benefits in selecting for higher genetic fat such as requiring less supplementary feeding to maintain Lifetime Ewe Management targets at joining and lambing or increasing stocking rates. There are likely to be additional benefits of genetic fat given the ongoing R&D into resilience and feed efficiency to determine with greater accuracy the impact and value of fat and muscle for:

- increasing resilience
- increasing survival of the ewe and lamb
- improving meat eating quality
- favourable associations with resistance to internal parasites.

The potential cost/discounts of excess carcase fat in the supply chain also needs to be considered. B

References: [1] Brown DJ & Swan AA 2016 "Genetic importance of fat and eye muscle depth in Merino breeding programs" Animal Production Science 56, 690–697 http://dx.doi.org/10.1071/AN14645