

# Merino Validation Project

## Introduction

The Australian Merino is the most important genetic resource for both the lamb and sheep meat industries of Australia. The contribution of wool and meat to the profitability of the Merino flocks is changing, as more value is being placed on carcase and reproductive characteristics.

Despite this importance, very little effort has been placed on understanding the genetics and value of growth, carcase traits and reproductive capacity of the Australian Merino. As a result there has been a lack of information on the relationships between carcase traits, disease resistance and reproductive traits in Merinos. There is also limited knowledge of the relationships between carcase and fleece traits.

The Merino Validation Project (MVP) is a research project funded by Meat and Livestock Australia (MLA). It is a five year project, which began in 2001. The primary aim of this project has been to investigate the genetic relationships that exist between fleece traits and other important production traits of the Merino, such as fertility, internal parasite resistance, temperament, growth, and carcass development.

## Genetic Correlations

In any animal selection program genetic correlations, or relationships, may exist between traits of interest. The effect is that when selecting for one trait another trait, or traits, may be influenced.

For seedstock and commercial breeders, these traits are often highly desirable animals. To identify these animals within the population requires all traits of interest to be measured and analysed.

### a) Genetic Correlations with Live Weight

The weight traits are found to be highly correlated within themselves. When measured at the same age, fat and eye muscle depth are moderately correlated with live weight, the genetic correlation between fleece weight and live weight is positive, fibre diameter is positively correlated to live weight. Fibre curvature has a small positive genetic correlation with live weight. Scrotal circumference, number of lambs born, and number of lambs weaned are all positively correlated to live weight, with the highest correlations are found for scrotal circumference.

### b) Genetic Correlations with Carcase Traits

The genetic correlation between fat and eye muscle depth measurements at the same age stage is high, as is the genetic correlation between fat and eye muscle depth. Staple strength has a small positive genetic correlation with fat and eye muscle depth. Number of lambs born and number of lambs weaned have small positive genetic correlations with fat and eye muscle depth.

## Heritability

Fleece traits such as fibre diameter (HFD) and staple length (H-SL) have a high heritability, which means that genetic progress can be made a lot quicker.

Carcass traits such as muscle depth (YEMD) and fat depth (YFAT) have a low to medium heritability.

Number of lambs weaned (NLW), a trait used for the genetic improvement of fertility, has a very low heritability (0.08). However, it has a moderate positive correlation with live weight (YWT), and a higher positive correlation with scrotal circumference, particularly at yearling age (YSC).

## Genetic Variation

One of the common anecdotes in the Merino industry is that you “cannot breed a dual purpose sheep that has both wool and muscle”, with the idea being that as soon as you start selecting for one trait, it has a negative impact on the other.

There are sires within MGS that have the highest EBV for muscle depth also has one of the highest EBVs for fleece weight, showing that there are Merinos in industry that are more than capable of producing well muscled animals with plenty of wool.

## Fitness: it's in the fatness

While the Merino is a peerless producer of natural fibre and meat, new research suggests that it can be genetically pushed only so far into the demanding business of growing wool and carcase before it starts surrendering ‘fitness’.

Fitness in this context doesn't mean marathon runner's muscles. Also referred to as 'do-ability', it is the ability of the sheep to survive and successfully breed under the punishing conditions that the Australian environment can dish out.

While these conditions may not matter in areas with reliable year-round feed, they become significant in drought or when sheep are fed on poor quality pasture or stubble – particularly for heavy wool producing ewes during pregnancy or lactation.

Growing more wool isn't a simple issue for a sheep. To produce a kilo of wool, a Merino needs to synthesise five kilograms of protein in its skin, which has ramifications right through the animal's metabolism.

Selecting animals because of their protein turnover in wool also affects protein turnover in muscle. When you're selecting for wool, you actually change the metabolism of the whole sheep.

As the concentration of glycogen in muscle at slaughter is a major determinant of the ultimate pH of muscle, this indicates that selection for high fleece weight contributes to the increased incidence of dry, dark-cutting meat in Merinos. Selecting merinos with high EBV's for muscle and growth will reduce dark cutting meat.

Research by Dr Graham Gardner has found that, the muscling potential of an animal is not reduced by nutrition. Sheep with high muscle EBV's are programmed to grow muscle and under low and high nutrition conditions don't deposit more fat. Furthermore they generally demonstrate reduced bone growth irrespective of nutrition, and the increase in wool growth that is usually seen in response to nutrition is much less in high muscle lambs.

### ***Other indicators of fitness***

Coefficient variation of fibre (CV) seems to give a particularly strong signal: high CV seems to have a negative relationship to fitness.

Despite the industry's long-standing emphasis on wool as the focus for genetic selection, we suggest that producers trying to select toward fitter Merinos should instead focus on animal fatness – particularly in challenging times.

The forthcoming 'fitness' ASBV may ultimately draw on a number of factors, but we believe the fatness ASBV will play a crucial role.

Fitness is how sheep deal with tough conditions. People look at size as a substitute for fitness, but I think it's more to do with fatness. It's their ability to withstand the long haul.

### **Do-ability: the missing trait**

#### ***The profitability philosophy***

To produce a productive sheep, they must convert whatever is in the paddock into profitability. High bodyweight requires not only a certain contribution from genetics, but a mother that can feed her lambs well.

If you breed an animal 100 per cent toward growing wool, it is going to partition its nutrient intake away from things like milking and fertility into fibre production. That may be okay for studs in good country with a reliable year-round feed supply, but with our selection we can't afford to lose do-ability.

Some commercial flocks are saying they have lost their do-ability. Their sheep have the genes for growing good carcasses and wool, but they have to be put on permanent feed to do it.

Without do-ability, nothing else works.

### **Take home message**

Carcass traits have a moderate level of heritability and only a small correlation with fleece traits. This suggests that carcass traits can be included in breeding objectives without a large trade-off in the genetic progress of wool traits. The large genetic variation within the Merino industry for carcass traits means that breeders have a much better opportunity to find sheep with specific traits that will suit their breeding objectives.