Dohne index

Why use a selection index?

A selection index is an important tool to drive genetic improvement in ram breeding programs when there are a range of traits of economic or functional importance. Collectively, these traits make up the "breeding objective", which aims to improve profitability in commercial sheep enterprises.

Indexes are useful for two main reasons:

1. They balance genetic improvement appropriately across a range of traits, with the emphasis placed on each individual trait determined by its relative importance.
2. Because indexes balance improvement across traits, they can be used to overcome economically antagonistic relationships *between* traits.

> Appropriately designed indexes are central to the goal of breeding more profitable sheep for your ram buying clients.

How Sheep Genetics develops selection indexes

When Sheep Genetics develops standard selection indexes, a breeding objective is defined for each breeding scenario. This involves an analysis of commercial flock production data to calculate the economic value of improving traits which affect profit, based on flock structure, production and price data.

The second step is to translate the breeding objective into the index by linking profit traits to ASBV traits through genetic correlations. Often the profit and ASBV traits are the same, for example fleece weight and body weight are key profit drivers in commercial Dohne flocks and are also easy to measure in ram breeding flocks. For profit traits which are hard to measure however, we may rely on other correlated traits to drive improvement in the objective. An example of this is ultrasound scan measurements of muscle and fat to improve carcase yield.

By combining the economic values of traits with the genetic relationships between traits we can determine the appropriate relative weights which allow us to combine ASBVs into a single index value for each animal.

> The changes in individual traits from using an index depend on the information you record in your flock. If you want to improve, or even just maintain a trait, you must record it to ensure ASBVs are sufficiently accurate for the index to do its job.

Dohne index

The Dohne analysis uses the Dohne Plus index.

Dohne index

Summary of Dohne index

- The Dohne index is based on a production system for a self-replacing Dohne commercial enterprise.
- The Dohne Plus index focuses genetic improvement on growth, carcass traits and reproduction.

Production system outline

The Dohne index is based on a production system for a self-replacing Dohne commercial enterprise turning off lambs as early as possible and harvesting quality wool from the breeding flock. Therefore, there is a focus on increasing early growth and muscle, with surplus lambs being sold at post-weaning, as well as a focus on improving reproduction. Wool production is still important, however the balance is towards increasing growth and reproduction traits, while maintaining fleece weight and fibre diameter.

Trait contributions

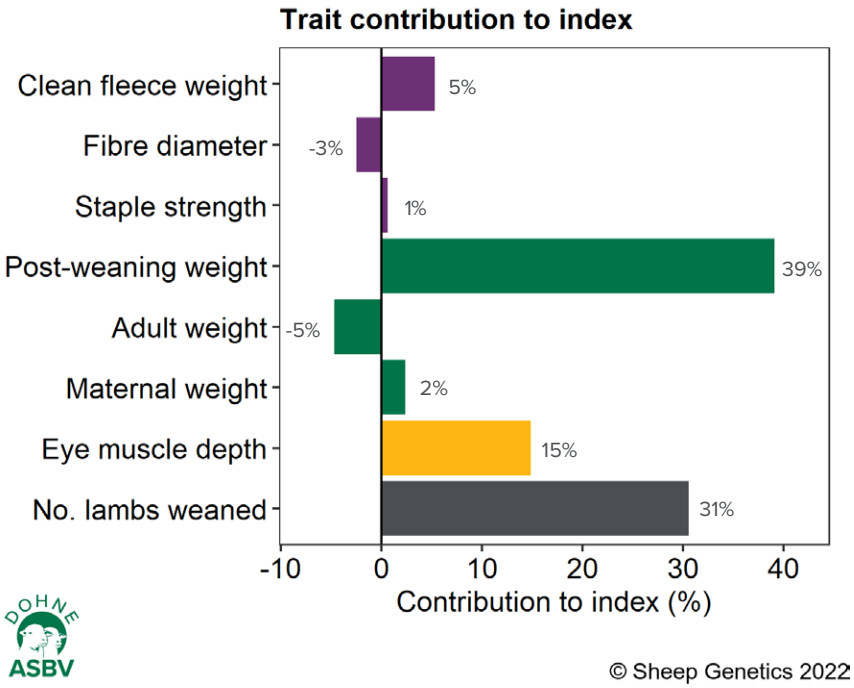
Figure 1 illustrates which traits are in the index and how much they contribute to the overall balance of the index in the top 10% of current progeny. The longer the bar, the greater the impact on the index, and the greater the impact on the profitability of the production system.

In the Dohne Plus index, post-weaning weight and eye muscle depth contribute significantly to the index.

Adult weight makes a small negative contribution to the index when considered on its own because bigger ewes have higher feed costs. However, bigger ewes also produce more lambs which reach sale weight faster, so the index makes a trade-off to achieve an optimal balance across all traits.

Because of the relative weightings and genetic relationships between traits, the index puts more emphasis on growth and reproduction while maintaining fleece traits. In some circumstances use of the index leads to a small reduction in fleece performance. If these traits are important to your flock, ASBVs for fleece traits should be considered in conjunction with the index.

Figure 1: The traits in the Dohne Plus index and how they contribute to the overall balance of the index in the top 10% of current progeny



Selection advantage

Table 1 shows the selection advantage for the top 10% of current progeny selected on the index. The numbers show how much better the ASBVs of the top 10% are compared to the average of the drop. For example, ASBVs for post-weaning weight for the top 10% of progeny are 2kg higher for Dohne Plus.

Table 1: The selection advantage for the top 10% of the current progeny drop selected on the Dohne Plus index

	Dohne Plus
Clean fleece weight (%)	1.5
Fibre diameter (µm)	0.1
Staple strength (NKTEX)	0.2
Post-weaning weight (kg)	2
Adult weight (kg)	1.9
Maternal weight (kg)	0.7
Eye muscle depth (mm)	0.3
No. lambs weaned (%)	6.3

When selecting on the Dohne Plus index, long-term responses in individual traits will vary depending on features of the breeding program, including traits measured, level of pedigree recording, use of genomic testing, flock structure and selection emphasis on the index. The selection advantages shown in table 1 give an indication of the likely direction and relativity of responses for the Dohne Plus index.

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