

Dohne indexes

A ram breeder's guide

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.

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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.

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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 indexes

The Dohne analysis has two standard indexes for breeders:

- Dohne Base
- Dohne Plus.

Both indexes target the same production system, but the plus index includes the number of lambs weaned ASBV in addition to the traits included in the base index. Ram breeders can use either index, with the choice coming down to preferences regarding the balance of traits in the base and plus indexes, and whether the inclusion of number of lambs weaned in the Dohne Plus index is important to the breeding program. It is also important to keep in mind that the Dohne Plus index is a more accurate reflection of the overall breeding objective for the production system.



Dohne indexes

Summary of Dohne indexes

- The Dohne indexes are based on a production system for a self-replacing Dohne commercial enterprise.
- The Dohne Base Index focuses genetic improvement on growth and carcase traits.
- The Dohne Plus Index additionally includes reproduction.

Production system outline

The Dohne indexes are 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 in both indexes, with surplus lambs being sold at post-weaning, and there is additional focus on improving reproduction in the Dohne Plus index. Wool production is still important, however the balance is towards increasing growth and reproduction traits, while maintaining fleece weight and fibre diameter.

Trait contributions

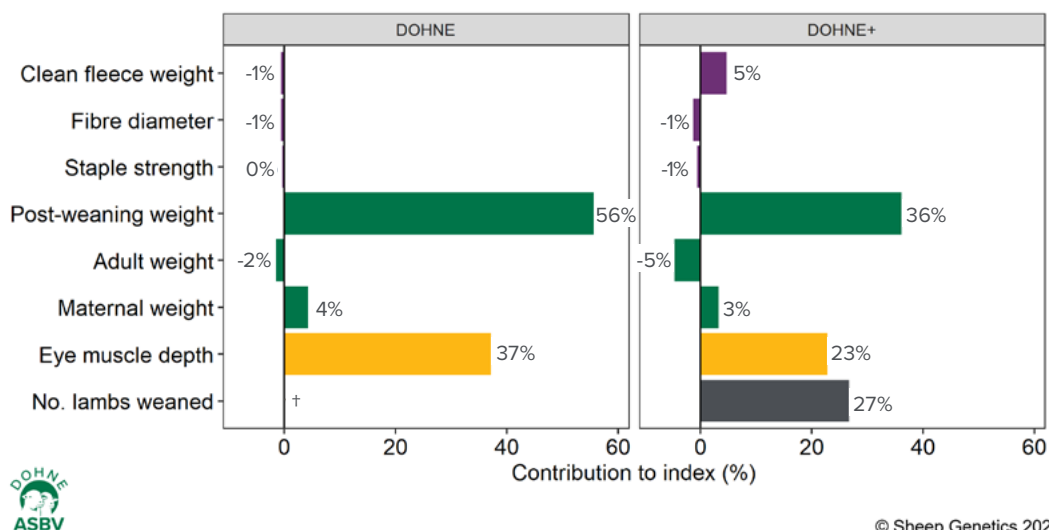
Figure 1 illustrates which traits are in each index and how much they contribute to the overall balance of the indexes in the top 10% of current progeny. The longer the bar, the greater the impact on the index, and the greater the impact on the profitability of the production system.

In both the Dohne Base and Dohne Plus indexes, post-weaning weight and eye muscle depth contribute significantly to the index. The main difference between the two indexes is the contribution from number of lambs weaned in the Dohne Plus 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 indexes put more emphasis on growth and reproduction (only in the Dohne Plus index) while maintaining fleece traits. In some circumstances use of the indexes leads to a small reduction in fleece performance (fleece weight in the Dohne Base index, and staple strength in the Dohne Plus index). If these traits are important to your flock, ASBVs for fleece traits should be considered in conjunction with the indexes.

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



Selection advantage

Table 1 shows the selection advantage for the top 10% of current progeny selected on each 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 2.2kg higher than the average of the drop for Dohne Base, and 1.9kg higher for Dohne Plus.

Both indexes show similar selection advantages for post-weaning weight and eye muscle depth, but selection on the Dohne Base index results in a lower (but still positive) advantage in number of lambs weaned because this trait is not included in the index. The Dohne Base index is able to achieve a small positive advantage in number of lambs weaned by placing more selection emphasis on post-weaning and adult weight. The Dohne Plus index gives greater control in balancing increased adult weight with higher reproduction.

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

| | Dohne Base | Dohne Plus |
|---------------------------------|------------------|------------|
| Clean fleece weight (%) | 0.2 | 1.4 |
| Fibre diameter | 0.0 | 0.0 |
| Staple strength (NKTex) | -0.1 | -0.1 |
| Post-weaning weight (kg) | 2.2 | 1.9 |
| Adult weight (kg) | 2.2 | 1.9 |
| Maternal weight (kg) | 0.2 | 0.2 |
| Eye muscle depth (mm) | 0.6 | 0.5 |
| No. lambs weaned (%) | 2.0 [†] | 5.5 |
| [†] Trait not in index | | |

When selecting on the Dohne Base and Plus indexes, 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 Base and Plus indexes.



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More information



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