



## NVI 2022: Updated breeding goals

**The NVI is the total merit index that is used in the Netherlands and Flanders to rank cows and bulls according to how well they suit a certain, defined breeding goal. Once every five years, these breeding goals are reviewed and established together with the members of the herdbook. In comparison to the NVI 2018, the new NVI 2022 has seen some modifications. These changes bring the ranking more in line with the picture of the desirable cow for the next five to ten years.**

Certain traits have been reviewed to determine whether more or less progress is necessary in these specific areas. The NVI combines breeding values for production, efficiency, functional traits such as longevity and health traits, and conformation. The combination is based on a defined breeding goal: a long-lasting cow that can produce milk in a healthy and efficient way. Different breeding goals are applied for dairy and dual-purpose breeds, so two distinct NVI merit indexes are published.

### Traits in the NVI

For dairy breeds, the NVI consists of Inet (Net Milk Revenue index), saved feed costs for maintenance (SFCM), longevity, udder health, fertility, claw health, calving traits, udder and feet and legs.

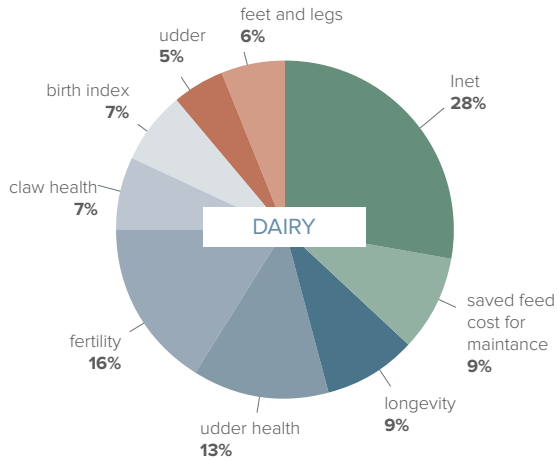
The NVI for dual-purpose breeds consists of Inet, beef index, longevity, udder health, fertility, calving traits, udder and feet and legs. When used as a guide for selection, the NVI enables farmers to make progress across all these traits. The speed of progress depends

on the weighted importance of the traits in the NVI and their mutual correlation.

### Weighting in the NVI

Figures 1 and 2 show the weighted importance of the various traits in the NVI 2022, for dairy and dual-purpose breeds. In the NVI dairy, 37% is allocated to production traits, 52% to functional traits and 11% to conformation traits. In the NVI dual-purpose, the allocation is 34%, 42%, 24%.

Compared with the NVI dairy 2018, greater attention is now paid to more efficient production by allocating a higher weighting to SFCM and udder health traits, and reducing the importance of Inet and feet and legs. In the dual-purpose NVI, the shifts in the breeding goal are less evident, but are still comparable to weightings in the dairy NVI as shown by a greater importance devoted to health and a lower weighting for production. In the calving index, calf vitality has been added as a new trait. The formulas used in the NVI and explanations are shown in the box.



Weighted importance in NVI 2022 dairy

The weighted importance of the traits in NVI 2022 results in the NVI formula (see box). Selection based on NVI will lead to certain progression. This is shown for dairy and dual-purpose in figures 3 and 4. The traits can be compared as they have been scaled in genetic standard deviations. This enables easy comparison of absolute breeding values such as kg of milk and longevity with relative breeding values. Progress when selection is based on NVI

If a farmer uses the NVI as the basis for selections, progress will be made in all traits in the breeding goal. This applies to both milk and dual-purpose breeds. When the NVI dairy is used as the basis for selection, progress will be made in production, and savings will be achieved for feed costs (green). All the functional traits (blue) will progress, despite the negative correlations with production traits. The greatest progression is seen in longevity, as this

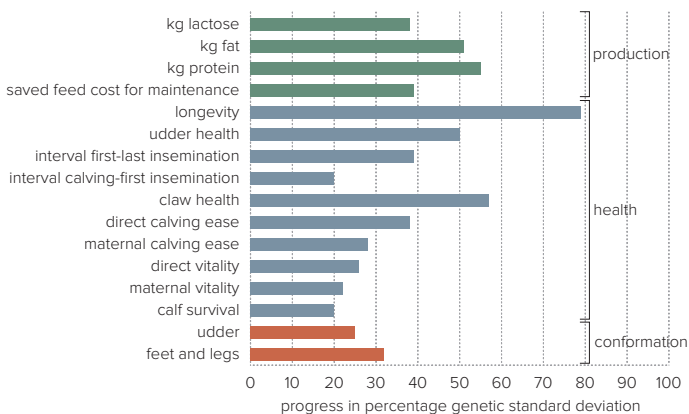


Figure 3. Progress in traits when selection is based on NVI for dairy breeds

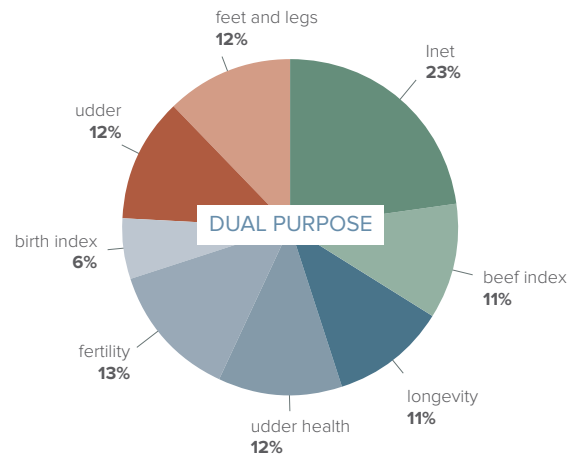


Figure 2. Weighted importance in NVI 2022 dual-purpose

trait also benefits from the positive correlations with other NVI traits. On average, the cows' udders and legs are good, so a light weighting of conformation traits (orange) in the NVI is sufficient. When selection is based on NVI dual-purpose, progress will also be made across all traits. However, in this case there are certain differences in the extent of progress in the various traits compared with NVI dairy. There is marginally less progress in production, but greater progress for udder, feet and legs, fertility and udder health.

### The easy way to make progress

The NVI makes it easy to make progress in production, functional traits, conformation and efficiency. The NVI 2022 represents an easier way for farmers to breed cows that align with the desired breeding goals.

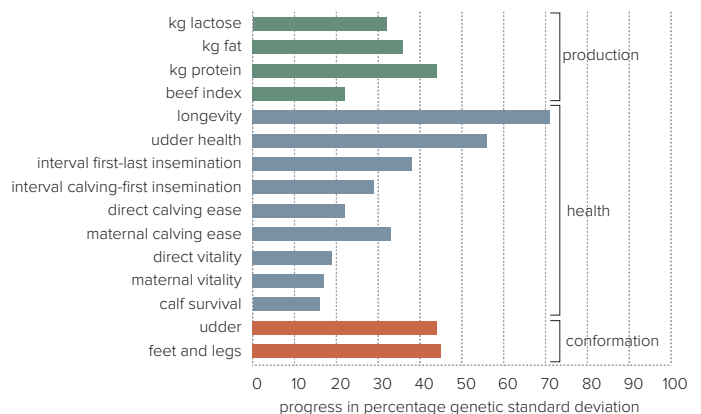


Figure 4. Progress in traits when selection is based on NVI for dual-purpose breeds

The calculations used to formulate the NVI for dairy and dual-purpose breeds are shown below. For more background information, please consult [E-Chapter NVI](#).

### NVI dairy:

$$\text{NVId} = 0.37 \times \text{Inet} + 0.37 \times \text{SFCM} + 0.07 \times \text{longevity} + 5.5 \times (\text{UDH}-100) + 6.5 \times (\text{FER}-100) + 3.0 \times (\text{CLW}-100) + 2.0 \times (\text{CAL}-100) + 2.0 \times (\text{U}-100) + 2.5 \times (\text{F\&L}-100)$$

### NVI dual-purpose

$$\text{NVIdp} = 0.33 \times \text{Inet} + 5.0 \times (\text{BI}-100) + 0.09 \times \text{longevity} + 5.7 \times (\text{UDH}-100) + 5.5 \times (\text{FER}-100) + 2.0 \times (\text{CAL}-100) + 5.5 \times (\text{U}-100) + 5.5 \times (\text{F\&L}-100)$$

Where:

$$\text{Inet} = 0.3 \times \text{kg lactose} + 2.1 \times \text{kg fat} + 4.1 \times \text{kg protein}$$

$$\text{UDH} = 0.477 \times (\text{SCM}-100) + 0.641 \times (\text{CM}-100) + 100$$

$$\text{FER} = 0.322 \times (\text{ICI}-100) + 0.786 \times (\text{IFL}-100) + 100$$

$$\text{CAL} = 0.08 \times (\text{DCE}-100) + 0.07 \times (\text{MCE}-100) + 0.50 \times (\text{DV}-100) + 0.75 \times (\text{MV}-100) + 0.14 \times (\text{SUR}-100) + 100$$

**SFCM** = saved feed costs for maintenance

**UDH** = udder health

**FER** = fertility

**CLW** = claw health

**CAL** = calving index

**BI** = beef index

**ICI** = interval calving-first insemination

**IFL** = interval first-last insemination

**SCM** = subclinical mastitis

**CM** = clinical mastitis

**DCE** = direct calving ease

**MCE** = maternal calving ease

**DV** = direct vitality

**MV** = maternal vitality

**SUR** = calf survival

**U** = udder

**F&L** = feet and legs