National Breeding Objective

2019/20 review outcomes

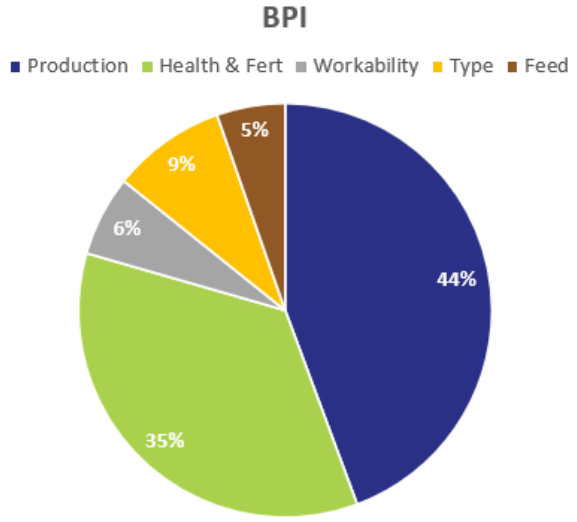
Key changes

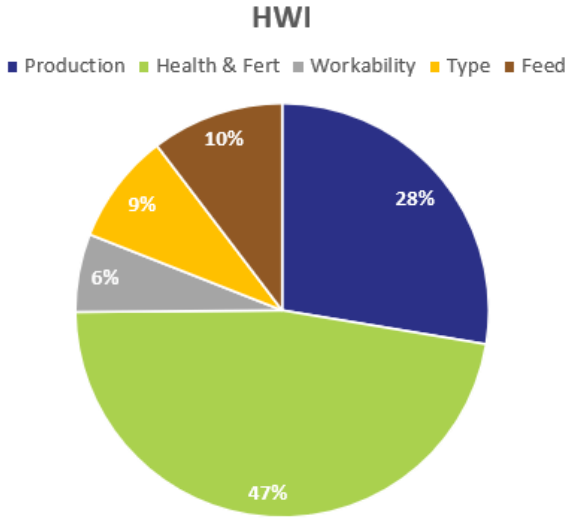
1. **Balanced Performance Index (BPI)**
   - updated with current economic values for fat, protein, feed and labour.
   - greater emphasis on health traits and less emphasis on production traits, compared with 2019 BPI.
   - Jersey BPI excludes Feed Saved, reflecting significant differences between breed objectives and differences in the evaluation of the Feed Saved ABV.
2. **Health Weighted Index (HWI)**
   - updated with current values for fat, protein, feed and labour.
   - double weighting on Daughter Fertility.
3. **Type Weighted Index (TWI)**
   - replaced by Good Bulls Guide tables that rank bulls by Overall Type and Mammary System.
4. **The base (used to compare animals)**
   - remains consistent but adds a breed purity filter so it is a truer reflection of the breed.

What the updated indices look like

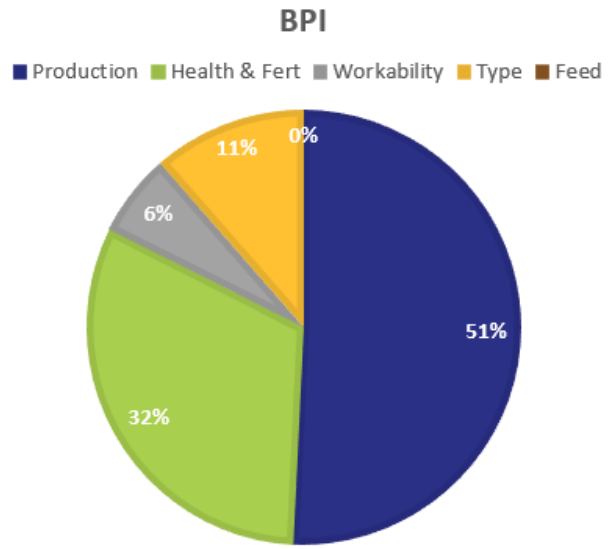
Both the updated BPI and HWI have more emphasis on health traits than the current indices, however the pie chart shows that HWI has significantly more emphasis on health and fertility (green) and less on production traits (blue). The HWI also includes a stronger emphasis on feed saved which improves feed efficiency. The correlation between BPI and HWI is lower than it is currently meaning top bulls will re-rank between the two. The impact that the updated indices will have over time is shown on page 5 for Holstein and Jersey. For breeds other than Holstein and Jersey, the impact is similar to Holsteins.

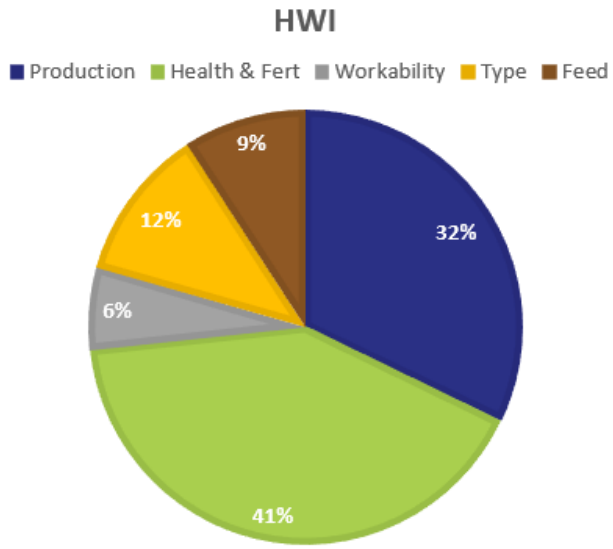
Figures 1 and 2: Holstein - percent emphasis on trait groups in the updated BPI and HWI





Figures 3 and 4: Jersey – percent emphasis on trait groups in the updated BPI and HWI





Which one to use?

The BPI is an economic index that balances improved milk solids production while lowering herd costs. It rewards high component milk, longer lasting cows with better mastitis resistance and fertility. Farmers who want a balanced index that improves health, longevity and production should choose the BPI.

The updated HWI drives stronger selection on improved health, fertility and feed efficiency. By using this index, expect stable production per cow, improved feed efficiency and faster rates of gain for fertility and mastitis resistance compared to BPI and compared to the current HWI. Farmers who want to fast track genetic gain for health, fertility and feed efficiency should choose the HWI.

Balanced Performance Index (BPI) - Economic index - Blends production, health, fertility and longevity traits according to their economic values	*The BPI is a breeding selection tool that drives improved production, type, health, fertility and longevity traits in Australian cows.* *The BPI is backed by strong science, current economic values, relationships between genetic traits and an understanding of trait preferences of farmers.* *The BPI for Jerseys is adjusted for breed-specific requirements, such as a desire for larger cows.*
Health Weighted Index (HWI) - Modelled on a strictly seasonal calving system - Fast track fertility, mastitis resistance and feed saved	*The HWI is a breeding selection tool for farmers who want to drive health and fertility while holding (not improving) milk yield per cow. This is the best index for improving feed saved. In all breeds, this index is expected to reduce cow size.*

NBO Review process

The NBO review was overseen by DataGene's Genetic Evaluation Standing Committee which determined the key themes for the review. The process involved a survey to explore broad industry views on the key themes and scientific analysis of 21 options for index refinement. From this, the Standing Committee made five recommendations for consideration by industry. These recommendations were discussed with stakeholders during June 2020 and reviewed by the committee in July. Changes to the index will be made in December 2020.

The Genetic Evaluation Standing Committee identified the following themes for discussion in this NBO Review: base change, fat:protein price ratio, longevity, fertility, feed efficiency, new traits, multiple indices.

Survey

A total of 307 people participated in the NBO Survey, of which two thirds (196) were farmers.

The BPI was nominated as the most useful index by 71% of participants. Only about 4% relied on TWI exclusively. More survey results are described in the NBO Options Paper.

Trait priorities

Daughter Fertility was significantly more important than any other trait. The table shows four priority levels for traits (no significant difference between traits within a level).

Table: Industry priorities for breeding traits (survey)

Highest priority	Daughter Fertility
Priority level 2	Protein %, temperament, fat, fat %, survival/longevity, somatic cell count, mastitis resistance, calving ease, type
Priority level 3	Milking speed, likeability, milk L, feed saved
Lowest priority	Gestation length, heat tolerance

Base change

The 'base' refers to a clearly defined group of animals to which all others are compared. The last base change occurred in 2014 following a period of annual base adjustments. From a scientific point of view, there isn't a right/wrong frequency for updating the base.

While no base change will be made, the impact of changing the base is fully described in the NBO Options Paper.

There will be a small change to the base to refine breed purity. A consistent 4-digit breed code will ensure that Jerseys are compared to purebred Jerseys only.

National Breeding Objective

The National Breeding Objective (NBO) describes an agreed group of desirable traits, providing breeding direction for both bull and cow breeding across the country. Australia's NBO is aimed at increasing net farm profit. It is expressed through the three breeding indices – Balanced Performance Index (BPI), Health Weighted Index (HWI) and Type Weighted Index (TWI).

The NBO is reviewed every five years, to ensure it keeps pace with the evolving needs of dairy businesses, new knowledge and breeding technologies. The previous review, undertaken in 2014, resulted in the introduction of the three indices (BPI, HWI, TWI) in 2015. Since then there has been a sustained increase in the utilisation of Australian indices.

Fat:protein price ratio

The BPI is an economic index based on input costs and farmgate returns for milk and stock. Milk price is a vital component of the analysis. If the relative price paid for fat to protein changes then it is appropriate for breeding indices to reflect this.

An analysis of three fat:protein price ratios was conducted. However, there is little evidence of a long-term national shift in farmgate price ratio to justify an increase in the price ratio applied to the BPI, HWI or TWI. The current milk pricing policy will continue. This uses five-year historical prices for milk, fat and protein.

Milk

During the consultation period, new milk prices were published for FY20/21. Virtually all processors have moved to a payment system that does not include a penalty for milk volume. It is widely acknowledged that high component milk is valued and the real costs of milk volume are accounted for in the final price offered to farmers. An economic index accounts for milk price as well as the cost of feed to produce the milk.

Index options with varying weights on milk L were tested. In the updated BPI and HWI, the economic weight for Milk L is $0.01 more to reflect five-year historical price trend as well as the higher feed costs associated with producing additional milk volume.

Longevity

The two most important determinants of a dairy bull's genetic merit for profitability are milk yield and survival.

Given the strong support for survival in the survey, the Survival ABV is included in both BPI and HWI (rather than residual survival which had been removed from indices in 2019).

Fertility

Fertility is the No 1 priority for surveyed farmers. Most people (76%) support that HWI should have even more emphasis on fertility and health traits. The updated HWI has double the weight on fertility. The BPI includes fertility at the same weight as the current BPI. When combined with the addition of survival and mastitis resistance, the total emphasis on health and fertility is larger in the updated BPI compared to current.

Feed efficiency

The current BPI has Feed Saved ABV weighted at 50% of its true economic value. The survey indicated the industry does fully support a full weight on Feed Saved in the BPI and so it remains at 50%.

There is a slight increase in the economic weight of feed saved in the updated BPI which is consistent with higher feed costs in recent times. The weight remains 50% of the full weight in the current and updated BPI.

In Jerseys, the negative impact of Feed Saved on liveweight inhibits the ability for Jerseys to compete in mixed herds and may affect calf survival. As a result, Feed Saved has been removed from the updated BPI for Jerseys.

The updated HWI has the full economic weight of Feed Saved for all breeds.

New traits

Since the last NBO review, several new traits have been added to genetic evaluation, including heat tolerance and mastitis resistance.

Of the new traits, mastitis resistance is the only new trait to be added to the updated BPI and HWI.

Multiple indices

Both the survey results and an analysis of marketing materials used to promote bulls show the BPI is most popular, followed by HWI. Even though type is important to many farmers, the TWI tool is used by only a small minority of the industry.

Overall Type and Mammary System are more direct traits that can be used to identify high type bulls. The TWI will be replaced by tables for Overall Type and Mammary in the Good Bulls Guide.

In addition, Overall Type, Mammary System, Pin Set, Udder Depth are included in the updated BPI and HWI. Type traits are also linked to longevity which is also valued through the inclusion of the Survival ABV.

Further reading

NBO Options Paper.
NBO recommendations to industry

More information

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Figure 3: Holstein – change in relative emphasis in Australia's index over time

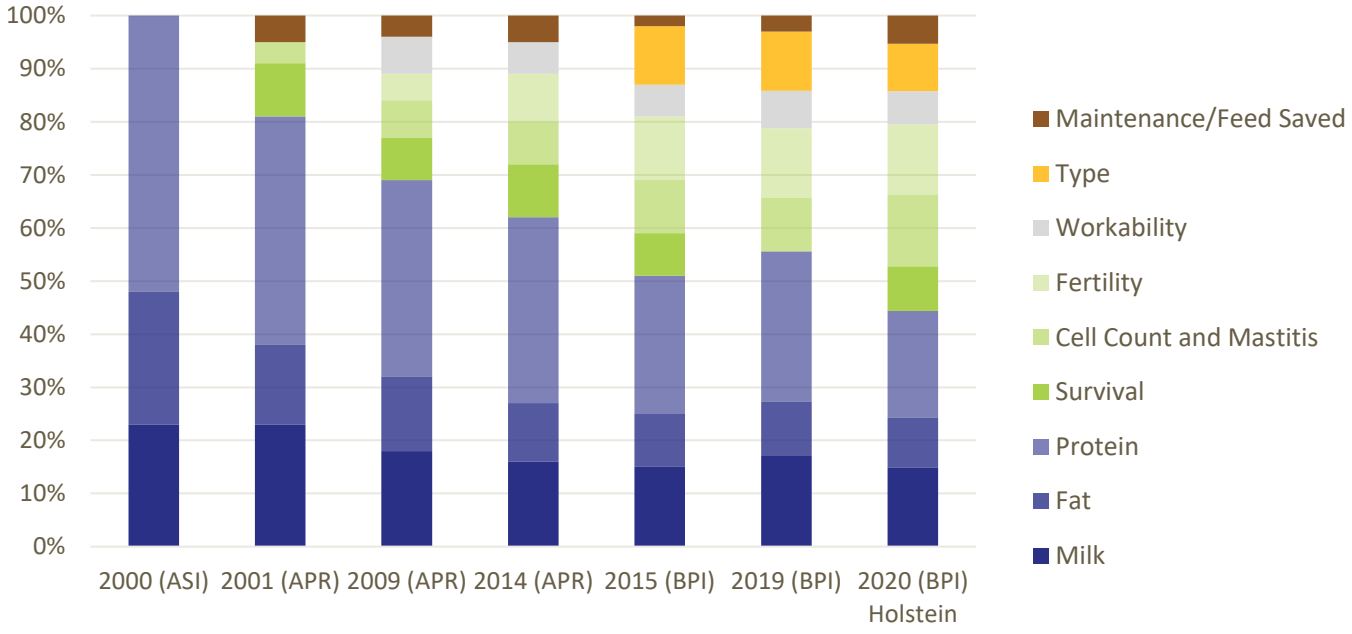

Figure 4: Holstein – response to selection over three generations of breeding

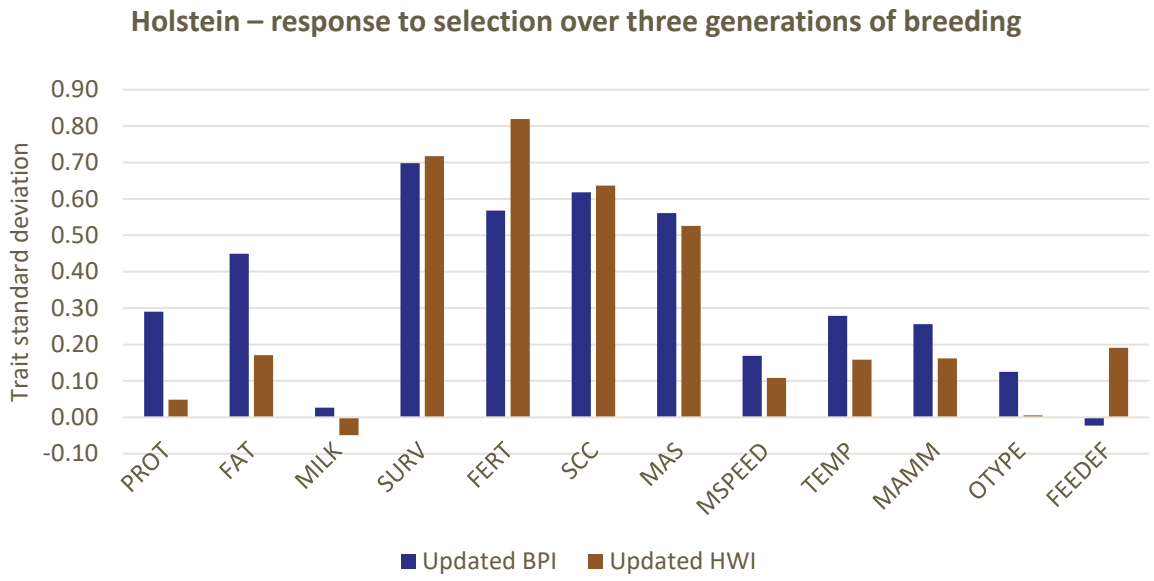

Figure 5: Jersey – response to selection over three generations of breeding