Feed Saved ABV
Technote 3

HIGHLIGHTS

- For no additional cost or effort farmers can breed a herd that utilizes feed more efficiently.
- The Feed Saved ABV identifies animals that produce the same amount of milk with reduced maintenance requirements.
- Both selection indices – BPI and HWI include the Feed Saved ABV (except for Jersey BPI). Farmers using these indices farmers will be breeding for greater feed efficiency.
- An updated model for calculating the Feed Saved ABV was implemented in November 2020, resulting in an improvement in reliability (by 11% for Holstein bulls). Owners of genotyped Holstein animals may notice some changes in Feed Saved ABVs and ranking.

Farmers have been making gains in feed efficiency over the last 30 years through better nutrition and intense selection on milk production. Modern cows have become more feed efficient in that their substantial increase in milk production has had the effect of diluting their maintenance requirements.

The Feed Saved ABV allows farmers to breed cows in a new way: by reducing the maintenance requirements of a cow for the same amount of milk produced.

Australia was the first country in the world to release a feed efficiency breeding value for cattle in 2015. Our researchers were part of an international collaboration to devise a way to use measured feed efficiency in a breeding value that incorporates real feed intake data as well as a prediction of feed required for maintenance purposes.

The Feed Saved ABV

The Feed Saved ABV identifies animals that can save on dry matter intake per cow per year while maintaining milk production at the same level.

Breed differences

Feed Saved is calculated using a prediction of maintenance requirements using ABVs for bodyweight (available on Jerseys, Guernsey, Reds and Holsteins) and residual feed intake genomic ABVs (available only for Holsteins), where RFI is the difference between actual and predicted feed intake.

Expression of Feed Saved ABV

The Feed Saved ABV is expressed in kilograms (dry matter) of feed saved per cow per year.
The base (or breed average) is zero: a positive number represents feed saved; a negative number represents extra feed consumed.

BPI and HWI

Feed Saved is included in both the Balanced Performance Index (BPI) and Health Weighted Index (HWI), with the higher weighting in the HWI.

The exception is the Jersey BPI which excludes Feed Saved, reflecting differences between breed objectives and differences in the evaluation of the Feed Saved ABV.

Example Feed Saved ABVs

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Holstein	BPI	FEED SAVED
BULL ID	BALANCED PERFORMANCE INDEX	FEED SAVED ABV
A	336	– 43
B	320	– 147
C	302	– 4
D	301	110
E	285	2
F	282	– 6
G	277	72
H	277	– 26
I	274	18
J	268	111
	$ profit/cow/year	kg feed saved /cow/year

Figure 1. An example of Feed Saved ABVs.

Range

There is a range in Feed Saved ABVs amongst bulls and cows. In November 2020, genomic Holstein bull Feed Saved ABVs ranged from -380 to +370 kg. The standard deviation is 90 kg in Holstein bulls which means that most bulls (66%) will have Feed Saved ABVs between -120 and +60 kg/year.

Use the Good Bulls App to filter high BPI bulls that are also high for Feed Saved.

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Heritability

Heritability is a measure of how much a trait is influenced by genetics.

Feed Saved is a moderately heritable trait (20-30%) which means that selection for feed saved will make a difference.

Reliability

Reliability is a measure of confidence in an ABV. The reliability of an animal's breeding values improves with age as more information becomes available, for example genomics and daughters' performance records and herd test results (see table).
An updated model for the Feed Saved ABV was implemented November 2020, resulting in improved reliability. For Holstein bulls, this represented an 11% improvement in reliability.

Reliability (%) of Feed Saved ABV
(November 2020)

Breed	Young genomic bull	Proven bull with genotype	Young genomic heifer	3-lactation cow with genotype
Holstein	43	50	42	45
Jersey	37	49	37	41

At this stage, reliabilities for Feed Saved ABV are lower than production traits but this will improve through adding cows each year to the reference population and extending international collaborations.

Genetic trends for Feed Saved ABV

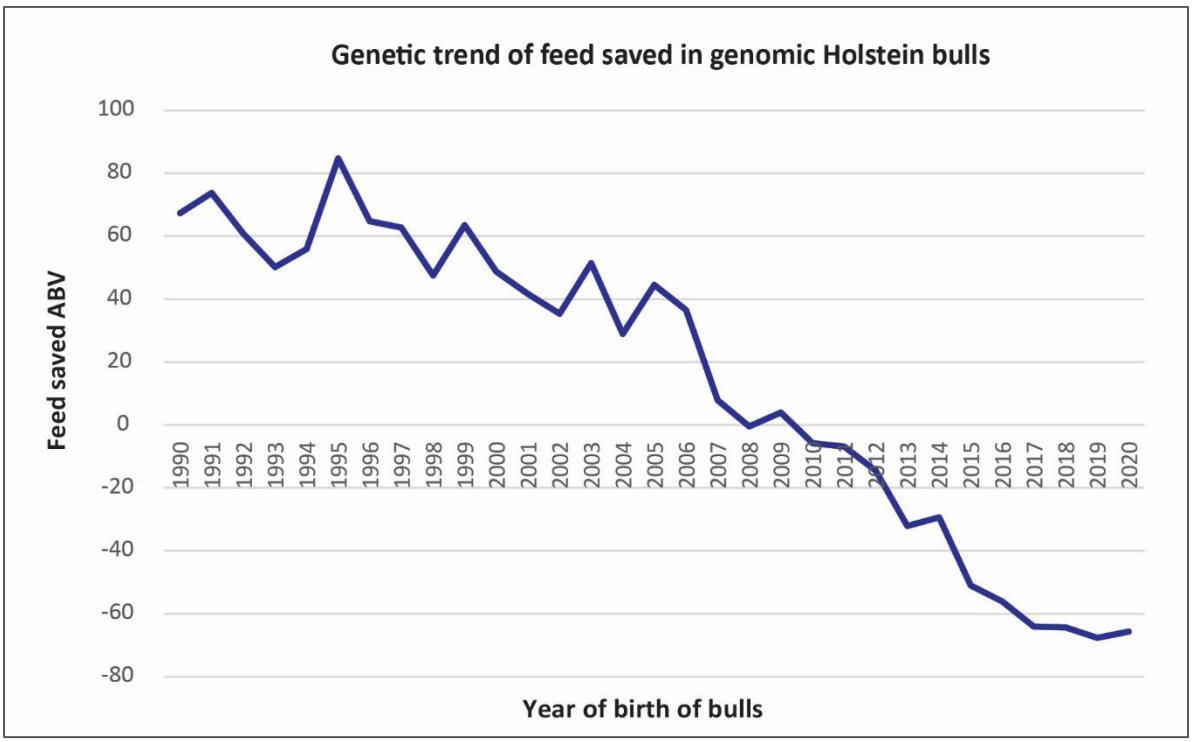
The graph shows the genetic trend of Feed Saved in Australian Holstein bulls. Since 1990 there has been a negative trend for Feed Saved, with significant variation from year to year. To put this trend in context, the change in the trait over the 22 year time frame was about half a genetic standard deviation. This trend is typical of a trait where no evaluation or active selection has taken place.
It is expected that this trend will improve over time with the implementation of Feed Saved ABV and its inclusion in breeding indices.

Genomics

In genotyped Holsteins, Feed Saved ABV utilises two components:

- Maintenance feed requirements predicted from type traits.
- Residual Feed Intake (RFI) which is the feed consumed by an animal above or below the predicted feed intake estimated by growth and production of the animal.

Feed Saved was the first of a new generation of traits that relies on genomics for its evaluation. Individual dry matter intake data is too expensive and impractical to collect on farm. However, the feed intakes from cows based in research centres in Australia (Agriculture Victoria, Ellinbank) and overseas were measured to establish a reference population. These data are combined with a prediction of the feed required for maintenance purposes. Genomics is then used to evaluate residual feed intake and in turn Feed Saved for all other genotyped Holsteins.



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In other breeds, Feed Saved is calculated based on maintenance requirements predicted from type traits.

The value of Feed Saved

Any increase in feed efficiency is valuable for dairy farmers because feed represents about half of a typical dairy farm's variable costs.

As shown in Figure 1, some bulls can save at least 100 kg of dry matter per cow per year. While this might only equate to a quarter of a bale of hay, when multiplied over an entire herd and compounded year on year, the savings really add up. Remember, genetic gain is permanent and cumulative.

The best way of breeding for feed efficiency is to use one of Australia's breeding indices. Feed Saved ABV is included in both breeding indices except the BPI in Jersey.

Breeding and feeding

Breeding for feed efficiency goes hand-in-hand with on-farm management and supports the work nutritionists are doing to improve feed efficiency.

The **Feeding the Genes** report demonstrated that genetic improvement works for all feeding systems. In every feed system the cows with higher merit for production produced more milk and the cows with higher merit for survival lived longer. In fact, Feeding the Genes suggested the benefits of using ABVs are even more significant in more intensive feeding systems and at higher production levels.

Good feeding practice and the strategic selection of high genetic merit bulls is a profitable combination.

Impact of updated model, November 2020

An updated model to calculate the Feed Saved ABV was implemented in November 2020, resulting in improved reliability.

The three contributors to the updated model were:

- Increasing the number of SNP markers from 28 to 41.
- Doubling the Holstein reference population used for residual feed intake (RFI) with additional data from Australia and overseas.
- An update in the formula to calculate Feed Saved from the type traits.

Holsteins: Some Holstein owners may notice changes in Feed Saved ABVs and rankings for genotyped animals. The flow on effect on BPI and HWI is relatively small because of the relatively low contribution of Feed Saved to index values.

Jersey BPIs are unaffected as the Feed Saved ABV is excluded. Although Feed Saved is included in the Jersey HWI, the impact of the updated model is minor as residual feed intake is not included in the Jersey model.

Red Breeds are affected only by the update in the Feed Saved calculation from type traits. The effect on BPI and HWI is small.

Summary

The Feed Saved ABV allows farmers to breed more efficient cows by identifying the animals that eat less for the same amount of milk produced.

With every joining, farmers have the opportunity to make genetic gain. For no additional cost farmers can breed a herd that utilizes feed more efficiently. All it takes is making the right breeding decisions. Australia's breeding indices (BPI, HWI) make this a straight-forward task.

Acknowledgment

The Feed Saved ABV model was updated in 2020 by DairyBio, a joint initiative between Agriculture Victoria, Dairy Australia and the Gardiner Dairy Foundation.

The updated model for the Feed Saved ABV drew upon data from the Efficient Dairy Genome Project (EDGP), an international collaboration led by Canada. Currently, the database contains from eight research herds in six countries (Australia, Canada, Denmark, Switzerland, United Kingdom and United States).

More info

Fact sheet: Feed Saved ABV
Feeding the Genes fact sheet
Feeding the Genes final report

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