DairyNZ

Breeding indexes made easy

A brief guide to Breeding Worth, Breeding Values, Production Worth and Lactation Worth.

Introduction to breeding indexes

Genetic merit is essential to your dairy herd's profitability. By having a clear breeding strategy which includes maximising Breeding Worth, supported by other breeding indexes, you can continue to build a stronger herd.

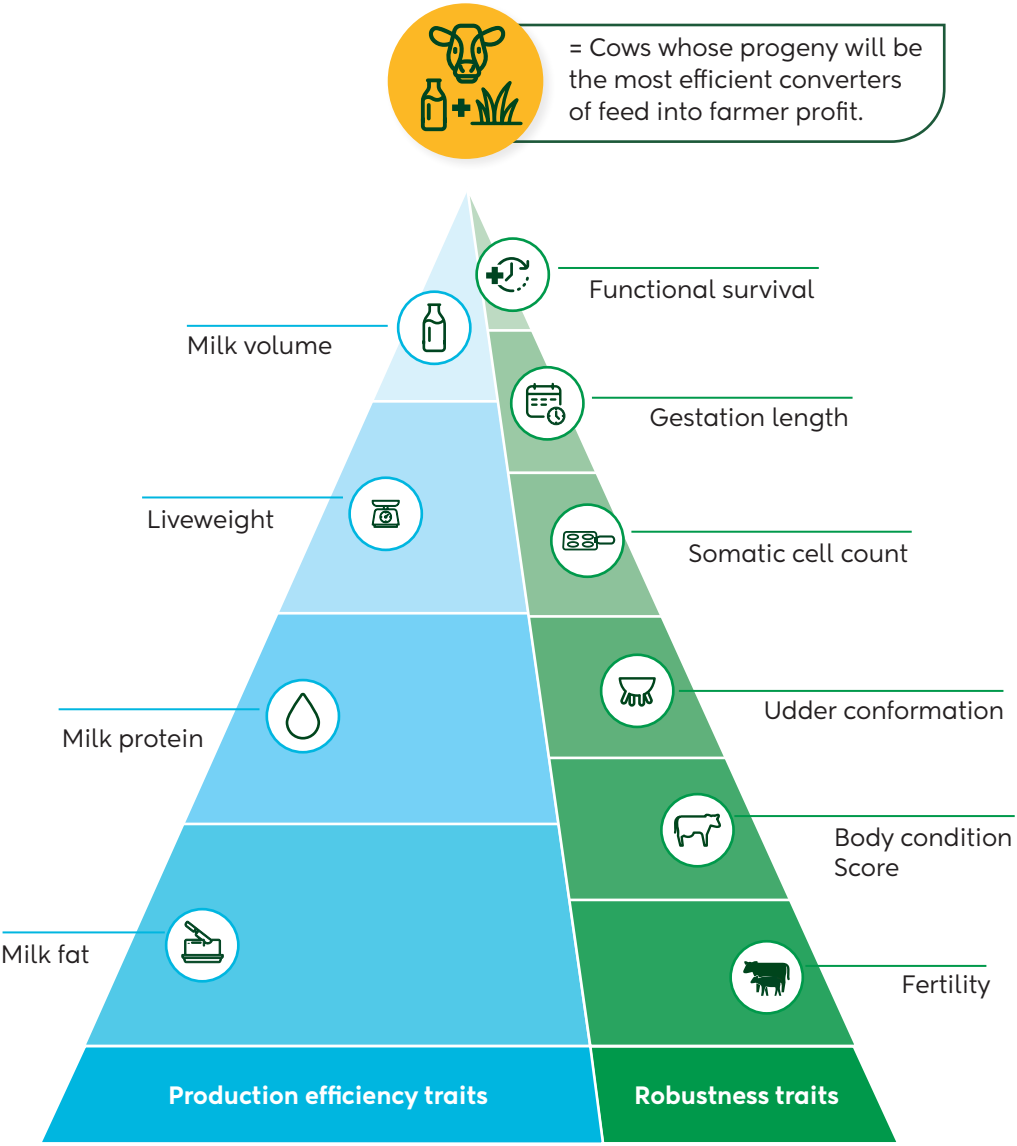
Breeding Worth (BW), along with Production Worth (PW) and Lactation Worth (LW), are breeding indexes that help you make informed breeding and culling decisions. These metrics are crucial for comparing New Zealand (NZ) dairy cattle across breeds, herds, and ages.

The national breeding goal:

Breed cows that efficiently turn feed into profit.

Find any bull listed by breeding companies.
dairynz.co.nz/bullteam

10 traits contribute to BW



The 10 Breeding Values that make up Breeding Worth

Ten traits with direct economic value to the NZ dairy sector are identified by NZ Animal Evaluation. These traits have the greatest impact on breeding profitable and efficient animals. Traits are categorised as 'Production efficiency' and 'Robustness' traits.

Production efficiency traits

Milk protein and milk fat yield
Cows that produce more protein and fat will bring in more income for the dairy farm business.

Volume
Volume refers to the litres of milk a cow produces. More milk does not always mean more profit because of feed costs and milk solids content. BW assigns a negative economic value to excessive volume, promoting genetic selection for cows that produce more milk solids efficiently.

Liveweight efficiency
Liveweight is included to balance production efficiency. Heavier animals produce more milk volume and need more feed for maintenance and growth, reducing production efficiency.

Robustness traits

Somatic cell count
Cows with lower somatic cell counts have better survival, reduced mastitis-related cost, and fewer penalties due to lower bulk tank somatic cell count.

Fertility
More fertile cows tend to live longer and have lower empty rates. They also achieve higher in-calf rates and increase the chance for being mated to produce heifer replacements.

Gestation length
Shorter gestation length increases days in milk, gives more recovery time after calving and allows for a condensed calving period.

Functional survival
Cows that fail for functional reasons have shorter lifespans and higher costs due to undesirable traits. This excludes cows with poor fertility or poor milk production, as cows are commonly culled for these traits.

Body condition score
Cows that maintain condition easily can be dried off later. This increases days in milk and boosts potential production and profit.

Udder overall
Udder overall is the score for the entire udder conformation, this includes teat placement and udder support. Poor udder conformation increases costs due to a higher risk of mastitis or being culled due to a poor udder.

Breeding indexes explained

Breeding Worth (BW), Production Worth (PW) and Lactation Worth (LW) are indexes that can be used to make decisions.

Each index is made from two components: a dollar value that is placed on the traits and a ranking for each animal. Learn more about each and their uses:

What is Breeding Worth?

Shows genetic ability for breeding replacements

Breeding Worth is a dollar value which ranks bulls and cows on their ability to breed replacements that efficiently convert feed into profit. It can be used for comparison across any breed or herd in New Zealand.

Breeding Values (BV) and Economic Values (EV) are combined to make one number that balances the 10 traits for easy comparing. This is combined by:

Breeding Value x Economic Value = Breeding Worth

Use BW to select the best sires for your herd and to decide which cows to breed replacement calves from.

- Use for selecting bulls for the **mating period**
- Use for selecting or purchasing heifers or cows

What is an Economic Value?

Shows the financial impact of a trait

Economic Values (EV's) show the financial impact of a trait on NZ dairy farms. Economic Values estimate the dollar value of a one-unit increase in a specific trait, assuming that all other traits remain the same.

Economic Values are calculated using economic models which take into account milk production, historic and current milk prices, income from culls, surplus cows and bobbies, cost of generating replacements and dairy farm expenses. The same EV's are applied for all bulls and cows. These are updated in December every year. The EV's for BW include the past five years, while PW and LW use data from the last three years.

See the latest Economic Values here: **dairynz.co.nz/ev**

What is a Breeding Value?

Shows the genetic potential for a given trait

A Breeding Value (BV) is an estimate of how desirable that animals' traits are when passed down to offspring. A Breeding Value ranks animals by estimating their genetic potential to influence traits in the next generation.

There are 10 breeding values that are used to calculate BW, but there are many others that are important to NZ dairy that can be used to inform breeding decisions. This includes Traits Other than Production (TOP) such as teat length, body capacity and Farmer Opinion Traits such milking speed and shed temperament.

Read more here: **dairynz.co.nz/bv**

What is Production Worth?

Shows expected lifetime performance

Production Worth (PW) ranks cows based on their expected lifetime performance. Data is collected each season throughout her lifetime. This provides a comprehensive view of the cow's real-time performance. However, this data does not clearly indicate her daughter's performance; for that, use BW supported by PW and LW.

Use PW to identify who the top cows are and assist decisions on which cows to keep, cull, sell or buy.

- Use **throughout the year** for purchasing cow decisions
- Use for culling decisions towards the **end of the year**

What is Lactation Worth?

Shows seasonal performance

The Lactation Worth (LW) ranks female animals based on their milk production and liveweight, assessing their efficiency and profitability for the current season. However, a cow's seasonal performance can be influenced by environmental factors.

Use LW to for making seasonal decisions around which cows have the best performance that year and to help inform herd management and culling decisions.

- Use towards the **end of season.**
- Use for culling decisions

Calculating Breeding Worth for your future replacements

Animals will only pass on half their BW to their offspring.

To calculate what you expect the genetic potential of your future replacement, use the following equation:

If a bull's BW is $100, we expect him to pass on half of that $100 to his daughter, leaving $50.

If your selected cow BW is $80, your future replacement will get $50 from the bull (half of $100) and $40 (half of $80) from the cow.

Future heifer replacement BW is:

$50 + $40 = $90

This genetic potential for the heifer replacements is a $10 improvement. This is because the bull was $20 better than the cow.

What is considered a good value?

Animal evaluation is not driven by the actual performance of cow, it is driven by the differences in performance between cows that are managed similarly.

Each year we see genetic improvement in the national herd; which leads to the average of each successive group of replacement heifers coming through having a higher Breeding Worth (BW) than the replacement heifers from previous groups.

The best way to compare the genetic merit of some other group of animals is to use the national averages.

Find out more: **dairynz.co.nz/animal-averages**

Five strategies to improve Breeding Worth on your farm

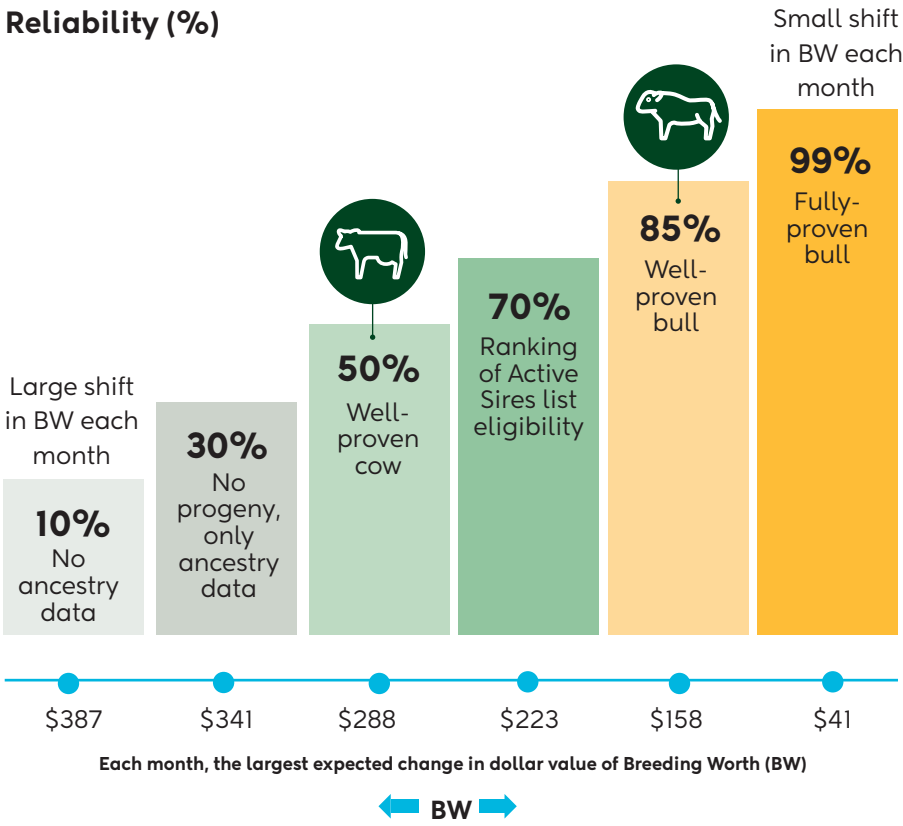
There are five strategies to consider implementing on your farm to improve Breeding Worth. These are:

- Using high breeding worth sires
- Targeting replacements from your top BW cows and heifers
- Keeping accurate and detailed mating and calving records
- Using DNA parentage verification
- Measuring cow performance

Reproduction performance impacts your ability to improve the Breeding Worth of your herd. This is because getting more of the right cows in-calf to high genetic merit bulls will give options to select the best replacements and accelerate genetic gain.

How reliable are the numbers?

To see how reliable Breeding Worth is, you can check the reliability. This is shown in the figure below.



For both cows and bulls, reliability is shown as a percentage from 0% to 100%. The higher the percentage, the more confidence you can have in the data and the less likely it is to change. In other words, it gives confidence that the BW and BV are good indications of the animal's true genetic merit, with minimal likelihood of large changes.

Recording information such as mating and calving dates, herd testing or weighing cows on farm improves the reliability of the breeding indexes and Breeding Values. For bulls, the more of his daughters that have been recorded, the more reliable his BW will be. For cows, the more records and older she is, the more reliable her BW will be. As more information is gathered about a bull's daughters, the bull's ancestry data becomes less important.

How to interpret the data

Breeding Worth Ranking	Bull Code	Breed	Breeding Worth (BW)	Protein (Kg)	Milk Fat (kg)	Milk (L)	Liveweight (Kg)	Fertility (%)	Somatic Cell (Score)	Functional Survival (%)	Body Condition Score (BCS)	Udder Overall	Gestation length
Ranking of Average Sires (RAS) - Average			475/88	40	60	600	50	1.5	-0.09	2.5	-0.02	0.2	-1
Example Bull	522725	XBR	419/83	36	54	674	53	3.1	-0.11	1.8	-0.011	0.34	-1.2

Breeding Worth

BW is expressed as a dollar value to represent the potential profit from the expected increase of genetic gain from future replacements.

Here's how to interpret it:

Positive BW: Indicates that the animal is expected to breed a replacement that is more profitable than an animal with a BW of $0. For example, a BW of $300 means the animal is expected to produce offspring that are $150 more profitable than that of an animal with a BW of $0.

Negative BW: Indicates that the animal is expected to breed a replacement that is less profitable than an animal with a BW of $0.

	BW	PW	LW
$ terms	+60 = expected to breed daughters that are $30 more profitable than daughters of a 0 BW cow	+78 = expected to generate $78 more profit in each of her lactations, than a cow with a PW of 0	+98 = expected to generate $98 more profit in the current season, than a cow with a LW of 0

Breeding Values:

Three factors to consider when reading Breeding Values:

1. The Trait: The characteristic being measured (e.g., milk production, fertility, stature).
2. The BV Value: The numerical value that shows the genetic potential for that trait.
3. The Units: The measurement units for the trait (e.g., kilograms for milk protein production).

Here's how to interpret it:

Breeding values can be positive or negative values. For example, a BV of +50 for protein production means the progeny is expected to produce 25kg more milk protein than an animal with 0kg.

However, a higher BV doesn't necessarily mean a better genetic outcome. For example, a high somatic cell count would be worse. Similarly, a BV of +1.5 for somatic cell means the progeny is expected to have a higher somatic cell count compared with an animal with a BV of 0.

Let's say you have a bull with the following BVs:

- Milk Volume: +200 L
- Fat: +10 kg
- Protein: +5 kg

This means that, on average, the bull's daughters are expected to produce 100 L more milk volume, 5 kg more fat, and 2.5 kg more protein than a bull that had BVs of 0.

Should I nominate sires, or use a bull team?

No matter what your breeding goals are, always use a team of bulls in your mating plan for genetic diversity. How you decide which bulls to include in your team will depend on your farm goals and the mating plan you would like to create. There are pros and cons to both strategies.

A bull team pre-selected by your breeding company provides a quick decision approach that still ensures your herd is going to improve year on year.

Benefits include:

- Genetic diversity
- Balanced traits
- Reduced risk around bull availability
- Simplify the mating plan

Nominating individual sires lets you tailor your mating plan to specifically address traits you would like to improve in your cows or herd.

Benefits include:

- Targeted genetic improvement
- Consistency in herd conformation
- High genetic merit in particular traits

When deciding your mating plan, the genetic diversity of your herds, balancing traits, and considering the risk around only using a small selection of sires, its best to have a diverse range of bulls.

Build my bull team **dairynz.co.nz/bullteam**

Why compare bulls

No two bulls are the same. Two bulls can have the same BW but will have reached it through different strengths.

Which bull is the best for my herd?

In the table below, Bull A has superior milk production traits while Bull B has superior Fertility, Somatic Cell and BCS. Out of these two bulls, the best bull for your herd is the one that fits your breeding objective.

		A		B
	BW	$546/75		$546/75
Trait	BV	BW Contribution BV X EV	BV	BW Contribution BV X EV
Milk fat (kg)	67	$353	55	$290
Protein (kg)	45	$319	38	$270
Milk Volume (L)	699	-$80	866	-$100
Liveweight (kg)	41	-$69	58	-$97
Total Production BW contribution ($)	$523		$363	
Fertility (%)	1.5	$9	6.8	$40
Gestation length (days)	1.3	-$3	-8	$10
SCC (score)	-0.09	$4	-0.75	$35
Functional survival (%)	2.5	$5	4.4	$8
BCS (score)	-0.02	-$3	0.33	$58
Udder overall (score)	0.2	$11	1.2	$32
Total Robustness BW contribution	$23		$183	

Who publishes Breeding Worth?

Bull Breeding Worth

Bull Breeding Worth and Breeding Values are published by NZ Animal Evaluation. NZ Animal Evaluation is a wholly owned subsidiary of DairyNZ.

NZ Animal Evaluation sets the National Breeding Objective and determines the traits included in Breeding Worth. The national breeding objective is "Animals whose progeny will be the most efficient converters of feed into farmer profit."

Breeding companies have their own Bull Breeding Worth that at times can differ to other companies and the NZ Animal Evaluation Breeding Worth. There are several reasons as to why this is. If you want market comparison, start with NZ Animal Evaluation.

Cow Breeding Worth

LIC are responsible for cows Breeding Worth, Production Worth and Lactation Worth.

A brief history of Breeding Indexes

In 1996, LIC, with support from industry experts, introduced Breeding Worth (BW), Production Worth (PW) and Lactation Worth (LW).

In 2002, LIC passed sire BW to DairyNZ, while LIC kept cow BW, PW and LW.

After creating the Dairy Industry Good Animal Database (DIGAD), Animal Evaluation, was moved to NZ Animal Evaluation, a subsidiary of DairyNZ.

Find the 30 top-ranking enrolled bulls in the country by visiting: **dairynz.co.nz/ras**

For more information visit **dairynz.co.nz**

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