

# A better BW for the New Zealand Dairy Sector

Consultation Discussion Document



DairyNZ 

Animal   
Evaluation



## Have your say

NZAEL welcomes your feedback on this consultation document. The information gathered will help direct decisions around the future of Breeding Worth evaluations for the New Zealand dairy herd.

The questions throughout the text are summarised in the list of consultation questions. They are a guide only and all comments are welcome. You do not have to answer all the questions. To ensure your point of view is clearly understood, you should explain your rationale and provide supporting evidence where appropriate.

### Timeframes

This consultation starts on 16 May 2023 at 10am and closes on 27 June 2023 at 5pm. Submissions will be analysed, and a summary of submissions will be made available.

### How to provide feedback

You can make a submission by filling out the online form for this consultation at this link. Or sending a copy of your submissions to [NZAEL.Manager@dairynz.co.nz](mailto:NZAEL.Manager@dairynz.co.nz).

[dairynz.co.nz/better-bw](https://dairynz.co.nz/better-bw)

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### Publishing Submissions

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Unless clearly specify otherwise in submission, DairyNZ and NZAEL will consider that submitters have consented to website posting of their submission with their name and contact details excluded.



# A better BW for the New Zealand Dairy Sector

**NZAEL believes that accurate, independent and inclusive animal evaluation using genomic information is key to increasing profits for Kiwi dairy farmers and improving outcomes for the entire New Zealand dairy sector.**

Genetic gain is well proven to drive profit on dairy farms both overseas, and here in New Zealand<sup>1</sup>. Genomics allows for faster, more informed breeding decisions that in turn help farmers to increase yields, improve efficiencies, and breed herds that are easier to farm and have a lower environmental footprint.

Genetic gain in New Zealand has fallen behind our overseas competitors in the last decade. This is because other countries have made more use of genomic selection than we have.

To give New Zealand the best chance of achieving internationally competitive genetic gain, NZAEL is proposing to:

1. Improve the **accuracy** of NZAEL's Breeding Worth by including all relevant New Zealand genomic and phenotypic information.
2. Create an **inclusive** system, giving all dairy farmers the ability to utilise the NZAEL Breeding Worth data to improve their herds.
3. Create **one independent** source of Breeding Worth, enabling farmers to better compare bulls across providers, with the knowledge that they are using the same credible data to inform their choices. An independent Breeding Worth including genomics for cows would also assist farmers in making breeding and culling decisions for their herds.

**“ Now's the time. There's an opportunity for us all to work together, all play our part, and all contribute what we need to do for the benefit of the sector. If we do - it'll be an exciting time. ”**

Andrew Fear, NZAEL Manager

<sup>1</sup><https://www.mpi.govt.nz/dmsdocument/47635>

# Improving the NZ system for better genetic gain

Genetic gain provides significant value for the dairy sector. Farmers benefit from the efficiency and productivity gains that come from better genetics passed on to their animals. Farmers get animals that are more resilient, more profitable, and easier to farm.

Genetic gain in the New Zealand dairy herd is supported by a large, complex system involving farmers, animal evaluation science, and providers of artificial breeding and herd testing services.

NZAEL is proposing to improve the system that supports genetic gain by:

- Improving the accuracy of NZAEL's Breeding Worth by including all relevant New Zealand genomic and phenotypic information.
- Creating an inclusive system, giving all dairy farmers the ability to utilise the NZAEL Breeding Worth data to improve their herds.

- Creating one independent source of Breeding Worth, enabling farmers to better compare bulls across providers, with the knowledge that they are using the same credible data to inform their choices. An independent Breeding Worth including genomics for cows would also assist farmers in making breeding and culling decisions for their herds.

Genetic gain accelerates the efficiency and performance gains on-farm from breeding better animals, and is key to ensuring New Zealand farmers remain internationally competitive. The figure below shows that New Zealand is lagging behind other comparative countries such as Australia, UK and USA. The data below is based on the Holstein breed but similar trends have been seen in Holstein-Jersey cross-breeds (*appendix 1*). These countries have succeeded in driving more accurate animal evaluations of young bulls using genomics, which has given farmers greater confidence to use genomic information and young sires.

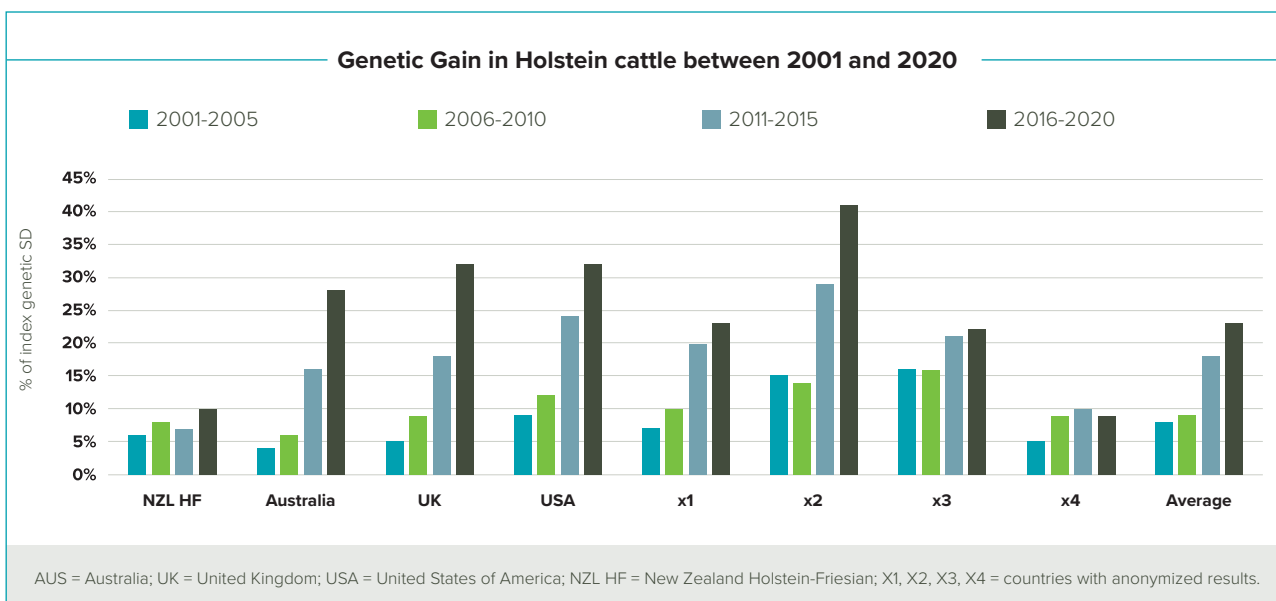


Figure 1. Holstein yearly genetic gain expressed as a percentage of the genetic standard deviation of the index

NZAEL believes that we can close the genetic gain gap and improve our competitiveness by:

- Incorporating genomic information into Breeding Worth calculations.
- Improving the accuracy of phenotypic data and the reference population.
- Collaborating across the sector.

How these steps can be implemented for the benefit of the New Zealand dairy herd is explained in more detail in the following sections.

## Why genetic gain matters to kiwi farmers

By breeding for selected traits such as milk production and quality, live weight, fertility and gestation length a farmer's herd can gain efficiency and profitability with every generation.

**Better Breeding Worth** with genomics will mean all farmers can choose to utilise genomic information in their breeding decisions.

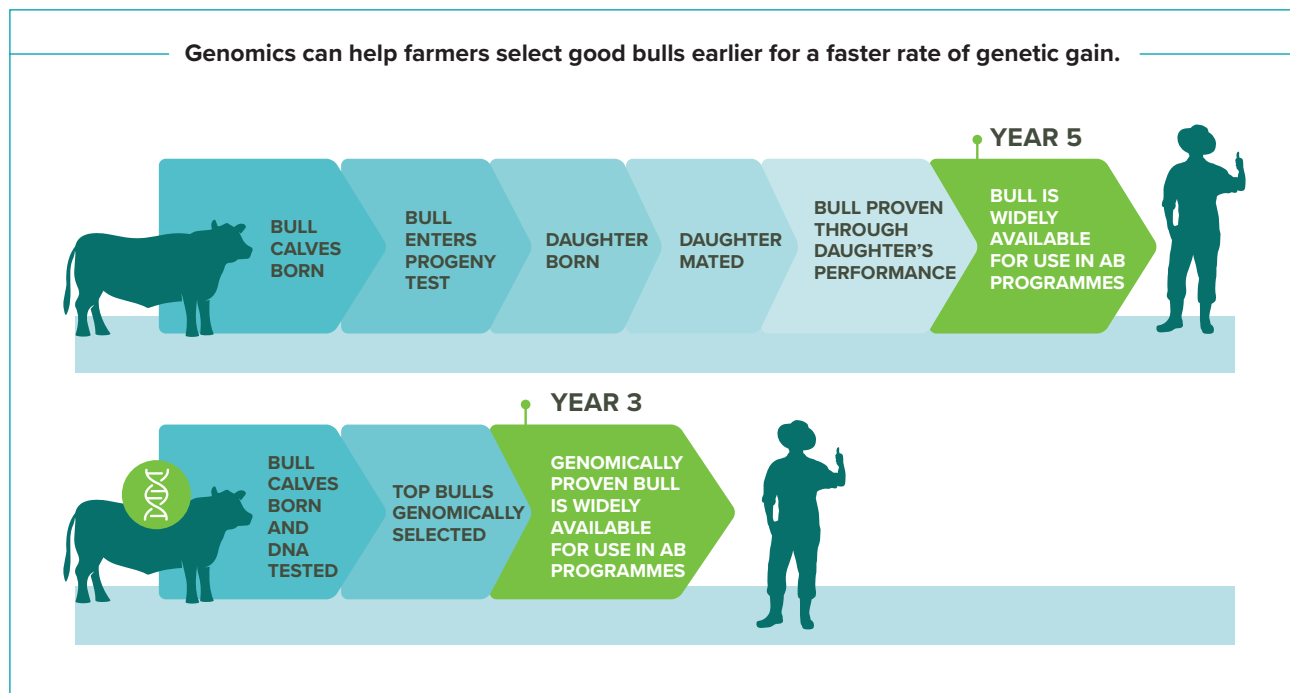
## The opportunity genomics provides

### What is genomics

A genome refers to the DNA of a living thing. DNA provides the genetic 'code' for genes, which are expressed in combination as performance or traits. Genomics is the study of genes and their expression as traits – both desirable and undesirable. Genomic predictions require both genotypic data (DNA profiles) and phenotypic data (measurements of performance or traits).

Genomics allows for better and earlier predictions of the desirable and undesirable traits of bulls and cows. This information then supports better breeding decision-making.

Using genomics can decrease the generational interval from at least five years to just three years. New Zealand herds can therefore benefit from improved genetic gain at a faster rate than with traditional daughter proving process (see figure below).





## Unlocking a greater rate of genetic gain for kiwi farmers

A significant opportunity exists to improve the efficiency and performance of New Zealand dairy herds by using all available useful genomic information in NZAEL's Breeding Worth calculations.

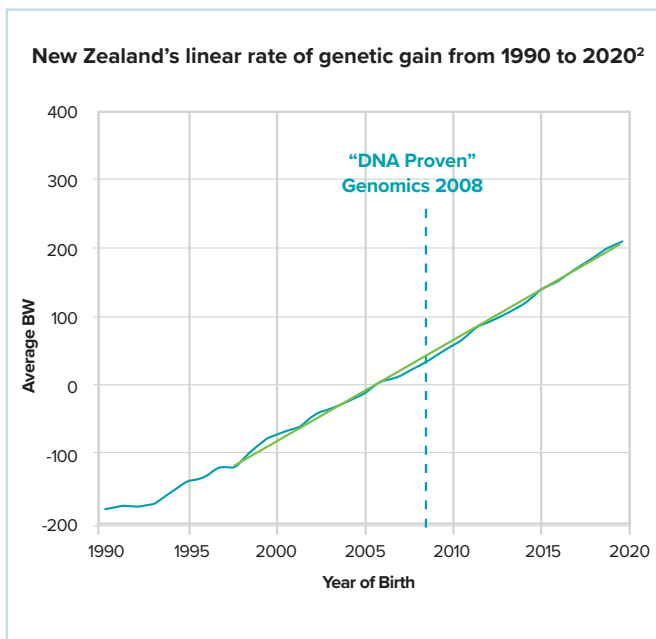
The main reason genetic gain has fallen behind our competitors is our relatively slow uptake of young sires supported by genomic evaluation.

Genomic information has been available in New Zealand to farmers through commercial providers

since 2008, but has not been included in NZAEL's independent Breeding Worth calculations since 2010.

However, genomic science has continued to evolve over the past decade and other countries have made significant gains with genomics. NZAEL is confident that now is the right time for New Zealand's genomic information to be integrated into a large, centralised system that can deliver reliable genomic predictions for farmers and other participants.

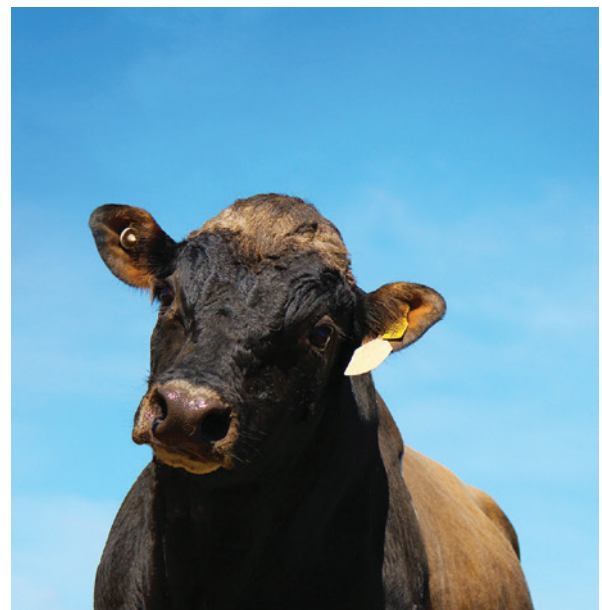
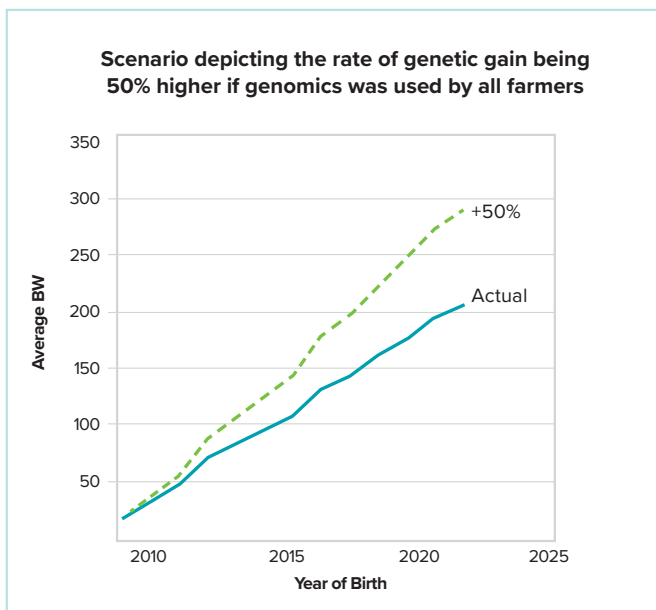
The graph below depicts how despite genomic technology becoming available in New Zealand in 2008, genetic gain has not accelerated.



This demonstrates that New Zealand's overall system hasn't been delivering the potential benefits of genomics across the whole herd. In contrast, successful implementation of genomic technology should have seen a considerable increase in the rate of gain as modelled in the graph below and achieved by other international dairy industries.

NZAEL proposes that New Zealand could achieve a 50% increase in the rate of improvement in Breeding Worth if there was high uptake of young genomic sires, supported by a world leading system to incorporate genomic information into New Zealand's Breeding Worth calculations.

This increase in Breeding Worth would result in an increase from around \$10 per cow per year, to \$15 per cow per year. Over 10 years this could accumulate to \$1.36 Billion for the New Zealand dairy industry<sup>3</sup>.



<sup>2</sup>These figures have been calculated by NZAEL using DIGAD data on cows with performance data born from 1990 to 2020. A line was added to depict the linear progression of the rate.

<sup>3</sup>These figures have been modelled by NZAEL based on the percentage increase of other comparative countries as presented in the international Benchmark report 2023 prepared by Abacus Bio. The sectors actual Breeding Worth data held by NZAEL and is based on the average of each age group of animals. The scenario model assumes the rate of genetic gain will increase steadily from the current rate up to 50% higher than current over a 4 year period.

## Progressing improvements to the NZ system for better genetic gain

Independent research by The New Zealand Institute for Economic Research in 2021<sup>4</sup> showed that New Zealand's structures for animal evaluation were not delivering the best possible rates of genetic gain. The report concluded that there was slow uptake of genomics in New Zealand, a chilling effect on innovation and new entry within the sector, and a lack of incentives for industry good research.

AbacusBio undertook research for DairyNZ titled; Value of implementing genomics within NZAEL (AbacusBio, 2021). This paper concluded that "A concerted national level and collaborative effort to overcome these limitations is now essential to ensure that the full industry benefits are realised."

NZAEL is now acting on the findings of these independent reviews. To do this NZAEL is changing the way it delivers animal evaluation for the New Zealand dairy herd. This will mean significant changes to how the animal evaluation system operates. Therefore, effort has gone in to ensuring the changes being consulted on will deliver a successful system for the benefit of all farmers.

NZAEL believes that being accurate, inclusive and independent are the key underpinning principles for a successful system. These principles have been considered throughout the document.

## Key principles for a successful Better BW with genomics



### Accurate

Large datasets of quality, fit-for-purpose data, using the best available science



### Inclusive

Everyone gets a fair opportunity to participate, and to benefit from their contribution to improving genetic gain



### Independent

An independent system to deliver for the best interests of the dairy sector



- 1 Do you agree **accurate** is an important principle for a successful animal evaluation system?
- 2 Do you agree that **inclusive** is a key principle for a successful animal evaluation system?
- 3 Do you agree that **independent** is a key principle for a successful animal evaluation system?
- 4 If you disagree with any of these principles what else would you use to design a successful system?

<sup>4</sup>The New Zealand Institute for Economic Research developed a report for the Ministry of Primary Industries on Dairy herd improvement: What evidence do we have on the linkages between market structure, incentives, and performance? (NZIER, 2021)



## Progressing the use of genomics

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**Using genomic information is not without risks. Careful steps need to be taken to ensure that the benefits identified through genomics are being delivered in the dairy herd. To ensure we manage the risks and deliver for farmers, the sector requires:**

- a robust animal evaluation system; and
- use of reference populations that link genotypes with accurate phenotypic data; and
- the on-going collection of daughter performance data to check accuracy over time.

Genomic science has evolved over the past decade and other countries have made significant gains with genomics. NZAEL is confident that now is the right time for New Zealand's genomic information to be integrated into a large, centralised system that can deliver reliable genomic predictions for farmers and other participants.

### A sector-wide solution

NZAEL believes farmers will benefit from a single national animal evaluation system that calculates Breeding Worth with genomic information to improve New Zealand's rate of genetic gain.

This would create a single, independent source of Breeding Worth for farmers to use when comparing

bulls and cows, regardless of who a farmer's service provider is. Farmers will then be able to make better breeding decisions that are best suited to their farm.

For the New Zealand dairy sector to harness the full benefits of genomic information a sector-wide solution is needed, supported by an accurate, inclusive and independent system.

Genomic predictions require both genotypic and phenotypic data. Most genotypic data are currently held in New Zealand by commercial entities – mainly CRV and LIC. The sharing of genotypic data with NZAEL would support more accurate predictions of genomic Breeding Worth for young sires and cows. But this would also allow other participants who haven't built up their own genotype pools to quickly assess the merits of their unproven bulls and market those with high genetic merit in the New Zealand system to New Zealand farmers. This disincentives LIC and CRV to provide access to their genotypic data, which would reduce the accuracy of NZAEL predictions.

To recognise this tension, we have proposed an operating model of payments for access to data and genotypes, funded from fees paid by all participants to access NZAEL services. The proposed operating model is detailed in the following section.



# An operating model to deliver an accurate, inclusive, and independent system

**NZAEL is seeking your feedback on its proposed operating model – to provide a better service for farmers.**

This has been developed over 18 months, including seeking constructive feedback from current participants, to assess feasible options that will deliver a Breeding Worth with genomics for the New Zealand dairy herd.

This is a significant shift from how Breeding Worth is currently delivered by NZAEL and will have flow-on effects throughout the sector.

The proposed operating model outlines how all participants will:

- provide genotypes and data,
- access information, and
- obtain an NZAEL Breeding Worth with genomics.

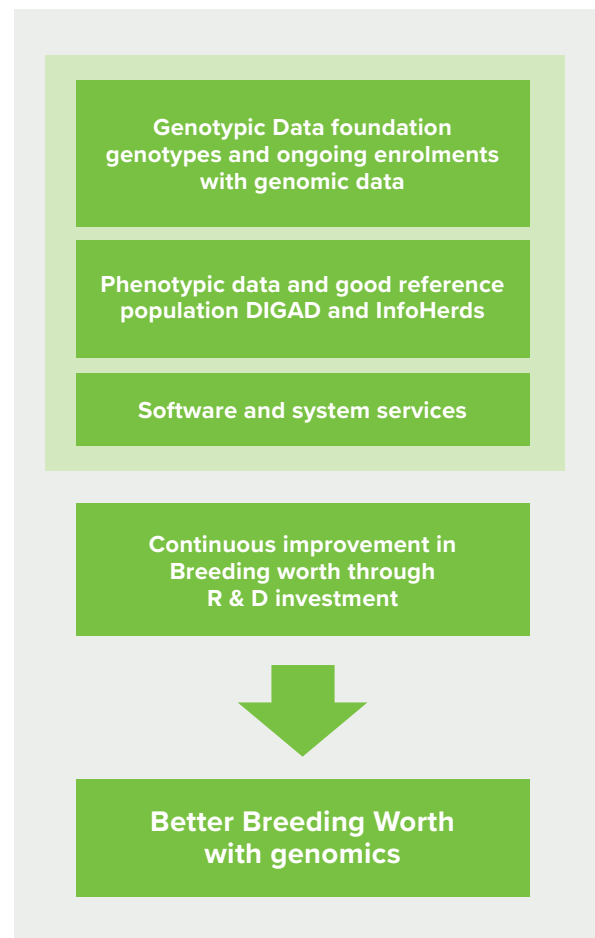
## How it works

All available genotypic data will be shared with a national database, where the supplying parties retain ownership but grant NZAEL specific access rights.

The phenotypic data required is already held by NZAEL in DIGAD. In the longer-term, a programme called InfoHerds will develop a more accurate reference population with more accurate and additional phenotypic data.

This system will prioritise delivering the best outcomes of genetic gain for the New Zealand herd and will focus on continuously improving the system with the best information and science available.

One version of Breeding Worth with genomics from NZAEL would reduce fragmentation within the sector and would provide more reliable predictions as more of the data available would be utilised.

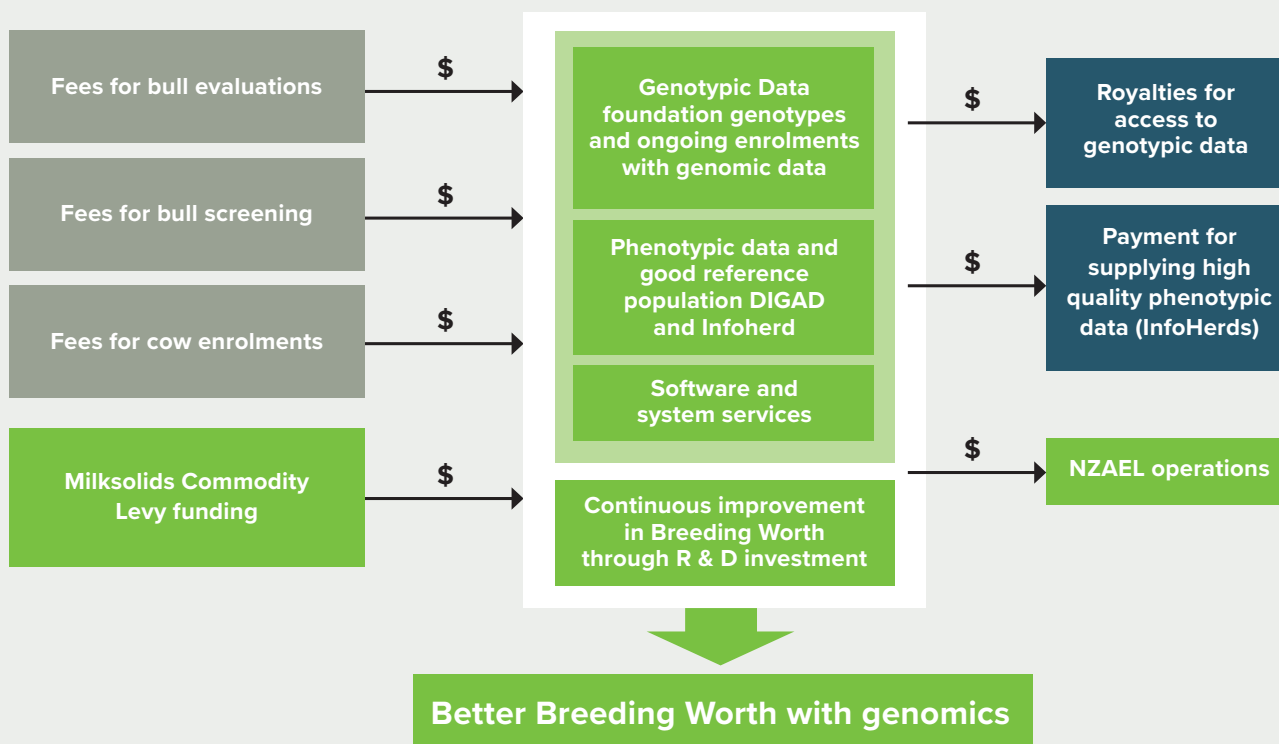


## Funding the operating model

The system needs to both encourage participation and be economically sustainable, meaning it receives sufficient revenue from users and participants to balance the costs.

The diagram below shows a high-level overview of how the proposed system could work, with funding on the left-hand side balancing the expenses on the right-hand side.

Diagram of the operating model and indicative funding.



The goal is to have users funding access to quality genotypic and phenotypic data through fees paid for NZAEL services. Royalties or incentive payments for data supply will provide an incentive for the sector to invest and improve the accuracy of animal evaluations and services to farmers. NZAEL will achieve this by shifting how the animal evaluation system is funded and the services it delivers, including payments for the supply of useful information.

Alongside the Milksolids Commodity Levy funding that NZAEL receives, fees will also apply for new services for bull and cow owners.

This means:

- Bull owners will pay a fee to NZAEL for screening their bulls and for enrolling them with NZAEL.
- Cow owners will pay fees (most likely indirectly) for enrolling their cows through herd records providers, and for receiving genomic Breeding Worth predictions for their cows from NZAEL.

- A straw levy may also be collected to fund additional services in the system.

This proposed fee structure would replace the existing system where the costs of genotypic and phenotypic data collection are funded by commercial parties and by farmers (e.g., herd testing, parentage testing and on-farm data recording), and where NZAEL has been predominantly funded by the Milksolids Commodity Levy received from DairyNZ.

In the proposed system, fees will be paid by commercial companies providing services to farmers. Individual farmers and organisations such as Breed Societies will be able to access NZAEL outputs directly if they are NZAEL participants or through commercial service providers. This won't necessarily see farmers paying more, but it will make the cost structure more transparent for farmers.

Find out more about the proposed operating model and funding structure on our website: [dairynz.co.nz/better-bw](http://dairynz.co.nz/better-bw).



## Funding future research

There is a lot of existing research into improving the genetics of the New Zealand dairy herd. This research is funded by DairyNZ, the commercial sector and government in a range of projects, and often in partnership. For example, LIC, CRV and NZAGRC are co-funding methane genetics research. DairyNZ and MPI are co-funding research into puberty traits to improve fertility.

The changes proposed by NZAEL could potentially shift the incentives for the commercial sector to invest in research. There is a risk that this might create a situation where important research doesn't get done because individual companies can't capture enough benefit. Solving these types of issues is a key part of DairyNZ's role in the sector. The proposal in this document is intended to address a current issue whereby individual companies are not incentivised to share genotypes with NZAEL, despite this being valuable to the whole sector.

DairyNZ commits to continued investment into genetics and genomics research for the sector. The proposed funding model allows for fees to be paid by users to reduce the levy funding required to operate NZAEL. This provides opportunity to increase research funding if incentives for commercial research are impacted.

## Creating a fair and inclusive operating model

**While the change for farmers of using one Breeding Worth in the sector will require minimal effort, the proposed operating model will mean significant changes to the way the animal evaluation system operates in New Zealand for current and new participants.**

## Bull owners

One of the biggest changes is that owners of bulls without daughters in the New Zealand system will be able to purchase a genomic evaluation that will give a much better prediction of how well those bulls will perform in the New Zealand dairy herd as sires than the current Interbull or parent average data provides. These bulls could be from overseas or in New Zealand.

Farmers interested in purchasing unproven young sires would then have greater confidence in making those selections. This is positive for farmers looking for more options, and overall could benefit New Zealand by introducing new high-genetic merit animals with wider genetic diversity into our national herd. However, for the existing participants who have already invested in genotypes and genomics in New Zealand, there is a justifiable concern that the proposed system could use their information to provide a relatively risk-free market entry pathway for new competitors.

## A system that works for everyone

To achieve the full benefits of NZAEL's proposal needs all parties to participate in the system - to have one common national animal evaluation system with collated and accurate data. Therefore, the system needs to be designed to work for all participants.

The transition to a new system needs to be fair, inclusive and acknowledge the prior investment in genomic information that some stakeholders have undertaken.

**To do this there are two key settings that NZAEL will need to get right in the system:**

- All users pay a fair price for information and services.
- All participants are paid fair royalties for access to their genotypes and phenotypic data.





## Balancing fees and royalties

Getting the balance right between the fees and royalties is vital. We need a system that allows new participants to enter whilst paying a fair price as well as recognising the investment of existing participants in providing access to their information to benefit the wider sector.

NZAEL is aiming to balance the royalties and fees. This means:

- Existing participants will be paid for access to their genotypes and phenotypic information.
- New participants will pay entry fees reflecting the cost of the information and NZAEL systems used to generate animal evaluations.

The next fundamental decision that needs to be made on the settings of the systems is at what price point to set the fees and royalties at.

### Low fees might mean:

- Smaller royalties for existing participants meaning they would have less incentive to contribute their genomic data and reducing the accuracy of NZAEL outputs.
- Reduced barriers to participation for new users, meaning New Zealand farmers will likely benefit from more diverse participation and genetics.

### Higher fees might mean:

- A system with higher royalties for existing participants, meaning they would be more likely to contribute their genomic data leading to increased accuracy.
- New participants would be less likely to use the national animal evaluation system to generate Breeding Worth for unproven genetics, reducing the diversity of animals screened.



- 8 Do you agree fees should be structured to encourage wider participation in the system?
- 9 Do you agree that fees should be structured to support higher royalties to encourage the current participants to share access to their genomic data?



As NZAEL is an industry good organisation, the proposed operating model is not profit orientated. The approach taken to the Operating Model is to start with an estimate of the costs to support NZAEL provision of genomic Breeding Worth. The three main costs and the approach taken are summarised as:

1	<b>ACCESS TO GENOTYPIC DATA</b>	Collection of all available genotypic data to develop a large data set to verify calculation of BW using genomics.
2	<b>PHENOTYPIC DATA AND GOOD REFERENCE POPULATION</b>	Collection of good quality phenotypic data (physical qualities of animals) to ensure predictions are relevant to NZ herds.
3	<b>SOFTWARE AND SYSTEM SERVICES</b>	New model and software to support it.

In total, the proposed system will cost roughly \$10 million to run and is expected to be funded by the Milksolids levy (\$3m) and through fees (\$7m) attributed to the proposed system.



#### **Milksolids Commodity Levy**

This is a continuation of the funding that NZAEL receives to deliver animal evaluation services (alongside \$2m of levy funding that is directed towards Research and Development).



#### **Bull owners**

The majority of fees will be collected from bull owners to reflect the commercial advantage they receive from the system, and fund the royalties paid to those parties who are providing access to genotypic and phenotypic data.



#### **Cow owners**

Based on the current proposal, the new fees expected to be paid directly by cow owners will not be significant. NZAEL believes that the costs of the system versus the services and benefits are appropriately weighted.



- 10 Do you agree that these are the right costs to calculate fees from? If not, what services or information should be prioritised for funding from fees?
- 11 Do you support fees being paid by those who utilise the system, i.e., mostly bull owners, service providers and cow owners?
- 12 Are there alternative operating model structures we should consider that deliver on the principles of accurate, inclusive and independent?

## Ensuring the system is accurate

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**Including genomic information is only one of the changes we are proposing to deliver a more accurate Breeding Worth. Additional accuracy will be obtained from filtering the data used for animal evaluation, improved data validation and the introduction of InfoHerds.**

### Filtering for Accuracy

Current practice uses almost every piece of phenotypic data collected in DIGAD for Breeding Worth calculations. This includes data that could have been recorded inaccurately, such as when a large number of animals within a herd are recorded as calving or mating on the same day. The problem with this sort of inaccuracy is that it creates a bias in trait calculations, which then flows through to Breeding Worth.

Filtering out this inaccurate data where it can be identified will reduce the bias and will increase the accuracy of cow Breeding Worth and Reliability back to farmers, allowing better decisions to be made. For some farmers their herd's Breeding Worth reliability may be lower than previously calculated. An extension programme will explain these changes and point farmers to the changes they need to make on-farm to improve Reliability.

### Data Validation

In some instances, new technology or advances in computing, means better identification of data records in DIGAD that are incorrect. In addition, the correct data to replace incorrect or missing records may be identified. Parentage is a particularly important piece of information for animal evaluation, but can also contain mistakes which then cause problems in animal evaluation.

Genotyping will enable the identification of instances whereby the recorded sire or dam is improbable, and then remove that from the calculations. It will also enable historical records to be corrected affecting the wider pedigree. Data validation and corrections will lead to a better Breeding Worth, although it will also lead to some adjustments for individual animals.

### InfoHerds

Historically, the New Zealand animal evaluation system relied on most farmers herd testing and submitting data along with parentage to the national database. However, as Breeding Worth has become more sophisticated and included more traits, this has expanded the need for more measurements. In practise, not every farmer has the time and resources (or the incentive) to measure every trait (e.g., liveweight, BCS). Many herds therefore only have some trait information recorded.

The concept of InfoHerds is to obtain most of the information needed from a smaller proportion of the national herd. Incentives will be created to ensure that those animals are measured more extensively and accurately. These select animals would also be genotyped, and that combined with extensive measurements would then drive more accurate predictions based on genotypes.



**13** Do you agree with the changes we are making to improve the accuracy of animal evaluations?



**NZAEL can deliver  
the system for the  
benefit of the NZ  
dairy herd**

**NZAEL believes it is the organisation best placed and with the mandate to deliver an accurate, inclusive and independent animal evaluation system. To deliver on this responsibility for the sector, NZAEL is:**

- transparent in its decision-making and findings
- building in-house skillset and partnering with world-leading experts
- the industry good organisation for animal evaluation in New Zealand, working for all farmers and is independent of commercial interests.



## Who is NZAEL?

### Industry good

New Zealand Animal Evaluation Limited (NZAEL) is a subsidiary of DairyNZ, which is funded by dairy farmers through the Milksolids Commodity levy. The role of NZAEL as the industry good organisation for genetic evaluation is to ensure that the New Zealand dairy herd is resilient, and that rates of genetic gain are internationally competitive.

NZAEL develops and delivers the technologies that support publication of the independent evaluation of all dairy animals using the Breeding Worth (BW) index. This is critical information farmers and industry use to help guide their breeding decisions to increase both the genetic gain of their herds and to increase their farm profit.

### Setting the direction

NZAEL is responsible for driving the National Breeding Objective (NBO) for farmers. The NBO focuses the development and improvement of traits towards delivering the information that helps farmers make breeding decisions for cows that are fit-for-purpose for New Zealand's pasture-based farm system and are efficient converters of feed into profit.

### Dairy animal database

NZAEL is the custodian of the Dairy Industry Good Animal Database (DIGAD), the only database for all recorded animal data in New Zealand. Every BW value created for farmers in New Zealand relies on the information stored in DIGAD.

### World-leading science

NZAEL is at the forefront of farm systems and genetic science and works with local and international experts to help farmers create the most profitable herds possible. This is done by researching on-farm performance related to genetics and identifying

how genetics can support improvements in the farm system. NZAEL collaborates with the world's leading scientists to deliver the best BW for farmers and invest in continuous improvement of evaluation methods and traits that matter most.

### Collaborative

NZAEL carries out robust processes for sign-off of important decisions that ensure they are in the best interests of the sector. This process is informed by the Science Advisory Committee, includes engagement from the State of the Art (SOTA) panel, and consultation with the Farmer Advisory Panel.

NZAEL has its own Board of Directors with accountability to the DairyNZ Board and follows a rigorous testing process that includes farmers and experts for all improvements or changes to BW. Every improvement is tested with these groups before sign-off from the NZAEL board. NZAEL then communicates everything the organisation does with farmers and the sector.

### Transparent

NZAEL is committed to transparency within the sector. NZAEL has a track record for being up-front with reporting of genetic gain and any problems discovered, as well as its plans for further development of the animal evaluation system. This is because NZAEL's first responsibility is to dairy farmers.

These results are made available to everyone in the sector through AI companies, bull catalogues, herd record providers and the independent comparison of AI bulls published in the Ranking of Active Sires (RAS) list on the DairyNZ website.



- 14 Do you agree NZAEL is best placed to deliver an accurate, inclusive and independent system for Breeding Worth with genomics?
- 15 Do you value NZAEL delivering a transparent industry good animal evaluation solution for farmers? If so, why is this important to you?



## Timeframes for changes

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**Changes to the way NZAEL calculates the Breeding Worth Index to include genomic information is being planned for delivery in June 2024. Over time breeders will screen their bulls using the proposed system and NZAEL will publish Breeding Worths that include genomic information on the DairyNZ website.**

A full launch is planned for June 2024. However, NZAEL is looking to take advantage of improvements as they are developed, so the industry doesn't have to wait for the full model to be completed.

Any changes NZAEL make to Breeding Worth go through a significant quality assurance process before any new traits are approved for launch, ensuring NZAEL's animal evaluation information is of the highest quality.

The first improvements include filtering the phenotypic data used in animal evaluation to remove bias. This change is expected to have a significant improvement on sire Breeding Worth. The Core production traits will be the next areas of improvement as the team works on the introduction of genomic information to the animal evaluation process. This will be followed by working through the remaining Breeding Worth traits.

NZAEL limits making significant changes to Breeding Worth to two periods in the season - December and June/July. These periods are times between either the primary industry sales and mating periods, and so any changes to Breeding Worth or bull rankings can be managed more effectively.

Once the full genomic solution has been launched, NZAEL will continue to pilot the new features of the system such as InfoHerds to ensure they are fit for purpose. After about 18 months (i.e., June 2025), a Better Breeding Worth with genomics will be fully available to be utilised by farmers and the sector to make breeding decisions.

For the most part breeding decisions will be made the same as usual for farmers, by working with their Artificial Breeding companies and choosing the right genetics for your herd. However, the decisions farmers make will be backed by independent calculations, using data from a wide range of sources and the best available science.

This may take a few years but in the long term it will mean that the New Zealand dairy herd will start to increase the efficiency and profitability gains that can be achieved through using genomic information in Breeding Worth predictions.

NZAEL want to ensure these changes deliver the benefits to the sector that we expect them to. NZAEL will review the performance of the Better Breeding Worth with genomics at appropriate intervals of three, five and ten years to ensure it is fit for purpose.



## Reference List

AbacusBio. 2021. "VALUE OF IMPLEMENTING GENOMICS WITHIN NZAEL."

NZIER. 2021. "Dairy herd improvement: What evidence do we have on the linkages between." <https://www.mpi.govt.nz/dmsdocument/47635-Dairy-herd-improvement-report>.

## Glossary

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### Breeding Worth (BW)

The index that is used to rank cows and bulls on their expected ability to breed profitable and efficient replacements. Breeding values are multiplied by their respective economic values to produce the index Breeding Worth (BW).

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### Daughter proving

Determining the value of a bull/cow based on the traits inherited and production data of the animals' daughters. This confirms that desired traits are passed on through breeding.

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### DIGAD – Dairy Industry Good Animal Database.

DIGAD is the only industry database that holds pedigree and performance data on all recorded dairy animals in New Zealand. Data held in DIGAD is used to operate Animal Evaluation runs and deliver individual Breeding Worth for animals which is published in the RAS list. Find out more about DIGAD.

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### Enrolling

enrolling the animal in NZAEL register of bulls to receive a Breeding Worth assessment.

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### Generational interval

In population biology and demography, generation time is the average time between two consecutive generations in the lineages of a population.

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### Genetic gain

Genetic gain is the improvement in performance or quality between age groups of replacements because of selective breeding or genetic improvement programmes.

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### Genomic information

Genomics is the study of an animal's genes and their expression; it examines how the genes interact to influence the animal's traits, development and growth.

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### Genotype

The genetic code consisting of a pair of alleles that describes an inheritable characteristic or trait.

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### Infoherds

Info herds is a programme where farm business can enter a contract to collect and supply high quality phenotypic data for a payment. The standard of phenotypic data required includes all cow physical traits (weight, Body Condition Score, etc), frequent herd testing, management decisions and fertility treatments. The cost of payment is a substantial and will potentially involve 100,000 animals per annum.

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### National Breeding Objective (NBO)

NZAEL is the owner and custodian of the National Breeding Objective. The NBO determines which traits and information are most important to farmers to enable improvements in genetic gain in the national dairy herd. New traits and changes in data are established through the NBO and reflected in NZAEL's Breeding Worth index and other industry animal evaluation indexes.

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### Phenotypes

The physical expression of a specific genetic trait or characteristic. Common phenotypic data collected from dairy cows include; weight, Body Condition Score, milk production and other traits collected through herd testing.

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### Screening

Using genomic technology to assess a large number of animals to determine their BW/Profitability.

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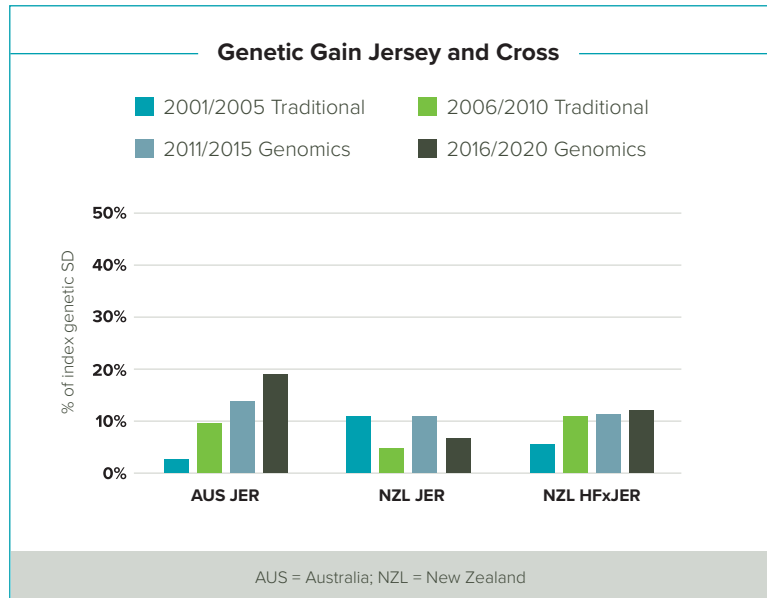
### Straw Levy

A levy collected on the purchase of each semen straw to fund the operation costs of the services that NZAEL delivers.

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## Appendix 1

Figure 2. Jersey (JER) and NZ Crossbred (HFxJER) yearly genetic gain expressed as a percentage of the standard deviation of the index.



## How the proposed operating model delivers on each principle for success

 <b>Accurate</b>	<ul style="list-style-type: none"> <li>• Filters out inaccurate data and only uses data to calculate BW</li> <li>• Uses a large data set of all useful genotypic and phenotypic data</li> <li>• Uses reference populations so calculations are fit for purpose in NZ</li> <li>• Utilises InfoHerds to collect high quality data for use in calculations</li> <li>• Uses a robust model based on best available science (NZAEL 3.5)</li> </ul>
 <b>Inclusive</b>	<ul style="list-style-type: none"> <li>• Works with all providers</li> <li>• Consultation with the Farm Advisory Panel</li> <li>• Creates entry pathways for new entrants</li> <li>• Acknowledges existing investment through royalties</li> </ul>
 <b>Independent</b>	<ul style="list-style-type: none"> <li>• Use of wide-ranging experts through Science Advisory Committee and the State of the Art (SOTA) panel Provides</li> <li>• BWs are calculated independent of commercial services</li> <li>• Provides BW calculations to all participants</li> <li>• Calculates BW based on best available science.</li> </ul>



*DairyNZ*  | *Animal*   
*Evaluation*