HERD IMPROVEMENT STRATEGY 2019-2024

HERD IMPROVEMENT INDUSTRY STRATEGIC STEERING GROUP

MARCH 2019

CONTENTS

EXECUTIVE SUMMARY

The first Herd Improvement Strategy was launched in June 2014 under the auspices of the Herd Improvement Industry Strategic Steering Group (HIISSG) which was established in January 2014. There have been significant changes in the industry and operating environment since 2013/14 and in late 2018 it was agreed that it was timely to assess the industry's performance in relation to its Herd Improvement strategy.

Good progress has been made since the first strategy in 2014 with achievements in many of the areas to achieve the 2020 outcomes. However, a review of the previous strategy and collation of new ideas contributed to identification of five refreshed focus areas within the 2019-2024 strategy:

1. Improved decision-making from data
2. Increased farm profitability through herd improvement
3. Improved animal performance from research and development
4. Improved and diversified service offerings
5. Strengthened capabilities

The strategy is summarised below, and contains the five focus areas and a number of strategic objectives and recommended activities designed to ensure the dairy industry can take advantage of the opportunities to improve farmer profits through herd improvement.

HERD IMPROVEMENT STRATEGY 2019-2024

FOCUS AREAS	**Improved decision-making from data**	**Increased farm profitability through herd improvement**	**Improved animal performance from research and development**	**Improved and diversified service offerings**	**Strengthened capabilities**
STRATEGIC OBJECTIVES	Enabling seamless data flow	Increasing genetic gain	Maintaining R&D capability	Stimulating pre-competitive innovation	Facilitating training and support
	Increased cow performance data	Delivering world-class evaluation services	Increasing genetic gain through R&D	Maintaining support functions	Developing extension capabilities
	Supporting data-driven decisions	Increasing data-driven breeding	Addressing emerging needs	Facilitating appropriate technologies	
ACTIVITY AREAS	• Centralised data repository • Coordinated data management • Herd recording innovation • Decision support tools • Access to phenotypes	• Use of Australian metrics • Increased AI use • Innovation in evaluations • Extension & marketing focused on clear value proposition	• Improve trait reliability • Improve genomic reliability • New breeding values • Increasing genomic technology use • Prediction of performance	• Shared infrastructure and capability • Shared efficiencies • Adequate support functions • Coordinated service development • Expanded collaboration	• Implement training plan

1. BACKGROUND

1.1 REFRESHING OUR STRATEGY

Given there had been many changes in the herd improvement industry and it was over four years since the launch of the first strategy in June 2014, in late 2018 it was timely to assess the industry's performance in relation to the Herd Improvement strategy and refresh the strategy for the next five years – with a vision out to 2024.

The refresh of the original strategy from June 2014, was guided by consideration of the following questions:

1. What recommendations in the 2020 strategy have been achieved – and can be removed?
2. What recommendations have we made progress on but are still ongoing?
3. Are there gaps remaining or emerging requirements?
4. Are the principles and assumptions underpinning a 2024 strategy still relevant?
    - What is changing?
    - What is the scale and impact for the herd improvement industry?
    - When will impacts occur? How likely is the trend?
5. Is the 2020 vision still relevant and applicable for 2024?

The consultation process for this Strategy began with a survey of 30 key stakeholders to assess which recommendations in the initial strategy had been achieved (and could therefore be removed), which recommendations had been partly achieved but were ongoing, and which recommendations had not been achieved. Feedback from stakeholders indicated a mix of perceptions on levels of achievement, with most responses indicating recommendations had been "partly achieved" since the strategy commenced in 2014.

There was broad consensus that the industry is better placed and that a lot of progress had been made in many of the areas to achieve 2020 outcomes. A number of areas of consistent dissatisfaction that were nominated for higher priority by key stakeholders were:

- Industry training, development and support
- Improving services, efficiency and access to technology for herd test centres
- Development of genomic tools, e.g. genomic mating programs, calf selection, etc.

A summary of a refreshed strategy incorporating stakeholder feedback was circulated broadly amongst the industry in late 2018, with additional input integrated into a final draft in February 2019.

This strategy contains five focus areas and a number of strategic objectives designed to ensure the dairy industry can take advantage of the opportunities to improve farmer profits through herd improvement.

1.2 HERD IMPROVEMENT INDUSTRY STRATEGIC STEERING GROUP

The Herd Improvement Industry Strategic Steering Group (HIISSG) was established in January 2014 and was tasked with producing a strategy to the dairy industry, with specific delivery to the Board of Dairy Australia as the organising entity for the work. The creation of HIISSG was the result of a broad cross-section of the herd improvement industry recognising that the absence of a whole of industry strategy to drive significant change was of critical concern. In addition, five Task Forces were set up

under HIISSG - Herd Test; Genetic Evaluation & Research; Marketing & Extension; Genomic Technology & Pipeline; and Breed Society.

HIISSG and the respective Task Forces operated as Communities of Interest (COI) under the Dairy Moving Forward (DMF) framework. More recently, DataGene and its Standing Committees have providing guidance to identify, priortise and develop research, development and extension initiatives.

DEFINING HERD IMPROVEMENT

HIISSG defined 'herd improvement' as ***"the provision of information to enable dairy farmers to improve farm profitability by making data-driven decisions to manage the production, health and breeding of their cows".***

1.3 OUR VISION

HIISSG agreed the following vision in 2014, which remains unchanged for the Herd Improvement Strategy 2019-2024:

Dairy farmers maximise their profit through a vibrant herd improvement industry offering effective and highly valued services

This vision will be achieved through:

- Using an Australian genetic evaluation system to rank domestic and foreign sires and females to support farmers in building their herd which are best suited to profitable Australian dairy farms.
- Farmers and service providers understanding the link between decisions on herd improvement and profit, and being able to make decisions through reliable, easily understood and accessible information about genetics, environment and herd management.
- A strong Australian herd improvement industry underpinning the industry strategy which has all links in the supply chain functioning well (including research, evaluation and data systems) alongside the evaluation of animals to provide for the needs of the Australian dairying environment.
- The herd improvement industry having a collaborative and constructive approach to adopting new technology and practical innovations.
- Industry data collection, management and analytics being seamless, streamlined and cooperative – and acquiring data from a wide range of sources include non-herd improvement industry participants such as milk processors, etc.

1.4 OUR PRINCIPLES

HIISSG agreed to a number of principles in 2014 which have underpinned subsequent discussions and the updated principles for the Herd Improvement Strategy 2019-2024 are:

1) Genetic improvement is vital to the profitability of the Australian dairy herd;
2) Australian evaluation and research capability is vital to genetic improvement in Australia;

3) Broad based farmer support/understanding of genotype by environment (GxE) effects and Australian evaluations is vital to Australian evaluation and research capability;
4) Industry wide extension/marketing and advocacy/leadership is vital for broad based farmer support/adoption of Australian evaluations;
5) Measurement of animal performance is vital to managing animal performance;
6) Cooperation and efficiency in the sharing of data is vital for mutual benefit across the industry;
7) Farmers control access to on-farm data, and;
8) Animal performance and farm data is critical for enhanced traceability and transparency through the value chain.

1.5 DAIRY MOVING FORWARD

Dairy Moving Forward (DMF) is the dairy industry's research, development and extension (RD&E) strategy under the National Primary Industries RD&E Framework. The national framework structure through DMF has become widely accepted as the basis for coordinated RD&E in the industry. The objective of the national framework is to develop, oversee and guide the coordination and alignment of research, development and extension in the dairy industry, and to ensure the outcomes of investments in RD&E address the industry-agreed priorities.

There are six theme areas with DMF, including Animal Performance, which encompasses herd improvement as well as other aspects such as animal health and welfare. There are also strong connections between all other DMF theme areas (Feedbase, People, Farm Business Management, Precision Dairy and Land, Water, Climate) and herd improvement especially in regards to data management and analytics.

2. SITUATIONAL ANALYSIS

In order to set the right context for the refresh of the strategy, key trends and risks facing the industry were identified at both a herd improvement industry-specific level and also within the broader operating environment. It is also worth reflecting on some of the key changes in the herd improvement industry since development of the first strategy in 2013/14.

The scale of the herd improvement industry in Australia is essentially defined by the size of the national dairy herd. Numbers of dairy cows have been falling by about 1.6% per annum over the past ten years, and for the 2016/17 year the national herd stood at 1,512,000 cows. The average herd size was 261 cows for 2016/17 compared to 223 cows in 2006/07. The shrinking population of dairy cows is putting severe operational and economic pressures on service providers involved in herd improvement.

40% of cows and 44% of herds are herd tested by eight Herd Test organisations, compared to 49% of cows and 55% of herds and ten years ago. This compares to 73% of cows in New Zealand and Canada, and 52% in Ireland (based on 2015 ICAR data). When measured in 2012/13, 11% of farms had in-line systems capable of providing milk volume information for individual cows. In 2016, 20% of farms reported having in-line meters.

Table 1: Herd test participation, cow numbers (2006/07 and 2016/17)

State	2016/17		2006/07	
	No. recorded cows	% all cows	No. recorded cows	% all cows
Victoria	348,435	35.0%	554,136	48.2%
NSW	99,529	60.3%	108,371	51.6%
Queensland	28,840	33.1%	54,616	45.1%
South Australia	43,772	67.3%	67,313	59.0%
Tasmania	48,106	33.2%	58,554	41.8%
Western Australia	29,408	53.5%	34,814	58.0%
Australia	**598,090**	**39.6%**	**877,804**	**48.9%**

When surveyed, almost all dairy farmers (97%) believe it is important to continuously improve herd genetics and a substantial 67% of farmers think it is very important. 84% of dairy farms use artificial insemination (AI), either exclusively (15%) or in conjunction with some herd bulls (69%). The remaining 16% of farms use herd bulls only (33% in Queensland, 23% in Western Australia). The average proportion of herd replacements from AI is 71%, but in 2016/17 only 28% of herds had at least 80% of their herd sired by AI.

Increasing numbers of dairy females and bulls are being genotyped by both farmers and bull companies. In 2017/18, the number of genomically-tested bulls was 4,018, up from 555 bulls in 2012/13. The number of genomically-tested cows from commercial herds was 15,199 from a base of zero in 2012/13. Cumulatively, an additional 53,762 cows have been genomically-tested since 2012/13 through various industry projects.

A National Breeding Objective (NBO) review was conducted in 2014 and involved a comprehensive industry consultation, farmer prioritisation and scientific analysis process. As a result of the review, in April 2015, three new breeding indices were launched to replace the Australian Profit Ranking (APR). The new indices were the Balanced Performance Index (BPI), Health Weighted Index (HWI) and Type Weighted Index (TWI). The next review of the NBO is scheduled to commence in 2019, with implementation in 2020/21.

DataGene was formed in July 2016 as a result of leadership from HISSG and commitment from many diverse organisations in the herd improvement sphere. The creation of DataGene was identified in the Herd 2014 Improvement Strategy and brought together many non-competitive herd improvement functions under the one umbrella, including genetics, herd recording, data systems and standards. DataGene incorporated the functions of MISTRO Centre in July 2016, and acquired the operations and staff of Australian Dairy Herd Improvement Scheme (ADHIS) in November 2016. DataGene is owned by the dairy industry, with foundation members being Dairy Australia, Australian Dairy Farmers (ADF) and the National Herd Improvement Association (NHIA). As at October 2018, total membership of DataGene was 22 members including herd test centres, genetics suppliers and breed associations as well as animal health companies and genomic service providers. DataGene has a much broader remit than predecessor organisations and the capacity to move beyond a specific herd improvement focus to ultimately providing software and data services across the dairy industry.

Through research conducted at the Dairy Futures Cooperative Research Centre (CRC) and subsequently DairyBio, work on new traits has progressed significantly. In 2015, a Feed Saved ABV was launched. In 2018, a Heat Tolerance Australian Breeding Value (ABV), and in 2019, genomic ABVs for Calving Ease and Gestation Length will be introduced. Further work at DairyBio, collaboratively funded by Dairy Australia, Agriculture Victoria and the Gardiner Foundation will see an ongoing pipeline of new traits, especially in the animal health and resilience areas. DairyBio was funded for five years from July 2016 and has five major projects that will improve animal performance. Focus areas include improving the reliability of genetic evaluations that use DNA markers (genomics), delivery of priority traits such as calving ease and gestation length, development of new and improved traits (such as mastitis resistance and other health traits) and methods to predict the merit of cattle of multiple breeds.

2.1 SWOT ANALYSIS

Strengths and weaknesses of the herd improvement industry and opportunities and threats in the wider operating environment were identified as context for this strategy.

	Helpful To achieving the vision	**Harmful** To achieving the vision
Internal origin (attributes of the herd improvement industry)	STRENGTHS	WEAKNESSES
External origin (attributes of the wider operating environment)	OPPORTUNITIES	THREATS

STRENGTHS

- World-class dairy bioscience research capability within DairyBio, that is linked to international R&D collaborators
- Long-term and stable funding commitment to dairy bioscience research via DairyBio (2016-2021), supported by joint-venture partners (the Victorian Government, Dairy Australia, the Gardiner Foundation) and commercial project partners
- Long-term and stable funding commitment to DataGene from Dairy Australia, and specialist skillset and capability within DataGene
- Redeveloped Genetic Evaluation System New Platform (GESNP), which provides a step-change for genetic evaluations for the industry
- Development of a Centralised Data Repository (CDR) which will be capable of housing data from a variety of sources and will enable single-entry, multi-use for farmers
- A broad appreciation of the benefits of genetic gain on improving farm income over feed costs
- Strengthening culture of collaboration and cooperation to drive pre-competitive innovation for service delivery and tools
- Service providers are increasingly supporting and promoting the use of Australian breeding values

- Breed societies and other herd improvement stakeholders are operating collaboratively to provide more cost-effective services
- All bulls available in Australia have Australian breeding values and selection intensity is driven higher by a large number of tested bulls
- Innovative herd test reports and tools are being developed for farmers

WEAKNESSES

- Some critical data exists in silos and does not move easily between on-farm packages, service providers and industry
- There is difficulty in industry access to some phenotypic data, e.g. data collected from inline milk meters
- Ongoing reduction in herd test participation
- Milk production recording is viewed predominantly as a management tool for managing cell count, inconvenient for farmers and technologically limited
- Use of genomic testing of female animals remains relatively low
- Herd test staff and others in the industry have little opportunity to improve skills and service provision through training
- Need for greater efficiency and capacity to offer herd improvement services on-farm

OPPORTUNITIES

- Upsurge in device connectivity, data volumes and computer speeds, plus rapid advances in automated systems and artificial intelligence
- Use of date to improve decision-making and provide predictive analysis
- Changes in scale of farm operations and increased requirements for decision-making support
- Data and data analytics to better understand trends and complex interactions between multiple variables
- Increasing uptake of inline milk measuring tools and other sensing technologies
- A truly global genetics marketplace, with an increased pool of dairy genetics to draw on
- Ongoing improvements to efficiency and effectiveness of services through increased coordination / reduced duplication
- Develop flexible and responsive arrangements for accessing and maintaining key expertise
- Traceability, transparency and objective provenance are becoming critical
- Collaboration with related sectors, e.g. red meat industry, and other dairy industries

THREATS

- Limited growth potential as a reduced national herd size is shrinking the potential market for service providers, hindering their ability to innovate
- Farm and industry productivity and profitability remains volatile and under pressure
- Genetics accepted as important, but not linked clearly to profit by all farmers and service providers
- Little engagement of milk companies and banks to help improve profit through herd improvement
- Slow adoption of new innovations

- Social licence and increasing consumer scrutiny on how were animals are treated and milk is produced, including animal treatments, dehorning, timed AI programs, etc.

3. STRATEGY

The review of the previous strategy and collation of new ideas contributed to identification of five focus areas within the refreshed 2019-2024 strategy:

1. Improved decision-making from data
2. Increased farm profitability through herd improvement
3. Improved animal performance from research and development
4. Improved and diversified service offerings
5. Strengthened capabilities

Table 2: Comparison of strategic themes, August 2014 and March 2019

Herd Improvement Strategy 2020 August 2014	**Herd Improvement Strategy 2019-2024 March 2019**
1) Increase the ability of herd improvement to deliver farm profit 2) Redesign oversight of the herd improvement sector 3) Demonstrate value from herd improvement 4) Improve service provision at farm level 5) Reset genetic evaluations to changed conditions 6) Refocus industry on the importance of people in herd improvement	1) Improved decision-making from data 2) Increased farm profitability through herd improvement 3) Improved animal performance from research and development 4) Improved and diversified service offerings 5) Strengthened capabilities

The scope of this strategy includes:

- Research, development, extension and other activities within 'herd improvement', defined as "the provision of information to enable dairy farmers to improve farm profitability by making data-driven decisions to manage the production, health and breeding of their cows";
- Pre-competitive innovation for service delivery and tools; and
- The use of animal performance and other industry data to support not only herd improvement but emerging opportunities around traceability, transparency and other value chain requirements.

The scope of this strategy does not include:

- Animal performance policy or advocacy issues, such as animal welfare, however herd improvement and data management may provide solutions in such areas; and
- Provision of commercial services.

3.1 FOCUS AREA 1: IMPROVED DECISION-MAKING FROM DATA

Well known issues around data collection, access and use have persisted for many years and reduced the ability to deliver improved farm profit through data-driven decisions. Development of a 'Centralised Data Repository' was considered by the Australian dairy herd improvement industry for more than a decade and a number of reviews over recent years confirmed the value of creating a pre-competitive pool of animal performance data. With more data being collected on-farm, farmers require aggregation and tools to sort and prioritise this data to help them make decisions. If data silos persist or additional ones are created, these tools will be increasingly difficult to optimise. This is true from both farm and industry perspectives. A trusted, independent source is required to enable secure sharing of data across a competitive landscape.

DataGene subsequently developed DataVat, a centralised, industry-owned repository where quality-assured data from all sources are accessible for industry-wide use. Data can move easily across the industry and be used by both industry and service providers to deliver decision-making tools to farmers. The priority in this area over the timeframe of this strategy is to support and enhance this infrastructure, acquire data from range of industry participants (including 'non-traditional' contributors such as milk processors, animal health companies, etc.) and support industry partners to develop tools, resources and analysis that leverage the data for the benefit of farmers.

In absolute terms, there are 280,000 fewer cows enrolled in herd testing in 2016/17 compared to 2006/07. Herd testing historically provided the basis for phenotypic data collection and analysis. To ensure continued herd test participation, value must be shown and delivered via reports and data analysis, which leads to profitable on-farm decision making. Reduced herd test participation also has the flow on effect of reduced data for genetic evaluation and other industry R&D purposes (e.g. Fertility Focus Report, Mastitis Focus Report, etc). Increasing uptake of inline milk measuring tools may reduce the demand for traditional herd test, although calibration will still be required. Unless the data collected from these meters is included in industry databases, the ability of the industry to produce breeding values, track on-farm events and measure production is threatened. The priority for herd recording is to provide improved reporting and services to support decision-making.

STRATEGIC OBJECTIVES

1. **ENABLING SEAMLESS DATA FLOW** - Industry data collection, management and analytics is seamless, streamlined and cooperative for dairy farmers and service providers;
2. **INCREASED COW PERFORMANCE DATA** – Increase the measurement of individual cow performance through an increased number of cows participating in herd testing and increased data accessed from farms with in-line meters;
3. **SUPPORTING DATA-DRIVEN DECISIONS** - The majority of dairy farmers and service providers are making data-informed decisions to drive animal performance, improve profitability and meet value chain requirements (including transparency, integrity and safety of dairy production).

2024 GOALS

- **CENTRALISED DATA REPOSITORY** – The CDR/DataVat system is supported and enhanced, and operates as 'single entry/multiple use' system with seamless transmission of data between on-farm systems, DataGene, and industry data users;
- **COORDINATED DATA MANAGEMENT** - DataGene, with industry support, acts as a single responsible data aggregator cooperating with milk processors, industry regulators, animal health sector and other industry partners to exploit efficiencies and synergies in data collection and analytics;
- **HERD RECORDING INNOVATION** – Herd Test centres rapidly introduce new technology and services that are of increased value for farmers from herd recording and associated data (e.g. pregnancy testing, novel milk composition analysis, etc.);
- **DECISION SUPPORT TOOLS** - The use of existing tools and resources (e.g. Good Bulls Guide, Selectabull, Genetic Progress Report, Genetic Futures Report, Fertility Focus Report, Mastitis Focus Report, etc.) to make the best whole-farm decisions is increased from 2017/18 levels, and new reports, tools and resources are developed; and
- **ACCESS TO PHENOTYPES** - The GINFO system is adequately resourced, supported and maintained to enable phenotypic data collection and build the accuracy of genomic selection in the future.

2024 KPIs	**Baseline**
Data accessed from herd test participants and farms with in-line meters for measurement of individual cow performance represents over 60% of the national herd	2016: 20% of farms have in-line meters 2017: 39.6% of cows are herd tested
Milk production and other herd analyses are considered essential management tools by at least 70% of farmers	n/a
Use of existing tools, e.g. Good Bulls Guide, Selectabull, Genetic Progress Report, is 50% above 2017/18 levels	2016: 47% farmers using Good Bulls Guide; 18% downloaded Good Bulls app
75% of farmers are using the Good Bulls Guide or app as a source of sire data	2016: 47% of farmers using Good Bulls Guide
20% of herds genomically-testing 50% or more of their heifer calves before mating	n/a

3.2 FOCUS AREA 2: INCREASED FARM PROFITABILITY THROUGH HERD IMPROVEMENT

Increasing the rate of genetic gain of the national herd has the potential to increase gross farm margin by $25 million per annum. The rate of gain is a function of the reliability of breeding values, the level of artificial insemination (AI) use (particularly across replacement stock), the selection of the best available genetics, ongoing innovation in evaluations, and use of genomic technologies. Almost all dairy farmers (97%) believe it is important to continuously improve herd genetics and a substantial 67% of farmers think it is very important. The priority in this area over the timeframe of this strategy is to close the gap between potential and actual genetic gain, by increasing the number of farmers using Australian profitability metrics to drive elite sire selection.

Effective extension, marketing, proof of concept and demonstration of the verified link between profit and herd improvement, and a clear understanding of this for farmers and the wider industry, will enable the industry to capture more of the potential genetic gain by demonstrating how to make better decisions for herd improvement. These messages need to engage a wider section of the dairy industry including finance, milk companies, veterinarians and on farm consultants These changes will also improve the utilisation of performance recording reports and other on-farm data to drive profitable decisions. Lack of integration of herd improvement messages into broader Dairy Australia extension programs has reduced the potential impact of genetics on areas such as animal health, fertility, welfare and farm performance. Closer integration of simple genetics messages into Regional Development Program delivery will help encourage genetic gain and data-driven decisions. The priority is to increase the number of farmers and service providers that recognise the value of genetic improvement, its contribution to farm profitability, and that have confidence in Australian breeding values.

The measurement of individual cow performance (phenotypes) is the foundation of genetic improvement. Historically, many phenotypes were collected through progeny test programs operated by bull companies. This has changed over time and a proactive system is needed to ensure the industry's continued ability to accurately evaluate genetic performance in Australia. To address this, DataGene will continue the Ginfo Plus project, undertaken using contracted collection of data and tissue samples from Holstein Australia. The Ginfo Plus initiative follows the successful GINFO (Australia's genomic information nucleus) project funded through the Dairy Futures CRC which concluded in June 2016. GINFO increased the reliability of the Balanced Performance Index by over 5% and for Overall Type by over 7%, demonstrating the power of this approach. This strategy aims to ensure phenotypic data is sufficiently available to underpin the calculation of both traditional and genomic breeding values.

STRATEGIC OBJECTIVES

1. **INCREASING GENETIC GAIN** - increasing the number of farmers using AI and Australian profitability metrics to drive herd improvement;
2. **DELIVERING WORLD-CLASS EVALUATION SERVICES** - Evaluation services are market-focused, including transparent quality assurance processes, service level agreements, and regular benchmarking of services against local needs and global trends; and
3. **INCREASING DATA-DRIVEN BREEDING** - increasing the number of farmers using individual cow performance data to drive herd improvement.

2024 GOALS

- **USE OF AUSTRALIAN METRICS** - A large majority of farmers and service providers recognise the value of herd improvement, its contribution to farm profitability, and have confidence in the BPI (and HWI and TWI);
- **INCREASED AI USE** - The importance of artificial insemination (AI) is reflected in an increased percentage of replacement cows from AI sires across the national herd compared to 2017/18 levels and more heifers joined to AI compared to 2017/18 levels;
- **INNOVATION IN EVALUATIONS** - Technological and methodological innovation maintains world best practice genomic evaluations; and

- **CLEAR VALUE PROPOSITION** - The value proposition of data-informed decisions and herd improvement (e.g. herd recording, use of breeding indices) to farmers, as well as other industry participants (such as veterinarians, consultants, milk processors and other industry bodies), is effectively communicated.

2024 KPIs	Baseline
Rate of genetic gain doubled from 2013/14 level	n/a
75% of farmers report that the BPI, HWI or TWI is relevant to their farming system	2016: 58% of farmers believe BPI/HWI/TWI is relevant to their farming system (13% very relevant, 45% fairly relevant)
50% of farmers report that the BPI, HWI or TWI has a lot of influence on their semen purchase decisions	2016: 27% of farmers say BPI/HWI/TWI has a lot of influence on semen purchase decisions (51% some influence)
The average proportion of herd replacements from AI is 85%	2013: 71%
All bulls screened by international companies active in Australia are also screened on the Australian genomic system	2017: number of genomically-tested bulls was 3,202; cumulatively, 15,175 bulls have been genotyped in Australia

3.3 THEME 3: IMPROVED ANIMAL PERFORMANCE FROM RESEARCH AND DEVELOPMENT

The Australian dairy industry requires the retention of research and evaluation capacity attuned to our specific environment for domestic and international genetics. The Wickham report 2014 recommended that Australia maintains and enhances the research infrastructure required to enable future developments in genomic technologies to be evaluated and effectively exploited in a timely fashion. Also, that this research infrastructure has the capacity to identify any undesirable genetic trends in a timely manner.

The Australian herd improvement sector is fortunate that the quality and capacity of research in Australia is world-class, is highly rated by global peers, and regularly initiates global trends. The sector is also fortunate that the Victorian Government, through Agriculture Victoria, Dairy Australia, the Gardiner Foundation and other partners are strategic investors in the provision of science, methodologies and research outcomes via DairyBio.

The priorities for research and development in this strategy are to improve the reliability of existing traits, develop breeding values for new traits and the development of new herd management tools that use genomic data.

STRATEGIC OBJECTIVES

1. **MAINTAINING R&D CAPABILITY** – Support research partners to maintain world-class science capability and infrastructure, collaboration with industry and global research, and a balanced portfolio of research to support the industry-stated goal of doubling of the rate of genetic gain in cows;

2. **INCREASING GENETIC GAIN THROUGH R&D** - Research and development supports world-leading breeding values, genomic services and highly reliable genomic selection to accelerate genetic gain; and
3. **ADDRESSING EMERGING NEEDS** - Accelerate improvement in health and resilience traits and reduce the environmental impact of the Australian dairy herd.

2024 GOALS

- **IMPROVE TRAIT RELIABILITY** - Improvement in reliability of existing traits, e.g. fertility, feed saved, calving ease, heat tolerance, etc.;
- **IMPROVE GENOMIC RELIABILITY** - Improve reliability of traits measured using genomic methods / selection such that genomic reliability is at globally comparable rates for major traits and indices;
- **NEW BREEDING VALUES** - Development of new breeding values which are of particular economic and/or sustainability importance to Australian dairy farmers, e.g. lameness, resilience, mastitis, etc.;
- **INCREASING GENOMIC TECHNOLOGY USE** - Genomic technology uptake and the on-farm benefits from this technology for farm profit improvement are increased, including development of new herd management tools that use genomic data; and
- **PREDICTION OF PERFORMANCE** - Lifetime prediction of performance of individual cattle based on breeding merit, assessment of non-additive gene effects, observations of cow's performance, and novel characteristics (e.g. cow's individual response to feed and health challenges).

2024 KPIs	**Baseline**
The reliability of existing selection indexes (such as the Balanced Performance Index) increase to 80% or above	68%
The maintenance of reliability through multiple generations of genomic breeding without a significant reliability reduction	n/a
The reliability of key traits that are difficult to predict, e.g. fertility, survival and resistance to mastitis increases by more than 10%	n/a
Genetic evaluation for two new traits	TBC
Increase and maintain number of GINFO herds to 200 by 2020	2018: 100 herds

3.4 FOCUS AREA 3: IMPROVED AND DIVERSIFIED SERVICE OFFERINGS

The reduced national herd size is shrinking the potential market for service providers, hindering their ability to innovate. By collaborating, they can meet farmer demands more quickly. In order to improve the provision of herd improvement services to farmers and drive innovation in delivery, duplication of effort should be reduced and the focus shifted to pre-competitive collaboration. There is evidence that the culture of the herd improvement industry is transitioning to one of collaboration and

cooperation to improve advice, data and services at the farm level, and this needs to be sustained through the life of this strategy.

While significant rationalisation has occurred in herd test provision, there remains scope for further efforts to deliver efficient services to farmers. This should include a reinvigoration of herd testing in Australia and encourage investment in its future. Turning herd improvement services into better decisions on farm requires the practical presentation of disparate data sources through quality reports. An industry-wide approach is justified to revamp key reports that better use existing data and efficiently access new data. Equally, rapid changes in genetic evaluation technologies make the need for strong linkages across the functions of research, development, implementation and maintenance even more important.

STRATEGIC OBJECTIVES

1. **STIMULATING PRE-COMPETITIVE INNOVATION** - Fulfil opportunities for innovation, co-operation and rationalisation within the sector, particularly with regards to pre-competitive services, marketing, laboratories, transport and logistics;
2. **MAINTAINING SUPPORT FUNCTIONS** - Ensure development, implementation and maintenance functions are effectively resourced and responsive to rapidly changing environment, and periodically assess their performance; and
3. **FACILITATING APPROPRIATE TECHNOLOGIES** - Evaluate and facilitate uptake of appropriate technologies, and adapt them for Australian conditions where appropriate.

2024 GOALS

- **SHARED INFRASTRUCTURE AND CAPABILITY** - Infrastructure (e.g. CDR/DataVat) and capability is leveraged to provide software and data services across the dairy industry;
- **SHARED EFFICIENCIES** - Efficiencies are delivered in the administrative requirements of breed societies including the recording and processing of memberships, registrations, classification, transfers and exports;
- **ADEQUATE SUPPORT FUNCTIONS** - 'Development, implementation and maintenance' functions for services, tools and resources are comparable or better than international peers;
- **COORDINATED SERVICE DEVELOPMENT** - The industry efficiently and effectively coordinates development and implementation of data and software services for the benefit of dairy farmers; and
- **EXPANDED COLLABORATION** - DataGene identifies clear priorities for collaboration in the medium term with key stakeholders in other livestock sectors and/or non-herd improvement areas, e.g. feedbase, that are beneficial to the Australian dairy industry.

2024 KPIs	**Baseline**
40 industry organisations are contributing data to DataVat and/or developing tools, reports and resources that extract DataVat data	n/a
Deliver 15 new reports and tools from DataVat	n/a

Value from cow testing is at least three times the cost of the test	n/a
Greater than 50% of farmers are regularly using DataVat services and reports	n/a
Herd Test Centres have introduced two new services that are highly valued by farmers	n/a

3.5 FOCUS AREA 5: STRENGTHENED CAPABILITIES

A common theme across the industry is the need to focus on people involved in herd improvement, from herd test to genetic evaluation through research, resellers and breed societies. The industry has not adequately invested in developing its capacity to the extent necessary to achieve the potential gains from herd improvement. A focus on people will enable better service provision at farm level, driving better data driven decisions and so improve farm profitability.

A high priority is for delivery of practical AI training with a range of sources of demand including DIY farmers, accreditation of professional technicians, vets wanting to specialise in large animals, students wanting to complete the practical component of a certificated Vocational Education & Training (VET) course and training trainers at an appropriate standard to deliver AI courses. NHIA is taking the lead on setting standards and consistency for the delivery of AI training by Registered Training Organisations (RTO) nationally. NHIA is also considering how it provides training and accreditation of semen and embryo handling going forward.

Further work is required in the training and education area to fully scope out what is required in order to develop a program of industry training for herd improvement personnel.

STRATEGIC OBJECTIVES

1. **FACILITATING TRAINING AND SUPPORT** – Facilitate training providers to deliver appropriate contemporary training, development and support opportunities for people operating in the herd improvement sector, incorporating learning from international experiences; and
2. **DEVELOPING EXTENSION CAPABILITIES** - Ensure extension and marketing capabilities are developed and maintained for people operating in the herd improvement sector and the broader industry, to support the industry strategy.

2024 GOALS

- **IMPLEMENT TRAINING PLAN** - Develop a plan for education and training relevant to the herd improvement sector, and facilitate training providers to deliver industry training plan, once developed;
- **HERD IMPROVEMENT EXTENSION** - Ensure contemporary and relevant herd improvement content, focused at farm level, is integrated into industry training packages; and
- **FOCUS ON COMMUNICATION AND MARKETING** - Assist service providers to develop communication and marketing capabilities within their own staff so that extension and demonstration from within the herd improvement sector is improved.

2024 KPIs	Baseline
50% of herd improvement staff / service providers have completed a specific industry training program	n/a
20 herd improvement personnel have participated in communications and extension training	n/a

4. STRATEGY GOVERNANCE

Implementation of the Herd Improvement Strategy 2019-2024 will be overseen by DataGene and its respective Standing Committees. A recommendation from the 2014 strategy was that "*A HIISSG-like group should continue under the Dairy Moving Forward framework to provide strategic guidance in the herd improvement industry and ensure that farmer representation and advocacy is embedded to help drive outcomes*". Whilst DataGene and its Standing Committees will provide highly effective forums to identify and provide guidance on the priority of research, development and extension initiatives, it is recommended that an annual stakeholder forum (e.g. a herd improvement Community of Interest (COI)) is convened to ensure all stakeholders have the opportunity to be updated on progress against the strategy and provide additional feedback.

APPENDIX 1 - GLOSSARY

ABRI	Australian Business Research Institute
ABV	Australian Breeding Value
ADF	Australian Dairy Farmers Ltd.
ADHIS	Australian Dairy Herd Improvement Scheme
AHRS	Australian Herd Recording Services
AI	Artificial insemination
APR	Australian Profit Ranking
BPI	Balanced Performance Index
CDR	Centralised Data Repository
COI	Community of Interest
CRC	Cooperative Research Centre
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DMF	Dairy Moving Forward
DPC	Data Processing Centre
GES	Genetic Evaluation System
GESNP	Genetic Evaluation System new platform
GxE	Genotype by environment effects
HICO	Herd Improvement Cooperative Australia Ltd.
HIISSG	Herd Improvement Industry Strategic Steering Group
NBO	National Breeding Objective
NHIA	National Herd Improvement Association
RD&E	Research, development and extension
RDP	Regional Development Program

APPENDIX 2 – INDUSTRY STAKEHOLDERS

HERD TEST CENTRES

There are currently eight Herd Test Centres in Australia. Herd Test Centres are organisations that test milk for farmers for volume, fat, protein, somatic cell count and other parameters on an individual cow basis. This is distinct from the bulk milk testing performed by milk companies for the purposes of calculating milk payments.

HERD TEST CENTRE SOFTWARE PROVIDERS

There is only one major provider of software to run herd test centres in Australia. DataGene provides and supports DataGene Centre, which is used for over 90% of the cows under test. The second largest is Tasherd in Tasmania and then Australian Herd Recording Services (AHRS) in Queensland.

ON-FARM SOFTWARE PROVIDERS

On-farm software holds data related to farm management, including milking, feeding of individual cows, veterinary treatments, matings, production information, etc. From this information various reports are created to assist farm management decisions, such as feeding, treatments, culling, breeding, etc. Use of these systems has grown dramatically in the past decades and the field of companies providing on-farm software is very broad, however there are two main types of on-farm software.

Dairy-based software programs used to operate and support equipment from that company – for example, software from De Laval, Lely or Jantec. This is proprietary software developed by the parent companies for their systems which may or may not integrate with other software or industry systems.

On-farm software developed either in Australia or overseas to integrate with various dairy equipment brands, but usually do not integrate across multiple companies and may not communicate with other industry data services. Some examples are MISTRO Farm, EasyDairy and DairyComp 305.

BULL COMPANIES

Bull companies are companies that produce semen for sale to farmers. These can be both domestic and foreign owned and have both domestic and foreign bulls. Some importing companies are marketing collaborations between multiple bull companies.

RESELLERS

Resellers are a unique feature of the Australian herd improvement landscape and operate as intermediaries or brokers between farmers and bull companies that produce semen for sale to farmers. Resellers are often also herd test centres and may provide many other management services such as synchronisation programs, inseminations, pregnancy testing, data entry, etc. Resellers play a critical filtering role for Australian dairy farmers and exercise a significant amount of influence on semen purchasing decisions.

ARTIFICIAL BREEDING COMPANIES

Artificial Breeding Companies are companies that perform inseminations for farmers. They may or may not be part of a bull company, a herd test centre or a reseller. There are very limited numbers of non-reseller affiliated providers.

BREEDING ADVISERS

Breeding Advisors are individuals or companies that provide advice to farmers on what bulls to use and over what cows. They can be independent, but most advisors have connections with particular bull companies.

Breeding advisors may also provide a type inspection service which is used to suggest corrective mating to improve certain traits.

BREED SOCIETIES

The registered sector in the Australian dairy industry consists of seven major breed societies (Holstein, Jersey, Brown Swiss, Ayrshire, Illawarra, Guernsey and Australian Dairy Red Breed). Traditionally breed societies have provided four main functions:

1. Pedigree recording and reporting services; the custodians of breed purity
2. Evaluation of dairy animal conformation according to breed standards
3. Coordination of farmer social interactions such as community, show and sale activity
4. Representation of farmer member interests to the wider herd improvement industry

The two largest breed societies are Holstein Australia and Jersey Australia, which together cover 95% of registered cattle and members. The main areas of activity are pedigree recording and type classification. In recent years they have moved into the provision of mating programs, genomic breeding values and the joint promotion of bulls together with bull companies.

INDUSTRY ORGANISATIONS

AUSTRALIAN DAIRY FARMERS

Australian Dairy Farmers (ADF) is the national advocacy body representing dairy farmers across the six dairying states. ADF's mission is to improve the profitability and sustainability of dairy farmers in Australia. ADF were instrumental in establishing the Australian Dairy Herd Improvement Scheme (ADHIS), the predecessor of DataGene, in 1982 and are a foundation member of DataGene.

DAIRY AUSTRALIA

Dairy Australia is the national services body for the dairy industry. Dairy Australia's role is to help farmers adapt to a changing operating environment, and achieve a profitable, sustainable dairy industry. Dairy Australia acts as the 'investment arm' of the industry, investing in projects that can't be done efficiently by individual farmers or companies. Dairy Australia plays an integral role in the herd improvement industry through its funding of DataGene (and as foundation member), as a joint venture partner in DairyBio, and through project investments in extension and education programs such as CountDown and InCalf.

DAIRYBIO

DairyBio is creating improved pastures and improved herds for the Australian dairy industry through the latest approaches in bioscience. DairyBio is an initiative of the Victorian government, Dairy Australia and the Gardiner Foundation with a dedicated purpose of delivering to Australian farmers through the use of bioscience.

DATAGENE

DataGene was formed in July 2016 as a result of leadership from HISSG and the Herd Improvement Strategy and the commitment from many diverse organisations in the herd improvement sphere. DataGene brought together many non-competitive herd improvement functions under the one umbrella, including genetics, herd testing, herd recording, data systems and herd test standards. DataGene is an independent and industry-owned organisation responsible for driving genetic gain and herd improvement in the Australian dairy industry and is an initiative of Dairy Australia and industry.

NATIONAL HERD IMPROVEMENT ASSOCIATION (NHIA)

The National Herd Improvement Association is the peak body for the herd improvement industry. Its members include herd test centres, bull companies, resellers, breed societies, and artificial breeding companies.

Table 2: Industry stakeholders

Stakeholder	Region	Service type									Business type
		Herd test centre	Herd test software provider	On-farm software provider	Bull company	Reseller	Artificial breeding company	Breeding advisor	Breed society	Livestock sales	
ABS Australia*	National				✓			✓			Listed multinational
Afimilk	National			✓							Multinational co-op
Agri-Gene*	National				✓		✓	✓			Private
Alta Genetics	National				✓		✓	✓			Private multinational
Australian Ayrshires	National								✓		Association
Australian Business Research Institute (ABRI) / Dairy Express*	National	✓	✓								
Australian Herd Recording Services (AHRS)	Queensland	✓									Private
Australian Reds*	National								✓		Association
Auzred Xb	National				✓	✓		✓			Private
Bovine Inseminations	Victoria	✓				✓	✓				Private
Brown Swiss Australia*	National								✓		Association
Cobden Artificial Breeders*	Victoria					✓	✓				Co-op
CRV Australia	National				✓			✓			Multinational co-op
DairyData	National			✓							Private
Dairy Livestock Service	National									✓	Listed owner (Ruralco)
DataGene	National		✓								Aust. public co.

Stakeholder	Region	Service type									Business type
		Herd test centre	Herd test software provider	On-farm software provider	Bull company	Reseller	Artificial breeding company	Breeding advisor	Breed society	Livestock sales	
Daviesway	National			✓							Private
De Laval	National			✓							Multinational
Easy Dairy	National			✓							Private
FarmWest*	WA	✓				✓	✓	✓			Private
GEA Farm Technologies	National			✓							Listed multinational
Generations	National				✓						Private
Genetics Australia*	National				✓	✓					Co-op
Guernsey Cattle Society*	National								✓		Association
HICO*	Victoria	✓				✓	✓				Co-op
	National			✓							
Holstein Australia*	National							✓	✓		Association
Illawarras Australia	National								✓		Association
Jantec Systems	National			✓							Private
Jersey Australia*	National					✓			✓		Association
Leading Edge Genetics	Gippsland					✓	✓	✓			Private
Lely	National			✓							Multinational
Livestock Improvement Australia	National				✓		✓	✓			Multinational co-op
National Herd Development*	Victoria / SA	✓				✓	✓	✓			Co-op
Numurkah NuGenes*	Victoria / SA	✓				✓	✓	✓			Private
Orchard Superior Herds	Victoria					✓					Private
Semex*	National				✓			✓			Multinational co-op

Stakeholder	Region	Service type									Business type
		Herd test centre	Herd test software provider	On-farm software provider	Bull company	Reseller	Artificial breeding company	Breeding advisor	Breed society	Livestock sales	
TasHerd*	Tasmania	✓	✓								Multinational co-op
Viking Genetics*	National				✓						
Wellbred Genetics*							✓				
Yarram Herd Services*	Victoria	✓				✓	✓	✓			Co-op

*Members of Datagene

Other Datagene members:

- Apiam Animal Health
- Australian Dairy Farmers
- Dairy Australia
- NHIA
- Zoetis
- Neogen Australasia
- Livestock and Business Centre

HERD IMPROVEMENT STRATEGY 2019-2024			LEAD	DIRECT SUPPORT											
FOCUS AREA	**2024 GOALS**			**DataGene**	**ADF**	**NHIA**	**DairyBio**	**Dairy Australia**	**Herd Test Centres**	**Breed societies**	**Herd test software provider**	**On-farm software provider**	**Bull company**	**Reseller**	**Artificial breeding company**
improved decision-making from data	CENTRALISED DATA REPOSITORY	The CDR/DataVat system is supported and enhanced, and operates as 'single entry/multiple use' system with seamless transmission of data between on-farm systems, DataGene, and industry data users	DataGene					X	X	X	X	X			
	COORDINATED DATA MANAGEMENT	DataGene, with industry support, acts as a single responsible data aggregator cooperating with milk processors, industry regulators, animal health sector and other industry partners to exploit efficiencies and synergies in data collection and analytics;	DataGene					X	X	X	X	X			
	HERD RECORDING INNOVATION	Herd Test centres rapidly introduce new technology and services that are of increased value for farmers from herd recording and associated data (e.g. pregnancy testing, novel milk composition analysis, etc.);	Herd Test Centres	X		X	X								
	DECISION SUPPORT TOOLS	The use of existing tools and resources (e.g. Good Bulls Guide, Selectabull, Genetic Progress Report, Genetic Futures Report, Fertility Focus Report, Mastitis Focus Report, etc.) to make the best whole-farm decisions is increased from 2017/18 levels, and new reports, tools and resources are developed	DataGene					X					X	X	X
	ACCESS TO PHENOTYPES	The GINFO system is adequately resourced, supported and maintained to enable phenotypic data collection and build the accuracy of genomic selection in the future.	DataGene				X	X		X					
Increased farm profitability through herd improvement	USE OF AUSTRALIAN METRICS	A large majority of farmers and service providers recognise the value of herd improvement, its contribution to farm profitability, and have confidence in the BPI (and HWI and TWI);	DataGene		X	X		X		X			X	X	X
	INCREASED AI USE	The importance of artificial insemination (AI) is reflected in an increased percentage of replacement cows from AI sires across the national herd compared to 2017/18 levels and more heifers joined to AI compared to 2017/18 levels	DataGene			X		X	X				X	X	X
	INNOVATION IN EVALUATIONS	Technological and methodological innovation maintains world best practice genomic evaluations	DataGene				X								
	CLEAR VALUE PROPOSITION	The value proposition of data-informed decisions and herd improvement (e.g. herd recording, use of breeding indices) to farmers, as well as other industry participants (such as veterinarians, consultants, milk processors and other industry bodies), is effectively communicated.	DataGene		X	X		X	X	X		X	X	X	X
improved animal performance from research and development	IMPROVE TRAIT RELIABILITY	Improvement in reliability of existing traits, e.g. fertility, feed saved, calving ease, heat tolerance, etc.;	DairyBio	X											
	IMPROVE GENOMIC RELIABILITY	Improve reliability of traits measured using genomic methods / selection such that genomic reliability is at globally comparable rates for major traits and indices;	DairyBio	X											
	NEW BREEDING VALUES	Development of new breeding values which are of particular economic and/or sustainability importance to Australian dairy farmers, e.g. lameness, resilience, mastitis, etc.;	DairyBio	X											
	INCREASING GENOMIC TECHNOLOGY USE	Genomic technology uptake and the on-farm benefits from this technology for farm profit improvement are increased, including development of new herd management tools that use genomic data	DataGene				X		X				X	X	X
	PREDICTION OF PERFORMANCE	Lifetime prediction of performance of individual cattle based on breeding merit, assessment of non-additive gene effects, observations of cow's performance, and novel characteristics (e.g. cow's individual response to feed and health challenges).	DairyBio	X											
	SHARED INFRASTRUCTURE AND CAPABILITY	Infrastructure (e.g. CDR/DataVat) and capability is leveraged to provide software and data services across the dairy industry	DataGene			X		X	X	X	X	X			
	SHARED EFFICIENCIES	Efficiencies are delivered in the administrative requirements of breed societies including the recording and processing of memberships, registrations, classification, transfers and exports;	Breed Societies	X											

HERD IMPROVEMENT STRATEGY 2019-2024			LEAD	DIRECT SUPPORT											
FOCUS AREA	**2024 GOALS**			**DataGene**	**ADF**	**NHIA**	**DairyBio**	**Dairy Australia**	**Herd Test Centres**	**Breed societies**	**Herd test software provider**	**On-farm software provider**	**Bull company**	**Reseller**	**Artificial breeding company**
Improved and diversified service offerings	ADEQUATE SUPPORT FUNCTIONS	'Development, implementation and maintenance' functions for services, tools and resources are comparable or better than international peers	DataGene												
	COORDINATED SERVICE DEVELOPMENT	The industry efficiently and effectively coordinates development and implementation of data and software services for the benefit of dairy farmers	DataGene			X		X	X		X	X			
	EXPANDED COLLABORATION	DataGene identifies clear priorities for collaboration in the medium term with key stakeholders in other livestock sectors and/or non-herd improvement areas, e.g. feedbase, that are beneficial to the Australian dairy industry	DataGene												
Strengthened capabilities	IMPLEMENT TRAINING PLAN	Develop a plan for education and training relevant to the herd improvement sector, and facilitate training providers to deliver industry training plan, once developed	NHIA					X							
	HERD IMPROVEMENT EXTENSION	Ensure contemporary and relevant herd improvement content, focused at farm level, is integrated into industry training packages	Dairy Australia	X		X									
	FOCUS ON COMMUNICATION AND MARKETING	Assist service providers to develop communication and marketing capabilities within their own staff so that extension and demonstration from within the herd improvement sector is improved.	NHIA	X											