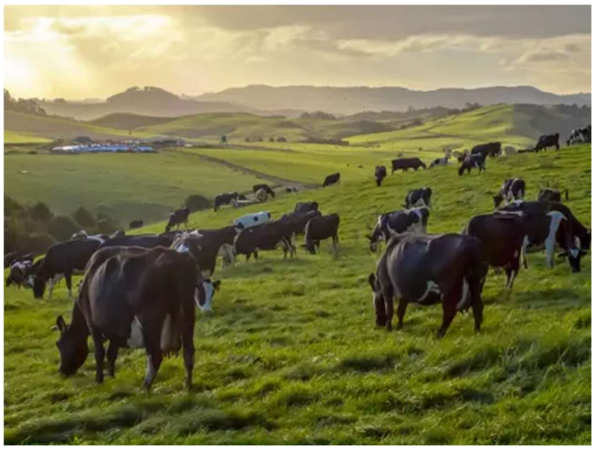

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Final Report

Independent review of return on investment to New Zealand dairy farmers of the milksolids levy

30 October 2025

NIMMO-BELL & ASSOCIATES

A Division of the Prime Group

Nimmo-Bell & ASSOCIATES

[1] Photo credits: https://www.dairynz.co.nz/

Table of Contents

Index to Tables

Table of Figures

Acknowledgements

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Glossary of Abbreviations

Abbreviation	Full Form / Meaning
AB	Animal Breeding
AE	Animal Evaluation
APB	Accelerated Plant Breeding
BAU	Business As Usual
BW	Breeding Worth
CBA	Cost–Benefit Analysis
CNMA	Certified Nutrient Management Advisor
CSA	Critical Source Area
ETS	Emissions Trading Scheme
DIN	Dissolved Inorganic Nitrogen
DIGAD	Dairy Industry Good Animal Database
FMD	Foot and Mouth Disease
FVI	Forage Value Index
GFP	Good Farming Practice
GMP	Good Management Practice
GHG	Greenhouse Gas
GIA	Government Industry Agreement
KPI	Key Performance Indicator
LIC	Livestock Improvement Corporation
MPI	Ministry for Primary Industries
NBCR	Net Benefit–Cost Ratio
NBO	National Breeding Objective
NPMP	National Pest Management Plan
NPV	Net Present Value
NZ	New Zealand
NZAEL	NZ Animal Evaluation Ltd
OTOP	Ōrari–Temuka–Ōpihi–Pareora
OSPRI	Operational Solutions for Primary Industries
PC1	Plan Change 1 (Waikato)
PPPP	Plantain Potency and Practice Programme
PGGRC	Pastoral Greenhouse Gas Research Consortium
QRA	Quantified Risk Analysis
R&D	Research and Development
ROI	Return on Investment
RSR	Reduced Stocking Rate
SDH	Southern Dairy Hub
SQ	Status Quo
TB	Tuberculosis
WRC	Waikato Regional Council

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Executive Summary

This independent review evaluates the return on investment (ROI) to New Zealand dairy farmers from the DairyNZ milksolids levy over the current six-year period (2020/21–2025/26), and projects likely benefits into the future. The assessment was commissioned to provide an objective, data-driven account of the value generated through levy-funded activities.

Purpose and Scope

The review sample was based on $341 million of levy revenue (for the five-year period 2020/21-2024/25), of which $295 million was invested across 179 initiatives. A representative sample of 92 initiatives (84% of investments by value) was subjected to rigorous cost–benefit analysis (CBA) and quantified risk analysis (Monte Carlo simulation). The scope included research, science, extension, policy advocacy, and core operational programmes.

Methodology

- **Representative sampling:** Initiatives were grouped into 10 bundles across DairyNZ's nine strategic priorities.
- **CBA framework:** Net Present Value (NPV), net benefit–cost ratios, and per-hectare returns were calculated against counterfactual scenarios. Returns per kilogram of milk solids are also presented in this report, for ease of comparison against the milksolids levy.
- **Risk analysis:** Sensitivity testing and Monte Carlo simulations quantified uncertainty ranges and probabilities of positive returns.
- **Validation:** Findings were reviewed by DairyNZ staff, Board members, external experts, and a farmer panel to ensure robustness and credibility. The findings in the report are those of Nimmo-Bell.

Key Findings

- **High overall viability:** All levy investments delivered positive net benefits, either in terms of returns/gains or avoided costs, with only *Better Ryegrass* showing a modest (9%) chance of negative NPV.
- **Strong aggregate returns:** The portfolio is estimated to deliver $2.98 billion in net benefits, equivalent to $187 per hectare per year. This equates to a weighted average of 26 cents per kilogram of milksolids[2] (c/kgMS) produced over the six-year levy period.
- **Major contributors:**
    - *Strong Biosecurity* – NPV $709.0 m; $44/ha/year (3.73 c/kgMS/year).
    - *Supporting Farm Profitability* – NPV $465.7 m; $29/ha/year (2.46 c/kgMS/year).
    - *On Farm Change* – NPV $291.8 m; $18/ha/year (1.53 c/kgMS/year).
    - *LowN Leaching Systems* – NPV $358.8 m; $19/ha/year (1.61 c/kgMS/year).
    - *Better Freshwater Policy* – NPV $248.2 m; $16/ha/year (1.36 c/kgMS/year).

[2] Total kilograms of milksolids for the 6-year levy period is 11.45 billion. Source DairyNZ. The total NPV is divided by this volume to calculate c/kg/MS. This reconciles with a cross-check using net-benefit cost ratio NBCR of 7.1 (see Table 10) x levy of 3.6 kgMS is 25.6 c/kgMS.

- **High multipliers:** Co-funding leveraged levy dollars substantially, lifting the weighted average net benefit–cost ratio from 5.9x to 8.2x.
- **Risk profiles:** While several initiatives (e.g. *Better BW, Better Ryegrass*) show wide outcome ranges, nearly all maintain a 100% probability of positive NPV.
- **Nature of benefits:** Returns are split between productivity gains (45%) and avoided costs (55%), reflecting the dual role of levy investments in lifting farm efficiency and shielding farmers from regulatory, biosecurity, and environmental risks.

Insights

- **Farmer confidence and adoption** are critical to unlocking genomic and forage gains. Clear communication and practical tools (e.g. the MaxT milking time app) support uptake.
- **Workforce challenges** remain significant; efficiency tools help but broader retention issues are difficult to quantify.
- **Productivity protection** has been central: without DairyNZ programmes, farm efficiency would likely have declined under economic and regulatory pressures.
- **Governance and systems matter:** DairyNZ's leadership in biosecurity (TBfree, *M. bovis*) demonstrates value farmers cannot achieve individually.
- **Science-based advocacy** has secured more practical environmental and climate policy settings (e.g. Nitrogen leaching standards, Greenhouse Gas policy), protecting farm viability while enabling continued progress.

Recommendations

- Develop a **results dashboard** across all strategic priorities to improve transparency, track outcomes, and support future ROI reviews.
- Translate portfolio-level returns into **farm-based case studies** to help levy payers connect industry-wide benefits to on-farm realities.
- Continue to strengthen **data quality, independent review, and farmer co-design**, which underpin credible ROI estimates and policy influence.
- Maintain focus on **both productivity gains and avoided costs**, recognising that the latter are increasingly important as environmental and regulatory pressures intensify.

Conclusion

The analysis shows that levy investments are delivering substantial net benefits to New Zealand dairy farmers. With an estimated $2.98 billion in value generated—equivalent to $187 per hectare annually—or 26c per kilogram of milksolids, the milksolids levy provides a compelling economic case for renewal. Investments have enhanced farm profitability, resilience, and sustainability, while ensuring New Zealand dairy maintains its social licence and international competitiveness.

1 Introduction

1.1 Background on the milksolids levy

DairyNZ is the industry good organisation representing New Zealand's dairy farmers, with a purpose to secure and enhance the profitability, sustainability and competitiveness of New Zealand dairy farming. Value is delivered to farmers through leadership, influencing, investing, partnering with other organisations and through its strategic capability. DairyNZ, as is the case with biosecurity, may collect levy streams for other parties to utilise on behalf of the industry, or co-invest. These partnered activities provide benefits for the industry and are therefore included in this assessment, even if the activities are not directly delivered by DairyNZ.

Under the Commodity Levies Act 1990, a vote is undertaken every six years by participants (i.e. levy payers), these being the 10,500 dairy farmers who produce milksolids and supply a milk processor, as to whether DairyNZ is to continue to exist for another six years for the benefit of its levy base. In addition to the yes/no vote, farmers also vote for a levy range, which includes the maximum a rate can move to within the coming six years.

The current Commodity Levies (Milksolids) Order 2020 is required to be renewed prior to 1 December 2026.

1.2 Purpose of the ROI review

This independent review on the return on investment (ROI) to the dairy industry from the 'Industry Good' activities and investments made by DairyNZ aims to quantify how dairy farmers directly and indirectly benefit from their investment of the levy at the farm and sector level. It is an independent, data-driven assessment of the return on investment (ROI) from the milksolids levy.

The objectives of the independent ROI review are:

- Undertake an economic assessment of the national benefit to farmers of the dairy industry's investment of the milksolids levy invested by DairyNZ and the returns or value against that investment.
- Provide an assessment of future projected value of research, science and extension delivered or to be delivered by DairyNZ.

1.3 Intended audience

The two audiences for the independent ROI review are:

- Levy-paying dairy farmers – via a summary outlining the work completed, methodology and findings, and key messages about the actual and projected returns from research, science and extension over the last six years and projected into the future.
- Minister for Agriculture – the output of the ROI review will form part of a formal submission to enable the Minister to make a recommendation to the Governor-General to continue to impose a levy payable to DairyNZ.

1.4 Scope and timeframe

The independent ROI review scope covers DairyNZ-funded research, science, extension, policy advocacy and other core operational activities spanning the six years from the previous 2020 vote

(i.e. the current levy period between 2020/21 and 2025/26). It also provides forward-looking projections to inform the 2026 levy vote and Ministerial decision-making.

In addition to the core review, two initiatives were selected for a longer term analysis. These initiatives are reported on separately in section 6.

2 Methodology

2.1 Overall Approach

The independent ROI review approach involved:

i. **Representative sampling/selection of initiatives for cost-benefit analysis (CBA):** Stratified sampling from the DairyNZ portfolio of activities to attain representativeness of the levy investment portfolio.

ii. **Briefing/orientation of project managers and DairyNZ Board on CBA methodology:** Orient project managers and DairyNZ Board on the objectives, methodology and data needs of the CBA.

iii. **Individual project CBAs**: Undertake CBAs of the selected sample of initiatives and produce individual CBA models and reports.

iv. **Peer review workshop**: Conduct a series of internal and external workshops including:

   a. **Peer and Executive review workshop** with project managers and the senior leadership team, facilitated by DairyNZ Chief Science Advisor.

   b. **DairyNZ Board workshop** with select Board Directors and senior leadership team, facilitated by the DairyNZ Chief Science Advisor.

   c. **Farmer peer review workshop** with a reference group of leading farmers to validate robustness of the individual initiative CBAs, facilitated by DairyNZ Chief Science Advisor and supported by project managers.

v. **Reporting**: Draft review report with Executive Summary (ROI results, key messages and findings) and individual initiative CBA reports.

2.2 Initiative Selection

The starting point is the levy collection for the period 2020/21 to 2024/25 period, amounting to $341 million. Of this amount, 13% comprising of operations overhead and residuals is excluded. This leaves $295 million in investments, comprising a total of 179 initiatives, of which $248.6 million was sampled for economic assessment. This represents 73% of total levy collection or 84% of eligible investments for sampling (see Figure 1).

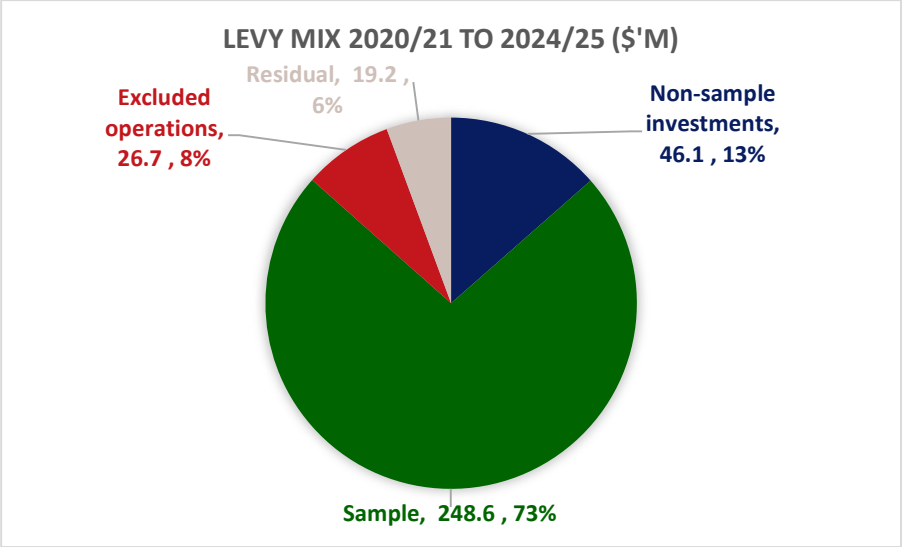

Figure 1: $341 million levy mix by investments, operations and residual

The pool of levy investment initiatives were categorised by DairyNZ three strategic themes[3] and three priorities in each theme. These nine strategic priorities are outlined in Table 1.

Table 1: DairyNZ strategic themes and priorities

ID	Priority
1	**Accelerating on farm productivity**
A	Sector rates of animal genetic gain match world-leading competitors.
B	Gains in forage performance through genetics, forage combinations, and management enable resilience to climate and improve international competitiveness.
C	Workplace productivity on dairy farms has significantly increased and is internationally competitive, and dairy farming is an attractive employment and career opportunity.
2	**Powering more adaptable and resilient farms**
A	New Zealand dairy production systems are world-leading in cost of production, customer desirability and business resilience profile, and match world-leading competitors in emissions intensity.
B	Access to high-quality data and insights is unlocking significant benefit to the sector and delivering credibility and trust with customers and stakeholders.

[3] https://www.dairynz.co.nz/about-us/our-strategy/

ID	Priority
C	An integrated and sustainably funded biosecurity system that minimises the impacts of biosecurity incursions through collective readiness activities and robust on-farm biosecurity measures.
3	**Enabling sustainable and competitive dairying**
A	Empowered farming communities are driving improvements in water quality and ecosystem health at scale across dairy catchments and the public and consumers view dairy farmers positively as responsible stewards of the land.
B	New Zealand dairy farming remains internationally competitive in animal care.
C	The sector to have dairy farmers on track to meet GHG commitments enabled by fair and practical policies and measures and access to cost-effective mitigation practices and technologies.

For each strategic priority, a bundle of related initiatives were chosen, except for 3A where two initiative bundles were selected (see Table 2). This resulted in 10 initiative bundles with a total of 92 initiatives (51% of 179 initiatives) and investment total of $248.6 million (84% of total investments). Ranging in size from $3 million to $77 million, the largest strategic priorities are 2.C Strong Biosecurity ($77m) and 2.A Supporting Farm Profitability ($66m). Investment size and share of total $249 million investments sampled is shown in Figure 2.

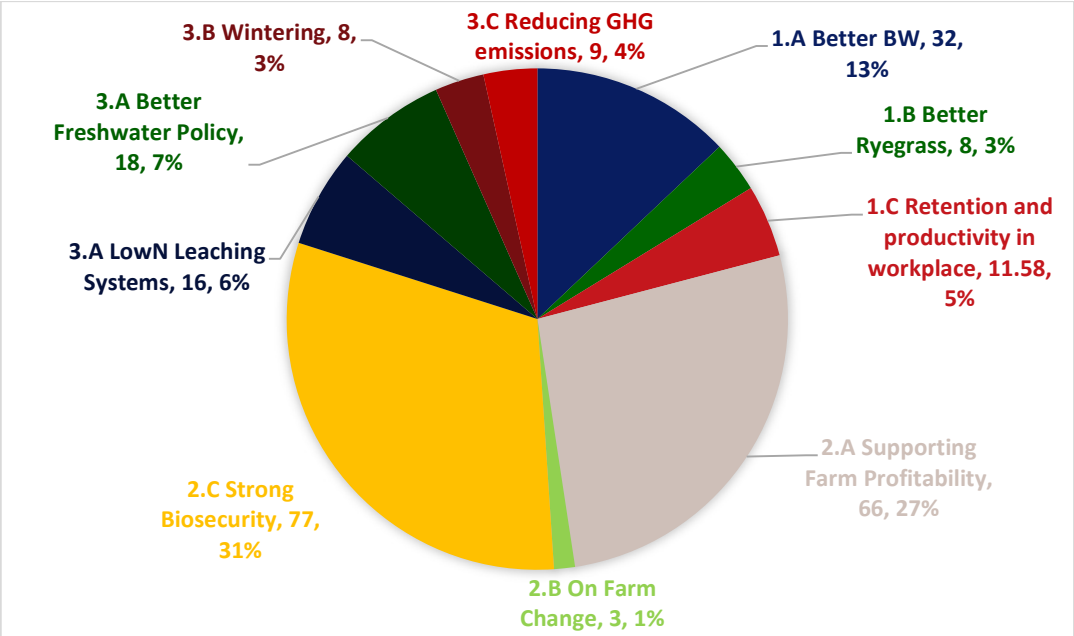

Figure 2: Sampled initiative bundles by strategic priority, amount ($m) and % share of sample

Table 2: Representative sampling by strategic priority, number of initiatives and investment amounts

Strategy and initiative bundle	# initiatives	Levy 2021-25 ($'millions)
1.A Better BW	7	32.2
1.B Better Ryegrass	5	8.2
1.C Retention and productivity in the workplace	16	11.6
2.A Supporting Farm Profitability	22	66.4
2.B On Farm Change	6	3.3
2.C Strong Biosecurity	3	77.1
3.A LowN Leaching Systems	8	15.8
3.A Better Freshwater Policy	7	17.6
3.B Wintering	9	7.9
3.C Reducing GHG emissions	9	8.6
Total	**92**	**248.6**

2.3 Cost Benefit Analysis (CBA) Framework

- Key concepts (NPV, B/C, (B–C)/C, counterfactual, time horizon)
- Standard CBA model structure
- Risk simulation (Quantified Risk Analysis)

To assess the returns or value of the milksolids levy investment, the CBA approach has been adopted. A CBA is a valuation methodology to evaluate investments by systematically comparing the expected costs and benefits over the economic lifetime of the initiative. This comparison is made against a counterfactual scenario—what would happen in the absence of the investment. The results are expressed as a Net Present Value (NPV), which discounts future costs and benefits to reflect their value in today's terms, enabling informed decision-making. The CBA framework involves:

- Scenarios
    - Status quo scenario or counterfactual – what would happen without the investment (do nothing) based on trajectory of current knowhow (not static)
    - Investment scenario – what happens with the investment
    - Difference between the two scenarios for each year is the cashflow of costs and benefits
- Costs = upfront investment plus implementation or adoption costs

  - Investment costs = past (from 2020/21) and future investments required, from levy and non-levy sources, to deliver the target outcome. Costs prior to 2020/21 are sunk costs that are disregarded in the CBA.
  - Implementation costs = costs to implement or adopt the investment R&D product or technology output on-farm. This is akin to operations and maintenance (O&M) for capital assets or equipment.

- Benefits = typically gains, savings or avoided costs attained from adoption of investment output.
- Economic lifetime = period where investment output exceeds performance of counterfactual or status quo until technology decays (i.e. when status quo catches up with investment output). forecast into the future. This is estimated as 15 years from the midpoint of the 6-year levy investment period (i.e. 18 years).
- Present value = like with like comparison of dollar value in different future years (e.g. 2025, 2030, 2035) using a discount rate.
- Discount rate = cost of funds (opportunity cost; $1 today is worth more than $1 in the future); adopted 8% from NZ Treasury for commercial initiatives[4].
- Net present value = PV of all benefits less PV of all costs.

Apart from NPV, the other CBA metrics are:

- Net benefit-cost ratio (B-C/C) - ranks initiatives in a budget constrained environment; demonstrating efficient use of investment capital.
- $/ha/year - annual benefit at farm level by converting the NPV into an annual annuity over economic lifetime and dividing by the aggregate effective dairy area.

In addition to the CBA, the initiatives have been considered based on value add or avoided cost. Benefits from levy investments either add value (productivity gain) or avoid costs from internalisation of environmental, social or regulatory costs. The latter arise from growing pressures on social license to farm balanced by research and advocacy of science-based solutions. Table 9 in Section 5.1 Anticipated returns, categorises the strategic priority initiative bundles' present value of benefits whether value add or avoided costs.

2.4 Quantified risk analysis

As forecasting into the medium to long term future is inherently uncertain, the CBA is augmented by risk analysis tools, namely sensitivity analysis and Quantified Risk Analysis (QuRA).

- Sensitivity analysis increases or decreases the value of one variable and holds all other variables constant to identify the sensitive variables that have outsized influence on the NPV.
- A range of low, most likely and high values is identified for the sensitive variables. The initial value of the variable is most likely which has 90% probability as the value of the variable. The low value is 5% probability that it will not be lower. The high value is 5% probability that it will not be higher.

[4] Updated three-yearly. Last updated October 2024. https://www.treasury.govt.nz/sites/default/files/2024-10/treasury-circular-2024-15.pdf

- QuRa applies Monte Carlo simulation with 5,000 iterations selecting values from the sensitive variables to calculate NPV (4%, 8%, 12%), net benefit to cost ratio[5] (NBCR) (with and without co-funding leverage), and return per hectare per year ($/ha/year).
- A probability distribution is illustrated as a chart describing the risk and uncertainty surrounding the NPV outcome including 90% confidence interval and the 5% and 95% NPV.

Table 3 describes the CBA metrics and what they mean.

Table 3: CBA metrics description and interpretation

Metric	What it is	What it means
Net present value (NPV)[6]	PV of benefit less costs over 18 years	0 or higher is viable as covered cost of money
Probability of NPV > 0	% change NPV is positive	Less than 100% means there is chance that NPV is negative
90% probability that the NPV will be in the range of	Low and high estimates of NPV	5% change it is lower than the low and 5% chance it is higher than the high
Net Benefit to total cost ratio	Net benefit multiplier of total levy and co-funding	Anything above 0 is viable
Net Benefit to levy only cost ratio	Net benefit multiplier of levy dollar	Higher multiplier than NB-C ratio if there is co-funding (cost sharing)
Return per hectare per year ($/ha/year)	Converts the NPV to per hectare return - Present Value of benefit less costs over 18 years, divided by the industry effective dairy area	Annual benefit at farm level
NPV sensitivity 4% and 12%	NPV if lower or higher discount rate (plus or minus 50% of 8%)	8% is commercial rate. 4% is typically for environmental or social investment. 12% is riskier investment

2.5 Data Collection

The work commenced with identifying key DairyNZ stakeholders for initiative bundles (e.g. lead contact, programme leader, executive sponsor, project portfolio office) and gathering key initiative references including:

- DNZ internal initiative proposals.
- Business case or investment/budget proposal/plan.
- Co-funder proposals/contracts.

[5] NBCR = NPV/costs

[6] Net Present Value (NPV): A measure of how much an initiative or investment is worth in today's dollars. It adds up all expected future cash gains and costs, adjusting for the time value of money to provide the net value in todays $.

- Annual initiative reports or review/evaluations.
- Relevant external references.

After undertaking a desk review of initiative references, a series of interviews and/or email exchanges was conducted with key initiative bundle stakeholders to identify costs and benefits or quantifiable outcomes, along with the data requirements to quantify the benefits.

This could include external references or interviews with external or independent experts or stakeholders to enable triangulation of benefit variables and ranges (e.g. probability of success, % of benefit attributed to milksolids levy).

2.6 Review and Validation

A series of internal and external peer reviews strengthened the robustness of the CBAs. Internal peer reviews involved standardisation of CBA assumptions and structure, report template, multiple rounds of model checking for comparability and identifying issues of double counting across the portfolio, a sense-check session with a long-time Waikato dairy farmer, and quality assurance review of CBA reports.

External peer review involved:

- Initiative bundle key contact/s review of initial CBA models.
- Peer review workshop with DairyNZ initiative bundle key stakeholders and senior leadership team.
- Peer review workshop with DairyNZ Board.
- Peer review workshop with a representative panel of dairy farmers (comprising a mix of geographic and farm size/type representation).

3 Overview of Findings

An overview and results of CBAs by strategic priority is presented in next 10 sub-sections, with the full individual CBA reports in Appendix 4.

3.1 1.A Better BW

Better BW (Breeding Worth) comprises seven initiatives that support Strategic Priority 1A Sector Rates of Animal Genetic Gain that Match World-leading Competitors. The goal is DairyNZ taking a leading role in achieving this ambition, in partnership with main animal breeding (AB) providers. During the period considered, this goal was addressed by increased investment to build a genomic evaluation model and a genomic reference population, conduct research to improve BW, and routine BW outputs to the sector provided by NZ Animal Evaluation Ltd (NZAEL).

In 2024, an Industry Working Group (IWG) made a set of recommendations that led to a pivot in approach to achieve the strategic goals. DairyNZ is progressing IWG recommendations with NZAEL 4.0 genomic AE with OneBW targeted to launch in late 2026.

Key components of the work following this pivot include:

- A future-facing National Breeding Objective (NBO);
- OneBW with genomics;
- Fertility and BW improvement; and
- Data quality for animal performance.

Of the total benefit, 62% is value add as it supports the uptake of genomics and 38% is avoided cost as it is protecting BW gain from backsliding. Further detail is contained in the full CBA report for this bundle of initiatives in Appendix 4.

Initiative	**Start**	**End**
NZAEL operations	Ongoing	Ongoing
Fertility	Oct 2013	Sep 2021
Resilient dairy	Jun 2020	May 2026
OneBW/ Future NBO	Feb 2025	Dec 2026
BetterBW	Mar 2023	May 2024
Thematic area	**1.A Better BW**	
Funding* ($'million)	**Total $45.6m**	
Dairy Farmer Levies	AB companies	Crown
$40.2m	$1.4m	$4.0m
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$51.1m	**$3**	**1.2x**

* Actual for years 2020/21-2024/25 and estimate for 2025/26. The total also includes CAPEX of $6.3m.

3.2 1.B Better Ryegrass

The Better Ryegrass investment falls within the Accelerating on Farm Productivity strategic priority and, more specifically, targets gains in forage performance through genetics, forage combinations, and management, enabling resilience to climate and improving international competitiveness.

The work encompasses the Forage Value Index (FVI) and broadly supports the development of improved forages through accelerated breeding. This accelerated breeding work has focused on traits such as higher yield, heat tolerance and nitrogen use efficiency. It includes genomic selection, genetically modified high metabolisable energy (HME) ryegrass and related technologies (Accelerated Plant Breeding (APB) scenario). Most of this work has been undertaken in partnership with industry and Government, enabled by significant investment from these parties.

Plant breeding must deliver measurable gains in forage performance for the pastoral sector to maintain its international competitiveness; however, the FVI validation trial showed an inability to capture gains in dry matter (DM) yield at the farm-system level. The next phase of FVI research will investigate the impact of plant breeding at both a plant level and farm system level to understand why gains were unable to be captured in the FVI validation trial. The two possible scenarios are that the gains in plant breeding cannot be captured in harvestable energy (Base scenario), or that the value of modern varieties comes from much more than just DM yield, and that the genetic gain lies in an increase in harvestability. This is a trait that provides the ability to hold nutritive value for longer at higher pre-harvest herbage masses than what are typically targeted in conventional pasture-based systems and offers improved grazing management flexibility with higher annual DM yields and greater milk production potential (Business as Usual (BAU) scenario). Better Ryegrass is considered to be 100% value add, as improving ryegrass production is core to productivity gain.

This analysis takes proprietary seed sales volumes and converts to a dairy area grassed. That is then moderated by adoption rates reflecting the number of users of the FVI Cultivar Selector Tool.

The resultant area is planted proportionally in Base, BAU and APB varieties. The Base and BAU are valued by the FVI and the ABP is an AgResearch estimate. The value created by the Base is then netted off combined BAU and APB values to give a net benefit.

Initiative	Start	End
Forage Value Index	1 Sept 2019	Ongoing
Pasture Accelerator Programme	23 Nov 2023	31 May 2025
Hybrid Grass	1 Jul 2016	31 May 2022
GM Forages	1 Jun 2016	31 May 2024
Thematic area	**Better Ryegrass**	
Funding* ($'million)	**Total $9.3**	
Dairy Farmer Levies	Co-funders	
$9.3	NA	

CBA results		
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$155.1	**9.71**	**16.3**

* Actual for years 2020/21-2024/25 and estimate for 2025/26.

3.3 1.C Retention and productivity in the workplace

Retention and Productivity in the workplace has comprised sixteen initiatives that support the strategic priority of Increased Workplace Productivity. The 10-year sector ambition is that workplace productivity has significantly increased and is internationally competitive, and dairy farming in New Zealand is an attractive employment and career opportunity. Since 2019 the workplace-related programme of work has included initiatives to attract people to work on dairy farms, develop tools and resources to help farmers create more productive and efficient workplaces and retain their people, development of the Great Futures in Dairying Plan, undertake research into farm systems changes such as flexible milking, extended lactation and batch robotic milking, and research workplace productivity drivers and reduction of sprains and strains injuries.

Two key components of this initiative bundle were assessed in this CBA as representative examples. That is because the overall scope of work in the initiative bundle is complex and for many of the activities, benefits are difficult to directly quantify.

The first aspect quantified was the work undertaken by DairyNZ during the COVID-19 pandemic when the New Zealand dairy sector was severely short staffed. DairyNZ, in conjunction with Federated Farmers, advocated consistently to government on industry immigration needs using robust workforce data and insights. This work resulted in two definitive and unique outcomes for dairy – being on the scarce list for Residency Visa 2021 and being granted a class border exception, for which DairyNZ was the implementation partner.

The second stream of work investigated the research and development of a tool to support more efficient milking practices. The aim was to provide farmers with the confidence to shorten milking times to improve efficiency with no impact on profitability and improve staff working conditions. This tool was the MaxT App, which aims to reduce milking time by ending milking at a predetermined time based on a herd's milk volume rather than waiting for each cow to be milked out individually. Retention and productivity is considered to be 66% value add as the MaxT app improved milking efficiencies. The residency visa initiative, at 34%, was cost avoidance.

Initiative	Start	End
Go Dairy	Jun 2022	May 2024
Milking Systems	Jun 2019	Jun 2022
Thematic area	**1.C Increased Workplace Productivity**	
Funding* ($'million)	**Total $16.0**	
Dairy Farmer Levies	Various	
$13.6	$2.4	
	CBA results	
Expected NPV ($'million)	**Return($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$46.99	**$2**	**1.6**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

3.4 2.A Supporting Farm Profitability

The Supporting Farm Profitability bundle falls within the Accelerating on Farm Productivity Strategy envelope and, more specifically, aims to ensure New Zealand dairy production systems are world-leading in cost of production, customer desirability and business resilience profile, and match world-leading competitors in emissions intensity.

The Step Change (5032) and Future Fit Farm Systems (8824) initiatives are key initiatives led by DairyNZ to help New Zealand dairy farmers adapt to increasing environmental and economic pressures, while improving profitability and increasing resilience.

Step Change was launched in 2020 to support farmers in reducing greenhouse gas (GHG) emissions and nitrogen (N) losses, improving financial performance, and building resilience. It emerged in response to growing regulatory and market expectations around sustainability.

Future Fit Farm Systems builds on this foundation by testing and demonstrating what lower-emissions, lower-input, and more resilient farm systems look like in practice. This links in with hub and monitor farm examples.

Another key component of the Future Fit Farm Systems initiative is the use of data analysis through DairyBase. This national database includes financial, physical, and environmental key performance indicators from farms across New Zealand. By leveraging these data, DairyNZ can visually represent where farmers in each region sit in terms of profitability and environmental performance, thereby identifying opportunities for improvement. DairyBase also provides a service to individual farmers to benchmark their financial performance against peer groups and find areas for improvement.

In addition to extension, DairyNZ partnered with MPI on the Baseline initiative. The initiative was for the supply of farm datasets including financial, physical and environmental data. The value of the data collected was significant, in that both MPI and DairyNZ received a large amount of in-depth physical, financial and environmental data, spread across NZ.

Looking at the data, productivity growth has stalled over the last decade, signalling a mature sector where leading farmers have achieved high efficiency and without large technical breakthroughs in key pasture, animal or people productivity components. However, performance gaps remain. DairyNZ's extension and support services focus on maintaining peak performance while helping lower performing farms to improve, sustaining overall milk solids production and sector-wide efficiency. This has happened in the context of 'headwinds' for the sector in the last decade. Staffing constraints, COVID-19, environmental pressures and on-farm inflation might all have decreased productivity. In this analysis it is assumed DairyNZ services have protected against a drop in on-farm

efficiency caused by these headwinds. This protection of efficiency should not be confused with gains in profitability made through favourable milk price trends and terms of trade.

The CBA utilises DairyBase analysis showing that preventing a reduction of 1% in on farm efficiency is associated with an on-farm profit loss prevention of $22,000 per farm per annum.

This is the inferred loss prevention by those that implemented the opportunities from the Supporting Farm Profitability bundle. On this basis, supporting farm profitability is considered to be 100% avoided cost.

The value of the uptake is moderated by a factor reflecting that not all content in the bundle would lead to an efficiency increase (thereby farm profit protection) and lastly, an adoption rate based on Dairy NZ Farmer Perception Survey results is applied.

Initiative	**Start**	**End**
Future Fit Farm Systems	June 2024	May 2025
Step Change	June 2019	May 2024
Engagement and Partner Networks	June 2021	May 2024
Island Hub leads	June 2018	Nov 2022
FFS - Involve, Content, Connect, B2B	June 2024	May 2025
Monitor Farms		
Underpinning work	June 2018	May 2022
DairyBase	June 2019	Sep 2020
Baseline	June 2012	Ongoing
	Sept 2020	May 2024
Thematic area	**Category 2A, Future fit farm systems**	
Funding* ($'million)	**Total $72.2**	
Dairy Farmer Levies	Various	MPI
$68.9m	$1.2m	$2.1m
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$465.7	**$29.18**	**6.8**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

3.5 2.B On Farm Change

The On Farm Change investment falls within a range of strategy envelopes and initiative areas. These include:

- **Powering more adaptable and resilient farms**
    - New Zealand dairy production systems are world-leading in cost of production, customer desirability and business resilience profile, and match world-leading competitors in emissions intensity.
    - Access to high-quality data and insights is unlocking significant benefit to the sector and delivering credibility and trust with customers and stakeholders.
- **Enabling sustainable and competitive dairying**

- Empowered farming communities are driving improvements in water quality and ecosystem health at scale across dairy catchments and the public and consumers view dairy farmers positively as responsible stewards of the land.

Broadly speaking, On Farm Change uses/develops farmer groups (catchment/regionally representative) across a range of dairying locations to support farmers on their change journey to achieve the required environmental obligations, while minimising negative profitability impacts (avoided cost) and increasing resilience of the farm business.

In most cases, a co-development approach is/was used, working alongside partner farms, rural professionals and scientists to provide farmers with confidence in the mitigation options and pathways for implementation. While a key focus was reducing N loss, often sediment, eDNA, GHG and other assessments were included. The catchments initiatives included:

- Tararua (plantain)
- Selwyn-Hinds (Mid Canterbury)
- Waimea (Southland)
- Ōrari- Temuka- Ōpihi- Pareora (OTOP) water zone (South Canterbury)

This analysis, for the catchments above, models the losses in profitability of GMP implementation vs a simple stocking rate reduction for the equivalent reduction in N loss. The adoption rate is then assumed to align with the DairyNZ quarterly farmer perception survey support level for DairyNZ adding value on farm or in the case of Tararua and Selwyn-Hinds 70% and 100% respectively given regulatory requirements. Given On Farm Change is protecting against losses, it is assumed to be 100% avoided cost.

The analysis is conservative as there will be the adoption of GMP and associated benefits outside of these catchments and, where N reduction has a regulatory requirement, as noted above, the uptake will exceed the farmer perception survey level of support used as a base for adoption rate.

Initiative	**Start**	**End**
Plantain Tararua Rollout	June 2019	May 2024
SDH Participatory Research	July 2019	June 2022
Selwyn - Hinds	Sept 2020	May 2024
South Canterbury OTOP catchments	Oct 2022	June 2025
Waimea Catchment	Oct 2022	June 2025
Thematic area	**Enabling Sustainable and Competitive Dairying**	
Funding ($'million)	**Total $5.3**	
Dairy Farmer Levies	Industry	Government
$3.3	$1.2	$1.01
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$291.8	**$18.28**	**50**

3.6 2.C Strong Biosecurity

Strong Biosecurity comprises three initiatives that support Strategic Priority 2C aimed at an integrated and sustainably funded biosecurity system that minimises the impacts of biosecurity incursions, through collective readiness activities and robust on-farm biosecurity measures. The goal is for the biosecurity system to be integrated, science-based and sustainably funded, reducing institutional fragmentation, improving coordination, and ensuring efficient investment of dairy farmer levies. Components include:

- Policy, Advocacy and Engagement;
- Biosecurity System Governance; and
- Readiness for Response.

Strong Biosecurity has an enduring timeframe, starting prior to the current levy period and expected to persist into the foreseeable future.

Of the total benefit, 95.5% is value add as it supports the control of TB which is an endemic disease and 0.5% is avoided costs for all others (Mb, FMD, DEBRIeF), either because they are exotic diseases that the investment helps prevent (FMD), or because the investments resulted in costs that would otherwise fall to the dairy industry disproportionately being taken up by others. Further detail is contained in the full individual CBA report for this bundle of initiatives in Appendix 4.

Initiative	**Start**	**End**
TBfree	Jun 2020	Ongoing
Biosecurity Systems	Oct 2019	Ongoing
D-BRiEF (DairyNZ Biosecurity Risk Identification and Evaluation Framework)	Jun 2020	Aug 2022
Thematic area	**2.C Strong Biosecurity**	
Funding* ($'million)	**Total $205.3m** initiative	
Dairy Farmer Levies	Crown	TB slaughter levy
$93.3m	$49.0m	$63.0 m
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$709.0m	**$44**	**1.8x**

* Actual for years 2020/21-2024/25 and estimate for 2025/26

3.7 3.A LowN Leaching Systems

LowN Leaching is comprised of eight initiatives aligned to the strategic theme of Enabling Sustainable and Competitive Dairying Whilst Ensuring Healthy Waterways.

This work will empower farming communities to improve water quality and ecosystem health, whilst proving to consumers and the public that dairy farmers are responsible stewards of the land.

LowN Leaching invested in two main work streams. The LowN livestock/Systems programme (2651) initially focused on genetic solutions before pivoting to focus on stacking N mitigations and management practices to achieve significant reductions (>40-60%) in N leaching whilst maintaining on farm viability. Farm management practices include reduced fertiliser use, standoff facilities, riparian planting, supplementary feed etc. Farmers could utilise different variations of these by "stacking" different practices to reduce their nitrogen leaching.

The Plantain Potency and Practice (2463) initiative was to understand and quantify the contribution of bioactive plantain-based pasture in farm systems to minimise N leaching. The initiative aims to provide scientific evidence that a plantain-based pasture would reduce the level of nitrogen leaching and provide dairy farmers with a tool to mitigate leaching with no significant impact on farm profitability.

Results from the initiative showed that plantain introduced into pasture had minimal impact on productivity and profitability, whilst reducing N leaching by significant levels. The integration of plantain in pasture is a mitigation for nitrogen leaching and is assumed to be a 100% avoided cost.

Initiative	Start	End
MBIE LowN		
Livestock/Systems	Jan 2018	Dec 2025
PR Programme	Mar 2021	Feb 2028
PR Extension	Mar 2021	Feb 2026
Thematic area	**3.A Healthy Waterways**	
Funding* ($'million)	**Total $ 34.88**	
Dairy Farmer Levies	Crown	Co-funding
$18.2	$12.9	$3.7
	CBA results	
Expected NPV ($'million)	**Return($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$358.8	**$18.68**	**4.8**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

3.8 3.A Better Freshwater Policy

The Better Freshwater Policy investment falls within the Enabling Sustainable and Competitive Dairying Strategy envelope, and more specifically, empowered farming communities driving improvements in water quality and ecosystem health at scale across dairy catchments with the public and consumers viewing dairy farmers positively as responsible stewards of the land.

While spread over different portfolios at times, the focus has consistently been:

1. **Influencing the policy process** to deliver fair, evidence-based and pragmatic policy outcomes which solve the environmental problem, protect the viability of dairy farms and provide certainty and a fair transition.
2. **Providing science** to support policy and practice change.

A range of analysis options were considered for the CBA. Given the changing regulatory framework at the national level, several regions are in a state of flux regarding environmental requirements. It was agreed that Waikato Regional Council (WRC) Plan Change 1 (PC1) provided a sound reference example on which to develop the CBA. This benefits for this initiative are considered to be 100% avoided cost. This is not to say there may not have been some productivity gains as farmers refine their systems.

Two primary areas are included in the analysis; i) the change in compliance activity required based on Dairy NZ feedback to initial proposals; and ii) the policy shift to implementing good management practice (GMP) rather than a simple stocking rate reduction to meet Nitrogen (N) loss levels[7].

In addition, DairyNZ, through the utilisation of science, economic modelling and targeted policy and advocacy, successfully contributed to amendments to the Essential Freshwater Package[8]. The New Zealand Government's Freshwater Science and Technical Advisory Group adopted a dissolved inorganic nitrogen (DIN) national bottom line of 2.4 mg NL^{-1} on the basis of science based policy submissions and engagement with Ministers and other stakeholders, avoiding the requirement for unnecessary reductions. Under national direction, regional councils have discretion in how they give effect to a national bottom line, either through input controls (e.g. restrictions on stocking rates or fertiliser use), output controls (e.g. maximum nutrient discharges), or land-use controls (e.g. limits

[7] These analyses do not include any capital costs avoided from DairyNZ's involvement, e.g. upgraded effluent systems, standoff pads, changed irrigation systems.

[8] A suite of central government policies introduced in 2020 to improve the health of New Zealand's waterways.

on the area of dairy farming). Councils also have the ability to impose more stringent limits than a national bottom line.

The impact on individual farmers would therefore have depended on both the level of exceedance in their catchment and the regulatory approach chosen by their regional council. Because councils had not yet implemented the national direction, or considered whether more stringent limits were applicable, it is difficult to estimate precisely how many farms would have been affected, what regulatory constraints they would have faced, and the resulting effect on farm viability.

For the purpose of analysis, DairyNZ has adopted a conservative estimate of 2,000 dairy farms directly affected. We have assumed that councils would most likely have implemented controls through stocking rate restrictions, as this was the simplest and most readily modelled pathway to achieving the proposed bottom line. The modelling showed this change averted a potential loss of 5% of on farm profit for the estimated 2,000 farms affected[9]. We have estimated the number of farms affected based on regional council assessments of existing nitrogen loads provided publicly as part of the regional implementation of the national direction.

This modelling indicates the impacts would have been felt in 'dairy prevalent' catchments, particularly in the Waikato, Southland, Canterbury, Horizons, Otago and Taranaki regions.

This is a conservative analysis, as the total cost of the bundle has been put against the benefits for the Waikato and DIN standards.

Initiative	Start	End
Government Regulations	Dec 2021	May 2024
Freshwater Science	Sep 2016	Ongoing
Freshwater/Regional Policy	Sep 2016	Ongoing
Catchment Level Solutions	Sept 2021	May-2024
National Level Solutions	Sept 2021	Ongoing
AgR E.Coli	Nov 2022	May 2028
Ecosystem Health	July 2023	Ongoing
Thematic area	**Enabling Sustainable and Competitive Dairying**	
Funding* ($'million)	**Total $22.1**	
Dairy Farmer Levies	Various	
$21.7	$0.4	
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$248	**15.50**	**12.65**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

3.9 3.B Wintering

The Wintering bundle comprises nine initiatives that collectively support the strategic priority Enhanced Animal Care, ensuring that New Zealand dairy farming remains internationally competitive in animal care. While this report primarily highlights the Wintering Good Farming Practice Initiative, this initiative was underpinned and supported by a wider bundle of research and demonstrations. Together, knowledge from the nine initiatives built on previous efforts in Southland and Otago and

[9] Economic assessment of alternate nitrogen and phosphorus limits in the *Essential Freshwater* package. Dr Graeme Doole and Jennifer Leslie, DairyNZ Economics Team

responded in part to public perceptions of poor grazing practices leading to poor animal health and welfare.

Within the bundle, the Wintering Good Farming Practice Initiative focused was on three areas: i) a targeted media and practice change campaign to engage with farmers to winter their stock well and provide them with the appropriate resources and information; ii) extension events to demonstrate good farming practice on winter crops; and iii) conducting research to support the evidence base of good farming practice uptake, to demonstrate to regulators and the community that dairy farmers were improving their wintering practices.

The intended initiative outcomes were to show improved environmental and animal care outcomes, improve public perception and provide credible evidence to demonstrate a change in performance. Whilst initially addressing a Southland/Otago issue, the initiative hoped to provide solutions for all dairy farmers in New Zealand who winter stock on farm, particularly on forage crops. The benefits for this initiative were 100% avoided cost. There may be other unquantified benefits that may have downstream productivity gains.

Initiative	**Start**	**End**
Wintering Infrastructure	Sep 2020	May 2025
Fodder Beet	Jul 2018	May 2023
Wintering systems	Jun 2019	Nov 2024
Thematic area	**3.B Enhanced Animal Care**	
Funding* ($'million)[10]	**Total $9.95**	
Dairy Farmer Levies	Co-funding	
$8.3	$1.65	
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$3.6	**$0.3**	**0.5**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

3.10 3.C Reducing GHG emissions

The reducing Greenhouse Gas (GHG) Emissions investment consists of a bundle of nine initiatives aligned with the strategic priority of Enabling Sustainable and Competitive Dairying. These investments are intended to support DairyNZ's wider effort for the sector to be on track to meet its GHG commitments, which will be enabled by policy development, advocacy, and access to cost effective mitigation practices and technologies.

The Reducing GHG Emissions investment was focused in two main areas: i) climate policy and advocacy on behalf of dairy farmers; and ii) research to find solutions for reducing GHGs. These initiatives aimed to provide scientifically based evidence to advocate for a fair and practical regulatory framework and contribute to the development of mitigation technology. In addition to levy investment, DairyNZ's wider GHG efforts included engagement with commercial and government stakeholders to develop research partnerships and funding opportunities and contracted research delivery.

Included in this was science-based advocacy to inform the decision to keep agricultural greenhouse gas emissions out of the NZ Emissions Trading Scheme (ETS) and to seek fairer treatment of

[10] Funding for the initiative has been grouped into three main areas which are slightly asynchronous with the focus areas. The various initiatives were closely interlinked within the ROI bundle.

biological methane, based on its warming impact in the atmosphere. It also provided technical input into estimations of on-farm emissions, an independent science review of NZ's 2050 methane target and the recalibration of central government and Climate Commission estimates and assumptions on efficacy and availability. For these reasons Reducing GHG is 100% avoided cost.

The second work stream continued DairyNZ's investment into the Pastoral Greenhouse Gas Research Consortium to support development of vaccines and methane inhibitors.

Initiative	**Start**	**End**
RGP	Jan 2018	Dec 2025
Climate Change	Oct 2015	Ongoing
He Waka Eke Noa Contribution	Oct 2020	Dec 2024
Future GHG Solutions	Feb 2022	Ongoing
Thematic area	**Reduced GHG Emissions**	
Funding *($'million)	**Total $9.2**	
Dairy Farmer Levies	Co-funding	
$9.1	$0.1	
	CBA results	
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$184.9	**$12.36**	**22.1**

*Actual for years 2020/21-2024/25 and estimate for 2025/26

4 ROI Findings

4.1 Overarching themes and challenges

Simplistically, DairyNZ activities could be described as overlapping (see Figure 3**Error! Reference source not found.**). Extension and adoption overlap the core areas of Policy & Advocacy, R&D and Economics & Farm Business.

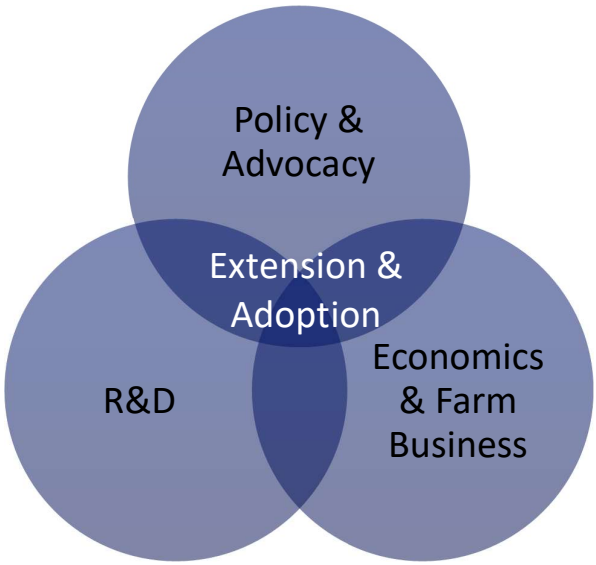

Figure 3: DairyNZ activity overlap

This analysis has been focused on valuing the constituent parts of a farm system. In reality they are all interrelated and often provide synergies, or activities contribute to more than one outcome. GMP is a good example of this. While mostly focused on water quality, focusing on more efficient nutrient management will also likely reduce the cost of production. Similarly, SOPs will ensure jobs get completed consistently but also remove doubt around labour expectations reducing the potential for conflict. The focus DairyNZ has in the extension area, outlined in Supporting Farm Profitability CBA, focuses on farm systems to maximise these outcomes.

With regard to the CBA, this creates a challenge as there is the potential to double count the benefits. Examples include:

- On Farm Change in the extension space - GMP valued at $18/ha could be considered as part of the practices adopted within the 1% cost avoided benefit from DairyBase model in Supporting Farm Profitability. Similarly, the benefits from Retention and productivity in the workplace could also be wrapped up in the Supporting Farm Profitability.
- Water quality - has the highest risk with three initiatives being On Farm Change, LowN Leaching Systems and Better Freshwater policy. LowN Leaching primarily considered the use of plantain. This was excluded from the On Farm Change analysis. Similarly, the Waikato region was excluded from the LowN Leaching to avoid overlap with the Better Freshwater policy analysis. With respect to the dissolved inorganic nitrogen (DIN) standards in Better Freshwater Policy, the benefit is derived from not having to meet the higher proposed standard (i.e. the difference between the higher proposed and implemented standard) rather than cost effectively meeting the implemented standard.

Overall, the CBAs have managed the challenge through using conservative assumptions on adoption rates unless driven by regulatory pressure (e.g. On Farm Change).

More broadly, the approach distinguishes the value of the innovation or practice on its own against value of extension activities to maximise adoption. We do not believe this compromises the analysis but should be noted as potential point of challenge.

4.2 Summary of results

The largest levy investments tend to have the largest return. Strong Biosecurity and Supporting Farm Profitability account for 31% and 27% of sample investments (see Figure 2). These are also the top two NPV and farm returns contributors (see Figure 4 and Table 4).

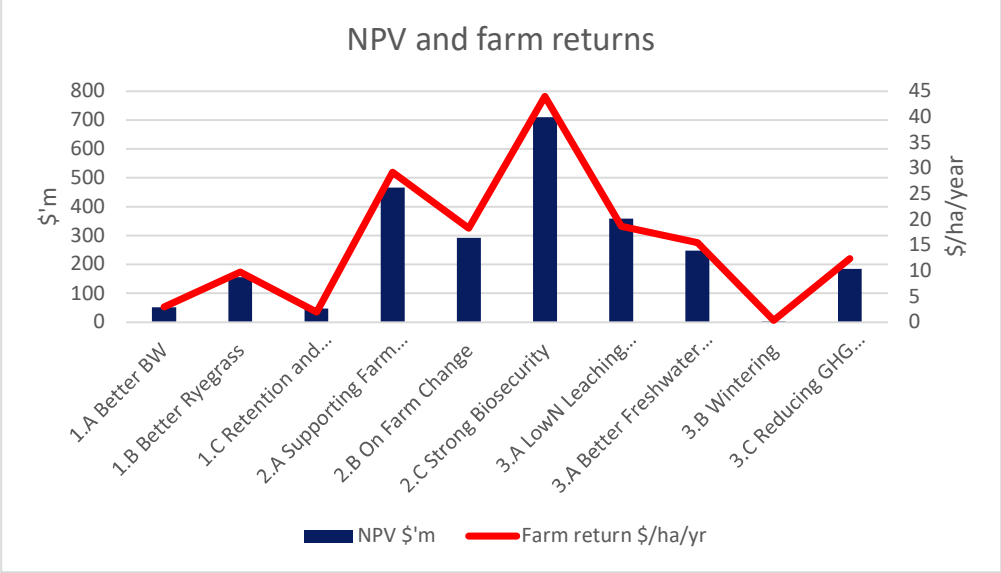

Figure 4: Strategic priorities NPV and farm returns

Table 4: Portfolio-level summary of economic outcomes

Strategy and initiative bundle	NPV (8%) $'millions	Farm return $/ha/year	Farm return c/kgMS/year[11]
1.A Better BW	51.1	3	0.25
1.B Better Ryegrass	155.1	10	0.85
1.C Retention and productivity in workplace	46.9	2	0.17
2.A Supporting Farm Profitability	465.7	29	2.46
2.B On Farm Change	291.8	18	1.53
2.C Strong Biosecurity	709.0	44	3.73
3.A LowN Leaching Systems	358.8	19	1.61
3.A Better Freshwater Policy	248.2	16	1.36
3.B Wintering	3.6	0.3	0.03
3.C Reducing GHG emissions	184.9	12	1.02

[11] $/ha/yr divided by 1180kgMS/ha average production from DairyNZ Economic Survey 2023-24 season.

Considering anything above zero is viable, all levy investments have demonstrated viability with positive net benefit to total cost and net benefit to levy cost ratios, ranging from 0.3x to 87x (see **Error! Reference source not found.**). Leveraging levy funding with co-funding (e.g. government and industry co-funders) multiplies the return to levy dollars with net benefit to total cost ratio expanding from 5.9x to 8.2x for net benefit to levy cost ratios on a weighted average basis[12] (see Table 5). The levy investments with the highest multipliers (On Farm Change, Reducing GHG Emissions) are not necessarily the largest NPV contributors (Strong Biosecurity, Supporting Farm Profitability).

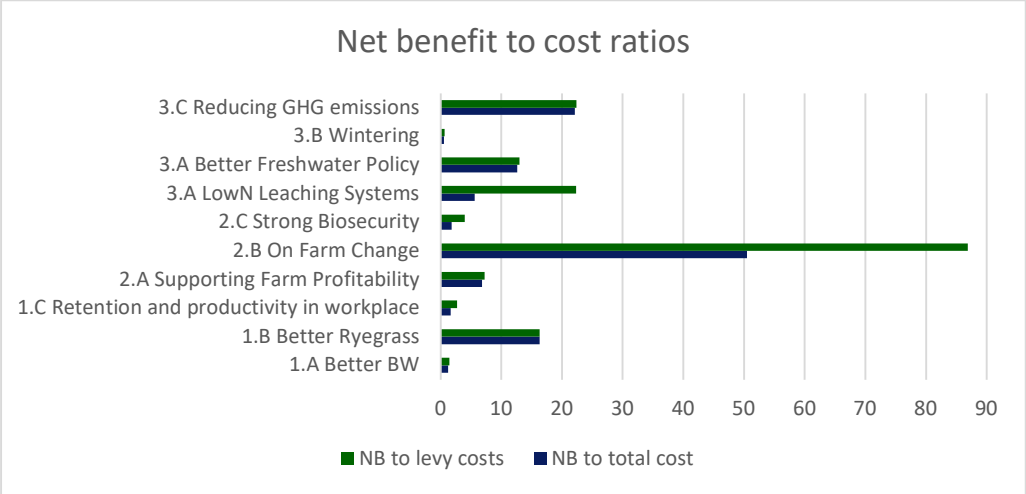

Figure 5: Strategic priorities net benefit to total and levy costs ratios

Table 5: Leverage of co-funding and net benefit to cost ratio

Strategy and initiative bundle	NB-C ratio (total)	NB-C ratio (levy)
	x	x
1.A Better BW	1.2	1.4
1.B Better Ryegrass	16.3	16.3
1.C Retention and productivity in workplace	1.6	2.7
2.A Supporting Farm Profitability	6.8	7.2
2.B On Farm Change	50.5	86.9
2.C Strong Biosecurity	1.8	3.9
3.A LowN Leaching Systems	5.6	22.3
3.A Better Freshwater Policy	12.7	13.0
3.B Wintering	0.5	0.6
3.C Reducing GHG emissions	22.1	22.4

[12] Using 2021 to 2025 levy funding weighting.

Strategy and initiative bundle	NB-C ratio (total)	NB-C ratio (levy)
Weighted average	**5.9**	**8.3**

All levy investments have nil probability of a negative NPV except for Better Ryegrass which has a 9% chance of a negative NPV and Wintering which has a <1% chance of a negative NPV (see Figure 7 and Table 6). Those with the widest relative confidence interval represent levy investments with the widest range of possible outcomes. These are Better Ryegrass, Better BW, Supporting Farm Profitability and LowN Leaching Systems (see Figure 6). While having a wide range of possible NPV outcomes, these have nil chance of negative NPV except for Better Ryegrass.

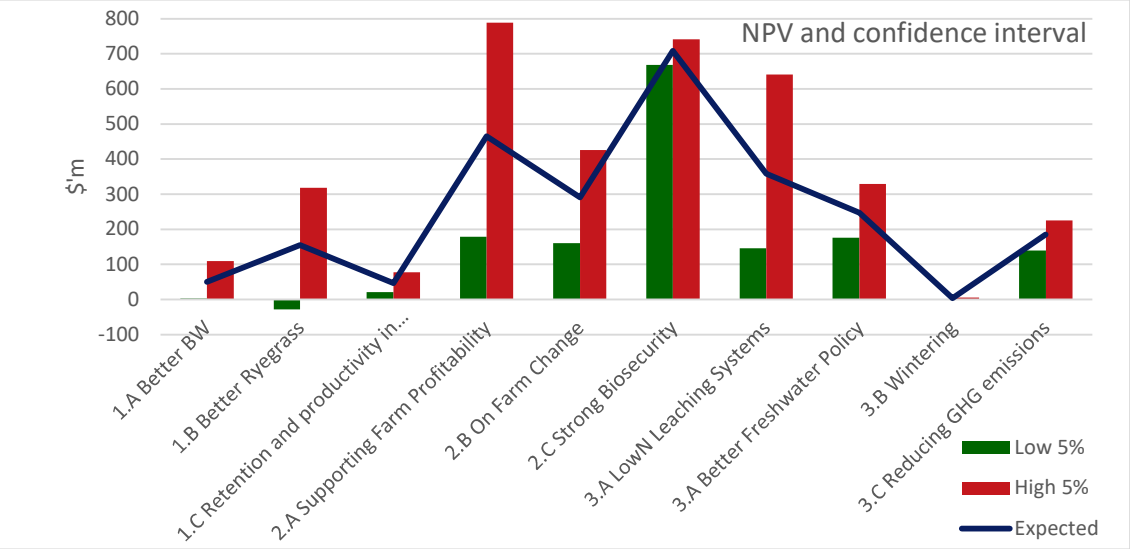

Figure 6: Strategic priorities NPV and confidence interval

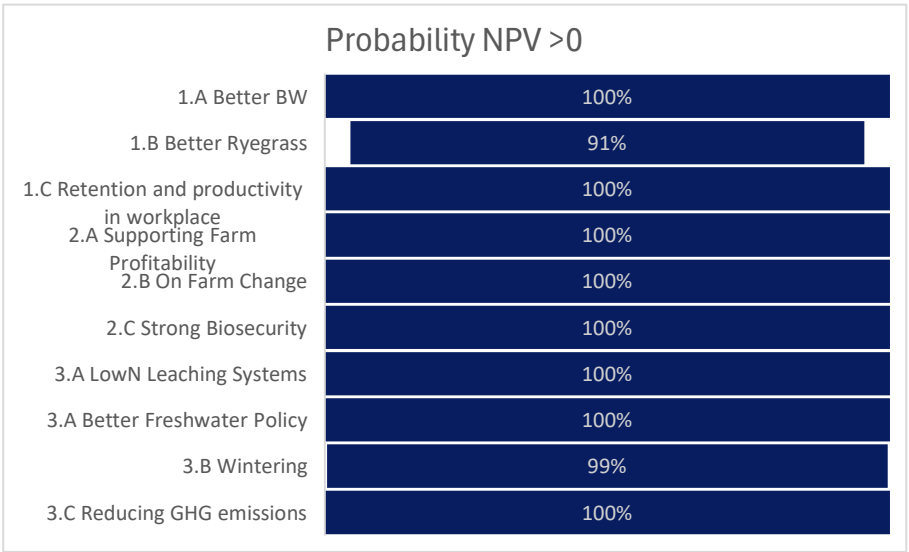

Figure 7: Strategic priorities probability of positive NPV

Table 6: Confidence intervals and likelihood of returns

Strategy and initiative bundle	Confidence interval NPV $'m		NPV > 0
	Low 5%	High 5%	%
1.A Better BW	3.6	109.6	100%
1.B Better Ryegrass	-28.4	319.0	91%
1.C Retention and productivity in workplace	201.2	78.5	100%
2.A Supporting Farm Profitability	179.0	789.0	100%
2.B On Farm Change	161.0	426.0	100%
2.C Strong Biosecurity	668.9	741.9	100%
3.A LowN Leaching Systems	147.0	641.0	100%
3.A Better Freshwater Policy	177.0	329.0	100%
3.B Wintering	1.0	6.2	99%
3.C Reducing GHG emissions	140.2	225.9	100%

4.3 Themes across strategic priorities

4.3.1 Value assessment and lessons

Themes are emerging from value assessment and lessons learned among strategic priorities (see Table 7). While avoided costs deliver over half of returns (see section 5 for discussion), there is significant potential to turn compliance and assurance into market advantage. For example, where farms already meet GMP or policy-driven requirements, these could be presented as customer-facing assurance claims, potentially delivering premiums. Similarly, milking efficiency tools may deliver labour market advantage in workforce recruitment and retention.

Lessons learned themes include:

- **Maximising adoption and policy impact** – farmer-led co-design approaches, agile initiative management, clear communication and science-backed advocacy have consistently driven adoption on farm and influence in policy such as in LowN Leaching and Wintering.
- **High credibility data supports stronger results** - confidence in reported returns is strongest where high-quality data and independent review are in place. Tools like DairyBase and well-structured economic modelling provide the baselines and evidence needed for credible CBA. External expert input has also been important in complex areas such as Better BW.
- **Risk management for high payoff** - programmes in science and genetics, such as Better Ryegrass or Breeding Worth, have potentially high payoffs but are highly sensitive to assumptions. For example, Better Ryegrass shows a positive return of +$10/ha in one scenario but flips to a −$2.04/ha loss if baseline pasture performance improves as quickly without the investment. These uncertainties underline the need for staged investment ("stage gates"), regular re-analysis as new data comes in, and explicit recognition of

downside scenarios. This approach enables continued investment where the upside is significant, while managing risks to credibility and sector resources.

Table 7: Portfolio-level summary of value assessment and lessons learned

Strategy and initiative bundle	Value Assessment	Lessons Learned
1.A Better BW	Success of NZAEL 4.0/OneBW is essential for the dairy industry as it unlocks a significant opportunity gain that has been missed for the past decade.	Because the calculation methods for BW are complex, access to an external technical expert enhances the robustness and credibility of the benefit estimation.
1.B Better Ryegrass	Overall value is potentially high with an expected return of $10/ha. This does however assume that the BAU and APB varieties perform better than Base. If this is not the case, and BAU only performs as well as the Base, there is the potential for a negative return (-$2.04/ha). The new FVI research programme developed in conjunction with the PBRA to explore the FVI challenges, is critical as gains in forage plant breeding are essential in underpinning the performance of NZ's pastoral sector.	Not all science investments will produce a positive return. In this case however, the value of the upside is such that ongoing investment in refining the FVI and breeding is warranted. Using the updated investment analysis recommended would help ensure the investment remains in line with potential returns.
1.C Retention and Productivity in the Workplace	Overall return of $2/ha is low. However, development of tools to increase efficiencies in milking can lead to improved working conditions making it easier to recruit and retain staff. Quantification of staff retention proved difficult.	Focusing on workforce issues improves staff recruitment and retention. It remains an area for future focus. Many activities in this thematic area have benefits that are difficult to quantify but farmer feedback suggests are needed.
2.A Supporting Farm Profitability	The overall return at $29/ha is one of the highest in the analysis. This is not surprising given the range of activities included and the higher level, though conservative, analysis. The primary benefit noted is assumed as avoiding a 1% loss in an efficiency index leading to protecting $22,000 in profit per farm. Based on previous DairyBase analysis, 1% loss was considered to be at the conservative end of the range.	Undertaking CBA requires a considerable amount of solid data, both financial and physical, to provide a credible assessment. The use of DairyBase and the modelling skills in DairyNZ Economics Group supported this initiative significantly. Looking forward, there are many datasets from financial, farm management and assurance schemes, which when combined, could provide solid data for analysis both to support the efficient operation of a farm and

Strategy and initiative bundle	Value Assessment	Lessons Learned
		any ex-post analysis of the type undertaken in this initiative.
2.B On Farm Change	$18/ha/year is a strong return on investment. Having said this, this is an avoided cost scenario rather than value added. The counterfactual of reducing stocking rate would have given rise to a greater profitability loss. This is not a criticism of the DairyNZ work, more reflection of changing requirements which add cost.	The on farm change bundle has supported the creation of both a process (iterative co-design) and an outcome (GMP) widely relevant to the industry. How these outcomes can be applied broadly would warrant further investigation e.g. GMP outcomes as value add through assurance programmes/meeting customer requirements.
2.C Strong Biosecurity	TBfree programme contributing 99% of benefits underscores the value of biosecurity, primarily driven by avoided losses. Real value lies in preventing incursions and in reducing the size of incursions that do occur via readiness.	This work has proven the value of DairyNZ leadership in biosecurity system governance and its significant influence on policy development
3.A LowN Leaching Systems	Plantain in dairy pastures provides a tool to reduce N leaching significantly without impacting on farm productivity. It is an effective low-cost tool for the management of N leaching.	A key success factor, initiative management was flexible and agile in changing situations. There was clear communication between groups and governance, and a balance between competing interests from multiple shareholders
3.A Better Freshwater Policy	$16/ha/year is a strong return on investment. Having said this, this is an avoided loss scenario rather than value added. The counterfactual would have given rise to larger profit reduction. This is not a criticism of the DairyNZ work, more a reflection of changing requirements which add cost. How these requirements can be used as value add as part of assurance programmes/customer requirements or potentially in productivity gains from farming practice requires ongoing consideration.	The farmer interviews noted that the policy process is a "journey and not a destination". DairyNZ needs to maintain relevance and therefore involvement in the overall policy process both nationally and regionally. Keeping abreast of issues/opportunities, maintaining relevant science and economic/farm systems analysis is key to relevance and maintaining a seat at the table. This is seen in the current DairyNZ workplan.

Strategy and initiative bundle	Value Assessment	Lessons Learned
3.B Wintering	A low NPV of $3.6m understates the value of the initiative. If change had not occurred, dairy farmers faced the likelihood of increased regulation, costs and restrictions on land use leading to possible erosion of land values. The social licence to farm was at threat.	An excellent example of a farmer led initiative with high levels of collaboration between farmer and industry organisations leading to a high level of adoption amongst farmers who winter livestock.
3.C Reducing GHG emissions	Avoidance of potential costs equated to $12/ha/year. The value of this initiative was *providing evidence to inform the decision to* remove pastoral GHG emissions from the NZ Emissions Trading Scheme. It has provided more time for research and allowed the industry to be involved in future decision making.	Providing science-based data strengthens business cases for inclusion and advocacy in future decision making and setting emission targets. Collaboration with industry organisations presents a strong, united and compelling case when advocating for policy change.

Insights, mainly from the Farmer Panel workshop, indicate broad endorsement and strong support of the value of strategic priorities levy investments (see

Table 8). The levy investments are closely aligned with farmer needs, experiences and feedback, with a consistent emphasis on delivering tangible returns and improving farm performance (whether productivity gain or avoided profit loss). Approaches employ either a systems view (management systems, GMP) or leading science facilitation (BW, FVI).

Table 8: Stakeholder insights

Strategy and initiative bundle	Stakeholder insights
1.A Better BW	• The combination of NZAEL 4.0/OneBW validation results to increase farmer confidence in the use of genomics and improvements in the quality of the reference population (as the NZ multibreed composition requires a significantly larger reference population to achieve high reliabilities for genomically estimated breeding values) drives the size of the genomics prize. • The upside of Better BW benefits depends on NZAEL 4.0/OneBW accelerating uptake of genomics which will be addressed by the Farmer Awareness and Communications initiative that aims to improve farmer understanding of the importance/value of genetic gain and how this this value can be unlocked. • Better BW continues to invest in non-genomic avenues to accelerate BW gain for traits such as improved GHG footprint, extended lactation, and future calf opportunities as well as Fertility Breeding Value as fertility is a major issue of concern in high producing herds, both in New Zealand and internationally.
1.B Better Ryegrass	• Farmer feedback is supportive of work in forages including ryegrass as these underpin our farm systems. The FVI is sound in principle but managing plot trials in a way that aligns with actual on-farm

Strategy and initiative bundle	Stakeholder insights
	practice will always be a challenge. Local knowledge combined with an improved FVI would provide value. • The most common issues with pastures reported by farmers are decreasing persistence and varied outcomes based on grazing management. Given the FVI has received mixed feedback in some contexts, a successful roll out of the improved FVI would need careful consideration and stakeholder engagement.
1.C Retention and productivity in workplace	• Dairy farmers noted that recruiting and retaining staff can be difficult and expensive. • Apps and tools such as MaxT are seen by farmers as being simple tools which enable efficiencies within their milking systems. • The one-off border exception is seen as being positive but hard to quantify. One farmer noted he benefited by employing staff during COVID-19 lockdown, he stated he didn't know what the consequences would have been if he had been unable to employ two staff. • The initiative was complex due to the interaction between the individual initiatives.
2.A Supporting Farm Profitability	• Support for the farm profitability work was strong. Some interviewees noted it was a 'no-brainer' and 'super important'. Concern was expressed that productivity had plateaued, as in time of low payouts, and in the longer term in general, the only true gains come from productivity improvement. • DairyNZ has a broad base of knowledge on which to base its extension work. The challenge is identifying effective methods to support adoption especially for growing cohort of the younger generation (26-40 years) taking over the business as farm succession likely to ramp up.
2.B On Farm Change	• Overall support for the On-Farm change bundle is strong. Developing GMP 'on the ground' with strong science and technical support has developed relevant and robust systems and processes. Local Regional Council involvement has ensured their buy-in. • GMP can also be applied in other catchments, modified to fit as required. DairyNZ should continue to support this.
2.C Strong Biosecurity	• DairyNZ exercises essential governance and oversight not only for the milk commodity levy investment of about $15 million/year but also the total annual $75 million dairy farmer investment in the biosecurity system. This has produced non-quantifiable benefits (e.g. cessation of MyOSPRI investment as it was not capable of replacing the animal traceability system (NAIT) and integrating disease management (TB and *M. bovis*), greater oversight and transparency of OSPRI with constitution changes and establishment of a monitoring body for operational and Board performance, keeping MPI Biosecurity on mission given regular turnover in MPI staff) • The success in TB and *M. bovis* programmes demonstrate the strength of the biosecurity system relative to competitor nations. However, there remain challenges that require agility and vigilance.

Strategy and initiative bundle	Stakeholder insights
	• The significant wider environmental benefits of the TBfree programme in reducing possum numbers cannot be overemphasised.
3.A LowN Leaching Systems	• Overall farmers and researchers can see the benefit of having plantain in their pastures, and that N leaching is reduced for little impact on productivity. • Plantain is a simple low cost mitigant to reduce N leaching. • Issues such as palatability and weed control were noted as barriers to uptake by dairy farmers.
3.A Better Freshwater Policy	• Overall support is strong for the freshwater policy work. It is recognised as keeping dairy farming aligned with environmental drivers, while balancing the sustainability (in all respects) of the business. • To remain relevant, DairyNZ needs to continue with science and economic analysis to support positions with evidence that bring value to the wider discussion. Partnering with other organisations in areas of common interest supports gaining appropriate outcomes and enduring solutions.
3.B Wintering	• Overall support is extremely high given the implications of not taking any action. • Simple systems and processes have been developed to assist in developing Good Management Practice (GMP). • Extension work by the industry was well promoted and attended by farmers and rural professionals. • Uptake of GMPs from 2022 to 2024 was significant which proved the success of the initiative and buy-in from all participants.
3.C Reducing GHG emissions	• Support for this initiative is high given the requirement for dairy farmers to reduce GHG emissions, however maintaining productivity and profitability are seen as key for producers and milk processors. • Farmers understand the requirements of global markets and the implications of restricted market access. • Stakeholders understand the exclusion of dairying from the ETS allows time for more work to be completed ahead of future mitigation actions.

5 Projected Future Value

5.1 Anticipated returns from ongoing and upcoming investments

Benefits from levy investments either add value (productivity gain) or avoid costs from internalisation of environmental, social or regulatory costs. The latter arise from growing pressures on social license to farm balanced by research and advocacy of science-based solutions. Table 9 categorises the strategic priority initiative bundles' present value of benefits whether value add or avoided costs. Overall, the mix between value add and avoided costs is slightly weighted towards avoided costs at 55%. This means over half of levy returns protect farm surplus from downside while improving environmental and social outcomes and protecting licence to farm.

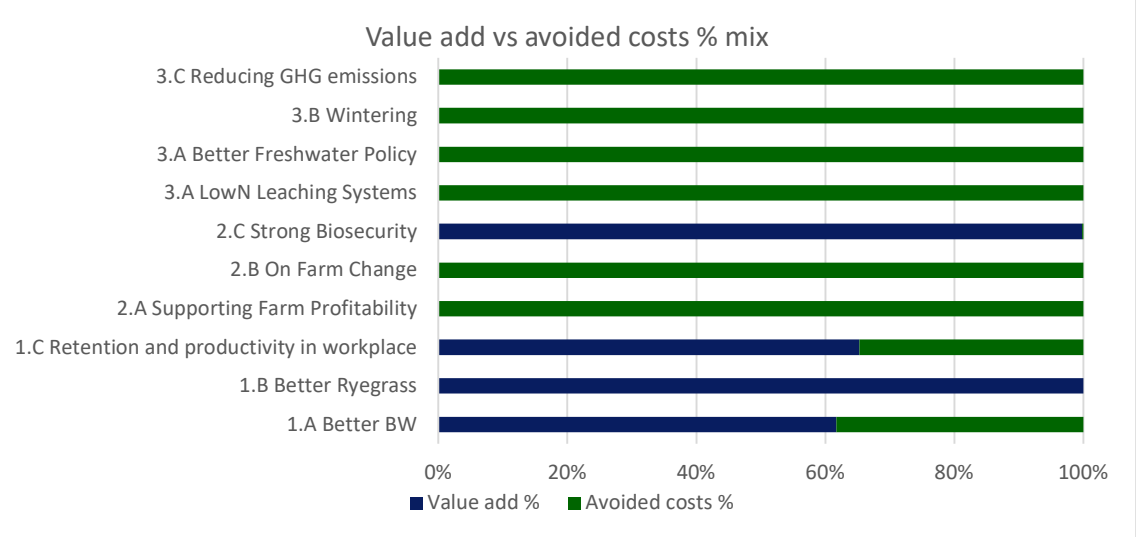

Figure 8: Strategic priorities mix of value add and avoided costs

While the analysis has grouped a number of activities as avoided cost, such as those around water quality and reducing GHGs, they actually solve a genuine problem for the industry. Over the course of the analysis, it is very clear sound progress has been made in the development of GMP for example. This allows sustainable dairy farming in nutrient constrained catchments and supports meeting consumer needs for sustainably produced products. While there are still some science challenges to overcome, good progress has been made on methane reduction with promising technology in the commercialisation phase. In the absence of these developments, there is a real possibility dairy farms would have to significantly reduce stocking rates or in the case of water quality, potentially cease to farm.

Table 9: Mix of value added and avoided costs benefits

Strategy and initiative bundle	Value add	Avoided costs
	% share of total benefits	
1.A Better BW	62%	38%
1.B Better Ryegrass	100%	0%
1.C Retention and productivity in workplace	65%	35%
2.A Supporting Farm Profitability	0%	100%
2.B On Farm Change	0%	100%
2.C Strong Biosecurity	100%	0%
3.A LowN Leaching Systems	0%	100%
3.A Better Freshwater Policy	0%	100%
3.B Wintering	0%	100%
3.C Reducing GHG emissions	0%	100%

Strategy and initiative bundle	Value add	Avoided costs
Weighted average	**45%**	**55%**

The 10 strategic priorities levy investments can be seen as a representative sample of the entire levy investment portfolio, as they account for 84% of the portfolio and include at least one initiative bundle from all strategic priorities. Given this assumption, the value of the entire levy investment portfolio can be estimated via two methods (see Table 10):

- Sum all strategic priority NPVs and aggregate up (see NPV column)
- Weighted average levy-only NBCR to generate value of sampled investments and aggregate up (see NBCR column)

The weighted levy only NBCR is 7.1x using levy costs beyond 2026 where relevant. The two methods generated a levy investment portfolio value amounting to $2.98 billion equivalent to $187 per hectare per year.

Table 10: Aggregating value to entire investment portfolio

	$'m NPV	$'m NBCR
Sampled investments (levy 2021-25)	248.6	
Non-sampled investments (levy 2021-25)	46.1	
Sampled % of total portfolio	84%	
Weighted NBCR levy only (x)	NA	7.1
Sampled investments value	2,515	2,513
Aggregated value of levy investments	2,981	2,978
Aggregated $/ha/year	187	187

5.2 Implications for levy renewal

A results and outcomes dashboard for each strategic priority is recommended primarily for initiative management and reporting to the Board, and secondarily as a good quantitative database for ROI reviews. This covers not only new initiatives but also business as usual especially where BAU is a material budget allocation.

Currently, strategic priority initiative bundle budget proposals indicate one to three year targets for key performance indicators (KPIs) but reports of achievement of key indicators do not include outcomes. A dashboard across all strategic priorities would enable a holistic view of the DairyNZ ecosystem, facilitating synergies across strategic priorities and would engender value to levy payers.

For example, the Better BW communications initiative to increase farmer uptake of unlocking genomics value would target and monitor increase in adoption KPI (baseline and targets). This is a common KPI that NZAEL can coordinate with the extension team involved in the Supporting Farm Profitability work. Aside from regular KPI outcomes reporting to Board, the dashboard would provide future CBAs and ROI reviews with a ready quantitative metrics database to facilitate quantification of benefits and minimise subjective retrospective assessments.

Communicating the CBA outcomes to farmers may be challenging as they are primarily considered at industry level. The return per hectare is intended to provide direct farm relevance. There would be benefit in developing the CBAs into farm-based case studies to 'ground' the outcomes for farmers and add farmer credibility. These could be used on the website as well as in farmer presentations. DairyNZ already has strong farmer networks in the 10 strategic priority investments, which could provide the farmer input.

There are many datasets from the Economics Group, financial, farm management and assurance schemes, which when combined, could provide solid data for analysis both to support the efficient operation of a farm and any ex-post analysis of the type undertaken in this review. Similar data could be used in ex-ante analysis to assist initiative development and prioritisation and eventually review.

6 Extended Initiative CBAs

6.1 Introduction

Two initiatives were selected for longer term review. These were 1.C Retention and Productivity in the workplace and 3.C Reducing GHG emissions. Many initiatives run for periods longer than the levy timeframe. To get a feel for the longer term returns, these two initiatives were chosen for a longer term review. The additional investment period considered was from 2019–26 for Retention and Productivity and 2003-26 for Reducing GHG emissions. These are outlined in the table below.

Table 11: Extended initiatives

Extended Initiative Bundle	# initiatives	Levy ($'millions)
1.C Retention and productivity in workplace Included Flexible Milking from 2019	10	13.7
3.C Reducing GHG emissions Included PGGRC investment from 2003	10	24.7

6.2 Methodology

While analysed in the same manner, these initiatives are not included in the consolidated analysis as the investment time frame is not consistent with the core review initiatives.

6.3 Overview of findings

An overview and results of the two extended CBAs follows, with the full individual CBA reports in Appendix 5.

3.C Reducing GHG emissions (including PGGRC)

The reducing Greenhouse Gas (GHG) Emissions investment originally consisted of a bundle of nine initiatives aligned with the strategic priority of Enabling Sustainable and Competitive Dairying.

These investments are intended to support DairyNZ's wider effort for the sector to be on track to meet its GHG commitments, which will be enabled by policy development, advocacy, and access to cost effective mitigation practices and technologies.

This initiative scope was extended with the addition of the Pastoral Greenhouse Gas Research Consortium (PGGRC) investment back to the consortium inception in 2003.

The Reducing GHG Emissions investment was focused in two main areas: i) climate policy and advocacy on behalf of dairy farmers; and ii) research to find solutions for reducing GHGs. These initiatives aimed to provide scientifically based evidence to advocate for a fair and practical regulatory framework and contribute to the development of mitigation technology. In addition to levy investment, DairyNZ's wider GHG efforts included engagement with commercial and government stakeholders to develop research partnerships and funding opportunities and contracted research delivery. Included in this was science-based advocacy to inform the decision to keep agricultural greenhouse gas emissions out of the NZ Emissions Trading Scheme (ETS) and to seek fairer treatment of biological methane, based on its warming impact in the atmosphere.

It also provided technical input into estimations of on-farm emissions, an independent science review of NZ's 2050 methane target and the recalibration of central government and Climate Commission estimates and assumptions on efficacy and availability.

The second work stream continued DairyNZ's investment into the PGGRC to support development of vaccines and methane inhibitors. For the extended analysis, the PGGRC Investment is extended back to 2003.

The development of the PGGRC and the DairyNZ investment also supported the pastoral sector remaining outside the ETS. Given there were no viable mitigations, investing in developing them was a logical action to support sector mitigation.

Initiative	**Start**	**End**
RGP	Jan 2018	Dec 2025
Climate Change	Oct 2015	Ongoing
He Waka Eke Noa Contribution	Oct 2020	Dec 2024
Future GHG Solutions	Feb 2022	Ongoing
PGGRC	Jan 2003	Dec 2021
Thematic area	Reduced GHG Emissions	
Funding *($'million)	**Total $25.6**	
Dairy Farmer Levy	Co-funding	
$24.7	$0.86m	
CBA results		
Expected NPV ($'million)	**Return ($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$36.3	**$2.27**	**3.03**

*Actual for years 2003/21-2024/25 and estimate for 2025/26

1.C Retention and productivity in workplace (including flexible milking from 2019)

Retention and Productivity in the workplace has comprised sixteen initiatives that support the strategic priority of Increased Workplace Productivity. The 10-year sector ambition is that workplace productivity has significantly increased and is internationally competitive, and dairy farming in New Zealand is an attractive employment and career opportunity. Since 2019 the workplace-related programme of work has included initiatives to attract people to work on dairy farms, develop tools

and resources to help farmers create more productive and efficient workplaces and retain their people, development of the Great Futures in Dairying Plan, undertake research into farm systems changes such as flexible milking, extended lactation and batch robotic milking, and research workplace productivity drivers and reduction of sprains and strains injuries.

Three key components of this initiative bundle were assessed in this CBA as representative examples. That is because the overall scope of work in the initiative bundle is complex and for many of the activities, benefits are difficult to directly quantify.

The first aspect quantified was the work undertaken by DairyNZ during the COVID-19 pandemic when the New Zealand dairy sector was severely short staffed. DairyNZ, in conjunction with Federated Farmers, advocated consistently to government on our immigration needs using robust workforce data and insights. This work resulted in a definitive and unique outcome for dairy – being on the scarce list for Residency Visa 2021 enabling the granting of a class border exception, for which DairyNZ was the implementation partner.

The second stream of work investigated the research and development of a tool to support more efficient milking practices.

The aim was to provide farmers with the confidence to shorten milking times to improve efficiency with no impact on profitability and improve staff working conditions. This tool was the MaxT App, which aims to reduces milking time by ending milking for every cow at a predetermined time based on the herd's average milk volume rather than waiting for each cow to be milked out individually.

The third stream was the research and analysis and the subsequent extension of flexible milking systems. Traditionally NZ dairy farmers have milked twice a day (TAD). Over the past decade there has been a shift to trialling and converting to different milking systems, away from TAD and once a day (OAD) to 3-in-2 (three milkings every 2 days) and 10-in-7 (ten milkings every seven days). This shift has been driven mainly to provide more flexible and acceptable working hours, especially following calving in the spring. Some farmers are now using a combination of these different systems, for example TAD in early lactation with a switch to 3-in-2 or OAD for the remainder of the milking season.

Initiative	**Start**	**End**
Go Dairy	Jun 2022	May 2024
Milking Systems	Jun 2019	Jun 2022
Flexible Milking	Jun 2019	Jun 2023
Thematic area	**1.C Increased Workplace Productivity**	
Funding* ($'million)	**Total $18.8**	
Dairy Farmer Levy	Various	
$13.7	$2.7	
	CBA results	
Expected NPV ($'million)	**Return($/ha/year)**	**Net Benefit-Cost Ratio (x)**
$44.8	**$2**	**1.7**

*Actual for years 2018/19-2024/25 and estimate for 2025/26

6.4 Summary of findings

3.C Reducing GHG emissions (Including PGGRC investment from 2003)

Helping inform the decision to remove pastoral GHG emissions from the NZ ETS provided value to the dairy industry. It has provided time for more work to be completed on the research front and

allowed the industry to be involved in future decision making around emission targets and policies. The value of this is hard to quantify, but likely to be substantial.

The inclusion of the PGGRC investment has lowered the return compared with the core analysis (NPV of $197.3 vs $36.3), as there is a long period of research (from 2003) and no imminent and measurable commercial benefits at this point. Given the magnitude of the GHG reduction challenge and the potential benefit/cost to the industry, investing in long term research in this area is definitely warranted.

Work continues with both the inhibitors and vaccine, now led by AgriZero, with commercial partners showing a strong potential for success. In the meantime, the investment has shown the industry's commitment to solving this challenge and supported agriculture remaining outside the ETS.

1.C Retention and productivity in workplace (including Flexible Milking from 2019)

The dairy industry is one of many industries, not only primary industry based, in NZ that faces issues of attraction and retention of staff. The opportunity to gain an exemption during border lockdowns, and the conversion to permanent residency provided immediate value to the industry.

The inclusion of the flexible milking programme in this analysis provided a slight decrease in return compared to the core analysis (NPV of $46.9 vs $44.8)

The value of this workstream is likely to be underestimated, as workforce recruitment and retention is a very important issue for dairy farmers, with anecdotal feedback suggesting the overall business benefits of a stable, motivated and skilled workforce on farm is a key success factor for farm operators, but these benefits are difficult to directly quantify. It is noted that the three initiatives chosen for analysis were minor parts of the overall programme, however they provide illustrative examples of the cost/benefit of investing in this area.

7 Conclusion and Recommendations

7.1 Return on investment

- **High overall viability** – all levy investments deliver positive net benefits, with only Better Ryegrass carrying a small (9%) and Wintering (<1%) chance of negative NPV.
- **Biggest contributors** – the largest levy investments tend to have the largest return. Strong Biosecurity ($709m NPV, $44/ha/yr) and Supporting Farm Profitability ($466m NPV, $29/ha/yr) account for account for 32% and 27% of sample investments, respectively.
- **Strong performers across environment and productivity** – On Farm Change ($292m NPV, $18/ha/yr), LowN Leaching Systems ($358m, $19/ha/yr), and Better Freshwater Policy ($248m, $16/ha/yr) all show high economic value.
- **Leveraged multipliers from co-funding** – leveraging levy funding with co-funding (e.g. government and industry co-funders) multiplies the return to levy dollars with net benefit to total cost ratio expanding from 5.9x to 8.2x.
- **Variation in certainty** – most initiatives have a wide range of possible outcomes (e.g. Better Ryegrass, Better BW, LowN), but nearly all maintain a 100% likelihood of positive NPV.
- **Potential overlapping benefits** – the approach across individual CBAs distinguishes the value of the innovation or practice on its own against the value of extension infrastructure.

- **Benefit of enhancing profits vs protecting the downside** – the mix between value add and avoided costs is slightly weighted towards avoided costs at 55%. This means over half of levy returns protect farm surplus from downside while improving environmental and social outcomes and protecting licence to farm.
- **Estimating total investment value** – the levy investment portfolio value is estimated at achieving $2.98 billion in total net benefits, equivalent to $187 per hectare per year.

7.2 Insights for stakeholders and decision-makers

- **Farmer confidence and adoption are critical** – whether genomics (Better BW) or FVI (Better Ryegrass), uptake depends on clear communication, farmer awareness, and alignment with on-farm realities.
- **People remain a pressure point** – recruitment and retention challenges are costly and persistent. Simple efficiency tools (e.g. MaxT) are valued, but broader workforce solutions are harder to design and deliver.
- **Profitability depends on productivity improvement** – stakeholders see productivity gains as the only sustainable long-term driver of profitability, making initiatives like Supporting Farm Profitability and On-Farm Change "no-brainers." Farmers will however 'buy' production short term when the opportunity arises.
- **Strong governance and systems add resilience** – DairyNZ's leadership in biosecurity demonstrates how robust oversight (e.g. TB and M. bovis programmes, OSPRI reforms) delivers value that farmers could not achieve individually.
- **Environmental change needs practical, science-based solutions** – Plantain (Low N leaching systems), wintering GMPs, and freshwater policy work show that farmers support mitigations when they are developed with farmer input, practical, evidence-backed, and maintain business viability.
- **Market and regulatory expectations are shaping priorities** – farmers and stakeholders understand that global market access and future regulation (e.g. GHG reductions, ETS exclusion being temporary) mean mitigation is not optional, even if profitability pressures remain front of mind.

7.3 Recommendations for future investment and review processes

Recommendations for future ROI reviews include:

- A results and outcomes dashboard for each strategic priority primarily for initiative management and reporting to the Board, and secondarily as a good quantitative database for ROI reviews.
- Utilise co-design processes wherever practical including farmers, consultants, scientists and potentially regulators to get fit for purpose outcomes.
- Develop farmer case studies to support the explanation of the CBAs.
- Utilise wider industry datasets to support on farm decision making, ex-ante and ex-post initiative analyses.

Appendix 1: Stakeholders consulted

Name	Role	Programme
DairyNZ		
Andrew Fear	NZAEL Manager	Better BW
Bruce Thorrold	Executive	All strategic priorities except Strong Biosecurity
Sarah Gard	Senior Project Manager	Better Ryegrass
Jane Muir	Senior People Specialist	R&P Workforce
Julia Murphy	GM People & Capability	
Callum Eastwood	Senior Scientist	
Virginia Serra	Head of the Solutions and Development Team	Supporting farm Profitability
Paul Bird	Senior Business Specialist	
Mario Fernandez	Principal Economist	
Alyce Butler	GM Strategy & Commercial Partnerships	On Farm Change Supporting Farm Profitability
Carol Barnao	Biosecurity Principal Advisor	Strong Biosecurity
Rachael Evans	Senior Biosecurity Advisor	
Fi Roberts	Head of Biosecurity	
Nick Robinson	Executive	
Adam Duker	Senior Environment Specialist	On Farm Change
Daniel Teasdale	Manager, Strategy and Commercial Partnerships (Insights)	Supporting farm Profitability On Farm Change
David Burger	Executive	Reducing GHG

Name	Role	Programme
		Better Freshwater Policy On Farm Change
Roger Lincoln	Head of Policy	Reducing GHG Better Freshwater Policy
David Cooper	Principle Policy Advisor	Better Freshwater Policy
Anna Sing	Senior Regional Policy Advisor	
Liese Galvin	Senior Policy Advisor	
Ryan Mills	Senior Economist	On Farm Change Better Freshwater Policy
Kate Fransen	Senior Project Manager	LowN leaching
Paul Edwards	Senior Scientist	LowN Leaching/R&P Workforce
Claire Phyn	Principal Scientist	LowN Leaching
Dawn Dalley	Senior Scientist	Wintering
Justin Kitto	Environment Manager	
Penny Timmer-Arends	Senior Animal Care Specialist	
Laura Kearney	Principal Policy Advisor	Reducing GHG
External		
Peter Amer	Managing director, AbacusBio	Better BW

Appendix 2: Management and Board workshops

Name	Role
Management	
Campbell Parker	CEO
Robyn Marsh	CFO
Nick Robinson	GM Corporate Affairs
Bruce Thorrold	Chief Science Advisor
Board	
Tracy Brown	Chair
Jacqueline Rowarth	Director
David Hunt	
Chris Lewis	
Richard McIntyre	

Appendix 3: Farmer panel workshop

Name	Farmer type
Colin Glass (Canterbury)	Corporate multiple farms
Kerry Chestnut (Northland)	
Paul Clements (West Coast)	Owner operator
Aiden Bichan (Wairarapa)	Farming Partnership
Jo Bishell (Taranaki)	

Appendix 4: Individual CBA full reports

1.A Better BW

Objectives and Status

Problem/opportunity addressed

New Zealand's rate of genetic gain lags international peers post the introduction of genomics (missed opportunity estimated by NZAEL at $136 million annually) leading to the IWG concluding that the animal evaluation (AE) system is not fit for purpose[13].

Expected impact

Intended outcome is an acceleration in rate of genetic gain to match overseas competitors. This requires gains in multiple aspects:

- Improved generation interval (less than 3 years);
- Farmer uptake of genomic sires;
- Genomic BW reliability to increase (target minimum 65%);
- Wider bull screening through NZAEL (target 500 bulls);
- Enrolment of these elite non LIC/CRV bulls increases by 20%; and
- Extension of messaging to farmers on importance of genetic gain.

Strategic alignment

Better BW supports a strategic priority on accelerating on farm productivity, in particular sector rates of animal genetic gain match world-leading competitors.

Initiative status

The initiative. through NZAEL, provides industry good routine BW outputs to the sector and is progressing IWG recommendations with NZAEL 4.0 target launch date of late 2026.

Achievement and outcomes to-date

DairyNZ carried out a range of activities aimed at re-unifying genomic AE and the provision of OneBW to the sector. This included negotiation and a public consultation process, investing in genotyping and phenotyping to build an independent genomic reference population and building improved genomic AE statistical models (NZAEL 3.0 and 3.5).

These activities led to an IWG Report that provided analysis and recommendations for solving the problem of lagging genetic gain. A Governance Group including LIC and CRV was established to implement the IWG recommendations to improve the AE system.

At the same time, NZAEL provided a national AE service to the NZ Dairy sector with launch of NZAEL 3.0 in 2021. This includes management of the Dairy Industry Good Animal Database (DIGAD), as well as enrolment and performance evaluation of artificial insemination sires.

Research into improving BW focused on the fertility trait with changes to BW already made and further improvements in the pipeline.

[13] Traced to historical industry structure, legislation and commercial tensions with CRV and LIC (market share risk) reinforcing LIC control, limiting industry good freedom and competition.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

NZAEL BAU (business as usual core operations) – genetic gain that would be lost with NZAEL not providing routine BW outputs to the sector. The animal evaluation system is non-independent or fragmented (e.g. provided commercially by LIC and CRV separately) potentially leading to suboptimal breeding decisions, reduced sector-wide progress and limited uptake of overseas genetics. In the experience of Australia from 1980 to 2000, the loss of farmer uptake of industry good services resulted in the slowdown of genetic gain.

NZAEL 4.0 – level of genetic gain lost in the current situation when genomic animal evaluation is provided commercially by animal breeders such as LIC and CRV, with fragmentation and low reliability This is the trend over the past decade with the national herd increasing its average BW by $17.40 annually[14], but not accelerating as has happened overseas.

There are multiple routes that will contribute to acceleration of gain. These include greater farmer confidence in genomics and higher bull reliability. Importantly, an independent NZAEL service will also provide genomic estimates of BW to all participants. Currently, about 8% of the market do not have access to genomic prediction on the NZ BW scale, significantly reducing their ability to contribute to the dairy industry's rate of genetic gain. This includes the use of imported overseas bulls as farmer acceptance of international sires has increased significantly in recent years, with over 25% of herds including international sires as part of their breeding scheme (see Figure 9). Genomics would allow international sires to be ranked against all other sires to identify which will suit NZ conditions.

Figure 9: Herds with at least one insemination of international origin

Source: Dairy Industry Good Animal Database (DIGAD)

CBA Assumptions

- % of benefit attributable to milksolids levy:
  - NZAEL BAU – 6% of current gain
  - NZAEL 4.0 – 27% of future acceleration
- Rate of genetic gain for NZAEL 4.0 – 57% increase in rate of gain

Benefits

Identifying the benefits:

[14] https://www.dairynz.co.nz/animal/breeding-decisions/genetic-trends-in-the-national-herd/

- **NZAEL BAU**; The benefits relate to protection of current genetic gain (avoided slowdown). This is the portion of average BW gain that would be lost without farmer trust and confidence in the AE service exclusively provided by independent and industry good NZAEL.
- **NZAEL 4.0**; The benefits involve the share of the incremental genetic gain arising from higher adoption of genomics that is attributable to NZAEL 4.0 and OneBW, expected to be launched at end 2026. Though still to be built and proven, this NZAEL launch of an industry wide genomic AE will provide an important part of the industry wide solution to enable world leading rates of genetic gain. In addition, NZAEL has a key role to provide information that will give farmers the confidence required to increase using young genomic sires as standard. This information will also support improved reliability of AE predictions for all participants, supporting further improvements in the rate of genetic gain.

Quantifying the benefits:

- **NZAEL BAU**; The proportion of the 10-year annual average genetic gain of $17.40 that is protected and attributable to NZAEL BAU relates to slowdown in genetic gain due to loss of NZAEL BAU and what would have happened anyway based on industry providers. Because attribution is subjective, viewpoints have been averaged. As this value attribution relates to long term core activities of NZAEL, geneflow weighting was adopted for the last six years where weighting is higher - years 15 to 20 (see next discussion for NZAEL 4.0). Lastly, the benefit timeframe is limited to the current levy period, recognising that benefit quantification correlates to the cost of ongoing NZAEL operations and would cease after 2026 as no NZAEL operational costs were forecast beyond 2026.
- **NZAEL 4.0**; The benefits comprise of incremental genetic gain from higher genomics adoption, the proportion attributed to NZAEL 4.0 and weighting by geneflow vector over 20 years. The geneflow vector[15] recognises the genetic improvement benefits (measured in extra BW units) of superior bulls occur in milking cows in a phased manner:
    - Only one half of a bull's superiority is passed to daughters.
    - It is not until year 3 that daughters of the superior bulls start milking.
    - There is a period before superior daughters replace all the cows in the herd as all of the animals in the herd age and die or are culled.
    - Some of the benefits accumulate through the mothers of new calves having also been sired by the superior bulls (hence numbers exceeding 100%) by year 15.

  The incremental genetic gain is benchmarked[16] from rate of gain achieved by genomics in Australia, UK and USA (115% higher annual rate for period 2011-2015 vs baseline 2006-2010[17]) and adjusted for substantial challenges including breed admixture in the NZ national herd (50% reduction). As attribution is subjective, differing viewpoints have been averaged.

Costs

Investment costs:

- NZAEL operations - $27.3 million
- NZAEL BAU CAPEX - $4.6 million

[15] P. Amer, AbacusBio (personal communication, August 12, 2025)

[16] https://www.dairynz.co.nz/media/tmelbofp/dairy_genetic_trends_benchmarking_report_2022_public-003.pdf

[17] The period 2016-2020 was not used as recent period tend to be overestimated. Sires of cows born in the 2011-2015 period will have been fully progeny tested in the genetic evaluation runs used for this study which means less likely to be influenced by genomic inflation (see footnote 3).

- NZAEL 4.0 CAPEX - $1.7 million
- Fertility - $0.8 million
- Resilient dairy - $4.2 million
- OneBW/Better BW/NBO - $1.6 million

Co-funding of costs:

- Commercial fees from AB companies - $1.4 million
- Crown -LIC Resilient Dairy - $2.8 million
- Crown – Fertility - $1.2 million

Operating costs:

- NZAEL 4.0 - additional $0.08 million from 2027

Risk and Sensitivity Analysis

Sensitivity Analysis

The sensitive variables that have significant impact on benefits are:

- % attribution to milksolids levy for NZAEL BAU and NZAEL 4.0
- Rate of incremental genetic gain for NZAEL 4.0

Quantified Risk Analysis (QRA):

Key risk variables ranges were from perspectives of DairyNZ and external industry expert AbacusBio (Table 11):

- **Attributable % to NZAEL BAU** – this is highly subjective. In the Australian situation, lack of farmer confidence in the industry good index and market fragmentation caused substantial slow down. In New Zealand, this situation is highly unlikely given the strong market share that LIC holds and its co-operative principles. In the most likely scenario, 6% loss occurs as non-LIC providers seek market share by promoting alternative indices. A low of 2% reflects a scenario where farmer confidence in LIC's index forces competitors to align. The high of 15% reflects a scenario where alternative indices gain traction and significantly fragment the market.
- **Attributable % to NZAEL 4.0** – the low of 20% reflects a scenario where 80% of potential genomic gains would have occurred anyway using LIC and CRV commercial AE systems. The high of 50% attributes more acceleration to NZAEL 4.0 as driving the necessary farmer confidence in genomics along with higher genomic reliability to get wider adoption and impact.
- **Incremental genetic gain due to NZAEL 4.0** – more effective genetic improvement based on genomics might increase genetic trends by 25% as the low estimate as half of expected 50% gain while the high of 100% approaches the 115% average among Australia, UK and USA.

Table 11: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Attributable % to NZAEL BAU	2%	6%	15%
Attributable % to NZAEL 4.0	20%	27%	50%
Incremental genetic gain due to NZAEL 4.0	25%	57%	100%

Stakeholder Insights and Broader Impacts

Interview Summary

The genomics solution still has challenges that need to be overcome. The prize of genomics stems from the use of younger superior bulls and an improvement in the reliability of the genomic predictions. This outcome depends on the combination of NZAEL 4.0/OneBW, validation results to increase farmer confidence in the use of genomics and improvements in the quality of the reference population (as the NZ multibreed composition requires a significantly larger reference population to achieve high reliabilities for genomically estimated breeding values).

With global consolidation of breeding companies and the cross-bred nature of the national herd, New Zealand cannot rely on an international reference populations and must invest in its own dataset. Noting that genotyping for reference populations is not an NZAEL role.

Adoption and Uptake

Better BW benefits are conservative estimates, with upside if NZAEL 4.0/OneBW is highly successful in accelerating uptake of genomics. This will be addressed by the Farmer Awareness and Communications initiative that aims to improve farmer understanding of the importance/value of genetic gain and how this this value can be unlocked.

Co-Benefits or Externalities

Beyond the core focus of milk production and efficient feed conversion, this investment provides capability to expand BW for traits such as improved GHG footprint, extended lactation, and future calf opportunities as well as Fertility Breeding Value. Fertility is a major issue of concern in high producing herds, both in New Zealand and internationally with current work improving the fertility BV. This also leads to acceleration of gain in BW without relying on genomics.

Unquantified Benefits

The value of NZAEL that is nonquantifiable is its role as an industry watchdog providing services that effectively audit the performance of animal breeding companies. Note that this is estimated in the counterfactual calculations.

CBA Results

Table 12: CBA results

Expected Net Present Value (8%)	
NPV	$51.1m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$3.6m to $109.6m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to total cost ratio	1.2x
Net Benefit to levy only cost ratio	1.4x

Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$3
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$96.3m
NPV (12%)	$27.3m

The sheet on the last page illustrates the cost and benefit cashflows across 18 years. The NPV shown is not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 11.

Conclusions and Key Messages

Value Assessment

Success of NZAEL 4.0/OneBW is essential for the dairy industry as it unlocks a significant opportunity gain that has been missed for the past decade. Despite challenges in benefit attribution to Better BW, the CBA shows a solid return with 100% probability that NPV is positive and a net benefit to total cost ratio of 1.2x (considering anything above zero is positive).

With respect to value add/cost avoidance:

- 62% from NZAEL 4.0 is value add since this is accelerating uptake of genomics - unlocks a significant opportunity gain that has been missed for the past decade
- 38% from BAU core operations is avoided costs since protecting BW gain from backsliding - genetic gain that would be lost with NZAEL not providing routine BW outputs to the sector.

Recommendations

Given the inherent conflicts of interest in genetics—particularly in genomics—NZAEL's role as an independent watchdog must be actively reinforced and transparently demonstrated to earn farmers' trust, foster confidence, and accelerate genetic progress.

Lessons Learned

Because the calculation **methods** for BW are complex, access to an external technical expert enhances the robustness and credibility of the benefit estimation.

1.B Better Ryegrass

Objectives and Status

Problem/opportunity addressed

The New Zealand dairy production system is underpinned by the use of perennial ryegrass as the primary feed input. This programme supports two themes; i) the combined commercial ryegrass breeding industry and science sector producing improved ryegrass varieties; and ii) the development of the FVI to allow farmers to independently compare the value of different ryegrass varieties. The majority of DairyNZ's investment is in the FVI (65%).

This work would not have been possible without substantial investment and co-funding from key industry partners and government. In particular, commercial seed companies have invested millions of dollars into their breeding and development programmes, playing a critical role in enabling these initiatives.

Expected impact

The primary impacts are improved ryegrass performance (DM yield, energy, persistence etc) and the use of the highest performing variety applicable to the farm system.

The potential impact can be seen by the relative FVI values of Base $319, BAU $548 and the AgResearch assessment of APB of $756 (increase in operating profit per hectare, per year). Utilising higher performing ryegrass varieties can lift farm performance significantly.

Strategic alignment

The Better Ryegrass investment falls within the Accelerating on Farm Productivity strategic priority, and more specifically, targets gains in forage performance through genetics, forage combinations, and management enabling resilience to climate and improving international competitiveness.

Initiative status

- FVI:
    - Following the unexpected results from the FVI validation trial, a comprehensive review of the trial was conducted from mid-2022, ultimately resulting in the index being decommissioned in March 2024.
    - A new research programme that aims to relaunch an FVI will begin in spring 2025.
- Pasture Accelerator:
    - The Pasture Accelerator programme commenced in July 2023. Sound operational and technical progress has been made to date.
    - Next steps (from mid-2025) will focus on scaling adoption, refining prediction models, and incorporating farmer input into trait priorities.
- HME ryegrass:
    - Progress continues on HME ryegrass with expected benefits from increased energy, reduced methane emissions and reduced nitrous oxide emissions.
    - The programme is currently seeking investment to fund the next stage of the work toward commercial handover to its seed company partners.
- Hybrid Ryegrass:
    - The initiative did not yield results that justified further continuation, and as such, it has been concluded.

Achievements and outcomes to date

- FVI; Over the analysis period:
    - The earlier FVI validation trial was concluded.
    - A comprehensive forensic review was undertaken to understand the unexpected results from the validation trial. This ultimately resulted in DairyNZ decommissioning the index until confident in the economic differences predicted. The index was removed from the DairyNZ website in March 2024.
    - The Forage Value Index Lead Group in conjunction with the Plant Breeding and Research Association (PBRA) was formed. This group provides a collaborative, strategic oversight on the science needed to relaunch the FVI.
    - Through the FVI Lead Group, DairyNZ has been working closely with the PBRA to co-develop a new research programme to understand the validation trial's results and

ultimately relaunch an FVI. The first phase of this new research will get underway in 2025/26.

- Pasture Accelerator:
  - The initiative started in July 2023 with a focus on genomic selection in ryegrass and white clover.
  - Strong progress was made in moving from setup to full trial delivery and data analysis.
  - Practical outputs emerging are consistent Nitrogen Use Efficiency (NUE) trial results, delivery of clover Genomic Estimated Breeding Value (GEBVs), improved genomic selection systems and working phenomics (measurement) tools.
  - Next phase (from mid-2025) will focus on scaling adoption, refining prediction models, and incorporating farmer input into trait priorities (e.g., heat tolerance).
- HME ryegrass:
  - Progress continues on HME ryegrass with expected benefits from increased energy (from increased lipid content), reduced methane emissions (7% on a per kg DM intake) and reduced nitrous oxide emissions.
  - The programme is currently seeking investment to fund the next stage of the work toward commercial handover to its seed company partners. Further research and trials of the HME ryegrass may take place in New Zealand or Australia depending on funding arrangements.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

Value created by the Base scenario using the relevant base FVI value ($319/ha/yr).

CBA Assumptions

- Total base for analysis is annual proprietary perennial ryegrass seed sales (actual sales 2021-24 and the average of this period thereafter).
- Assumed 50% utilised by dairy (industry estimate).
- Average sowing rate of 22kg/ha (industry estimate).
- 33% influenced by Dairy NZ (3,748 FVI users per year/11,372 farmers).
- Total area sown is dairy seed volume/average sowing rate.
- FVI values are used to value the Base and BAU with APB an AgResearch estimate.

Benefits

- Benefit is calculated from subtracting the value of the Base from the value created from BAU and APB varieties, with Base and BAU at FVI value and APB an AgResearch estimate.
- Given APB varieties are likely to be genetically modified (GM), it is assumed that by the likely commercial release date of 2035, the use of GM varieties is permitted.
- Considering the outcome of the previous FVI validation trial, the sensitivity analysis includes a low estimate where BAU is assumed as zero. This will reflect a scenario where the FVI has limited value but reflecting lack of progress in ryegrass breeding for farmer profit.

Costs

- Total investment of $9.3m from DairyNZ.
- The seed cost difference between Base and BAU/APB has been subtracted from the BAU and APB FVI values. The balance of the sowing cost (cultivation, drilling etc) is assumed to be the same.

Risk and Sensitivity Analysis

Sensitivity Analysis

The Risk sensitivity analysis shows that the returns are most sensitive to the variance in the BAU FVI with a range of $20.44/ha. The DairyNZ influence is $5.89, Base $2.58 and APB $0.88. Given the risk ranges, this is logical.

It should be noted that if the FVI BAU is of no more value than the base, with a mean return of $9.71/ha, the return would be negative (-$2.04).

Quantified Risk Analysis (QRA)

Key risk variables are the % of pasture renewal attributable to FVI and the FVI values for the Base and BAU and an AgResearch estimate for APB (Table 1).

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
% Dairy use DairyNZ influenced	23%	33%	43%
FVI benefit - Base	$0	$319	$398
FVI benefit – BAU*	$0	$548	$628
FVI benefit - APB	$0	$756	$925

*Note: In this context, the likelihood of the 'Low' scenario occurring is comparable to that of the 'Most Likely' scenario. Therefore, the full range of potential outcomes should be considered with equal weighting.

Stakeholder Insights and Broader Impacts

Interview Summary

Grazeable forages are the base of New Zealand's international cost competitiveness and natural value proposition, allowing the country to remain a relatively low-emission food producer. NZ's climate and soils make pasture-based farming highly efficient, reducing reliance on imported feed and lowering production costs.

Plant breeding must deliver measurable gains in forage performance that enable farm systems to perform to their maximum potential. Currently, forage plant breeding is conducted by commercial companies who are predominantly internationally owned. Clear progress in forage plant breeding and endophyte development has been seen with changes in heading date, pest and disease resistance and ploidy, but the recent FVI validation trial showed an inability to capture gains in DM yield at the farm-system level.

The next phase of FVI research has been developed to understand the unexpected results from the validation trial. As noted earlier, if this research shows that the value of BAU ($548) is in fact no more than the base ($319), with a mean return of $9.71/ha, the return would be negative (-$2.04).

Alongside this research is the continued development of genetically modified (GM) forages, which have the potential to unlock significant value in forage performance. The gene technology legislative reform is expected to support the commercial release of GM forages in the near to mid-future.

Farmer feedback is supportive of work in forages including ryegrass. These underpin our farm systems. The FVI is sound in principle but managing plot trials in a way that aligns with actual on farm practice will always be a challenge. Local knowledge combined with an improved FVI would provide value. The most common issues with pastures reported by farmers are decreasing persistence and varied outcomes based on grazing management. Given the FVI has received mixed feedback in some contexts, a successful roll out of an improved FVI would need careful consideration and stakeholder engagement.

Adoption and Uptake

The dairy industry renews pasture as standard practice either as part of a crop rotation or in response to paddock productive performance. The primary question here is what value the FVI has played in choice of ryegrass variety for renewal. Given the proportion of farmers who have used the FVI database (33%), this indicated the level of potential influence. That is included as a key risk variable.

Conversely, the primary barrier to adoption is the concern that the FVI system does not reflect the on farm outcomes noted. This will not affect decisions to re-grass, more the variety of ryegrass used to re-grass. A new FVI research programme has been developed to address this.

Co-Benefits or Externalities

Reliable, resilient, and adaptable homegrown feed supply is fundamental to sustaining milk production and optimising animal performance. New pasture varieties, depending on trait selection, may confer benefits including drought tolerance, low soil fertility tolerance, pest resistance, low emissions etc. These all build towards supporting the resilience of the dairy industry. Benefits are not solely in DM yield.

Unquantified Benefits

This analysis does not account for any traits outside those valued in the FVI, which historically related to volume of dry matter and energy content. As noted above, traits including drought tolerance, low soil fertility tolerance, pest resistance, low GHG emissions and/or reduced nitrate leaching would all contribute value. Most of these traits are still in the selection stage in pasture breeding programmes.

CBA Results

Table 2: CBA results

Expected Net Present Value (8%)	
NPV	$155.1m
Probability of NPV > 0	91.3%
90% probability that the NPV will be in the range of	-$28.4 to $319m
Expected Net Benefit to Cost Ratio ((B-C)/C)	
Net Benefit to Total R&D cost ratio	16.3x
Net Benefit to levy only R&D cost ratio	16.3x

Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$9.71
Number of farms	10,485
Amount per farm	$1547.12
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$198.5m
NPV (12%)	$125.2m

Conclusions and Key Messages

Value Assessment

Overall value is potentially high with an expected return of $9.71/ha. This does however assume that the BAU and APB varieties perform better than Base. If this is not the case, and BAU only performs as well as the Base, there is the potential for a negative return (-$2.04/ha).

Farmers have raised concerns that the performance of ryegrass varieties as predicted by the FVI did not reflect their on-farm experience. A new FVI research programme has been developed in conjunction with the PBRA to explore these issues, because gains in forage plant breeding are essential in underpinning the performance of NZ's pastoral sector

There is huge potential in improved ryegrass to the dairy industry. Traits that confer benefits for cow performance are front of mind, though other factors such as low nutrient, heat and pest tolerance underpin ongoing productivity and resilience. There is also upside in an operational FVI as this will assist farmers to select the most appropriate ryegrass variety.

100% of the value is considered value add as driving improved ryegrass returns supports improved production.

Recommendations

An ongoing update of this investment analysis would be warranted. While this CBA has been structured as a review, inputting future investment and revised assumptions would provide a forecast return.

Lessons Learned

Not all science investments will produce a positive return. In this case however, the value of the upside is such that ongoing investment in refining the FVI and breeding is warranted.

Using the updated investment analysis recommended above would help ensure the investment remains in line with potential returns.

1.C Retention and productivity in workplace

Objectives and Status

Problem/opportunity addressed

The New Zealand dairy industry is heavily reliant on people to operate and has faced significant workforce challenges including attracting and retaining enough skilled employees. These issues stem from a combination of factors like long hours, physically demanding work, and remote locations. A high percentage of farm workers leave their jobs within the first twelve months.

An aging farming population combined with a decline in young people entering the industry have exacerbated the problem. For dairy farmers this creates added costs in the way of recruitment, staff training and potentially hampers owners from working on their business by being drawn away from other tasks which could lead to better productivity.

In 2022 the Great Futures in Dairying 10-year Plan was co-developed to deliver initiatives to improve workforce retention and to continue to build a sustainable and thriving dairy sector. It was developed with input from a wide range of farmers and sector stakeholders.

Expected impact

A total of twenty-three initiatives were planned within Great Futures in Dairying, with the following intended outcomes from the initiative at three levels:

- **Shape up** so the industry is competitive and can retain and grow their people.
    - Support farmers to make workplaces competitive in the wider market;
    - Invest in careers for their people; and
    - Facilitate access to international employees to fill critical workforce gaps.
- **Change the job** to provide modern, productive, and safe workplaces.
    - Support farmers to evaluate and adopt time saving technology.
    - Support farmers to test alternative and more productive business processes and employment models.
- **Look in new places** to attract a larger and more diverse talent pool.
    - Support farmers to improve recruitment, onboarding, and employment practices so that they can make the most of the talent pool.
    - Develop targeted approaches to talent attraction where there is the highest likelihood of success, including opportunities to work with food and fibre partners.
    - Diversify and broaden the pools of talent that the industry draws on.

Strategic alignment

Retention and productivity in the workplace supports DairyNZ's strategy of accelerating on farm productivity, making dairy farming an attractive employment and career opportunity whilst improving employee satisfaction and safety.

Initiative status

- The GoDairy initiative work has been completed but work continues under the Great Futures in Dairying Plan with an emphasis on supporting the dairy industry in attracting and retaining staff.
- Work is continuing to develop systems and processes around milking frequency and flexible milking.
- Analysis of farmer and employee surveys provides evidence of retention trends, the source of applicants and the demography of those employees.
- DairyNZ is continuing to work with Government agencies in the immigration space.

Achievements and outcomes to date

- **Advocacy**; Exemption for dairy recruits to enter NZ under border restrictions due to the COVID19 pandemic and the initiative to gain permanent NZ residency for just over 4,000 dairy workers was seen as successful.
- **Working Conditions**; Development of tools to enable more efficient and safer workplaces. Tools such as MaxT result in less hours worked in the milking shed. Workplace360 is a self-assessment tool that allows dairy farmers to assess current practices, identify strengths and weaknesses and provide steps for improvement.
- **Staff retention**; DairyNZ statistical analysis of dairy farm employees indicates a trend towards higher rates of retention of staff. This would result in lower recruitment costs to replace staff who have left, lower training costs and less disruption to farm systems as an inexperienced staff member is onboarded alongside increased performance of staff due to increased experience.
- **GoDairy recruitment campaign**; A digitally led campaign launched in 2022 to drive recruitment into farm assistant roles. This campaign was targeted at 18-25 year olds, men and women and mixed nationalities. Results indicated an elevated level of engagement with potential employees.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

- Attracting and retaining staff in the dairy industry was an issue identified by the industry that needed addressing. Inability to attract and retain staff can lead to staff shortages and high turnover rates of staff, which result in extra recruitment and training costs and potential loss of productivity due to the disruption to the existing farm "team."
- Prior to 2019 there had been an annual conversion of people holding visitor/work visas of approximately 200 per year. The process for application for residency was challenging for people working on farm as they needed to meet skill thresholds (at least Farm Manager), wage thresholds (not often seen in dairy sector), tenure thresholds and English language requirements (which many could not pass). Without dairy advocacy the dairy sector is very unlikely to have been named on the scarce list of the 2021RV (Residency Visa) which effectively enabled all international employees on temporary worker work visas to qualify for residency.
- The dairy industry has had a historical reputation of low wages, long hours and early morning starts, which can deter people from engaging with the industry.
- Not addressing these issues would have resulted in little or no change and a potential loss of productivity and profit.

Timeframe: 15 years from initiative midpoint of levy period – through to 2039

CBA Assumptions

The CBA focuses on MaxT and the NZ Residency initiative. It does not include benefits of any other GoDairy or immigration initiatives.

- MaxT
    - Attribution: DairyNZ was the key driver in this initiative, hence the high attribution rate of 85%.
    - Adoption: The MaxT App has been downloaded 1130 times in the two years June 2023 to June 2025. This equates to 10% of the total herds in New Zealand. There has been some promotion of MaxT but a concerted effort through extension field days

and promotion from consultants could see the increasing use of this App. An adoption rate of 7% has been used.
    - Number of milking days: A range of days from 270 to 320 was used with a most likely period of 295.

- NZ Residency
    - Residency attribution: DairyNZ and Federated Farmers were the key drivers in dairy getting onto the scarce list hence the high attribution rate of 50%.
    - This initiative was successful in enabling just over 4,000 people to attain NZ residency.

Benefits

- MaxT
    - Labour savings: The key benefit is a reduction in the hours during milking, resulting in lower overall labour costs.
    - Working conditions; Shortening the milking time provides opportunities for staff to work lower hours or start or finish work earlier. These factors could bring greater enjoyment to an employee leading to higher retention rates.
- NZ Residency
    - Visa application cost: The key benefit to employers is the cost of recruitment and associated costs not being expended. The cost of recruitment and employer visa associated costs, and a working visa is approximately $10,000 per application. This cost is legally required to be borne by the farmer, or employer who is supporting the application. Flights and other costs can be on top of this.

Costs

- MaxT
    - There is no cost to downloading of the MaxT App, and no other costs were identified in this initiative, beyond the direct initiative funding.
- NZ Residency
    - Visa applications cost between $1,200 and $2,000; we have used a most likely figure of $1,600 per application.

Risk and Sensitivity Analysis

Sensitivity Analysis

- MaxT - The largest driver in the sensitivity analysis is the time saved in milking with a range between $24.4 mill and $74.08 mill.
- NZ Residency – Attribution rate contributed the greatest sensitivity range between $35.2 mill and $55.8 mill.

Quantified Risk Analysis (QRA)

- MaxT
    - Hourly rates: the range of hourly rates was between $25/hr and $30/hr.
    - Days milked per year; a range from 320 days to 270 days was used.
    - Adoption rate: the adoption rate benefit is calculated for future uptake of the MaxT App using a range of 5-7%. This equates to between 40 to 60 herds per annum.
    - Attribution rate: this initiative has been developed and promoted by DairyNZ. An attribution rate range was between 75-90% acknowledging that farm consultants and farmers may be promoting the App to their clients or fellow farmers.

- New Zealand Residency
    - Accredited Employer Work Visa application costs; Costs of visa applications through a licensed immigration agent/lawyer range between $9,000 and $18,000. We have used an average of $10,000 to allow for farmers (expected around 20%) who complete the process independently for a cost closer to $3,000.
    - Applications processed; Annually there is an average of 120 people who would normally apply for residency. These have been subtracted from the number of applicants for those two years 2022 and 2023.

Table 1 below summarises the risk variable ranges used.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Hourly rates farm workers	$25	$27	$30
Milking days per season	295	300	320
Adoption rate (%)	5%	7%	8%
Attribution rate (%)	75%	85%	90%

Stakeholder Insights and Broader Impacts

Interview Summary

The DairyNZ team noted the complexity of the work undertaken and the interrelationship between the individual initiatives.

Farmers noted that recruiting staff and retaining them is challenging and can be expensive. They see a benefit to levy payers from the MaxT and NZ residency initiatives.

The one-off border exception is seen as having a positive impact and the value is hard to quantify. One farmer employed staff through this process commented that he did not know what the consequences would have been if he had been unable to fill the roles on farm.

Adoption and Uptake

Adoption rates of MaxT for the two years 2023-2025 were high with 565 Apps being downloaded per year. This trend is expected to continue given the App does not cost anything, is simple to use and provides an immediate saving that can add to profitability.

Co-Benefits or Externalities

- Reducing milking times also reduces the standing time for cows while milking, reducing any stress the animal may be experiencing.
- Reducing milking times also increases the time for cows to be grazing this may lead to higher production per cow.
- Taking a structured approach to milking has the potential to carry over into other farm systems and processes. The opportunity to review and modify these could lead to an improved workplace as well as improved productivity.
- Not having the residency pathway would have increased labour shortages and workforce disruption. This would have placed increased pressure on farmers in both dollar terms and mental load.

Unquantified Benefits

- **MaxT**; There are other factors that could also be of benefit such as reduced electricity usage because of shorter milking times, and a reduction in repairs and maintenance as machinery is working for less time. None of these factors were included in the analysis.
- **NZ Residency**; Those who have been granted NZ residency will become permanent members of communities and contribute to the economy and vibrancy of these local communities. It is likely that not all will stay working in the dairy industry and some could transition to other vocations.
- **Immigration Advocacy**; During the COVID19 pandemic, and associated lockdowns, dairy farmers, like other primary based industries faced severe staff shortages. DairyNZ worked in partnership with Federated Farmers to advocate for dairy recruits to cross NZ's closed border. An exemption was given to allow 550 international employees to enter NZ and work on dairy farms at a critical time.
- **Staff retention**; DairyNZ has statistics that track employment figures for employees. An analysis of trends in staff retention proved hard to quantify given factors such as a reduction in cow numbers, changes in milking frequencies and a reduction in overall people employed on dairy farms in NZ.
- **Border class exception attribution**: DairyNZ was the implementation partner for the Dairy Class Border Exception. Without DairyNZ no visas would have been granted. As noted above, this initiative was successful in enabling over 550 international employees to enter New Zealand.

CBA Results

There is a 100% probability of the NPV being greater than zero.

Table 2: CBA results

Expected Net Present Value 8%	
NPV	$46.9m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$21.2m to $78.5m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to Total R&D cost ratio	1.6
Net Benefit to levy only R&D cost ratio	2.7
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$2

Expected Net Present Value (discount rate sensitivity analysis)	
NPV 4%	$64.3m
NPV 12%	$37.8m

The sheet on the final page illustrates the cost and benefit cashflows across 18 years. The NPV is a point estimate based on the numbers in the most likely column in Table 1 and not the average of 5,000 iterations.

Conclusions and Key Messages

Value Assessment

The dairy industry is one of many industries, not only primary industry based, in NZ that faces issues of attraction and retention of staff. The opportunity to gain an exemption during border lockdowns, and the conversion to permanent residency provided immediate value to the industry.

Tools to reduce milking time contribute to improved labour efficiency and make dairy farming a more attractive industry to work in.

The value of this workstream is likely to be underestimated, as workforce recruitment and retention is a very important issue for dairy farmers, with anecdotal feedback suggesting the overall business benefits of a stable, motivated and skilled workforce on farm is a key success factor for farm operators, but these benefits are difficult to directly quantify. It is noted that the two initiatives chosen for analysis were minor parts of the overall programme.

Recommendations

Continued analysis and monitoring of employment trends will add value to future employment initiatives by identifying areas for targeted employment drives, why staff are remaining in the industry and what defines a competitive working environment.

Lessons Learned

This initiative shows that focusing on workforce issues in the industry can pay dividends. It remains an important area of focus for future investment.

2.A Supporting Farm Profitability

Objectives and Status

Problem/opportunity addressed

The Step Change and Future Fit Farm Systems initiatives are key initiatives led by DairyNZ to help New Zealand dairy farmers adapt to increasing environmental and economic pressures while minimising profitability impacts and supporting resilience. Broadly they represent ~70% of the investment in this bundle.

Step Change was launched in 2020 to support farmers in reducing greenhouse gas (GHG) emissions and nitrogen (N) losses, improving financial performance, and building resilience. It emerged in response to growing regulatory and market expectations around sustainability. The programme provides tools, resources, and case studies to help farmers make practical, science-based changes to their systems. It focuses on the key areas: nutrient loss reduction, GHG mitigation, financial

performance, farm system design. Step Change evolved in 2024 into what is now called Future Fit Farm Systems.

Future Fit Farm Systems builds on this foundation by testing and demonstrating what lower-emissions, lower-input, and more resilient farm systems look like in practice. One notable example is the Taranaki Step-Change trial, which began in 2020. It compared a "Current" system (typical of many NZ farms) with a "Future" system designed to reduce N leaching and GHG emissions. The Future system featured a lower stocking rate, reduced nitrogen fertiliser use, and less supplementary feed. Over four years, it consistently achieved environmental improvements without significantly compromising profitability, although milk production per hectare was lower. These trials provide real-world data to inform national strategies and farmer decision-making.

Another key component of the Future Fit Farm Systems initiative is the use of data analysis through **DairyBase**. This national database includes financial, physical, and environmental key performance indicators from farms across New Zealand. By leveraging these data, DairyNZ develops graphs that visually represent where farmers in each region sit in terms of profitability and environmental performance. These graphs have been instrumental in demonstrating that it is indeed possible to maintain high farm profitability while simultaneously achieving lower nitrogen leaching and reduced greenhouse gas emissions. This analytical approach complements the practical farm trials and farmer case studies and reinforces the core message that sustainable, profitable dairy farming is achievable. As well as supporting wide messaging, DairyBase also provides a service to individual farmers to benchmark their financial performance against peer groups and find areas for improvement.

In addition to extension, DairyNZ partnered with MPI on the **Baseline initiative**. The initiative was for the supply of 900 individual farm datasets including financial, physical and environmental data. This has significantly improved the breadth and depth of data in DairyBase.

With COVID-19 and weather events this was reduced to 600. Despite the issues and setbacks encountered, the value of the data collected was significant, in that both MPI and DairyNZ received a large amount of in-depth physical, financial and environmental data, spread across NZ.

Expected impact

This initiative focuses on supporting overall farm performance, with the key areas of nutrient loss reduction, GHG mitigation and minimising cost of production while maintaining business resilience and meeting customer requirements. It is underpinned by the use of DairyBase which provides a range of metrics outlining overall farm performance.

Strategic alignment

The Supporting Farm Profitability bundle falls within the Accelerating on Farm Productivity Strategy envelope, and more specifically, aims to ensure New Zealand dairy production systems are world-leading in cost of production, customer desirability and business resilience profile, and match world-leading competitors in emissions intensity.

Initiative status:

All of the initiatives in this bundle have been completed as they relate to this analysis. Future Fit Farm Systems however will continue beyond the scope of this analysis. The outcomes from the majority of the initiatives and others analysed in the wider CBA fit into Future Fit Farm Systems moving forward as it underpins the DairyNZ extension programme.

Achievement and outcomes to date

The following bullet points summarise the key outcomes in the analysis period:

- **Core Focus**: Helped farmers optimise profitability while reducing their environmental footprint—especially nitrogen loss and greenhouse gas emissions.
- **Quadrant Graphs**: A key tool showing where farms sit on profit vs emissions and profit vs purchased nitrogen surplus. These visuals revealed that many farms were already achieving high profit with low environmental impact, motivating others to improve.
- **Farmer Engagement**: The quadrant graphs sparked strong interest—farmers were keen to see where they sat and how to shift into the "high profit, low footprint" quadrant.
- **Regional Benchmarking Events**: These events showcased local data, helping farmers compare performance and learn from peers. The graphs were also widely used at national events and in media.
- **Behaviour Change Strategy**: The initiative successfully used data-driven storytelling to prompt action—turning complex environmental metrics into relatable, farm-level insights.
- **Case study farms**: Provided examples of farmers achieving high profit and low environmental footprint, providing a pathway for other farmers to follow
- **Tools**: A range of tools were made available to support farmers in implementing changes on farm
- **Legacy:** Step Change laid the foundation for the Future Fit Farm Systems programme, which continues to test and demonstrate resilient, lower-input, lower-emission systems.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario: That in the absence of DairyNZ activity the productivity on farm would reduce by 1% leading to an annual reduction in farm profitability of $22,000 per farm.

CBA Assumptions

- A 1% change in an efficiency index relates to a $22,000 change in on farm profitability based on DairyBase regression analysis (800 farms).
- The adoption of DairyNZ farm profitability practices was consistent with the level of farmer support shown for DairyNZ adding value on farm in the quarterly Farmer Sentiment Survey (500 farmers).
- It should be recognised that there is broad assistance from the wider support community that assists with the efficiency drive. This is primarily driven by farm consultants, but also veterinarians, fertiliser representatives, irrigation companies and training providers as examples. This community use DairyNZ tools in their work, often help to build them, and add significant value.

Benefits

- The primary benefit noted is assumed as avoiding a 1% loss in an efficiency index leading to protecting $22,000 in profit per farm. Based on previous DairyBase analysis, 1% loss was considered to be at the conservative end of the range.
- To quantify the benefits, an adoption rate is required. The affirmative response to the quarterly farmer sentiment survey question, *"DairyNZ has delivered value to my farm business over the last year"* provides a range of values over the levy period on which to base adoption.
- Given not all outcomes from the initiative bundle will provide for benefits that protect profitability, a factor has been introduced to discount the protection value. After discussion

it has been estimated that 70% of the bundle will likely result in an outcome supporting financial protection. This factor has been included in the sensitivity analysis.

Costs

- The total investment is $72.2m, with DairyNZ contributing $68.9m and industry co-funders and MPI contributing $3.3m
- The efficiency index considers capital invested as part of the total factor productivity model on which it is based.
- The $22,000 is a net farm profit so includes costs associated with the efficiency change.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is the additional return gained per herd which provides a range of $34.34 in net benefit per ha. Second is the proportion of the programme supporting direct financial benefits at $15.46. The least sensitive is adoption rate with a range of $11.85.

Quantified Risk Analysis (QRA)

Three key variables have been included in the QRA analysis (Table 1):

- The $22,000 loss avoided for the 1% change in efficiency.
- The proportion of programme activity directly providing financial benefits.
- The adoption rate based on the Quarterly Farmer Perception Survey response.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Loss avoided per herd	$11,000	$22,000	$33,000
Proportion of programme supporting direct financial benefits	50%	70%	80%
Adoption rate based on farmer sentiment survey %	32%	36%	44%

Stakeholder Insights and Broader Impacts

Interview Summary

- Support for the farm profitability work was strong. Some interviewees noted it was a 'no-brainer' and 'super important'. Concern was expressed that productivity had plateaued, as in time of low payouts, and in the longer term in general, the only true gains come from productivity improvement.
- In times of high payout, production can be brought with increased farm inputs e.g. feed. This tends towards a higher cost of production which is not sustainable at lower payouts.
- While it was understood that the CBA was analysing productivity protection, which is valid, it is a concern that we are not showing productivity gain overall.
- It was noted that over time delivery had evolved from discussion groups to more topic focused events. The power of a discussion group should not be underestimated, but

understand the younger generation are more time poor and tend to learn through other mediums e.g. online.

- DairyNZ has a broad base of knowledge on which to base its extension work. The challenge is around what methods are used to support adoption. The challenge will likely grow with succession likely to ramp up and the younger generation (26-40 years) taking over the business.
- It was noted that people respond quickest in a near crisis. Environmental challenges in Canterbury got many farmers on board with change. A low payout has similar effects. In this situation DairyNZ needs to maintain a ready response approach as required. This can be challenging as it is seen as insurance rather than investment.

Adoption and Uptake

Utilising the quarterly Farmer Perception Survey as a proxy for uptake is likely to be a conservative approach. Given the breadth of offering from DairyNZ, farmers are likely to pick and choose from what is on offer to align with their needs at the time. The Survey is being extended to cover value analysis in more detail.

Some recent metrics from the Survey are relevant (% support).

- DairyNZ difference (Q1 2025)
  - Farm systems approach makes knowledge and support relatable - 46%
- Farmer change and solutions uptake:
  - Sufficient and viable solutions;
    - Manage water quality - 73%
    - Manage animal health - 80%
    - Improve productivity of farm staff - 49%
    - Increase profit a reduce emissions footprint - 50%
  - Changing approaches;
    - Intend to adopt/trial farm solutions in next 1-3 years to increase profit and reduce footprint - 56%

The 56% support is higher than the 36% adoption assumed, though there is often a significant difference between those that say they will act and those that do.

Co-Benefits or Externalities

Given the breadth of activity in this bundle, there are few if any external co-benefits. That said, taking a farm systems approach is the only way to really gain the inherent co-benefits. Dairy farms are sophisticated integrated systems with many trade-offs required to reach potential. Considering things in a systems context is preferable to individual topics.

Unquantified Benefits

Given the analysis was undertaken at a high level with industry data, there will be many benefits that have not been directly quantified. Given the high level analysis, these are likely to have been rolled up into the analysis, even if not directly attributable.

CBA Results

Table 2: CBA results

Expected Net Present Value (8%)	
NPV	$465.7m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$179m to $789m
Expected Net Benefit to Cost Ratio ((B-C)/C)	
Net Benefit to Total R&D cost ratio	6.8
Net Benefit to levy only R&D cost ratio	7.2
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$29.18
Number of farms	10,380
Amount per farm	$4,863
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$597m
NPV (12%)	$376m

Conclusions and Key Messages

Value Assessment

The overall return at $29.18/ha is one of the highest in the analysis. This is not surprising given the range of activities included and the higher level, though conservative, analysis.

As noted earlier, rather than a gain, the primary benefit noted is assumed as avoiding a 1% loss in an efficiency index leading to protecting $22,000 in profit per farm. Based on previous DairyBase analysis, 1% loss was considered to be at the conservative end of the range. This supports the assessment that 100% of Supporting farm profitability is avoided costs.

Recommendations

The on farm change bundle has supported the creation of both a process (iterative co-design) and an outcome (GMP) widely relevant to the industry. The Supporting Farm Profitability bundle has brought a wide range of on farm data analysis highlighting opportunities and providing paths to change. If not undertaken already, how these outcomes can be collectively applied to improve farm profitability would warrant further investigation.

Lessons Learned

Undertaking CBA requires a considerable amount of solid data, both financial and physical, to provide a credible assessment. The use of DairyBase and the modelling skills in DairyNZ Economics Group supported this initiative significantly. Looking forward, there are many datasets from financial, farm management and assurance schemes, which when combined, could provide solid data for analysis both to support the efficient operation of a farm and any ex-post analysis of the type undertaken in this initiative.

2.B On Farm Change

Objectives and Status

Problem/opportunity addressed

On Farm Change developed farmer groups (catchment/regionally representative) across a range of dairying locations to support farmers on their change journey to achieve the required environmental obligations, while minimising profitability lost and building the resilience of the farm business. These catchment initiatives include:

- Tararua (plantain)
- Selwyn-Hinds (Mid Canterbury)
- Waimea (Southland)
- Ōrari- Temuka- Ōpihi- Pareora (OTOP) water zone (South Canterbury)

The challenges varied by catchment, though as an example Selwyn had to reduce N loss by 30% by the 2022/23 season and Hinds progressively by 36% by 2035 with the first 15% reduction required by 2025. Over time the requirements changed with changing legislation, for example the Essential Freshwater Policy and the requirement for Freshwater Farm Plans were delayed with the change in government in 2023.

In the majority of cases a co-development approach was used, working alongside partner farms, rural professionals and scientists to provide farmers with confidence in the mitigation options and pathways for implementation. While a key focus was reducing N loss, often sediment, eDNA, GHG and other assessments were included.

Expected Impact

Broadly speaking the catchment initiatives aimed to:

- Support dairy farmers to continue operation by adopting the best mitigation for their farms and across the catchment to achieve increased farm business viability and community recognition of the effort's farmers are making to improve water quality.
- Provide confidence and knowledge to implement the best mitigation options and integrate the mitigation options into a sustainable farm system.
- Support communication of the actions and benefits to gain wider uptake.

The objective data from DairyBase supports monitoring and analysis which provides proof points for outcomes, data to support on farm change practices and benchmarking to support practice change in a whole farm context.

Strategic Alignment

The On Farm Change investment falls within a range of strategy envelopes and initiative areas:

- **Powering more adaptable and resilient farms**
  - New Zealand dairy production systems are world-leading in cost of production, customer desirability and business resilience profile, and match world-leading competitors in emissions intensity.
  - Access to high-quality data and insights is unlocking significant benefit to the sector and delivering credibility and trust with customers and stakeholders.
- **Enabling sustainable and competitive dairying**
  - Empowered farming communities are driving improvements in water quality and ecosystem health at scale across dairy catchments and the public and consumers view dairy farmers positively as responsible stewards of the land.

Initiative status

The catchment initiatives have all been completed as per the dates below:

- Tararua May 2024
- Selwyn-Hinds October 2023
- Waimea June 2025
- OTOP water zone June 2025

The learnings from the catchment groups have been incorporated into broader farm change initiatives in DairyNZ such as Future Fit Farm Systems and wider policy initiatives.

Achievement and outcomes to date

- While the catchment groups all had similar objectives, the work undertaken had to fit within the cultural, practical, financial and environmental (weather, soil type etc) boundaries of the catchments. To this end they were all led by farmers who provided initiative skills, contributed trial sites and suggested new ideas as the initiatives progressed.
- The initiatives were highly collaborative including people from farming, industry, science and policy.
- The initiatives benefited from being able to draw on existing science based information from prior research (e.g. Pastoral21 next generation dairy systems initiative, Forages for reduced nitrogen leaching initiative, Resource efficient dairying trial) that was practical and robust. The learnings were consolidated into GMP systems relevant for the catchment/area.
- GMP has been developed for all of the catchments to fit local conditions.
- The environmental and financial value of the GMP has been assessed and provides the basis of the CBA.
- The initiatives were all completed through a collaborative process with DairyNZ acknowledging the many industry partners, including milk supply companies, irrigation scheme providers, and farm system consultants, who contributed to the overall success of these initiatives.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

- In the absence of good management practice (GMP) to reduce nitrogen (N) loss, the most likely option is to destock and reduce inputs.
- The model status quo destocks from 2.88 cows/ha to 2.42 cows/ha with a leaching reduction from 53kg/ha to 45 kg/ha. This creates a farm profit on average of $2702/ha.

CBA Assumptions

- GMP N leach vs stocking rate (SR) N loss benefit $/ha has been modelled using DairyBase data for a range of GMP practices vs a simple stocking rate reduction to create equivalent N loss reduction.
- Percentage farmer support is sourced from DairyNZ Quarterly Farmer Perceptions Survey responses to the statement *"My DairyNZ levy has been invested to deliver value to NZ dairy farmers over the last year".* This is used for the adoption rate with OTP and Waimea and prior to regulatory implementation in 2025.
- Given impending and actual regulatory requirements, adoption in Taraua is assumed as 70% and Selwyn-Hinds as 100% from 2025.
- Weighted by catchment, this gives and average adoption rate of 78% over a combined 175,400 ha. As per the key risk variables, the range in adoption modelled covers a low of 37%, a high of 90% and a most likely value of 79% being the weighted average.

Benefits

- The benefits are derived by modelling the profit lost through reducing N loss through implementation of GMP and a smaller SR reduction (rather than simply SR reduction alone). This in effects avoids the majority of the cost of destocking.
- The GMP model destocks from 2.9 cows/ha to 2.8 cows/ha with the same leaching reduction from 53kg/ha to 45 kg/ha. This creates a profit on average of $3019/ha. On average this creates a benefit of $317/ha.
- Figure 1 below, utilising the DairyBase model output, provides the range over the period analysed. The difference between the Reduced Stocking Rate (red) and GMP Operating Profit (green) is the incremental benefit in profit/ha over the analysis period.
- GMP practices include changing N fertiliser use and timing, effluent systems, irrigation type, minimum tillage and stand-off structures. Plantain was not included as it is analysed in a separate initiative bundle.

Costs

- The total cost is $9.5m, with $5.1m from DairyNZ and $4.4m in co-funding. $1.2m of co-funding was from industry and $3.2m from government.
- In relation to the model, the financial and GMP data are included from DairyBase, therefore the operational costs are captured in the operating profit. Any one-off capital costs such as effluent systems, irrigation and stand-off pads do not flow through operating profit and are not identifiable in the DairyBase statistics as relating to the GMP actions. The benefits are also broader than N loss reduction.

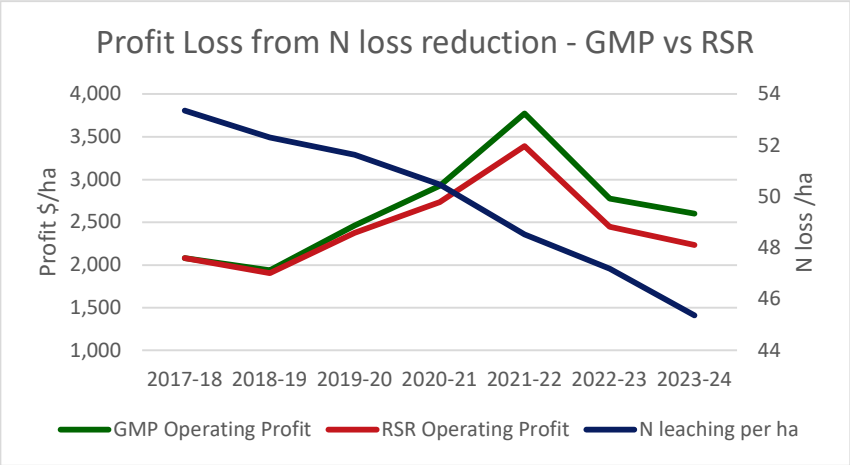

Figure 10: Profit loss from N loss reduction GMP vs RSR

Source: DairyBase On Farm Change Model.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is the benefit per ha which provides a $12.41 range in net benefit per ha vs $11.65 for the adoption rate.

Quantified Risk Analysis (QRA)

The two key variables in the analysis (Table 1) are:

- The benefit in $/ha generated between the application of GMP and the counterfactual of a simple stocking rate reduction.
- The rate of farmer adoption of GMP practices based on the quarterly survey of farmers.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
GMP vs SR reduction benefit/ha	$192	$317	$380
% farmer adoption based on quarterly survey	37%	79%	90%

Stakeholder Insights and Broader Impacts

Interview Summary

- Overall support for the On-Farm change bundle is strong. Developing GMP 'on the ground' with strong science and technical support has developed relevant and robust systems and processes. Local Regional Council involvement has ensured their buy-in.
- GMP can also be applied in other catchments, modified to fit as required. DairyNZ should continue to support this.
- Interviewees noted that the adoption/attribution rates assumed are conservative.

Adoption and Uptake

- Adoption and uptake are in the majority of cases driven by customer/commercial and legislative requirements.
- The N cap requirement of 190kg N/ha/yr is driving attitude change and assisting the uptake of GMP.
- In catchments that have regulatory requirements, the uptake is likely to be close to 100%, though not all elements of the GMP may be implemented. A good example of these are where irrigation companies are providing support and driving uptake such as Selwyn-Hinds. The Tararua District is also under strong regulatory influence and an uptake of 70% reflects that.
- For the remaining catchments, assuming a DairyNZ facilitated adoption rate of 37% is conservative but avoids overstating the benefit.
- GMP will continue to roll out across NZ as market and regulatory needs drive this.

Co-Benefits or Externalities

The iterative co-design systems approach has application in other aspects of the DairyNZ portfolio. Farmers working together with sound technical input will ensure fit for purpose outcomes are developed and implemented as the farmers have strong ownership of the outcomes.

Unquantified Benefits

- The investment to develop GMP can be leveraged into other catchments, hence reducing ongoing cost.
- As noted above, the systems approach has relevance to other programmes such as Future Fit Farm Systems where the examples can be followed.
- Momentum for change created through these activities could be leveraged to address other matters e.g. reproduction rates.

CBA Results

Expected Net Present Value (8%)	
NPV	$291m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$161m to $426m
Expected Net Benefit to Cost Ratio ((B-C)/C)	
Net Benefit to Total R&D cost ratio	50.5
Net Benefit to levy only R&D cost ratio	86.9
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$18.28

Number of farms	1000
Amount per farm ($/yr)	$3,034
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$400m
NPV (12%)	$223m

Conclusions and Key Messages

Value Assessment

$18.28/ha/year is a strong return on investment. Having said this, this is an avoided cost scenario rather than value added. The counterfactual of reducing stocking rate would have given rise to a greater profitability loss. This is not a criticism of the DairyNZ work, more reflection of changing requirements which add cost.

Industry good investment is often undervalued as it may protect the status quo or against worse outcomes rather than be seen to add value. In the face of industry challenges, protecting the status quo or avoiding downside creates significant value which should not be underestimated.

Recommendations

The on-farm change bundle has supported the creation of both a process (iterative co-design) and an outcome (GMP) widely relevant to the industry. How these outcomes can be applied broadly would warrant further investigation.

How the GMP outcomes can be used as value add through assurance programmes/meeting customer requirements requires ongoing consideration.

Lessons Learned

Undertaking CBA requires a considerable amount of solid data, both financial and physical, to provide a credible assessment. The use of DairyBase and the modelling skills in DairyNZ Economics Group supported this initiative significantly. Looking forward, there are many datasets from financial, farm management and assurance schemes, which when combined, could provide solid data for analysis both to support the efficient operation of a farm and any ex-post analysis of the type undertaken in this initiative.

2.C Strong Biosecurity

Objectives and Status

Problem/opportunity addressed

Strong Biosecurity aims to influence policy settings to reduce the fragmentation of biosecurity institutions, so that science-based risk management across the supply chain is strengthened and the impacts of biosecurity incursions are minimised.

Expected impact

Intended outcomes involve:

- Advocacy (influencing policy and legislation at the pre-border, border, and post-border stages);
- Funder representation (promoting farmers' interests in post-border institutions (e.g. OSPRI, GIA) guiding investment and strategic direction;
- Delivery partnerships (plan and deliver joint readiness and response activities under the Government Industry Agreement (GIA) Deed and Foot and Mouth Disease Operational Agreement (FMDOA), including building industry capability and supporting farmers during outbreaks);
- Thought leadership (influencing thinking and strategic direction across the livestock sectors and scientific community); and
- Pragmatic advisory work (providing trusted, practical guidance to support on-farm biosecurity, grounded in science-based risk assessments).

Strategic Alignment

Strong Biosecurity supports a strategic priority on powering more adaptable and resilient farms in particular an integrated and sustainably funded biosecurity system that minimises the impacts of biosecurity incursions through collective readiness activities and robust on-farm biosecurity measures.

Initiative status

The initiative has an enduring timeframe starting prior to the current levy period and expected to continue into the foreseeable future.

Achievement and outcomes to date

Strong Biosecurity is unique amongst the initiative bundles as in addition to milk commodity levy investment, it administers on-payment of a fixed amount of milk commodity levy[18] to OSPRI for the TBfree programme. Other dairy contributions to biosecurity activities; such as the *M. bovis* eradication programme, the remaining dairy contribution to the TBfree programme and NAIT, are funded by separate levies, and not funded by the milk commodity levy. The outcomes produced under Strong Biosecurity Systems, some of which are unable to be quantified for the CBA, include:

- **Biosecurity system governance (benefits not quantified, with exception of *M. bovis* transition to NPMP)**
    - TBfree 2016 to 2055 National Pest Management Plan (NPMP) funder oversight with Programme Governance Group representation in the 10-yearly review undertaken in 2025.
    - *M. bovis* transition from Government Industry Agreement (GIA) to a NPMP undertaken by OSPRI, and representation on *M. bovis* Governance Group prior to the transition.
    - NAIT scheme 3-year review, covering NAIT funding.
    - Advocating for and supporting review of OSPRI governance, which resulted in changes to the OSPRI constitution and establishment of a new Shareholder and MPI group, strengthening oversight of OSPRI's performance.
    - Advocating for and supporting review of OSPRI's Information Systems Strategic Programme (ISSP), which saved further investment in IT systems that would not be fit for purpose.

[18] https://www.dairynz.co.nz/about-us/your-levy/

- **Readiness for Response (benefits quantified)**
  - FMD Operational Agreement signed, with readiness and response commitments effective 1 July 2025 for an initial term of five years, renewable for three two-year terms. This commits dedicated resourcing from both industry and MPI to prepare for FMD, and ensures industry participation in response decision-making should there be an outbreak.
  - Dairy Biosecurity Risk Evaluation Framework (D-BRiEF), which enabled focus on high-priority risks and excluded dairy from biosecurity costs for low-risk, low-relevance threats Fall Armyworm (FAW) and Blackgrass responses.

- **Policy, Advocacy and Engagement (benefits not quantified)**
  - Biosecurity Act Review engagement and policy submission aimed to shape and strengthen the biosecurity system
  - Driving for levy consolidation policy change to enable simplification of dairy farmer levy investment in biosecurity.
  - Biosecurity Response Levy changes to unlock funding reserves and enable its use for biosecurity readiness at no additional cost to dairy farmers.
  - Biosecurity System Action Plan involvement to drive implementation of key actions that will strengthen the biosecurity system to better protect what New Zealand values and grows.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

The Strong Biosecurity investment is large and multi-layered, hence the CBA involves a substantial financial analysis.

TBfree relates to the contribution of the milk commodity levy to OSPRI, while Strong Biosecurity Systems relates to policy and advocacy, biosecurity system governance, including for NAIT, TBfree, and *M. bovis* programmes, as well as general readiness and awareness of biosecurity.

TB eradication is considered in the counterfactual as the DairyNZ milk commodity levy contribution of $14.5 million annually is on-paid to OSPRI and is more than half of the dairy industry share, with the TB dairy slaughter levy considered as co-funding as it is a separate levy[19].

In contrast, the *M. bovis* counterfactual considers the policy and advocacy, and biosecurity system governance aspects and the transition to a NPMP **only**, as eradication activities are not funded from the milk commodity levy[20].

The overall counterfactual considers four components as follows:

[19] Meat processors collect a TB levy for cattle at slaughter: $12.25 per head for dairy cattle. TB slaughter levy increasing to $14.50 per head from 1 October 2025. Source: OSPRI

[20] M. bovis NPMP levy for dairy: An actual rate of 0.8 cents per kilogram of milk solids produced in New Zealand by a dairy farmer for supply to a dairy processor, which took effect from 1 January 2025. This is expected to decrease to 0.4c/kgMS from 1 October 2025. Source: OSPRI

- **TBfree**: 'No control' counterfactual (PWC, 2025)[21] where the only interventions are pasteurisation and works surveillance (i.e. requirements under food safety legislation). There would be no organised testing or vector control. The number of infected herds would start to increase after 13 years (See **Error! Reference source not found.**).
- Figure 12 shows a similar trajectory in the past (1980s and 1990s) following the scale back of TB funding showing a rise in infected herds peaking at about 1,600 herds until a sustained TB control investment programme reduced the number of infected herds

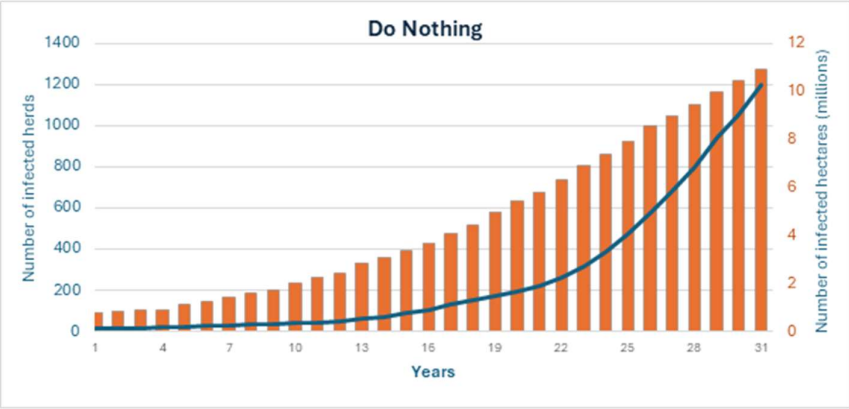

Figure 11: Number of infected herds and infected hectares by year for no control counterfactual

Source: (PWC, 2025)

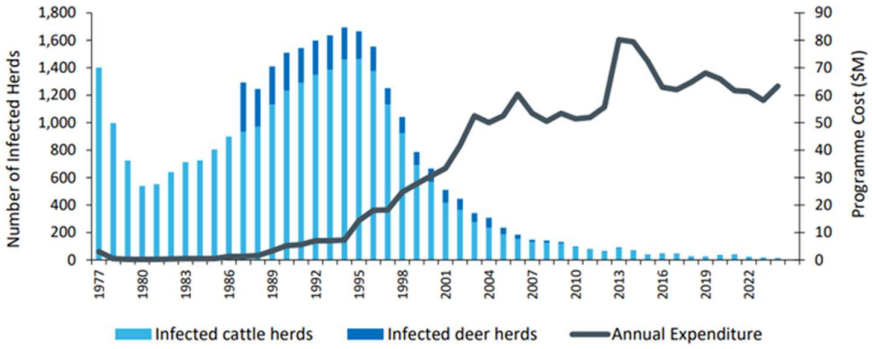

Figure 12: Number of infected herds by year against programme costs

Source: DairyNZ

- **Foot and Mouth Disease (FMD) Readiness and Response**: The counterfactual to the biosecurity governance work of DairyNZ is the initial proposal of the Crown in FMD cost sharing between the government and industry.
- **Mycoplasma bovis (*M. bovis*) National Pest Management Plan (NPMP)**: The counterfactual is the *M. bovis* programme operates under the Government Industry Agreement (GIA) within MPI, not under an NPMP, with related forecast expenditures. The response continues to be led by MPI, DairyNZ and Beef + Lamb New Zealand, and delivered primarily by MPI.

[21] PriceWaterhouseCoopers (PWC), 2025. Benefit Cost Analysis: 2025 TB Plan Review

The programme reaches the expected delimiting phase and moves into background surveillance and checking (Deloitte, 2023)[22].

- **D-BRiEF**: The counterfactual is the inclusion of the dairy industry as liable to contribute towards biosecurity response for incursions that do not benefit the dairy industry, such as, Fall Army Worm and Blackgrass.

CBA Assumptions

Share of benefits attributable to the milksolids levy:

- **TBfree**; The benefits for the dairy industry were extracted from the PWC CBA model across 11 benefit streams weighted for dairy share for years 2021 to 2055.
- **FMD Readiness costs**; $1.5m for initial year and doubled from year 2 to 11 of FMD Operational Agreement. Reduction of 4.2% in share of DairyNZ for Readiness costs.
- **FMD Response costs**; Reduction of 2.1% in share of DairyNZ for Response fiscal cap, comprising of cost levels per outbreak size (small, medium, large) and weighted by probability by outbreak size by year (annual probability[23] small 0.10%, medium 0.075%, large 0.05%). With Readiness investment, the probability of medium to large outbreaks is assumed to reduce after year 5 (2030).
- ***M. bovis* NPMP**; Share of net savings (OSPRI overhead savings less additional costs of NPMP) to OSPRI funders based on funding share of DairyNZ to OSPRI. Assumed 2-year delay in net savings cashflow as requiring review of the Funders Agreements[24].
- **D-BRiEF**; The avoided share of DairyNZ in response costs for Fall Army Worm and Blackgrass amounting to $0.22 million in 2021 and 2022.

Benefits

Identifying the benefits:

- **TBfree**: The relevant 11 benefit streams for the dairy industry include:
    1. Production saved;
    2. Farmer and farmer community wellbeing benefits;
    3. Carcass value loss saved;
    4. Impact of possums on pasture and other feed saved;
    5. Reduced resources required managing responses to bovine TB;
    6. Clinical diagnosis costs avoided;
    7. Increased ability to select and retain superior genetic animals;
    8. Costs of disposing of clinically infected animals saved;
    9. On farm mustering costs;
    10. Herd management and livestock movement costs: and
    11. Carcass value losses - test reactors slaughtered.
- **FMD Readiness costs**: The reduction in industry share from 50% to 40% of Readiness costs.
- **FMD Response costs:** The reduction in industry share from 20% to 15% of Response costs.
- ***M. bovis* NPMP:** Share in NPMP additional costs offset by share in OSPRI savings.
- **D-BRiEF**: The avoided DairyNZ contribution towards response costs for Fall Army Worm and Blackgrass as D-BRiEF illustrated that the dairy industry does not benefit from responding to these incursions.

[22] Deloitte, 2023. Cost benefit analysis: National Pest Management Plan for *Mycoplasma bovis*, June 2023

[23] Nimmo-Bell and DairyNZ estimates only as MPI Biosecurity Intelligence had no reference probability.

[24] NAIT funding is fixed for a period to be reviewed in 2025/26, while TB is currently undergoing a 10-year plan review.

Quantifying the benefits:

- **TBfree:** Dairy industry share in the 11 benefit streams of TBfree converted from 2016 to 2025 dollars is shown in Table 13.

Table 13: Dairy industry share of TBfree benefits - Source: PWC, 2025

Benefit stream	Dairy share
Production saved	95%
Farmer and farmer community wellbeing benefits	51%
Carcass value loss saved	76%
Impact of possums grazing on pasture and other feed saved	70%
Reduced resources required managing responses to bovine TB	17%
Clinical diagnosis costs avoided	89%
Increased ability to select and retain superior genetic animals	86%
Costs of disposing of clinically infected animals saved	56%
On farm mustering costs	13%
Herd management and livestock movement costs	56%
Carcass value losses - test reactors slaughtered	63%

- **FMD Readiness costs:** With 42% dairy share of industry, the 10% reduction equates to 4.2% for DairyNZ of the annual Readiness costs ranging from $1.5 million in 2026 to $3 million from 2027 to 2036.
- **FMD Response costs**: With 42% dairy share of industry, the 5% reduction equates to 2.1% for DairyNZ of the fiscal cap of Response costs. The fiscal cap is assumed to be the compensation and response costs of FMD by outbreak size (NZIER, 2024)[25] (see Table 14).

Table 14: Fiscal cap estimates by size of outbreak

Size of outbreak	$'000
Large	2,978,000
Medium	721,000
Small	215,000

- ***M. bovis* NPMP**: Share in NPMP additional costs is 94% of 32% industry share. The milk commodity levy share in OSPRI savings is 19% (distinct from dairy slaughter levy). The net savings run from 2026 to 2031.
- **D-BRiEF**: The avoided response costs is based on DairyNZ share of industry costs which in turn is the distribution of response costs between industry and the Crown.

[25] NZIER, 2024. The economic impact of a Foot and Mouth Disease incursion in NZ. Summary report.

Costs

- Investment costs include those that have no counterfactual as their benefits cannot be quantified (e.g. Strong Biosecurity Systems):
  - **TBfree**: Milk commodity levy contribution of $14.5 million annually up to 2028 and declining from 2039 based on PWC, 2025.
  - **FMD readiness:** DairyNZ share amounting to $0.25 million to $0.50 million annually.
  - **Strong Biosecurity Systems:** From $0.2 million in 2021 to $1.5 million annually from 2026 onwards.
  - **D-BRiEF**: $0.7 million between 2021 and 2022.
- Co-funding comprises of:
  - **TBfree:** Dairy share of $24 million gross Crown funding after netting out shares for non-paying TBfree beneficiaries (i.e. landowners, NZ Public and Government, others).
  - **TBfree slaughter levy**: Ranges from $9.3 million to $11.3 million annually with steady $10.6 million for 2025 to 2038 and declining from 2039 based on PWC, 2025.

Risk and Sensitivity Analysis

Sensitivity Analysis

With TBfree responsible for 99% of benefits, key variables from this benefit were identified for sensitivity analysis. These were:

- Production saved;
- Carcass value loss saved;
- Farmer and farmer community wellbeing benefits; and
- Increased ability to select and retain superior genetic animals.

Quantified Risk Analysis (QRA):

Key risk variables were capped at most likely level and reduced by 10% for the low estimate (see Table 15).

Table 15: Risk variable ranges used in QRA (Monte Carlo simulation)

Key risk variable (% share of dairy)	Low	Most likely	High
Production saved	85%	95%	95%
Carcass value loss saved	68%	76%	76%
Farmer and farmer community wellbeing benefits	46%	51%	51%
Increased ability to select and retain superior genetic animals	77%	86%	86%

Stakeholder Insights and Broader Impacts

Interview Summary

DairyNZ exercises essential governance and oversight not only for the milk commodity levy investment of about $15 million/year but also the total annual $75 million dairy farmer investment in the biosecurity system including (2023/24 amounts):

- *M. bovis* - $45m

- NAIT - $4m
- TB slaughter levy - $11m

The NPV may appear understated relative to critical value delivered by biosecurity investment. However, the NPV can only reflect the quantifiable benefits of milk commodity levy investment and not the separate biosecurity levies paid by farmers, which are subject to their own cost-benefit analysis as required by levy orders for NPMP development.

The success in TB and *M. bovis* programmes demonstrate the strength of the biosecurity system relative to competitor nations, for example:

- The successful and pioneering government-industry partnership in *M. bovis* eradication, the only country to do so.
- The positive trajectory in TB control is a positive relative to recent outbreaks in Europe.
- Strengthening of biosecurity response systems and shortcomings that were identified, including operational and IT system improvements, strengthening of border protections, better support systems and compensation processes for impacted farmers, as well as better functioning governance and influencing our advocacy on future policy changes to strengthen the system further.

However, there remain challenges that require agility. For example, there was no fit-for-purpose IT system at the start of *M. bovis* programme in 2017 and one had to be built. MyOSPRI IT system was recently written off as not fit-for-purpose and the need for OSPRI IT system replacement remains (see further discussion under Unquantified Benefits).

Co-Benefits or Externalities

The significant wider environmental benefits of the TBfree programme in reducing possum numbers cannot be overemphasized. This is achieved by reducing the impact of uncontrolled possum browsing on native flora and fauna as well as plantation and catchment protection forests, with a flow-on effect of protecting endangered species and environmental wilderness as well as enhancing people's (and native animal's habitat) experience of the natural environment (PWC, 2025).

Unquantified Benefits

The strategic oversight and accountability of the biosecurity system delivered by DairyNZ has produced non-quantifiable benefits including:

- Biosecurity system governance for OSPRI and GIA.
- Review of the Information Systems Strategic Programme (ISSP) leading to cessation of further investments in MyOSPRI as it was found through a funder-driven review that it was not capable of replacing the animal traceability system (NAIT) and integrating disease management (TB and *M. bovis*).
- Review of OSPRI governance leading to greater oversight and transparency of OSPRI with constitution changes and establishment of a monitoring body (Shareholder and MPI group) for operational and Board performance.
- Keeping MPI Biosecurity on mission given regular turnover in MPI staff.
- Policy, Advocacy and Engagement activities.

CBA Results

Table 4: Full CBA results for Strong Biosecurity

Expected Net Present Value (8%)	
NPV	$709.0m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$668.9m to $741.9m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to total cost ratio	1.8x
Net Benefit to levy only cost ratio	3.9x
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$44
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$1,540.9m
NPV (12%)	$301.4m

The sheet on the last page illustrates the cost and benefit cashflows across 18 years. The NPV shown is not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 15.

Conclusions and Key Messages

Value Assessment

Despite significant investment in Strong Biosecurity as it is essential (amounting to $93 million from the commodity levy over the current levy period), it has also delivered significant value with an NPV of $709 million. This equates to a strong net benefit-cost ratio of 1.8x and with significant co-funding, net benefit to levy only cost ratio more than doubles to 3.9x, albeit a significant co-funder is the non-milk income of dairy in the form of TB slaughter levy. The TBfree programme contributing nearly all (99%) of Strong Biosecurity benefit underscores the value of biosecurity, primarily driven by the value created by reduced incidence of TB. However, the real value of Strong Biosecurity lies in preventing incursions and in reducing the size of incursions that do occur via readiness. In the financial sense, there is a small avoided cost (relatively) with the government co-funding of FMD readiness and fiscal cap, M. *bovis* eradication and response costs for Fall Army Worm and Blackgrass.

Recommendations

As a watchdog for such a critical investment for the industry, Strong Biosecurity needs to be continually vigilant with a risk framework and to regularly review its capability to deliver on its mission efficiently and effectively.

Lessons Learned

Strong Biosecurity has proven its leadership in biosecurity system governance and its significant influence on policy development.

3.A LowN Leaching Systems

Objectives and Status

Problem/opportunity addressed

The motivation behind this initiative was the increasing pressure on NZ pastoral farmers to reduce nutrient losses to the environment, particularly nitrogen loss via nitrate leaching from dairy farms

Following a mid-term review in 2021 the genetics research pivoted towards delivering management solutions and by "stacking" farm management options and technologies.

Stacking options include reducing fertiliser use, reducing stock numbers, pasture-baleage feeding while wintering stock, the use of nitrogen inhibitors, and incorporating nitrogen fixing plants in pasture swards

Plantain, specifically Ecotain[26], was identified as a plant species worthy of future research. It was a high-quality feed, had nutritive value attributes and contained secondary compounds that could influence the nitrogen leaching. The Plantain Potency and Practice Programme (PPPP) was implemented in June 2021. This initiative is the focus of this CBA.

The high-level purpose of the PPPP was to maximise the contribution of bioactive plantain-based pasture in farm systems to minimise N leaching and enhance consumer and public trust. To achieve this the programme was organised into four delivery initiatives:

- Prove that Ecotain substantially reduces nitrate leaching at the farm system scale.
- Confirm Ecotain efficacy across soils and climate; define pasture composition targets; develop soil and other assays.
- Remove any risk to value chains and animal wellbeing, scope product value potential.
- Develop management guidelines and tools; demonstrate and communicate; drive adoption; extend to catchment impacts.

Expected Impact

The overall objectives of the programme were:

- Deliver the knowledge, and support required for farmers to have confidence in using plantain in pastures.
- Farmers would adopt the use of Ecotain as a low-cost scalable forage solution for reducing N leaching.
- Reduction in N leaching for other pasture-based farm systems.
- Preserve the fundamental competitive advantage of NZ's high value, edible protein-based industries.

[26] Ecotain is a registered Agricom product proven to reduce N leaching (Lincoln University Trials 2017)

Strategic Alignment: These initiatives fit into DairyNZ's broader investment strategy of enabling sustainable and competitive dairying whilst empowering farming communities to improve their water quality and ecosystem health across dairy catchments and farmers are recognised positively as responsible stewards of the land.

Initiative status

- The initiative has progressed well and reached some of its original goals as outlined below.
- Extension work is continuing to disseminate the results of trials and achieve target adoption rates for the initiative.

Achievement and outcomes to-date

- Plantain in pastures reduces the level of nitrogen leaching. Trials at Lincoln and Massey Universities confirm a range between 18-26%, dependent on several factors such as different soil types and higher rainfall levels.
- Development of a Visual Assessment Guide to enable farmers to assess the percentage of plantain in pastures.
- Confirmation that milk from plantain-fed cows poses no risk to human health and there are no negative effects of plantain on milk composition or processability.
- Development of case studies with partner farms based in Dannevirke (Passey's) and Rotorua (Holdem's). These case studies are available on the DairyNZ website and provide valuable information on plantain use and farm productivity.
- Spring farm visits to partner farms. Attendees include partner farm coordinators, Agricom agronomists, extension staff and programme leads. The purpose of these is to discuss results, future planning and potential trials. A survey of animal health is also conducted in these visits.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

Nitrogen entering waterways from agricultural sources can cause harm by reducing water quality, disrupting healthy aquatic ecosystems and the quality of drinking water sources. In July 2021 the synthetic nitrogen fertiliser cap, a limit of 190kg/ha/year, was introduced as one of several regulations to reduce the amount of nitrogen in waterways. Some Local Territorial Agencies (LTAs) are asking dairy farmers to lower nitrogen.

As an example, farms in the Selwyn Waihora catchment in Canterbury with nitrogen losses greater than 15kg nitrogen per hectare per year have a reduction requirement of 30%.[27] For dairy farmers to reach these targets the most likely option is to destock at the risk of a loss of production and profitability.

CBA Assumptions

- The CBA focuses on adoption of plantain as a means to reduce N leaching.
- The benefit of the investment has been applied to dairy herds in New Zealand that will be required to reduce their N leaching to targets within the next 5 years. Herds were identified in Southland, Canterbury, Wairarapa, Horizons, and Rotorua Kaituna regions. Herds in the Waikato were excluded. The Freshwater Policy initiative CBA includes the Waikato herds, and they were removed from LowN Leaching to ensure that the benefit was not double counted.

[27] Environment Canterbury regional Council – N loss reductions in Selwyn Waihora Feb 2023

- An adoption rate of 45% is used for the ten years from 2024 to 2034. The requirement for farmers to initiate systems to reduce N leaching is seen as a driver for a high uptake of plantain use.
- Plantain is currently used by dairy farmers in NZ but is unable to be directly quantified as it is commercially sensitive information.

Benefits

- Research has shown nitrogen leaching can be reduced by using, amongst other things, different plant species in pasture swards[28]. Current status quo farming practices show that practices to reduce nitrogen leaching from soils by 20% lead to an average profit loss of 12%/cow. Plantain has been shown to reduce nitrogen leaching by up to 27% with a profit loss of only 3%/cow.
- Profit loss per cow was compared between the status quo and two systems, one using a reduction in fertiliser and stocking rate (12% profit loss), the other using plantain in the pasture (3% profit loss). This difference was then applied to the forecast number of dairy cows being milked. Dairy cows from Waikato were excluded.
- The annual profit gained by using plantain was between $48 and $135 per cow.

Costs

- The method of sowing plantain seed is to combine it with applications of fertiliser as well as including plantain in seed mix of new swards at pasture renewal. Cost of including in new swards is negated by a reduction of ryegrass seed rate. For broadcasting, we have used an application cost of $52/ha. Application of plantain seed is recommended every 1 to 3 years.
- The CBA for N leaching only costed the PPPP. No other initiatives were included. The rationale was that this programme could provide dairy farmers with a quick, simple and cost-effective tool to reduce nitrogen leaching without impacting farm productivity levels. In addition, whilst other components of the initiative bundle have undoubtedly been beneficial, their benefits have been difficult to directly quantify.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver responsible for benefits is the adoption rate with a range between $160.2 million and $587.7 million.

Quantified Risk Analysis (QRA)

The key risk variables are shown in Table 1 and described below.

- **Profit/cow** - calculated using data from the DairyNZ Statistics Report 2023-24. The highest and lowest profit per cow were used to estimate the lowest and highest levels of $530 and $1,500 respectively. The most likely value is slightly higher than the average and is based on four years of profit over $1,000 per cow.
- **Profit loss per cow under deintensification** (reduced fertiliser application, reduced supplements and corresponding reduced stocking rates) to achieve a 20% reduction in nitrogen leaching levels.
- **Profit loss per cow using plantain in pasture** to achieve a 20% reduction in nitrogen leaching levels.

[28] Massey University Farmlet Trials

- **Adoption**: the requirement to quickly reduce N leaching in specific regions suggests that farmers will consider a range of mitigation strategies. The use of Plantain is a cheap easily applied mitigant. Because of this, adoption rates were determined of 30%, 45% and 60%.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Profit difference b/w SQ & plantain pastures ($)	$48	$75	$135
Adoption rate (%)	30%	45%	60%

Stakeholder Insights and Broader Impacts

Interview Summary

The initiative managers and scientists see plantain as a simple low cost mitigant to reduce nitrogen leaching in pastures. It is one of several tools such as reducing nitrogen fertiliser application and reducing stocking rates which farmers have available to them.

Adoption and uptake were identified by farmers as key factors in this initiative. This is mentioned in the next section. Most believe future regulatory requirements will be the major driver for increasing adoption rates.

The initiative is an example of farmer co-development. DairyNZ, researchers and farmers working together to solve the concerns that farmers have, and provide practical, cost-effective solutions.

Adoption and Uptake

Farmers spoken to note the following farm level barriers to plantain adoption:

- **Weeds**; herbicides used to control pasture weeds such as docks and thistles and other broadleaf weeds will also remove plantain from pastures. Spraying removes the level of plantain in the sward and so lessens the efficacy of N leaching reduction, however without spraying the pasture may contain a high level of unpalatable or low value plant species such as docks and thistles.
- **Persistence in pastures**; NZ pastoral farmers have traditionally used perennial grasses in their pastures. Plantain is not a perennial and there is the requirement to reseed to maintain optimum levels of plantain to provide the N leaching benefit.
- **Soil types**; heavy clay-based soils are not conducive to the establishment and persistence of plantain in pasture swards.
- **Palatability**; plantain is a highly palatable plant, however, its palatability decreases in the hardened seedhead stage, at low nitrogen levels or when leaves become too old due to prolonged grazing.
- **Policy reform and associated delays** in the release of regional plans are likely to delay the widespread adoption of plantain use. The programme is working proactively with identified motivated farmer groups in high N risk catchments such as Southland and Canterbury to achieve adoption ahead of regional plan notifications.

Co-Benefits or Externalities

- Research has shown plantain can help reduce methane emissions by affecting the rumen fermentation process in cows[29]. This research is in its early stages, but early trial results show promise.

[29] Effects of Plantain Metabolites Aucubin, Acteoside, and Catapol on Methane Emissions (Sivanandarajah et al May 2025)

Unquantified Benefits

- **Reduction in Facial Eczema spores** – plantain provides an environment unsuitable for facial eczema spores and the fungus to grow on when compared to perennial ryegrass pastures.
- **Increase in Omega 3 fatty acids in milk** – including plantain in pastures can increase omega-3 fatty acids in cow's milk. Cows grazing on plantain pastures have a more favourable ratio of omega-3 to omega-6 fatty acids which is considered beneficial for human health. There may be opportunities to promote this to health-conscious markets.
- **GHG benefits** – research conducted at Lincoln University showed that plantain reduces nitrous oxide emissions by causing a diuretic effect in cows, which dilutes nitrogen in the urine and increase urination frequency spreading the nitrogen over a larger area[30].

CBA Results

There is 0% chance that NPV is negative. CBA results are in Table 2.

Table 2: CBA results

Expected Net Present Value	
NPV	$358.8m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$147.1m to $641.0m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to total cost ratio	4.8
Net Benefit to levy only R&D cost ratio	18.5
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$18.68
Expected Net Present Value (discount rate sensitivity analysis)	
NPV 4%	$466.1m
NPV 12%	$195.9m

The sheet on the final page illustrates the cost and benefit cashflows across 18 years. The NPV shown not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 1.

Conclusions and Key Messages

Value Assessment

There is strong evidence of reduced N leaching from plantain mixed pastures with no significant impact on production. Plantain is a "low hanging fruit" with low costs for nitrogen reduction. This initiative has quantified a tool which can be used to reduce N leaching whilst maintain productivity

[30] DairyNZ Tech Series 2019 – Plantain helping farmers to achieve environmental targets.

on farm. Overall, those spoken to see value in the initiative, however it is noted that for the true value of this initiative to be realised, future adoption rates are the key to unlocking its potential.

DairyNZ needs to continue to promote the benefits of Plantain as a tool for reducing N leaching to maximise this value. Future regulatory requirements may drive up the adoption rate.

Recommendations

DairyNZ could consider continued future research focusing on:

- Benefits of plantain for environmental effectiveness;
- Potential changes to milk composition and animal health;
- Plantain cultivar evaluation;
- Gain further understanding of N leaching across a range of soil types and climates; and
- Continue to achieve adoption targets.

Lessons Learned

A mid-term review of the initiative titled Plantain Potency and Practice Programme[31] noted that one of key success factors for this body of work was good management. The flexibility and agility in changing situations, clear and effective communication between initiative groups and governance, and the ability to balance competing interests from multiple stakeholders.

3.A Better Freshwater Policy

Objectives and Status

Problem/opportunity addressed

Over time environmental policy evolves to align with better knowledge, societal change and broader requirements of the voting public. These changes can occur at national level, e.g. Essential Freshwater Package or at regional level, such as Waikato PC1.

Expected impact

DairyNZ, in partnership with other parties, such as Beef + Lamb New Zealand and Federated Farmers, work to inform the policy process to provide fair, evidence-based and pragmatic policy outcomes which solve the problem for dairy and provide certainty and a fair transition. The DairyNZ focus is dairy, but often other industries are affected and can make good allies or may require pushback if impinging on the dairy industry.

Strategic alignment

The Better Freshwater Policy investment falls within the enabling sustainable and competitive dairying strategy envelope, and more specifically, empowered farming communities driving improvements in water quality and ecosystem health at scale across dairy catchments with the public and consumers viewing dairy farmers positively as responsible stewards of the land.

Initiative status

In the **national policy space**, relevant to this bundle of initiatives, DairyNZ led a large response on the Essential Freshwater policy proposals, with a focus on:

- **A more scientifically robust and justifiable approach to national N standards**; A requirement of a national DIN number of 1mg/L was promulgated, however, based on water

[31] Scarlatti; Plantain Potency and Practice Programme (October 2024)

quality outcomes and economic analysis 3.6 was promoted as a better level and 2.4 was eventually agreed. This has been included in the CBA analysis.

- **Rather than regulations and consents, the use of Freshwater Farm Plans as a better approach to manage environmental risk and on the ground action**; These reflect Good Management Practice (GMP), which links good practice to plan actions. While the farm plan approach is now in legislation, the regulatory framework development has been slow, so the plans have been implemented voluntarily.

In the **regional policy space**, many of the Regional Councils have long running planning processes. These have required ongoing monitoring and input. Relevant examples include:

- **Waikato PC1**; This has been a 13-year process, with an initial disproportionate focus on N and dairy. DairyNZ, through its evidence base and advocacy, moved the approach to better recognise the contributions from all land uses and the relevant impact and risk resulting from the four contaminants. Operationally, a number of compliance activities were modified and the use of GMP to reduce N loss vs. a simple stocking rate reduction have created the value in the CBA analysis.
- **Horizons**; DairyNZ submitted on the One Plan and provided economic modelling. The Tararua Plantain initiative was developed to support implementation. The latter is the subject of a separate CBA.
- **Selwyn**; With a 50% N reduction on the table, for dairy only, DairyNZ advocated, based on science, for a 30% reduction and multi species approach. This then extended to the Selwyn-Hinds practice change initiative to support farmers to develop solutions to deliver on the targets, which have now been achieved. This initiative is outside the timeframe of the CBA analysis, so is excluded.

Councils are currently barred from notifying any new freshwater planning instruments until 31 December 2027, unless they qualify for a specified ministerial exemption.5 As a result, DairyNZ's regional policy, science, and economics work to support implementation of the 2020 national freshwater direction has not yet been realised. The value of this work is therefore not captured within this assessment.

National policy direction is currently under consultation. To support this work, the freshwater science, regional policy, national level solutions and ecosystem health initiative streams are ongoing.

Achievements and outcomes to date

While there are a range of achievements to date as noted above, the two most relevant for this analysis are the Waikato Plan Change 1 and the change in the DIN number. These have been included in the economic analysis below.

The following list provides qualitative examples of achievements through a range of processes since 2020:

- **Southland Land and Water Plan**; Successfully advocated against land use consent and confirmed permitted activity pathway for all farms. Confirmed the use of farm plans as an alternative pathway to a resource consent for many farm activities, including the use of land for farming.
- **Otago Regional Council**; Authored Dairy Sector chapter of Phases 1 and 2 of the Otago Region Economic Profile, resulting in improved analysis of proposed regulations.
- **Taranaki Regional Council**; Submitted on the freshwater consultation highlighting key concerns which resulted in ongoing collaboration on the science basis of Target Attribute States. This will inform an improved evidence base when Taranaki's regional planning process recommences.

- **Horizons Regional Council**; Developed economic modelling of proposed water quality targets, strengthening the sector's submissions and improving regulatory analysis.
- **Northland Regional Council**; Used science and policy expertise to give practical advice on riparian margin management, balancing shading benefits with productivity, leading the council to explore economically informed setback and planting options.
- **Greater Wellington Regional Council**; Presented at the hearing on the Regional Policy Statement to demonstrate the impracticality of including greenhouse gases at a farm-level in resource consents, resulting in the removal of the policy (pending confirmation).
- **National Policy Processes**; Through submissions to RMA reforms and national freshwater direction, secured key changes including: pauses to council freshwater planning to align with national direction, removal of 'Te Mana o te Wai' from consent processes, improvements to Intensive Winter Grazing rules, and provision for industry-driven farm plans and certification.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

- The original proposal from WRC for PC1 required a specific reduction in N loss, to be quantified through Overseer and including tools as a drafting gate. These requirements have been assumed to require a stocking rate reduction in absence of GMP and increased compliance requirements (audit, farm plan, farm nutrient modelling).
- The value of GMP adoption versus stocking rate reduction has been modelled using DairyBase data to meet required N loss requirements resulting from PC1. This covers a range of GMP practices vs a simple stocking rate reduction. The modelling has been broken down into sub-regions as the requirements vary.
- The PC1 requirements are implemented from 2025 and in the case of nutrient reduction, are assumed to not create an on-farm benefit (vs the counterfactual) for the first 10 years with GMP meeting nutrient reduction requirements (prior to 2035).
- For the 10 years post 2035, the counterfactual model destocks from 2.80 cows/ha to 2.55 cows/ha which reduces profit per ha from $2489 to $2290.
- The original National Freshwater Standards as proposed requiring a DIN of 1 mg N L^{-1} , were implemented nationally, affecting an estimated 2000 farms.

Benefits

- The benefits are broken down into three broad areas. Firstly, a reduction in compliance activity required by WRC under PC1, secondly, applying GMP rather than an input based alternative such as simple stocking rate reduction thereby reducing the profit lost and lastly, the policy input into the National Freshwater Standards resulting in a higher national DIN of 2.4 mg N 1^{-1} compared to earlier proposals.
- Reduced compliance activity (non-target benefits):
    - Top quartile of leaching farms in the majority of the catchments covered by PC1 were switched from a discretionary activity to a controlled activity. A discretionary activity predominantly costs more to apply for and gain approval and provides more scope for council to decline.
    - Under Waikato Plan Change 1 (PC1), farms in the lowest quartile of nitrogen risk, as determined by the Nitrogen Risk Scorecard, are classified as permitted activities and are not required to maintain a certified Overseer file for auditing purposes. DairyNZ

and Fonterra advocated for replacing Overseer with the Scorecard as the primary tool for determining consent requirements for dairy farms. Consequently, only higher-intensity farms, identified by the Scorecard as having greater nitrogen risk, are required to maintain a certified Overseer file when applying for a resource consent.

- Those farms that are consented are only required to have an Overseer file to track against the Baseline every 5 years rather than annually. Note, farms may still voluntarily choose to do this for management purposes.
- Farms can provide a National Freshwater Farm Environment Plan in place of an individual farm environment plan.
- Implementing GMP to reduce N losses:
  - Compared with the counterfactual, utilising GMP for the first 10 years post 2035, the model destocks from 2.82 cows/ha to 2.80 cows/ha. This reduces profit per ha from $2510 to $2504. For this period there is on average a $130/ha advantage over simply destocking.
- National Policy (bottom line) DIN of 2.4 mg N 1^{-1} rather than the 1 mg N 1^{-1}
  - Modelling the potential outcomes of a change from a DIN of 1 mg N 1^{-1} to a DIN of 2.4 mg N 1^{-1} showed a potential loss of 5% of farm profitability could be avoided. It is assumed that 60% of the benefit can be attributed to the milksolids levy over about 2000 farms affected. The farm number is a variable for the Quantitative Risk Analysis (QRA).

Costs

- The total R&D cost is $22.1m, with DairyNZ contributing $21.7m and co-funders $0.4m.
- In relation to the DairyBase model, the financial and GMP data are included from DairyBase, therefore the operational costs are captured in the operating profit. Any one-off capital costs such effluent systems, irrigation and stand-off pads do not flow through operating profit and are not identifiable in the DairyBase statistics as relating to the GMP actions.

  The benefits of these capital investments are also broader than N loss reduction. Therefore, capital costs are not included in the analysis.

Key CBA Assumptions

- Waikato PC1 Non-Target benefits are totalled and then assumed to arise over 10-year period, with the same return cycle starting in 2025 with PC1 implementation.
- Assumed no benefit in the first 10 years post 2025 for GMP vs stocking rate reduction as GMP provides for the required reductions for first 10 years, with only a destock benefit post interim period.
- Benefits have been developed for the Waikato region as they were quantifiable. This underestimates the potential national benefit.
- Plan implementation assumed in 2025.
- DIN change results in a 5% reduction in profit, 60% of the benefit attributed to DairyNZ input and assumed to apply to 2000 farms (subject to QRA).

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is the number of farms subject to the DIN limitation, with a range of $9.76. This is followed by no CNMA file at $0.66 range, change from discretionary to controlled activity at $0.50 and GMP vs reduced stocking rate with a $0.46/ha range, these values should be considered in the context of the return per ha of $15.50.

Quantified Risk Analysis (QRA)

There are 3 key variables (Table 1):

- Cost saved from top quartile farms moving from discretionary activity to a controlled activity.
- Cost saved from lower quartile farms not requiring a CNMA Overseer file.
- Benefit from implementing GMP vs reduced stocking rate.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Discretionary to controlled activity ($m)	$1.05	$1.57	$2.09
Lower quartile farms no CNMA file ($m)	$0.69	$1.22	$1.74
GMP vs reduced stocking rate (% of benefit)	90%	100%	115%
Farms affected by DIN change	1500	2000	3000

Stakeholder Insights and Broader Impacts

Interview Summary

Overall support is strong for the freshwater policy work. It is recognised as keeping dairy farming aligned with environmental drivers, while balancing the sustainability (in all respects) of the business. To remain relevant, DairyNZ needs to continue with science and economic analysis to support positions with facts that bring value to the wider discussion.

Partnering with other organisations in areas of common interest supports gaining appropriate outcomes and enduring solutions.

Adoption and Uptake

Adoption and uptake are in the majority of cases driven by customer/commercial and regulatory requirements. This is the case with the CBA examples. Having said that, there are a number of farmers that get on board early as they believe it is the right thing to do. The DairyNZ Dairy Environment Leaders group are a good example. These groups lead best practice development, implementation and guide uptake for the next cohort of farmers.

Co-Benefits or Externalities

While the policy work is NZ focused, the outputs are also relevant for international customers. The policy outcomes are reflected in GMP, which is in turn reflected in the overall farm plan and customer assurance programmes. These allow customers to demonstrate compliance and NZ points of difference relevant to consumers.

Unquantified Benefits

The majority of unquantified benefits are in the area of maintaining relationships with key contacts at national and regional levels. There may or may not be changes in freshwater policy under consideration. These are key to success of DairyNZ policy.

In the regional context this has resulted in:

- The ability to raise compliance and plan implementation issues as they arise.
- Representing the dairy sector in working groups and targeted consultation.
- Providing technical expertise for the early stages of plan development processes.
- Ensuring improved engagement with farmers.

In a national context, DairyNZ has led responses to changes to resource management legislation, relevant national direction and Freshwater Farm Plan regulations under the current and previous governments. This required coordinating and representing views on behalf of dairy companies and gaining agreement with other primary sector bodies.

CBA Results

Table 2: CBA results

Expected Net Present Value (8%)	
NPV	$248m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$176m to $329m
Expected Net Benefit to Cost Ratio ((B-C)/C)	
Net Benefit to Total R&D cost ratio	12.6
Net Benefit to levy only R&D cost ratio	12.9
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$15.50
Number of farms	1.73m
Amount per farm	$2,433
Expected Net Present Value (discount rate sensitivity)	
NPV (4%)	$376m
NPV (12%)	$169m

Conclusions and Key Messages

Value Assessment

$15.50/ha/year is a strong return on investment. Having said this, this is an avoided loss scenario rather than value added. The counterfactual would have given rise to additional reduced profit. This is not a criticism of the DairyNZ work, more a reflection of changing requirements which add cost. How these requirements can be used as value add as part of assurance programmes/customer requirements or potentially in productivity gains from farming practice requires ongoing consideration.

Recommendations

The farmer interviews noted that the policy process is a "journey and not a destination". DairyNZ needs to maintain relevance and therefore involvement in the overall policy process both nationally and regionally. Keeping abreast of issues/opportunities, maintaining relevant science and economic/farm systems analysis is key to relevance and maintaining a seat at the table. This is seen in the current DairyNZ workplan.

Lessons Learned

Undertaking CBA requires a considerable amount of solid data, both financial and physical, to provide a credible assessment. The use of DairyBase and the modelling skills in DairyNZ Economics Group supported this analysis significantly. Looking forward, there are many datasets from financial, farm management and assurance schemes, which, when combined, could provide solid data for analysis both to support the efficient operation of a farm and any ex-post analysis of the type undertaken in this initiative.

3.B Wintering

Objectives and Status

Problem/opportunity addressed

In July 2019, a nationwide campaign by public interest groups was launched to highlight animal welfare and environmental issues related to wintering on crop. The campaign focused largely on Southland due to the number of farmers who winter on forage crops there and the wet, muddy conditions that are common through the winter. This coincided with the proposed introduction of national wintering regulations, including a "pugging" rule.

It is well accepted that poor farming practices and intensification of land use can lead to increased pressure on waterways, soils, ecosystems, and animal welfare. In 2018 the primary sector had worked together to define a set of Good Farming Principles (GFPs).

The DairyNZ Wintering initiative aimed to work with farmers, sector partners and supporting partners in the winter cropping supply chain to facilitate the adoption of GFPs for improving animal welfare, farm ecosystems, and water quality.

Expected impact

Intended outcomes included:

- Enabling the rapid adoption of GFPs by dairy and dairy grazing farmers.
- Research and development to provide farmers with knowledge and a suite of practices to achieve good farming practice for animal care and winter management.
- Facilitation of extension events and one on one engagement with farmers unaware or at risk.
- Modelling and monitoring changes in water quality and ecosystem health over time.

- Improve the public perception that dairy farmers are taking steps to improve animal welfare.
- Providing positive media coverage on the change to farming practices.
- Designing and building a prototype modular, cost effective and fit for purpose wintering infrastructure for dairy cows. This initiative included assessing and developing suitable cow loafing surfaces.

Strategic alignment

The Wintering investment aligns with DairyNZ's strategy of enabling sustainable and competitive dairying and that New Zealand dairying remains internationally competitive in animal care.

Initiative status

- **Wintering infrastructure**; the initiative successfully produced a detailed design for a fully covered wintering facility. Rapidly escalating construction costs and a lack of a "one size fits all" solution resulted in the design being uneconomic for on farm adoption. The initiative then pivoted to focus on providing insights and learnings from cow lying surface testing, consenting process, and farmer case studies.
- **GFPs**; initiative is complete, with all scoped tasks completed and objectives achieved. Business-as-usual work continues, and the GPPs initiative has merged with the current National Wintering Initiative.
- **Farm systems research**; farm systems research at the Southern Dairy Hub (SDH) investigating the impact of kale and fodder beet wintering on the physical, financial and environmental performance of four diverse farm systems was completed in 2023 with key messages integrated into GFP guides.

Achievements and outcomes to date

- Wintering GMP increased during the initiative to high levels. Rural professionals and farmers noted improvements to wintering practices. Farmer surveys confirmed an increase in the awareness of GFPs, the development of written plans and the implementation of these plans.
- The partnership approach taken by farmers, farming organisations, and DairyNZ was a resounding success and noted by government representatives. One of the strengths of the initiative lay in DairyNZ's science and research advice and guidance, and the resources it created to assist farmers.
- In addition to the farm systems learnings the SDH farmlets provided a platform to investigate the cumulative effects of fodder beet feeding on animal performance, to calculate the greenhouse gas footprint of different winter cropping systems and to determine the effect of weather and soil conditions on animal behaviour for cows wintering on kale and fodder beet. The results of the behaviour research provided evidence for DairyNZ submissions on the proposed winter pugging rules and resulted in the identification of contingency plan options for crop winter and triggers for when these should be implemented. Learnings from the fodder beet research enabled updates to the DairyNZ Feed Checker tool, allowing users to better customise their scenarios.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

In September 2019, dairy farm wintering practices in Southland came under review when images of dairy cows tightly grazed in muddy conditions resulted in a high profile anti-dairy campaign, through national media channels, to highlight poor farm wintering practices, citing animal welfare issues. The industry realised that change was needed to improve farming practices and improve public perception of the industry. If change was not instigated, then it could result in regulatory conditions

being imposed leading to potential increased costs and a drop in profitability – and in a worst-case scenario, loss of "license to farm" for some farmers.

Timeframe: 15 years from initiative midpoint of levy period – through 2039.

CBA Assumptions

- The benefit (consent application savings) has been applied to dairy farms that winter livestock on forage crops in areas that may have issues with pugging of soils and wet winter conditions. Regions chosen include Southland, Otago, Canterbury, West Coast (South Island), Manawatu, Tararua and the Central Plateau share of benefits.
- Attribution: local farmers, and farming groups drove this initiative and worked with DairyNZ and other industry organisations in this initiative. As such an attribution rate of 50% has been applied.

Benefits

- **Cost of consents**; the benefit to dairy farmers wintering on crops is the saving of not having to apply for consents to winter cows. Implementing good wintering practices proves that plans are in place to mitigate any issues that may arise, such as heavy rain, and improve animal welfare whilst protecting Critical Source Areas (CSAs)[32].
- **Farmer awareness and implementation**; one of the objects of this initiative was to increase dairy farmer awareness of GFPs for wintering stock as well as an increase in those implementing those practices. GFPs include:
  - Utilising back fences and portable troughs
  - Using strategic directional grazing
  - Excluding stock from waterways
  - Creating a winter grazing plan, and
  - Protecting CSAs such as watercourses.
- **Uptake assessment**; DairyNZ engaged the services of SCARLATTI group to conduct an independent survey of South Island dairy farmers, rural professionals, members of DairyNZ initiative team and government agencies to analyse engagement and awareness of the initiative[33]. The survey results are summarised below in Table 1.

Table 1: Farmer survey results on wintering practices in select regions October 2024

Measure	2022	2024
Awareness of CSAs	63%	80%
% Farmers with written plans	63%	80%
% Farmers with written contingency plans for adverse weather	52%	74%

Costs

- The assumption has been made that costs of the move from previous stock wintering practices to an improved plan are minimal, given that there have been three key areas of change:

[32] CSAs are areas such as swales and gullies which can transport soil, phosphorus and E.coli to waterways. It includes raceways, stock campsites, silage pits, yards, intermittent waterways and cultivated land.

[33] Getting to good wintering – Project Evaluation report (SCARLATTI October 2024)

  - Using a back wire, which farmers already own
  - Portable troughs
  - Standoff area if wet weather ensues which may be pasture saved up for spring feeding.
- No other costs were identified.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is attribution to the milksolids levy, which provides a $4.2 million range in net benefit compared to consent cost with a $3.2 million range.

Quantified Risk Analysis (QRA)

- Consent approval costs were sourced from a private consultancy firm[34]. A consent cost of $8,500 was used, with an annual cost of $800.
- Attribution rate recognises that DairyNZ were key supporters of this initiative empowering farmers and farming groups. There was a high level of engagement and support from farmers to change.
- QRA assumptions are in Table 2 below.

Table 2: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Consent approval cost ($)	$6,000	$8,500	$10,000
Attribution rate (%)	40%	50%	55%

Stakeholder Insights and Broader Impacts

Interview Summary

All participants spoken to strongly support the Wintering bundle of initiatives. Farmer engagement was high, and the tools and practices developed to mitigate issues are now widely used and available to other livestock industries.

Adoption and Uptake

Uptake of this initiative has been extremely high. Dairy farmers recognised the issues and drove the initiative with collaboration from different industry organisations. The result is an exemplar of a collaborative initiative, which has provided systems and procedures that can be utilised not only by dairy farmers throughout New Zealand but also beef farmers finishing cattle in intensive systems and graziers wintering dairy cows.

Co-Benefits or Externalities

The Wintering initiative produced several additional benefits that have not been quantified. Some are outlined below.

Animal behaviour/welfare

- **Lying time**; there is anecdotal evidence that the lying times of cows have increased. Using back fences and strategic grazing reduces the level of pugging, and the provision of standoff areas during periods of high rainfall provide better ground conditions for cows to lie down thereby reducing stress on the animal.

[34] MyEnviro – Havelock North, Hawkes Bay

- **Cow condition**; there are indications that dairy cow condition remains constant or improves when following good wintering practices.
- **Targeted Feeding;** good practice when wintering cows is to cap mobs at 120 animals. This enables monitoring of cow condition and flexibility to provide targeted supplementary feed to maintain cow condition.

Environmental benefits

- **Critical Source Areas (CSAs)**; defined as areas which can transport large amounts of soil, nutrients, and bacteria to waterways. Identification and management of CSAs is important when developing winter grazing plans to reduce the impact on waterways.
- **Soil pugging** can also lead to contamination of waterways as well as nutrient leaching. Good wintering practices can reduce the amount of pugging in soils thereby reducing environmental impacts and nitrogen leaching.

Other Unquantified Benefits

- Wintering structures such as loose housed barns and Herd Homes® [35]were a part of the research. This was not included in the CBA analysis.
- Research findings and evidence of on-farm adoption of good practices was used to influence policy development, across both the RMA and Animal Welfare Act 1999. For example, the NES-FW IWG regulations were altered so that a minimum pugging depth was no longer required to be met, to remain a permitted activity, based on knowledge from the wintering initiative.
- Wintering provides the sector with a very successful case study to argue for voluntary, sector led change as an alternative to regulation.

CBA Results

Table 3: CBA results

Expected Net Present Value	
NPV	$3.5m
Probability of NPV > 0	99%
90% probability that the NPV will be in the range of	$0.9m to $6.2m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to Total R&D cost ratio	0.5
Net Benefit to levy only R&D cost ratio	0.6
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$0.30
Expected Net Present value (discount rate sensitivity analysis)	
NPV 4%	$6.0m

[35] Herd Homes is a New Zealand based company starting in Northland. They design and manufacture herd shelters.

NPV 12%	$1.9m

The sheet on the final page illustrates the cost and benefit cashflows across 18 years. The NPV shown is illustrative and not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 2.

Note that the return per hectare figure is averaged across all farms in New Zealand. In reality, only some farms/regions are substantively affected by the intensive winter grazing issues, so actual value to those farms affected would be higher.

Also, no consideration of possible loss of "license to farm", cost of expensive capex infrastructure as an alternative to crops or consequent exits from dairying due to consenting issues has been included.

Conclusions and Key Messages

Value Assessment

Whilst the NPV is $3.6 million, the overall value of this initiative is extremely high. International markets will be a major factor in determining farming practices in the future. There is an increasing requirement from consumers that want to know where their food comes from and they want to know if it has been produced in an environmentally safe manner and, if appropriate, in accordance with good animal welfare practices. The situation which presented itself in the national media in 2018-2019 was the catalyst for change. There was a momentum shift amongst southern dairy farmers that something needed to be done. As that momentum built, there was a culture change. This change resulted in:

- Increased awareness of the issues amongst farmers nationally;
- A desire to change, and
- A higher farmer adoption of GFPs.

If this change had not occurred, dairy farmers would have been faced with the likelihood of increased regulation, increased costs, restrictions on land use leading to possible erosion of farm asset values and the possibility of not being able to dairy farm in certain areas. The social licence to farm was at threat.

Recommendations

Continued investment into research on the impact of wintering practices and their appropriate use should be considered. Early results from research indicate there may be benefits from:

- Improved ability to achieve pre-calving body condition score targets;
- Understanding the effect of late pregnancy diet on the calf prior to birth, and
- A better understanding of wintering conditions on animal behaviour and identification of contingency plan options.

Lessons Learned

Collaboration with other organisations was paramount for success. It gave farmers and industry organisations the confidence to work with each other. Farmers became advocates for the initiative, with much of the success due to it being farmer driven. The process followed in this instance could be replicated in future DairyNZ initiatives.

3.C Reducing GHG Emissions

Objectives and Status

Problem/opportunity addressed.

- **Climate policy**; Priorities were to work with government to influence and inform policy and decision making. The focus was on achieving fair and practical climate change policy for the primary sector, informing Climate Change Commission work relevant to the dairy sector, working collaboratively with industry partners to ensure effective evidence based advocacy, and monitoring Regional Council activity relevant to agriculture and climate change, as well as engaging where possible.
- **Methane reduction targets:** As part of keeping agricultural emissions out of the ETS, the He Waka Eke Noa process developed a business model for the sector to achieve the government of the day methane reduction target.
- **Research initiatives**; Development of viable and scalable mitigation strategies and more accurate GHG accounting for New Zealand dairy farmers. This would be achieved by evaluating technologies and delivery methods, evaluating current and new farm-systems practices, improving inventories for pasture-based systems, as well as identifying knowledge gaps and research direction.
- **Investment in new technology:** DairyNZ co-invested with sector and government in research to develop methane vaccines and methane inhibitors suitable for pastoral systems. This was through the Pastoral Greenhouse Gas Research Consortium and Ruminant Greenhouse Gas Partnership.

Expected impact

- DairyNZ has had input into the Government's policy direction and Climate Change Commission advice.
- Dairy farmers are clear on the future direction of the Government's ag emissions pricing mechanism and DairyNZ is supporting on-farm implementation.
- To ensure that future decisions and policies are scientifically based and fair in practice.
- Technologies are available to accurately measure on farm GHG emissions and the development of mitigation strategies to reduce these emissions whilst retaining farm profitability.

Strategic Alignment

Reducing GHG emissions aligns with DairyNZ's strategy of enabling sustainable and competitive dairying whilst having dairy farmers meet their GHG commitments enabled by fair, practical and science based policies. This includes the provision of measures and access to cost effective mitigation practices and technologies.

Initiative status

Milestones achieved include:

- Input to Government decisions on (a) whether to adjust 2050 target and (b) next commitment under Paris Agreement (2031-2035) completed February 2025.
- Input to the Ministry for Regulation review of agricultural products (methane inhibitors) lodged in 2024.

Next steps for the GHG workstream include:

- Active engagement in the Government's Pastoral Sector Group on methane to advocate for fair and pragmatic treatment of those emissions.
- Input to MPI's second phase of development for the methodology for estimating on-farm emissions (recognition of existing activities).
- Continuing stakeholder engagement to develop partnerships and funding opportunities domestically and internationally.
- Enhanced understanding of emissions associated with dairy farming on peat soils.
- Continued research into the impacts of pastures and supplementary feed, feed additives, and breeding traits to reduce GHG emissions.

Achievements and outcomes to-date:

- Policy advocacy:
  - An independent science review of NZ's 2050 methane targets.
  - Informing the decision to remove agricultural obligations from the NZ ETS.
  - Recalibration of Government and Climate Commission estimates and assumptions regarding mitigation technology efficacy and availability.
  - The establishment of a Pastoral Sector group on biogenic methane.
  - Technical input into MPI's development of a methodology for estimating on-farm emissions.
- Research
  - Investment in vaccine IP has been taken up by AgriZero through Lucidome Bio who are taking this through to commercialisation.
  - AgriZero has also picked up the PGGRC methane inhibitor IP and is pursuing this work further.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

Greenhouse gas emissions from dairy farming have been reducing steadily for the past decade, however the rate of change is less than 1% per annum. This level of reduction is closely linked to the decreasing dairy herd numbers. Dairy farmers need a range of options available to them to reduce their greenhouse gas emissions without impacting profitability.

Timeframe: 15 years from initiative midpoint of levy period – through to 2039.

CBA Assumptions

- Agriculture emissions are not priced in the New Zealand ETS. The benefit to dairy farmers was that they would not incur this cost.
- Attribution to the milksolids levy funded efforts was determined at 45%, acknowledging that other organisations were also involved such Federated Farmers, DCANZ and Beef + Lamb New Zealand.

Benefits

- Policy advocacy: In 2019, the government of the day launched He Waka Eke Noa[36] as a collaborative process with the sector to develop and analyse emissions pricing options for biological emissions from agriculture to achieve a 10% methane reduction by 2030 (from 2017 levels) and working towards a 24-47% reduction by 2050, as well as addressing nitrous oxide emissions. The basis was to develop a system that was grounded in science, fair and

[36] He Waka Eke Noa was a partnership between industry, Māori and Government to develop a practical framework to measure, manage and reduce agricultural GHG emissions. It was disestablished in June 2024.

equitable. The He Waka Eke Noa partnership was able to agree on a proposal to government to reduce agricultural emissions through a levy that would fund the use of mitigation technology as this became available. Despite the sector's efforts, the government of the day rejected the proposal, instead consulting on a revised version. Political events then led to a change in government, bringing in a decision to delay emissions pricing to 2030 and to amend the climate change legislation to remove agricultural obligations from the ETS. The outcome was that agriculture emissions are not yet being priced or included in the NZ ETS. This removed the requirement for farmers to pay costs of biological emissions from Methane (CH4) and Nitrous Oxide (N2O).

- The He Waka Eke Noa process was enabled by agreement to treat short-lived gases, like biogenic methane, and long-lived gases like nitrous oxide and carbon dioxide, separately. This agreement was based on research on warming effects or methane.
- GHG costs; Economic research conducted on dairy farms in Canterbury and the Waikato[37] quantified the cost of CH4 and N2O based on a carbon price and 95% free allocation. These values are $0.032/kg milk solids (MS) and $0.008/kg MS for CH4 and N2O, respectively.
- Timeframe: In June 2024, the Government removed the legislative requirement for primary industries to enter the NZ ETS. The benefit has been determined until 2030. It is anticipated the government will introduce farm-level pricing of agricultural GHGs.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is attribution rate, which provides a range from $141.2 million to $220.2 million.

Quantified Risk Analysis (QRA)

- Costs of CH4 and N2O were sourced from economic analysis in Canterbury and the Waikato. The range used was from a low value of $0.03/ Kg MS to $0.0036/Kg MS for CH4 and from $0.0075 to 0.009 for N2O.
- Status quo reductions in CH4 and N2O were sourced from the New Zealand Greenhouse Gas Inventory Report 2023. The trend is just under 1% per annum since 2019 for both gases. A range from 0.5% to 1.1% was used. This reduces total pricing over time but is of little significance as 100% of GHGs are priced.
- The attribution rate for the milksolids levy in this initiative is set at 45%, with a range of 30-50%. Primary industry organisations and bodies, along with farming groups, participated in making representations to Central Government for change. These include, but are not limited to, Federated Farmers, Beef + Lamb New Zealand, Horticulture NZ, and Fonterra.

Table 1 below shows the range of risk variables used.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Cost of Methane ($/kgMS)	$0.030	$0.032	$0.036
Cost of Nitrous Oxide ($/kgMS)	$0.0075	$0.008	$0.009
SQ Annual reductions methane (%/annum)	0.5%	1.0%	1.1%

[37] He Waka Eke Noa Farm Level Levy Recommendations and Case Studies October 2022

SQ Annual reductions Nitrous oxide (%/annum)	0.5%	1.0%	1.1%
Attribution to the milksolids levy (%)	30%	45%	50%

Interview Summary

Support for this initiative is high given the potential implications for dairy farmers to reduce GHG emissions and the pressure from global markets. In saying that productivity and profitability are key factors for both farmers and milk processors. There is also the element that not doing anything could result regulations being imposed which could affect the viability of the industry. Many farmers are aware that excluding dairy from the NZETS has provided time for more work to be completed ahead of future GHG mitigation measures that will still be required (the current Government intends to introduce a pricing system for agricultural emissions by 2030).

Adoption and Uptake

The discussion of GHG emissions, the NZETS and climate change in general is seen as somewhat divisive at the farmer level. There are people who are reluctant to engage in any conversations or adopt any technologies which could reduce GHG emissions especially at the potential loss of farm productivity. There are others that see the need to reduce emissions but mitigation options that do not impact profitability are limited.

Co-Benefits or Externalities

A reduction in GHG emissions is regarded as being beneficial to the environment, and our reputation globally as a “clean and green” country. Reputational damage caused by adverse media can have an impact on our access to markets or put pressure on pricing.

Unquantified Benefits

Market drivers: It is believed that overseas markets will drive the uptake of mitigation strategies to reduce industry GHG emissions and individual farms’ greenhouse gas footprints. This has come and will continue to come in the form of payment premiums or a possible restriction to access in certain markets.

CBA Results

Table 2: CBA results

Expected Net Present Value	
NPV	$184.9 m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$140.0 m to $258.9 m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to Total R&D cost ratio	22.1
Net Benefit to levy only R&D cost ratio	22.4
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$12.36
Expected Net Present Value (discount rate sensitivity analysis)	
NPV 4%	$235.6 m
NPV 12%	$167.6m

The sheet on the final page illustrates the cost and benefit cashflows across 18 years. The NPV shown is illustrative and not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 1.

Conclusions and Key Messages

Value Assessment

Helping inform the decision to remove pastoral GHG emissions from the NZ ETS provided value to the dairy industry. It has provided time for more work to be completed on the research front and allowed the industry to be involved in future decision making around emission targets and policies. The value of this is hard to quantify, but likely to be substantial.

Recommendations

Dairy farmers are facing Government GHG targets and market drivers which will lead to government-imposed GHG pricing (from 2030) and pricing incentives from customers. Currently there are limited viable and scalable technologies or farm system practices for meaningful and cost-effective GHG reductions whilst trying to maintain profitable production levels. To meet national targets and maintain market access, New Zealand needs to maintain its position as a world leader in GHG efficiency. Promising mitigations need to be identified, evaluated and quantified for New Zealand dairying practices. The development of cost-effective mitigation strategies will help ensure a profitable dairy industry for New Zealand.

Lessons Learned

- Providing science based research data strengthens the business case for inclusion in future decision making and setting targets.
- Collaboration with industry organisations and joint submissions are important when advocating for policy change.

- Thorough preparation prior to any engagement with government departments is vital for ensuring success. The DairyNZ team were well prepared for this process.
- The final submission the Climate Change Commission in September 2023 on behalf of Beef + Lamb New Zealand, DairyNZ and Federated Farmers is a prime example of the preparation needed and collaboration between organisations.

Appendix 5: Extended CBA full reports

3.C Reducing GHG emissions (including PGGRC)

Objectives and Status

Problem/opportunity addressed.

- **Climate policy**; Priorities were to work with government to influence and inform policy and decision making. The focus was on achieving fair and practical climate change policy for the primary sector, informing Climate Change Commission work relevant to the dairy sector, working collaboratively with industry partners to ensure effective evidence based advocacy, and monitoring Regional Council activity relevant to agriculture and climate change, as well as engaging where possible.
- **Methane reduction targets:** As part of keeping agricultural emissions out of the ETS, the He Waka Eke Noa process developed a business model for the sector to achieve the government of the day methane reduction target.
- **Research initiatives**; Development of viable and scalable mitigation strategies and more accurate GHG accounting for New Zealand dairy farmers. This would be achieved by evaluating technologies and delivery methods, evaluating current and new farm-systems practices, improving inventories for pasture-based systems, as well as identifying knowledge gaps and research direction.
- **Investment in new technology:** DairyNZ co-invested with sector and government in research to develop methane vaccines and methane inhibitors suitable for pastoral systems. This was through the PGGRC and its successor, the Ruminant Greenhouse Gas Partnership (RGP) and co-investment with the Ag Emissions Centre (AEC) (previously the NZ Agricultural Greenhouse Gas Research Centre, NZAGRC).

Expected impact

- DairyNZ has had input into the Government's policy direction and Climate Change Commission advice.
- Dairy farmers are clear on the future direction of the Government's ag emissions pricing mechanism and DairyNZ is supporting on-farm implementation.
- To ensure that future decisions and policies are scientifically based and fair in practice.
- Technologies are available to accurately measure on farm GHG emissions and the development of mitigation strategies to reduce these emissions whilst retaining farm profitability.

Strategic Alignment

Reducing GHG emissions aligns with DairyNZ's strategy of enabling sustainable and competitive dairying whilst having dairy farmers meet their GHG commitments enabled by fair, practical and science based policies. This includes the provision of measures and access to cost effective mitigation practices and technologies.

Initiative status

Milestones achieved include:

- Input to Government decisions on (a) whether to adjust 2050 target and (b) next commitment under Paris Agreement (2031-2035) completed February 2025.

- Input to the Ministry for Regulation review of agricultural products (methane inhibitors) lodged in 2024.
- The successful conclusion of the PGGRC and its IP taken into successor organisations AgriZero and Lucidome Bio for further development and potential commercialisation.

Next steps for the GHG workstream include:

- Active engagement in the Government's Pastoral Sector Group on methane to advocate for fair and pragmatic treatment of those emissions.
- Input to MPI's second phase of development for the methodology for estimating on-farm emissions (recognition of existing activities).
- Continuing stakeholder engagement to develop partnerships and funding opportunities domestically and internationally.
- Enhanced understanding of emissions associated with dairy farming on peat soils.
- Continued research into the impacts of pastures and supplementary feed, feed additives, and breeding traits to reduce GHG emissions in partnership with others as relevant e.g. AEC, AgriZero, LIC and CRV.

Achievements and outcomes to-date:

- Policy advocacy:
  - An independent science review of NZ's 2050 methane targets.
  - Informing the decision to remove agricultural obligations from the NZ ETS.
  - Recalibration of Government and Climate Commission estimates and assumptions regarding mitigation technology efficacy and availability.
  - The establishment of a Pastoral Sector group on biogenic methane.
  - Technical input into MPI's development of a methodology for estimating on-farm emissions.

- Research
  - PGGRC & RGP

  A range of science outcomes have been delivered by the PGGRC. These include:

    - Methane inhibitor development: Over 10m compounds were screened, which were narrowed to two promising classes and reserves. These showed reductions in the 4-12% range. There is a strong commercialisation pathway through AgriZero with international partners engaged and IP secured.
    - Methane vaccine development: The aim of the work is to stimulate animal immune system to produce antibodies in saliva to target methanogens in the rumen. There has been success in the lab with antibodies produced in sheep/cattle binding to methanogens across species. Prototypes however haven't reduced emissions in live animals to date. Vaccines have great advantages as universal across livestock, fits existing vaccination systems, nil residues and applicable in extensive pasture-based farming systems. Investment in vaccine IP has been taken up by AgriZero through Lucidome Bio who are taking this through to commercialisation.
    - Low-Methane feeds and forage supplements: A range of forages have been investigated with forage rape, plantain and fodder beet showing the most promise. With a 100% diet reductions of ~ 32%, 16% and 20% were shown respectively. Using as 100% of the diet is not realistic in most situations.

While not standalone solutions, these are part of a "toolbox" alongside inhibitors, vaccines and breeding.

- In addition to research work, the PGGRC co-ordinated a range of science reviews which ensured focus on the most promising technologies and often resulted in inappropriate technologies being de-bunked. The combined effort of the PGGRC and the AEC have advanced GHG understanding significantly and underpinned ongoing work of the RGP and AgriZero.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

Greenhouse gas emissions from dairy farming have been reducing steadily for the past decade, however the rate of change is less than 1% per annum relative to future government or processor targets. This level of reduction is closely linked to the decreasing dairy herd numbers. Dairy farmers need a range of options available to them to reduce their greenhouse gas emissions without impacting profitability. While some of the core technologies developed in the PGGRC are in commercial development, they are not without significant technical challenges and are not available at this time. They are therefore not assigned any benefits in the analysis.

Timeframe: 15 years from initiative midpoint of levy period – through to 2039.

CBA Assumptions

- Agriculture emissions are not priced in the New Zealand ETS. The benefit to dairy farmers was that they would not incur this cost.
- Attribution to DairyNZ was determined at 45%, acknowledging that other organisations were also involved such Federated Farmers, DCANZ and Beef + Lamb New Zealand. Sheep and beef farmers gained similar benefits through not being in the ETS.

Benefits

- Policy advocacy: In 2019, the government of the day launched He Waka Eke Noa[38] as a collaborative process with the sector to develop and analyse emissions pricing options for biological emissions from agriculture to achieve a 10% methane reduction by 2030 (from 2017 levels) and working towards a 24-47% reduction by 2050, as well as addressing nitrous oxide emissions. The basis was to develop a system that was grounded in science, fair and equitable. The He Waka Eke Noa partnership was able to agree on a proposal to government to reduce agricultural emissions through a levy that would fund the use of mitigation technology as this became available. Despite the sector's efforts, the government of the day rejected the proposal, instead consulting on a revised version. Political events then led to a change in government, bringing in a decision to delay emissions pricing to 2030 and to amend the climate change legislation to remove agricultural obligations from the ETS. The outcome was that agriculture emissions are not yet being priced or included in the NZ ETS. This removed the requirement for farmers to pay costs of biological emissions from Methane (CH4) and Nitrous Oxide (N2O).
- The He Waka Eke Noa process was enabled by agreement to treat short-lived gases, like biogenic methane, and long-lived gases like nitrous oxide and carbon dioxide, separately. This agreement was based on research on warming effects or methane.

[38] He Waka Eke Noa was a partnership between industry, Māori and Government to develop a practical framework to measure, manage and reduce agricultural GHG emissions. It was disestablished in June 2024.

- GHG costs; Economic research conducted on dairy farms in Canterbury and the Waikato[39] quantified the cost of CH4 and N2O based on a carbon price and 95% free allocation. These values are $0.032/kg milk solids (MS) and $0.008/kg MS for CH4 and N2O, respectively.
- Timeframe: In June 2024, the Government removed the legislative requirement for primary industries to enter the NZ ETS. The benefit has been determined until 2030. It is anticipated the government will introduce farm-level pricing of agricultural GHGs.

Risk and Sensitivity Analysis

Sensitivity Analysis

The largest driver in the sensitivity analysis is attribution rate, which provides a range from $25.3 million to $45.1 million.

Quantified Risk Analysis (QRA)

- Costs of CH4 and N2O were sourced from economic analysis in Canterbury and the Waikato. The range used was from a low value of $0.03/ Kg MS to $0.0036/Kg MS for CH4 and from $0.0075 to 0.009 for N2O.
- Status quo reductions in CH4 and N2O were sourced from the New Zealand Greenhouse Gas Inventory Report 2023. The trend is just under 1% per annum since 2019 for both gases. A range from 0.5% to 1.1% was used. This reduces total pricing over time but is of little significance as 100% of GHGs are priced.
- The attribution rate for DairyNZ in this initiative is set at 45%, with a range of 30-50%. Primary industry organisations and bodies, along with farming groups, participated in making representations to Central Government for change. These include, but are not limited to, Federated Farmers, Beef + Lamb New Zealand, Horticulture NZ, and Fonterra.

Table 1 below shows the range of risk variables used.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Cost of Methane ($/kg/MS)	$0.030	$0.032	$0.036
Cost of Nitrous Oxide ($/kg/MS)	$0.0075	$0.008	$0.009
SQ Annual reductions methane (%/annum)	0.5%	1.0%	1.1%
SQ Annual reductions Nitrous oxide (%/annum)	0.5%	1.0%	1.1%
Attribution to the milksolids levy (%)	30%	45%	50%

Stakeholder Insights and Broader Impacts

Interview Summary

Support for this initiative is high given the potential implications for dairy farmers to reduce GHG emissions and the pressure from global markets. In saying that productivity and profitability are key factors for both farmers and milk processors. There is also the element that not doing anything could result in regulations being imposed which could affect the viability of the industry. Many farmers are

[39] He Waka Eke Noa Farm Level Levy Recommendations and Case Studies October 2022

aware that excluding dairy from the NZETS provided more time for work to be completed ahead of future measures that will still be required (the current Government intends to introduce a pricing system for agricultural emissions by 2030). Technology development initiated by the PGGRC, if commercialised, is likely to play an important part in GHG reductions and to date has shown strong support from the industry.

Adoption and Uptake

The discussion of GHG emissions, the NZETS and climate change in general is seen as somewhat divisive at the farmer level. There are people who do not believe in climate change and as such are reluctant to engage in any conversations or adopt any technologies which could reduce GHG emissions especially at the potential loss of farm productivity. In recognition of this, the PGGRC research aimed to maintain or improve productivity if at all possible. There are others that see the need to reduce emissions but mitigation options that do not impact profitability are limited.

Co-Benefits or Externalities

A reduction in GHG emissions is regarded as being beneficial to the environment, and our reputation globally as a "clean and green" country. Reputational damage caused by adverse media can have an impact on our access to markets or put pressure on pricing.

Unquantified Benefits

Market drivers: It is believed that overseas markets will drive the uptake of mitigation strategies to reduce industry GHG emissions and individual farms' greenhouse gas footprints. This has come and will continue to come in the form of payment premiums or a possible restriction to access in certain markets. The Fonterra Emissions Excellence[40] Achievement and Co-operative Difference programme are two examples.

CBA Results

Table 2: CBA results

Expected Net Present Value	
NPV	$36.3 m
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$24.9m to $46.2m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to Total R&D cost ratio	2.9
Net Benefit to levy only R&D cost ratio	3.0
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$2.27
Expected Net Present Value (discount rate sensitivity analysis)	

[40] https://www.fonterra.com/nz/en/our-stories/media/fonterra-announces-new-incentives-for-farmers-to-reduce-emissions.html

NPV 4%	$95.3m
NPV 12%	$12.7m

The sheet on the final page illustrates the cost and benefit cashflows across 36 years. The NPV shown is illustrative and not the average of 5,000 iterations. It is a point estimate based on the numbers in the most likely column in Table 1.

Conclusions and Key Messages

Value Assessment

Informing the decision to remove pastoral GHG emissions from the NZ ETS provided value to the dairy industry. It has provided time for more work to be completed on the research front and allowed the industry to be involved in future decision making around emission targets and policies. The value of this is hard to quantify, but likely to be substantial.

The inclusion of the PGGRC investment has lowered the return compared with the core analysis (NPV of $197.3 vs $36.3) as there is a long period of research (from 2003) and no imminent and measurable commercial benefits at this point. Given the magnitude of the GHG reduction challenge and the potential benefit/cost to the industry, investing in long term research in this area is definitely warranted.

Work continues with both the inhibitors and vaccine, now led by AgriZero, with commercial partners showing a strong potential for success. In the meantime, the investment has shown the industry's commitment to solving this challenge and supported agriculture remaining outside the ETS.

Recommendations

Dairy farmers are facing Government GHG targets and market drivers which will lead to government-imposed GHG pricing (from 2030) and pricing incentives from customers. Currently there are limited viable and scalable technologies or farm system practices for meaningful and cost-effective GHG reductions whilst trying to maintain profitable production levels.

To meet national targets and maintain market access, New Zealand needs to maintain its position as a world leader in GHG efficiency. Work on mitigations technologies is ongoing. The development of cost-effective mitigation strategies will help ensure a profitable dairy industry for New Zealand.

Lessons Learned

- Providing science based research data strengthens the business case for inclusion in future decision making, target setting and mitigation technology development and adoption. The PGGRC, RPG and ongoing involvement with the AgriZero, MPI, and AEC are key to this.
- Collaboration with industry organisations and joint submissions are important when advocating for policy change. This is underpinned by the joint investment in R&D.
- Thorough preparation prior to any engagement with government departments is vital for ensuring success. The DairyNZ team were well prepared for this process.
- The final submission the Climate Change Commission in September 2023 on behalf of Beef + Lamb New Zealand, DairyNZ and Federated Farmers is a prime example of the preparation needed and collaboration between organisations.

1.C Retention and Productivity in the Workplace (including Flexible Milking)

Objectives and Status

Problem/opportunity addressed

The New Zealand dairy industry is heavily reliant on people to operate and has faced significant workforce challenges including attracting and retaining enough skilled employees. These issues stem from a combination of factors like long hours, physically demanding work, and remote locations. A high percentage of farm workers leave their jobs within the first twelve months. In 2023 according to DairyNZ statistics, 62% of new entrants left the industry after 12 months.

An aging farming population has also exacerbated the problem. For dairy farmers this creates added costs in the way of recruitment, staff training and potentially hampers owners from working on their business by being drawn away from other tasks which could lead to better productivity. owners from working on their business by being drawn away from other tasks which could lead to better productivity.

In 2022 the Great Futures in Dairying 10 year Plan was co-developed to deliver initiatives to improve workforce retention and to continue to build a sustainable and thriving dairy sector. It was developed with input from a wide range of farmers and sector stakeholders.

Expected impact

A total of twenty-three initiatives were planned within Great Futures in Dairying, with the following intended outcomes from the initiative at three levels:

- **Shape up** so the industry is competitive and can retain and grow their people.
    - Support farmers to make workplaces competitive in the wider market;
    - Invest in careers for their people; and
    - Facilitate access to international employees to fill critical workforce gaps.
- **Change the job** to provide modern, productive, and safe workplaces.
    - Support farmers to evaluate and adopt time saving technology.
    - Support farmers to test alternative and more productive business processes and employment models.
- **Look in new places** to attract a larger and more diverse talent pool.
    - Support farmers to improve recruitment, onboarding, and employment practices so that they can make the most of the talent pool.
    - Develop targeted approaches to talent attraction where there is the highest likelihood of success, including opportunities to work with food and fibre partners.
    - Diversify and broaden the pools of talent that the industry draws on.

Strategic alignment

Retention and productivity in the workplace supports DairyNZ's strategy of accelerating on farm productivity, making dairy farming an attractive employment and career opportunity whilst improving employee satisfaction and safety.

Initiative status

- The GoDairy initiative work has been completed but work continues under the Great Futures in Dairying Plan with an emphasis on supporting the dairy industry in attracting and retaining staff.
- Work continues on an ad hoc basis to support communication of messages around milking frequency and flexible milking.
- DairyNZ is continuing to work with Government agencies in the immigration space.

Achievements and outcomes to date

- **Advocacy**; Exemption for dairy recruits to enter NZ under border restrictions due to the COVID19 pandemic and the initiative to gain permanent NZ residency for just over 4,000 dairy workers was seen as successful.
- **Working Conditions**; Development of tools to enable more efficient and safer workplaces. Tools such as MaxT result in less hours worked in the milking shed.
- **Staff retention**; DairyNZ statistical analysis of dairy farm employees indicates a trend towards higher rates of retention of staff. This would result in lower recruitment costs to replace staff who have left, lower training costs and less disruption to farm systems as an inexperienced staff member is onboarded alongside increased performance of staff due to increased experience
- **GoDairy recruitment campaign**; A digitally led campaign launched in 2022 to drive recruitment into farm assistant roles. This campaign was targeted at 18-25 year olds, men and women and mixed nationalities. Results indicated an elevated level of engagement with potential employees.

Cost-Benefit Analysis (CBA) Framework

Counterfactual/Status Quo Scenario

- Attracting and retaining staff in the dairy industry was an issue identified by the industry that needed addressing. Inability to attract and retain staff can lead to staff shortages and high turnover rates of staff, which result in extra recruitment and training costs and potential loss of productivity due to the disruption to the existing farm "team."
- Prior to 2019 there had been an annual conversion of people holding visitor/work visas of approximately 200 per year. The process for application for residency was challenging for people working on farm as they needed to meet skill thresholds (at least Farm Manager), wage thresholds (above levels seen in dairy sector), tenure thresholds and English language requirements (which many could not pass). Without dairy advocacy the dairy sector is very unlikely to have been named on the scarce list of the 2021RV (Residency Visa) which effectively enabled all international employees on temporary worker work visas to qualify for residency.
- The dairy industry has had a historical reputation of low wages, long hours and early morning starts, which can deter people from engaging with the industry.
- Not addressing these issues would have resulted in little or no change and a potential loss of productivity and profit.

Timeframe: 15 years from initiative midpoint of levy period – through to 2039

CBA Assumptions

The CBA focuses on MaxT, NZ Residency initiative and flexible milking. It does not include benefits of any other GoDairy or immigration initiatives.

- MaxT

- Attribution: DairyNZ was the key driver in this initiative, hence the high attribution rate of 85%.
- Adoption: The MaxT App has been downloaded 1130 times in the two years June 2023 to June 2025. This equates to 10% of the total herds in New Zealand. There has been some promotion of MaxT but a concerted effort through extension field days and promotion from consultants could see the increasing use of this App. An adoption rate of 7% has been used.
- Number of milking days: A range of days from 270 to 320 was used with a most likely period of 295.

- NZ Residency
  - Residency attribution: DairyNZ and Federated Farmers were the key drivers in dairy getting onto the scarce list hence the high attribution rate of 50%.
  - This initiative was successful in enabling just over 4,000 people to attain NZ residency.
- Flexible milking
  - Average salary for a dairy employee in NZ is $60,000.
  - Dairy employee turnover rate has varied between 15% to 25% (DNZ People Statistics), we have used a turnover rate of 20%.
  - A turnover rate of 20% equates to every NZ dairy farm having to employ a staff member every 2.5 years. The Work Institute[1] survey of employees identified reasons employees left their jobs.
    - Work life balance rated 12%
    - Manager behaviour rated 12%
    - Job Characteristics rated 10%
    - Well-being rated 10%
    - Salary benefits rated 9%
    - Work environment rated 6%, and
    - Career development rated 20%

    3-in-2 milking could address up to 78% of the reasons that employees gave for leaving, we have assumed 40%.

    - We have assumed a turnover rate of 12.5% for those using 3-in-2. This equates to every dairy farm in NZ replacing a staff member every 3.5 years. The difference between the two rates (20% and 12.5%) is the potential cost saving.
    - The Work Institute estimates replacing a staff member can cost approximately between 33% and 150% of the employee's salary. Respondents to a survey conducted by B Miller[2] as part of a Kellogg scholarship believed that the cost of replacing a staff member was between $10,000 and $20,000 with training, potential productivity loss and work disruption costs adding a further $10,000. We have used a likely figure of $27,000. This equates to $5,400 each year over a five year period.

Benefits

- MaxT
  - Labour savings: The key benefit is a reduction in the hours during milking, resulting in lower overall labour costs.
  - Working conditions; Shortening the milking time provides opportunities for staff to work lower hours or start or finish work earlier. These factors could bring greater enjoyment to an employee leading to higher retention rates.
- NZ Residency

- Visa application cost: The key benefit to employers is the cost of recruitment and associated costs not being expended. The cost of recruitment and employer visa associated costs, and a working visa is approximately $10,000 per application. This cost is legally required to be borne by the farmer, or employer who is supporting the application. Flights and other costs can be on top of this.

- Flexible milking
  - The key benefit is the retention of staff resulting in lower costs to replace and train staff, as well as less disruption to the rest of the team.

Costs

- MaxT
  - There is no cost to downloading of the MaxT App, and no other costs were identified in this initiative, beyond the direct initiative funding.
- NZ Residency
  - Visa applications cost between $1,200 and $2,000; we have used a most likely figure of $1,600 per application. This equates to a potential saving of $8,400 per staff member.
- Flexible milking
  - Reducing the number of milkings generally reduces the level of production resulting in a lower farm income. The savings in costs e.g. labour costs, milking shed consumables, cow lameness etc. balance this out resulting in a net zero loss. A case study of six dairy farms conducted by DairyNZ found that five of the six maintained their profitability after switching to a 3-in-2 milking system.

Risk and Sensitivity Analysis

Sensitivity Analysis

- MaxT - The largest driver in the sensitivity analysis is the time saved in milking with a range between $23.6 mill and $69.8 mill.
- NZ Residency – Attribution rate contributed the greatest sensitivity range between $36.6 mill and $54.8 mill.
- Flexible milking – There was no one major driver that stood out in the sensitivity analysis.

Quantified Risk Analysis (QRA)

- MaxT
  - Hourly rates: the range of hourly rates was between $25/hr and $30/hr.
  - Days milked per year; a range from 320 days to 270 days was used.
  - Adoption rate: the adoption rate benefit is calculated for future uptake of the MaxT App using a range of 5-7%. This equates to between 40 to 60 herds per annum.
  - Attribution rate: this initiative has been developed and promoted by DairyNZ. An attribution rate range was between 75-90% acknowledging that farm consultants and farmers may be promoting the App to their clients or fellow farmers.
- New Zealand Residency
  - Residency application costs; Costs of visa applications through a licensed immigration agent/lawyer range between $9,000 and $18,000. We have used an average of $10,000 to allow for farmers (expected around 20%) who complete the process independently for a cost closer to $3000.
  - Applications processed; These are exact numbers where DairyNZ were involved in during this process. Annually there is an average of 120 people who would normally

apply for residency. These have been subtracted from the number of applicants for those two years 2022 and 2023.

- Flexible milking
    - Range of estimated cost to replace and train was between 33% and 100% of the average salary.
    - The percentage of herds using 3-in-2 had a base of 14% in 2019. Adoption rates were the percentages above this from 2020 to 2025. From 2026 onwards the adoption rate was flat lined at 5%.

Table 1 below summarises the risk variable ranges used.

Table 1: Risk variables for QRA (Monte Carlo simulation)

Key risk variable	Low	Most likely	High
Hourly rates farm workers	$25	$27	$30
Milking days per season	295	300	320
Time saved/milking (hrs)	0.3	0.5	1.0
Adoption rate MaxT (%)	5%	7%	8%
Attribution rate MaxT (%)	75%	85%	90%
Annual staff turnover rate (%)	16%	20%	25%
Cost to replace a staff member	$19,800	$27,000	$60,000

Stakeholder Insights and Broader Impacts

Interview Summary

The DairyNZ team noted the complexity of the work undertaken and the interrelationship between the individual initiatives.

Farmers noted that recruiting staff and retaining them is challenging and can be expensive. They see a benefit to levy payers from the flexible milking, MaxT and NZ residency initiatives.

The one off border exception is seen as having a positive impact and the value is hard to quantify. One farmer employed staff through this process commented that he did not know what the consequences would have been if he had been unable to fill the roles on farm.

Farmers using flexible milking systems noted that they have a low turnover of staff, one farmer spoken to said he had had the same two staff for 8 years, the time he switched from TAD to 3-in-2 milking.

Farmers spoken to also extolled the benefits for staff being able to spend more time with their families, having more time for themselves for relaxation or working on improving their farming systems.

One farmer tried moving from a TAD system to 3-in-2. He found the feed budgeting difficult to calculate accurately enough to maximise feed intake, and the different starting times with milking didn't suit him or his staff. He made the decision to fully convert to OAD stating that if DNZ hadn't provided the support and resources for attempting the switch to 3-in-2, and eventually OAD, he would still be milking TAD and have the issues associated with that such as finding and keeping staff, and less time with his young family.

Adoption and Uptake

Adoption rates of MaxT for the two years 2023-2025 were high with 565 Apps being downloaded per year. This trend is expected to continue given the App does not cost anything, is simple to use and provides an immediate saving that can add to profitability.

Adoption rates for flexible milking increased markedly from 2018 to 2022 but have since plateaued.

Co-Benefits or Externalities

- Reducing milking times also reduces the standing time for cows while milking, reducing any stress the animal may be experiencing.
- Reducing milking times frees up time for higher value tasks e.g. management review of farm systems which in turn may lead to higher production per cow.
- Taking a structured approach to milking has the potential to carry over into other farm systems and processes. The opportunity to review and modify these could lead to an improved workplace as well as improved productivity.
- Not having the residency pathway would have increased labour shortages and workforce disruption. This would have placed increased pressure on farmers in both dollar terms and mental load.

Unquantified Benefits

- **MaxT**; There are other factors that could also be of benefit such as reduced electricity usage because of shorter milking times, and a reduction in repairs and maintenance as machinery is working for less time. None of these factors were included in the analysis.
- **NZ Residency**; Those who have been granted NZ residency will become permanent members of communities and contribute to the economy and vibrancy of these local communities. It is likely that not all will stay working in the dairy industry and some could transition to other vocations.
- **Immigration Advocacy**; During the COVID19 pandemic, and associated lockdowns, dairy farmers, like other primary based industries faced severe staff shortages. DairyNZ worked in partnership with Federated Farmers to advocate for dairy recruits to cross NZ's closed border. An exemption was given to allow 550 international employees to enter NZ and work on dairy farms at a critical time.
- **Staff retention**; **Border class exception attribution**: DairyNZ was the implementation partner for the Dairy Class Border Exception. Without DairyNZ no visas would have been granted. As noted above, this initiative was successful in enabling over 550 international employees to enter New Zealand.
- **Staff Retention**; **Other benefits**: The quantification of extra sleep gained by working less hours, more free time to be spent with family or spent on hobbies and pastimes and the wellbeing of staff proved difficult to quantify. All participants spoken to noted it was a major factor in switching to a flexible milking system.

- **GoDairy: Recruitment campaign**: Approximately 30% of the levy funding (2020-2024) contributed to this bundle of initiatives. The impact of this investment was not quantified as the impact of COVID19 and the ensuing focus on the work done on New Zealand residency had a more quantifiable impact on new entrants into the industry.

CBA Results

There is a 100% probability of the NPV being greater than zero.

Table 2: CBA results

Expected Net Present Value (8%)	
NPV	$44.8
Probability of NPV > 0	100%
90% probability that the NPV will be in the range of	$20.7m to $73.9m
Expected Net Benefit to Cost Ratio (x)	
Net Benefit to Total R&D cost ratio	1.7
Net Benefit to levy only R&D cost ratio	3.5
Expected Per Hectare Return	
Return per hectare per year ($/ha/year)	$2
Expected Net Present Value (discount rate sensitivity analysis)	
NPV 4%	$49.4
NPV 12%	$23.6m

The sheet on the final page illustrates the cost and benefit cashflows across 18 years. The NPV is a point estimate based on the numbers in the most likely column in Table 1 and not the average of 5,000 iterations.

Conclusions and Key Messages

Value Assessment

The dairy industry is one of many industries, not only primary industry based, in NZ that faces issues of attraction and retention of staff. The opportunity to gain an exemption during border lockdowns, and the conversion to permanent residency provided immediate value to the industry.

Tools to reduce milking time contribute to improved labour efficiency and make dairy farming a more attractive industry to work in.

The value of this workstream is likely to be underestimated, as workforce recruitment and retention is a very important issue for dairy farmers, with anecdotal feedback suggesting the overall business benefits of a stable, motivated and skilled workforce on farm is a key success factor for farm operators, but these benefits are difficult to directly quantify. It is noted that the three initiatives chosen for analysis were minor parts of the overall programme, however they provide illustrative examples of the cost/benefit of investing in this area.

Recommendations

Continued analysis and monitoring of employment trends will add value to future employment initiatives by identifying areas for targeted employment drives, why staff are remaining in the industry and what defines a competitive working environment.

Lessons Learned

This initiative shows that focusing on workforce issues in the industry can pay dividends. It remains an important area of focus for future investment.

[1] Work Institute; Retention Report -Employee retention Truths in Todays Workplace 2021
[2] What is the true cost of transience to the New Zealand dairy industry, B Miller (2021)

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Appendix 5: CBA cashflow models

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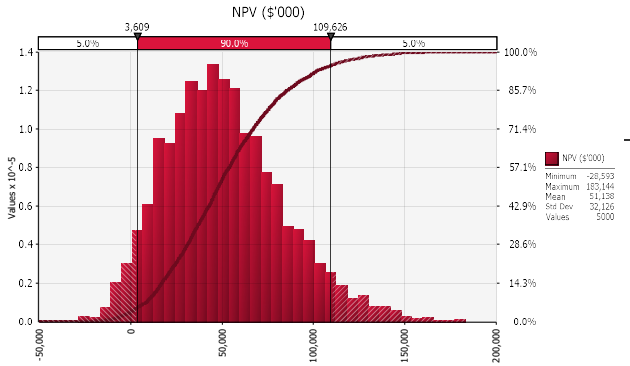
Project Better BW

Year ($'000)		PV	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ending June			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Costs																					
DairyNZ	NZAEL operations	**23,691**	3,847	3,944	4,589	5,572	5,515	5,554	0	0	0	0	0	0	0	0	0	0	0	0	0
	NZAEL BAU CAPEX	**4,678**	621	3,050	823	585	86	0													
	NZAEL CAPEX 4.0	**1,235**	0	0	164	469	0	1,062													
	Fertility	**998**	829	183	0	0	0						0	0	0	0	0	0	0	0	0
	Resilient dairy	**3,763**	827	662	1,048	571	442	950	0												
	OneBW/Better BW/NBO	**1,266**	0	0	370	422	379	491													
Subtotal		**35,632**	6,124	7,840	6,995	7,620	6,422	8,056	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Commercial fees	**1,312**	286	307	254	220	276	215	0												
	Crown -LIC Resilient Dairy	**2,491**	499	479	699	380	294	633													
	Crown - Fertility	**1,430**	1,261	183																	
Subtotal		**5,233**	2,046	969	953	600	570	848	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**40,865**	**8,170**	**8,809**	**7,948**	**8,220**	**6,992**	**8,904**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Implementation		**420**	**0**	**0**	**0**	**0**	**0**	**0**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**
Total Costs		**41,285**	**8,170**	**8,809**	**7,948**	**8,220**	**6,992**	**8,904**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**	**78**
Benefits																					
Cows ('000)			4,904	4,842	4,675	4,702	4,698	4,677	4,655	4,634	4,611	4,587	4,563	4,539	4,513	4,487	4,487	4,487	4,487	4,487	4,487
BW avoided loss from NZAEL BAU ($/cow)			1.05	1.08	1.11	1.13	1.16	1.18	-	-	-	-	-	-	-	-	-	-	-	-	-
BW genetic from NZAEL 4.0 ($/cow)			-	-	-	-	-	-	-	-	0.43	0.53	0.88	1.12	1.46	1.67	1.91	2.10	2.26	2.40	2.51
Benefit for BAU ($'000)		**26,412**	5,166	5,227	5,168	5,316	5,434	5,528	-	-	-	-	-	-	-	-	-	-	-	-	-
NZAEL 4.0 benefit ($'000)		**42,560**	-	-	-	-	-	-	-	-	2,002	2,428	4,034	5,071	6,583	7,506	8,587	9,430	10,155	10,784	76,209
Total Benefit		**68,973**	5,166	5,227	5,168	5,316	5,434	5,528	0	0	2,002	2,428	4,034	5,071	6,583	7,506	8,587	9,430	10,155	10,784	76,209
Net Benefit		**27,688**	**-3,004**	**-3,582**	**-2,780**	**-2,904**	**-1,558**	**-3,377**	**-78**	**-78**	**1,924**	**2,350**	**3,956**	**4,993**	**6,505**	**7,428**	**8,509**	**9,352**	**10,077**	**10,706**	**76,131**

Values	**Most likely**
NPV ($'000)	27,688
Net Benefit/Total Cost	0.7
Net Benefit/Cost DairyNZ Funding	0.8
Net Benefit $/ha/yr	2
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703



Sensitivity analysis - discount rate		
	NPV ($'000)	$/ha/yr
4%	60,232	3
12%	10,792	1

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 DNZ costs converted to 2025$ based on PPI. Includes capital expenditures and implementation costs for NZAEL 4.0 from 2027.
2 NZAEL BAU benefit (AE from LIC to NZAEL industry good) - from 10-year annual average genetic gain of $17.40, attributable to NZAEL BAU is 6% and weighted by geneflow vector from years 15 to 20 from AbacusBio.
3 NZAEL 4.0 benefit (NZAEL genomics-enabled AE) - annual gain of global genomic performance vs their baseline is 115% and NZ genomics is expected to achieve half of this increment due to its crossbred base. Attributable to NZAEL 4.0 is 27%.

Project **Better Ryegrass**

Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	Forage Value Index (FVI)	**6,778**	2,602	2,188	1,133	346	237	1,071													
	GM Forages	**1,105**	921	0	215	0	0	0													
	Pasture Breeding Accelerator programme	**355**	0	0	48	209	200	0													
	Hybrid Grass	**1,295**	690	651	2	0	0	0					0	0	0	0	0	0	0	0	0
Subtotal		**9,532**	4,214	2,840	1,398	556	437	1,071	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Co-investment	**0**	0	0	0	0	0														
Subtotal		**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**9,532**	**4,214**	**2,840**	**1,398**	**556**	**437**	**1,071**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Implementation		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Costs		**9,532**	**4,214**	**2,840**	**1,398**	**556**	**437**	**1,071**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																					
Ha ('000)			1,714	1,701	1,659	1,703	1,688	1,688	1,687	1,687	1,686	1,685	1,684	1,683	1,680	1,678	1,678	0	0	0	0
% dairy use Dairy NZ influenced			33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%	33%				
% Base			20%	19%	18%	17%	16%	15%	13%	12%	11%	10%	9%	8%	7%	6%	5%				
% BAU			80%	81%	82%	82%	83%	84%	85%	85%	86%	87%	88%	88%	89%	90%	90%				
% Accelerated Plant Breeding (APB)			0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	5%				
Base value		**26,726**	4,396	4,440	3,496	2,971	3,237	3,009	2,781	2,553	2,324	2,096	1,868	1,639	1,411	1,183	955	-	-	-	-
BAU Value		**278,281**	30,231	32,621	27,526	25,164	29,617	29,884	30,152	30,419	30,687	30,955	31,222	31,490	31,758	32,025	32,293				
APB Value (Accelerated Plant Breeding)		**848**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,490				
Net FVI benefit		**252,403**	25,836	28,180	24,029	22,192	26,379	26,875	27,371	27,867	28,363	28,859	29,355	29,851	30,346	30,842	33,828	0	0	0	0
Net Benefit		**242,871**	**21,622**	**25,340**	**22,632**	**21,636**	**25,942**	**25,805**	**27,371**	**27,867**	**28,363**	**28,859**	**29,355**	**29,851**	**30,346**	**30,842**	**33,828**	**0**	**0**	**0**	**0**

Values	**Most Likely**
NPV ($'000)	242,871
Net Benefit/Total Cost	25.5
Net Benefit/Cost DairyNZ Funding	25.5
Net Benefit $/ha/yr	15
Discount Rate	8%

Key assumptions

Aggregate effective ha million	1.703

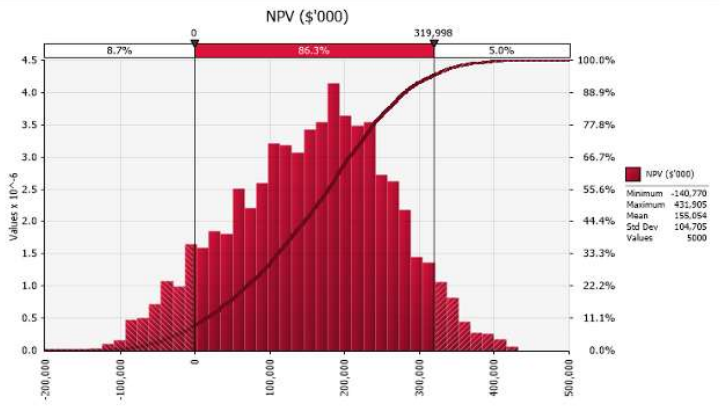
Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	309,574	14
12%	196,965	16

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 Total base for analysis is annual proprietary ryegrass seed sales
2 Benefit of $/Ha sourced from FVI lists for base and BAU and AgR assessment for APB
3 Assumed 50% utilised by dairy (industry estimate)
4 Average sowing rate of 22kg/ha (industry estimate)
5 33% influenced by Dairy NZ (3748 FVI users/11,372 farmers)
6 Total area sown is dairy seed volume/average sowing rate



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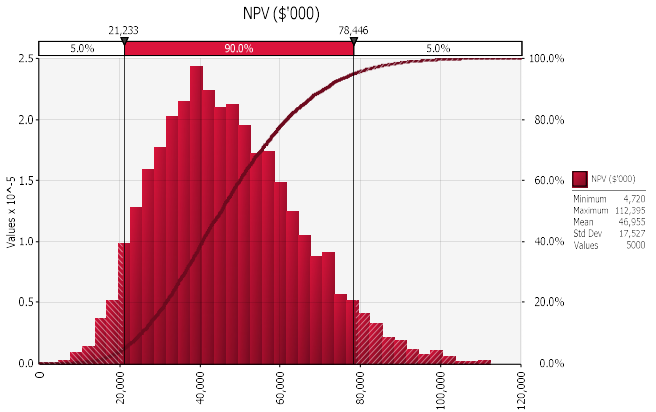
Project R&P in the Workplace

Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	R & P Attract	**5,104**	1,785	1,481	1,618	706	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R & P Retain	**7,428**	1,571	813	1,443	1,161	2,040	2,125	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**12,532**	**3,356**	**2,293**	**3,061**	**1,867**	**2,040**	**2,125**	0	0	0	0	0	0	0	0	0	0	0	0	0
Co funding	R & P Attract	**1,732**	1,459	260	21	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R & P Retain	**857**	0	356	348	288	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**2,589**	**1,459**	**616**	**369**	**306**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total R&D Costs		**15,121**	**4,815**	**2,909**	**3,430**	**2,173**	**2,040**	**2,126**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Visa application costs		**6,160**	0	4,840	1,958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Costs		**21,282**	**4,815**	**7,749**	**5,388**	**2,173**	**2,040**	**2,126**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																					
Potential labour savings all Herds			0	0	0	84,929	84,078	83,236	82,369	81,543	80,692	79,834	78,983	78,157	77,298	76,448	76,448	76,448	76,448	76,448	76,448
Adoption rate of 7%			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labour savings using MaxT		**36,297**	-	-	-	5,053	5,003	4,953	4,901	4,852	4,801	4,750	4,699	4,650	4,599	4,549	4,549	4,549	4,549	4,549	4,549
Visa Savings		**19,252**	-	15,125	6,120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefit		**55,548**	0	15,125	6,120	5,053	5,003	4,953	4,901	4,852	4,801	4,750	4,699	4,650	4,599	4,549	4,549	4,549	4,549	4,549	4,549
Net Benefit		**34,267**	**-4,815**	**7,376**	**732**	**2,880**	**2,962**	**2,826**	**4,901**	**4,852**	**4,801**	**4,750**	**4,699**	**4,650**	**4,599**	**4,549**	**4,549**	**4,549**	**4,549**	**4,549**	**4,549**

Values	**Most likely**
NPV ($'000)	34,267
Net Benefit/Total Cost	1.6
Net Benefit/Cost DairyNZ Funding	2.7
Net Benefit $/ha/yr	2
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Labour savings per milking	$27
Labour savings per herd	8,100
Number of herds	10,380
Employees per herd	2.00
Number days milking	300



Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	48,737	2
12%	25,051	2

Notes
Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

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Project **Supporting Farm Profitability**

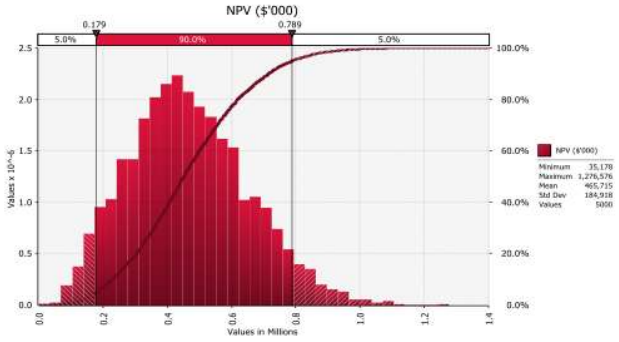
Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	Future fit farm systems	**6,976**	0	0	0	0	9,490	0													
	Step Change	**7,366**	1,519	1,190	2,081	3,702	30	0													
	Engagement & Partnership Networks	**2,644**	0	656	1,449	1,001	0	0													
	Island Hub Leads	**10,209**	10,209	0	0	0	0	0													
	FFS - Involve, Content, Connect, B2B	**22,084**	0	6,108	7,414	8,106	4,949	0													
	Monitor farms/Farmer Groups	**753**	85	90	234	485	-2	0													
	DairyBase	**9,017**	1,435	1,230	1,393	1,341	2,795	3,130													
	Baseline	**1,946**	538	471	575	602	0	0													
	Other	**3,811**	2,496	123	148	1,076	298	0													
Subtotal		**64,804**	16,282	9,868	13,295	16,313	17,559	3,130	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Industry co funders partners	**1,233**	287	216	253	229	280	209													
	BaseLine MPI	**2,425**	927	828	853	0	0														
Subtotal		**3,658**	1,213	1,044	1,106	229	280	209	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**68,463**	**17,495**	**10,912**	**14,402**	**16,541**	**17,840**	**3,339**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Implementation		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Costs		**68,463**	**17,495**	**10,912**	**14,402**	**16,541**	**17,840**	**3,339**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																					
Herds			11,034	10,796	10,601	10,485	10,380	10,276	10,169	10,067	9,962	9,856	9,751	9,649	9,543	9,438	9,438	9,438			
Farmer support for Levy invested delivering value over last year			44%	32%	32%	35%	37%	37%	37%	37%	37%	37%	37%	37%	37%	37%	37%	37%			
Total Benefit		**551,919**	74,797	53,224	52,263	56,537	59,169	58,577	57,967	57,385	56,787	56,182	55,584	55,002	54,398	53,800	53,800	53,800	0	0	0
Net Benefit		**483,457**	**57,302**	**42,312**	**37,861**	**39,996**	**41,330**	**55,238**	**57,967**	**57,385**	**56,787**	**56,182**	**55,584**	**55,002**	**54,398**	**53,800**	**53,800**	**53,800**	**0**	**0**	**0**

Values	**Most Likely**
NPV ($'000)	483,457
Net Benefit/Total Cost	7.1
Net Benefit/Cost DairyNZ Funding	7.5
Net Benefit $/ha/yr	30
Discount Rate	8%

Key assumptions

Aggregate effective ha million	1.703
Proportion of programme supporting direct financial benefits	70%
Loss avoided represented by a 1% change in efficiency index/herd	**$22,009/ha**

Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	620,172	29
12%	390,700	32



Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 DNZ costs converted to 2025$ based on PPI.
2 % Farmer support sourced from DairyNZ 1/4ly Farmer Sentiment Survey - My DairyNZ levy has been invested to deliver value to NZ dairy farmers over the last year.
3 Efficiency index per herd calculated regression between profit per farm (gross revenue minus operating expenses in 2024 terms) and an index representing farm efficiency.
This index takes values between 0 and 1, where 1 represents a fully efficient farm and any value below 1 indicates that a farm has room to adjust inputs or management practices to increase production without necessarily incurring additional expenses.
The estimates show that for a 1% change in the efficiency index, an average farm would change profit by about $22,009.
4 % of perceived value contributing to financial change estimated by DairyNZ to reflect the proportion Supporting Farm Profitability as directly profit related.

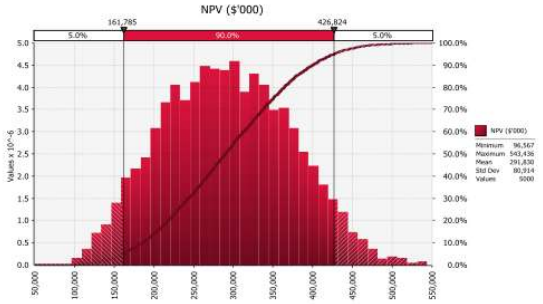
Project	On Farm Change																				
Year ($'000)		PV	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ending June			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Costs																					
DairyNZ	Catchment implementation	**3,357**	1,012	1,196	791	338	370	29													
Subtotal		**3,357**	1,012	1,196	791	338	370	29													
Leverage	Tararua (Nestle, MPI)	**866**	547	175	183	0	0														
	Sth Canterbury/Waimea (MfE)	**1,015**	0	0	20	671	299	361													
	Other	**539**	369	144	43	0	0	0													
Subtotal		**2,420**	916	319	246	671	299	361													
Total R&D Costs		**5,777**	**1,927**	**1,515**	**1,037**	**1,009**	**668**	**390**													
Total Costs		**5,777**	**1,927**	**1,515**	**1,037**	**1,009**	**668**	**390**													
Benefits																					
GMP N leach vs SR N leach benefit $/ha			192	380	331	365	317	317	317	317	317	317	317	317	317	317	317	317	317	317	317
% farm adoption 1/4ly survey/Reg requirement			44%	32%	32%	35%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%	79%
Benefit ($,000)		**365,910**	14,784	21,280	18,536	22,356	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825
Total Benefit		**365,910**	14,784	21,280	18,536	22,356	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825	43,825
Net Benefit		**360,133**	**12,857**	**19,765**	**17,499**	**21,347**	**43,157**	**43,435**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**	**43,825**

Values	**Most likely**	**Key assumptions**	
NPV ($'000)	360,133		
Net Benefit/Total Cost	62.3	Aggregate effective ha million	1.730
Net Benefit/Cost DairyNZ Funding	107.3	Catchment effective ha	0.175
Net Benefit $/ha/yr	22		
Discount Rate	8%		

Sensitivity analysis - discount rate		
	NPV ($'000)	$/ha/yr
4%	499,304	23
12%	271,460	22

Notes
Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:
1 DNZ costs converted to 2025$ based on PPI.
2 GMP N leach vs SR N leach benefit $/ha has been modelled using dairy base data for a range of GMP practices vs a simple stocking rate reduction to creat equivalent N loss reduction.
3 % Farmer support sourced from DairyNZ 1/4ly Farmer Sentiment Survey - My DairyNZ levy has been invested to deliver value to NZ dairy farmers over the last year.
4 Benefit applied to Tararuas, Selwyn-Hinds, Waimea and OTOP catchments

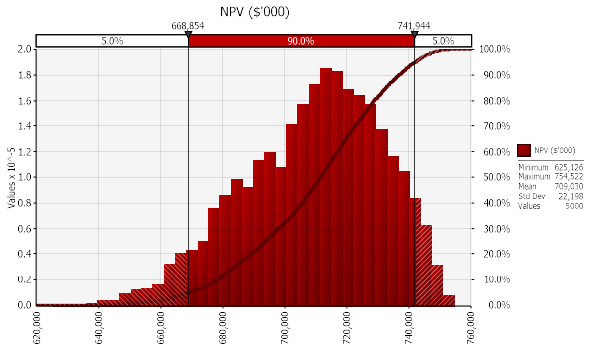


Project Strong biosecurity

Year ($'000)		PV	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
ending June			2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039
Costs																					
DairyNZ	Tbfree	**164,006**	17,811	16,378	15,567	15,180	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	14,500	42,910
	FMD readiness	**2,473**	0	0	0	0	0	252	504	504	504	504	504	504	504	504	504	504	0	0	0
	Biosecurity Systems	**12,554**	275	549	1,096	998	1,152	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517	1,517
	DEBRiEF	**859**	649	227	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**179,892**	18,735	17,154	16,662	16,178	15,652	16,269	16,521	16,521	16,521	16,521	16,521	16,521	16,521	16,521	16,521	16,521	16,017	16,017	44,427
Leverage	Tbfree Crown	**92,255**	9,771	8,692	8,665	9,053	8,427	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	8,187	24,228
	Tbfree slaughter	**119,258**	13,470	10,451	11,263	11,614	10,550	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	10,608	31,391
		0																			
Subtotal		**211,513**	23,241	19,144	19,928	20,667	18,977	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	18,795	55,620
Total R&D Costs		**391,406**	**41,976**	**36,297**	**36,590**	**36,845**	**34,629**	**35,064**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**34,812**	**34,812**	**100,047**
Other Costs - Implementation		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Costs		**391,406**	**41,976**	**36,297**	**36,590**	**36,845**	**34,629**	**35,064**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**35,316**	**34,812**	**34,812**	**100,047**
Benefits																					
Tbfree dairy benefit ($'000)		**1,139,775**	886	1,871	3,103	4,638	6,840	18,598	20,121	25,365	30,497	35,656	40,512	38,707	44,650	52,614	63,422	77,802	70,459	85,675	3,552,669
FMD readiness benefit ($'000)		**618**	0	0	0	0	0	63	126	126	126	126	126	126	126	126	126	126			
FMD response benefit ($'000)		**228**	0	0	0	0	0	47	47	47	47	47	39	39	39	39	39	39			
Mb NPMP benefit ($'000)		**1,273**	0	0	0	0	0	8	499	812	781	711	-643								
DEBRiEF avoided costs ($'000)		**197**	-	120	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Benefit		**1,142,090**	886	1,991	3,203	4,638	6,840	18,716	20,793	26,351	31,451	36,540	40,033	38,872	44,815	52,779	63,586	77,966	70,459	85,675	3,552,669
Net Benefit		**750,685**	**-41,089**	**-34,306**	**-33,388**	**-32,207**	**-27,788**	**-16,348**	**-14,523**	**-8,965**	**-3,865**	**1,224**	**4,717**	**3,556**	**9,499**	**17,463**	**28,271**	**42,650**	**35,647**	**50,863**	**3,452,622**

Values	**Most likely**
NPV ($'000)	750,685
Net Benefit/Total Cost	1.9
Net Benefit/Cost DairyNZ Funding	4.2
Net Benefit $/ha/yr	47
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703



Sensitivity analysis - discount rate		
	NPV ($'000)	$/ha/yr
4%	1,620,359	75
12%	324,029	26

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

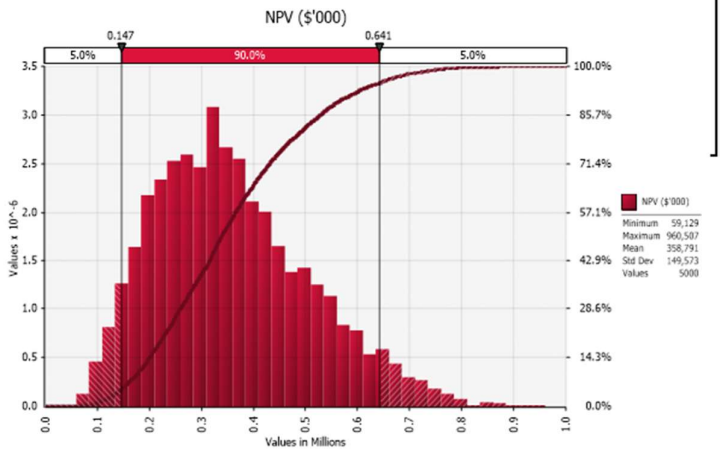
1 Tbfree benefits is dairy industry share of 11 benefit streams from OSPRI Tbfree CBA tool (status quo scenario).
2 Tbfree benefits and costs in 2039 includes cashflow stream from 2040 to 2055 in 2039 $. Commodity levy contribution of $14.5m reduce from 2039 based on OSPRI Tbfree CBA tool (status quo scenario) total costs % decline.
3 Tbfree leverage Crown funding - from $24m, deduct dairy industry share of total funding less non-paying share of benefits (i.e. landowners, NZ Public & Govt, others)
4 Tbfree slaughter is contribution from Tb slaughter levy from dairy cattle (under Tb (cattle and deer) 2016 biosecurity levy order) which is distinct from and additional to DNZ commodity levy.
5 FMD Readiness costs is $1.5m for initial year and doubled from year 2 to 11 of FMD Operational Agreement. DNZ share is: 42% of industry cost share of: 40%
6 FMD Readiness benefit is reduction of 4.2% in share of DNZ for Readiness costs due to negotiations that increased Crown funding share.
7 FMD Response benefit is reduction of 2.1% in share of DNZ for Response fiscal cap comprising of cost levels per outbreak size (small, medium, large) and weighted by probability by outbreak size by year.
8 Mb NPMP benefit is DNZ share of net savings to OSPRI funders due to moving from MPI to OSPRI. Net savings is OSPRI overhead savings less additional costs of NPMP.
Assumed 2-year delay in net savings cashflow as requiring review of the Funders Agreements. NAIT funding is fixed for a period until review in 2025/26 while Tb is currently undergoing a 10 year plan review.
9 DEBRiEF benefit is avoided response costs for FAW and Blackgrass based on DairyNZ share of industry costs which in turn is the distribution of response costs between industry and the Crown.
10 Biosecurity Systems and DEBRiEF costs are actual up to 2024/25 and budgeted for 2025/26 and estimated by DNZ from 2027 excluding FMD response which is a separate line.

Project **LowN Leaching**

Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	MBIE LowN Stock/Sys	**7,093**	1,393	1,303	1,915	1,685	1,272	851	0	0	0	0	0	0	0	0	0	0	0	0	0
	Plantain	**9,025**	1,012	1,806	1,889	2,651	2,138	1,537	0	0	0	0	0	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**16,117**	2,405	3,109	3,803	4,335	3,410	2,388	0	0	0	0	0	0	0	0	0	0	0	0	0
Co funding	MBIE LowN Stock/Sys	**4,605**	932	1,055	773	1,660	0	1,052	0	0	0	0	0	0	0	0	0	0	0	0	0
	Plantain	**8,910**	713	2,110	2,167	2,949	1,586	1,290	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**13,514**	1,645	3,165	2,940	4,609	1,586	2,342	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**29,632**	**4,050**	**6,274**	**6,743**	**8,945**	**4,995**	**4,730**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Plantain application		**32,047**	0	0	0	0	3,179	3,179	3,179	6,358	6,358	3,179	6,358	6,358	3,179	6,358	6,358	3,179	6,358	6,358	3,179
Total Costs		**61,678**	**4,050**	**6,274**	**6,743**	**8,945**	**8,174**	**7,909**	**3,179**	**6,358**	**6,358**	**3,179**	**6,358**	**6,358**	**3,179**	**6,358**	**6,358**	**3,179**	**6,358**	**6,358**	**3,179**
Benefits																					
Adoption Rates						0	9%	18%	27%	36%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%	45%
Impacted herds avoided profit loss from plantain use		**359,833**	0	0	0	0	13,254	26,509	39,763	53,018	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272
Total Benefit		**359,833**	0	0	0	0	13,254	26,509	39,763	53,018	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272	66,272
Net Benefit		**298,155**	**-4,050**	**-6,274**	**-6,743**	**-8,945**	**5,080**	**18,599**	**36,584**	**46,660**	**59,914**	**63,093**	**59,914**	**59,914**	**63,093**	**59,914**	**59,914**	**63,093**	**59,914**	**59,914**	**63,093**

Values	**Most Likely**
NPV ($'000)	298,155
Net Benefit/Total Cost	4.8
Net Benefit/Cost DairyNZ Funding	18.5
Net Benefit $/ha/yr	18.68
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Average profit per cow	$ 830.00
Difference in N leaching profit loss	9%
Total herds impacted by N Leaching regulations	3,167
Average herd size	620
Adoption rate range	9-45%



Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	466,148	22
12%	195,910	16

Notes
Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:
1 Pasture with 17-25% Ecotain Plantain in diet can reduce nitrate leaching by up to 26% Massey University trials.
2 Initial target of N leaching reduction is 20%
3 Plantain as part of pasture mix leads to a reduction in profit of 3%
4 Implementing other practices lead to a 12% drop in profit e.g. reducing N applications, lowering stock rates.
5 Difference of 9% is the potential profit loss
6 Profit per cow taken from DairyNZ statistic Report 2023-24 and is an average from 2014 to 2024

Project	Better Freshwater Policy																			
Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	Government Regulations	**159**	0	40	100	46	0	0													
	Freshwater Science	**7,429**	1,205	962	1,155	1,722	1,724	2,512					0	0	0	0	0	0	0	0	0
	Freshwater Policy / Regional Policy	**10,320**	2,226	1,981	2,289	2,357	1,887	1,527	0												
	Solutions	**1,234**	0	403	351	415	229	91													
Subtotal		**19,143**	3,431	3,386	3,895	4,541	3,839	4,130	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Government R&D Investment (NIWA, AgR)	**471**	205	103	88	68	57														
		0	0	0	0	0	0														
		0																			
Subtotal		**471**	205	103	88	68	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**19,613**	**3,636**	**3,489**	**3,983**	**4,609**	**3,896**	**4,130**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Implementation		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Costs		**19,613**	**3,636**	**3,489**	**3,983**	**4,609**	**3,896**	**4,130**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Average farm ha			155	158	156	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162	162
Farm profit ($/ha)			2,976	3,920	2,775	2,576	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062	3,062
Benefits																					
Waikato PC1 Non-Target Benefits																					
Discretionary to controlled activity		**1,067**	0	0	0	0	157	157	157	157	157	157	157	157	157	157	157	157	157	157	157
Lowest 1/4 farms not requiring a CNMA file/audit		**830**	0	0	0	0	122	122	122	122	122	122	122	122	122	122	122	122	122	122	122
Overseer five 5 yearly rather than annual		**1,854**	0	0	0	0	273	273	273	273	273	273	273	273	273	273	273	273	273	273	273
Farm freshwater plan provided rather than farm environment plan		**4,898**	0	0	0	0	721	721	721	721	721	721	721	721	721	721	721	721	721	721	721
	Sub total - Non target	**8,649**	0	0	0	0	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273	1,273
Waikato PC1 Target Benefits																					
Benefit from implementing GMP to meet limits rather than destocking		**18,859**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,426	8,986	13,546	18,106	22,666
Farms			2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
DNZ attribution			60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%	60%
Cost avoided with water regulation DIN 2.4 vs 1 (5%)		**202,742**	0	0	0	0	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838	29,838
Total Benefit		**230,250**	0	0	0	0	31,111	31,111	31,111	31,111	31,111	31,111	31,111	31,111	31,111	31,111	35,537	40,097	44,657	49,217	53,777
Net Benefit		**210,637**	**-3,636**	**-3,489**	**-3,983**	**-4,609**	**27,215**	**26,981**	**31,111**	**31,111**	**31,111**	**31,111**	**31,111**	**31,111**	**31,111**	**31,111**	**35,537**	**40,097**	**44,657**	**49,217**	**53,777**

Values	Most Likely
NPV ($'000)	210,637
Net Benefit/Total Cost	10.7
Net Benefit/Cost DairyNZ Funding	11.0
Net Benefit $/ha/yr	13
Discount Rate	8%

Key assumptions	
Waikato effective ha million	0.3744
National effective ha million	1.703

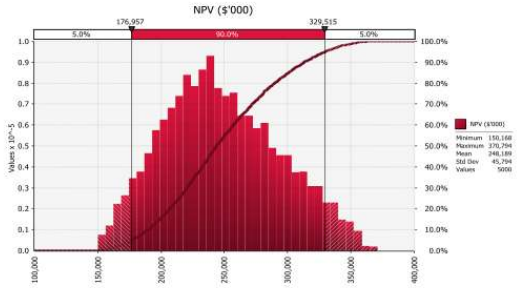
Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	321,272	15
12%	143,136	12

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 Waikato PC1 Non-Target benefits totalled and then assumed to arise over 10 year period with same return cycle starting in 2025 with PC1 implementation
2 Assumed no benefit in first 10 years post 2025 for GMP vs SR as GMP covers this for first 10 years, with only a destock benefit post interim period
3 Benefits have been developed for the Waikato region as they were quantifiable. This underestimates the potential national benefit.
4 Plan impementation assumed in 2025
5 Cost avoided from water regulation with 2.4 vs 1 is asumed to be 5% of farm profit



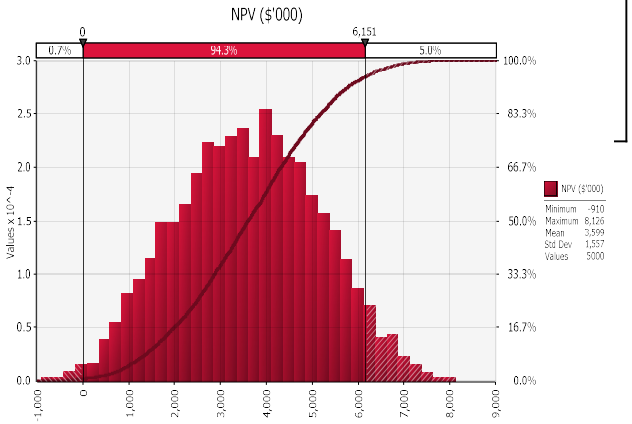
Nimmo-Bell & ASSOCIATES
A Division of Prime Consulting International Ltd

Project **Wintering**

Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	SDH Farm Systems	**4,251**	1,209	1,229	1,002	87	933	428	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wintering Infra/build	**1,176**	121	131	203	784	187	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FB/Sustainable	**311**	172	90	63	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	National Wintering	**1,179**	0		679	479	175	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aparima	**475**	443	35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Southern Wintering	**459**	267	207	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**7,764**	2,213	1,691	1,947	1,353	1,295	428	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	SDH Farm Systems	**123**	9	70	26	29	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Wintering Infra/build	**950**	123	161	212	90	578	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	FB/Sustainable	**356**	142	41	198	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	National Wintering	**18**	0	0	17	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Aparima	**13**	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Southern Wintering	**21**	0	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**1,481**	287	295	453	130	583	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**9,245**	**2,500**	**1,986**	**2,400**	**1,483**	**1,878**	**428**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs		**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Costs		**9,245**	**2,500**	**1,986**	**2,400**	**1,483**	**1,878**	**428**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benefits		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Benefits		**14,010**	0	0	0	9,915	1,083	1,083	1,083	1,083	1,083	1,083	1,083	1,083	1,083	1,083	1,083	0	0	0	0
Total Benefit		**14,010**	**0**	**0**	**0**	**9,915**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**0**	**0**	**0**	**0**
Net Benefit		**4,765**	**-2,500**	**-1,986**	**-2,400**	**8,432**	**-795**	**656**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**1,083**	**0**	**0**	**0**	**0**

Values	**Most Likely**
NPV ($'000)	4,765
Net Benefit/Total Cost	0.5
Net Benefit/Cost DairyNZ Funding	0.6
Net Benefit $/ha/yr	0.30
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Consents cost range b/w $6-10k	
Annual consent costs	$ 800
# Herds wintered	2,708



Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	7,348	0
12%	2,958	0

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

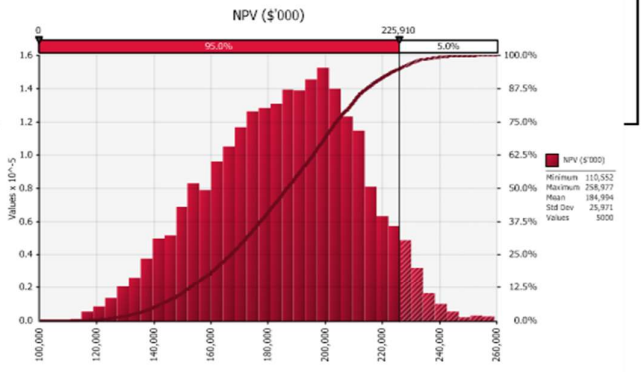
1 Initial cost of Farm Environment plan $8,500
2 Annual cost $800
3 Attribution rates high at 85%. Survey results showed farmers have shown voluntary change rather than be regulated
4 Benefit is that no costs are incurred because of Good Farm Practices e.g. Catch crops, back fences, portable troughs etc.
5 Dairy Herds were used in areas where wintering on crops is a common practice, total of 2,708.
6 All dairy farms have a plan by 2030

Project **Reducing GHG**

Year ($'000) ending June		PV	0 2021	1 2022	2 2023	3 2024	4 2025	5 2026	6 2027	7 2028	8 2029	9 2030	10 2031	11 2032	12 2033	13 2034	14 2035	15 2036	16 2037	17 2038	18 2039
Costs																					
DairyNZ	Climate Change	**5,448**	1,284	1,885	1,590	786	341	266	0	0	0	0	0	0	0	0	0	0	0	0	0
	RGP	**1,400**	0	821	585	0	0	203	0	0	0	0	0	0	0	0	0	0	0	0	0
	Future GHG	**996**	0	75	673	250	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	He Waka Eke Noa	**961**	377	433	123	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**8,805**	1,661	3,214	2,971	1,135	546	469	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Climate Change	**110**	0	73	1	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**110**	0	73	1	52	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**8,915**	**1,661**	**3,287**	**2,972**	**1,187**	**546**	**469**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Other Costs - Implementation		**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total Costs		**8,915**	**1,661**	**3,287**	**2,972**	**1,187**	**546**	**469**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																					
Cow numbers		**0**	0	4,842	4,675	4,702	4,698	4,677	4,655	4,634	4,611	4,587	0	0	0	0	0	0	0	0	0
Total cost methane		**0**	0	61,979	59,837	60,180	60,128	59,869	59,584	59,317	59,022	58,714	0	0	0	0	0	0	0	0	0
Net Methane saving		**164,921**	0	27,271	26,328	26,479	26,456	26,342	26,217	26,099	25,970	25,834	0	0	0	0	0	0	0	0	0
Total cost N02		0	0	15,495	14,959	15,045	15,032	14,967	14,896	14,829	14,756	14,678	0	0	0	0	0	0	0	0	0
Net Nitrous Oxide Saving		**41,230**	-	6,818	6,582	6,620	6,614	6,586	6,554	6,525	6,492	6,458	0	0	0	0	0	0	0	0	0
Total Benefit		**206,152**	**0**	**34,089**	**32,910**	**33,099**	**33,070**	**32,928**	**32,771**	**32,624**	**32,462**	**32,292**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Net Benefit		**197,237**	**-1,661**	**30,802**	**29,938**	**31,912**	**32,524**	**32,459**	**32,771**	**32,624**	**32,462**	**32,292**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Values	Most Likely
NPV ($'000)	197,237
Net Benefit/Total Cost	22.1
Net Benefit/Cost DairyNZ Funding	22.4
Net Benefit $/ha/yr	12.36
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Cow numbers from DairyNZ forecasts	
Cost of methane ($/kg MS) from HWEN case studies	$ 0.032
Cost of N2O ($/kg/MS) from HWEN case studies	$ 0.008
Attribution to DairyNZ	45%



Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	235,586	11
12%	167,626	14

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

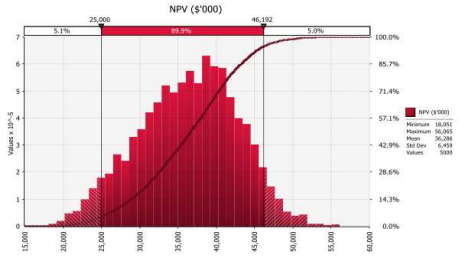
1 Cost of CH4 and N20 from HWEN Case Studies Waikato/BoP and Canterbury, they are net of all costs and an ave from the case studies
2 Attribution 45% rate based on work done supporting farmers and other primary industry organisations
3 Kg MS per cow and cow numbers taken from DairyNZ Economic Survey 2023/24
4 Cow numbers forecast numbers from DairyNZ Economic Survey 2023/24
6 Analysis to 2030 when ETS requirements change to 10% reduction against 2017 levels. This assumes no further changes to Central Government and policies
7 Annual reductions of CH4 & N2O have been just under 1% for the last five years

Project **Reducing GHG - Extended**

Year ($'000) ending June		PV	0 2003	1 2004	2 2005	3 2006	4 2007	5 2008	6 2009	7 2010	8 2011	9 2012	10 2013	11 2014	12 2015	13 2016	14 2017	15 2018	16 2019	17 2020	18 2021	19 2022	20 2023	21 2024	22 2025	23 2026	24 2027	25 2028	26 2029	27 2030	28 2031	29 2032	30 2033	31 2034	32 2035	33 2036	34 2037	35 2038	36 2039
Costs																																							
DairyNZ	Climate Change	**1,363**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,284	1,885	1,590	786	341	266	0	0	0	0	0	0	0	0	0	0	0	0	0
	RGP	**350**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	821	585	0	0	203	0	0	0	0	0	0	0	0	0	0	0	0	0
	Future GHG	**249**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	75	673	250	206	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	He Waka Eke Noa	**241**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	377	433	123	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	PGGRC	**9,756**	651	938	910	875	848	800	751	1,311	638	713	855	960	1,125	1,265	1,485	1,304	1,270	994	983	452	32	43	70	0													
Subtotal		**11,960**	651	938	910	875	848	800	751	1,311	638	713	855	960	1,125	1,265	1,485	1,304	1,270	994	2,643	3,666	3,003	1,178	616	469	0	0	0	0	0	0	0	0	0	0	0	0	0
Leverage	Climate Change	**273**	0	0	0	0	0	0	0	0	0	0	0	0	0	20	34	0	382	69	284	130	0	68	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**273**	0	0	0	0	0	0	0	0	0	0	0	0	0	20	34	0	382	69	284	130	0	68	1	50	0	0	0	0	0	0	0	0	0	0	0	0	0
Total R&D Costs		**12,233**	651	938	910	875	848	800	751	1,311	638	713	855	960	1,125	1,285	1,519	1,304	1,652	1,064	2,927	3,796	3,003	1,245	617	519	0	0	0	0	0	0	0	0	0	0	0	0	0
Other Costs - Implementation		**0**																			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Costs		**12,233**	651	938	910	875	848	800	751	1,311	638	713	855	960	1,125	1,285	1,519	1,304	1,652	1,064	2,927	3,796	3,003	1,245	617	519	0	0	0	0	0	0	0	0	0	0	0	0	0
Benefits																																						
Cow numbers		**0**																				4,842	4,675	4,702	4,698	4,677	4,655	4,634	4,611	4,587	0	0	0	0	0	0	0	0	0
Total cost methane		**0**																				61,979	59,837	60,180	60,128	59,869	59,584	59,317	59,022	58,714	0	0	0	0	0	0	0	0	0
Net Methane saving		**41,271**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27,271	26,328	26,479	26,456	26,342	26,217	26,099	25,970	25,834	0	0	0	0	0	0	0	0	0
Total cost N02		0																				15,495	14,959	15,045	15,032	14,967	14,896	14,829	14,756	14,678	0	0	0	0	0	0	0	0	0
Net Nitrous Oxide Saving		**10,318**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,818	6,582	6,620	6,614	6,586	6,554	6,525	6,492	6,458	0	0	0	0	0	0	0	0	0
Total Benefit		**51,589**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34,089	32,910	33,099	33,070	32,928	32,771	32,624	32,462	32,292	0	0	0	0	0	0	0	0	0
Net Benefit		**39,357**	-651	-938	-910	-875	-848	-800	-751	-1,311	-638	-713	-855	-960	-1,125	-1,285	-1,519	-1,304	-1,652	-1,064	-2,927	30,293	29,907	31,854	32,453	32,409	32,771	32,624	32,462	32,292	0	0	0	0	0	0	0	0	0

Values	**Most Likely**
NPV ($'000)	39,357
Net Benefit/Total Cost	3.2
Net Benefit/Cost DairyNZ Funding	3.3
Net Benefit $/ha/yr	2.47
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Cow numbers from DairyNZ forecasts	
Cost of methane ($/kg MS) from HWEN case studies	$ 0.032
Cost of N2O ($/kg/MS) from HWEN case studies	$ 0.008
Attribution to DairyNZ	45%



Sensitivity analysis - discount rate		
	NPV ($'000)	$/ha/yr
4%	102,518	4.76
12%	14,130	1.14

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 Cost of CH4 and N20 from HWEN Case Studies Waikato/BoP and Canterbury, they are net of all costs and an ave from the case studies
2 Attribution 45% rate based on work done supporting farmers and other primary industry organisations
3 Kg MS per cow and cow numbers taken from DairyNZ Economic Survey 2023/24
4 Cow numbers forecast numbers from DairyNZ Economic Survey 2023/24
6 Analysis to 2030 when ETS requirements change to 10% reduction against 2017 levels. This assumes no further changes to Central Government and policies
7 Annual reductions of CH4 & N2O have been just under 1% for the last five years
8 Cost from 2003 have been converted to 2025$

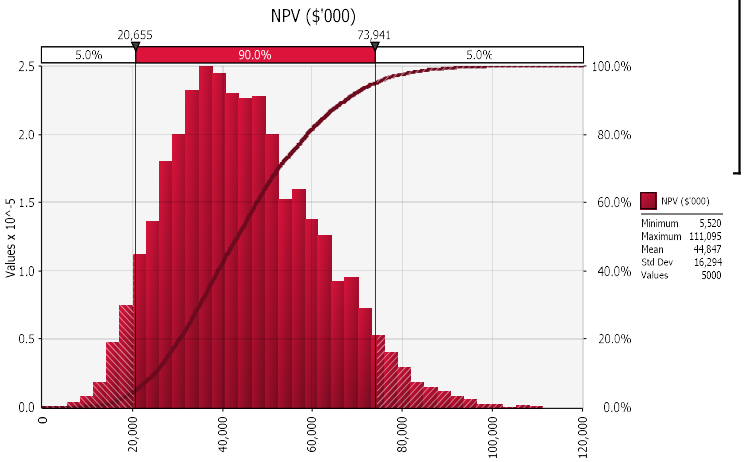
Nimmo-Bell & ASSOCIATES
A Division of Prime Consulting International Ltd

Project R&P in the Workplace

Year ($'000) ending June		PV	0 2020	1 2021	2 2022	3 2023	4 2024	5 2025	6 2026	7 2027	8 2028	9 2029	10 2030	11 2031	12 2032	13 2033	14 2034	15 2035	16 2036	17 2037	18 2038	19 2039
Costs																						
DairyNZ	R & P Attract	**4,533**	211	1,532	1,389	1,532	675	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R & P Retain	**5,048**	0	1,348	762	1,366	1,110	799	1,114	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**9,580**	**211**	**2,880**	**2,151**	**2,899**	**1,785**	**799**	**1,114**	0	0	0	0	0	0	0	0	0	0	0	0	0
Co funding	R & P Attract	**2,711**	0	1,534	1,258	234	20	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	R & P Retain	**1,859**	0	1,142	93	371	324	275	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Subtotal		**4,570**	**0**	**2,676**	**1,352**	**605**	**344**	**292**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Total R&D Costs		**14,150**	**211**	**5,556**	**3,503**	**3,504**	**2,129**	**1,091**	**1,115**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Visa application costs		**5,704**	0	0	4,840	1,958	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Costs		**19,854**	**211**	**5,556**	**8,343**	**5,462**	**2,129**	**1,091**	**1,115**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Benefits																						
Potential labour savings all Herds			0	0	0	0	84,929	84,078	83,236	82,369	81,543	80,692	79,834	78,983	78,157	77,298	76,448	76,448	76,448	76,448	76,448	76,448
Adoption rate of 7%			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Labour savings using MaxT		**33,608**	0	-	-	-	5,053	5,003	4,953	4,901	4,852	4,801	4,750	4,699	4,650	4,599	4,549	4,549	4,549	4,549	4,549	4,549
Visa Savings		**17,826**	-	-	15,125	6,120	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Staff retention savings 3-in-2		**1,930**	147	326	248	209	275	170	169	167	165	163	162	160	158	157	155	155	155	-	-	-
				-	-	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Benefit		**53,363**	147	326	15,373	6,329	5,328	5,173	5,121	5,068	5,017	4,965	4,912	4,859	4,809	4,756	4,703	4,703	4,703	4,549	4,549	4,549
Net Benefit		**33,510**	**-64**	**-5,230**	**7,030**	**866**	**3,199**	**4,082**	**4,006**	**5,068**	**5,017**	**4,965**	**4,912**	**4,859**	**4,809**	**4,756**	**4,703**	**4,703**	**4,703**	**4,549**	**4,549**	**4,549**

Values	**Most likely**
NPV ($'000)	33,510
Net Benefit/Total Cost	1.7
Net Benefit/Cost DairyNZ Funding	3.5
Net Benefit $/ha/yr	2.0
Discount Rate	8%

Key assumptions	
Aggregate effective ha million	1.703
Labour savings per milking	$27
Labour savings per herd	8,100
Number of herds	10,380
Employees per herd	2.00
Number days milking	300



Sensitivity analysis - discount rate	NPV ($'000)	$/ha/yr
4%	49,351	2.2
12%	23,649	1.9

Notes

Benefits are estimated net of all costs but before tax and excluding GST as taxes are a transfer to other sectors of the economy

Assumptions:

1 Adoption rate of 7% given existing uptake
2 Staff per milking provided from DairyNZ tech survey 2023
3 Hourly rates pertain to dairy staff, no account taken for Managers, share milkers or owners who would be on higher wages
4