Ministry for Primary Industries
Manatū Ahu Matua

INNOVATE/ ACCELERATE

TRANSFORMING THE DAIRY VALUE CHAIN
PRIMARY GROWTH PARTNERSHIP PROGRAMME

Ministry for Primary Industries
Manatū Ahu Matua

Dairy for life

CONTENTS

Collaboration in practice	2
United we stand – and prosper	3
Savvy people	4
Green shoots of innovation	5
Building a better future	6
It's about people as well	7
We're working on the value chain, gang	8
Good health is good business	10
More value in the pipeline	11
Pumping new products, markets	12
To the future…	13

Government has an ambitious plan to double the value of primary sector exports by 2025.

Meeting that target is going to require a step-change in thinking and a serious investment in lifting capability, capacity and value across New Zealand's primary industries.

The Ministry for Primary Industries (MPI) is working hand-in-hand with industry to invest in a number of Primary Growth Partnership (PGP) programmes that enable and promote game-changing research and innovation across the sector. The objective is to accelerate thinking and make the kind of progress for the New Zealand economy that might not have been possible without that combined, collaborative effort.

COLLABORATION IN PRACTICE

In 2011, MPI, Livestock Improvement Corporation, Fonterra, and DairyNZ joined forces with other industry players including Zespri, Agricultural Services Limited, Landcorp and New Zealand Young Farmers to invest in a seven-year, $170 million PGP programme called Transforming the Dairy Value Chain. This programme is further boosting the efficiency, health and production of New Zealand farms and farmers, supporting vital environmental goals and enabling the dramatic yet sustainable diversification of the industry's consumer products. The vision is that the benefits of this work will be worth $2.7 billion a year by 2020.

The programme has five themes of dedicated research and innovation right along the value chain, from the paddocks and milking dairies to universities, research labs, product development and production.

It's not just about making more money or only supporting farmers. Some of the investment is directed towards the country's smaller farms and much of it is building capability and capacity in the nation's rural and research communities.

This is an evolving story but the benefits so far have been many and far-reaching.

UNITED WE STAND – AND PROSPER

The real value in New Zealand's dairy industry is the combined sum of its many productive parts. It's one of the greatest successes of the Transforming the Dairy Value Chain PGP programme: Farmers, scientists, industry groups, service providers and the government working together in sometimes unprecedented partnerships to make a difference.

Two of the five programme themes are building innovation, capability and capacity on dairy farms across the nation. They include applied phenotypic and genetic research for pasture improvement and the cows grazing on it. Farmers and their wellbeing are an important focus too, as are the farming systems, tools and technologies they employ to improve productivity and profitability.

The programme's Train the Trainer schemes are for rural professionals, consultants who offer important advice to farmers and PGP-supported networks. Farmer capability is being boosted, as is agricultural education and opportunities for the young. All of this is building a pipeline of talented workers and future industry leaders.

Tradition and transformation – it's about trading on our competitive advantage in pastoral farming and targeting new horizons and markets in places like Shanghai.

SAVVY PEOPLE

Some of the world's top researchers and scientists in labs and universities around New Zealand and the globe are involved in the programme, accelerating our knowledge of food structure design, processing technology and nutrition and health. They are turning the efforts of the farmers in the earlier part of the chain into higher-return, value-add products for new and growing markets.

Farmers understand the value of that post-farm gate work, just as those charged with product and process innovation understand the need for high-quality source material – milk.

That partnership is a key part of the campaign, says DairyNZ chief executive Tim Mackle.

"Transformation is all about innovation – and that needs to happen behind the farm gate as well as in our products if we are to boost our export competitiveness. All the work we do is aimed at lifting our industry's ability to deliver regional and national economic gains at a faster pace." – *Tim Mackle*

GREEN SHOOTS OF INNOVATION

It's no good building state-of-the-art farms and factories to make the most out of our pasture-based rural economy if the grass doesn't cut it. That's why pasture performance is an important part of an on-farm $98 million investment by the Transforming the Dairy Value Chain PGP programme.

PASTURE

The programme is enabling exhaustive, long-term science to find elite grasses that are persistent, productive and bounce back quicker from droughts. The programme is also developing new tools to help farmers improve pasture management, potentially worth about $1 billion a year to the New Zealand economy.

GENETICS

Transforming the Dairy Value Chain has supported cutting-edge genetic and phenotypic research by LIC and DairyNZ to boost the resilience and productivity of the national dairy herd and give farmers access to more accurate breeding products that are also quicker to market.

Some of this research has never before been attempted in New Zealand and is so complex that it needs the might of the most powerful computers in the country to work through mind-boggling genetic variations. It has also been used by the University of Auckland to further its own study of human genetic disorders.

Benefits of this research and other work include an increase in tolerance to facial eczema and fewer 'empty' cows at calving, which is already delivering $2 million a year to farmers. It also means a boost in the annual rate of change in Breeding Worth, an industry-recognised value which ranks breeding cattle in traits such as milk production and fertility. A change in that value of just a fraction of a per cent can equal many millions of dollars to the industry and economy.

Other projects under the Transforming the Dairy Value Chain PGP programme look to raise the national dairy herd's milk production while making them more efficient at turning grass into milk.

NUTRIENT AND EFFLUENT MANAGEMENT

Transforming the Dairy Value Chain programme partner DairyNZ is working to boost riparian, nutrient and effluent management around the country. As a result, every region now has a regionally-tailored riparian planting guideline developed in conjunction with regional councils. This will help farmers meet goals under the National Policy Statement on Freshwater Management.

More than 100 rural professionals, primarily in fertiliser companies, are now certified as nutrient management advisers and over 20 companies are accredited for effluent system design, providing farmers with advice on how to manage nutrients and effluent in an effective and profitable way.

As a result, 8600 nutrient budgets have been processed and 75 per cent of farmers have a plan in place to manage Nitrogen impacts.

Effluent discharges have hit a record low as well, with significant non-compliance down to just 5 per cent, from 15 per cent a few years ago.

This work has delivered many of the Sustainable Dairying: Water Accord targets agreed with industry partners including DairyNZ, dairy companies and the Dairy Companies Association of New Zealand.

PGP investment into gene-sequencing research is rapidly improving the national dairy herd, making cattle more productive.

The world still loves our cheese but they are also very interested in our creams, yoghurts, UHT products and other beverages.

BUILDING A BETTER FUTURE

New Zealand is an innovator, we've had to be. As a small dairy producer at the bottom of the planet we've never been able to rely solely on our pasture-based farming system for our competitive advantage.

We pioneered refrigerated transport to get our perishable product to market and now we must meet the challenge once more. We must innovate and accelerate.

That means building on the basic commodity backbone to produce a new body of higher-return, value-add products in a huge global market seeking food and dairy products to support longer, healthier lifestyles. The Transforming the Dairy Value Chain PGP programme is playing a vital role in this.

Joint investment and collaboration has helped New Zealand R&D compete against some of the world's largest countries and corporations.

And this is delivering different ways of doing things and exciting new products.

On-farm, Transforming the Dairy Value Chain has accelerated our understanding and use of genetic improvement and pasture management. It is also transforming how farmers and rural professionals store and analyse many streams of data, delivering new opportunities in genetics, management and production from various sources of information.

It's letting us look into the future, with one project studying what lies ahead for dairy products and what the industry might need to do to catch-up and become the global leader. It is giving us valuable insights into changing consumer demands involving sustainability, point of origin and taste preferences.

Beyond the farm gate the Transforming the Dairy Value Chain PGP programme is creating new, innovative processing systems and building the platform for new products.

It has accelerated the science and innovation needed to produce high-quality mozzarella in six hours (rather than the traditional three months) and other possible advances that could make hundreds of millions of dollars for New Zealand's economy, in a global market worth $36 billion.

The PGP investment has allowed partners to collaborate with some of the world's best food and dairy scientists to create new products and processing systems, such as milk-fingerprinting, which won a national award for innovation. It allows inexpensive, fast data collection and analysis of milk production that will help Fonterra direct more of its farmers' milk into premium-value products.

The Transforming the Dairy Value Chain PGP programme is involved in industry-leading science and innovation, including milk fingerprinting, which won this New Zealand Innovators award.

That work will also support PGP investment into value-added products, improved new creams, yoghurts, UHT products and other beverages. It also backs the scientific research around health benefits and branding of those products.

IT'S ABOUT PEOPLE AS WELL

Cutting-edge science is great, innovative new on-farm tools and technologies are fantastic, but you need talented people to do the research and use those tools. The Transforming the Dairy Value Chain PGP programme is investing in this as well.

On farms, in the offices of rural professionals and companies, in our schools, research labs and universities, PGP support is building knowledge, capacity and the capability to make change.

NETWORKS MATTER

Transforming the Dairy Value Chain has built and backed numerous networks to connect the rural community, including the Rural Business Network, Professional Land Managers and SMASH (Smaller Milk and Supply Herds). They pass on the message of innovation and the means to make it happen. A recent SMASH survey showed that nearly three-quarters of farmers left one of their events with at least one action to make their farm management more effective.

The PGP programme is supporting people like Cameron Mitchell, from the University of Auckland, who is researching the impact of dairy products on muscle metabolism.

GROWING OUR CHILDREN

The programme is also nurturing a pipeline of future dairy workers and leaders through a partnership with NZ Young Farmers and their projects AgriKids and TeenAg. Through these schemes and in conjunction with work at schools and on the education curriculum, more than 9000 children have connected with agriculture and its many career possibilities.

MĀORI AGRI-BUSINESS

Investment is also focused on tapping the huge potential of Māori in agriculture through research on their participation in the industry and possible strategies on how to get them more involved in rural careers.

GROWING PROFITABILITY

Strengthening farm business management capability has been driven through a partnership between Massey and Lincoln Universities.

Transforming the Dairy Value Chain has established a centre of excellence to provide scholarships, research and training at tertiary and post graduate levels and beyond to professional development.

Farms that move their capability from average to excellent are able to improve their profitability by $1000 per hectare.

TRAIN THE TRAINER

One of the programme's most important campaigns is the Train the Trainer project. DairyNZ research suggests it could potentially be worth an additional $50,000 per farm per year. That could make a big difference in tough times.

This part of the programme is upskilling rural professionals on everything from stock breeding to effluent management and animal and staff welfare.

It's in the numbers:

- More than 2500 plans provided to farmers as of February 2016.
- More than 100 certified Nutrient Management Advisors operating across the country, including half of the fertiliser industry.
- Close to 160 rural professionals are now Sustainable Milk Plan Advisors and able to assist in highly nutrient-sensitive catchments.
- 200 trained in Farm Dairy Effluent System Design; nearly 200 trained in pond design and construction.
- More than 250 Certified Body Condition Score assessors able to give high-quality, quantifiable advice to the industry on keeping animals healthy and productive.

Other on-farm projects in the Transforming the Dairy Value Chain PGP programme are supporting more productive relationships with farm staff and local authorities.

The impact of PGP investment is just as profound in the country's universities and research labs - about 60 of our best and brightest students are being supported in cutting-edge research on new technologies and products.

They are working with some of the best scientists in this country and around the world, largely thanks to the Transforming the Dairy Value Chain PGP programme. The results are not only new products but a substantial number of publications and a higher level of learning that lifts their reputations and that of New Zealand's dairy research institutions.

WE'RE WORKING ON THE VALUE CHAIN, GANG

BIG AMBITION, BIG COMMITMENT

A world-leading partnership between government and industry that is growing capability on farm and beyond and developing new products to boost the dairy industry and economy

$170 M
TOTAL INVESTMENT

$2.7 B
Goal for boost to economy every year

7 YRS
Length of programme

$85 M
Each from MPI and industry

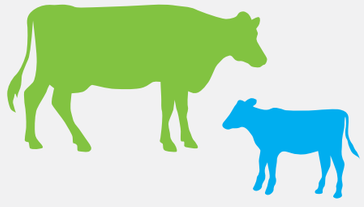
$98 M
Pre farm-gate investment

$72 M
Post farm-gate investment

SUCCESS – IT'S IN OUR DNA

The industry is earning many millions from advanced research by LIC into the genetics of the national dairy herd

20 MILLION
GENETIC MARKERS TARGETED IN NATIONAL DAIRY HERD



120,000+
Genotyped animals in LIC database

$15 M
Value to industry every year of promoting good genes and removing bad ones

6 PATENTS FILED

MANAGING BETTER RETURNS

Part of the PGP capability drive is about improving on-farm management and advice. Research shows this can be worth a lot of money to the industry

3000
NUMBER OF FARM PLANS DELIVERED TO IMPROVE FARM MANAGEMENT

$1000
Potential return per hectare for farmers who go from average to excellent management

$50,000
Money farmers could make each year if they adopted Train the Trainer initiatives

BOTTOM-LINE BOOST

Fonterra is putting more and more milk into higher return, value-added products, and the benefits are showing on the balance sheet

$409 M
2016 INTERIM PROFIT

235 MILLION LITRES
Extra milk put into value-added business

108%
Growth in profit for consumer/ food service

353% & 230%
Increases in profit from China and Oceania

PRODUCTIVE, HEALTHY PEOPLE

It's also about building the numbers and talent-base in our dairy workforce, and keeping them safe, happy and producing

9000
CHILDREN INTRODUCED TO AGRICULTURE CAREER POSSIBILITIES THROUGH TDVC PGP

60
Students whose research is supported by PGP

$3 M
Spent on mental health and well-being initiatives

3000
Farmers at Health PitStops

440
Rural professionals trained in mental health awareness

$100 M
Annual cost to industry of fatigue and stress

AND A HEALTHY PLANET TOO

The programme is helping farmers grow their production while limiting the impact on the environment

100%
DAIRYING REGIONS WITH TAILORED RIPARIAN PLANTING GUIDELINES

8,600
Nutrient budgets processed (75% of industry)

117
Certified nutrient management advisers

50%
Fertiliser industry certified

5.8%
Significant non-compliance for dairy effluent discharges – lowest on record

NEW PRODUCTS AND POSSIBILITIES

The PGP investment has enabled the creation and development of exciting new products that are making money for the dairy industry. Just one of those success stories is Fonterra's mozzarella

6 HRS
HOW LONG IT TAKES TO MAKE THE NEW, NATURAL INDIVIDUAL QUICK FROZEN MOZZARELLA

THREE MONTHS
How long it takes for the traditional product

130 M
Cakes topped with Anchor Cream each year

3 M
Milk finger prints each year to measure quality

$72 M
Expansion to Fonterra's Clandeboye site on back of product advances

300 M
Pizzas topped with the new mozzarella each year

Thousands of farmers have been through Health PitStops, an important initiative to help keep the industry healthy and productive.

GOOD HEALTH IS GOOD BUSINESS

The Transforming the Dairy Value Chain is investing in building a talented, educated workforce on the nation's farms and in its universities, labs and factories.

None of that will matter, however, if that workforce doesn't remain fit and healthy, physically and mentally. That extends to its livestock, as well as the rigorous scientific work being done to support health benefits on new and existing value-added products.

HEALTH AND WELL-BEING

The programme has invested about $3 million in a number of initiatives to raise the well-being and mental health of the rural community. It is working with a range of other organisations, including the health sector, New Zealand Institute for Rural Health, the Dairy Women's Network, Federated Farmers, universities and AgResearch to develop and deliver a range of wellness initiatives aimed at reducing fatigue and stress on dairy farms.

PGP investment has built strong capability in this area, with 440 rural professionals receiving mental-health training. In a survey conducted after the training, nearly a third of those who attended the workshops said they used what they had learned to help others under stress.

The programme has delivered Health PitStops to more than 3000 farmers since 2011. This has raised awareness of wellbeing and highlighted concerns about the high levels of stress, fatigue, burn-out and cardiovascular risk in the workforce.

It is estimated that fatigue and stress could be costing the industry more than $100 million annually.

ANIMAL HEALTH

It's vital that our livestock are healthy and productive. Certified Body Condition Scoring (BCS) advisory services provide farmers with a relatively easy and standardised way to assess the condition of the country's national dairy herd.

More than 250 rural professionals around the country, including many of the nation's vets, are now certified BCS assessors, meaning they can give farmers high-quality advice about the health, productivity and breeding prospects of their livestock. Cow condition is key for animal and reproductive health, with potential gains from improved fertility alone being at least $500 million a year.

DESIGN-THINKING

Transforming the Dairy Value Chain has also accelerated research into the best design of barns and other off-paddock facilities. It has held a number of workshops around the country and created tools and best-practice design documents for the industry and rural professionals.

FEEDING MINDS

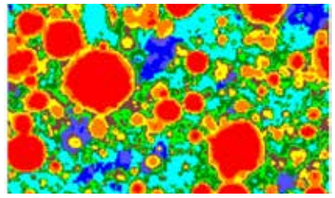
Universities around the globe and in sites such as Fonterra's Research and Development Centre in Palmerston North are studying the benefits of dairy ingredients and products in cognitive development of the young and mobility of the not-so-young.

Their research is backing the impact of dairy in a healthy diet and lifestyle. It is also benefiting the industry and national economy by supporting new and existing products in a challenging regulatory environment, and helping to boost sales in New Zealand and around the world.

All of this will be essential in a global marketplace where consumers are increasingly interested in food safety and quality, the origin of products, how they are grown and processed, and the sustainability and ethical quality of production and supply lines.

MORE VALUE IN THE PIPELINE

Just as you have to walk before you can run, you won't get far with that exciting new dairy product if you don't have the processes in place to produce it.



Raman Spectroscopy allows researchers to analyse images of food structures like this one and have a clearer picture of the composition of that structure and how changes impact on it. This is a great help in designing new products.

That's why the Transforming the Dairy Value Chain PGP programme has invested millions into advancing research into new tools to ensure consistent, high-quality products.

WINNING FINGERPRINT

Fonterra's award-winning milk-fingerprinting innovation is a good example of the cutting-edge science that would not have been possible without collaborative investment through the Transforming the Dairy Value Chain programme.

This near-real time testing process can provide more information on the composition of milk than ever before, with a massive cost saving – more than 99 per cent in some cases.

In New Zealand it could help the industry extract a premium price from its milk by better aligning farm supply with certain products and factories.

LASERS AND FOOD STRUCTURES

Through PGP investment, Fonterra scientists, supported by some of the country's bright young researchers in places such as the University of Auckland and the University of Otago, are developing new techniques and technologies, some of which have never before been used by the dairy industry.

One of those is Raman Spectroscopy, which dairy scientists use to analyse high-resolution laser images of different foods. It gives them a clearer picture of changes in the composition of food structures, which is a big help in designing new products.

FINDING THE SWEET SPOT

Real-time processing is another PGP-supported innovation. It's the result of many years of exhaustive study and analysis of factory processing data. Scientists believe it will help the industry find the "sweet spot" in milk-powder manufacturing that produces more premium-quality product.

MILK AND KIWIFRUIT

New Zealand kiwifruit exporter Zespri is also benefiting as a partner in the food structure component of the Transforming the Dairy Value Chain PGP programme. Zespri is working with scientists at Massey University on research that looks to maximise the potential of radio frequency (RFID) temperature logging by understanding the impacts time and temperature have on fruit softening. By developing sophisticated fruit-softening models and exploring food physics-based measurement technology, the programme hopes to deliver a suite of tools to help optimise inventory management in the supply chain.

There is innovation of processes on farm too. As part of the transformation of the industry DairyNZ is using the PGP investment to create new tools to help farmers better manage nutrient-intake and effluent output, as well as staff relations. They are harnessing video technology and creating apps to help farmers and other rural professionals run more productive, safe and sustainable businesses.

Fonterra R&D Programme Manager Steve Holroyd holds a portable milk fingerprinting machine, an award-winning innovation that allows inexpensive, near-real time milk testing.

Fonterra's development of a mozzarella that can be produced in six hours rather than close to three months has supported the $72 million expansion of its Clandeboye plant, with 25 permanent, new jobs.

PUMPING NEW PRODUCTS, MARKETS

René Dedoncker, Fonterra's acting head of Global Brands and Nutrition, often talks about finding the sweet spot of cutting-edge science and commercial vision. That means more money for the dairy industry and economy.

New developments in creams, supported by PGP investment in science and research, have enabled new products that are sturdier and better able to handle longer shelf lives and temperature fluctuations.

That takes time and it requires significant investment, which is being delivered by the Transforming the Dairy Value Chain PGP programme.

The goal is to significantly boost the value of primary sector exports over the next few years, but the industry and economy is already benefiting from new science emerging from the programme, which has enabled the development of new products. The benefit derived from producing more value-added products was evident in Fonterra's 2016 interim result, a $409 million profit that featured a growing focus on higher-return goods.

Fonterra pumped 235 million more litres of liquid milk into its consumer and food service business, which returned a 108 per cent growth in profit because of higher margins. The biggest profit growth came from China (353 per cent) and Oceania (230 per cent).

The PGP programme played a key role in that success, helping to enable the transformation of the co-op's product mix and value-added business , in turn boosting the national economy.

STRETCHING PRODUCT INNOVATION

Six-hour Individually Quick Frozen mozzarella cheese is a jewel in Fonterra's crown. PGP investment in the science behind it has enabled the development of a world-leading process, a new product and at least 25 permanent new jobs in the $72 million expansion of the co-op's Clandeboye site. Fonterra can now produce enough mozzarella to cover 300 million pizzas a year.

Advances in science and research are also playing a role in the development of sturdier new creams better equipped to handle temperature and supply-chain variations, particularly in Fonterra's growing Asian markets. It's a similar story in the development of new and improved UHT, yoghurt and beverage products.

UNDERSTANDING CONSUMERS

PGP investment is accelerating consumer studies in New Zealand and overseas to give the industry a greater understanding of what people want in those markets in terms of taste, texture and the products to support their healthier lifestyles. Some of that research is transforming previous perceptions, particularly in Asia.

It is also reshaping attitudes towards global markets, bringing customers into the value chain and potentially putting farmers and scientists right next to chefs and other consumers, to help them gain more knowledge of the new products they want – and how to get them.

It's not just Fonterra that is benefiting. PGP investment has enabled Synlait to develop three new, value-added products.

All of this is putting hundreds of millions of dollars into the New Zealand economy every year.

Studies show dairy remains an important part of a healthy diet for the young and not-so-young. Consumers have a wide variety of products to choose from in a competitive high-value market.

TO THE FUTURE...

The real value of New Zealand's dairy industry may be the sum of its many parts, but it's the Transforming the Dairy Value Chain PGP programme that is effectively linking these pieces. It's the collaborative mechanism that is pulling them together, giving them direction and extracting maximum value for our economy and our wider rural sector.

The impact and benefits of the PGP investment go beyond that. They are far reaching.

It is supporting initiatives to find and nurture not only future workers and leaders in the dairy industry but also agricultural researchers and scientists in our universities.

Sixty students are being supported by that PGP investment as they work on new processes, technologies and products for the dairy industry and economy. As those students gain their PhDs and Masters and work on post-doctorate research, New Zealand will gain revenue and valuable intellectual property from their hard work. Many of those students will go on to careers within the primary industries' research and development community, building on their PGP science to create even more new products and supporting the country's global reputation as one of the world's great centres of dairy research.

Some of the world's top dairy and food scientists believe New Zealand's work on food structure design and the collaborative approach of the PGP programme are helping the country lead the world.

A recent independent expert review panel noted: "Few other programmes exist that involve industry and academic partnership with funding levels and time scales that permit the depth of science and advancements in technologies developed in this project."

Those comments point to perhaps the greatest ongoing benefit of the Transforming the Dairy Value Chain PGP programme – the building of capacity and capability at every link in that chain.

Growing capability and capacity is important right along the dairy value chain, including in the country's universities and research labs, where students and young researchers get access to some of the world's top scientists and thinkers.

From the farm gate to the factory floor and beyond, PGP-supported research, science and innovation are advancing our knowledge base and transforming both our understanding of what we will need to do and how we will get there.

The Transforming the Dairy Value Chain programme is future-proofing not only the industry but the rural professionals, universities and research institutes who will support that growth.