



PEOPLE POWER – FROM GATE TO PLATE

THE FACES OF THE TRANSFORMING THE DAIRY VALUE CHAIN
PRIMARY GROWTH PARTNERSHIP PROGRAMME



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Government is keen to see the value of primary sector exports double by 2025.

That's an ambitious plan needing a serious investment towards lifting capability, capacity and output across New Zealand's primary industries. So industry is working hand-in-hand with the Ministry for Primary Industries to invest in a number of Primary Growth Partnership (PGP) programmes and promote game-changing research and innovation across the sector. The objective is to accelerate thinking and make the kind of progress for the national economy that might not have been possible without that combined effort.

In 2011, MPI, Fonterra, and DairyNZ joined forces with other industry players to invest in the Transforming the Dairy Value Chain PGP programme. This is a seven-year, \$170 million project that is 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 programme has five themes of dedicated research and innovation right along the value chain, from the paddocks and milking sheds to product development and production.

An important aspect of the programme is about supporting its greatest resource – its people. In universities and research institutions around the country and the world, the Transforming the Dairy Value Chain PGP programme is providing valuable opportunities for the bright young minds who will make that next important breakthrough. It is also promoting diverse agricultural careers in the nation's schools and nurturing the next generation of industry leaders.

In this publication we highlight some of these great stories.

NURTURING GROWTH OF THE DAIRY INDUSTRY'S BRIGHT FUTURE

People power – it's one of the greatest successes of the Transforming the Dairy Value Chain PGP programme.

The programme is investing tens of millions of dollars into cutting-edge science, research and development. This has benefits far and wide for the nation's farms, firms, schools, universities and research centres in the development of some of our brightest young minds and a pipeline for a talented rural workforce.

Many of these people are building on that investment in capability to make important scientific breakthroughs, create a sustainable value-added dairy industry and drive innovation on-farm.

"The primary goal of the PGP is assisting towards increasing the market success of New Zealand's primary industries," says Programme Manager Andrew Fletcher. But the work towards upskilling people is one of the most important, enduring benefits of the programme because it's boosting the country's capacity and capability to do even better and push the boundaries.

"We are growing the next generation of dairy scientists and on-farm innovators."

People like Oriane Thionnet, a Fonterra research technologist who helped build the scientific knowledge behind the Co-op's breakthrough mozzarella. That development played a pivotal role in the \$72 million expansion of Fonterra's Clondeboy plant and the creation of 25 permanent new jobs. She is now using that research in the development of other products.

Much of Oriane's work was supported by the Transforming the Dairy Value Chain PGP programme, which helped to accelerate her learning and the potential outcomes by encouraging new partnerships.

"You have all these connections between different experts from different universities in different areas - that really helps," she says. "And I think it helps to develop new scientists as well."

There are close to 60 students and researchers right along the dairy value chain whose Masters, PhDs and post-doctoral research is supported by the programme. These future

industry leaders are delivering science and knowledge that will enable new high-value products, build better farms and realise vital environmental goals.

Auckland's Mel Hayr is completing her PhD degree at Iowa State University, one of the world's top varsities for studying animal breeding and genetics.

Her research, supported by the programme, focuses on novel ways of using information about natural genetic variants to improve knowledge of the underlying biological mechanisms behind important dairy cattle traits. The aim is to increase the accuracy of selecting bulls for mating.

"It's very exciting to be part of the group exploring this wealth of data and finding ways to use it that will benefit New Zealand and advance our scientific knowledge," she says.

Mel's work sits alongside other on-farm science, including research into pasture persistence, precision agriculture and excellence in farm management.

That science and the private/public collaboration at its core have been described as unique and world-leading.

A recent review of the food structure component of the programme by an independent panel of global experts said it was one of the top programmes of its kind in the world.

They praised its "high-calibre research" into cheese, cream and other foods and the balance struck between academic study and "clear industry objectives".

The panel said the research and innovation was helping the industry develop more high-return, value-added products to "escape the commodity spiral".

One of the panellists, Allen Foegeding from North Carolina State University, said students were working on "cutting-edge" science and "clearly defined, industry-relevant goals".

"The programme gives them access to a broad range of equipment and knowledge to take their work as far as it can go," he said.

Many of these students will go on to work in the dairy industry and build on what they have learnt to create

even more new products and opportunities and further enhance New Zealand's strong global reputation for innovation.

The Transforming the Dairy Value Chain PGP programme is future-proofing on-farm rural talent and leadership as well.

More than 9000 young people have been given a taste of the many opportunities available in the dairy industry through PGP-supported initiatives co-ordinated by a number of organisations, including the Primary Industry Capability Alliance (PICA) and New Zealand Young Farmers.

The programme helped to set up PICA, which takes a collaborative approach to building rural capability; the dairy industry working with other primary industries to connect more effectively with young people.

PICA Chief Executive Andy Somerville says the organisation now has an "alliance of 10 organisations and growing, with members including industry-good bodies, education and training providers and government agencies".

It offers primary industry-based activities and educational resources targeted at primary and secondary school students, including a list of all scholarships available to school leavers looking at further study in primary industry-related courses.

New Zealand Young Farmers is doing similar important work through programmes such as AgriKids and TeenAg. These initiatives support regional and national competitions and clubs that promote a positive image of the industry and also empower future farming leaders to strive for excellence through the Leadership Pathway Programme.

Chief Executive Terry Copeland says the industry needs "skilled, vibrant young people" to replenish the dairy workforce.

"Career options for people in the industry are very wide, so it's agri-business, science attributes and marketing attributes that we actually need, to take NZ Inc and its products overseas"

In the next few pages we learn a little more about some of the people who are contributing to that great effort.

HELEN THODAY

Developer, Animal Welfare and Husbandry Team, DairyNZ



MAKING HISTORY, BREAKING DOWN BARRIERS

DairyNZ's Helen Thoday has travelled the world and seen it all in her journey of agricultural discovery.

But it's New Zealand that she now calls home. In fact, it represents a bit of a home-coming for the pioneering 38-year-old.

Agriculture has been a constant in the Christchurch-based woman's life, whatever country she's lived in.

"I came from a rural background in England; Wiltshire was a farming county and I always knew I wanted to go to agricultural college," she says.

She finished with an honours degree in agriculture, land and farm management, but that was just the start of her education. The real learning would be delivered in highly regulated farms through-out Britain, mass-production centres in Canada and the wild, isolated islands of the Falklands.

She spent 10 years working in Britain, including stints with a pig-breeding company and the Agriculture and Horticulture Development Board, the country's equivalent of our DairyNZ.

"I realised my skills lay in communicating with farmers. I loved sitting around farmers' kitchen tables."

Helen had a taste of travel during a Nuffield farming scholarship that allowed her to study livestock production around the world. Afterwards she realised she needed a new experience.

"I was keen to have experience that was as globally broad as possible in farm animal welfare requirements and I wanted something completely different.

"It was about personal development, living inside other farming systems with differing welfare requirements and very different consumer needs."

The Falkland Islands government was looking for farm advisers so she and husband Warren Landles accepted the challenge and a two-year contract in the remote South Atlantic archipelago.

It could not have been more different.

"The UK was absolutely tied up in knots and regulation; Canada's industry was about mass-production and razor-sharp efficiency; the Falklands was totally free-range, with animals out all winter in some of the worst weather."

But it was not just the regulations that were a novelty to the islanders.

"I was the first female agricultural adviser they had had," says Helen. "The previous ones were all Aussie males and they were all about 'you can't do it that way, you have to do it this way'."

"I tried to engage more and work with the farmers and broke down barriers. I loved it. It's your personality that keeps farmers engaged in doing the right thing."

That engagement is an important aspect of what Helen and her team do as part of their work in the rural community, which is funded by the DairyNZ farmer levy and Transforming the Dairy Value Chain Primary Growth Partnership, a seven-year, \$170 million innovation programme led by commercial partners, including DairyNZ and Fonterra, and partnered by MPI.

The PGP project has allowed Helen to accelerate what she calls "ground-breaking" training of farmers and rural professionals.

As a developer, she works with those professionals to co-ordinate with farmers on what they need to do to meet new regulations and requirements involving animal welfare and husbandry.

"When change occurs in industry codes and regulations we turn them into farmer-friendly resources. We try to cover all routes of communications so as a developer one day I might be creating scripts for videos and the next updating our team with information around husbandry techniques. We concentrate primarily on the cow, but it's also about the people working with the cows."

Just like the farmers she has encountered in other parts of the world, New Zealand's farmers are "time-poor".

"Farmers have lots of regulations and requirements, it's the same everywhere, so we try to make things practical and easy for busy farmers to help them check everything is right on farm – it's about good practice."

Kiwi farmers still have some way to go in accepting the global trend towards more regulation and requirements around food production and animal welfare.

"The EU and North America are further down the track."

But farmers need not fear the changes. "Compliance should not be seen as a hardship; it's here, it's not going to change but can be used as a way to improve your business."

"If you're a good, responsible farmer then you are doing it anyway."

And there are plenty of great farmers in New Zealand. The global reputation for the country's dairy industry was an attraction for Helen and her husband. As well as its scenery and lifestyle.

"New Zealand was always the last stop on our travels. It's the Mecca of farming countries, a place where farming is still a highly respected industry with a big impact on GDP."

The couple have bought a lifestyle block and a few animals and would like to have their own Kiwi farm some day.

That's partly because farming in New Zealand is in Helen's blood.

She and Warren like to travel around the country, taking in the walks and views. They are also keen to visit Gisborne and the East Cape to explore some family history.

"My grandfather, Forrest Thompson, was from Gisborne. He fought in World War II with the RAF. He met my grandmother in England and married but died in the war. She stayed in England so that part of my family was separated from New Zealand."

"My great-grandfather managed a sheep station at Waipiro Bay, north of Gisborne. Apparently he was pretty wild and I'm keen to check that out."

Whatever Helen discovers about her family's history, it appears her future and that of the country's dairy industry are now inseparable.

Below image: Helen Thoday with some of the feathered friends she met in The Falkland Islands.



SIMON CAUSER

Synlait Research and Development Manager



HE'S UP FOR THE CHALLENGE

Extracting cosmetic ingredients from wool, deriving pharmaceuticals from milk and spending weeks alone in the Alps.

Synlait's Simon Causer likes a challenge, especially if it's a learning opportunity. And he's prepared to undertake a fair bit of learning to meet those challenges, including four academic degrees and a couple of stints across the Tasman.

The first trip across the ditch was inspired by a flyer for a university scholarship on a noticeboard at Christchurch Boys' High School.

Seventeen-year-old Simon had been considering a career in medicine or dentistry - "probably more because I had the marks for it, not because I was really passionate about it".

But the "outdoorsy" teen who grew up fascinated by National Geographic and Jacques Cousteau sensed an opportunity for a shift in career and a greater adventure. So he accepted the challenge, got the scholarship and made his way to the University of New South Wales in Sydney to begin a Bachelor of Science degree in Textile Chemistry.

As part of the scholarship Simon was bonded to the Wool Research Organisation of New Zealand for two years. That turned into 12 years as he made his way up from assistant scientist to general manager of applied science.

Projects involved extracting cosmetic ingredients from wool, entomology and even public health issues connected

with textiles, all of which led Simon back to university.

To better understand the interaction of insects and wool products indoors he did a post-grad diploma in entomology at Lincoln University and then a PhD, again part-time, in Biological Science, through Victoria University in Wellington.

Simon's move into the dairy sector involved even more learning, a leap of faith and a neighbourly conversation with one of the country's more controversial political leaders.

He had been watching a dairy factory being built down the road from his South Canterbury farmlet, so he did what most Kiwis do when they're intrigued about something in their communities - he had a natter with the neighbour, who just happened to be former Finance Minister Ruth Richardson.

"She was a director of Synlait and was telling me that they were raising capital to build this dairy factory in Dunsandel and it all sounded quite ambitious and exciting to me," says Simon.

"So I watched Synlait for another couple of years get established in the dairy industry and then I gave them a call one day and said, 'How about it, I'd like to be your research and development manager'."

That was five years ago. Since then Simon has completed a fourth degree - at the National Centre for Dairy Education in Geelong, Melbourne - worked on farms to learn about dairying from the grass roots up, and gone a long way towards establishing a thriving special milks business.

Several projects have resulted in the development of new added-value products, including a pharmaceutical colostrum powder to combat travellers' diarrhoea and a night milk to encourage healthy sleep.

The innovation is exciting, he says.

"Vibrant dairy companies will lead to a vibrant dairy industry in New Zealand and the PGP is helping to drive that innovation through our supply chain."

As important as that work is, Simon often likes to unlink himself from that chain and head for the hills. Alone.

"I'll often go away for several weeks on end climbing and solo-hunting up in the Alps, mainly for tahr, chamois and deer. I love the physical and mental challenge."

Above Image: One of Simon's favourite things to do is to head for the hills and mountains for some solo hunting and climbing.

HAPPY TO BE A 'CHEESY' COUPLE

When Orianne Thionnet marries her "Kiwi boy" Grant it won't be a surprise if the wedding cake is made out of cheese.

The delicious dairy product has been an essential ingredient in so many important aspects of the Frenchwoman's life: the self-confessed foodie's love for cheese and cooking put her on a path to a career in food science; her research into cheese established an early career highlight; and the man she intends to marry is a fellow Fonterra worker who makes... you guessed it... cheese.

"We are a very cheesy couple," says Orianne. "It's a cliché for the French but there's quite a lot of cheese in my cooking."

That interest in cooking and creativity helped to sharpen her focus from a broad interest in science to specialising in food technology.

She backed up that interest with intelligence: a Masters degree in chemistry at prestigious college Chimie ParisTech was followed by another in food science and technology at Agro ParisTech.

That led to a six-month internship and an important decision: France or abroad?

"I had some connections through previous interns who had been at Fonterra Research and Development Centre in New Zealand in the past and so I did six months here working on cheese-based products."

That was nearly five years ago.

"Plans are meant to be changed - I met a Kiwi boy and we're engaged now. We're planning to get married in France next year."

France's loss has been a gain for the New Zealand dairy industry and economy.

Orianne's research on Fonterra's mozzarella cheese, a project funded by the Transforming the Dairy Value Chain Primary Growth Partnership (PGP) programme, has helped build scientific knowledge to further develop a product that has been a huge success for the co-operative and the country.

Orianne's work and that of the wider mozzarella team has supported the investment of tens of millions of dollars to expand Fonterra's Clandyboye plant, creating 25 jobs, with the likelihood of more in the future as a result of the successful technology transfer from the PGP team to the product developers at the Co-op.

"The mozzarella project has been very successful," she says. "It was very rewarding to be part of that team and contribute to that."

Her next project will involve working on yoghurt as part of the cultured foods team.

She particularly values the opportunity to apply her academic knowledge to achieving commercial outcomes.

"Industry focus is important because the PGP science is about industry outcomes and that helps you to stay on track and to feel that you are making a difference."

"It's good for industry to say 'why is this relevant for us? That's what we want and here are some targets.'"

She believes the PGP programme has accelerated her knowledge and its potential outcomes by encouraging new partnerships. "You have all these connections between different experts from different universities in different areas - that really helps. And I think it helps to develop new scientists as well."

And new friendships. Her new Fonterra family includes her future father-in-law who, like Orianne's fiance, works at the Co-op. And of course, her new team at FRDC.

And the New Zealand dairy industry and wider economy are better for it.

ORIANNE THIONNET

Research Technologist, Fonterra



Orianne and her Kiwi beau - fellow Fonterra work Grant Bleaken.

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

40+
 Universities & Research Centres working on rural science & innovation

\$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

AND A HEALTHY PLANET TOO
 The programme is helping farmers grow their production while limiting the impact on the environment



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

117
 Certified nutrient management advisers

100%
 DAIRYING REGIONS WITH TAILORED RIPARIAN PLANTING GUIDELINES

50%
 Fertiliser industry certified

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

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



100+ Trainers building farm staff animal husbandry skills nationwide



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

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

440 Rural professionals trained in mental health awareness

3000 Farmers at Health PitStops

FROM GRASS-ROOTS TO GREAT FUTURES

EXCELLENT CAREER OPPORTUNITIES DON'T END AT THE FARM GATE – THERE ARE PLENTY OF WELL-PAID, EXCITING AND DIVERSE JOBS ALONG THE PRIMARY INDUSTRY DAIRY VALUE CHAIN. HERE'S JUST A FEW...

ON THE LAND

- Crop farmer
- Dairy farmer

SUPPLY CHAIN

- Importer/Exporter
- Customs/freight broker

RESEARCH AND DEVELOPMENT

- Environmental scientist
- Agricultural/horticultural scientist

FROM GATE TO PLATE

- Food technologist
- Chemical and process engineer

SUPPORT TEAMS

- Health and safety adviser
- Human resources adviser

ANIMAL CARE

- Veterinarian
- Veterinary nurse
- Animal care attendant

WELL-INFORMED ADVISERS

- Agricultural/horticultural consultant
- Financial adviser
- Agricultural engineer
- Accountant

FUTURE

- Design/product development engineer
- Entrepreneurs





LOGAN BOWLER

Environment Extension Specialist,
DairyNZ

HE'S BEEN EVERYWHERE, MAN

Tinker, tailor, soldier, sailor. DairyNZ's Logan Bowler hasn't gone quite that far, but he's given it a decent crack: Boilermaker, milkman, funeral director, farmer.

Plus a degree in Applied Science, majoring in forestry. No wonder he has little time for the telly or relaxing.

But let's start a little further back.

"I was a qualified boilermaker by trade. I'd left school and did an engineering apprenticeship."

Logan ended up at the Wanganui railway workshops but soon learned the pain of redundancy when they closed. After a short stint at a steel construction site in Ashhurst he finished up on the doorstep of his uncle's funeral business.

"He had a man off work with tennis elbow for six weeks," says Logan. "I ended up staying for 18 months."

He didn't know it at the time but Logan's next step would put him on a path towards his most important career destination.

Milk ran through the family's veins. A number of family members had owned milkruns so it seemed a natural fit when he and his wife bought a run in home town Marton.

"It was a good, cash-positive business where you could roll your sleeves up, work hard and make some good money, and we did that for 14 years," he says. "But I had a gutsful of seven days a week, chilled product, service industry and I felt that I needed to go."

He also felt the nag of something missing, an inner potential untested.

"At the age of 37 I wanted to go to Massey University to prove to myself I was better than my very average School C marks. It was kind of a personal journey for me, really."

He emerged three years later with that degree in Applied Science, ready to write that next chapter; ready to test the notion that life begins at 40.

"I took a compliance job at Horizons Regional Council to try to get a foot in the door – you are exposed to a lot of dairy, checking farms against their consent conditions, but also commercial and industrial stuff; a lot of water and irrigation."

That lasted five years, including the last 12 months in a new advisory role, but Logan wasn't always happy with the way local authorities sometimes dealt with farmers.

When a new role with DairyNZ came up in 2010, "I jumped up".

Now Logan uses all that education and experience – the practical engineering background, the service delivery, the regulatory and compliance knowledge – to work with farmers, the farm service industry and local authorities to improve effluent and nutrient management systems.

"We are doing more in the nutrient space, there's heaps more focus on that and modelling; we work with farmers around off-paddock design and there's work around effluent. We've done small bits around energy capture, around methane, energy use in dairy sheds, milk cooling and water heating – those areas that use a lot of energy."

He says farmers now have a greater understanding of their impact on the environment and the need to protect it.

Logan uses 'we' a lot. That's probably because he and partner Kathy bought their own farm three years ago – 96 hectares with about 220 cows. It has given him another valuable insight into farming.

"Like other farmers we don't have the perfect effluent management system but we have a plan to have a fit-for-purpose system and we will get there."

Above Image: Logan Bowler brings a wealth of diverse experience to his DairyNZ role.

CHRISTINE COULDREY

LIC Senior Scientist

DOING THE LONG HAUL FOR DAIRY

Christine Couldrey doesn't do anything by halves.

To get some understanding of that, consider this: It's 2160km from Auckland to Sydney. That's a fair way, but it's still 100km short of the distance Christine would like to swim, bike and run in 2018.

It's called a deca ultra-triathlon, which is 10 ironmans combined into one event - 38km swim, 1800km bike ride and 422km run.

"There's talk of a deca event being held in the United States in 2018, so that might be my next goal," says the LIC scientist.

And don't bet against her doing it - this woman has form.



Christine Couldrey competes during a marathon bike ride around Lake Taupo.

In 2013 she completed a quintuple event – a mere 1130km of swimming, biking and running. She did it in four and a half days, with just 10 hours sleep.

She knows it sounds crazy but it's simply what she has been doing since she was a child - pushing herself beyond her comfort zone.

"I decided about the age of 13 that I was going to do a PhD in animal science," she says. "I grew up out in the country at Te Kowhai and when there were home-kills I was allowed to cut through all the internal organs, which I found quite cool – I was fascinated with how it works and what goes on inside the body."

Christine would get that PhD, but her education and career would take her even deeper inside the body, into the genetic building blocks.

A Bachelor of Science at Lincoln University was just the opening leg of her own ultra-education marathon. She was awarded a scholarship to do her PhD at Cambridge University in England, where she studied mice and the genes involved in the production of sperm and egg to try to find reasons why humans can be infertile.

Three years later, her dream as a 13-year-old realised, she moved to the United States for post-doctoral work at the National Institutes of Health.

It was in the US that she found her other "buzz".

"After helping for two or three years to put on some of these ultra-distance triathlons and adventure races, I thought to myself... I could try them too."

But after six years in the States, she was struck by the strong call of home.

Back in New Zealand the highly regarded molecular biologist was soon snapped up by AgResearch in Hamilton, where she studied reproductive technologies, including genetics.

Her work there over nine years increasingly moved her out of the lab and into bioinformatics, which uses statistics and mathematics to analyse data.

That appealed to LIC, which had a major gene-sequencing project and needed someone with her broad knowledge and background.

"I take all of the things I know about biology from all the other jobs that I have had and ask if all these statistics make sense biologically with what I know about how DNA works, and then I do a bunch of analysis from the data."

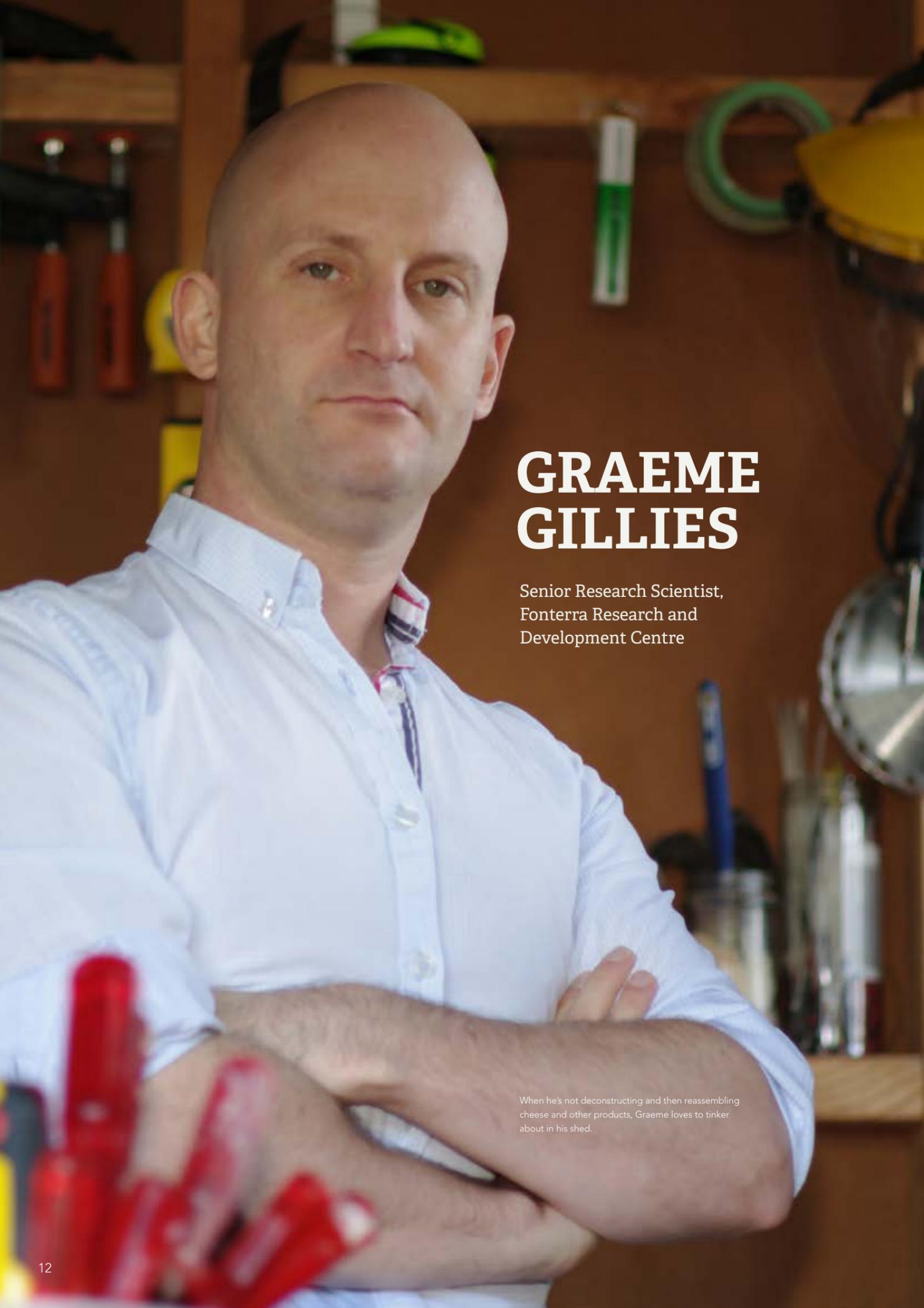
The work Christine and others are doing is funded by the Transforming the Dairy Value Chain Primary Growth Partnership programme.

It has supported the development of an unprecedented genetic database of the national dairy herd.

"We have a huge pool of 120,000 genotyped animals ... if we can breed cows that are genetically superior then they can produce more milk and more profit with less environmental impact," she says.

Those gains are incremental and compounding and they take time. But they are potentially worth billions of dollars to the economy.

Luckily, Christine knows all about the long, difficult haul. And she always finishes the race.



GRAEME GILLIES

Senior Research Scientist,
Fonterra Research and
Development Centre

When he's not deconstructing and then reassembling cheese and other products, Graeme loves to tinker about in his shed.

BUILDING A FUTURE FOR NEW ZEALAND MOZZARELLA

Graeme Gillies likes to pull things apart. Sometimes he even puts them back together again.

He's done it since he was a kid growing up in South Australia; it's fuelled his curiosity and propelled his interest in science. And luckily for the New Zealand dairy industry and economy, it's now playing an important role in transforming the dairy value chain.

Graeme's knowledge and the global journey that has enriched it can be likened to a chain, with every stop adding value and lustre to the latest link.

You can hear that journey in his voice, an accent that is at once familiar and then so quickly obscure. It speaks to a life of travel, overseas experience, of encountering and adapting to different cultures and ideas.

Ideas that began by taking things apart and adopting his family's spirit of self-reliance.

"My father worked for the Aussie equivalent of Spark, fixing communication aerials and stations across the Nullarbor Plain and regional South Australia," Graeme says. "So we had access to soldering irons, angle grinders and screws and broken televisions, and my brother and I spent hours pulling stuff apart."

"When I was growing up I never saw a tradesperson at our house and when I was at university I had this car that broke down every other day and my dad would say 'don't go to a mechanic, I'll explain how you do that.'"

He learned similar lessons from his mother.

"To pay her way through university she used to work in a bakery, so I learned baking at a really, really young age because she would make bread for us and cakes rather than buying them."

All of this helped inspire a can-do attitude, a strong interest in science and a place at the University of Adelaide, where he studied maths and computing.

"After a couple of years I decided that wasn't really what I wanted to do – it was like the prime numbers and groups and some really, really strange stuff."

So he started doing more with chemistry and eventually completed a PhD in material science at the University of South Australia, which put him in touch with an Atomic Force Microscope.

Graeme likens the instrument to a record player. "You've got this kind of stylus just dragging over a surface, going up and down as it goes over these bumps."

Those 'bumps' give you a scan of the surface, but they can be less than half a micron in size.

"It was quite a tricky device," says Graeme. "You needed a variety of skills, so those experiments were quite hard and I got to a position where I could do some of the really, really tricky stuff."

That put Graeme on a path that would take him way beyond South Australia and the vast, featureless Nullarbor, to a job with the prestigious Max Planck Institute for Polymer Research in Germany.

This 2003 move not only broadened his academic horizons but put him in touch with many different cultures. As he had done in Australia, he was soon 'pulling them apart' to study their detail and nuances.

"In Europe you see a lot of regional differences. From one side of a country to the other they speak different languages or dialects but also they have different foods, different appreciations. I really enjoyed exploring those."

But after seven years in Germany and Switzerland and experiences with different labs and technologies in Geneva and Friborg, including using light-scattering to examine substances, Graeme and his Brazil-born Swiss wife Joanna wanted a change.

He considered returning home to Australia but still couldn't quite shake that instinct to strive for the 'new'. So he looked west, to an "adventure" at the Fonterra Research and Development Centre in Palmerston North.

He saw opportunities to learn new techniques as well as pass on the benefit of his wide variety of skills, which he has used over the past five years to help pull apart the structure of mozzarella, study its composition and then reassemble a pizza cheese that can

be ready in six hours rather than two months. All while retaining its natural taste, texture and stretch.

That has meant learning about rheology – how substances feel in the mouth – and also using mathematical modelling.

"It was sitting in front of the computer and solving a lot of equations."

We went through quite a few theoretical models but also testing those ideas in the pilot plant, making tonnes and tonnes of mozzarella over the five years but also sort of working through problems with processing."

Some of that work and follow-up research on further advances has been funded by the Transforming the Dairy Value Chain Primary Growth Partnership programme, a seven-year, \$170 million innovation programme led by commercial partners, including DairyNZ and Fonterra, and partnered by MPI.

Graeme's work and that of others supported Fonterra's \$72 million Clandeboye expansion, which injected many millions into the regional and national economy and created at least 25 new, permanent jobs.

Back in Palmerston North, he has his own expansion planned – albeit on a much smaller scale.

"I want to build a passivhaus – a super-airtight, super-insulated house; there's not many people making them. I'm attracted by the technology and I've got a wife who comes from the tropics and I really want a warm house - it's a bit cold here for her."

Like many of his colleagues, Graeme is an active relaxer. He's not interested in slumping in front of the telly or reading a book – "unless it is to learn something about photography or maths or something". He'd rather develop his interest in DIY and tinker in his shed.

As he did in Australia with his brother, he's still taking things apart and sometimes putting them back together. All the while helping to build new products and value-add business for New Zealand's dairy industry and economy.

CECILE DE KLEIN

AgResearch Scientist



BACKING TEAM ON CLIMATE CHANGE

Pop quiz, sports fans: Who won the 1991 Rugby World Cup in Wales?

If you picked Australia, well done, but that's too easy. How about which country won the inaugural, albeit unofficial women's event in Wales that same year?

You're probably tempted to say New Zealand, but you'd be wrong – they didn't make the final. That was between England and the United States and it was the North American Eagles who won 19-6 to be crowned champions.

One person who remembers it well is AgResearch principal scientist Cecile de Klein. She was there as captain and number eight of the Dutch women's rugby team that dipped out to Spain in the semi-finals of the Plate competition.

Cecile made a number of important connections during her 11-year rugby career. The sport gave her an early insight into the culture of the country she would soon call home, and it put her in touch – frequently and sometimes with a great deal of pain – with the soil and grass that would define her career.

Twenty-five years later the Dunedin-based scientist is still "the general" at the back of an AgResearch scrum focused on the ground beneath their feet, and more particularly the emissions escaping the soil and contributing to greenhouse gases and climate change.

Her work is funded by the Transforming the Dairy Value Chain Primary Growth Partnership (PGP) programme.

Long before she picked up a rugby ball it was maths and science that held Cecile's interest. She was particularly fascinated with biology and went to the University of Utrecht to study.

Cecile "didn't have a mapped-out plan" and soon her path and passion were diverted by landscape ecology and agricultural science.

"There were issues around the environmental impact of agriculture," she says, "and we were working with a group of farmers around effluent in those years. We helped them define problems or pressure points and what they could do to improve how they use their effluent."

That became a joint PhD project with the Netherlands' agricultural university in Wageningen, in which Cecile studied nitrous oxide and the way nitrogen cycles through the soil, contributing to greenhouse gases; it is the smallest of three contributors to our emissions, the other two being carbon dioxide from industry and transportation and methane, mainly from our livestock.

Cecile's work and a relationship with a Kiwi eventually brought her to New Zealand, where he secured a role with AgResearch.

Two months later she too would have a job with AgResearch, as part of a project looking at soil acidification.

"Because of my previous experience I also started to develop the capability to set up work around nitrous oxide emissions."

Twenty-one years on she still studies the cycling of nitrous oxide. Through the PGP programme she is also taking a leading role in a project to lessen the impact of all greenhouse gas emissions.

That's about working with farmers and rural consultants to find the best tools to calculate those emissions and then set about reducing them.

"Under PGP we're working on developing a training programme and to work that into a certification programme," says Cecile. "It's about what these consultants need to know to give good informative advice that the industry has confidence in."

The next step is to work out how that can be used by people in the dairy industry. She says it will probably resemble a "traffic-light system".

"The application is still to be developed and that will be done with DairyNZ, consultants and end-users next year."

Above image: AgResearch principal scientist Cecile de Klein with son Ben during a tramp in France.

SUNNY GEORGE GWANPUA

Massey University Researcher

FEEDING HIS GLOBAL MISSION

Sunny George Gwanpua is a man on a mission – one that has taken him around the world.

It's a journey that is benefiting New Zealand's food industry and may eventually help to develop one in his own country, Cameroon.

"In my country, we are one of the key exporters of raw materials like cocoa, coffee, but at the end of the day they need to import processed food like chocolate - it doesn't make sense. So I thought maybe it's time that people started to get involved in understanding how to process and preserve food material, because we can have things like post-harvest loss of about 50 per cent in my country."

Sunny had a dream and the desire to see it realised. But he also had smarts.

After completing a Bachelor of Biochemistry at the University of Buea in Cameroon he was one of just two from his country to be offered a Belgium government scholarship at KU University Leuven to do a Masters in Food Technology.

At just 23 he left home and his young wife Angeline for a new continent and the next stage of his educational journey.

"It was a major change, particularly the climate because I got there in the winter," he says. "But there were things I admired; I saw a culture of hard work, where you get up at 7am for school and everyone is busy."

Sunny was busy too. Angeline joined him eight months later, by which time he was well on the way to earning a Masters in Bio-Science Engineering. Then came a PhD, with his research including quality prediction in apples, a pointer to a possible future.

Having earlier met researchers from Massey University, Sunny was interested in a role in Palmerston North as part of a three-year study of kiwifruit. He applied for the job, was successful and the family, now including daughter Daniella, was on the move again.

The work at Massey is funded by the Transforming the Dairy Value Chain Primary Growth Partnership (PGP) programme.

New Zealand has been exporting kiwifruit for decades but still has much to learn about why some fruit can go soft quicker than others, even if they've shared the same coolstore.

"That can mean you can't sell it, you can't ship it, you can't handle it, so it's something Zespri really wants to avoid."

Sunny's colleagues study the fruit's bio-chemistry, its quality; some of them use image analysis. And then he takes the data produced, consolidates their research and prepares mathematical models.

"It's about trying to understand how this [softening] happens and translate it into basic equations that can help you predict what will happen after some time."

His PGP-funded research is valuable work that could save millions of dollars in lost product and create new opportunities for the iconic New Zealand product.

"If you can predict what happens with the fruit then you can go into certain markets that you didn't go into before because the conditions were considered too harsh. And when you open the cool room and you notice that some fruit has gone soft then that costs the industry."

Sunny has a bigger dream to chase. He wants to head home one day, to Cameroon, to help build a sustainable food processing industry.

"I do miss Cameroon, basically I miss the family. However, having my wife and kids with me helps me feel at home."

In the meantime he's working hard on another profitable future – that of the New Zealand kiwifruit.



Sunny George relaxes at his Palmerston North home with son David.

STEVE HOLROYD

R&D Programme Manager, Fonterra



Steve Holroyd with one of the four motorbikes he owns.

ACCELERATING CHANGE

Steve Holroyd loves speed – whether that means his machine-gun vocal delivery or heading down the motorway on one of his four motorbikes, the Fonterra scientist understands the value of velocity.

It was speed that turned his head toward an award-winning career in spectroscopy, a technique that involves using a spectrometer to shine light through various substances. The results are analysed to gain a better understanding of what lies within.

“I was always interested in the science,” says Steve. “At university in the late 80s, spectroscopy was very classical, but as soon as the faster, more powerful computers turned up it changed the whole game.

“The marriage of spectroscopy and fast computers really revolutionised the field and I got really into it. Passion was ignited. Since then I have always been really interested in what spectroscopy can do in different applications.”

That passion and dedication were rewarded. After finishing his PhD in chemistry at the University of Auckland Steve earned a post-doctoral research role at one of the world’s top universities, Cambridge, where he used spectroscopy to study the interaction of drugs.

That led to a job with oil giant Texaco and the pursuit of Steve’s other great passion – motorcycling.

“I got to go round and collect motor fuel at different motorsports events as part of testing for the FIM [Federation of International Motorcycling],” he says. “I would work for Texaco during the week and then travel off to some place in Europe.”

That included some of the most prestigious motor-sport venues in the world – Le Mans, Brands Hatch and Hockenheim.

“A couple of my colleagues got to do cars, including Formula One, but I preferred the bike racing and you would meet the people you only dreamed about.

“When I was in England and went to the Grand Prix, as a punter you sit there and see these guys in the distance. And a couple of years later I was literally rubbing shoulders with them.”

Steve laughs out loud as he recalls how close he got to his idols.

“One of my memorable moments was probably standing next to Mick Doohan, the Australian who was a five-time world champion, at the urinal in the gents – oh, giddy Mick.”

But Steve’s race was run. He realised that it was time to move on after five years with Texaco.

“A colleague at university had come back to New Zealand and got a job at Fonterra. He emailed me and said ‘hey this looks like you’.”

Almost 20 years later Steve is now a programme manager at Fonterra’s Research and Development Centre in Palmerston North.

Much of his work involves managing post-farm gate research projects that are part of the Transforming the Dairy Value

Chain (TDVC) Primary Growth Partnership programme, a seven-year, \$170 million innovation programme led by commercial partners, including DairyNZ and Fonterra, and partnered by MPI.

The programme aims to enable the creation of new dairy products, increase on-farm productivity, reduce environmental impacts, and improve agricultural education.

Steve says the TDVC has “allowed us to invest more in areas Fonterra would not have invested in alone... And that’s to everyone’s benefit”.

The rest of the time he provides analytical support for Fonterra and those using its hundreds of spectrometers.

He says the work is vital to the co-operative, the dairy industry and the wider economy.

“We’ve transformed the way we use these instruments and it has created tremendous value.”

“Food safety quality is really important, and it has to be science-based. That underpins our brand. The other thing is around trade. If you’re going to trade any manufactured item such as a food you’ve got to measure it.”

That means using spectroscopy and analysing the data it provides to have a better understanding of product composition and quality. And it also means setting and following international standards.

“An important part of my role is science advocacy, so I’m very active in international standards-setting organisations around creation of international analytical standards.

“We need to ensure those standards are science-based and robust because uncontrolled standards can lead to uncertainty and this is a challenge for the New Zealand dairy industry as a whole.”

The work by Steve and his team has not gone unnoticed.

Fonterra’s milk-fingerprinting project, funded by the PGP, won the Innovation Excellence in Research prize at the 2015 New Zealand Innovators Awards. It harnesses the power of spectroscopy and computing to give an inexpensive analysis of milk composition and quality. At speed.

The need for speed remains with his motorcycles, too, even if the days of racing are long gone for the father of three.

“I raced, but not seriously. Nowadays I’m involved with the Central Districts bike club and we like to hire out Manfeild occasionally; that’s a bunch of middle-aged guys enjoying themselves.”

Whether he’s riding his favourite Honda 1000cc Fireblade or advancing the science of spectroscopy, Steve is moving forwards rapidly and shedding light on the future of the dairy industry and Fonterra’s operations.

Ministry for Primary Industries
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