

Apr-May 2024

Inside Dairy

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DairyNZ 



Over the fence...

My passion for dairy is part of why I'm focused on ensuring DairyNZ is helping meet the needs of our sector, and farmers, both now and into the future.

Over the past few months, I've spoken face-to-face with farmers across the country about what you see as priorities for DairyNZ.

I've consistently heard that you see DairyNZ playing a vital role in future-proofing our sector, and that we need to sharpen our focus to better support it and its farmers.

This issue of *Inside Dairy* is focused on looking forward, and how we can overcome challenges through lessons learned.

Our cover story includes farm insights from Greg and Gail Mitchell, who talk about the impacts they saw on-farm from Cyclone Gabrielle, their road to recovery and their optimism for the season ahead.

We also discuss some of the numerous challenges, milestones and changes we've seen in dairy over the years, and how that's helped us to shape our future direction.

Change happens constantly, so we appreciate that re-assessing and adjusting how you run your businesses is an important element in future-proofing, not just your own operation, but for the sector as a whole. We're also having a good look at DairyNZ's current business strategy and operation, to make sure we meet the requirements of the job to be done.

You'll hear more about the future focus of our work shortly. This includes key topics we'll invest in over the next 10 years to ensure dairying – and its farmers – continue to thrive.

I am proud of DairyNZ's team and the work we've done – and are now doing – to make sure we're progressing a positive future for NZ dairy farming, by working hard every day to deliver value for farmers.

As always, your feedback is welcome at Campbell.Parker@ceo.dairynz.co.nz

Nga mihi,

Campbell Parker
DairyNZ chief executive

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On the cover:

Hawke's Bay dairy farmers Greg and Gail Mitchell take a walk to monitor the farm's recovery progress from February 2023's Cyclone Gabrielle.



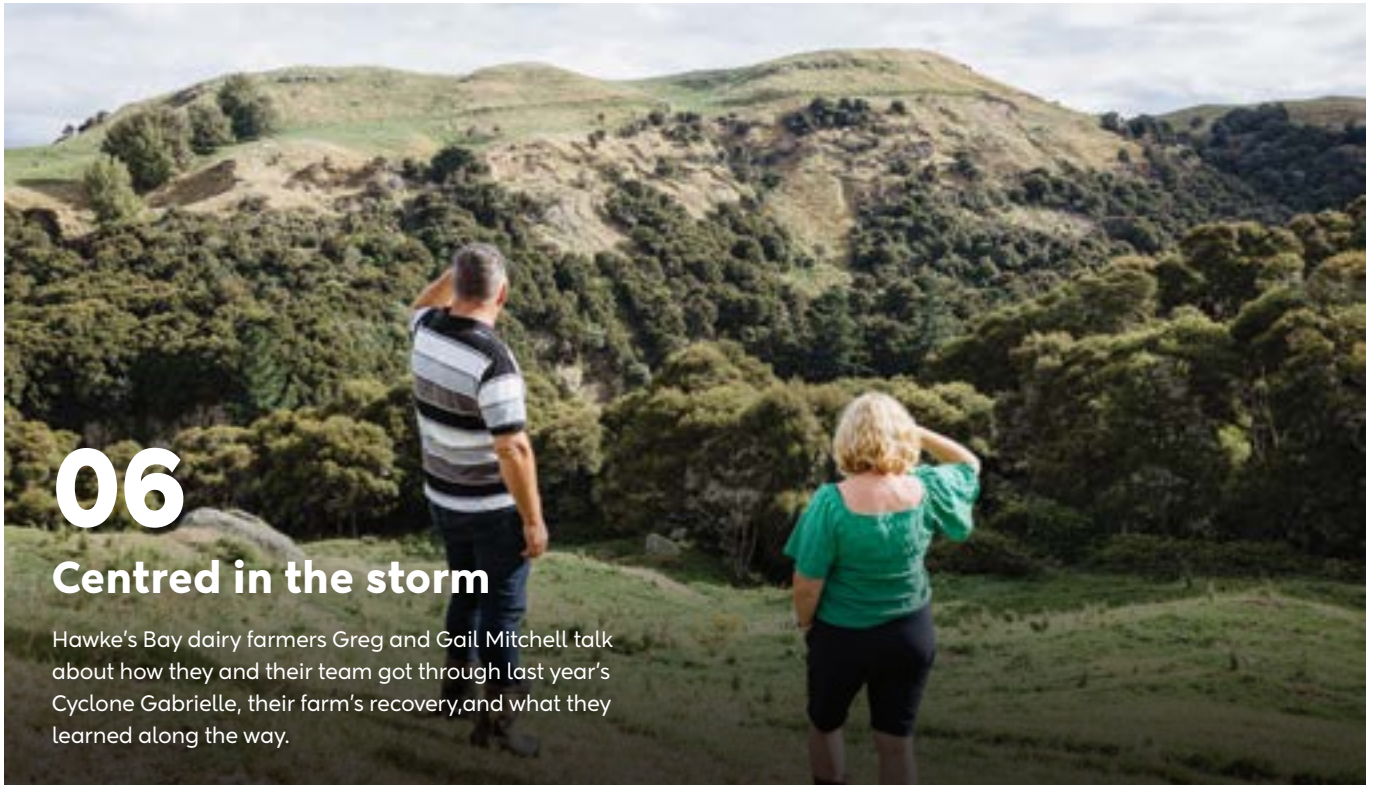
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Centred in the storm

Hawke's Bay dairy farmers Greg and Gail Mitchell talk about how they and their team got through last year's Cyclone Gabrielle, their farm's recovery, and what they learned along the way.



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Looking ahead's looking good

DairyNZ's CEO Campbell Parker and chief science adviser Bruce Thorrold talk about the sector's past and future – and why there's plenty to be positive about.



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New heifer phenotypes to improve fertility genetics

How will they contribute to better genetic gains so farmers can achieve their production and profit goals?



We appreciate your feedback

Email insidedairy@dairynz.co.nz or call us on 0800 4 DairyNZ (0800 4 324 7969).



To find out how to recycle the plastic wrap used to protect this magazine during postage, visit dairynz.co.nz/insidedairy



Optimise winter cow care

Back-fencing cows and using portable troughs over winter limits cow movement through the paddock, which helps to reduce treading damage and maintain soil structure. This improves drainage and creates better conditions for cows to lie down on. Plus, it could mean you can re-sow your paddocks sooner.

Visit dairynz.co.nz/portable-troughs

Register now for Mark and Measure

Registrations are still open for DairyNZ's popular business course, Mark and Measure. During this three-day course, you'll learn key business concepts and skills, and gain confidence to help your farm business to succeed. Spaces are limited – so don't miss out!

Visit dairynz.co.nz/mark-and-measure



What's your dry cow strategy?

At the end of lactation, dairy cows require a dry period to allow udder tissue to repair and rejuvenate. The right strategy to protect your cows against mastitis in the dry period can have a big impact on the following season.

Use dry cow antibiotics to treat cows that are likely infected, as indicated by somatic cell count (SCC) and mastitis history. Consider using teat sealants, alone or in combination with antibiotics, to protect all cows. Talk to your vet. They can help you reduce antibiotic use on your farm now, to preserve their effectiveness in future.

Visit dairynz.co.nz/dry-off



Pasture Summit autumn events

Run by farmers for farmers, the purpose of these events is to share ideas and developments on achieving profitable dairy food production from grass.

With input from dairy sector specialists and supported by DairyNZ, this year's host farmers will present their costs and returns and discuss their farm management strategy to drive profit – now and into the future.

South Island: Join Sam and Jenna Hodsell on-farm in Taramoa on **Wednesday, May 8, 2024.**

Learn more and register at pasturesummit.co.nz

Value in accurate record keeping

Collecting accurate cow performance information is vital if farmers want to increase genetic gain and farm profits, explains New Zealand Animal Evaluation (NZAE) manager Andrew Fear.

The value of animal evaluation depends on the quality of data feeding into it. Cow data contributes significantly to the rate of genetic gain across the national herd. This information feeds into the Dairy Industry Good Animal Database (DIGAD) to help improve the accuracy of Breeding Worth (BW) and Production Worth (PW).

An individual cow's information affects her relatives too. This is particularly important for bulls, where the accuracy of breeding values (BVs) relies on information generated from cows across the national herd.

Measuring performance helps you identify your best and most efficient cows. Consider what you can do on-farm to improve the accuracy of your cows' BW and PW.

Visit dairynz.co.nz/bw to learn more about Breeding Worth.

Herd testing

- Regularly testing throughout the season identifies your best cows.
- It also determines a cow's productive ability and estimates her milk protein, fat, and volume yield.
- Herd testing allows you to identify poor producers as well as cows with high somatic cell counts (SCC). These animals are candidates for culling during a drought or at the end of the season.

Weigh your herd

- The sector goal is to increase the genetic potential of a cow's production, while maintaining a constant liveweight.
- Herd-weighing data combined with herd-testing data shows which cows are the most efficient converters of feed into milk.
- A cow with a high liveweight is less efficient than a lighter cow with the same production.
- Weighing your cows at least once during their time in the milking herd is likely to have a noticeable impact on their BW and PW.

Calving & mating records

- It's important to know a cow's calving and mating dates to determine her genetic merit for fertility.
- Cows that present early for mating (and therefore calve earlier) are generally more fertile.
- Calving date influences fertility, gestation length and production Breeding Values (BVs). Accurately recording calving dates and the cow's offspring details is vital for accurate BW, PW, and BVs.
- NZAEL recommends confirming parentage through DNA testing so you can identify high-BW heifers, know which animals to sell or cull, and prevent inbreeding. Mismatched parents can reduce genetic gains in your herd and will lead to losses in profit.

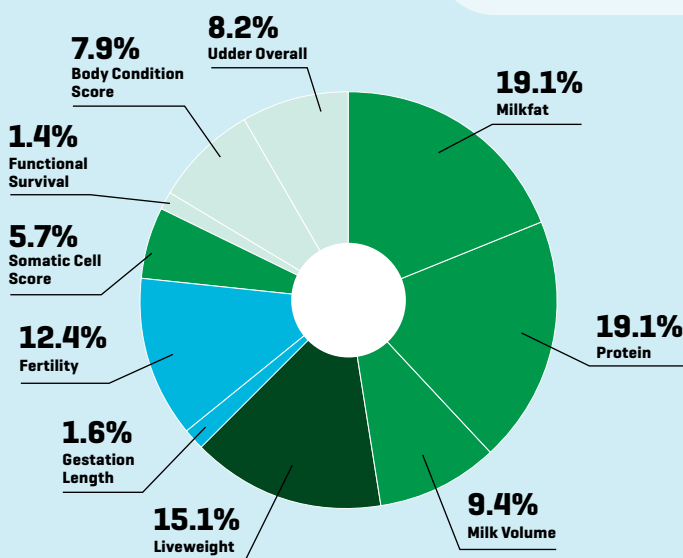


FIGURE 1.

Effective emphasis of traits in the BW Index.

- Calving and mating
- Weighing the herd
- Herd testing
- Other

New Zealand Animal Evaluation Limited (NZAEL) is a wholly owned subsidiary of DairyNZ. It is the sector-good provider of animal evaluation and leads work to optimise the national dairy herd through ongoing improvement in genetic evaluation.



Tales from the (awards) field

DairyNZ gets behind several agricultural and environmental farming awards every year, including providing judges for these events. *Inside Dairy* caught up with four of them recently.

2024 Ahuwhenua Trophy finalists (dairying) from Whakatōhea Māori Trust Board and Wairarapa Moana ki Pouakani Incorporation with dignitaries in February this year [photo: Alphapix.co.nz].

DairyNZ long-timer and farm systems specialist Chris Glassey has been a judge on and off for the Ballance Farm Environment Awards (BFEA) as far back as 20 years ago. He's been involved again this year too.

"The BFEA competition is cross-sector, not just dairying. This year's four finalists were all so passionate about farming as a business: the environmental outcomes were just one part of the whole sustainability issue," says Chris. "I also love meeting motivated farmers who've done a lot of work and reflection on their businesses."

DairyNZ senior extension partner Mike Bramley has also judged for the BFEA (11 years in total, across Waikato and Auckland).

"For DairyNZ, it's been a great way of facilitating farmer-to-farmer learning, as people become connected. Entrants sharing what they're doing and their knowledge with their community also links directly to DairyNZ's progressing a positive future for dairy farming."

Many entrants go on to great careers but also remain connected, as 2020 and 2024 NZ Dairy Industry Awards

(NZDIA) judge and DairyNZ extension partner Ashley Primrose confirms.

"At our Taranaki Field day in 2022, we had the last 10 years' worth of winners there. That was pretty amazing. Every entrant I've talked to has learned from the experience and it's helped their business in some way."

DairyNZ's farm business lead Paul Bird has judged the dairying entrants in recent years for the Ahuwhenua Trophy Competition, which celebrates business excellence in Māori-owned dairy, sheep and beef, and horticultural enterprises, alternating between each of the sectors three-yearly. This year's DairyNZ judges are Bruce Thorrold and Gill Haenga.

"It's an amazing experience being involved in this prestigious competition, learning about Māori land history and tikanga," says Paul. "A highly experienced kaumātua is part of the judging group, guiding us and clarifying each of the competition entrants' historical journeys."

All four judges agree that awards partners and sponsors are critical to any awards' success. Farmers hosting awards field days also go the extra mile to make everyone welcome.

"On one occasion, my fellow judge was 8-9 months pregnant," shares Chris Glassey. "The farmer had placed bales at key points across the farm so she could get in and out of the ute safely and easily!"

Awards underway

Field days were held during March/April 2024 for the awards events below, with finals coming up in May and June. Visit their websites for more information:

- Ahuwhenua Trophy Competition (2024 – dairying) Hamilton, Friday, May 17, 2024. ahuwhenuatrophy.maori.nz
- NZ Dairy Industry Awards (NZDIA) – Queenstown, Saturday, May 11, 2024. dairyindustryawards.co.nz
- BFEA - Ballance Farm Environment Awards – Hamilton, Thursday, June 20, 2024. nzfeawards.org.nz

Sleep study's calving tips



Calving's always a busy time on-farm, so how can you make sure everyone gets enough sleep to maximise their energy levels and wellbeing? DairyNZ's Dr Lucy Hall updates our sleep study.

Dairy farming and sleep are not always compatible – and sleep often slips to the bottom of our priority list. DairyNZ sleep studies have found that early starts for morning milking, and an increased workload over calving, can negatively affect sleep.

People should be getting 7-9 hours' sleep each night. Not getting enough sleep can create safety and wellbeing issues by increasing people's irritability, indecisiveness and fatigue, negatively affecting mental and physical health.

Sleep study update

DairyNZ scientists, alongside sleep expert Dr Kelly Dale (a sleep expert from Healthy Lifestyle NZ), have been working with dairy farmers over the last four years to better understand their sleep patterns and how those relate to different farm systems and milking schedules.

Our previous sleep studies found that the average total sleep time per farmer was just over six hours a night during calving. That equates to sleeping one night less a week (compared with someone who's getting around seven hours' nightly), or 52 nights less sleep per year!

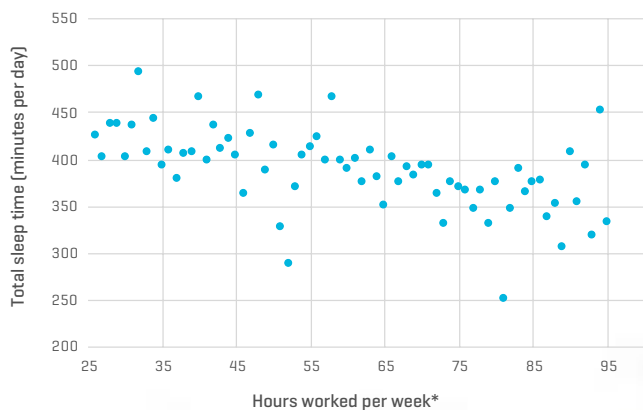
Our latest sleep study (in spring and autumn of the 2022/23 season) has found that this sleep debt isn't being repaid later in the season either: average sleep time remained very similar over autumn, and a long work week has a negative impact on sleep time (see Figure 1 below, left).

Sleep tips at calving time

- Aim for a few early nights per week, especially when doing the early shift.
- Use 'morning people' for early starts and 'night owls' for evening checks as much as possible.
- Adjust milking intervals/schedules to achieve longer breaks (i.e., 10+ hours) between work ending and re-starting (dairynz.co.nz/milking).
- Use work tools like kanban boards to improve task organisation and save time during the day (dairynz.co.nz/kanban).

Still sleeping badly? Check out these sleep tips at sleepfoundation.org/sleep-hygiene and get more calving set-up info at dairynz.co.nz/calving-setup

FIGURE 1. Total sleep time per day (minutes) versus hours worked per week.



*Generally as hours worked per week increased (especially past 40 hours), sleep time decreased.

About the study

The study involved farmer participants wearing Oura 'sleep rings' every night. Measures recorded included total sleep time, awake time and heart rate.





Greg and Gail Mitchell, their farm team and their families learned first-hand what it takes to cope with and recover from a severe weather event like 2023's Cyclone Gabrielle.

Centred in the storm

Cyclone Gabrielle in February 2023 left Greg and Gail Mitchell isolated on their Hawke's Bay farm along with 25 others. Here's how they coped with the crisis and what they learned from it.

At 3am on February 14 last year, Hawkes Bay dairy farmers Greg and Gail Mitchell woke up to a blackout on their Patoka property, their backyard covered by 10-20cm of water and hills collapsing around the farm.

"It sounded like avalanches. We didn't know what was going on," says Greg, who'd raced out to turn on the generator.

Gail hopped onto Facebook. Civil Defence had declared a state of emergency for Napier and Hastings, and many bridges were out.

By 6am she'd phoned sons Scott and James. They were both fine. Then, all the cell towers in the area lost power.

All hands to the pump

"You didn't know what was happening in the rest of the world. We were basically trapped," says Greg.

The Mitchells had a generator in the cowshed, and plenty of space, so they and their eight team members (all from Kiribati) ferried freezers from their homes into the shed, setting up a base and communal kitchen.

Phone and online contact remained cut off while the team continued milking. Finally on February 16, one of their team got a phone signal from the top of one paddock, enough to message but not to talk. Fonterra flew in their area manager and two vets who advised everyone in the area to dry off their cows, due to no milk tanker access.

"Meanwhile, vets helicoptered in dry cow treatments to all the dairy farms, along with a vet for those who needed to pregnancy-test their cows," says Gail.

Once restored, road access wasn't easy or consistent: some were open one day, then closed the next, says Greg. At one stage, 900 cull cows from across the district had to be walked out across a river.

Family and others rallied. Son James crossed the river with help from locals at Rissington, to bring a generator, extension cords and gas bottles to the farm. Then private helicopters started coming in with food drops, followed soon after by NZ Army and Civil Defence helicopters.



1



2



3



4

Soon after the storm:

1. Cows above a washed-out culvert.
2. Some of the farm team repairing fencing.
3. Paddock and fencing flooding damage.
4. Team BBQ in the woolshed's makeshift 'kitchen'.

“

It sounded like avalanches. We didn't know what was going on.

Recovery and reflection

Greg says it's hard to plan for recovery or an emergency, and although they thought they were prepared, there were things they didn't foresee.

"It was a month before we could get into town," he says. "Everyone on the farm is looking to you for leadership. Things are changing all the time. The key is to keep making decisions."

In the weeks following the cyclone, the Mitchells learned a lot.

"One thing was, to have a bit of a head count of how many people live on your farm," says Greg (27, including the team's family members).

Gail noted that people handle isolation differently. Restored access to news/social media coverage of the cyclone damage unfortunately led to one staff member having a panic attack and being helicoptered out, two weeks after the cyclone.

Gail says even though their farm was isolated, at least they knew they were okay. "We couldn't fathom how tough it must have been for those who had to climb onto their roofs to escape the floodwaters."

Resilience before and after

"Be prepared to look after yourself for at least a week," says Gail. "And have plenty of dry food, such as rice, that can be stored for a long period," adds Greg. Knowing about Starlink satellite service would have helped immensely too, says Gail.

A generator is a must-have, as is access to enough fuel, says Greg. "Unison electricity distributors brought a generator that Civil Defence would supply with fuel, but it needed 4000 litres a day, so farmers began sending tankers over the river every day to collect some."

The couple says portable solar-powered fences are another essential. "Once the power was off, cows quickly learned they could go through fences," says Gail. "You need to be able to control animals, and not just on one side."

The couple had a digger on the farm and began repairing culverts, but getting supplies in was slow. "For a month we couldn't really do anything," says Greg. Luckily, extensive work carried out before the cyclone, to

divert water away from their cowshed and spread it over many points down the hill, really paid off, as did previously-installed sediment traps.

In places where infrastructure didn't hold up, the Mitchells future-proofed it, replacing 500mm culverts with 1.2m culverts; and re-siting washed-away fences in less vulnerable locations. They also noticed ponding areas had helped slow water down, so they created more of them and raised more streams' areas.

A good relationship with their insurance broker made the Mitchells' life easier, especially when managing multiple claims. "We could pick up the phone and ring Heather, our broker, who did most of the firefighting for us," explains Gail, who also advises having farm buildings photographed. "A valuer will want to know what it looked like pre-flooding."

The couple's 'Force Majeure' clause in their Fonterra Terms of Supply also kicked in, so they had the security of a paycheck coming.



Greg (pictured with the farm's generator) says an alternative power source is a "must-have".



The key is to keep making decisions.

Slip damage caused by the storm (left) has been addressed with replanting (right).



The Mitchells say when preparing for future severe weather events, be aware that you may be without power and/or communication for at least a week.



“

It's crucial to step back after these events and assess how you'll manage rebuilding – and the fatigue that goes with it.



The Mitchells (far left) catch up with three of their team. Left to right: Taremon Beia, Motua Moanibwebwe and Mika Kanae.



If you want to help farmers, keep asking even a month or six weeks later.

After effects linger on

"We dried the cows off in February that year and didn't start milking again until that July," says Greg. "The long-term effects of a disaster shouldn't be overlooked. It's crucial to step back after these events and assess how you'll manage rebuilding – and the fatigue that goes with it."

He had a serious tractor accident eight weeks after the storm, and he puts this and other farmers' calls to 111 in the months post-cyclone, down to fatigue during the recovery in the region. "Everyone rips into it, but even if you are stuck on the farm, you can't work 24/7," he says.

Post-crisis support is very important too, adds Gail.

"If you want to help farmers, keep asking even a month or six weeks later. That's probably the best time, as they've had time to digest what needs doing – and there's access to the farm again."

Silver linings

"Don't waste a good crisis," emphasises Greg. "Learn to use what you've got, old wire and scrap metal can make a fence when you're in need."

Production-wise, they're recovering relatively well. Their usual 600,000kg MS/year is tracking to drop down to about 570,000, and pasture growth has returned to normal after considerable undersowing.

"Staff coped well overall," adds Greg, "but it did take some getting back into the swing of it for the next season."

The couple remain upbeat, despite the challenges of the last 12 months. If you can "batten down the hatches" you will get through anything, says Gail.

The ultimate pick-me-up came six weeks after the cyclone when the Mitchells were named regional Ballance Farm Environment Awards' Supreme Winner for the East Coast.

Planning for adverse weather

Having a contingency plan in place can help increase your resilience to future spells of adverse weather. We recommend that it include:

- an adverse event checklist readily available and updated for and by everyone on-farm
- a list of things to consider to care for your cows during an event, e.g.:
 - shelter
 - areas to lie down
 - availability of appropriate feed and the environment
- a calendar for regular plan discussions/updates with your team.

DairyNZ's website has a range of tips, resources and advice for preparing for a range of adverse weather events, including prolonged wet weather, cyclones and dry periods.

Visit dairynz.co.nz/adverse-events



Free online tool proves its worth

It's nearly a year since DairyNZ's free online Econ Tracker tool was launched to help farmers make informed decisions around financial planning, forecasting, and budgeting. Farmers say it's already proving worthwhile.



DairyNZ's Econ Tracker is a one-stop resource for the latest information on the New Zealand dairy sector and it's updated quarterly. Its data is based on information compiled from the DairyNZ Economic Survey and Dairy Statistics publications. The tool provides a snapshot of the dairy sector's economic situation including international market trends.

Farmers can use the forecast features for farm-level revenue and expenses to help with planning and decision-making for both present and future seasons. This forecast is generated using the most up-to-date data from DairyBase (DairyNZ's own database

with information collected from over 1500 farms), as well as external sources like Stats NZ.

New season forecasting

The forecasting tool is designed to help farmers prepare budgets for the coming season (see bottom left of next page*). For this reason, Econ Tracker forecasts are updated quarterly, and capture the most recent trends in price movements and sector announcements such as revised payout forecasts from Fonterra.

The latest quarterly update of the Econ Tracker, released in March

this year, provides a forecast for the current season, and includes a new forecast for the 2024/25 season. A key development in the 2023/24 forecast sees a drop-off in feed and fertiliser expenses continuing. There has been a significant price change for these two items, and they have now eased back closer to an historical average (see Figure 1, bottom left).

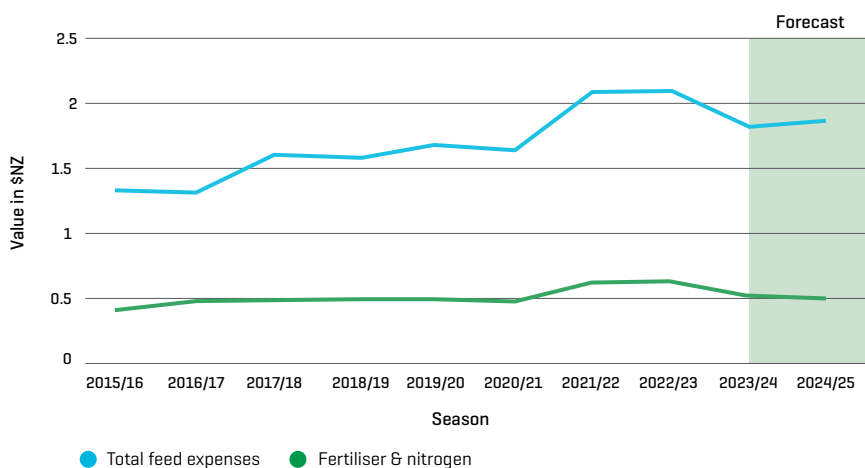
Revenue projections

Revenue projections for this season have also improved on the back of improved results at the global dairy auction and Fonterra's adjusted projected payout for the season. Overall, the 2023/24 season looks to be significantly brighter than was projected, even six months ago, with average operating profit predicted to be \$2.46/kg MS and Break Even Milk Price (BEMP) at \$7.75/kg MS. However, the costs of servicing debt have become a main point of concern for many farmers due to higher interest rates and effective borrowing costs.

Looking ahead to the 2024/25 season, we see a marginal tightening of dairy farmers' financial positions. DairyNZ is forecasting the size of the herd to continue to drop, and production to remain stable, indicating increased productivity per cow.

Both revenue and working expenses are forecasted to ease, largely but not

FIGURE 1. DairyNZ Econ Tracker past data and 2023/24 + 2024/25 forecasts: costs for feed and fertiliser.*



*For details see DairyNZ's most recent Annual Farm Survey

Source: DairyNZ estimates



Overall, the 2023/24 season looks to be significantly brighter than was projected, even six months ago.



completely off-setting each other. Interest costs will continue to remain a significant cost pressure for farmers in the 2024/25 season, while average operating profit is predicted to be \$2.05/kg MS, and BEMP, \$7.76/kg MS.

**While efforts have been made to ensure that the forecasts are based on reasonable assumptions, these forecasts may be influenced by incorrect assumptions or unknown risks and uncertainties, and final outcomes may significantly differ from the forecasts provided.*

Visit dairynz.co.nz/econtracker for more information.

Econ Tracker in action

North Canterbury farm shareholder Richie Bowman and his team used the Econ Tracker to come up with a suitable package when recruiting a new contract milker for their 2000-cow herd. Richie says they found the tool especially useful. It helped them to work through the process of finding an appropriate contract milking rate for their farm.

"All farms are different, and you can't rely on anecdote. Nor do you want anyone to be disadvantaged, so having independent economic information that broadly reflects the marketplace is valuable.

"The Econ Tracker gave us a Canterbury-wide overview about what costs we might incur rather than what we could assume by relying solely on our own farm numbers. It added some independence to the process so we could come up with a result that was fair for everyone," says Richie.

Te Aroha farm owner and operator Melissa Slattery finds the Econ Tracker most useful when benchmarking her farm's performance and helping with forward planning.

"It's always good to confirm where you're at in terms of performance. The Econ Tracker can provide a strong indicator of how well your decisions have gone and help identify the best way forward when it comes to decision-making.

"It verifies on an industry level, how our performance is tracking at a farm level, and ensures that our budget is realistic."

Looking ahead's looking good



Campbell Parker

Inside Dairy talks with DairyNZ's Campbell Parker and Bruce Thorrold about the sector's past and future, where DairyNZ fits in, and why there's plenty to be positive about.

The dairy sector has faced many challenges over recent decades, yet still made huge gains and progress. That's been driven by farmers, scientists, organisations, community groups and sector partners (including DairyNZ) working together for positive change, says DairyNZ CEO, Campbell Parker.

"I'm new here, but I'm incredibly proud of the work farmers and DairyNZ have done together over the last 15+ years and I think the sector will continue to play a really important role in the fabric of New Zealand."

Campbell believes the future of dairying will look different, but science will continue to lie at the heart of rising to that challenge.

"DairyNZ's role is to pull all of our research together and continue its development, so farmers can adapt their farm systems and remain relevant and profitable. I think that's at the core of it," he says.

"Our research also needs to be understood in the context of the farm system: to bring in the economic modelling to see

DairyNZ research in focus



2000

The Holstein Friesian Strain shows 20 years of genetic gains, \$600/ha additional profit, & identifies weight, body condition score & fertility challenges.



2001-2007

New ryegrass generation endophytes ARI/AR37 with less animal health effects tested for safe & productive use for cows.



2003

DairyBase created, adds input from farmers/accountants/consultants & academics; informs regional/national policy advocacy on how water/climate regulations affect farm profitability.



2003-2023

PGGRC & DairyNZ/other sector partners have invested \$90M+ in exploring technology-based solutions, so NZ's pastoral farmers can reduce GHG emissions & increase productivity.

what the impact might be, because we're acutely aware that our farmers are incredibly focused on profit – and they need to be."

DairyNZ chief science adviser Bruce Thorrold, who's been with DairyNZ for over two decades, agrees.

"In the 40 years since I started my career in research, I've never been more excited about the opportunities ahead. If you look at the current international context, the quality of the food we produce, and the talent we have in the sector – there are a lot of reasons to be very positive about where we go in the future."

From there to here

DairyNZ's science and research combines detailed experiments with farmer-led, robust on-farm testing, helping create a broad range of information, tools and resources for farmers.

"For example, working with partner farms trialling plantain," says Bruce. "If we tried to do that amount of on-farm research with structured programmes, we'd never get it done."



I think the sector will continue to play a really important role in the fabric of New Zealand.

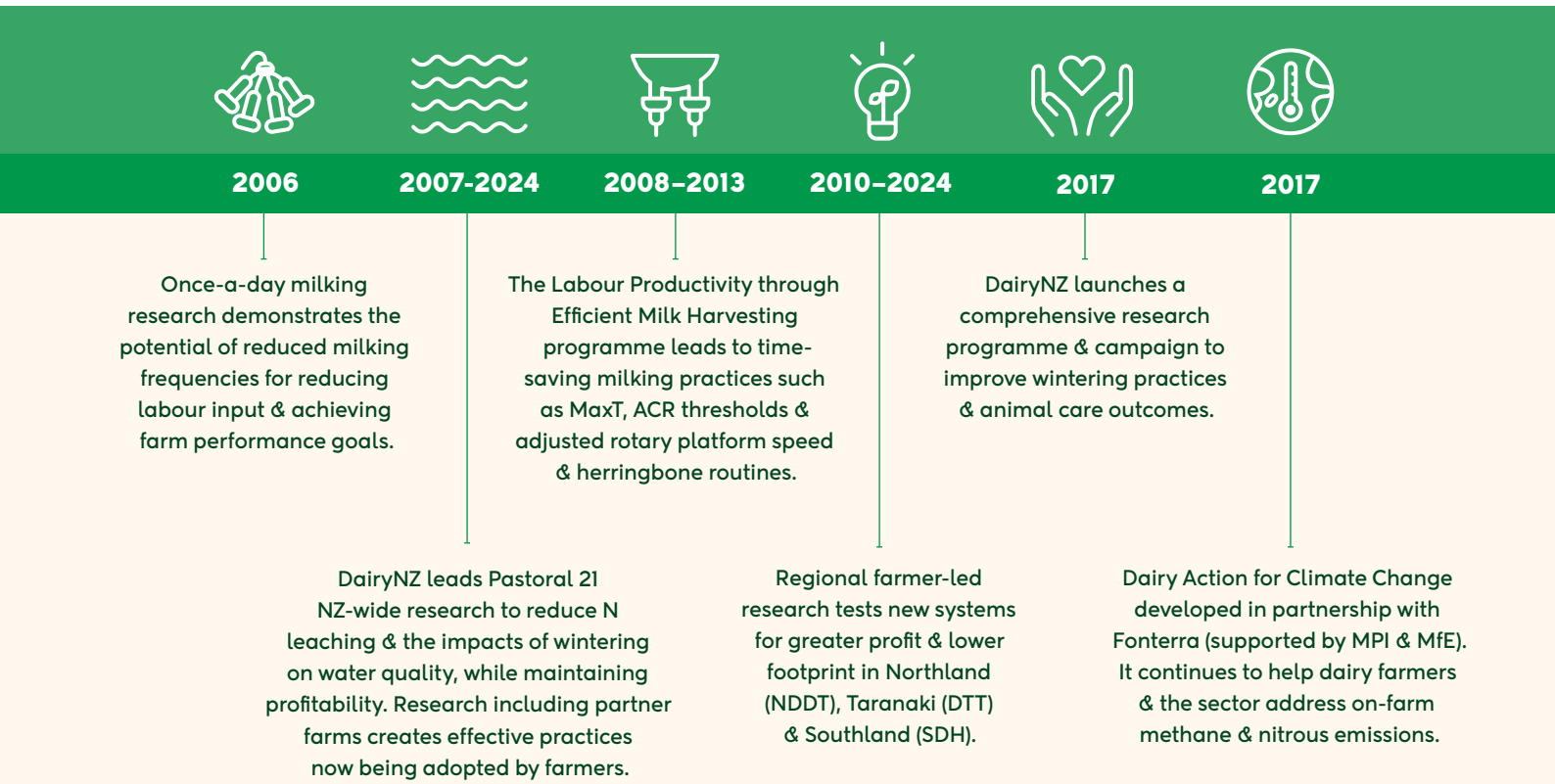


**Jason Christensen
WAIRARAPA**

Owens a 380-cow dairy farm that's been in the family 145+ years

To stay competitive, the Christensens are running Jerseys, building their genetics to produce lighter-hooved cows that can cope with the effects of climate change, and developing more shade/shelter. Jason's also involved in the Nestlé/Fonterra project.

"I think DairyNZ should be leaders in the field of science for the dairy sector and very much supporting. If we can keep a clean green low footprint focus on our farms, we should have a pretty good future. Especially, if farmers can see a reward in their milk cheque because of doing those things. As an industry leader DairyNZ needs to be driving that and it needs to be science-based rather than politically-based."





Bruce Thorold

Graeme Riesterer

BAY OF PLENTY

Whakatohea Māori Trust (finalists: 2024 Ahuwhenua Trophy competition)

Trust Board member Graeme chairs Whakatohea’s farm committee. The Trust’s Opōtiki-based multi-farms are Iwi-led and operated. They’re future-proofing through riparian planting, steadily reducing stocking rates and being involved in GHG/ methane reduction research with Lincoln University and the Nestlé/Fonterra project.

“Our tikanga is the basis of everything we do. Science also gives us the ideas which we, through practice, turn into knowledge. Often, a lot of what science finds, has already been discovered, be it from our elders, or from other cultures. We can all benefit from that. We’ve also taken up and enhanced all that by learning from the European culture as well.”



Campbell emphasises that evidence and trust plays a key role in what DairyNZ can achieve for the sector’s farmers at a national level.

“The evidence that we gain from our science and research underpins our advocacy on behalf of farmers to achieve fair and pragmatic policy outcomes,” he says. “It also helps to build trust across the sector. Our support for farmers to upskill on making submissions on regional policy ensures farmers’ voices are heard at every level.”

Research snapshot

Capturing the full span of 15-20 years’ worth of DairyNZ’s science and research is challenging, but the timeline shown at the bottom of this article captures some highlights.



2018

DairyNZ Sustainable Catchment projects launched in Taranua, Selwyn-Hinds & Aparima, to support farmers to improve water quality, while maintaining profitable & resilient businesses.



2019

Government introduces Zero Carbon Act. DairyNZ advocates successfully for a split-emissions approach, recognising differences between biogenic methane & long-lived fossil fuel gases.



2019

DairyNZ scientists’ ongoing partnering with commercial companies, Government & research organisations develops methane mitigation packages suitable for NZ pasture-based farm systems.



2019



2020

In the Resilient Dairy project, DairyNZ starts new work on genomic evaluation techniques & data sources supporting sector-wide genomic animal evaluation & greater rates of genetic gain.



2021

DairyNZ Pillars programme identifies new predictors of fertility. DairyNZ works with 100+ farmers giving access to 10,000+ heifers. Heifers’ lactations & reproduction tracked, to test effects on genetic gain rates.

DairyNZ’s Step Change programme launched. This programme gives farmers options for achieving environmental goals while also increasing profit.

“ In the 40 years since I started my career in research, I’ve never been more excited about the opportunities ahead.

Next, our Frontier Farms project and its extended lactation trials (2023 onwards) will focus on identifying further time-savings and efficiencies; and how to reduce the number of bobby calves born.

Campbell also points to the rise of innovative tools like wearable collars and how they’re shaping farm systems. “It’s really important that our sector keeps an open mind on what the possibilities might be around emerging tech.”

Looking ahead

“We need to keep pushing the frontier around productivity while also making sure we do things right for our animals and the environment,” says Campbell. “We also can’t lose sight of the fact that we still need to be really good at growing grass and turning it into milk – and doing that profitably.”

“That means we do the science, understand the implications, have input into policy, work with agri-business partners on technical solutions, and work with farmers to understand and innovate,” adds Bruce.

Blair Robinson CANTERBURY

*Dairy Holdings Limited
(Chief operating officer)*

We’ve got a positive view of the future and are buoyed to see many of our own sharemilkers continually reaching farm ownership, even over the last few years.

We’re investing in the development and progression of our people: they are our key to a successful future. We’ve moved to 100% pasture diet for our dairy farms several seasons ago. We’re also trying to do the basics well. For example, our six-week in-calf rate has steadily improved to 78%. Sector research and development, including by DairyNZ and Fonterra, will also help to make dairying’s future more sustainable, and in many cases, more profitable.



“There’s a lot to balance,” acknowledges Campbell, “but with the right science and support, underpinned by evidence and trust, and by working together, the future’s looking bright for the sector, its farmers, their communities and everyone who benefits from them.”



2021–2023

A study & scientific paper commissioned by DairyNZ looked at the carbon footprint of milk worldwide. It found NZ dairy is one of the lowest emissions per kg of fat & protein-corrected milk.



2021–2023

Government proposes agricultural emissions pricing. Agricultural leaders negotiate a partnership approach (*He Waka Eke Noa*) to pricing & managing emissions.



2022

Further research by world-leading scientists (with B+LNZ & Federated Farmers) reinforces the evidence for a split-gas, warming-based target for biogenic methane.



2022

Primary sector *He Waka Eke Noa* partners recommend Government adopt a split-gas approach to pricing agricultural emissions by 2025. This framework was later abandoned by Government.



2022

The *Dairy Tomorrow* sector-wide strategy commits the sector to Farm Environment Plans, delivering on good farming practice, nutrient use, & farm system solutions.



2023

NZAEL launches new Fertility Breeding Value.

Are you ready for winter?



It's crucial that farmers create a comprehensive wintering contingency plan, including portable trough and back fence strategies (pictured: Southland dairy farmer Luke Templeton).

With the winter season fast approaching, DairyNZ lead adviser Justin Kitto shares some great results from the annual wintering survey and some ideas on how to achieve good practice.



Farmers from all over the country have made an impressive effort to put good wintering practices in place, ensuring their animals are cared for no matter what the weather conditions are. Our recent DairyNZ wintering survey highlighted some notable achievements, including that 80% of farmers have now written wintering plans.

Planning makes perfect

Last winter, 74% of farmers implemented at least five good management practices to support their cows and manage winter conditions. Also, 96% of farmers surveyed said they had strategies to provide comfortable lying conditions for their cows.

Despite this, another finding is that portable trough use and back fencing had a low uptake, which hasn't increased over the last three seasons. If you're looking to lift farm performance in 2024, these are two highly beneficial actions to consider.

The benefits of portable troughs and back fencing

I've seen firsthand the advantages of using portable troughs and back fencing and encourage all farmers to consider how to make these a core part of winter grazing plans.

The main benefits farmers talk about relate to better soil conditions. Paddocks dry out sooner so you can get equipment in early and get something else growing more easily. And soils are less damaged, so when the wet weather arrives, back fences can be extended or dropped to provide more area for cows to lie on.

If you're concerned about the added work involved in moving portable troughs, there are some great 'number 8 wire' solutions

recommended by farmers who have used them successfully. These include the installation of skis for ease of movement, putting troughs under fences of neighbouring grass paddocks to avoid dragging them through mud, and putting troughs on trailers.

Identify comfortable lying surfaces

Portable troughs and back fencing are an essential part of a great winter toolkit to provide comfortable lying surfaces that allow cows to lie down for as long as they want to. Since cows require a minimum of 8-10 hours of lying time per day, and prefer 10-12 hours, it's important to make sure conditions are good enough for them to lie down comfortably when they want to.

During prolonged periods of wet weather when paddocks become too wet and muddy, it's important to have a contingency plan. The range of strategies available include shifting cows to a drier, lower-risk paddock, or using crops positioned in drier or more-sheltered areas for grazing during bad weather. You could also stand them off in a tree block, or use feed pads/stand-off pads, or grass strips in crop paddocks. I've also seen farmers roll out straw for cows to lie on.

The Gumboot Score

So how do you decide when the conditions aren't right for sufficient lying time? The gumboot score is a tried-and-true method for responding to winter weather conditions. However we've heard of a few other quirky, but sensible methods. One farmer told us, "If the mud pulls your red bands off, it's too wet for the cows to lie on". Another says, "If I won't lie down in that paddock, I shouldn't expect my cows to lie down in it either".

Whatever your strategy for identifying a comfortable lying surface, it's important to have a firm boundary for when you need to provide cows with a more comfortable surface to lie on. Outline this in your written wintering contingency plan, including your portable trough and back fence strategy, and share it with your farm team so everyone knows when to act.

“ Develop your wintering plans with your team so they clearly understand the 'why' behind the plan.

Farmers with teams tell us that because of the high risks around animal care and environmental requirements, they prefer to manage crop wintering themselves. But upskilling your team could take some of the pressure off. If you develop your wintering plans with your team so they clearly understand the 'why' behind the plan, you will get better outcomes and they might even have novel solutions to some of the day-to-day challenges.

For insights into successful wintering visit dairynz.co.nz/wintering

Keeping cows comfortable

Cows wintered on crops prefer to lie for 10-12 hours daily. Discover tips to keep your cows comfortable and ensure their wellbeing over winter at dairynz.co.nz/cow-comfort

Fresh solutions for water quality

DairyNZ has leading scientists working in partnership with farmers, to develop solutions to improve water quality and meet changing regulations.

Our scientists are developing a range of solutions to reduce contaminant losses and improve water quality. Farmers play a key role in helping us test and evaluate solutions on-farm. We also work closely with research partners to pool together expertise and get the best value for our farmers' Levy.

Solutions are designed to suit local water quality challenges. Working with farmers is helping us understand what changes are possible on-farm to meet regulations – while staying profitable. This research helps inform regional council decisions.

DairyNZ also works closely with farmers and catchment groups to trial practical tools and interventions on-farm. This work is part of a three-year DairyNZ Sustainable Catchments programme, part-funded by the Ministry for the Environment's Jobs for Nature programme. This builds on the success of previous partnerships with farmers in Selwyn Hinds (Canterbury), Tararua (Manawatū-Whanganui) and Aparima (Southland) to meet changing regulations and further improve water quality.

Read more below on the work DairyNZ has underway to continue water quality improvement.

Low-N Systems



The Low N Systems research programme is investigating how combining various mitigation options can help farmers significantly reduce nitrogen losses, while maintaining business viability. A multi-year farmlet trial is underway at Lincoln University to test and demonstrate a profitable and practical farm system with stacked N mitigations. The programme is also working with Fonterra and partner farms to develop a milk-based indicator tool to help farmers manage their herd's dietary nitrogen surplus.

Best practice dairy catchments



A joint AgResearch and DairyNZ project has shown adopting good farming practices reduces contaminant loss into waterways and improves water quality. The Best Practice Dairy Catchments project ran from 2001-2010 in five small dairy-dominated catchments. It drew on science to give farmers advice and helped them develop farm plans with mitigation strategies to reduce contaminant loss. Monitoring over 20 years has shown that two-thirds of water quality trends were improving.

Pōkaiwhenua Catchment



A new partnership between DairyNZ, Iwi and farmers is working to improve the health of the Pōkaiwhenua Stream in Waikato.

Plantain Potency and Practice programme



The DairyNZ-led Plantain Potency and Practice programme is quantifying the effect of Ecotain® plantain for reducing nitrogen losses to freshwater and greenhouse gas emissions. Massey University and Lincoln University farmlet trials show plantain can significantly reduce N leaching without compromising production. Over 20 partner farms across New Zealand are demonstrating plantain can be easily integrated into existing pasture-based systems. The farmers are also helping to develop regionally relevant recommendations for establishment and management. Farm and catchment level modelling conducted within the programme shows plantain is a low-cost high impact option for reducing N leaching.

Achieving nitrogen targets in Canterbury



DairyNZ partnered with 40 dairy farmers in Canterbury's Selwyn and Hinds catchments to help farmers meet challenging council N loss targets. Partner farm data shows there has been a 44% reduction in N loss from farm baselines over the project lifespan. Partner farms shared their strategies with other farmers across their catchments to provide farmers with new N loss solutions.

Understanding *E.coli*



A new joint research programme between AgResearch and DairyNZ is working with farmers in Manawatū-Whanganui to understand and reduce *E. coli* losses into waterways.

South Canterbury Catchment

A collaborative project between farmers, DairyNZ and other stakeholders in South Canterbury is finding viable solutions to decrease nitrogen in freshwater and helping ensure farmers can meet plan change rules.



Waimea Catchment



The Waimea catchment group in Southland is working together to develop a better understanding of the most effective on-farm changes and interventions to further improve water quality.

Tarawa Plantain project



DairyNZ worked with farmers in Tararua to successfully adopt plantain to reduce N losses and meet challenging local regulations.



Learn more in our podcasts and online – visit dairynz.co.nz/water-research

Seasonal toolbox

Key DairyNZ tools and resources for farmers, designed with the latest research and technology.

Welcoming new staff

A good induction and ongoing support goes a long way in helping new team members get off to a great start – and it helps with staff retention. Check out the comprehensive onboarding guide which covers everything from getting paperwork sorted before day one to creating a great culture through regular check-ins and training sessions.

dairynz.co.nz/onboarding



Moving day essentials

Moving for some farmers not only involves household items, but a farm-load of equipment and livestock. Early planning and clear communication with your team and others helping is key to ensuring it goes smoothly. Be sure to manage health and biosecurity risks by cleaning and disinfecting everything leaving the farm, particularly vehicles and machinery.

If you're planning to move farms next season, check out what you need to consider.

dairynz.co.nz/moving-day

Preparing cows for transport

Preparing cows for transport means they arrive at their destination fit and healthy. Remember, lactating cows have a higher risk of metabolic issues during transport – they need roughage, extra calcium and constant access to water until loading time. You can give them extra calcium through oral drench, increase their intake of calcium-enriched meals, or pour a slurry over dry feed (use the same rates of supplementation as for colostrum cows).

Discover key considerations for transporting livestock for a safe and comfortable journey.

dairynz.co.nz/transport



Transition cow nutrition

A cow's transition period requires specific feed management. To ensure a smooth transition before calving, focus on reaching desired body condition score (BCS) targets. The key to success is managing the BCS of each cow individually, rather than using average values. Take care of both underweight and overweight cows to minimise the BCS range at calving.

Aim for a BCS of 5 for mature cows and 5.5 for younger cows one month before calving. Keep in mind, it's difficult to change BCS in the last month before calving as the cow's energy and nutrient intake primarily support the growth of her calf. Check out this webpage below for more information about their nutritional needs and effective feeding strategies.

dairynz.co.nz/feeding-transition-cows



Rearing calves well

A recent study reveals how greater milk allowances can positively affect calf behaviour and welfare, but liveweight differences disappeared post-weaning.



Ashton McDonald

Globally, our understanding of animal welfare has evolved. Instead of thinking only about health and production, we now take a broader perspective that includes behaviour and affective state, which considers an animal's experiences and mood.

Hence, the latest research on calf rearing doesn't simply focus on reducing illness and increasing weight gain, but includes examining behaviours such as how much time calves spend lying and grooming.

DairyNZ's Ashton McDonald, who recently completed a Master of Science through The University of Waikato and AgResearch, studied the effects of milk allowance on the growth and behaviour of Holstein-Friesian calves.

Conducted at the Pāmu calf-rearing facility near Taupō, Ashton's study compared calves offered 5L of milk replacer per day from one week of age until weaning (at 12 weeks of age), with those offered a higher allowance of 10L/day. Calves were reared indoors with an automatic milk feeder until five weeks of age. After that, they went out onto pasture and were group-fed with a calfeteria.

Average daily milk consumption was 4.9 and 6.6L/calf for the 5L and 10L calves during the first five weeks of age. Calves offered 10L milk replacer per day spent more time lying and grooming, which indicated a positive affective state (e.g., calmness and fullness).

In contrast, the calves offered 5L/day had increased activity and visited the milk, meal and hay feeders more often. They had many unrewarded visits to the milk feeder (average 38 of the 50 visits per day for 5L calves versus three of the 15 visits per day for 10L calves, at 2-5 weeks of age). These behaviours indicated a negative affective state (e.g., hunger and frustration).

Liveweight gains were lower when less milk was offered, but from week 14, following weaning, average liveweights were no longer significantly different.

A good calf-rearing system will balance welfare, costs and labour requirements. As we learn more about what is important to calves, we can improve our systems to enhance calf welfare, while remaining profitable.

Animal welfare is more than just health – it includes natural state and affective state. As we begin to understand more about these other aspects, our animal care practices will change.

Affective state

Relaxed • calm • satisfied

Natural state (behaviour)

Lying and resting • grooming
• playing • sucking

Health and function

Disease free • growing well



Prepare calf facilities in autumn

- Clean out last season's bedding and re-order. Ordering early will give woodchip and sawdust time to dry out before calving.
- Tackle any maintenance. Check gate latches, pen dividers and troughs are in good order.
- Check that your bobby calf loading facility is suitable for calves and people, especially the flooring which can become slippery.

Visit dairynz.co.nz/calf-housing

Average liveweights of calves offered different milk allowances from arrival to weaning.

TABLE 1.

Average liveweights (kg)	Calves offered 5L per day	Calves offered 10L per day
At four days (arriving at rearing facility)	39	39
At five weeks (calves going on pasture)	49	54
At 12-13 weeks (weaning)	86	93
At six months	187	193
At 12 months	287	289

This project was funded by AgResearch and DairyNZ with in-kind support from Pāmu.

LOWER NORTH ISLAND

Science at farmers' fingertips



Ben Allomes talking plantain with fellow farmers.

As farmers continue to improve their farming practices, dairy farmer Ben Allomes talks about the benefits of being a partner farmer with DairyNZ.

“What could a dairy system look like that’s fit for the future – for its people, animals and the environment?”

Tararua’s Ben Allomes says that broader challenge for dairying continues, and that relies on having access to what he calls the “fingertip science” needed to back farmers’ decision-making.

“I saw a need for change to meet environmental targets, and wanted to try out some ideas myself to prove it was possible. That led me to partnering with DairyNZ on their Tararua Plantain project about five years ago, as it was quite daunting to try and make those changes alone,” explains Ben (see below*, bottom right).

“Profitability drives change. It was great to have the evidence I needed from the science and the partner farm relationship with DairyNZ, which helped build the confidence to keep going.”

Ben’s involvement in the Tararua Plantain project saw pasture growth measures being conducted to compare Ben’s Ecotain® plantain pastures and ryegrass pastures side-by-side. They found plantain achieved better growth with lower N fertiliser, which also saved costs. Benchmarking using DairyNZ’s monitoring and database tool, Dairybase, reflected Ben’s farm profit increase over time.

The Tararua Plantain project also strengthened trust between its partner farmers and local councils, the catchment and the region, adds Ben. “They can see we’re

taking this stuff seriously. We’ve got great intuition as farmers. It’s really nice to have the science to back that up.

“Now we have the evidence that we’re meeting our environmental targets and exceeding our financial targets as well.”

Partnering for practicality

By partnering with innovative studies such as plantain research, New Zealand farmers help scientists to identify and refine sector challenges or opportunities, says DairyNZ’s head of science Nico Lyons. “They also help co-develop research options, provide on-farm data, and implement potential solutions, ensuring our research is relevant, credible and provides clear value and impact to NZ dairy farmers.

“For example, we have 18 Waikato and 20 Canterbury dairy farmers involved in our Low N Systems programme’s observational study; 25 partner farmers nationally helping with the development of plantain management strategies as part of the Plantain Potency and Practice programme, and 100 dairy farmers who’ve given us access to over 10,000 heifers for research to accelerate genetic gain for fertility.

“We also support other organisations’ farmer-driven regional research like the Southern Dairy Hub, Lincoln University Demonstration Farm, Dairy Trust Taranaki, and Northland Agricultural Research Farm – and we encourage farmers to take on governance roles.”

Find out more at dairynz.co.nz/research and dairynz.co.nz/water-research



Ben Allomes says both farmers and DairyNZ benefit from the partner farm relationship.

*Links to the science being conducted at Massey University as part of the DairyNZ-led Plantain Potency and Practice programme provided evidence of the benefit of plantain for meeting N-leaching reduction targets.

New heifer phenotypes to improve fertility genetics



Dr Chris Burke
Senior scientist
DairyNZ



Dr Melissa Stephen
Quantitative geneticist
DairyNZ



Dr Susanne Meier
Senior scientist
DairyNZ



Dr Claire Phyn
Principal scientist
DairyNZ

DairyNZ's recent large-scale studies indicate that genetic gain for fertility could be accelerated by including two novel early-in-life (heifer) phenotypes.

The success of our seasonal, pasture-based system relies on cows being able to get back in calf quickly during early lactation. Animals that can't get back in calf quickly are culled at a younger age, which increases the herd replacement rate and cost to the farmer.

That's why accelerating the rate of genetic improvement for reproductive performance is so important. However, there's been little or no gain in the average genetic merit for fertility in the national herd in the last 20 years.

Current fertility traits

There are many measures of fertility that could be used to selectively breed to produce more fertile cows. The traits used in our current genetic evaluation model of fertility includes the cow's ability to be mated during the first three weeks of breeding and get in calf within the first six weeks of breeding (see Figure 1, next page). Unfortunately, both these

Key Points

1. NZ's seasonal, pasture-based system relies on cows being able to get back in calf quickly during early lactation.
2. Accelerating the rate of genetic improvement for fertility will lead to improved herd reproductive performance, fewer animals culled for reproductive failure, and reduced costs related to herd replacement.
3. Two new heifer phenotypes that could improve genetic gain in fertility are age at puberty (AGEP) and anogenital distance (AGD).
4. AGD is measured from the centre of a heifer's anus to the base of its clitoris.
5. Measuring AGEP and AGD in heifers can enable a more accurate assessment of a sire's genetic merit for fertility before he is widely used.

traits have a relatively low heritability (less than 5%), making for a slow rate of genetic improvement in fertility. To increase the rate of gain, use bulls with the higher-than-average Fertility BV and high BW.

Another constraint is that these submission- and pregnancy-based traits are expressed relatively late in an animal's life, meaning that full confidence in a sire's estimated breeding value (EBV) for fertility is often not available until after he's already been widely used. Conversely, younger sires with higher genetic merit in production traits can be overlooked due to a lack of confidence about their fertility EBV.

Our interest in early-in-life phenotypes of fertility

Moderately or highly heritable traits that are genetically correlated with a cow's ability to get in calf, and expressed earlier in life, can have value as predictors of fertility EBVs. Previous DairyNZ-led research in a custom-bred, Holstein-Friesian herd of 550 animals provided compelling evidence that age at puberty (AGEP) is predictive of the cow and sire's fertility EBV¹. Here, animals with a positive fertility EBV achieved puberty at a younger age than those with a negative fertility EBV. This was consistent with their substantially better reproductive performance when lactating².

In addition, cows classified with a long anogenital distance (AGD) were less fertile than those with a short AGD³, where AGD is the distance between the centre of the anus and the base of the clitoris (see Figure 2).

Our latest studies are providing further evidence that these two novel early-in-life phenotypes, AGEP and AGD, can better predict a sire's fertility EBV at a younger age than currently used traits.

How heritable are AGEP and AGD in Holstein-Friesians?

In the autumn of 2019, DairyNZ and research partners began the first

FIGURE 1. Effective emphasis of traits in the BW Index.

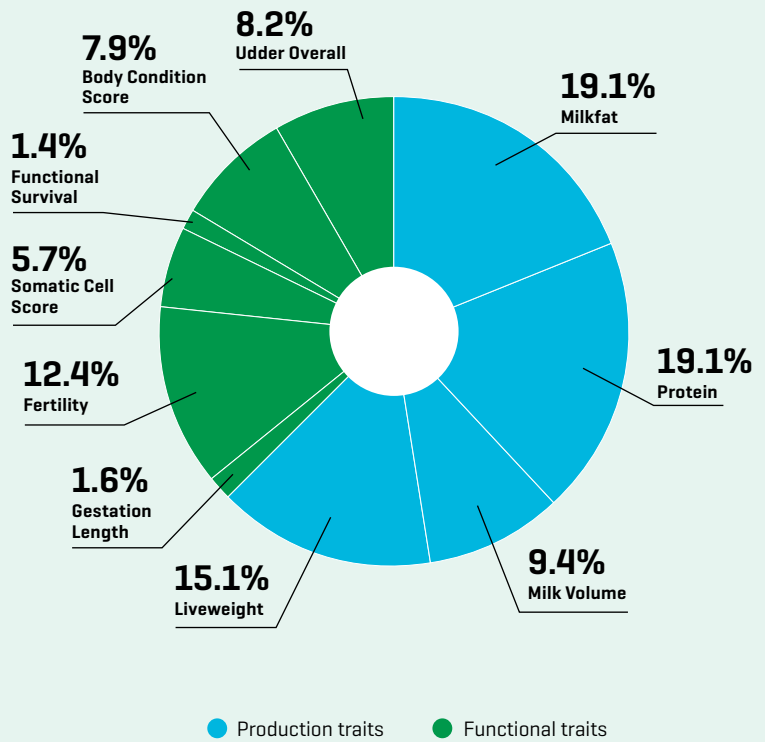


FIGURE 2. Measuring anogenital distance.



large-scale study to obtain more information about AGEP and AGD in a larger population of animals across multiple herds. We firstly wanted to better understand the heritability of these two traits.

The AGEP and AGD phenotypes were measured on 5010 Holstein-Friesian (HF) and HF cross Jersey (HFJ) heifers, farmed across 54 herds.

Our research showed that both AGEP and AGD are moderately heritable traits. This indicates that we can selectively breed for cows with earlier AGEP or shorter AGD.

- Heritability of AGEP was 34%. This was measured using a 'low resolution' but scalable method involving three blood progesterone tests taken at monthly intervals when heifers were about 10, 11 and 12 months old⁴.
- Heritability of AGD was 23% when measured at about 11 months old, increasing to 29% when the heifers were about 29 months old, during their first lactation⁵.

AGEP, AGD and fertility during lactation

The overarching aim of these studies is to find a genetic-based solution to improve fertility in lactating cows. Changing AGEP and AGD using selective breeding would only have value if there was a favourable correlated response in cow fertility (e.g., if breeding for cows that attain puberty earlier also resulted in cows that were more likely to get back in calf during lactation).

We detected favourable genetic correlations between AGEP and reproductive success measures during first and second lactation⁴. The strongest genetic correlations were with the calving (0.45 to 0.6) and submission rate (0.5 to 0.6) traits.

We also detected moderate genetic correlations between heifer AGD and reproductive success measures during first and second lactation⁵. The strongest correlations were again with the submission rate traits (0.4 to 0.5).

Furthermore, AGEP and heifer AGD were not well correlated. This means they could help accelerate genetic gain in fertility through different biological pathways.

These genetic correlations indicate that improved reproductive performance in lactating dairy cows, especially submission rates, would be expected if the AGEP and AGD measures are included in fertility EBVs.

Can AGEP be measured at scale?

A major challenge with measuring an AGEP trait is that onset of puberty occurs over several months for individual animals within a herd. This timing is also variable between herds. To overcome this challenge, we developed a method to estimate AGEP in large numbers of animals for the specific purpose of genetic evaluation. A simulation tool⁶ was initially used to predict that half of the heifers within a herd should achieve puberty at an average age of 327 days (11 months). We then visited each of the 54 herds to

TABLE 1. Descriptive statistics for Holstein-Friesian heifers (2019 study) and Jersey heifers (2023 study).*

	Holstein-Friesian**	Jersey
Heifers [n]	5010	5260
Age at Visit 1 [V1], in days	299 ± 14.4	258 ± 13.4
Age at Visit 2 [V2], in days	327 ± 14.4	287 ± 13.1
Age at Visit 3 [V3], in days	355 ± 14.6	330 ± 15.5***
Reached puberty by V1 [%]	20 ± 39.7	25 ± 16.5
Reached puberty by V2 [%]	39 ± 48.7	44 ± 23.9
Reached puberty by V3 [%]	56 ± 49.7	N/A
AGD at V1 [mm]	81 ± 10.3	72 ± 9.2
Height at V2 [cm]	115 ± 4.8	105 ± 4.0
Length at V2 [cm]	105 ± 5.9	100 ± 5.1
Liveweight at V2 [kg]	226 ± 34.1	191 ± 26.7

* For average age, percentage of the herd that reached puberty at each visit, anogenital distance (AGD) and body stature traits. Results are overall mean ± standard deviation.

** Steele *et al.*, 2023.

*** Includes only 1096 heifers in 15 herd-mobs that were selected to undertake an extra sampling point

The effect of liveweight measures

From a management perspective, we found that, as expected, measures of liveweight best explained the variation in AGEP within and between herds⁷.

The biology of heifer puberty is well-known. The prepubertal heifer needs to overcome the negative effect of the female sex hormone, oestradiol, on reproductive cycling. This occurs progressively as the heifer ages and grows. Puberty occurs when oestradiol switches to being a hormone that promotes oestrus and ovulation (as described in a June 2019 *Inside Dairy/Technical Series* article⁸).

Increased liveweight, and associated factors such as disease prevention and feed supplements⁷, accelerate removal of this negative oestradiol block, so first oestrus and ovulation occur earlier. An estimated heritability of 34% for AGEP suggests that an animal's genetics will also play a role in determining when this negative oestradiol block is removed.



DairyNZ researchers (from left): Dr Nicole Steele, Dr Claire Phyn, project lead Dr Chris Burke, and Dr Susanne Meier (absent, Dr Melissa Stephen). (Photo: The Kudos Science Trust).

take blood samples at about this time, as well as four weeks before and after (i.e., three visits per herd).

Progesterone, a hormone associated with sexual maturity in females, was measured in these blood samples, along with AGD and body size measures (see Table 1, p. 27). Variation in puberty rates among the 54 herds was large, ranging from less than 5% to 100% during the sampling visits⁷.

Although this large-scale method doesn't provide an exact AGE_P for each heifer, the progesterone-based phenotypes developed enable robust estimates of heritability and breeding value predictions^{9,10}. Our analyses also indicate that robust EBVs for AGE_P can be generated from just one or two samplings¹¹. This makes it more feasible to measure AGE_P in routine genetic evaluation.

Do Jersey cows behave the same way?

All the studies described previously were performed in Holstein-Friesians or crossbreds, while our National Breeding Objective covers all breeds. We are, therefore, currently doing similar large-scale trials with a focus on the Jersey breed.

In July 2023, the initial phase of measuring AGE_P and AGD in 5260 Jersey heifers was completed, with the support of the owner/managers of another 54 herds. Given our learnings in

the first puberty study, we reduced the number of sampling visits to two per herd, four weeks apart. We also started blood sampling when heifers were eight to nine months old, instead of 10 months old. We did this because Jersey-type heifers in our first study achieved puberty at an earlier age⁷.

These modifications resulted in similar puberty rates across both studies (Table 1, p. 27), which are near ideal for the purposes of genetic investigations. Again, there was large variation in puberty rates among the Jersey herds, reflecting differences in heifer management by farmers.

Our preliminary analysis indicates the heritability of AGE_P is also moderate in Jerseys. Ongoing work over the next two seasons will test whether AGE_P and AGD are genetically correlated with reproductive performance in lactating Jersey cows.

Benefits for farm businesses

Our studies to date have demonstrated that AGE_P and AGD are useful earlier-in-life predictors of fertility that could be incorporated into routine genetic evaluations. In effect, this will accelerate gain in the genetic merit for fertility in NZ herds.

While the genetic merit of a cow is just one of the eight ingredients affecting herd reproductive performance (as noted in DairyNZ's *InCalf* book¹²), any gains made are permanent, cumulative, and easily adopted by farmers. These gains will help farmers achieve their production and profit goals.

Funders and delivery partners

The Holstein-Friesian study was conducted under the Pillars of a New Dairy System research programme, funded by DairyNZ Inc. and MBIE, with additional support from LIC, CRV and NZAEL. The Jersey study is being conducted under the DairyNZ Resilient Dairy project, which is part of the Innovative Breeding for a Sustainable Future Programme funded by LIC, DairyNZ and MPI.



Learn more in our podcasts

In episode 68, we talked to Ee Cheng Ooi from AbacusBio, a vet and geneticist who worked with New Zealand Animal Evaluation Limited (NZAEL) to develop the new fertility breeding value. This Fertility BV is based on conception within the first six weeks of mating.

Also in episode 68, we chat to NZAEL quantitative geneticist, Melissa Stephen, who recently completed her PhD on early-in-life predictors of an animal's genetic merit for fertility, and Hayden Lawrence, South Taranaki dairy farmer, who shares the impact a more accurate Breeding Value will have on his farm business.

Hear the full conversation on this project in Episode 68 (and check out our other Fertility BV-focused podcasts episodes 18 and 21), at dairynz.co.nz/podcast

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