Ballance agri-nutrients

Together, Creating the Best Soil and Food on Earth

Grow

Autumn 2024

Contents

Ballance agri-nutrients

Ballance Agri-Nutrients is one of New Zealand's leading fertiliser manufacturers. A 100 percent farmer-owned co-operative, the company has approximately 18,000 shareholders and sells around 1.5 million tonnes of product each year, representing a turnover close to $900 million. Its products include imported and locally manufactured fertilisers, the majority of which attract a rebate for shareholders.

ballance.co.nz
0800 222 090

Super Air

Since its inception in the 1980s, Super Air has evolved into one of New Zealand's leading agricultural aviation companies. In addition to aerial fertiliser application, Super Air has developed a world-class reputation for aircraft engineering and innovation. Wholly owned by Ballance, Super Air services all of the North and South islands.

superair.co.nz
0800 787 372

SealesWinslow

SealesWinslow is a recognised leader in the production of high-performance compound feeds and feed additives. A fully owned subsidiary of Ballance, SealesWinslow has manufacturing sites located in Morrinsville, Ashburton and Whanganui, and supplies custom-blended pelletised feed to farmers throughout New Zealand. It also provides molasses feed blocks, feed supplements and additives.

sealeswinslow.co.nz
0800 287 325

Fertiliser's footprint

One way Ballance is working to reduce greenhouse gas emissions is fertiliser product choice.

While the new 2030 deadline for agricultural emissions pricing gives farmers and growers more time to reduce their greenhouse gas emissions, reduction remains on the radar.

Ballance has been conducting cradle-to-grave life cycle analyses (LCA) of different fertilisers so farmers and growers can know the emissions footprints of the products they buy. Life cycle analyses include every aspect of fertiliser products, from raw material extraction and transportation right through to application and field emissions.

After breaking down the manufacturing, production and on-farm processes of its New Zealand produced urea, Ballance is confident its nitrogen fertiliser is one of the most sustainable on the New Zealand market in terms of emissions footprint, compared to average imported products. The LCA was independently verified by AgResearch.

Ballance is also continuing to focus on perfecting nitrification inhibitors (see sidebar) in its fertiliser products, and plans to introduce a nitrification inhibitor solution, aiming to be in-line with when farmers start reporting their on-farm emissions.

In the meantime, Ballance continues to invest in a programme to decarbonise its manufacturing sites, including New Zealand's only ammonia-urea plant in Kapuni, Taranaki, with the aim of significantly reducing its urea manufacturing emissions.

What are nitrification inhibitors?

In New Zealand, most of the long lived, potent greenhouse gas nitrous oxide is produced by soil microbes acting on nitrogen in the soil from manufactured fertilisers or livestock urine. By suppressing the action of these microbes, nitrification inhibitors reduce nitrous oxide emissions.

How much does fertiliser contribute to emissions?

Fertiliser's contribution to greenhouse gas emissions vary by farm and by farm type, with huge differences between livestock and horticulture and arable.

For livestock farms, fertiliser is a much smaller source of emissions than methane from livestock digestive systems and nitrous oxide from livestock urine. For example, for dairy farms total nitrogen (N) fertiliser-related emissions are 7.38%, while livestock digestion (69.57%) and animal excreta/effluent (12.30%) are the main sources of emissions (see Figure 1)[1].

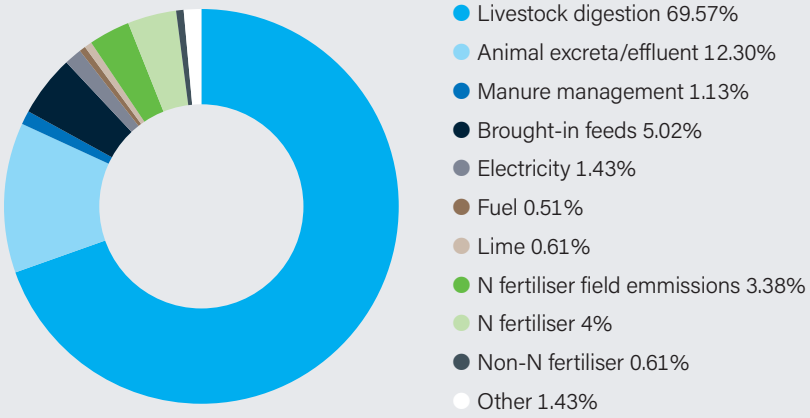


Figure 1 **Greenhouse gas sources from NZ milk production**

For horticulture and arable, apart from field emissions, the two main contributors of emissions are N fertiliser and energy. For example, for NZ produced wheat, N fertiliser (27%) and electricity and fuel (a total of 13%) are the next largest sources of emissions after field emissions from N fertiliser (33%) (see Figure 2)[2].

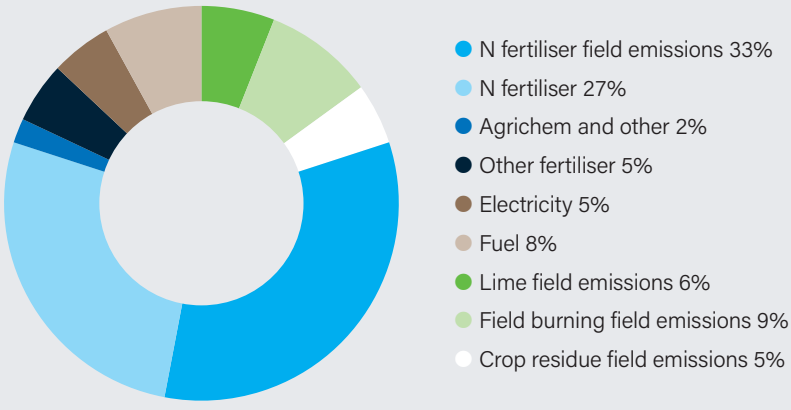


Figure 2 **Greenhouse gas sources from NZ wheat production**

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

[1] Ledgard S, Falconer S 2019. Update of the carbon footprint of fertilisers used in New Zealand. Report for Fertiliser Association of New Zealand

[2] AgriLINK New Zealand 2011. Carbon Footprint of New Zealand Arable Production – Wheat, Maize Silage, Maize Grain and Ryegrass Seed: MAF Technical Paper No: 2011/97, prepared for Foundation for Arable Research and Ministry of Agriculture and Forestry

Carry on and bounce back

Maintaining production puts your farm business in a better place to recover when prices improve.

With many farm budgets under pressure this year, farmers want to reduce expenses while keeping their business in good shape for when things come right.

In a cash constrained environment withholding fertiliser inputs is tempting, but care is needed. As farmers found out the hard way in the 1980s, lost production and profit can quickly erode any cash savings from cutting back on fertiliser inputs.

Maintaining a good production base and protecting revenue streams will mean your business is better placed to recover faster when commodity prices inevitably recover.

P and S – cornerstones of pastoral production

Phosphorus (P) and sulphur (S), the two main components of superphosphate, are limiting in most NZ soils. These nutrients are key drivers of pasture growth and vigour, particularly clover, hence superphosphate being recognised as one of the most effective ways to improve farm production and profit.

Conversely, much research has been done on the impacts of withholding superphosphate at research farms across New Zealand, with the general conclusion that pasture and animal production decline at approximately 5 per cent per annum if fertiliser is not applied. Pasture composition is also impacted, meaning a lower quality sward and less shoulder season feed.

What's at stake?

Recent econometric analysis undertaken by Ballance for a representative hill country sheep and beef farm scenario (with typical soil fertility for the industry) identified that withholding P and S inputs for 2 years before returning to maintenance would be expected to leave the farm $194/ha worse off in the long run than if maintenance inputs were continued. A Waikato dairy scenario (with Olsen P levels within optimum range) was shown to be more severely impacted due to the greater system profitability, at $615/ha worse off.

Making the budget go further

If full maintenance inputs are not achievable due to budget constraints, it's best to focus the nutrient spend on the areas of greatest impact, targeting those nutrients and areas of the farm that generate the most revenue. See the opposite page for top tips on prioritising your spend.

Tips include focusing on the most limiting nutrient. This will vary by soil type and rainfall, but S will often be number one, followed by P and potassium (K). Nitrogen is almost always limiting, but as a multiplier of pasture growth it's more appropriate to consider it against other sources of short term feed supply.

Soil testing to understand how soil fertility varies across the farm's different blocks or management units can also assist to identify areas where fertility is above the economic optimum, and could be reduced without impacting production.

Once the above are satisfied, focusing first on the most productive areas of the farm will usually provide the best returns from your spend. For example, flat and easy rolling areas will typically produce two to three times more than steeper slopes, and therefore are higher priority.

Prioritising the right nutrients in the right areas will help you navigate the current period and mean your business will be better placed to bounce back when things inevitably come right.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

Top tips to maximise fertiliser investment returns

1

Focus on the most limiting nutrients

In a pastoral context, consider S, P and K first. Annual S inputs are generally needed (as sulphate S is very mobile), but depending on soil test levels, maintenance P inputs may be reduced. Potassium can also limit production, depending on soil characteristics and climate.

2

Understand the current fertility

Have a robust soil testing strategy to identify soil fertility across different farm management units. Compare soil test levels for key nutrients with the pasture response curve – responses are generally larger when starting soil fertility is low, and smaller when it's high. Herbage testing will identify if micronutrients such as molybdenum are limiting clover (see page 11).

3

Prioritise most potentially productive areas

Prioritise areas and activities that produce the most feed (kg DM/ha) and value ($/ha). On this basis, better classes of land and crops are likely to be the top priorities, with new pastures and hay/silage areas also likely to make the cut.

4

Prioritise profit over production

Prioritise your fertiliser spend based on the economic optimum for different areas. The money you make from the extra feed grown from applying fertiliser should be more than the cost of applying the fertiliser.

5

Use your full toolkit

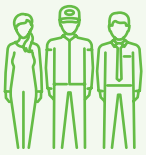
Digital mapping, geospatial tools, and variable rate application (both ground spread and aerial) can increase the return from fertiliser investments. Excluding fertiliser from unproductive areas and strategically redistributing it to areas of greater production response is good for the environment and your bottom line.

6

Safer with science

The impacts of applying or withholding fertiliser inputs are well studied and therefore very predictable. The current landscape is a breeding ground for peddlers of 'snake oil' touting all kinds of production benefits at reduced cost. Let the buyer beware.

7



Leverage your off-farm team

Trusted advisors play a key role in your long term success. Long term partners, including accountants and bankers, can help with cashflow forecasting, or temporary overdraft facilities to ensure short term cash constraints don't compromise future profits.

8

Apply something rather than nothing

Previous downturns show that pasture and animal production decline by about 5 per cent per annum when superphosphate is not applied, often preceding detectable declines in soil fertility. Applying reduced rates of fertiliser (as a minimum) will soften some impacts and leave the farm better placed to recover.

Best use of phosphorus

Good placement and use of phosphorus (P) fertiliser leads to better agronomic, economic and environmental outcomes.

At around $4/kg, P is the most costly fertiliser nutrient, so the way it is used can impact the economics of fertiliser use and farm profitability.

Applying P fertiliser in the right places at the right rate helps to optimise P fertiliser efficiency, and is part of the fertiliser industry-developed 'four R' guidelines – the right fertiliser product in the right place, at the right time and rate. When these guidelines are followed, fertiliser efficiency can improve agronomic, economic and environmental outcomes.

The right place

Hill country pasture is a mosaic of different slopes, aspects and soil types and depths, all of which contribute to large variations in pasture productivity.

Slope has the largest effect on pasture productivity, while aspect changes the seasonal distribution of pasture growth and pasture species composition.

Persistence and growth of perennial legumes such as white clover rely on an adequate supply of soil moisture, especially during spring and summer. Generally, there is more clover on easier slopes and south aspects which are moister and cooler in late spring-summer; in drier areas, steep slopes dry out first and the clover content is usually low.

In these drier, steeper areas the benefits of P fertiliser are limited by lower overall pasture growth rates, the variability of summer rainfall and by low clover content, compared to summer-moist environments where responses from P fertiliser are more consistent.

Therefore, P fertiliser efficiency is likely to be higher on easier slopes and shady southerly aspects as they generally have higher overall pasture production potential, which P fertiliser can help to fulfil.

Conversely, steep slopes are likely to have lower overall pasture production potential, so it makes agronomic sense to use lower rates of P fertiliser on such areas. Areas which carry no benefit of P application such as native vegetation, wetlands, waterways and other environmentally sensitive areas should be excluded from P application.

The right time

Timing is important, particularly when applying soluble P fertiliser. When the four R guidelines are followed, recently applied P fertiliser can be responsible for less than 10 per cent of farm P losses, but this can rise to between 30 to 80 per cent if the guidelines are not followed[1].

Potential P loss can be reduced by avoiding applications at times when P loss risk is high. This includes when runoff is more likely on land with a moderate to high slope, when soil moisture is high and/or when high rainfall is forecast. Low water soluble products such as SurePhos which slowly release P can also help to reduce P loss.

Use P where needed

GPS spreading technologies, such as Super Air's SpreadSmart, ensure P fertiliser is placed on target areas where it will provide the best result, and not on exclusion zones such as waterways or forested areas. The variable rate technology allows P to be applied at different rates to different areas of the landscape, based on the area's productive capacity.

A digital farm map, which includes information such as slope and aspect, is uploaded to the aircraft's onboard computer. The computer connects with the GPS guidance system and directs the pilot where to fly, and also automates the rate at which fertiliser leaves the hopper.

Financial analysis demonstrates that a strategy of applying less P (and sulphur) to steeper slopes (with low legume levels) and applying it in a more targeted way on easier slopes (with higher legume levels) costs less than applying P (and sulphur) at a uniform rate over all slopes[2].

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist, or Super Air on 0800 787 37 or superair.co.nz.

[1] Nash D, McDowell R, Condron L, McLaughlin M 2019. Direct Exports of Phosphorus from Fertilizers Applied to Grazed Pastures. Journal of Environment Quality. 48

[2] Morton JD, Gillingham AG 2017. Variable and differential application of nutrients to a hill country farm. Journal of New Zealand Grasslands 79. 111-118

Soil recovery

Strip tillage appears to be helping this farmer's soil recover after years of cultivation.

After using full cultivation to grow maize on his light ash soil for about 35 years, North Island farmer Paul Hunter decided to change tack.

Paul evaluated strip tillage on one block at Mulroy Farm, near Te Awamutu, for around 5 years, before adopting it across all his planted hectares in 2019. Strip tillage is a minimum tillage technique in which narrow rows of land are passively cultivated with fluted discs, leaving the areas between undisturbed.

While Paul has observed benefits of the switch (see sidebar), former Ballance Forage Specialist Murray Lane worked with Paul to conduct a number of tests to track the soil's recovery over time.

Since monitoring the soil twice, Murray says that although its health appears to be trending in the right direction, its recovery is likely to be slow.

"By leaving the soil alone we're starting to get a recovery of microbial biomass, and you'd expect that'd lead to other changes over time such as organic matter build up."

Testing indicates microbial life is improving. Over 4 years of strip tillage, there was a 90 per cent increase in the Hot Water Extractable Carbon test, which correlates with microbial biomass and indicates soil microbial activity.

Soil organic matter also appears to be improving, and rose 7 per cent over 4 years of strip tillage, according to Total Carbon test results. Organic matter plays a major role in determining soil physical characteristics such as structure, moisture retention and water infiltration.

Strip tillage reduces the amount of heavy machinery needed to plant a crop, and the associated soil compaction. Soil compaction is indicated by Dry Bulk Density (the weight of a specific volume of oven dried soil after stones have been removed). Over 4 years of strip till, there was a 13 per cent decrease in Dry Bulk Density, indicating increased soil porosity.

"These results are a testament to what Paul is doing to look after the soil," says Murray, specifically:

The strip tiller at work.

Paul is amazed at the life he finds in the soil.

- minimising soil disturbance
- always having something growing
- growing a variety of species (crimson clover, rye grass, maize)
- maintaining a reasonable level of fertility.

Murray concludes: "While the soil's health is generally moving in the right direction, further assessments in coming years are needed to identify strong trends and the speed of change."

In the meantime, Paul's strip till maize system is producing consistently high maize yields, while providing resilience and significant time saving benefits.

FOR MORE INFORMATION

For more on Paul Hunter's farm visit www.facebook.com/mulroyfarm. For more on strip tillage see page 20 Spring 2022 Grow - North Island. Past editions of Grow are available at ballance.co.nz.

Other benefits of strip tillage

Besides reducing his soil loss and improving his yield, soil structure, water infiltration and moisture retention, Paul also says strip tillage has halved his cultivation costs. "To get ready for planting now it's one tractor and one strip tiller, and I can get 30 ha ready in a day. Previously when we were ploughing, it would have been three tractors, two ploughs, a power harrow and three guys."

More accurate N test

A new test better indicates the potential supply of nitrogen (N) available to crops over a growing season.

Before sowing a crop, soil testing to identify available soil N levels can result in reduced fertiliser costs and environmental losses, and increased profits.

A new soil N test is giving arable crop growers the opportunity to further reduce their costs and losses and improve their bottom line even more.

The new Potentially Mineralisable N (PMN) test provides a more accurate indication of the potential supply of plant available N over the growing season than its predecessor, the Available N test (also known as the Anaerobically mineralisable N or AMN test).

The PMN test is suitable for arable crops such as maize, wheat, barley and oats, and can now be included in arable soil N testing.

The PMN test provides a measure of how much readily plant available mineral N might be released (mineralised) from organic matter in a given soil over the growing season, under optimal soil temperature and moisture conditions (as these environmental variables most affect the release of plant available N).

As the PMN test results indicate N likely to be mineralised under optimal conditions, typical soil moisture and temperature at the sampling location are taken into account to provide a more accurate indication of the soil N supply.

Soil sampling for PMN testing is completed just before sowing for spring or summer planted crops, or just before the first fertiliser application in early spring for autumn or winter sown crops. The recommended sampling depth is 0-30 cm, and either a single 0-30 cm sample or a 0-15 cm and a 15-30 cm sample can be taken. For shallow rooting crops or very shallow soils over gravel or stones, sampling at 0-15 cm is more appropriate. Sampling below 30 cm is not recommended, as minimal mineralisation is likely to occur at such depth.

Accounting for N mineralised over the growing season can improve N use efficiency and potentially reduce fertiliser costs and associated emissions while still achieving target yields, and the PMN test is the best option for growers wanting to take seasonal soil N supply into consideration.

The PMN test has been developed by Plant & Food Research as part of a Sustainable Farming Fund project, and is available through most commercial soil testing laboratories, at a cost of around $32 (compared to about $19 for Available N testing).

FOR MORE INFORMATION

Visit bit.ly/3bUUopG

My Ballance
Your farm at your fingertips

Easier N reporting

Nitrogen reporting is easier with the MyBallance Nitrogen Limit Management feature.

Under the nitrogen (N) cap rules, dairy farmers have to submit an N fertiliser report to their local council at the end of July each year.

Producing your N report can be complicated and time consuming, so Ballance has developed a Nitrogen Limit Management feature to make it easier. The feature is available on MyBallance, an online secure location where you can plan, order and record your fertiliser applications.

The Nitrogen Limit Management Feature helps you stay on track and make any necessary adjustments to meet the N cap. It provides your farm average N applied on grazed areas, and a heatmap makes it easy to see N applied on each paddock that will be included in the N cap limit.

Using the Nitrogen Limit Management feature

Ballance customers registered with MyBallance can use the Nitrogen Limit Management feature. To register, head to myballance.co.nz/register.

1. Upload your farm map

Check your digital farm map is in your MyBallance account (or email gis.support@ballance.co.nz to have it uploaded).

2. Upload your application data

You can enter your proof of application data into MyBallance, either:

- automatically via your spreader subscription (MyBallance currently integrates directly with Tabula and Precision)
- manually for self-spreads or spreads from other providers.

3. Define what the N was used for

The Nitrogen Limit Management feature lets you define what the N was used for – pasture, grazed crops or harvested crops. The more specific you are, the more accurate the report will be. You can easily specify the locations of crops, and whether they'll be grazed or harvested, and any non-productive areas that don't receive N.

4. Generate your report

MyBallance does the tricky bit for you, transforming your application data into a council-ready N usage report for you to submit to your council. Alternatively, you can authorise Ballance to automatically submit this data to your council on your behalf.

MyBallance is available exclusively to Ballance customers and can be accessed on any laptop, desktop or tablet. To become a Ballance customer and gain access to MyBallance phone 0800 222 090 or email customerservices-mount@ballance.co.nz.

What farmers say

Here's what dairy farmers say about the MyBallance Nitrogen Limit Management feature:

"It's definitely easier. You use the system the whole year and when you get to the end, you can just push the button."

- Josh Collier, Ōpōtiki

"It was accurate, and eliminated about 80 per cent of the error we had the year before."

- Mark Williams, Bay of Plenty

Time saving tips

Use the request spread feature in MyBallance to automatically get proof of application data in your MyBallance account once the spread is complete – this will save you the hassle of entering the data manually.

Ballance customers who supply Fonterra can opt to have their N fertiliser data shared with Fonterra, saving them time on their end of season Farm Dairy Record reporting.

FOR MORE INFORMATION

ballance.co.nz/nitrogen-reporting/overview

N frost protection

Late autumn nitrogen (N) does not appear to protect against frost.

A Ballance study has found that applying N fertiliser in late autumn is ineffective at protecting pastures from winter frost damage.

The practice of applying late autumn N for frost protection may have originated from anecdotal observations of urine patches being more frost tolerant than surrounding pasture. This could be due to the very high levels of N in the patches, but there is no published data to support this.

"We could also find no definitive scientific evidence of late autumn N's effectiveness at providing frost protection," says Ballance Nutrient Dynamics Specialist Jim Risk.

Given the restrictions on N fertiliser use, and a commitment to giving farmers robust, science-based advice, Ballance conducted trials to test late autumn N's effectiveness at protecting against frost.

In the trials, fertiliser treatments were applied at a low fertility and a high fertility site in Southland in mid-May 2023, when nutrients would still be assimilated by the plant but it was too cold for active growth and an effective N response.

The treatments applied were:

- 30 kg N/ha - approximately the current practice
- 50 kg N/ha - almost double the current practice
- 600 kg N/ha - the approximate rate of N in urine patches.

Pasture was harvested 12 weeks later in early August, and then another 4-5 weeks later in early September, when grazing would occur. Consistently occurring frosts were recorded at both sites.

Compared to the control (0 kg N/ha), the 30 and 50 kg N/ha treatments did not significantly affect the total dry matter (DM) grown, but the 600 kg N/ha treatment did result in more DM (see Table 1). The 30 and 50 kg N/ha treatments had a low response efficiency to applied N, averaging 5:1 across both the low and high fertility sites (see Table 1).

The low N response rates measured are not unexpected, as N was applied when the rate of pasture growth is low and declining (averaging around 15 kg/ha per day during mid to late May[1]).

"While there was an apparent N response compared to the control, when the cost of the DM grown is considered, it's not an efficient use of N either agronomically or economically at this time of year," says Jim.

The impact of the added N rates on pasture quality (measured as metabolisable energy or ME) was also investigated, with none of the N addition rates significantly improving pasture quality at time of harvest. There were notable overall differences between the two sites though, with the high fertility site displaying considerably higher pasture quality (ME) than the low fertility site (see Figure 2).

The 30 and 50 kg N/ha treatments did not affect the frost damage score (a visual score of pasture tip burning) at either site. However, at the low fertility site, the 600 kg N/ha treatment had a reduced frost damage score (indicating less damage).

"Overall, the study indicates no benefit in late autumn application of N for managing winter frost damage to pasture. It would be more efficient for farmers to use their N allowance to support spring growth or to fill deficits at other times of the year when more efficient N responses can be achieved," says Jim.

"But there is some evidence to suggest that the very high N content in urine patches may protect that pasture from frost – but potentially only in lower fertility areas."

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

[1] Smith L 2012. Long term pasture growth patterns for Southland New Zealand: 1978 to 2012. Proceedings of the New Zealand Grasslands Association 74: 147-152

Table 1 **Dry matter after 12 weeks and N responses**

	High fertility site		Low fertility site	
N rate (kg N/ha)	Dry matter (kg/ha)	N response (kg DM/kg N)	Dry matter (kg/ha)	N response (kg DM/kg N)
0	1969	-	1016	-
30	2172	6:1	1181	5:1
50	2193	4:1	1331	6:1
600	2494	0.8:1	1670	1:1

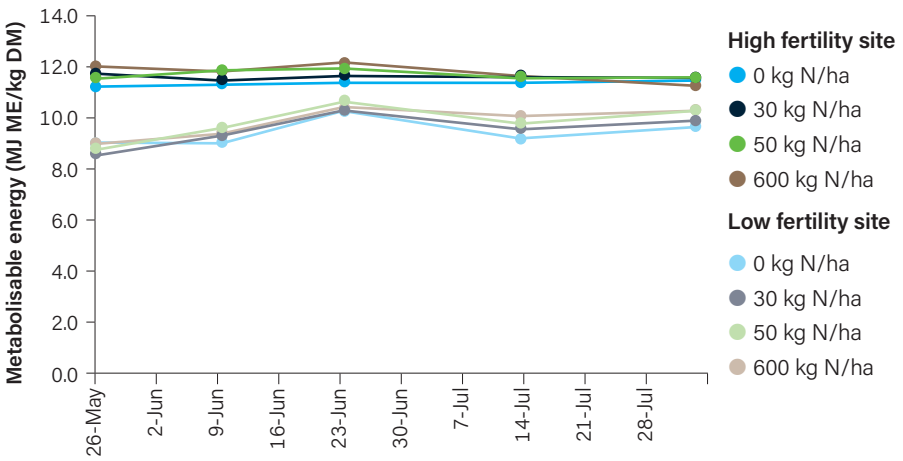


Figure 2 **Metabolisable energy over time**

Boost production with Mo

Molybdenum (Mo) might be your silver bullet for increasing production.

"Applying Mo to deficient pasture can be an extremely cost-effective way of lifting production. It improves nitrogen (N) fixation efficiency and N cycling, which in turn boosts clover and pasture growth," says Ballance Nutrient Dynamics Specialist Jim Risk.

"But before you apply Mo to pasture, it's important to identify if a deficiency exists, so as to avoid any potential animal health issues." Like most micronutrients, soil testing for Mo is not reliable, and herbage testing is needed to accurately identify a deficiency (see Table 1).

Research has shown that when both clover Mo and N herbage levels are deficient (as shown in Table 1), Mo application can boost herbage levels and increase dry matter production.

Molybdenum application consistently increased clover Mo levels over a 3 year period at a Te Anau trial site. In the trial, NutriMax Molybdenum 1% was applied to pasture at 2 kg/ha (20 g Mo/ha) in September 2020, and then clover-only samples were regularly tested for several years to measure the clover Mo status.

The test results revealed that Mo application increased the Mo levels of the clover consistently above 0.1 mg/kg DM (considered to be a low level of Mo in clover, see Table 1), including at the drier times of year. In contrast, when Mo was not applied, the test results suggest that the clover was at times deficient in Mo, particularly during drier times (see Figure 1).

A separate trial at an Eastern Southland site has shown the benefit of applying Mo in a deficient situation, with a 14 per cent increase in pasture yield and a 25 per cent increase in clover production over 1.5 years (see Figure 2)[1].

"Overuse of Mo should be avoided, so getting the application rate and frequency right are key," says Jim.

When both Mo and N are deficient in pasture (see Table 1), Mo deficiencies can be overcome by applying NutriMax Molybdenum 1% at 2 kg/ha (20 g Mo/ha) every 4 to 5 years. The paddocks can be resampled the following early summer or early autumn to check the application has raised Mo levels adequately, and testing should continue every 1 to 2 years.

"Trials have shown that applying Mo – at the right rate and when needed – can lift production without causing any animal health issues."

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

[1] Morton JD, Morrison JD 1997. Molybdenum requirements of pasture. Proceedings of the Fertiliser Research Conference

Table 1 **Mo sampling and testing to identify a deficiency**

	Sampling and testing	When Mo will produce a response
Pasture	Herbage test a clover-only sample, as clovers suffers from Mo deficiency before other plants.	Mo < 0.1 mg/kg DM N < 4.5%
Lucerne	Sample during active growth, collecting top 15 cm of vegetative growth from 15 -20 plants (500 g sample).	Mo < 0.5 mg/kg DM N < 4.5%

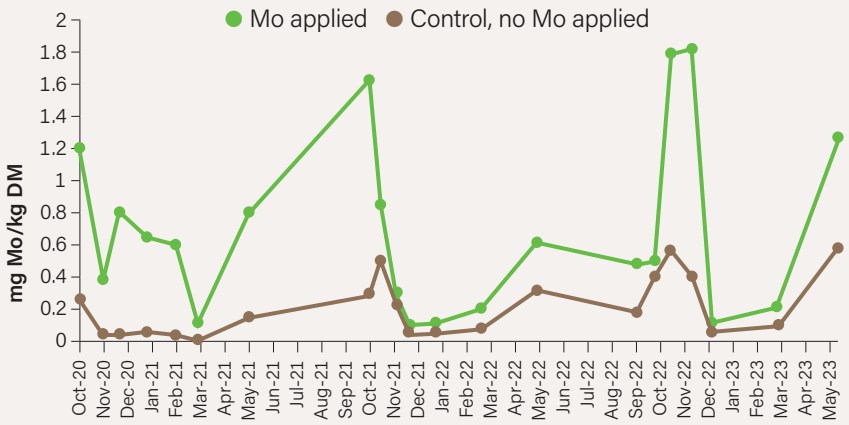


Figure 1 **Clover Mo content after 2 kg/ha of NutriMax Molybdenum 1% applied**

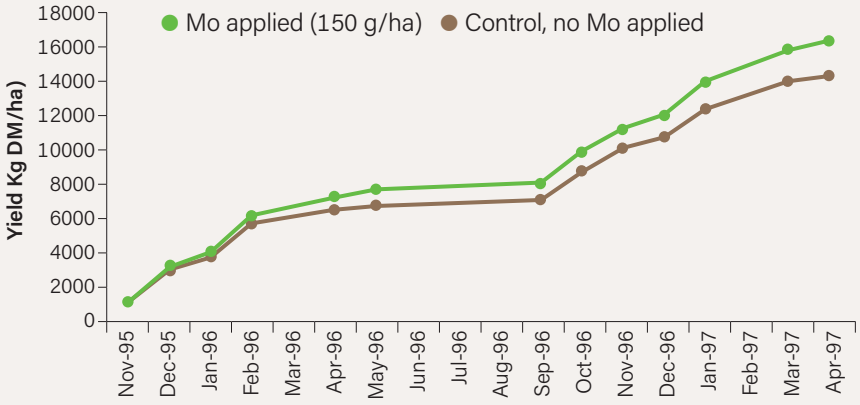


Figure 2 **Cumulative pasture production at an Eastern Southland site**[1]

Sheep winter grazing

For the first time, quantitative information has shown that protecting certain areas when sheep graze on winter forage crops can significantly reduce freshwater contaminants in runoff.

While winter grazing of cattle on forage crops is known to contribute to sediment, phosphorus and *E. coli* losses via runoff, little was known about sheep.

To fill this knowledge gap, a Sustainable Farming Fund (SFF) project sought to understand the extent of phosphorus, sediment and *E. coli* losses from sheep winter forage crop grazing, and the effectiveness of not grazing critical source areas (CSAs) – areas such as gullies, swales and seeps which have a high propensity for generating and transporting contaminants in runoff during and after rainfall.

A study was conducted on a property in Waitahuna, Otago over 3 years, in two catchments with comparable topography. In each catchment, a CSA was identified (see red outlined areas in photos) and monitoring equipment was installed to collect runoff losses. The grazing of each CSA was either 'standard' (cropped with brassicas and grazed along with the rest of the catchment) or 'strategic' (left in grass and not grazed) (see photos and Table 1). In year 1 (2020), both catchments were managed in the same way (standard grazing practice) to quantify baseline losses. The treatments in subsequent years are shown in Table 1.

Surface water samples taken during each runoff event were analysed to measure the concentration of phosphorus, sediment and *E. coli* coming from each catchment.

Overall, contaminant losses recorded in surface runoff were less than those reported in other studies such as cattle grazed studies, which likely reflects the low grazing and treading pressure on the soil, allowing rainfall to infiltrate.

Despite this, overall strategic grazing's protection of CSAs considerably reduced contaminant losses in surface runoff compared to standard grazing practice, with phosphorus, sediment and *E. coli* losses via runoff reducing by 48 per cent, 55 per cent and 63 per cent respectively (see Table 2).

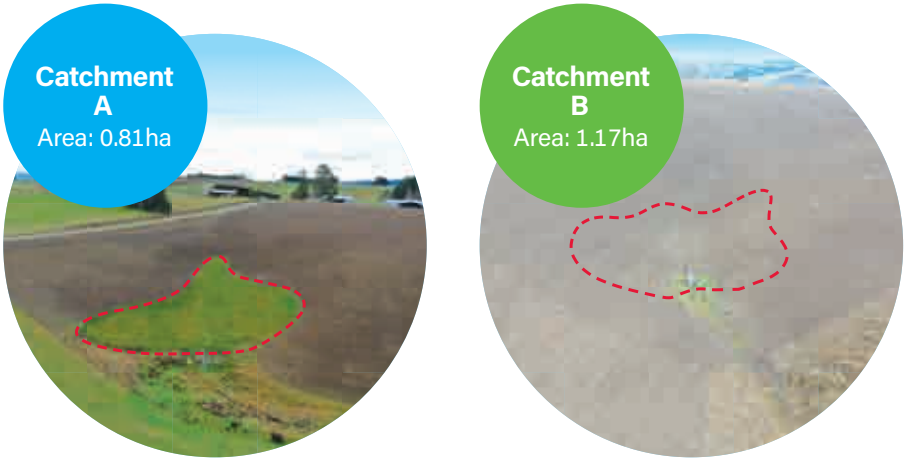
A key message from this study is that protecting CSAs from winter grazing can reduce contaminant losses.

This reinforces the use of mitigation strategies such as strategic grazing (leaving CSAs ungrazed) in winter to minimise contaminant losses in surface runoff. The reduced contaminant concentrations in the strategic grazing treatment are due to each CSA's protected soil structure and protective vegetation (pasture) trapping sediment from grazed areas and slowing surface runoff before it flowed out of the catchment.

This SFF project was funded by the Ministry for Primary Industries and managed by NZ Landcare Trust, with support from Ballance Agri-Nutrients, Beef + Lamb New Zealand, Horizons, Greater Wellington and Otago regional councils and Environment Southland.

FOR MORE INFORMATION

Visit landcare.org.nz/project/sheep-wintering-otago



In winter 2021, catchment A CSA remained ungrazed in grass, while catchment B CSA was cropped and grazed as conditions allowed.

Table 1 **Management treatments for the CSAs in each catchment in the study**

	Catchment A	Catchment B
Winter 2020	Standard grazing *CSA sown in swedes*	
Winter 2021	Strategic grazing *CSA sown in grass*	Standard grazing *CSA sown in kale*
Winter 2022	Standard grazing *CSA sown in kale*	Strategic grazing *CSA sown in grass*

Table 2 **Mean annual fluxes of contaminants under standard and strategic grazing for winter and early spring runoff events recorded during 2021-22**

	Total flux (kg or MPN ha^{-1})	
	Standard grazing	Strategic grazing
Suspended sediment	51	23
Total phosphorus	0.22	0.115
E. coli	20×10^{10}	7.4×10^{10}

Autumn ill thrift

By Dr Charlotte Westwood,
Veterinary Nutritionist, PGG Wrightson Seeds

What might be behind poor animal productivity in autumn?

After toughing out summer challenges of not enough and/or poor quality pasture, it's a relief to see rain and a flush of autumn feed. Frustratingly, autumn pastures don't always support good animal productivity. Stock might gain very little or no liveweight for many weeks.

'Autumn ill thrift' describes this challenge, and causes include animal health and/or nutritional challenges.

Internal parasites thrive in autumn conditions. Warm, wet conditions support mass hatching of parasite eggs and good survival of L3 larvae, loading up young stock with internal parasites.

In facial eczema prone areas, summer pasture rots after autumn rain, supporting growth of *Pithomyces chatarum* responsible for liver damage. Stock affected by facial eczema 'crash' due to liver damage failing to support normal metabolic processes. Other fungal species produce mycotoxins that potentially cause autumn ill thrift.

Older ryegrass pastures infected with the 'wildtype' endophyte produce alkaloids that cause ryegrass staggers, heat stress, scouring and ill thrift. Note that modern ryegrass cultivars contain novel endophytes that produce alkaloids NOT associated with ill thrift or scouring.

Underfeeding is a risk after autumn rains; total amount of dry matter (DM) falls due to rotting of summer pasture. Less DM in paddocks increases risk of underfeeding until new growth rebuilds pasture mass.

In extensive grazing situations, stock walk long distances to chase green pick during the 'green drought' phase after autumn rain. Stock use more energy walking and trying to graze very short pastures than what they can harvest, contributing to autumn ill thrift.

The nutritive value of autumn post-rain pasture is different to dryland, drought affected summer pasture. Sudden change in diet reduces feed conversion efficiency, contributing to autumn ill thrift. Time is needed for the rumen, and the liver to adjust to high quality autumn pasture.

Autumn pasture is more digestible than summer pasture, and contains more water. Rumen outflow rate is fast (causing liquid dung). Levels of protein are high in autumn pasture, increasing levels of rumen ammonia. The rumen microbial population needs to change quickly – to microbes capable of handling highly digestible, high protein pasture. Days or weeks may be needed for the rumen microbes to adjust. A dark coloured scour may be seen due to poorly utilised pasture protein and a high intake of chlorophyll.

The liver converts ammonia into urea that's excreted in the urine. Changing to autumn leafy pasture greatly increases the amount of ammonia arriving at the liver. The liver must 'ramp up' its capacity to metabolise ammonia to urea; changes may take days or weeks, contributing to signs of autumn ill thrift.

Your veterinarian can help diagnose what's causing autumn ill thrift in your stock.

FOR MORE INFORMATION

Access a Beef + Lamb New Zealand webinar at bit.ly/3HyNpzf

The change in diet from summer to autumn pasture can contribute to autumn ill thrift

Learning from disaster

What are we learning about recovering productive land after Cyclone Gabrielle?

Revegetation demonstrations and a baseline sediment sampling survey in areas affected by Cyclone Gabrielle are adding to existing knowledge, to build resilience to natural disasters.

Ballance conducted on-farm demonstrations near Napier in 2023 to investigate practical ways of revegetating land with heavy deposits of flood sediment.

The demonstrations confirmed that the state of the seedbed (e.g. texture and moisture) and sowing technique most influence successful pasture establishment and ground cover, similar to that of past research (Figure 1).

The flood sediment in the demonstrations typically had high pH, and low levels of fertility and organic matter. This was also generally the case across Hawke's Bay-Tairāwhiti following Cyclone Gabrielle, according to a baseline sediment sampling survey by LandWISE and other organisations (see Table 1).

In areas where flood sediment is now the new or major component of the growing medium for plants, ongoing monitoring (soil and herbage testing) of the nutrient status is essential, to continually maintain fertility levels to support growth, and identify if further remedial action is required.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

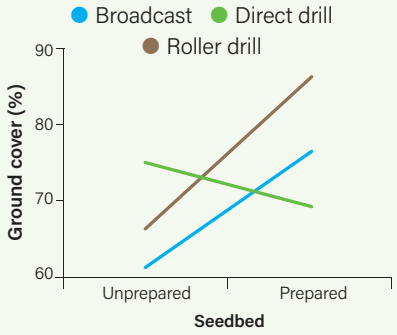


Figure 1 **Mean ground cover of regrassed paddocks sown by different techniques on unprepared and prepared seedbeds**[1]

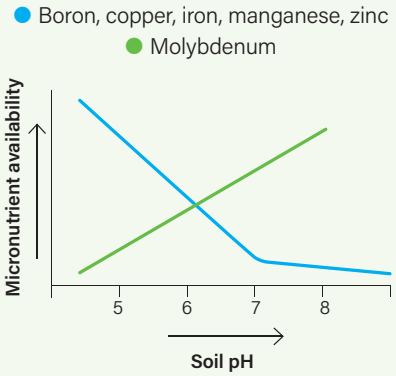


Figure 2 **Effect of soil pH on the relative availability of micronutrients**[3]

Table 1 **Baseline sediment sampling survey 2023 - nutrient status overview**

Baseline sediment sampling survey pH and nutrient status[2]	Comments
pH: above optimum range (overall)	pH levels above optimum range can affect plant nutrient availability, particularly micronutrients (Figure 2). If a deficiency is suspected in pasture or crops, herbage testing is necessary to indicate both the macro and micro nutrient status. Soil testing for micronutrients (with the exception of boron) is unreliable.
Olsen P: low (overall)	Capital inputs of phosphorus may be required to build Olsen P status to within optimum range. Typically, flood sediment also has low Anion Storage Capacity (ability to hold negatively charged ions, such as phosphate and sulphur), as the Ballance demonstrations indicated. Consequently, smaller and more regular applications of phosphorus may be required to decrease the risk of potential loss.
Potassium (QTK test): varied (but generally within optimum range for pasture species)	While a significant amount of potassium comes from the soil, high levels are removed in farm produce (i.e. crops). Therefore, regular applications of fertiliser potassium are generally required.
Sulphate sulphur (plant available): high Organic sulphur (slowly available): low	The high solubility of sulphate sulphur makes it vulnerable to leaching, so it's important to continually monitor soil levels and apply sulphur annually to pastures to correct any deficiency that may arise.
Nitrogen levels: low (overall)	Tactical use of N to increase the productivity of pasture and crops would be an effective addition to the biologically fixed nitrogen provided by clovers and other legumes.
Organic matter: low	Organic matter influences soil's capacity to retain nutrients, and helps to stabilise and improve soil structure, water infiltration and water holding capacity. Natural organic matter accumulation processes can be improved by increasing plant productivity, retaining plant cover and using minimum or no-tillage techniques to reduce soil disturbance.

[1] Wilson MD, Valentine I 2005. Regrassing flood-damaged pastures. Proceedings of the New Zealand Grassland Association 67: 117-121

[2] Dickson A, Bloomer D, Mackay A, Palmer A, Anderson S 2023. Cyclone Gabrielle Baseline Sampling 2023

[3] Use of Trace Elements in New Zealand Pastoral Farming 2019

Respect for recovery

Ballance pitched in to provide funding and practical support to those impacted by last year's extreme weather events.

In the aftermath of the cyclones that impacted many North Island farmers and growers last year, Ballance wanted to provide practical as well as financial support.

To coordinate the practical support, Ian Tarbotton, who then managed the Ballance Science Extension team, became the Ballance Cyclone Recovery Lead for 6 months in 2023.

As he was working in areas with varying of levels of devastation, Ian says his approach was to "expect the unexpected".

"One of my first priorities was to get onto a range of farms and talk to people, to build an understanding of what was needed, and to also link them to support," he says. This understanding also helped in preparing other Ballance staff to support farmers and growers.

Recognising that revegetation of silt was a priority, Ballance set up flood sediment revegetation trials early on (see previous page). In pastoral situations it was often not economical to remove the huge amounts of silt deposited, so revegetation was critical to prevent it being transported by further flooding, or as airborne dust.

Ballance, together with the Rural Support Trust and others, initiated a series of events in the East Cape/ Gisborne area, always with a farmer speaker. Ballance also participated in five events run by the Rapid Relief Team (a global organisation that provides support during natural disasters and other challenges), with over 1500 farmers attending events in the Gisborne area, Hawke's Bay and Northland.

Overall, Ian says the highlights were seeing successful silt revegetation, and rural communities becoming better connected. He also recognised the power of having locally based Ballance staff living in the affected areas to help people, and the importance of listening to local knowledge and expertise.

"I was also pleased that Ballance advised people not to revegetate hill slips straight away, as they did shift with subsequent rain, as we expected." Past research has shown that slips gradually recover on their own and are not economic to revegetate.

Ian noticed some farmers understating the damage they had incurred, especially if they were not as badly affected as their close neighbours. "I was concerned that some people were experiencing something like survivor's guilt, and that by downplaying how they'd been impacted they wouldn't get the right support." Sharing this insight proved valuable.

On top of practical support, Ballance also donated $1 million to the Rural Support Trust and matched any donations made by staff.

Looking back, Ian says: "Recovery will take years, but in many situations progress has been impressive in the year since the cyclones. Seeing what farmers and growers can cope with, and their dedication to rebuilding their farm or orchard has increased my admiration for them even more – huge respect there."

FOR MORE INFORMATION

See page 16 for some simple tips on looking after your mental health.

Top tips to get on track

By Sandra Matthews, red meat food producer at Rere, Tairāwhiti and wearer of many industry hats

Simple actions can keep your own 'most productive paddock' in tip top shape.

We read and hear a lot about resilience and having a positive mindset to ensure we keep on top of our wellbeing and mental health, but how do we do that?

Farmers have many ups and downs, and stresses and strains that come from areas we have no control over like the weather, interest rate variations and commodity prices.

We will be stressed, we will be sad and we will be happy. These are all human emotions and normal in life.

It is about recognizing when we are stressed, anxious, feeling overwhelmed and are not making decisions easily. Stressed decisions are usually based on emotion and not made from a rational mindset.

What we can control is recognizing how we respond to challenges, build the strength to cope, and grow our resilience to bounce back.

This is a golden opportunity to work through strategies that can help us cope and keep us in tip top shape mentally and physically, not only in tough times but in good times as well.

I recognize my stress signals when I put off doing something for too long, or get grumpy at those I love. I ask myself: "Am I OK?"

Then I reintroduce some of the following top tips to help me get back on track again.

- I am a big believer in making lists of work or personal things that are overwhelming me. This is crucial to move out what's stuck in your head to create a plan of action and reduce stress.
- Use a whiteboard to write your list on. When something is completed tick it off – DO NOT rub it off. Seeing what we are achieving enables us to celebrate our success.
- Exercise is one of the most important areas that can improve your physical and most productive paddock health. Make the time! Take the redbands or steel caps off and go do some exercise.
- Attend community get togethers, even if you are flat out on farm. Connection with others is crucial to looking after ourselves. Have fun!
- We farmers work in stunning natural surroundings. Stop the motorbike/tractor/horse and really look around you. Take a thermos then sit and enjoy a cuppa, take some deep breaths to relax, then listen to nature.
- Take time out and do not feel guilty about it! Working 7 days a week continuously is not healthy for our mind, body or relationships. Weekends were designed for rest and recuperation.
- Weekends are family time, couple time, me time, and rest time. Doing this keeps us balanced, manages our emotions more positively, and keeps us connected to one another.

With these few easy tips, you can look after your most important asset – YOU!

FOR MORE INFORMATION

For coaching support, contact Sandra at smcoachconsulting@gmail.com

Laughter while working relieves farm stress.

Katherine (right) with Tracy, holding the mini-rhizotron system

The root of the matter

By Katherine Tozer and Tracy Dale, pasture scientists, AgResearch

Root growth captured by underground cameras is helping to future-proof pastures to climate change.

Quantifying the impact of pasture management on root growth is difficult and typically involves removal of soil cores and destructive sampling of roots.

A strong healthy root system is critical for plants to access water and nutrients and recover from droughts, and can help us to future-proof our pastures to climate change.

The traditional method for assessing root growth involves taking samples of soils cores. It then takes many hours to wash away the soil, with small fine roots often lost in the process.

A better method uses a clear plastic tube (a mini-rhizotron system) inserted at an angle into the soil beneath the pasture. A specialised cylindrical camera inside the tube captures photos of surrounding roots, and can help in tracking changes in root length, diameter, surface area and volume.

At AgResearch, we are using this method to quantify the impact of standard rotational grazing, deferred grazing, and lax grazing (with high residuals) on pasture production and root growth in pastures grazed by beef cattle. This worked is funded by the Ministry for Primary Industries in collaboration with industry partners, including Ballance Agri-Nutrients, and rural professionals.

We are also comparing the growth rates, nutritive value, persistence of tiller populations and root growth of eight grass species: perennial ryegrass, tall fescue, meadow fescue, cocksfoot, phalaris, pasture brome, kikuyu and microlaena (a species indigenous to New Zealand and Australia). Rhizotrons have been installed in this grazed field study for over a year, providing data on root length, volume and depth, as well as visible damage from soil invertebrate pests.

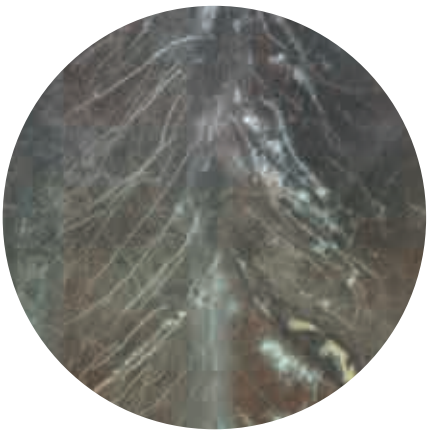
Our aim is to determine how grazing management and pasture species affect persistence, and identify herbage and root characteristics associated with increased persistence. This information will be valuable for plant breeders in developing cultivars that better withstand climate extremes and will help us refine grazing management recommendations that consider both above-ground and below-ground plant traits.

In the future, we also plan to explore if adjusting the timing of the deferred grazing period can increase the legume content in pastures. A pilot study funded by the Our Land and Water National Science Challenge indicates that a later closure may increase the legume content.

Our research will contribute to more persistent, productive and sustainable pastures with a lower environmental footprint and lower nutrient losses, with mini-rhizotrons continuing to be a key tool in understanding plants' responses to climatic extremes and different grazing strategies.

FOR MORE INFORMATION

Visit agresearch.co.nz/our-research/deferred-grazing or contact katherine.tozer@agresearch.co.nz



Dung eco-warriors

By Martin Hawke, former AgResearch scientist (agroforestry, land and environmental management)

Dung beetles are the ultimate eco-warriors.

In many parts of the world, dung beetles quickly and efficiently return animal dung into the soil – improving soil permeability and reducing levels of nutrients and *E. coli* to waterways.

Overseas research suggests dung beetles increase the rate of dung decomposition and removal, improve nutrient recycling and soil aeration, bioturbation and plant growth. Under the right conditions, they may also supress grazing animal parasites[1].

Eleven species were introduced into New Zealand in 2011 after passing very strict biosecurity and Ministry for Primary Industries (MPI) rules and conditions. However, their importation was controversial, with some concerns they may spread disease or wipe out some native insects.

The dung beetles introduced to New Zealand are tunnellers/paracoprids, rolling balls of dung and digging these into the ground below the dung patch, in tunnels which can be over 20 cm deep. Beetles have been introduced to many locations across the country, and their spread can be monitored by trapping, usually in the late summer and autumn.

In the Bay of Plenty, several species have been released onto farms as part of Project Parore, a catchment project covering nine streams at the northern end of the Tauranga Harbour. The introductions were spearheaded by Lawrie Donald and Dr Peter Maddison.

In summer 2020, three species (*Onthophagus binodis, Onthophagus taurus, Copris incertus*) were released at three locations, and a fourth species (*Geotruptes spiniger*) was released in 2022. Their establishment and spread were monitored from 2021-23 using traps with dung as bait.

Dung beetles are members of the Scarabaeidae (scarab) family. They feed on faeces, and there are over 7000 dung-friendly beetle species worldwide, on all continents except Antarctica.

It was encouraging to see the first three of the released species detected in the traps[2]. A further already-introduced species (*Onthophagus granulatus*) was also found in abundance at most sites. This species, accidently introduced from Australia in the 1870s and widespread in the northern North Island, is not considered very effective at dung removal and burial due to its size (6-10 mm).

The prevalence of the dung beetles introduced into the Project Parore catchment appears to be increasing in the catchment each year. It is expected to take up to 8-10 years for the introduced species to reach carrying capacity, and further monitoring throughout New Zealand is required to track beetle establishment. Dung beetles are generally more active in the warmer months of the year, but we don't know how they respond to climate change scenarios.

In a replicated trial near Katikati in 2021-2022, different abundances of *Copris incertus* dung beetles established in enclosures with fresh cattle dung made big differences in dung removal, particularly in spring (see photos)[3].

The world literature on dung beetles is huge and they inhabit many environments from tropical rainforests to NZ pastures, and the consensus is that dung beetles make a positive contribution to a broad range of functions and services. Biodiversity in our ecosystems is seen as very beneficial and the spread of dung beetles is just one method of enhancing our pastoral system.

FOR MORE INFORMATION

projectparore.nz/dung-beetle-study/

Dung Beetle Innovations at dungbeetle.co.nz breed and sell dung beetles.

[1] Nichols E, Spector S, Louzada J, Larsen T, Amezquita S, Favila ME 2008. Ecological functions and ecosystem services provided by Scarabaeinae dung beetles. Biological Conservation, Volume 141, Issue 6: 1461-1474

[2] Schon N, Wilson D 2023. Project Parore dung beetle releases and monitoring update. Unpublished

[3] Schon N, Waghorn T, Wilson D 2022. Dung Life project at Project Parore. Unpublished

Dung remaining after 4 weeks in enclosure with no dung beetles (left) compared to that remaining in an enclosure with a high abundance of dung beetles (right) in a trial near Katikati in the Bay of Plenty, conducted by AgResearch and Project Parore with funding from MPI

Worms at work

Are earthworms working for you? Find out how to check and increase their numbers.

In the mid 19th century Charles Darwin first proved that earthworms improve soil fertility, at a time when most people considered them to be pests.

Fast forward to today, and earthworms' role in increasing agricultural production is widely known. They improve soil structure, increase nutrient turnover and availability (especially nitrogen and phosphorus) and positively impact beneficial soil microbes such as mycorrhizal fungi.

New Zealand has approximately 200 species of earthworms, but most are native and seldom occur on developed agricultural soils. Introduced species arrived with early settlers, and most commonly live on agricultural land where they help to enhance pasture production (see Table 1 for the three key species).

As these beneficial species are introduced, they may not be present in all areas. You can check your earthworm populations (ideally in late winter or early spring when soil is moist and earthworms are more likely to be closer to the surface) as follows:

1. Dig out a 20 cm x 20 cm x 20 cm spade spit of soil.
2. Count the number of worms and species (see Table 1). The more, the better, and all three types and a diversity of species is ideal.
3. Multiply the number counted per spade spit by 25 to get the number of earthworms per m^2 to 20 cm depth.
4. Use Table 2 to score the overall beneficial population.

If populations are poor in certain areas, you can introduce earthworms as follows:

1. When soils are wet, find high earthworm areas, where earthworms are casting on the surface. There should be about 20 earthworms per 20 cm x 20 cm x 20 cm spade of soil.
2. Cut turf from these areas 20 cm x 20 cm x 5 cm deep.
3. After rain, when soil is moist, place turf, grass side down, on deficient pasture 10 m apart. As turf dries, the earthworms will move down into soil.

Once established, the earthworms will colonise paddocks, advancing at about 10 m/year[1]. They need organic matter, so maintaining or increasing organic matter, for example by applying fertiliser to ensure good soil fertility and plant production, helps support populations. They also like moist soils, but overirrigating deprives them of oxygen. Soil disturbance also negatively impacts earthworms, so no-tillage or direct drilling is preferrable over cultivation.

Darwin doubted whether many other animals have played such an important part in history as "these lowly organised creatures", so why not make sure you're not missing out on the many benefits of earthworms.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

[1] Stockdill SMJ 1982. Effects of introduced earthworms on the productivity of New Zealand pastures. Pedobiologia, 24, 29-35

Table 1 **Types of soil dwelling earthworms and examples of species beneficial to agriculture. Photos: AgResearch**

Type	Habitat and what they do	Example species
Surface dwellers	▪ Live on/near the surface. ▪ Eat material high in organic matter e.g. decaying roots and shoots, dung and leaves.	 *Lumbricus rubellus* ▪ commonly found ▪ 25-150 mm long ▪ red-brown or red-purple with pale underside ▪ flattened tail
Topsoil dwellers	▪ Live in the top 20-30 cm of soil. ▪ Burrow through and ingest soil, mixing the topsoil layer. ▪ Produce stable earthworm casts which help improve soil structure. ▪ Create cracks and channels which increase soil aeration.	 *Aporrectodea caliginosa* ▪ commonly found ▪ 40-100 mm long ▪ grey-pink all over ▪ tail not flattened
Subsoil dwellers	▪ Make permanent/semi-permanent burrows of up to 3 m and deeper. ▪ Survive best in undisturbed areas where burrows remain intact. ▪ Tend to forage on the soil surface, then drag food such as leaves down into burrows to consume.	 *Aporrectodea longa* ▪ mainly found in North Island ▪ 90-180 mm long ▪ dark grey-brown with black head ▪ paler, slightly flattened tail

Table 2 **Guide to assessing earthworm populations in the field**

Earthworms per:		Score
20 cm cube (spade spit)	**1 m^2 to 20 cm depth**	
> 20	> 500	2 - good
10-20	250-500	1 - moderate
< 10	< 250	0 - poor

A legumes first approach

A Waimakariri dairy operation is getting impressive responses from legumes and a focus on improving pasture health.

Ngāi Tahu Dairy Operations Manager Ben Jaunay oversees 9000 cows across 9 dairy farms spanning 2700 ha. He chats to Ballance Corporate Account Manager, Aaron Stafford, about their legume first approach to get the most from their natural farm system.

Ben also shares their journey improving the pasture health of their ex-forestry farmland through a two-pronged strategy of fixing pasture fertility and an intensive regrassing programme targeting 20 per cent of their farms each year. As Ngāi Tahu Farming enter their fifth year of this strategy, they have seen some phenomenal responses.

How do you assess soil and pasture health?

About 2 years ago, we started whole farm soil testing with the help of Ballance. This gave us a good picture of what strategically applied fertiliser was actually needed, rather than dealing with an average, and to create a 2 year plan. Recent tests have shown we've got our soil fertility to where it needs to be and that we can pull back to just maintenance, and continue to perform at a high level.

What other testing do you do on your farm?

Three years ago, we herbage tested and identified that we were really low on molybdenum (Mo), it was almost non-existent. A subsequent Mo application corrected this deficiency. Fast forward 2 years and we now have a thick swathe of clover.

We've started fixing more nitrogen (N) and growing more grass, we've probably grown the most these farms have ever grown through the autumn and that's due to the regrassing programme coupled with the targeted fertiliser plan. You can see it; we didn't apply any more N compared to the years prior, but I think through the extra N fixing and the increased soil organic matter our farms look healthier and more alive. We're up to about 30 to 40 per cent clover content in the heat of summer.

How do you use technology on farm?

We've got variable rate irrigation technology on every pivot, we can put effluent out across our whole farm to evenly spread these valuable nutrients back to the soil. It was quite clear with our last soil test that particular pivots were getting more than their share of effluent. Our key learning was that we have the opportunity to make even better use of the technology we have at hand, improving the spread of effluent nutrients back to the soil, and in doing so, further reducing our fertiliser use.

What keeps you optimistic about the future of dairy farming?

I think we are the most well positioned farmers in the world to produce the highest quality milk the most efficiently and with the least impact on the environment. We don't always get it all right and we've still got areas to improve on, but it's pretty cool what we're able to do.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist. See page 11 for more on Mo.

Aaron Stafford

Ben Jaunay

Mythbusters

This regular column sheds light on some common misconceptions.

Myth

Wait until rain arrives to resow summer crop paddocks.

Truth

Sowing new pasture early in autumn before rain arrives can provide a number of benefits, including improved establishment, yield and persistence.

In a trial near Cambridge, ryegrass seed sown early in dry autumn conditions germinated well after weeks with no rain, and treatments sown before the rain grew 2 T DM/ha more than seed sown post-rain[1].

Other studies have shown that delaying sowing decreases yield. In the Manawatu, yield dropped by an average of 26 kg DM/ha for each day sowing was delayed past 23 February[2]. In Canterbury, ryegrass yields decreased by an average of 64 kg DM/ha for each day sowing was delayed through autumn[3].

Later sowing in cooler autumn conditions slows down establishment. Early sown pastures can compete better with weeds before the temperature drops and denser, stronger ryegrass before winter grazing also provides greater protection against pugging[4].

Sowing early also improves persistence, as plants have more time to develop and reach over 20 tillers in size before the following summer.

Lastly, from a practical perspective, contractors are more likely to be available for early sowing, plus it is easier for them to get the job done.

[1] Corkran J, Henson W, Kerr G 2015. The effect of perennial ryegrass sowing date on endophyte presence and dry matter yield. Journal of New Zealand Grasslands, 77, 245–250

[2] Hamilton-Manns M, Ritchie, WR, Baker, CJ, Kemp, PD 1995. Effects of sowing date on ryegrass and tall fescue establishment by direct-drilling. Proceedings Agronomy Society of New Zealand 25: 43-46

[3] Rolston M, Archie W 2005. Effect of late autumn sowing dates on ryegrass seed yields. Proceedings of the Agronomy Society of New Zealand 35: 97-103

[4] Moot D, Scott W, Roy A, Nicholls A 2000. Base temperature and thermal time requirements for germination and emergence of temperate pasture species. New Zealand Journal of Agricultural Research 43: 15-25

Myth

To boost pasture growth after drought, it's best to apply nitrogen (N) fertiliser after drought breaking rain.

Truth

Applying N fertiliser as soon as drought-breaking rain arrives can lead to a fast pasture response, according to research commissioned by Ballance.

To simply grow grass (rather than get the best economic response), there is no need to wait for pasture covers to increase to 1000 kg DM/ha before applying the first round of post-drought N fertiliser. Once there is fresh green leaf, a good growth response can be expected.

This response will be greater if the soil remains moist after application, but even if it doesn't, the N will remain in the soil for plants to use when rainfall creates suitable growing conditions.

Once the N has been applied, paddocks should be spelled for 4-6 weeks, to give plants time to grow in response to the fertiliser. It's important to continue using supplementary feed after drought-breaking rain has arrived, to give pastures time to recover.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

Worldwide search for future forages

The hunt is on to find better pasture options for Northland.

The poor persistence of ryegrass-white clover pastures in Northland has prompted a multi-partner project proposal to find pasture systems better suited to the region's future climate.

More frequent and severe summer and autumn droughts, insect pest pressures, and competition from warm-season grasses have already reduced the productivity of many Northland farms. Tackling these challenges has also increased the environmental footprint of some farms.

The Northland region is made up of distinct subregional climates, each with differing climate change projections. One of the project proposal's key workstreams will be to identify other areas worldwide with similar climates to those projected for each subregion in Northland.

From these climate-matched regions, potentially suitable pasture systems – including new cultivars and species – will be assessed for their 'fit' with our farming systems and their risk of becoming weeds. A prioritised short list of species will then be developed, with field trials planned for the future.

The poor persistence of ryegrass-white clover pastures is also increasingly common in northern Waikato and beyond, so outcomes from this project will be applicable to wide areas of the upper North Island, and eventually further south.

Confirmed project partners to date include AgResearch, Dairy NZ and Beef + Lamb New Zealand.

Whangarei hub a year old

The Ballance hub in Whangarei recently celebrated its first birthday.

Since opening just over a year ago, the Whangarei hub has been blending and distributing vital nutrients for food production, specifically designed for Northland farmers and growers.

To benefit the Northland region's expanding agricultural sector and fast-evolving horticulture industry, upgrading of the existing infrastructure began in late 2021.

Today, the 180 m long extension houses 17,000 T of bulk product and 2000 T of bagged product, and what used to take an entire day to bag takes just an hour. A rain garden surrounding the site captures potentially contaminated water runoff, so plants can absorb the nutrients. Precision automated technology and digital infrastructure are in place to enhance product quality and reliability of supply for the region.

The upgraded Ballance hub in Whangarei is part of an investment of more than $50m into Northland by Ballance, as part of its commitment to the future of farming and growing in Northland.

Freshwater farm plans

As freshwater farm plans are rolled out across the country, Ballance encourages you to make a start.

What?

Under central government rules, all farms with 20 ha or more land in arable or pastoral use, 5 ha or more in horticultural use, or 20 ha or more in a combination of these uses will need to have a certified freshwater farm plan submitted to their regional council (or unitary authority) in a staggered rollout over the next 3 years.

When?

The freshwater farm plan system has already started in parts of the Waikato, Southland, Otago and West Coast regions, and will be rolled out across the country by the end of 2025. Start dates vary by region, and for different areas within each region (see map).

How?

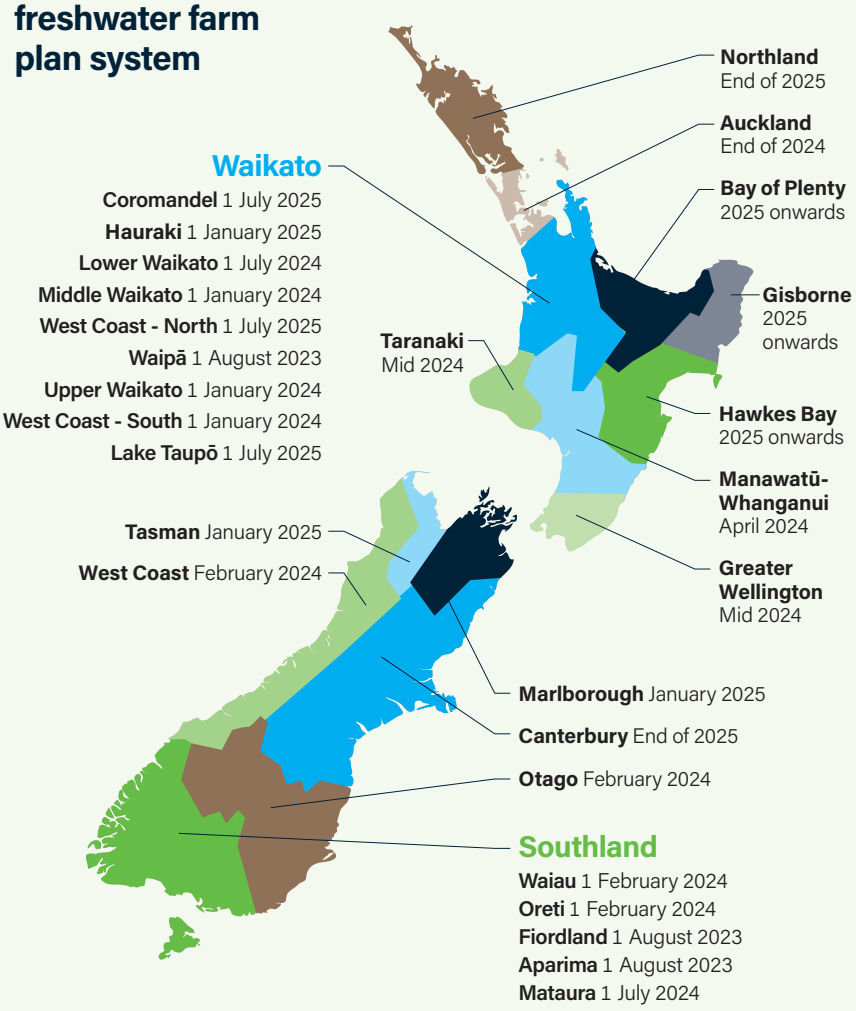
1. Develop: Anyone can develop a freshwater farm plan. You can develop one yourself or update your existing farm environment plan, or get help from an industry programme, farm advisor or consultant. Ballance has a team of specialists who can develop freshwater farm plans for anyone in the country, and ensure your plan meets all of the requirements, avoiding costly, time consuming hiccups at certification.

2. Certify: Within 18 months of the system starting in your area, you must submit your freshwater farm plan to a certifier who will ensure your plan meets the requirements. Ballance currently has freshwater farm plan certifiers in both Southland and Waikato, and our certifiers will be available across the rest of the country as the rules roll out (see sidebar).

3. Submit to council: When your plan is certified, the certifier will inform you and submit it to your council.

4. Audit: Your progress towards actions in your plan will be audited by an independent person. Ballance is not providing this service, but our certifiers can help walk you through this process, who to talk to, and what you need to do.

Start dates for the freshwater farm plan system



We can help

The Government estimates around 34,500 enterprises will need to submit their freshwater farm plans in less than 3 years. With a limited number of developers and certifiers across the country, Ballance encourages you to make a start now, regardless of the region you're in.

The Ballance Farm Sustainability Services team can help develop your plan and certify it. We can support you to do it yourself, or can handle the whole process for you.

For farmers wanting to develop their own plan, a number of options are available. Our team can talk you through the options and what best suits your farm and situation.

If you have any questions, want to request a quote, or want to know how to make a start, contact us on farm.sustainability@ballance.co.nz or 0800 222 090.

FOR MORE INFORMATION

This information summarises the rules and is current as at January 2024. For more, visit environment.govt.nz/acts-and-regulations/freshwater-implementation-guidance/freshwater-farm-plans, or your council's website.

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