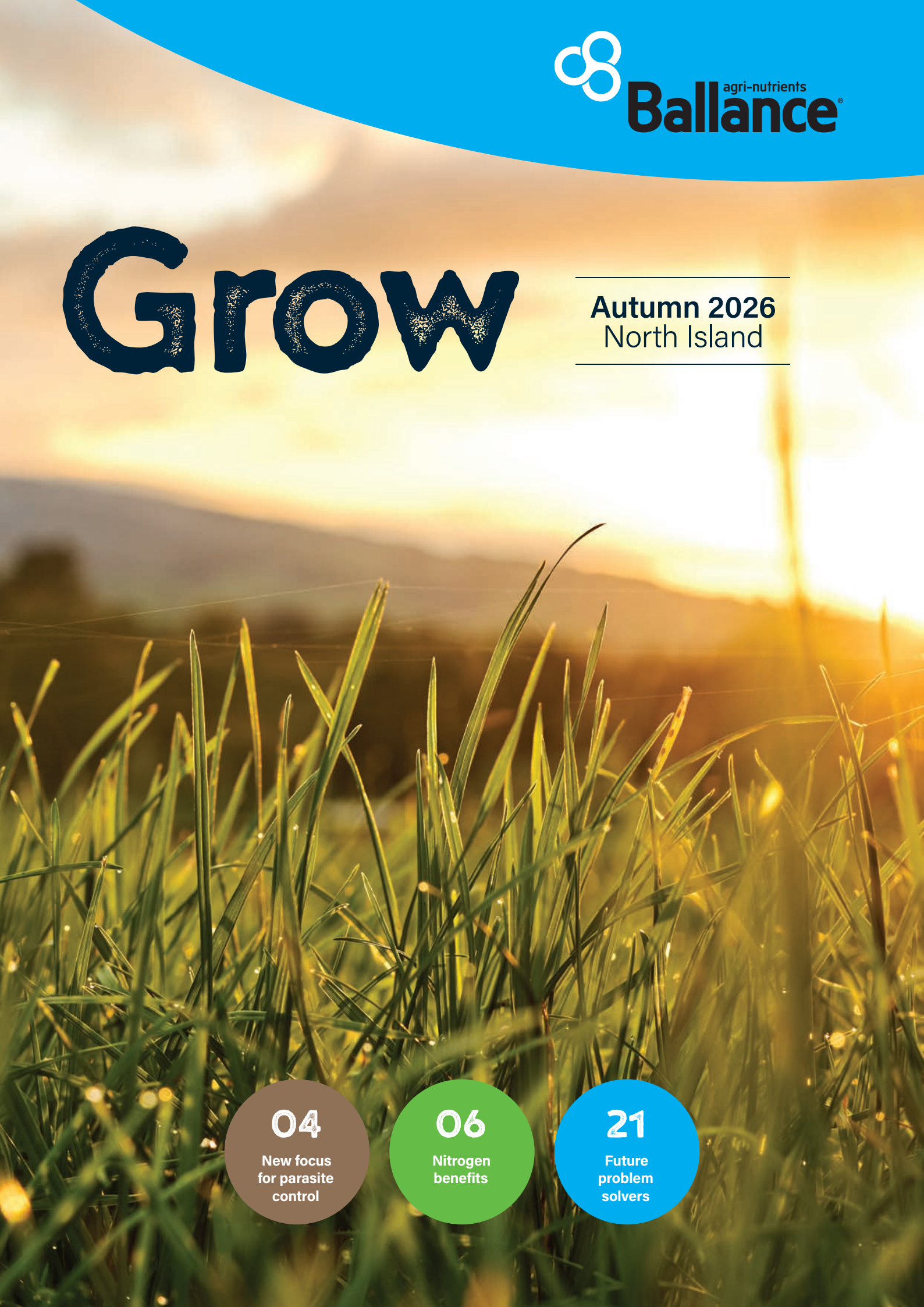
Ballance agri-nutrients

Grow

Autumn 2026
North Island



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Welcome

Welcome to the Autumn 2026 edition of Grow magazine – your twice-yearly source of practical insight, science-backed advice, and the latest developments shaping nutrient management across New Zealand farms.

At Ballance, we're committed to supporting our farmers and growers with information, advice and innovations that help them make informed decisions for healthier soils and better pasture performance, and ultimately, maximising their farm's potential.

As always, we cover a lot of ground in this issue. We explore the pros and cons of liquid fertilisers, such as when their rapid nutrient availability can be advantageous and where careful management ensures cost-effective and environmentally sound use. From application timing to nutrient delivery, understanding these trade-offs helps you optimise your fertiliser spend across the farm system.

Optimising nutrient investment is a theme woven through several articles including tips to reduce wastage and boost returns from every kilogram of nutrient applied, sharing perspectives from cutting-edge research and farm practice to support that goal.

It's also a pleasure to highlight the Lincoln University Innovation Challenge winners, the next generation of agribusiness thinkers proposing fresh ideas for challenges in nutrient efficiency, soil health, and primary industry resilience.

This edition also covers tackling soil pugging and compaction – a seasonal reality for many. We outline practical strategies to prevent soil damage and protect pasture productivity through the wetter months ahead.

And finally, we spotlight some exciting innovations which our innovation lead Stuart Kay talks to in more depth in his introduction. Thank you for reading Grow. We hope this latest edition inspires new thinking and gives you actionable tools to make each hectare count.

Kelvin Wickham
Chief Executive, Ballance Agri-Nutrients

Creating what matters

At Ballance, innovation is one of our strategic pillars for good reason.

New Zealand's farmers and growers are navigating more complexity than ever: regulatory pressures, climate variability, information overload and market expectation. Innovation isn't optional – it's essential.

But innovation isn't just creating what's new – it's creating what matters. That's why the Ballance Innovation Team begins with the problem, not the solution. In a world driven by urgency, change and constraint, it's our job to ask the right questions and define the problem correctly before solving it. We scan broadly and look into the future, seeking opportunities that align with farmers' future needs. We explore global innovations, emerging trends and technologies, and track scientific advancements, digital tools, data-led systems and new models of collaboration.

Our team's expertise in science, operations, strategy, commercialisation, technology and communications helps us build trust and deliver outcomes across a wide range of stakeholders, including MPI, research institutions and industry partners. Our co-investment in the Sustainable Food and Fibre Futures: Future Ready Farms programme is one powerful example of this, enabling Ballance and NZ farmers and growers to take bold steps into high reward innovation.

The recent launch of ReFlow, developed in partnership with Southwater and Plucks Engineering, is another. It shows we're evolving to become more adaptive, collaborative and open to the strengths others bring.

This edition of Grow covers our work on a dual benefit formulation to reduce livestock parasites on pasture and provide nutrients (pages 4–5) and on spring nitrogen's effect on sheep performance (page 6).

Finally, our work doesn't stop with the 'new.' Through ongoing product screening, validation and continuous improvement, we ensure all Ballance products and services – old and new – continue to meet the evolving needs of farmers. We also know that Ballance sits at the centre of a powerful supply chain, linking the best of NZ farming to the rest of the world. Our Innovation Team exists to ensure this supply chain is resilient, adaptive and leading from the front.

Stuart Kay
Innovation Leader
Ballance Agri-Nutrients

For more information
View a video about Ballance Innovation at bit.ly/4qMCDKI

Shifting the focus of parasite management

A new development from Ballance Innovation could be a lifeline for farms facing drench resistance.

Parasite control is now widely regarded as one of the most significant challenges facing New Zealand's beef and sheep sector. It continues to place pressure on farm systems – from the labour demands of routine parasite control and quarantine drenching, through to the growing issue of drench resistance.

With no new drench classes on the horizon, and triple drench resistance on the rise, farmers are increasingly relying on complex, high-effort management alternatives and expensive novel drenches to maintain animal health.

Recognising the need for a different approach, Ballance Innovation and the Bioeconomy Science Institute are currently advancing a solution – a spray on nitrogen (N) based pasture application designed to break the parasite life cycle on pasture, while simultaneously supporting pasture growth.

A new tool in the toolbox

There are no silver bullets when it comes to parasite management, but this solution could potentially be a powerful new addition to the toolbox currently available to manage parasites and fight resistance.

By targeting the larval population on the pasture, it significantly reduces animals' larval intake, thus lowering the worm burden on stock (see Figure 1).

Commercially, the aim is for the product to deliver real production improvements, particularly for high margin, young stock systems. It offers a dual benefit: lowering parasite exposure on pasture and boosting feed availability through the N component when it's needed most.

The result is a system designed to support faster growth rates and stronger body condition scores.

Technical findings from recent trials have highlighted the value of this nutrient boost (see page 6).

Lambs on treated paddocks were on average 2.3 kg heavier at weaning, with nearly 25 per cent reaching slaughter weights early – up from just 7 per cent in the control group. The increase in liveweight alone equated to an extra $90/ha in value – effectively covering the cost of the fertiliser while opening up options to sell more lambs earlier and reduce summer feed pressure.

"This innovation is an exciting outcome of our work through MPI's Future Ready Farms Programme," says Ballance Innovation Leader Stuart Kay. "It's truly dual purpose – giving farmers an extra tool for parasite management while also delivering a nutrient boost that supports improved animal liveweight. It reflects our commitment to backing the sheep and beef sector with practical, future focused solutions."

Who's this for?

The challenge of managing parasites and drench resistance is not the same for every farm. For some operations, it's a future risk to be managed; for others, it's already threatening productivity. This new product concept has the potential to benefit farms across both scenarios.

Pressure from drench resistance

Some farms are already at a point where triple drench resistance has been confirmed, and existing chemistries are visibly failing. For these farms, the failure of current drenches is resulting in productivity issues and stock losses – and in some cases forcing a move onto high cost systems that are reliant on expensive novel drenches.

With no new drenches on the horizon, it is possible that a pasture-based solution could offer these farms a lifeline.

Proactively keeping drench options open

Not all farmers are in a crisis state, but many are observing industrywide trends of drench resistance with concern.

For them, being proactive and making changes to retain their current drench status is important. This product may help to prolong the effective life of the drenches that still work on their farms, so they can avoid the issues others are facing.

In these cases, the product could bring the peace of mind that comes with slowing the development of resistance.

"It's truly dual purpose – giving farmers an extra tool for parasite management while also delivering a nutrient boost that supports improved animal liveweight."
Stuart Kay
Ballance Innovation Leader

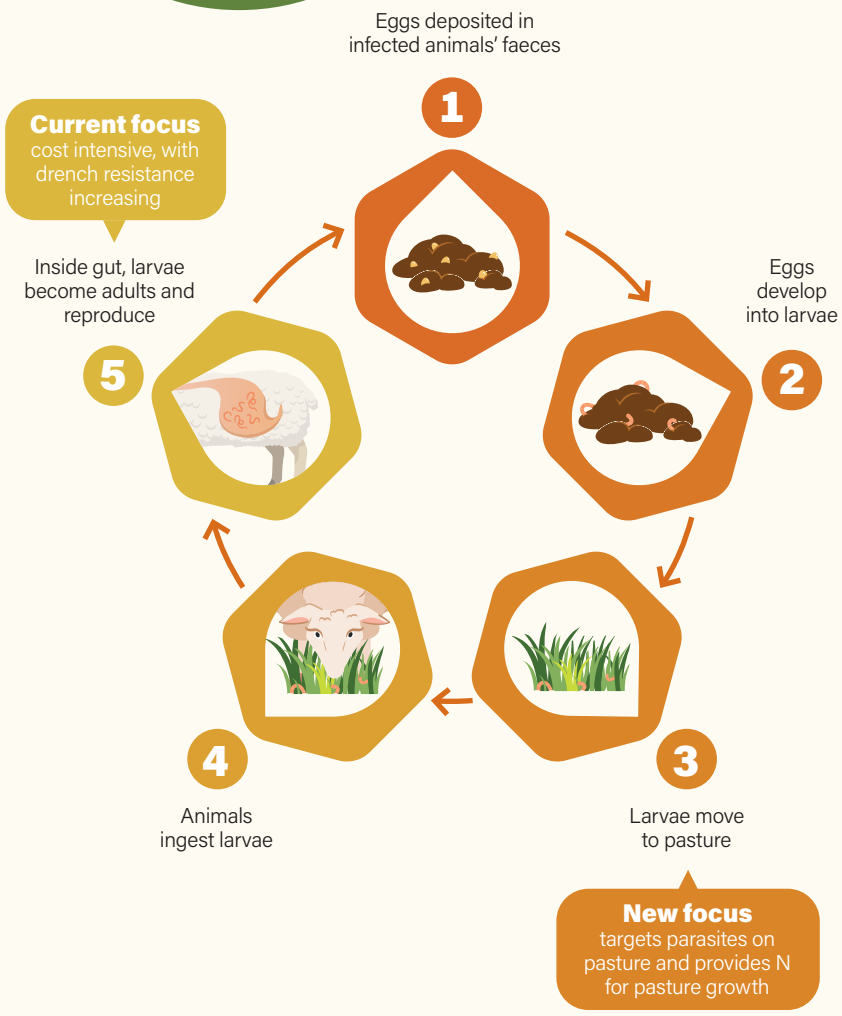


Figure 1 **Shifting the focus of parasite control to pasture to reduce stock's larval intake**

What's next?

Development of the concept is showing significant promise, and the project is progressing well, with patent protection already filed.

For the product to be viable, its performance needs to be supported by rigorous, independent evidence. Consequently, the project is currently undergoing a phase of further testing to provide proof of efficacy under real world conditions and in varied farm environments. This includes a thorough assessment of second order effects to ensure the product is safe for the environment and soil health.

With scientific validation and registration dossiers currently in development, the product is being staged for extensive on farm testing in 2027. It will initially be tested for sheep and beef farms, with plans to expand to dairy farms in the future.

This project is part of the Future Ready Farms Programme, a joint initiative between Ballance and the Ministry for Primary Industries (MPI) designed to reduce the environmental impact of food production and reduce agrichemical use.

FUTURE READY FARMS
Creating a lower emissions future

For more information
Be the first to know more about this product and its development. To register your interest and receive exclusive updates, scan the QR code or visit ballance.co.nz/innovation-for-growth

Milestone study shows spring N benefits

A sheep performance trial has shown that strategic spring nitrogen (N) use can lift production.

The latest research shows that even on established legume pastures, strategic nitrogen (N) use can boost sheep production, confirming what many farmers have long suspected[1].

The research, at Woodlands Research Station in Southland in 2023, measured the impacts of a single post-lambing application of N fertiliser on pasture growth, ewe and lamb liveweight and faecal egg count.

In late September 2023, when soil temperatures were below 10 °C, paddocks received either a liquid urea treatment (40 kg N/ha) or a control treatment (0 kg N/ha) and were then stocked with lambs and ewes.

At weaning, 9 weeks later on 4 December 2023, compared to the control paddocks, the urea-treated paddocks had 33 per cent higher pasture covers (1868 kg DM/ha compared to 1407 kg DM/ha, see Figure 1). In the 9 weeks before weaning, the urea-treated paddocks produced 65 kg/ha more ewe liveweight and 46 kg/ha more lamb liveweight.

Faecal egg counts weren't significantly different between the urea-treated and control paddocks. However, ewes from the urea-treated paddocks had higher mean body condition scores, which, together with the greater flexibility in pasture management created by the tactical N use, could help to reduce reliance on drenches.

"Worm resistance is a growing challenge on many farms," says Ballance Science Strategy Manager Warwick Catto. "This study shows that lifting feed supply through spring N use can be another tool in the toolbox – not to replace drenches entirely, but to reduce reliance on them."

"This is a milestone study that provides hard evidence for something farmers have anecdotally believed for years," says Warwick. "It confirms that the gains are real and measurable – and importantly, it's a practical, low cost tool farmers can use during one of the most demanding periods in the sheep farming calendar."

The pasture response to N in the trial was calculated at 28.5 kg DM/kg N applied (higher than industry assumptions) and is a reminder that even well developed legume pastures are deficient in N and are responsive to N fertiliser.

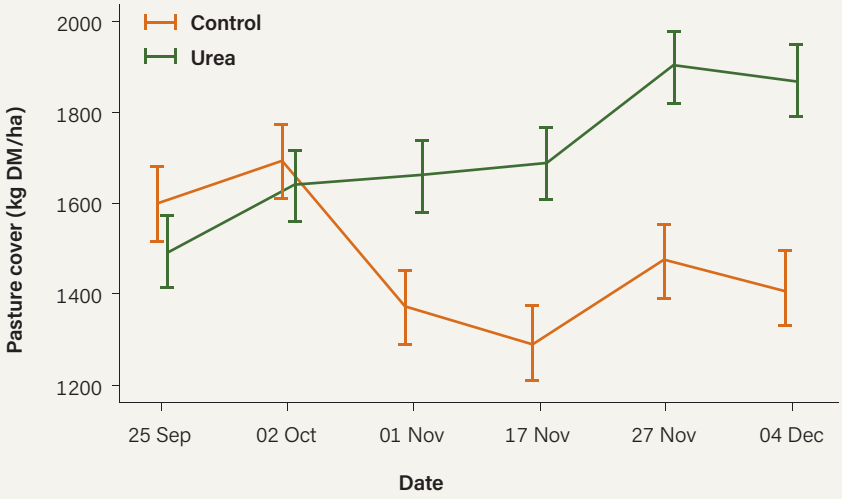


Figure 1 **Mean pasture covers and associated standard errors for the paddocks of the two treatments over the course of study**

The study also suggests it could be beneficial to aim for higher pasture covers and body condition scores at lambing, given the higher ewe and lamb liveweights from the urea-treated paddocks.

In terms of return on investment, the extra revenue from the additional lamb liveweight at weaning on the urea-treated paddocks covered the cost of purchasing, transporting and applying the urea. In the trial, 1 kg of applied N produced 1.1 kg of lamb liveweight.

As well as the added income from the improved lamb performance, the higher pasture covers and ewe liveweight at weaning from tactical N use can provide additional opportunities to increase returns.

Lastly, with increasingly unpredictable weather patterns, increasing stock performance and pasture covers at weaning with tactical N can provide greater flexibility and resilience to the system.

The study builds on Ballance's new fertiliser-based trials targeting parasite burdens on pasture – a wider programme exploring how nutrition can support livestock resilience, and is part of Ballance's ongoing investment in science-backed solutions for the primary sector through the Future Ready Farms programme, supported by the Ministry for Primary Industries' Sustainable Food and Fibre Futures fund (now replaced by the Primary Sector Growth Fund).

For more information

Contact your Ballance Nutrient Specialist. View the research paper at bit.ly/3WVrA4d.

1 Mackay A, Sauermann C, Miller C, Leathwick D, Candy P, Catto W, Luo D, Bryson B 2025. Effect of a post-lambing nitrogen fertiliser addition on the performance of an intensive lowland sheep breeding operation. New Zealand Journal of Agricultural Research 68: 2381–2395

SustaiN rules match good practice

SustaiN's new use restrictions follow Ballance advice and good practice.

With agricultural inhibitors offering enhanced nutrient use efficiency, higher yields and other benefits, it's no surprise they're attracting increasing interest globally from farmers, industry, researchers and regulatory bodies.

Inhibitors can be added to stock feed to reduce methane emissions, applied to land or used in fertilisers such as SustaiN, one of New Zealand's most used fertilisers.

To manage risks to trade and food residues and ensure the safety and effectiveness of fertilisers with inhibitors, in 2022 the Ministry of Primary Industries (MPI) introduced a registration requirement.

SustaiN was the first fertiliser with an inhibitor in New Zealand to be registered. Experts from MPI carefully assessed AGROTAIN®, the inhibitor compound that coats SustaiN, and the intended use of the product. Data on the chemistry and manufacture of SustaiN, safety and toxicology, plant uptake and soil, plant and animal metabolism, as well as claims and advice for use were also reviewed.

"For farmers and growers, the successful registration of SustaiN further reinforces its safety and effectiveness on both pasture and crops," says Ballance General Manager of Customer Jason Minkhorst.

The registration includes specific use pattern restrictions, which are in line with Ballance guidelines to date. The restrictions ensure consumer safety and manage environmental risks, and specify the maximum rate, timing and withholding period (see Table 1).

"Customers who already follow N fertiliser use advice from Ballance and good agricultural practice won't need to make any changes to meet the SustaiN use pattern restrictions, it's really a matter of carrying on what you're doing," says Jason.

"The only difference you might notice is some new information on bag labels, dispatch dockets and disclaimers at the end of fertiliser recommendations."

This includes an expiry date on bagged product (small 20 kg retail bags as well 0.5 and 1 T bulk bags). Unbagged bulk product will come with advice to apply it within 48 hours of dispatch.

SustaiN was first registered in December 2024 for a period of 18 months, and will be assessed for registration again in June 2026.

About SustaiN

SustaiN is urea with a urease inhibitor coating (AGROTAIN®). The coating reduces the amount of nitrogen (N) lost as ammonia gas when SustaiN is applied to land. The urease inhibitor also helps to mitigate emissions of the potent greenhouse gas nitrous oxide (as ammonia gas can contribute to these emissions).

Base change for PhaSedN range

The PhaSedN range – PhaSedN and PhaSedN Quick Start – now has an Nrich Urea base.

The nutrient specifications of PhaSedN products remain unchanged, but as they no longer use a SustaiN base, they won't reduce N lost as ammonia gas.

The formulation change, in late 2025, avoids the prohibitively expensive costs of separately registering each PhaSedN product with MPI, which was required if the range continued to use SustaiN.

SustaiN® Powered by AGROTAIN®

For more information
Contact your Ballance Nutrient Specialist or see ballance.co.nz/sustain

Table 1 **Use pattern restrictions for SustaiN**

Crop	Rates and timing[1]	Withholding period
Pastures (includes mixed swards – grasses, clovers and forage herbs such as chicory and plantain)	Apply broadcast applications up to 100 kg/ha as required, with 3–6 week spelling intervals for best response.	At least 3 days before grazing[2]
Arable (includes maize, cereal grain, pulses and oil seeds)	Apply up to 250 kg/ha as required.	At least 28 days before harvest
Fruit	Apply up to 250 kg/ha before flowering, and up to 100 kg/ha after flowering as required.	
Vegetables	Apply up to 200 kg/ha as required up to 56 days before harvest, and then up to 100 kg/ha as required.	
Forage brassicas and fodder beet	Apply up to 300 kg/ha as required.	At least 14 days before grazing
Silage, hay and cereal forage/ fodder (includes cereal greenfeed and straw/stubble)	Apply up to 150 kg/ha as required.	At least 14 days before cutting/harvest
Maize for silage	Apply up to 300 kg/ha as required.	

1 Apply to actively growing plants to meet N requirements. Rates represent single maximum application. Total application depends on crop and anticipated yield.

2 As with all fertilisers, do not graze animals if visible fertiliser is present on pasture.

The elemental difference

Optimising sulphur (S) nutrition begins with understanding the unique dynamics of elemental S.

Many New Zealand soils are naturally low in S, an essential nutrient for productive pastures, supporting nitrogen fixation, protein formation and overall plant health. As grazed systems lose S through leaching, animal transfer and product removal, ongoing fertiliser inputs are needed to maintain supply.

Fertilisers can typically supply S in two forms – sulphate S and elemental S – which differ in terms of their plant availability and vulnerability to loss by leaching (see Table 1).

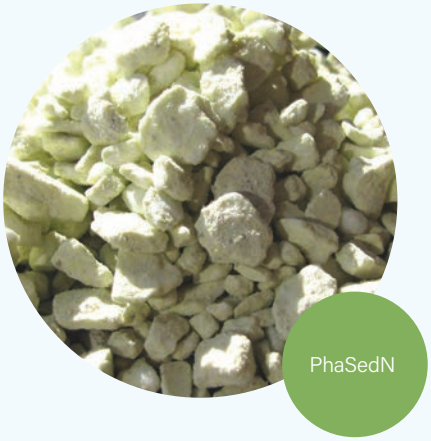
Elemental S is gradually converted into plant available sulphate S by soil bacteria. This process is influenced by soil temperature, soil moisture, and the size of the S particles.

In cold and/or dry environments, bacterial activity naturally reduces. In contrast, warm, wet conditions stimulate bacterial activity, accelerating the conversion process.

When applied in autumn, elemental S helps ensure S remains in the soil over winter, as the soil bacteria are less active in cold soil conditions and conversion slows down. But in spring as soil temperatures warm, the bacteria become more active and supply a steady source of sulphate S for plant uptake through spring and summer.

For farm systems where fertiliser is applied infrequently (such as South Island high country, where fertiliser may only be applied every 2 to 3 years) elemental S can be applied at increased rates in autumn or spring to provide a sustained release of S, long after application.

The rate at which elemental S becomes plant available is strongly influenced by particle size. Fine elemental S particles have a larger surface area and are more readily oxidised by soil bacteria than coarser particles. This means finer particles generally provide a faster conversion to sulphate S, while coarser particles release S more slowly over time.



New Zealand research has shown that the particle size threshold for rapid elemental S oxidation varies with climate[1]. In cooler, drier regions, fine particles (less than 0.15 mm) are required to achieve optimal pasture responses, while in warmer, wetter environments, slightly larger particles (0.15–0.25 mm) are rapidly oxidised.

Ballance fertilisers contain either or both sulphate S and elemental S (see Table 2).

Maintaining an adequate and continuous supply of S requires careful consideration of soil type, S form, application timing and frequency, climate, and, where applicable, elemental S particle size. Understanding how these factors interact enables more efficient nutrient use and supports consistent pasture productivity under changing environmental conditions.

For more information
Contact your Ballance Nutrient Specialist.

1 Boswell CC, Swanney B 1986. Alternative sulphur fertilisers in New Zealand. Proceedings of the New Zealand Grassland Association 47: 233–242

Table 1 **Comparison of sulphate and elemental S**

	Sulphate S	Elemental S
Plant availability	Immediately available	Must be oxidised by soil bacteria before becoming plant available
Leaching vulnerability	Vulnerable – especially on coarse textured, free draining soils with high permeability and low Anion Storage Capacity and over 1500 mm annual rainfall	Not vulnerable
Season typically applied*	Spring	Autumn (although can be used in spring)

*Sulphur fertiliser strategies should also take account of the soil type involved.

Table 2 **Ballance fertiliser products containing elemental S**

	Total S (%)	Sulphate S (%)	Elemental S (%)
PhaSedN	28.5	-	100
PhaSedN Quick Start	17.1	32	68
Sulphurgain 15S	15.2	70	30
Sulphurgain 20S	20.4	48	52
Sulphurgain 30S	29.8	29	71
Sulphurgain 90S	90	-	100

Liquid N fertiliser pros and cons

Could liquid nitrogen (N) fertiliser be an option for you?

Liquid fertilisers are widely used throughout the world, and their use is increasing in New Zealand, with N the nutrient most commonly applied in a liquid form.

Liquid N fertilisers can be applied to pastures or crop by spraying on or by using irrigation equipment (fertigation). Each method comes with its own advantages and disadvantages compared to solid fertiliser application (see Table 1).

Regardless of how they're applied, liquid fertilisers can be combined and applied together with other compatible liquids, so offer the convenience of doing two jobs at once. For example, if spraying gibberellic acid onto pasture to bring feed forward, liquid N could be added to the mix, reducing the cost of an additional application.

As well as convenience, applying liquid N more frequently at lower rates can produce just as much as an equivalent one-off application of granular N, while potentially reducing N losses and environmental impacts. In NZ fertigation trials, N applied often in small amounts via fertigation produced similar pasture quality, pasture N content and dry matter compared to a one-off granular N application of the same total amount of N[1].

Fertigating Nrich Liquid Urea 19N can also reduce volatilisation losses as normally there's enough water applied to wash the N into the soil profile (urea requires 5–10 mm of rainfall or irrigation within the 8 hours after application).

However, both spraying and fertigation require equipment which needs to be maintained. For example, both require flushing and cleaning to avoid corrosion from liquid fertiliser.

Storage of liquid fertiliser needs to be managed to avoid leakage and the risk of nutrients entering groundwater. Backflow contamination is also a risk in fertigation if irrigation systems are connected directly to a bore or surface waterbody.

Lastly, fertigation shouldn't occur if it's raining heavily or soil moisture levels are at field capacity. When spraying on liquid N fertiliser, full sun should be avoided to lessen the risk of leaf burn (scorching).

To ensure an even spread is achieved, calibration of liquid sprayers is important, and the Spreadmark Code of Practice now covers liquid fertiliser spreading.

Ballance liquid fertilisers

Ballance has two liquid fertiliser products for use in irrigation systems and spray equipment on a wide range of farms, including pastoral, arable and horticultural:

- Nrich Liquid Urea 19N - a fully dissolved urea solution, containing 21.3 kg N per 100 L
- Nrich Liquid SOA - an N and immediately plant available sulphate sulphur solution, containing 10.7 kg N and 11.8 kg sulphur per 100 L.

For more information
Contact your Ballance Nutrient Specialist.

1 Irrigation New Zealand. Fertigation – a new tool for nutrient management? Year 1 Summary Report

Table 1 **Summary of advantages and disadvantages of liquid N fertiliser (using sprayers or fertigation) compared to solid N fertiliser application**

	Spraying on	Fertigation
Advantages	▪ Can be sprayed in combination with certain crop protection or growth promoter products (check product compatibility before applying) ▪ Can apply low or high rates of N (5–60 kg N/ha) with even distribution ▪ For crops, can use the same tram lines ▪ Large spread width possible (> 24 m) with even distribution ▪ Useful for applying micronutrients ▪ Partial uptake via leaves, more readily available for plant to use	▪ Can apply low rates (5–10kg N/ha/application) ▪ Reduces potential volatilisation losses ▪ No application costs ▪ No reliance on contractors to apply when you require it ▪ More mobile in soil water solution for plant to use ▪ No risk of leaf burn as diluted with irrigation
Disadvantages	▪ Chance of leaf burn with higher N rates or hot weather ▪ Effect of ammonia volatilisation ▪ Buffer agent may be required if mixing liquid urea with other compatible products	▪ Capital cost to set up the system, tanks and fertigation pumps ▪ Requires a backflow preventer ▪ Cannot apply if soil moisture is at full field capacity
	▪ Limited products available, all of which have lower nutrient concentration ▪ Cost of nutrient per kg is more than solid fertiliser equivalent ▪ Liquid N provides no production advantage over granular N ▪ Corrosive effect on equipment if not effectively flushed ▪ Requires suitable storage tank/bunding (cost)	

Introducing Ballance Double Super

A new product is more concentrated in phosphorus, meaning less needs to be applied.

A new densified superphosphate fertiliser can save on costs, and is also easier to store and handle.

Double Super contains 70 per cent more phosphorus (P) than traditional single superphosphates such as Super. Its P concentration is comparable to high analysis P fertilisers such as Triple Super (19.6 per cent P) and DAP (20.0 per cent P) (see Table 1).

The higher P concentration means less product needs to be applied, which reduces associated costs of transportation and spreading.

Double Super granules are also stronger and harder than traditional superphosphate, so less prone to dustiness and easier to handle and store. This durability is a dual benefit of the process that densifies Double Super granules.

Just like traditional single superphosphate, all of the sulphur (S) in Double Super is immediately available for plant uptake as soon as the fertiliser has dissolved into the soil (water soluble sulphate S). This is particularly useful in spring, when plant available sulphate S levels can be low after leaching by rain over winter at a time when plants most need S.

Double Super is useful for New Zealand soils, which are naturally low in both P and S. It can be used on both pasture and crops as a capital or maintenance fertiliser.

Table 1 **Nutrient content of Double Super compared to Super and Triple Super**

	Double Super	Super	Triple Super
Phosphorus	**15.6%**	**9.0%**	**19.6%**
water soluble	> 78.0%	> 82.0%	> 73.0%
citric acid soluble	> 85.0%	> 86.0%	> 88.0%
Sulphur	**5.0%**	**11.0%**	**0%**
water soluble	100.0%	100.0%	0%
Calcium	**12.0%**	**21.5%**	**13.0%**
Magnesium	**2.0%**	**0%**	**0%**

Double Super can be safely blended with a number of other products, including potash (MOP - muriate of potash and SOP - sulphate of potash), Triple Super, Sulphurgain products and Serpentine Super. However, it should not be blended with Nrich Urea, SustaiN or DAP. Care should be taken if mixing with any other fertilisers. Your local nutrient specialist can advise which products can or cannot be mixed with Double Super.

For more information
Visit bit.ly/3LV1tsl or contact your Ballance Nutrient Specialist.

Principles of phosphorus

In what forms does phosphorus (P) occur in soil and in fertilisers?

What types of P are in soil?

Phosphorus in the soil falls into three broad groups:

- **Soluble P** - readily available forms plants and microorganisms can use. It is replenished by P from the other two P groups (below). Soil contains far less soluble P than inorganic or organic P.
- **Organic P** - the P in plants, animals and microorganisms in the soil, which use soluble P to grow and release soluble P when they die and decompose.
- **Inorganic P** - a range of P compounds with low solubility, most of which can become plant available soluble P. However, some can become insoluble forms and resistant to chemical and microbial decomposition and permanently unavailable to plants.

How is P lost from land?

Phosphorus runoff is the primary source of P loss to waterways from land, containing dissolved P and P bound to soil particles. Phosphorus doesn't normally leach but can in free draining soils (e.g. sandy and stony soils). However, reverted superphosphate fertilisers gradually release P into the soil, resulting in more P retained and less lost to the environment.

How does P bind to soil particles?

Phosphate is a negatively charged anion that can bind to positively charged cations such as clay particles, aluminium, iron and calcium to form insoluble compounds, so the P is less available to plants. The soil's ability to retain P in this way is indicated by its ASC (anion storage capacity).

This conversion of soluble P to insoluble P is beneficial for farmers and the environment. It reduces leaching risk, and provides a long term store of potentially available P (as insoluble P can be released back into the soil solution, making it plant available).

How do insoluble forms of P become plant available?

This happens in three ways:

- As plants take up soluble P from the soil its concentration reduces, and P bound to soil surfaces is released to replenish the soluble P.
- Organic P bound up in soil organic matter is converted into plant available inorganic P by soil microorganisms.
- Phosphorus that has formed into insoluble mineral compounds is released into the soil by mineral weathering and dissolving. This can be a slow process and depends on the pH of the soil and other factors.

How are soil P levels measured?

In New Zealand, soil P levels are usually measured with the Olsen P test, which has been extensively calibrated for our soils (far more than other tests such as the Truog, Bray and Resin P). The Olsen P test measures P available for plant uptake.

The exception to the rule is when reactive phosphate rock (RPR) has been applied to the pasture. As the Olsen P test can't detect RPR residues (which can provide P for plants), multiplying the Olsen P test result by 1.5–1.7 will provide an estimate of Olsen P for soils fertilised with RPR. Alternatively a Resin P test can be used.

What are the forms of P in fertiliser?

In fertiliser, P can be present in three possible forms, which differ in water solubility and thus in plant availability (see Table 1).

Table 1 **The three forms of P in fertilisers**

	Form of P in fertiliser		
	Monocalcium phosphate	**Dicalcium phosphate**	**Tricalcium phosphate**
Water solubility	Soluble	Partly soluble	Insoluble
Availability to plants	Readily available	Moderate to slowly available	Very slowly available
Examples of fertilisers	Superphosphate Triple Super	Serpentine Super Dicalcic phosphate RPR	Found in very low levels in superphosphate based fertilisers, and in high levels in RPR

How is the proportion of plant available P in fertiliser measured?

Two tests are used to measure the proportion of plant available P in fertiliser:

- water solubility test - measures the fraction of P immediately available for plant uptake
- citric solubility test - measures the fraction of P available to plants over the long term.

What's the difference between phosphorus and phosphate?

Phosphorus is highly reactive in its elemental form, but is an essential element in living organisms and present in compounds such as phosphates.

For more information
Contact your Ballance Nutrient Specialist.

Selenium for stock

Selenium (Se) levels can impact stock production and performance, so it could pay to check if you suspect a deficiency.

Soils in many parts of New Zealand are Se deficient, potentially affecting animal production, performance and revenue. Addressing a Se deficiency is a cost-effective (and relatively simple) way of resolving production and performance issues, and the benefits far outweigh the costs.

Selenium is an essential micronutrient for animal health, but over time, natural soil reserves are depleted as stock ingest pasture and soils weather. Certain soil types and locations are more at risk of Se deficiency. The most deficient areas have soils formed from rhyolitic pumice (North Island's Central Plateau), peats (Waikato), sands (Manawatu) and coarse stony soils (Hawke's Bay and Wairarapa). Most South Island soils are derived from loess, greywacke or schist, so are either marginally or potentially Se deficient.

Impacts of deficiency

Ruminants seem to be particularly vulnerable to Se deficiencies, with young stock the most prone.

A diet lacking in Se can cause ill thrift and poor growth, impaired immune systems and reduced fertility in livestock. In adult dairy cattle, milk production can decrease (in severe cases), and instances of infertility and retained placentas can increase. Calves and lambs can be born weak and suffer from poor growth or white muscle disease (nutritional myopathy). Selenium is transferred across the placenta and through milk, so the Se status of a cow, for example, influences that of her developing calf.

Accordingly, Se deficiency can significantly impact revenue. Figure 1 shows this impact (through loss in lamb liveweight gain) as blood Se level decreases below 250nmol/L. These trial numbers are based on a lamb schedule of $8.40/kg (carcass weight) and with the current schedule at around $10.60/kg (as at 1/2/26), results could be even more significant[1].

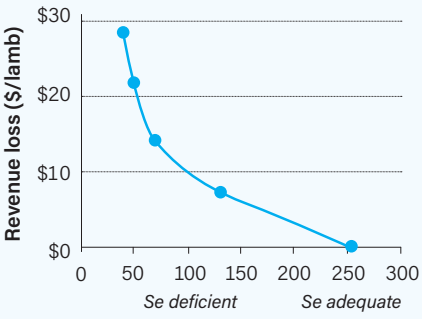


Figure 1 **Blood Se level and impact on revenue** (adapted from Managing Mineral Deficiencies in Livestock by N. Grace, S. Knowles and A. Sykes, 2010)

Identifying and fixing deficiency

Soil tests can't accurately measure micronutrients; only blood, liver or mixed pasture herbage testing are useful in identifying a potential Se deficiency.

Blood or liver testing provides a clear picture of animals' micronutrient status, helping to identify deficiencies before they affect animal health or performance. It's good practice to test at least once a year, ideally pre-mating or pre-lambing/calving, and again if you notice deficiency symptoms.

Mixed pasture herbage testing helps to build a fuller picture of Se availability on-farm and to track trends over time, supporting more targeted and effective supplementation decisions while avoiding the risk of oversupply. It's ideal to benchmark Se levels in autumn and recheck in spring, but spring testing is still helpful if autumn is missed, and allows action to be taken before mating and/or to support peak milking demands. For animal production, the Se concentration in a mixed pasture herbage test should be at least 0.03 ppm.

Selenium is relatively easy to incorporate into a fertiliser programme. It can be applied with maintenance fertiliser or with spring or autumn nitrogen, and levels of other nutrients generally don't affect pasture uptake.

Ballance NutriMax Selenium 1% contains two forms of Se to provide flexibility in timing of application – fast release sodium selenate for an initial lift, and slow release barium selenate to sustain levels over time (see Figure 2). Selenium content is generally maintained in herbage for a year post-application. Application rate depends on a farm's productivity, with dairy farms generally requiring 1 kg/ha and sheep and beef farms 0.5 kg/ha.

Applying Se in fertiliser is usually the most economical way to tackle deficiencies, and many farms could avoid potential Se-related issues by doing so.

1 Grace N, Knowles S, Sykes A 2010. Managing Mineral Deficiencies in Livestock. New Zealand Society of Animal Production

For more information

See ballance.co.nz/nutrimax. For herbage testing, contact our Customer Services Team on 0800 222 090 or your Nutrient Specialist.

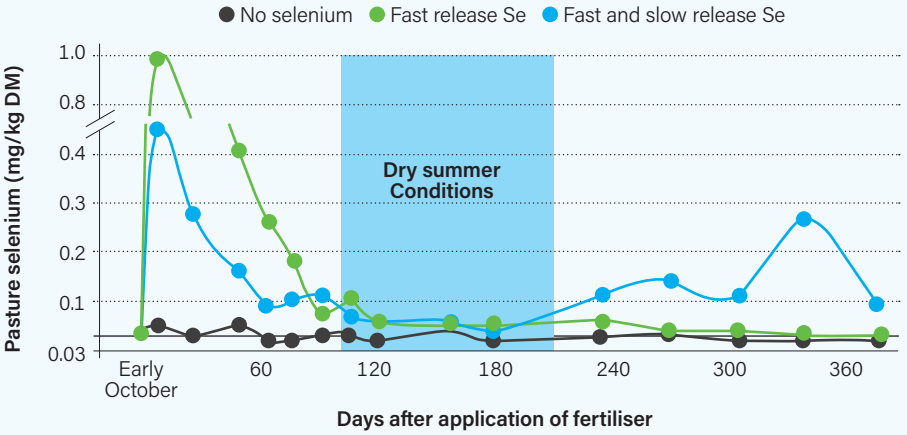


Figure 2 **Pasture uptake of Se over time**

Vet's perspective on trace elements

How can you keep trace element levels optimal across your farm?

By Camille Flack, Veterinarian, Vet Services Hawkes Bay

As a veterinarian working closely with farmers, I see firsthand the vital role that trace elements – specifically cobalt (Co), selenium (Se), and copper (Cu) – play in livestock health, productivity, and profitability.

Deficiencies can lead to poor growth rates, reduced pregnancy rates, compromised immunity, weak young stock and increased disease susceptibility. Ensuring animals get enough of these trace elements should be a priority, but how do we do this?

There's no one-size-fits-all approach and it's important to first identify what's deficient or lacking in your system through testing and monitoring. The best way to do this is to check your young stock, as they're the canaries in the mine when determining trace element deficiency.

Also, the time of year you test is important; Cu in pasture is lowest in winter and this is when animals need it the most. Pasture Co and Se levels are lowest when pasture's growing rapidly (typically spring and summer). This is when lambs need Co the most, as they grow post weaning.

Why trace elements matter

- **Cobalt:** vitamin B12 synthesis, energy metabolism
- **Selenium:** immune function, reproduction, muscle health (severe deficiency can cause white muscle disease)
- **Copper:** enzyme systems, wool quality, bone development, immune response

Getting trace elements into your system

Next, it's important to work out the best way to administer trace elements into your system, considering the practical, economic and biological factors which are important to you and what you're trying to achieve (see Table 1).

What's best?

Directly into the animal is the gold standard approach to ensure the animal receives the right dose at the optimum time. However, what's best is choosing the right approach for you and your farm, tailored to your needs, your farm and your animals.

Often several supplementation options can be used together in a well planned system e.g. Se prills applied in fertiliser can provide a good base but a pre-mating Se where levels are still limiting mating performance might need to be used. Always consult your veterinary advisory before using multiple methods of supplementation.

Trace element levels can also change from year to year depending on seasonal variabilities (i.e. wet years), animal requirements and change in policy. In summary, this is why it's best to have a robust plan for testing, supplementing (if required) and ongoing monitoring.

Final thoughts

Trace element management is a cornerstone of animal health and performance. You can either prevent trace element issues or treat the problem when your stock haven't performed. Work closely with your vet to develop a tailored plan; a little investment can yield big returns in animal performance and farm profitability.

Prevention is always better than cure; remember if you've waited to investigate a problem you've already lost money. Manage a preventative strategy to find issues before they find your pocket. By keeping trace elements front of mind you'll ensure your livestock thrive, and your bottom line stays healthy.

For more information

Contact your veterinarian to assess and diagnose your stock's trace element needs, and work through the best way to supplement. Your Ballance Nutrient Specialist can support you to implement your trace element programme.

Table 1 **Methods of supplementation and key factors to consider**

Method	Pros	Cons
Fertiliser application	▪ Whole farm coverage ▪ Cost-effective for large areas for some trace elements	▪ Cu uptake into animal not guaranteed as can be reduced by interactions with molybdenum, sulphur and iron (other micronutrients generally don't face these uptake issues) ▪ Not cost-effective for some trace elements
Feed/water Supplementation	▪ Good for housed or supplementary fed animals, or farms with infrastructure to administer through water supply	▪ Intake varies, dominant animals eat more, requires consistent mixing and monitoring ▪ Trough treatments impacted by other water sources
Injectable supplements	▪ Rapid, targeted doses that you know each animal is receiving, especially prior to key times of need i.e. before mating, giving birth ▪ Can be long or short acting depending on requirements ▪ Used when immediate correction required	▪ Requires animal yarding for administration
Oral solutions	▪ Often combined with other products required at the time	▪ No longer given if other products no longer required i.e. drenching for parasites ▪ Often short acting
Boluses	▪ Long term and slow release, reducing risk of overdose and maintaining levels for longer	▪ Requires yarding for administration and ideally a head bale
Lick blocks/free access minerals	▪ Low labour, convenient	▪ Variable intake, some animals don't even ingest them, placement and palatability can affect intake

Protecting your soil

Protecting soil during the wetter months helps to maintain productivity and environmental performance.

Soil function and pasture growth decline when soil is damaged. Wet soils are particularly vulnerable to structural damage from livestock and machinery, through processes known as pugging and compaction (see Figure 1).

The effects of soil damage have far reaching consequences. Soils with impaired structure drain poorly and are prone to waterlogging and anaerobic conditions, which restrict root development and nutrient uptake. As pasture yields decline, weeds establish more readily, and nutrient cycling becomes less efficient. Runoff risks increase, carrying sediment and nutrient (phosphorus). On hill country, heavy stock can increase soil disturbance and accelerate erosion.

Visually assess your soil

A Visual Soil Assessment (VSA) is a simple practical method of evaluating soil condition, based on observable characteristics in the field. Only basic equipment (a spade and the VSA field guide) is required. The guide provides scorecards, photos, and instructions to help assess key biophysical indicators of soil quality and plant performance. Free VSA guides and soil management resources are available at ballance.co.nz/soil-health

Preventing (or limiting) damage

Preventing or limiting soil damage and maintaining pasture production is preferrable to the many years it can take for damaged soils to recover. In studies involving dairy cows[1]:

- a single pugging event decreased pasture production by 52 per cent
- pasture production and surface roughness took 4 months to recover after just 4 hours of grazing in wet conditions.

Careful management (and in some cases remedial action) is required to prevent or limit damage. Grazing strategies are most effective, and include:

- timing rotations to graze wetter paddocks early
- maintaining pasture cover
- allocating at-risk soils to lighter stock types
- using back fencing to limit grazing in wet conditions
- standing stock off paddocks during heavy rainfall events.

Placing supplementary feed in drier paddock areas and away from gullies or waterways helps reduce stock movement on vulnerable soils as well as nutrient losses. Avoiding cultivation or use of heavy machinery on wet soils also decreases the risk of structural damage.

Another possible solution – mechanical loosening through subsoiling or aeration – can improve air permeability and soil physical properties, but timing is critical. If the soil's too wet, smearing and recompaction can occur, negating any improvement, and if it's too dry, cracking and excessive drying can follow, leaving the soil more prone to moisture stress and root damage.

In the longer term, preventing pugging and compaction increases resilience. Intact soil structures enhance infiltration, aeration and nutrient use efficiency. By contrast, damaged soils require years to recover, particularly on heavy or poorly drained profiles.

For more information

Contact Ballance Farm Sustainability on farm.sustainability@ballance.co.nz or 0800 222 090, or your Ballance Nutrient Specialist.

1 AgResearch 2003. Managing Treading Damage on Dairy and Beef Farms in New Zealand

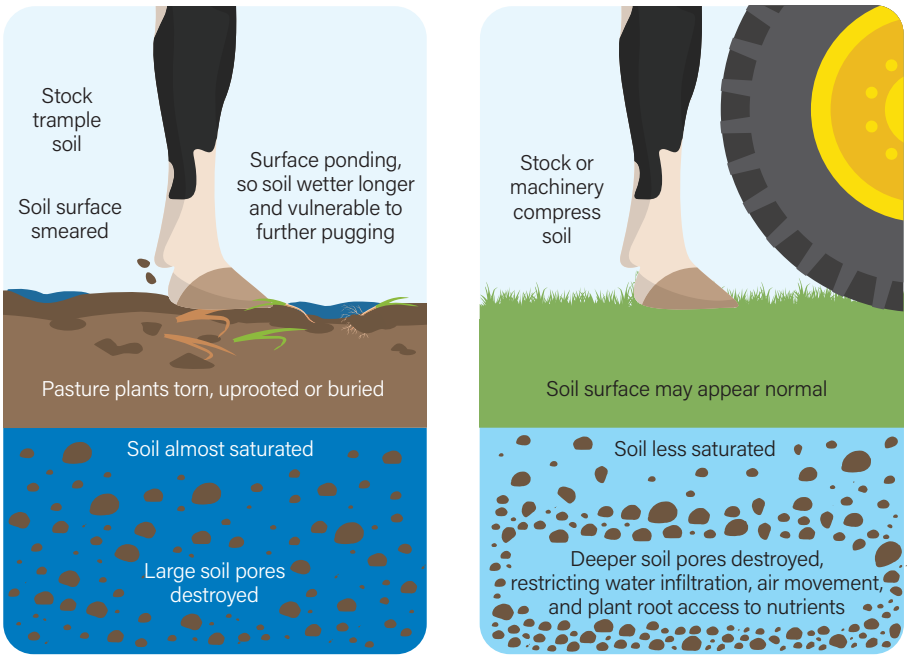


Figure 1 **Pugging (left) and compaction (right)**

Quality aerial spreading

What are the impacts of poor aerial spreading of fertiliser, and how can you ensure a quality spread?

In the past, aerial application of fertiliser was uniform, with one rate applied over an entire farm. Fast forward to today, with aerial topdressing planes spreading fertiliser at variable rates (based on soil fertility, stocking rate, slope or aspect) just to the parts of the farm which require nutrients.

The technology behind this – a GPS guidance system and an onboard computer that adjusts the rate at which the fertiliser leaves the hopper – ensures different areas get the prescribed rate, and that fertiliser isn't applied to non-productive areas and exclusion zones such as waterways.

Poor aerial spreading of fertiliser can result in incorrect application rates, nutrient waste, unintended gaps, uneven application and growth, reduced yield and quality, financial losses for farmers and environmental impacts.

Modelling has indicated that the economic impact of uneven aerial spreading of phosphate fertiliser on New Zealand pasture is highest when plant available soil phosphorus is low[1].

The evenness of fertiliser spreading is expressed by the coefficient of variation (CV) (how much the actual distribution of the fertiliser varies from the desired spread rate that's been set). A lower CV means a more even spread. One study concluded that a hill country farmer could suffer a significant economic loss if paddocks are aerially spread year after year by the same topdresser with a CV above 40 per cent[2].

For quality aerial spreading, Fertmark certified fertilisers and Spreadmark certified aircraft are recommended. Fertmark ensures the quality of the fertiliser product itself, while Spreadmark aims to ensure fertilisers are applied for maximum benefit and minimum environmental harm. Spreadmark certified operators strive for precision to ensure nutrients are applied where needed and to minimise environmental impact. They use GPS technology and adhere to regulations regarding weather, buffer zones, and risk assessments.

Many topdressing companies are also AIRCARE accredited. This requires spread testing every time a new type of spreader or aircraft is added to the fleet. When a satisfactory evenness of spread is achieved, both Spreadmark and AIRCARE accreditation are achieved.

Once the job's done, it's easy to track where nutrients have been applied and at what rate by accessing proof of placement data. This can be accessed through MyBallance if the spreader uses a compatible GPS system and has enabled data sharing.

SpreadSmart by Super Air

Super Air's SpreadSmart technology uses digital farm maps and GPS to adjust fertiliser rates across different areas based on slope and aspect. This ensures nutrients are applied only where needed, improving efficiency and the return on your fertiliser investment.

Super Air®

For more information
Visit superair.co.nz

1 Chiao YS, Gillingham A 1989. The Value of Stabilizing Fertilizer under Carry-Over Conditions. American Journal of Agricultural Economics 71: 352-362

2 Horrell R, Metherell A, Ford S, Doscher C 1999. Fertiliser evenness – losses and costs: A study on the economic benefits of uniform applications of fertiliser. Proceedings of the New Zealand Grassland Association 61: 215-220

The 4 Rs for optimised fertiliser spending

Putting good practice into action on pasture can help get the most from fertiliser, and save money.

The 4 Rs of good fertiliser management – right product, right rate, right time and right place – are about maximising fertiliser use efficiency and minimising waste.

The 4 Rs, an internationally accepted good practice framework developed by the fertiliser industry, help farmers and growers get the best agronomic, economic and environmental outcomes. Other practices which fall outside the 4 Rs, such as no-till cultivation and cover crops, can further enhance these outcomes.

Here's a closer look at each of the 4 Rs, and some options that could help you increase nutrient use efficiency, and save on fertiliser costs.

Thank you for thinking ahead

Your planning helps Ballance deliver the product you need in a timely manner.

When we import from overseas, we lock in shipments at least 4 to 6 months beforehand, based on a forecast of our customers' needs (looking mainly at fertiliser plans and orders for the season).

To make our forecast more accurate, we really appreciate you doing these two things:

- Book an appointment with your Nutrient Specialist to create a tailored plan for the season (or year) ahead.
- Place your order in advance with your preferred delivery date/s throughout the year.

Thank you, in advance!

Right product

Select the fertiliser that best matches the needs of your pasture or crop.

Is the product in a suitable form? Which nutrients can be supplied by the soil, and which need to be added? Are the nutrients needed for uptake immediately or later?

What could help

- SustaiN
- Sulphurgain range
- Muriate of Potash
- PhaSedN
- PhaSedN Quick Start
- Cropzeal range
- Yara range
- Pure Organics range
- NutriMax range

Right time

Apply fertiliser when your pasture or crop will use it, and when conditions will minimise losses.

When will response be greatest? When's the risk of nutrient loss high, due to factors such as soil temperature and soil moisture?

What could help

- Feed planning tools
- Consideration of forecast weather events
- Monitoring soil temperature and moisture
- Return on investment calculations for nitrogen and phosphorus
- Applications for growth stages of a crop

Right rate

Match the amount of fertiliser you apply to the needs of your pasture or crop.

What's the purpose of the fertiliser? What's the pasture's nutrient requirements, and how much of this can be met by the soil? What's your target yield?

What could help

- Super Air's SpreadSmart
- Soil testing (including by slope) and herbage testing
- Technical expertise
- Understand your soil types
- Nutrient calculators for tailored on farm recommendations
- 190 N reporting

Right place

Apply fertiliser where your pasture or crop will use it, avoiding places which don't need it.

Which areas will have a greater response to applied fertiliser, and which areas won't benefit from fertiliser application so should be excluded?

What could help

- Super Air's SpreadSmart
- Slope/aspect mapping
- SpreadWise (spreading technology)
- Variable rate application
- Exclusion zones
- MyBallance
- Spreadmark certified spreaders

For more information
Contact your Ballance Nutrient Specialist.

What do the 4 R principles look like in action? Here's how two North Island farms are using the right products, at the right rates and times, in the right places

Miranui Dairy

"Our main aim is well fed animals, for animal health as much as production," says Chris Klee, who is Equity Manager at Miranui Dairy at Opiki in Manawatu.

Miranui Dairy covers 220 ha (effective) of flat land, with sedimentary soils and about 1000 mm rainfall/year.

For Chris, soil testing is fundamental for getting the right products applied at the right rates to the right places. He's in his eighth season on the farm, and the soil is tested every 2 to 3 years, and the results are complemented by soil test records going back 10 years.

"We do regular soil tests to keep an eye on things, and to know which area to put different products on to. So the product that goes on is going to be related to the soil health, and where we see there's an advantage to be made from adding fertiliser."

A number of different products are used on the farm. Di-ammonium phosphate (DAP) and sulphur (S) are used as a general maintenance fertiliser across the whole farm. SustaiN Ammo is used in spring to boost cover and supply plant available sulphate S after the colder weather. Soil pH is maintained by applying lime when soil test results indicate it's needed.

"Our nutrient management specialist informs us of what seems to be trending and what tends to be required seasonally. We take their advice on board and weigh it up. Generally, that's what drives our fertiliser and feed planning, especially for the nitrogen (N) side of things."

Soil tests also dictate the rate required to get things to an optimum level. "We don't tend to use a lot of N. We only put on what we need to fill a hole, not surplus. We run a reasonably low stocked system, a system 3-4 – but probably more towards a 4 – that doesn't require us to put N on because we run out of feed all the time."

On a System 4 dairy farm, 70 to 79 per cent of total feed is home grown, with the remainder imported.

"The right time is related to conditions. There's a time for putting N on in the spring to get things up and moving so that it's in a growth stage, using S and N to boost growth, but not necessarily boost the quantity of feed above what we can utilize. We don't put N on in the winter, or when it's too wet, so we watch the forecast."

Planning is important, and allows Chris to be more responsive to current conditions. "We spend a fair bit of time on forward planning. We would have made the decision on the time of year to put things on at the end of the last season, or the start of the current season. And then it's just using the weather pattern and what's going on on farm at the time to decide when to actually go ahead and action it."

When it comes to the environment, Chris says their farming practice and fertiliser use have lowered their leaching numbers.

Hinewaka

Mitch Blackwood was a little bit worried when he excluded stock camps – around 20 per cent of the farm – from aerial topdressing.

Mitch runs Hinewaka, in the Gladstone area near Masterton, which he owns with his partner Morgan and parents David and Pip.

Hinewaka covers 680 ha (630 ha effective) of rolling to steep land on limestone soils, with some good finishing country and steeper westerly facing country. It encompasses a shorthorn cattle stud, 2600 ewes, and a commercial herd of around 75 Angus-Shorthorn cattle with the majority of the progeny being finished on farm. Annual rainfall is around 1000 mm on average, with dry summers.

Mitch says that getting the timing right to apply different types of fertiliser at certain times of year is crucial for Hinewaka.

"When we're applying pre-lamb nitrogen (N), getting that timing right is hugely important so we can feed stock accordingly when they need to be fed. We also use N to push feed in front of ourselves when we don't have it."

Traditionally, Hinewaka applied pre-lamb DAP, but when costs became prohibitive switched to strategic use of N pre-lamb through hogget blocks and earlier lambing blocks. However, DAP is still used in the cropping programme, and a capital fertiliser application of Sulphurgain 20S is applied in autumn.

Slope maps and exclusion zones ensure the right rates of capital fertiliser are applied to the right places, using Super Air's SpreadSmart technology.

Mitch says using a variable rate to target areas that need to be fed more while excluding other areas has significantly reduced their fertiliser spend.

"We've done a lot of work with slope maps, and go through the three different kinds of slopes and target the areas we need to feed better – the flatter country we're producing more off and stocking at higher rates. And then maybe backing off a little bit on the steeper country that doesn't need it as much, which seems to have worked really well."

Waterways are excluded from aerial topdressing, but the exclusion of the 126 ha of stock camps over a 630 ha effective property was a huge move for Mitch.

"Taking the stock camps out was a major one for us, because of the way our farm lies there was a huge amount of area that was all stock camps, which we didn't need to be putting fertiliser on because it's naturally transferred to those areas anyway.

"When we first started excluding stock camps I was little bit worried as it seemed a huge area taken out. So we're tracking it with soil testing to make sure it's definitely accurate, and it seems to be at this stage, but it's still early days."

Soil is tested every 2 years, but the last soil test was brought forward to make sure the variable rate application is getting fertiliser in the right places at the right rate.

"I rely a lot on our Ballance rep Milly in town, I ring her and bounce ideas around and go off suggestions from them. We're also in discussion groups and group chats with neighbouring farms and I always throw ideas around on different products and timing."

Nutrients for potatoes

Which nutrients do potatoes need to grow well, yield more and produce a top quality crop?

Potatoes are grown throughout New Zealand, and while total production has increased, the area planted has remained relatively stable, likely reflecting improvements in growing practices and nutrient management.

Potatoes' relatively shallow root system limits their ability to access nutrients and soil moisture at depth. To ensure plants get the right balance of nutrients to achieve the desired yield and tuber quality, nutrients should be applied as close as possible to the root uptake zone and timed to match the crop's demand.

The quantity of nutrients required will vary between sites, and depends on factors such as background soil fertility, soil moisture and water stress, variety, the grower's objectives, as well as expected field and marketable yields. To determine both the nutrients required and appropriate fertiliser rates, each field should be soil tested before planting at:

- 0–15 cm depth - standard soil testing, as well as Reserve K (TBK) and Anion Storage Capacity (ASC)
- 0–60 cm depth - mineral N test (nitrate N plus ammonium N).

Soil pH

Available evidence suggests soil pH should be in the range 5.2–6.0. Lime shouldn't be applied during crop growth, or in the 1–2 years before planting. This is especially important if potatoes have been grown in the field previously and the pathogen common scab is present. Where soil pH needs to be increased for other crops in the rotation, apply lime after the potato crop is harvested.

Nitrogen (N)

Potatoes have a large demand for N, which helps them establish ground cover rapidly and keep green leaves as long as possible. However, excessive N fertiliser on frequently irrigated potatoes can lead to leaching.

Soluble N fertilisers are best incorporated or applied down the spout at planting (but not in contact with the seed piece). When applying soluble N fertilisers like urea, ammonium sulphate or CAN, apply less than half the total recommended N fertiliser at planting (up to 100 kg N/ha if soil N supply is low). Split the remainder across at least one or more side dressings shortly after canopy closure (or earlier if the crop is struggling to achieve canopy closure). Side dressings should be readily available forms like SustaiN or CAN.

If fertigation is available, split the recommended N fertiliser across several applications during the season. This can help match N fertiliser supply with the demands of the crop, lessening the leaching risk.

Phosphorus (P)

Phosphorus is important for early root and shoot development, and for ensuring optimum numbers of tubers are formed.

Potatoes often respond strongly to P fertiliser when soil Olsen P levels are low — but the response curve flattens out quickly, and yield may be suppressed if P supply is beyond the optimum. If P fertiliser is required, apply up to 15 kg P/ha as a starter down the spout (keeping some separation from the seed piece) or knifed in close to the planting line. If possible, apply up to 50 kg P/ha of the remaining recommendation as a band 5–10 cm from the planting line. The remainder (if any) of the recommendation can be broadcast and incorporated pre-planting. Side dressings of P are unlikely to be taken up by the crop.

Potassium (K)

Potassium is essential for healthy tuber development. Potatoes can take up large amounts of K, but the yield response to K fertiliser depends strongly on existing soil K levels. Potassium fertiliser is best applied as a base dressing prior to planting, especially if QT K values are low. Maintenance applications of K must be broadcast and incorporated at least 2 weeks before planting to allow equilibration with the soil. Side dressing is much less effective. Provided K is applied as a base dressing and doesn't exceed crop yield requirements, the type of K fertiliser used is unlikely to reduce potato quality.

Other nutrients

Magnesium, calcium, and sulphur are all essential nutrients for potato growth and development. However, under NZ conditions, yield or quality responses to fertiliser applications of these nutrients haven't been observed. Soils used for vegetable production in New Zealand usually contain sufficient quantities to support plant growth, with additional inputs commonly supplied through other fertilisers.

Applications of trace elements are unlikely to generate an economic return, unless specific deficiencies have been identified in prior growing seasons. Exceptions could be boron on sedimentary soils after a wet winter and spring, and copper on organic soils. In those cases, the best option may be a foliar spray application.

For more information

This information has been adapted from Nutrient Management for Vegetable Crops in New Zealand, available at bit.ly/48WtmI7

Mythbusters

Shedding light on some common misconceptions

Myth

Applying boron (B) to pasture helps to increase yield.

Truth

Production responses to fertiliser B applications have rarely been seen on pasture, despite plants needing B for healthy formation of new tissue, effective clover nodulation and nitrogen fixation.

In a study measuring the effects of B applications to established grass-clover pasture, no yield response was observed, but herbage and soil B concentrations did increase[1]. The results suggest that a pasture response to B is unlikely unless B concentrations in clover are low (below 13 mg B/kg plant DM).

Legumes such as clover have higher B requirements than grasses, so can be more prone to B deficiency when grown on low B soils. In a glasshouse study, white and red clover and lucerne grown in soil low in available B all developed deficiency symptoms, and subsequent application of B increased yield in all three species[2].

To ensure plant available B for pastures, clover only herbage levels should be greater than 13 mg/kg.

Lastly, B should always be included in brassica fertiliser programmes to prevent the incurable disease brown heart.

Myth

Applying salt (sodium chloride - NaCl) to pasture can reduce the incidence of bloat in livestock.

Truth

In New Zealand, bloat usually occurs when stock consume rapidly digested, high protein feeds (such as clover, lucerne and young, lush leafy grasses). This can produce foam in the rumen which traps gas.

While research has found that increasing rumen pH can reduce this foam (and therefore the likelihood and severity of bloat), there's no scientific evidence to date that applying NaCl to pasture is effective at reducing the incidence or severity of bloat.

In a study where NaCl was applied to pasture, across all seasons the incidence and severity of bloat was similar to or higher than that on areas where NaCl wasn't applied[3].

Pasture and grazing management can help to prevent bloat, which can be treated with anti-foaming agents (such as bloat oil) and other methods should it occur.

Pasture does not require Na, but stock do. In New Zealand, most soils contain enough Na to support animal health (barring some inland soils). If Na is required by animals, direct supplementation is normally cheaper than adding Na to fertiliser.

1 McLareb RG, McLenaghen RD, Swift RS 1990. Boron applications to pastures: effect on herbage and soil boron concentrations. New Zealand Journal of Agricultural Research 33: 277–284

2 Sherrell CG 1983. Boron deficiency and response in white and red clovers and lucerne. New Zealand Journal of Agricultural Research 26: 197–203

3 Carruthers VR, Norton DH, O'Connor MB 1988. The incidence of bloat on pastures differing in K:Na ratio. Proceedings of the New Zealand Grassland Association 49: 169–170

The top students from the Ballance Future Farming Student Innovation Challenge: James Clark, Riley Collingwood, Bella Thompson and Sam Cranstone (not pictured: Lily-Grace Sanders)

Growing future problem solvers

The future of farming needs innovative solutions to complex, rapidly changing challenges, and Ballance is nurturing New Zealand's budding problem solvers with two great initiatives.

FUTURE READY FARMS
Creating a lower emissions future

New student innovation challenge with Lincoln University

Students from Lincoln University with the most promising solutions for agriculture's greatest challenges have further developed their ideas with Ballance.

The top five students from the Ballance Future Farming Student Innovation Challenge connected with a range of experts over several days in late 2025 at the Ballance national office in Mount Maunganui.

The innovation challenge, a partnership with Lincoln University, was open to over 220 first year students enrolled in the university's Primary Industry Systems course. They were tasked with examining critical challenges across dairy, sheep and beef, horticulture and arable farming sectors, covering areas such as nutrient efficiency, water quality and soil health. They worked through a process to unpack the farmer or industry challenge and then develop innovative and practical solutions.

The top 15 concepts were presented to the Ballance Innovation team at a pitch event at the university in May 2025. Concept highlights included the use of fungi like *T. melanosporum* (black truffle) to naturally suppress weeds, and producing a hybrid methane-reducing feed additive tailored to NZ dairy cows. One student now has a patent on their concept as a result of the challenge.

Ballance Innovation Leader Stuart Kay said the partnership with Lincoln University supports the co-operative's commitment to growing the expertise and capability of new graduates entering the food and fibre industries.

"We want to support those coming into the sector to gain further real-world experience. This event provided an opportunity for students to come up with fresh ideas, as well as giving them the ability to engage directly with farmers and growers in their region.

"It's a fantastic opportunity to encourage students to shine with their take on how to solve some of the current challenges facing food and fibre industries today," said Stuart.

The innovation challenge was developed with support from the Ministry for Primary Industries Future Ready Farms programme.

For more information
View a video of the student innovation tour at bit.ly/3ZwLVOG

Planting the seeds for a resilient future at STEMFest

Ballance was proud to nurture the next generation of problem solvers at Tauranga's STEMFest – New Zealand's largest celebration of science, technology, engineering, and mathematics (STEM).

The one day festival, in September 2025, attracted more than 6000 children, parents, educators and industry professionals to explore the wonders of STEM.

"It's about planting the seeds of curiosity in young minds, and nurturing the problem solvers who'll shape the future of farming," says Ballance Innovation Project Lead and STEMFest Ambassador Rebecca Drake.

The Ballance stand 'Soil Superheroes', produced in collaboration with the House of Science, was about the importance of soil health and the science behind it. Rebecca says the team was blown away by the number of children who stopped by to ask questions, experiment and get a taste of what a future in STEM might look like.

"Some of the careers that'll drive farming forward haven't even been imagined yet, but we know expertise in engineering, biotechnology, software development, and environmental sciences will be needed."

"And like those before them, the next generation of farmers will need to be resilient, adaptable, and equipped with the skills to think outside the box – in a world that's evolving faster than ever before."

Ballance was the headline sponsor of STEMFest as part of Ballance Innovation's youth engagement commitment under the Ministry for Primary Industries Future Ready Farms programme.

Soil secrets for schools

Students in primary schools across New Zealand are learning about soil in a three part video series 'Soil Secrets', produced by Ballance in collaboration with the House of Science and Hill Labs.

The videos and accompanying science resource kits are being used by teachers in 700 participating schools so far, with the number continuing to grow.

Ballance is a national sponsor of the House of Science.

For more information
View a video of STEMFest at bit.ly/45ZGyew. Learn more about the House of Science at houseofscience.nz

Celebrating Māori agribusiness excellence

Horticultural field days are being hosted by finalists in the Ahuwhenua Trophy.

Finalists vying for the prestigious Ahuwhenua Trophy are hosting public field days this autumn.

The Ahuwhenua Trophy celebrates excellence in Māori farming, and each year celebrates a different sector – dairy, sheep and beef, or horticulture.

This year the focus is on the horticulture sector, and the finalists, who were announced last month, are hosting field days in March and April.

Visionary Māori leader Sir Apirana Ngata and the Governor General Lord Bledisloe launched the trophy in 1933.
It showcases innovation, sustainability, and the outstanding achievements of Māori farmers and growers.

Winners of last year's Ahuwhenua Trophy, Whangaroa Ngaiotonga Trust

Ballance is proud to be a sponsor of the Ahuwhenua Trophy. This sponsorship reflects Ballance's commitment to strengthening relationships with Māori agribusinesses and to learning from their leadership in governance, sustainability, and community.

The winner of the Ahuwhenua Trophy Excellence in Māori Horticulture Award 2026 will be announced at the Awards Dinner in Whangārei on 5 June 2026.

For more information
Visit ahuwhenuatrophy.maori.nz for details of the awards and horticultural field days.

Clippings

Supporting sustainable farming for over 30 years

Ballance celebrates the people, passion, and progress driving sustainable farming across Aotearoa.

For more than 30 years Ballance has sponsored the Ballance Farm Environment Awards (BFEA).

"I can remember the conversation around the Farm Environment Awards and whether it was something we wanted to sponsor," says Ballance Science Strategy Manager Warwick Catto. "Environmental issues were quite sensitive back then, and the word 'environment' was quite polarising."

Today, the pan-sector awards programme attracts entrants from dairy, sheep and beef, horticulture, arable and deer, and everything in between. It recognises those who balance productivity with care for the land, while inspiring others through their stories of innovation and stewardship.

Throughout the year, the New Zealand Farm Environment Trust, which facilitates the awards programme, hosts regional awards functions and open days, ahead of the National Sustainability Showcase. These events connect farmers, growers, and communities, and shine a spotlight on what responsible, forward thinking farming looks like in New Zealand today.

The BFEA Regional Supreme Winners (RSW) for 2026 will be announced at regional awards functions in March and April. Each RSW will host a farm open day, which everyone is invited to attend and learn from.

These regional winners will then go on to the National Sustainability Showcase in July in Christchurch, where one of them will be announced as this year's National Ambassador for Sustainable Farming and Growing.

Ballance Farm Environment Awards®
Promoting Sustainable Farming and Growing

For more information
For details of the awards and regional open days visit nzfetrust.org.nz

Protein for people in need

Farmers are helping to feed hungry New Zealanders, and you can help them bridge the gap.

Across the country, farmers are providing quality protein to those in need through Meet the Need, a farmer founded and led charity.

By donating milk or livestock, farmers ensure fresh, locally produced food reaches families doing it tough. Partner organisations take care of collection and processing, turning those donations into nutritious meals delivered to more than 130 food banks and community organisations nationwide.

Since launching in 2020, Meet the Need has distributed over 3.1 million packs of mince and milk to Kiwi families – all thanks to the generosity of the rural sector. Farmers can donate a portion of their livestock or milk, while others choose to give financially. Every dollar goes directly towards providing consistent supplies of nutritious protein to food banks and community groups.

But the need continues to grow. More than 100 food banks remain on Meet the Need's waiting list – proof that while the farming community has made a huge impact, there's still more to do.

The process to donate is quick and easy. Donations can be one-off or ongoing, and donors can even nominate a specific food bank to receive their donation. Livestock donations of sheep, beef, deer, and pigs are all welcome.

For those unable to donate protein, 100 per cent of cash donations also go directly towards feeding families in need.

If you'd like to help nourish New Zealanders with quality, locally produced food, visit meettheneed.org.nz.

Ballance is proud to be a Platinum Sponsor of Meet the Need, supporting New Zealand farmers as they give back to their communities – from the land to the table, to the people who need it most.

For more information
meettheneed.org.nz

Ballance agri-nutrients

"Through regular soil testing to remove the guess work."

Cornel, Dairy Farmer

We asked our farmers:

How do you make it count?

At Ballance, we get to know you and your farm goals to create a tailored plan. Working together to make sure you get everything you need, and nothing you don't.

Talk to your Nutrient Specialist today, and make this season count.

ballance.co.nz/make-it-count
0800 222 090

"By tailoring the best plan for my farm."

David, Dairy Farmer

"By making good decisions early in the season."

Louise, Sheep & Beef Farmer

"When you trust your gut, and the advice you get."

Dan, Dairy Farmer