Ballance agri-nutrients

Together, Creating the Best Soil and Food on Earth

Grow

Autumn 2025

Contents

Ballance Agri-Nutrients is one of New Zealand's leading fertiliser manufacturers. A 100 per cent farmer-owned co-operative, the company has approximately 18,000 shareholders and sells around 1.2 million tonnes of product each year, representing a turnover of over $900 million. Its products include imported and locally manufactured fertilisers, the majority of which attract a rebate for shareholders.

ballance.co.nz
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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 Island.

superair.co.nz
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Sustainability at Ballance

Ballance helps farmers and growers to be more sustainable, and that includes managing our own environmental impacts.

At Ballance, we seek to create value for stakeholders, now and in the future, through our environmental, social and governance (ESG) activities. The diagram to the right shows our high level approach to managing our ESG impacts.

While our innovative nutrient product solutions and advice help farmers and growers reduce their environmental impacts, as a responsible business, it's also critical for us to manage our own environmental impacts.

This includes the greenhouse gas emissions produced through our operations such as manufacturing. Our work to reduce our own operational emissions footprint starts with measuring it, which we've been doing for many years.

Recognising the importance of being transparent about our impacts, we published our inaugural greenhouse gas inventory for the 2024 financial year (1 June 2023-31 May 2024). The inventory covers our Scope 1 and 2 emissions, as defined by the Greenhouse Gas Protocol Corporate Standard, a widely used standard for consistency in measuring and managing greenhouse gas emissions (see diagram below).

Environmental sustainability
Taking stock of our environmental footprint, and working closely with farmers and growers to help manage and mitigate their environmental impacts.

Social sustainability
Focusing on the wellbeing of our people and the communities we serve to achieve our goal of intergenerational prosperity.

Governance sustainability
Having strong governance that produces positive outcomes for shareholders, employees and the wider community.

The Ballance approach to managing our ESG impacts

Under the standard, Scope 1 emissions are 'direct emissions.' These come from operations owned or controlled by Ballance, such as emissions from gas used in manufacturing urea. For the 2024 financial year, our Scope 1 emissions were 176,317 tCO_2e (tonnes of carbon dioxide equivalent).

Scope 2 emissions cover 'indirect emissions' from the generation of purchased electricity used in our operations. These were 3137 tCO_2e in the 2024 financial year.

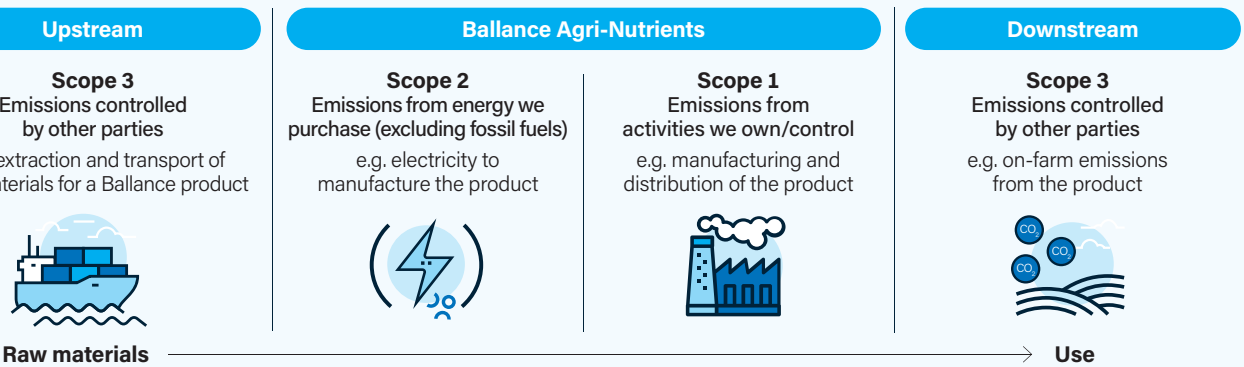
Like many organisations, Ballance has chosen to focus first on measuring and reporting our Scope 1 and 2 emissions, as these are from operations we fully control.

At the same time, we are developing a view of our Scope 3 emissions, which include all other indirect emissions from sources not owned or controlled by Ballance, such as extraction and production of purchased materials, transportation of purchased fuels and use of sold products.

This Scope 3 work aligns with our investment in commissioning an independent Life Cycle Analysis through AgResearch to enable greater clarity for our customers on the emissions impact of using one product over another.

Meanwhile, we are continuing to focus on nitrification inhibitors to reduce emissions of nitrous oxide (the most potent and long lived greenhouse gas) and other improvements such as future decarbonisation opportunities.

For more information
Our Greenhouse Gas Inventory Report for FY2024 is available at ballance.co.nz/reports/ghg-inventory-report



Scopes of greenhouse gas emissions under the Greenhouse Gas Protocol Corporate Standard, using a Ballance product as an example

What farmers say

"The shared delivery of the fertiliser workshop at Ngaroma was excellent. Well facilitated and good expertise with presenting pertinent information at a level which was not overwhelming."

Graeme Gleeson, Pukeatua

Making your fertiliser go further

When budgets are limited, how can you get the most from your fertiliser spend?

Workshops to make fertiliser count

Ballance Agri-Nutrients has teamed up with Beef + Lamb New Zealand to run workshops to help sheep and beef farmers make the most effective use of their fertiliser budgets.

The Making Your Fertiliser Count workshops proved very popular when piloted last October, so are now being rolled out around the country this autumn. Look out for them in your region, or contact your local Ballance Nutrient Specialist or B+LNZ Extension Manager for details.

Learnings from the workshops

If you want to find out more, or can't make it to a workshop, here's an overview of the key take home messages.

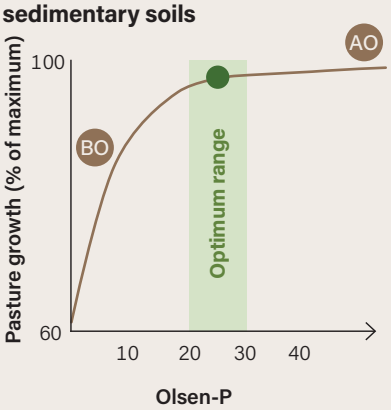
Know where to look first

New Zealand soils supply adequate amounts of most of the 16 elements plants require for growth (bar carbon and oxygen, which come from the air as carbon dioxide). But as pasture requires sufficient quantities of all 16 nutrients to grow, if any one nutrient is in short supply, it will only grow as much as this limiting nutrient allows.

For sheep and beef farms, the most limiting nutrients are usually phosphorus (P) and sulphur (S), and sometimes potassium (K) and molybdenum (Mo). Nitrogen (N) is almost always limiting on grass-clover pastures. However, as a pasture growth multiplier, N is best considered as a form of tactical feed.

Getting the most from your fertiliser spend starts with a robust soil testing regime and monitoring levels over time using tests calibrated in New Zealand. This allows you to compare levels with the pasture response curve to determine the expected response from inputs (see Figure 1). Levels of micronutrients (trace elements such as Mo) are best assessed via herbage testing, using clover only samples to determine levels for plant growth (or mixed pasture samples to check levels for animal health).

Figure 1 **Pasture response curve for phosphorus, on ash and sedimentary soils**



Optimum level - expect 97% of relative yield

AO *Above optimum* - no production gains from increasing soil fertility

BO *Below optimum* – production gains from increasing soil fertility

Soil pH affects the availability of nutrients to plants and how efficiently plants can use them (see page 13). For flat country, the optimum pH level is 5.8-6.0. However, on hill country, the economics of aerial application mean it's generally better to prioritise P over lime up to the point where Olsen P > 15. The next priority is liming to adjust pH where pH < 5.5.

Something is better than nothing; prioritise budget for greatest return

Fertiliser is a key driver of farm production, supporting pasture growth, pasture composition and quality, and important shoulder season feed, all of which are impacted when fertiliser is withheld. So, it's better to cut back fertiliser applications strategically if necessary, rather than stop them altogether. This helps to protect production and allows a faster recovery. There are some proven strategies farmers can use to make their fertiliser go further.

Exclude unproductive areas

Excluding unproductive areas is good for the environment as well as your pocket. Using fertiliser placement technologies such as SpreadSmart to exclude stock camps, gullies, ridges, fence lines and exclusion zones can result in 18 per cent less product applied, which helps stretch the fertiliser budget further.

It's all about getting the right nutrients, right rates, in the right place at the right time.

Focus on the 'engine room' first

Most farms have areas and activities that produce more revenue or are more strategically important than others. These 'engine room' activities such as crops, silage areas and new grasses can also be strategically important for the whole system, so typically rank highly when prioritising budgets (see Table 1).

Once you've identified your top priorities, applying fertiliser based on slope or aspect to the pastoral component can allow further tailoring of inputs at sub-block level. Flatter areas typically grow twice as much as steep slopes, so provide a better return on fertiliser investments. This applies whether simply maintaining fertility or seeking to increase it – focus on your most (potentially) productive land first where fertility is below optimum.

Identify the priority nutrients

Nutrients vary both in price (at time of writing P is $4.23/kg, K $1.61/kg and S $0.76/kg) as well as mobility in the soil, so there's further rationale to prioritise those of best value.

Sulphur is very mobile in the soil but also important for clover production, so continuing annual applications of this least costly nutrient is important to prevent legumes being limited by a deficiency, for example.

Phosphorus (the costliest) is not very mobile in the soil, so if P levels are above optimal, P applied as fertiliser can be cut back gradually, for example by halving the application rate. Most sheep and beef farms, however, do not have above optimal Olsen P levels, so withholding P will impact production.

Potassium can also limit production, depending on soil characteristics and climate, including in higher rainfall environments and soils of volcanic origin. However, on sedimentary soils, K is typically not required as weathering rates exceed system losses. This reinforces the importance of establishing the most limiting nutrients via soil testing, and comparing to the economic optimum.

Making the best use of a limited fertiliser budget means spending money on the things that will generate the best financial and production outcomes for your business. Working with your Nutrient Specialist to generate a strategic plan for your nutrients based on your farming business is the best way to make your fertiliser count.

For more information
Contact your Ballance Nutrient Specialist.

Table 1 **Prioritising nutrient (and lime) application to areas of most value if financially constrained**

Land management area to apply fertiliser to (from highest to lowest priority)	**Nutrients/lime to apply** (from highest to lowest priority)
Crops	Nitrogen, phosphorus, lime
New pasture	Nitrogen, phosphorus, sulphur, potassium, lime
Hay and silage	Potassium, nitrogen, phosphorus, sulphur, lime
Older pastures - ground spread	Phosphorus, sulphur, lime
Older pastures - aerial spread	Phosphorus and sulphur, lime

Find out how these farms have gone about prioritising their fertiliser budgets to achieve their goals.

Melrose Station

Snapshot

2800 ha (2600 ha effective)
200-480 m above sea level
13,000 breeding ewes and 625 cows
18,000-20,000 lambs finished (includes replacements)
1700 mm rainfall/year, summer safe

Melrose Station near Clinton is farmed by Johnnie and Emily Wilson, together with Johnnie's parents, Peter and Joy.

The original property was purchased in 1995, and expanded with the purchase of an additional 1300 ha in 2005.

The Wilsons are strong advocates of a balanced approach to soil fertility. They focus on the nutrients that are limiting production as well as lime, and have developed much of the property.

They also recognise that returns from correcting soil fertility depend on having the right pasture species, stock genetics, subdivision and farm management.

Current farm focus for fertility

A current focus is on lamb finishing, increasing lamb growth rates and targeting all lambs finished on farm at 20 kgCW. To support this the Wilsons are lifting the performance of the remaining 'undeveloped' blocks, creating an engine room of high quality feed for the finishing operation.

"The thing that's holding me back from achieving my farming goals is soil fertility, so that's where we're focused now," says Johnnie. "It's the lambs that make the money, so these areas need to be the priority in terms of spend."

The Wilsons have worked with local Ballance Nutrient Specialist Lucy McLean on a plan to lift fertility through the cropping rotation, which is close to optimal as it is sown in new grass.

"The blocks are starting at a quite low Olsen P level, around 8, so we're taking a staged approach to build fertility," says Lucy.

"Coming out of the cropping phase Olsen P is 11-16, so needs a further lift to hit our target of 20 to support our new grasses, optimal clover production and ensure new grass persists."

Other fertiliser strategies include typically applying all maintenance fertiliser in autumn. Sulphur (S) is also limiting in the high rainfall environment, so typically 30-40 units of S are applied, with 50 per cent of that being elemental S due to the leaching risk.

Using trusted advisors

"Lucy's understanding of my property and business goals means her advice is always well matched to our needs," says Johnnie.

"To achieve our current goals, we may have to cut back on the more developed parts of the farm this year, but as they're close to optimum, there's more room to reduce P inputs without impacting production. A full rate of S will still go on regardless.

"Lucy's good at challenging my thinking, and inspiring new ideas and opportunities. She's also not hesitated in bringing in Ballance experts and other industry professionals where needed, which has built trust between us."

- Prioritise blocks
- Gains from lifting Olsen P in a targeted, strategic manner
- Sulphur is non-negotiable
- Value from advice

Arohiwi Station

Snapshot

1488 ha (1118 ha effective)
460-750 m above sea level
4500 Romney breeding ewes and 400 Angus cows
Easy to rolling contour
1500 mm rainfall/year, summer safe

Robbie Schaw (right) with shepherds Sarah and Benny

Arohiwi Station, near Puketitiri in Hawke's Bay, is owned by Presbyterian Support East Coast, with farm dividends supporting local social services. The property is managed by Robbie Schaw, supported by farm consultant John Cannon.

"It's extremely fulfilling and rewarding to know surplus income from the Station is ultimately supporting and helping the wider community. This creates a real drive within our team to be the best we can in all aspects of our operation," says Robbie.

The farming system is predominantly a sheep and beef breeding-finishing operation. Robbie aims to finish 90 per cent of stock on the farm, and calves 400 cows, lambs 4500 ewes, and has a trade component of 160 angus weaner steers purchased in autumn and 600 (100 kg) Friesian bulls in spring as a summer trade.

With a scanning result of around 200 per cent and lambing 160 per cent in the ewe flock, the business is currently focusing on improving finishing performance and increasing the trading of cattle, which will also help with parasite management (worm burden).

"Ideally, all purchased weaners and home bred steers are slaughtered between 18-20 months of age and hang up at 300 kg. To achieve this, it's pivotal to feed them well all year round in order to target fast growth rates."

Using the off-farm team

Robbie worked with local Ballance Nutrient Specialist Russell Clayton to get the most from the farm budget. They identified the non-negotiables (crops and regrassing) then used a tiered approach for the rest of the farm to fit budget.

As a result, highly productive land was prioritised, and variable rates of fertiliser were used on the farm's three different land classes. Winter crops and young pastures, both fundamental for finishing young stock, were also top priorities.

The winter crops required lime to increase pH, 150 kg Cropzeal Boron Boost down the spout for drilling and a nitrogen side dressing, while new grass needed fertiliser for early plant development and to protect it through its first summer.

When it comes to rest of the farm, typical maintenance fertiliser would have exceeded budget constraints (19-20 units of phosphorus with 30-40 units of sulphur).

"Although the flats are near optimum, these also ranked number one because of their productive capacity. Medium country had a lower Olsen P and has our key lambing blocks, so full maintenance was also applied there.

"SpreadSmart enabled us to remove 132 ha of unproductive areas and stock camps so we could redistribute this spend elsewhere. We did have to cut rates back on our steeper country, but as it's the least productive, it'll have the lowest impacts on production," says Robbie.

"This collaborative approach has given us options and allowed a fertiliser plan for this year that meets our requirements, while also achieving our production goals."

- Crops and 'engine room' first
- SpreadSmart to free up unproductive spend
- Prioritise blocks based on productivity
- Advice aligned with goals

Assessing pasture vigour

Before deciding on fertiliser, it's valuable to assess pasture vigour and discuss what's affecting it.

By Jeff Morton, Consultant, MortonAg

There's been some discussion that pasture vigour isn't adequately assessed when fertiliser recommendations are provided. In my view it's essential to assess and find out the reasons for bad pasture vigour, before discussing these with the farmer so action can be taken.

The indicators of pasture vigour include the presence and vigour of legumes and sown grasses, the amount of dead material, the weed content and the amount of bare ground on the majority of the paddock (excluding excreta patches, which always look better because of more nitrogen and longer spelling from grazing).

To me, the purpose of assessing pasture vigour is to try and identify limiting factors (apart from soil nutrient supply as measured by soil testing), and then to discuss with the farmer how these might be overcome.

Although soil nutrient status is understandably a major concern of advisors working for a fertiliser company, it's only one factor that affects the vigour of improved sown pasture species. Others include soil moisture status during the life of the pasture, suitability of grazing management, susceptibility of the pasture to pests and diseases, persistence of the sown species and the ability of the soil to provide nitrogen, both from fertiliser and fixation by legumes. If any of these factors is limiting, then it doesn't matter what your soil test levels are.

Questions that can start the conversation are age of pasture, exposure to pests and diseases, time since last grazing, how the farmer thinks the paddock is performing, recent weather conditions and so on. Pushing a spade into the ground to find out the amount of moisture in the soil and depth to stones or a hard pan, and digging several holes to assess soil structure of the topsoil and earthworm population will also help assess soil health. At the same time, observations like soil pugging damage and signs of the effect of pests or diseases on plants can be made. Are there any unusually coloured spots or stripes on the leaf? Signs such as red patches of plant hormone or ammonia burns on leaves from urine excreted during hot dry periods are unavoidable. With permission, conversations can be recorded and related back to the farmer with the fertiliser advice.

Then if pasture vigour isn't satisfactory the conversation can turn to potential solutions – which are too numerous to list and differ from farm to farm.

One problem is that the best time to do this is mid-spring to early summer and autumn, when pastures are performing at their best. But advisors are more usually on the farm soil sampling during winter, which isn't a great time for pasture assessment. This can be overcome by using soil sampling contractors to take the soil samples, with the advisor visiting later to discuss the results (after sending results out and visiting the sampled paddocks).

Like any set of observations, a scoring system is useful. In a 1 to 5 system, 1 would be very poor vigour, 2 poor, 3 satisfactory, 4 good and 5 excellent. A score of 1 is likely to be a completely run out pasture and 5 possibly a new pasture.

The photographs below illustrate this. I'd score the pasture on the bottom a 2 (poor) and the other a 4 (good). The poor pasture on flat land has no legume or productive grass (bottom), quite a bit of dead material and a low plant density. The good pasture (top) has a satisfactory legume cover, much less dead material and a high plant density.

The benefits of assessing pasture vigour include value-added fertiliser application, better decision making and more knowledge, both for the farmer and the advisor.

Taking advantage of what you've got

Taking advantage of the nutrients already in your cropping system helps you apply just the fertiliser needed and make your dollar go further.

"Using the nitrogen (N) balance (the N left in the soil after harvesting) can help reduce fertiliser costs, and improve your N efficiency," says Ballance Nutrient Dynamics Specialist Jim Risk.

A cropping system's N balance (also known as 'soil-crop N balance' and 'mineral N balance') is the difference between N inputs and N outputs, with a lower N balance desirable. Figure 1 shows how the N balance is calculated.

In terms of N outputs, the amount of N removed varies by crop, and some crops will help return N to the soil. Table 1 lists depletive crops (which reduce soil nutrients such as N and organic matter) and restorative crops (which help to increase soil N and organic matter).

"Applying the right amount of N to your crop makes it more likely to be profitable. Aside from the wasted expense, overapplying N can in some cases be detrimental to a crop."

Excess N application can lead to issues such as secondary tillering, increased disease pressure and risk of lodging prior to harvest. Undersupplying N, on the other hand, can reduce yields or grain protein content (in milling wheat), both of which can affect the crop's profitability.

Using PMN test results to save money on N fertiliser

Scenario: Irrigated mid Canterbury autumn sown wheat crop, on Brown soil with a bulk density of 1.22 g/cm^3 (0-30 cm)

PMN test result: 85 mg N/kg of soil

Regional climate factor: 41*

Unit factor: 50 (0-30 cm)**

Amount of N mineralised in the field: 85 kg N/ha

Value of N mineralised in the field: At a price of $1.95/kg N (for SustaiN) this N has a value of $166/ha, which if unmeasured might have been partly or completely applied via N fertiliser.

*from Plant & Food Research look up table

**based on sampling depth

Table 1 **Restorative and depletive crops**[1]

Restorative	Grazed pastures with legumes
Partially restorative	Grazed forage and green manure crops, peas, beans, grass seed crops*, white clover, seed crops
Depletive	Wheat**, maize, brassica seed crops (including oil seed rape), barley, oats

*Grass seed improves soil organic matter and structure but depletes soil N.

**Wheat may be partially restorative if a large root mass and residues are retained, but soil nutrient status is depleted.

Identifying current and predicted plant available N

"When it comes to calculating the N balance for an arable crop, a newly available test, which seems to be more accurate at predicting plant available N than its predecessor, can now be used in conjunction with the commonly used Mineral N test," says Jim.

The Potentially Mineralisable N (PMN) test, which became widely available in 2023, predicts the N that may be made plant available via mineralisation of soil organic matter over the growing season. This can vary depending on the soil type, land use history and environmental factors such as

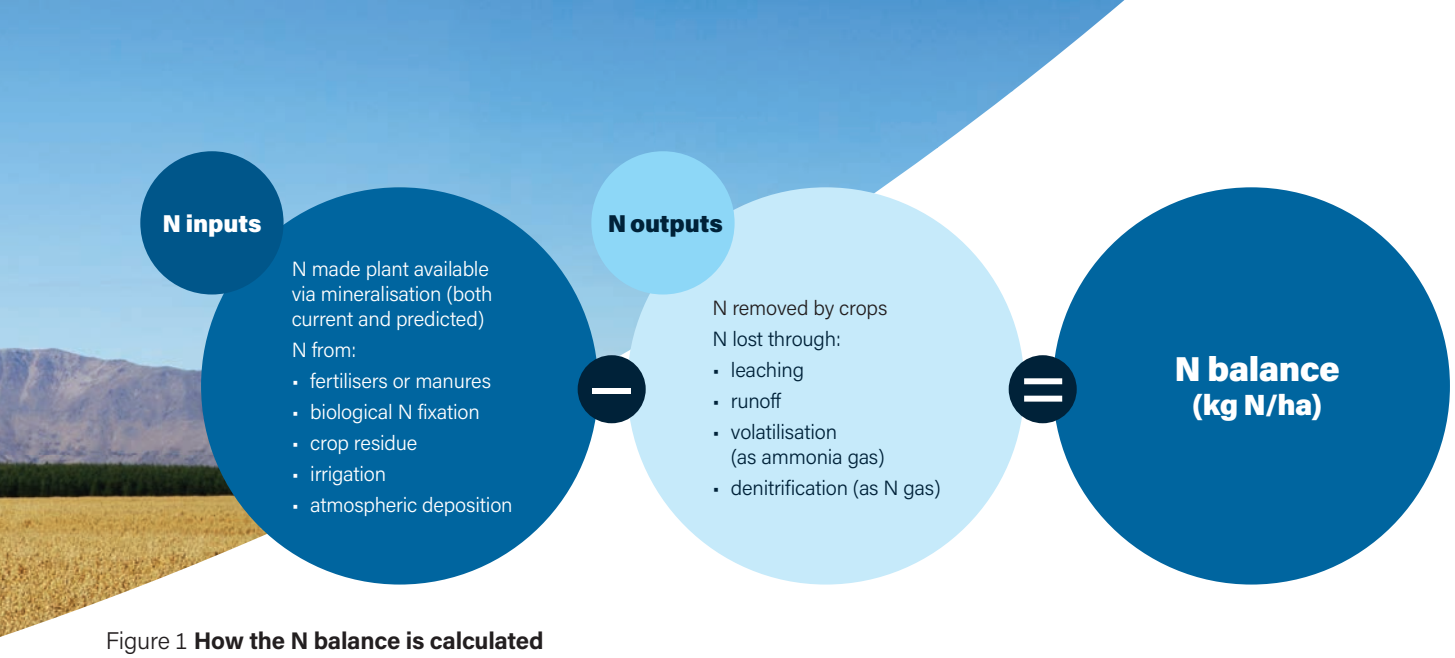


Figure 1 **How the N balance is calculated**

moisture and temperature. The PMN test appears to better predict the N supply via mineralisation than the traditional Available N test (also known as the 'Anaerobically Mineralisable N test' or 'AMN test').

"The PMN test predicts future N, so can now be used together with a Mineral N test, which measures current or mineral N."

The Mineral N test (also known as 'Deep N test' or 'Soil mineral N test') measures how much plant available N (i.e. mineral N – ammonium and nitrate) is already in the soil. Now performed at a depth of 30 cm (previously 60 cm) for cereals and maize or 30 cm for grass seed, it measures ammonium and nitrate N immediately available for plant uptake.

"Using the PMN test to identify predicted plant available mineralisable N together with the existing Mineral N test to identify current plant available N can improve N management and efficiency in cropping systems." (See Figure 2.)

Using N inputs efficiently

Using N fertiliser more efficiently can reduce costs while maintaining or increasing production, increase profitability and reduce risks to the environment.

Nitrogen use efficiency (NUE) describes how well a crop utilises the N supplied by the soil and by fertiliser. It is calculated by dividing the N taken up in the grain yield by the total amount of N available to the crop, and is expressed as a percentage (with a higher number reflecting a better performance).

Understanding both N balance and NUE metrics helps to improve performance and can help achieve a balanced approach to N management, resulting in optimum productivity, economic viability and long term sustainability.

As well as using soil testing to apply the right rate of fertiliser N, following the other '4 Rs' of good fertiliser management can help to improve a crop's N balance and NUE.

Right time

Timing N fertiliser application to match crop demand (including splitting applications as appropriate across key growth stages) reduces the risk of N loss and optimises yield. For cereal crops, fertiliser N is best applied during periods of rapid growth. For perennial ryegrass seed crops, timing N fertiliser application is not as critical, as long as enough seed heads are achieved and periods of intense N shortage avoided, with N typically applied between closing and 3-5 weeks later. For maize, applying a portion of the total N fertiliser at sowing (pre-spread or through the planter) with the remainder applied about 6-8 weeks after sowing is recommended.

Right place

The main methods of N fertiliser placement – surface broadcasting, broadcast and incorporate, and sidedressing – can all present N loss risks through either leaching, volatilisation or denitrification (N lost as nitrous oxide gas). This risk can be reduced by appropriate timing placement around rainfall or irrigation events, especially for surface broadcast N products. Agri-technology is also developing to allow variable application rates so fertiliser inputs are altered in relation to the yield variation within the field.

Right product

Surface broadcast urea is vulnerable to N loss through volatilisation, so is best incorporated into the soil. As this is not always feasible, a urea product with a urease inhibitor such as SustaiN reduces the risk of volatilisation, and allows for more flexible timing of surface broadcasting compared to standard urea, increasing the efficiency of N use.

1 Craighead M, Metherell A, Morton J, Nicholls A, Sneath G, Stevenson K, van der Weerden T 2009. Managing Soil Fertility on Cropping Farms, New Zealand Fertiliser Manufacturers' Research Association

For more information
Contact your Ballance Nutrient Specialist or visit Plant & Food Research's webpage at bit.ly/3bUUopG

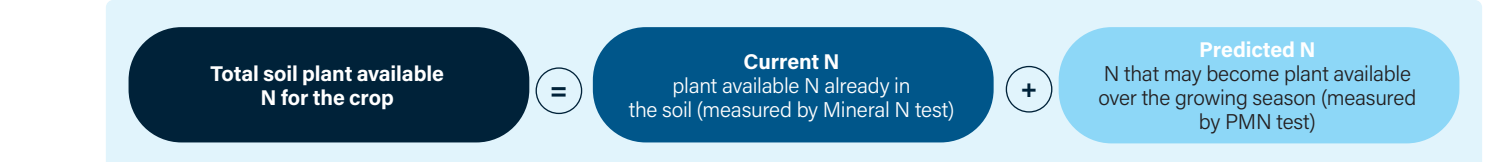


Figure 2 **Calculating total soil plant available N for a crop**

Applying the right nutrients at the right times and rates supports nutrient use efficiency, and ultimately higher yields and product quality.

Sowing cereal crops in autumn

Planning for autumn sown cereals' nutrient requirements can boost yields and quality.

Cereal crops demand a lot from the soil, and in most cases need nutrients at optimum levels to yield well.

On soils where it's not practical or economic to be at optimal nutrient levels, it's important to at least replace the nutrients removed by the last crop, to avoid mining soil nutrient reserves.

The amount of nutrients removed by the previous crops depend on the yield (a higher yield removes more nutrients), and the crop residue management that has occurred.

Grain crop residues contain varying amounts of nutrients. Burning residues causes most of the nitrogen (N) and sulphur (S) to be lost as gas, but about 80 per cent of the potassium (K), 60 per cent of the phosphorus (P), as well as magnesium (Mg) and calcium (Ca) are returned to the soil as ash. Residues left to decompose (either on the soil surface or incorporated into the soil) will slowly release nutrients into the soil.

A good time to test soil is before sowing autumn sown cereals crops each year, checking pH, Olsen P, K, S, Mg and Ca levels and trends over time. On a less frequent basis, testing soil TBK (total bound potassium), organic S and organic C (to check if these soil nutrient reserves have been mined) can help refine fertiliser inputs for the next crop.

Table 1 **Optimum soil test levels for cereals (15 cm sample)**

pH	5.8-6.2
Olsen P	15-25
K (QT K)	6-10
Sulphate S	10-15
Mg (QT Mg)	8-10

Table 1 shows optimum levels for cereals from a 15 cm deep sample.

To organise an N fertiliser programme, a 30 cm deep soil sample taken in late winter can be used to test currently available N (using a Mineral N test) and potentially available N over the growing season (using a Potentially Mineralisable N test, see page 8).

Nutrients for autumn establishment and spring growth

Some planning is needed to sow cereal crops in autumn to avoid nutrient losses over winter. Plant uptake is low over winter, and nutrients such as N, sulphate S (the plant available form of S) and to a lesser degree K are prone to leaching in the cold, wet soils.

Nitrogen is rarely applied when cereal crops are sown in autumn. Relatively little growth occurs between sowing and late winter, so N fertiliser is generally not needed for the crops to establish, and usually there's enough N in the soil to sustain and support growth until the first spring side dressing.

Application of N fertiliser should coincide with rapid growth periods, such as stem elongation. However, if spring soil mineral N levels are very low or the crop has had a poor establishment, some N application may be brought forward.

If winter rainfall's high, S can be split between autumn and spring, or delayed until spring. If S levels are low at sowing, a product with slow-release elemental S, which won't leach over winter, can be used. But not all of the elemental S will release by spring, so if levels are low in spring apply SOA or SustaiN Ammo as a first side dressing.

Phosphorus is required at sowing to ensure adequate root development. If Olsen P level is < 15, consider drilling P fertiliser next to the seed, otherwise it can be broadcast or incorporated into the soil.

Potassium can be applied in autumn, but on coarse soils with high rainfall splitting the application between autumn and spring minimises leaching losses.

Magnesium requirements are typically met by soil reserves, unless the soil QT Mg level is below 8. In this situation, apply 20-50 kg Mg/ha which could be split between autumn and spring.

Applying the right nutrients at the right times and rates supports nutrient use efficiency, and ultimately higher yields and product quality.

For more information
Contact your Ballance Nutrient Specialist.

Soil fertility on leased land

Before land is leased, it's wise to have a shared understanding of soil fertility responsibilities.

It's generally expected leased land will be returned to its owner in much the same condition it was at the start of the lease.

This is mostly straightforward for easily assessed features such as fences, races and trees, but can be less clearcut when it comes to soil fertility, which can lead to some difficult conversations.

Potential disagreements between the leasor and the leasee can be avoided if both parties have a shared understanding of the land's initial soil fertility, how it will be maintained, and the expected soil nutrient status once the lease ends.

The following questions can help both parties tie up any loose ends before signing a lease agreement.

1 What are the soil fertility trends?

While one-off baseline soil testing before a lease is helpful, a series of soil test results over multiple years is preferrable and gives a clearer picture of the land's soil fertility trends. One-off soil test results can be misleading, as results can vary between tests due to differences in soil sampling locations and conditions. For example, according to trials Olsen P results can have a variability of 15 to 20 per cent. So based on a 20 per cent variability, an Olsen P result of 20 could mean the actual level is anywhere between 16 and 24.

2 To what depth should soil samples be taken?

Clarity on the depth of samples to be taken at the start and the end of the lease can also prevent issues. For example, for land in pasture, soil will be sampled to a depth of 7.5 cm, and if the land is used for cropping during the lease but is afterwards returning to pasture, the soil should be sampled to the same depth at the end of the lease.

3 Is capital fertiliser required and who's responsible for it?

A fertiliser application history, together with soil fertility trends and a nutrient budget, will indicate the fertiliser strategy required to maintain soil fertility. If soil test records show fertility has been declining, the fertiliser strategy could well have been inadequate, so a capital application might be required to restore fertility. The lease agreement should be clear who is responsible for this.

4 Who's responsible for maintenance fertiliser?

Potential changes in land use and production systems, such as changes in stock type or stocking rate, as well as any recent improvements made to the land can affect the rate of nutrient removal, and ultimately fertiliser requirements. Fertiliser history records are also helpful for agreeing on a maintenance fertiliser strategy for the duration of the lease.

If land leased for cropping is returning to pasture when the lease ends, the agreed fertiliser strategy could be based on the crop's nutrient removal, or on target soil test levels for the subsequent pasture. A nutrient budget would help to support any agreement made on nutrient inputs, and avoid the potential distraction of soil test variability.

It is also a good idea for the leasee to provide evidence of what fertiliser has actually gone on (fertiliser type and rate of application) and where, to avoid any potential disagreement around what was applied.

5 What about unforeseen events?

Consider what do if the unexpected happens. For example if a flood changed the land's fertility, who would be responsible for restoring the land? Considering such possibilities when the lease is drawn up provides both parties with more security.

A lease agreement based on good advice helps avoid acrimony. Your Ballance Nutrient Specialist or trusted farm consultant can provide specialist advice about the soil fertility of the land to be leased and how to best manage it. Both parties should have a clear understanding of their responsibilities and the fertiliser strategy. Ideally, there should be some flexibility, so if key factors change, fertiliser management can respond accordingly.

For more information

Contact your Ballance Nutrient Specialist for advice on testing and managing lease land soil fertility.

Solving the trace element puzzle

Is a hidden trace element deficiency limiting your potential?

"If key macronutrients – nitrogen, phosphorus, potassium and sulphur – are in good supply but you're still not achieving desired yields or production, the problem could be a micronutrient deficiency," says Ballance Science Extension Leader Katie Aitkenhead.

A micronutrient deficiency – a shortage of a trace element such as copper (Cu), zinc (Zn), selenium (Se), cobalt (Co), manganese (Mn), boron (B) or molybdenum (Mo) – can limit pasture or animal production, or both, depending on the micronutrient.

Applying fertiliser to replace the nutrients agricultural production removes from the soil can prevent or remedy some nutrient deficiencies but may not always be the answer.

"Replacing nutrients helps if it's a primary deficiency – when one nutrient is in short supply. But it won't work if something else is preventing the availability, uptake or absorption of a nutrient that's in adequate supply. This is known as a secondary deficiency," Katie explains.

Figure 1 outlines the factors that can cause secondary micronutrient deficiencies.

Other nutrients

An abundant supply of another nutrient can affect plant uptake and animal absorption of micronutrients e.g. High soil levels of:

- Mo can interfere with animals' absorption of Cu, causing molybdenosis
- Zn can reduce plant uptake and animal absorption of Cu, causing a Cu deficiency.

Soil pH

Soil pH can impact the availability of micronutrients for pasture growth. As soil pH increases, availability of Zn, Fe, Cu, B and Mn decreases. Mo becomes more available with increasing pH.

Soil moisture

Low soil moisture promotes formation of manganese oxides which limit the availability of soil Co, and also limits availability of B.

Soil type

Plant availability of micronutrients varies according to parent material, age of soil, soil texture and organic matter content, which binds and helps retain Cu, Zn, Fe and Mn in the soil.

Fertiliser applications

Applying superphosphate to virgin soils or those low in phosphorus and sulphur can cause a large increase in plant growth, diluting the concentration of Se in herbage and creating a deficiency.

Figure 1 **Factors that can cause secondary micronutrient deficiencies in plants, animals or both**

Detecting micronutrient deficiencies

"Herbage testing is best for detecting micronutrient deficiencies in plants. It's also used for checking micronutrient levels for animal health, and can be complemented by testing micronutrient levels in animal blood and tissue samples.

"Soil testing isn't reliable for micronutrients, as they're present in such small amounts, and even with adequate levels in the soil, plant uptake or animal absorption could be the underlying issue."

Two types of herbage tests are commonly used in pastoral farming:

- Clover-only: Clover is the 'canary in the mine' for pasture. Its shallow rooting depth makes it a poorer competitor for nutrients than grasses, so it shows signs of nutrient deficiency sooner. As well as macronutrient levels, a clover-only test can examine levels of Mo – a key micronutrient for vigorous clover growth, and therefore for improving overall pasture quality.
- Mixed pasture: This test is taken across a transect in a paddock, taking a broader selection of species in the sward for the sample. The results will demonstrate the nutrient value of what stock are actually eating. It can also be analysed to measure other feed values such as nitrate-nitrogen levels, protein content, starch levels and other feed quality tests.

Herbage testing is generally timed prior to the micronutrient animal demand, to allow time for fertiliser application, with the usual times being:

- late spring for Co in anticipation of weaning
- spring for Se before mating
- early April for Cu, before peak demand by deer in autumn and winter, when pasture is less able to meet animal need.

"Levels in the herbage can vary throughout the year based on pasture uptake and growth, so it's important to take this into consideration when analysing test results."

Address deficiency

A well planned fertiliser programme can elevate micronutrient levels in pasture to support grazing stock. Products in the NutriMax range such as NutrixMax Selenium 1%, NutriMax Copper 25% and Nutrimax Cobalt 10% make micronutrients very easy to incorporate into fertiliser applications.

Serious deficiency requires direct-to-animal supplementation as well as correction of micronutrient levels in pasture.

"If pH or something else you can't fix straightaway is affecting micronutrient availability, consulting a vet or farm advisor for direct-to-animal solutions is recommended."

For more information

Contact your Ballance Nutrient Specialist. For more on soil nutrient interactions, refer to Mulder's chart.

Unlock pasture potential with pH

Using agricultural lime to achieve optimal soil pH can enhance your fertiliser investment and increase pasture growth.

Over time, soils naturally acidify due to biological and chemical processes including leaching, organic matter decomposition, erosion, and plant uptake of essential nutrients. Lime can neutralise this acidification and prevent it negatively impacting production.

In the process, lime can also enhance biological activity (and mineralisation of organic matter), increase phosphorus and molybdenum availability and improve soil moisture status.

For pasture production, the biologically optimal soil pH is 5.8-6.0 (see Figure 1). If soil pH is low (<5.5) applying lime to adjust pH can have a series of beneficial knock-on effects (see Table 1).

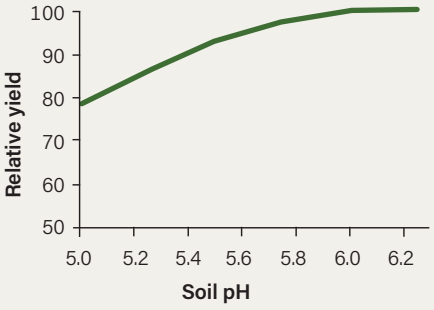


Figure 1 **Approximate pasture yield response to changes in soil pH (expressed as a percentage of potential yield)[1]**

One of the main ways in which liming increases pasture growth is by stimulating earthworm and microbial activity. Earthworms are sensitive to soil pH and prefer pH levels above 5.5, which support their conversion of organic matter into plant available nutrients. Increasing soil pH from 5.5 to 6.0 can result in the release of an additional 20-25 kg nitrogen (N)/ha.

As soil pH decreases below 5.5 the amount of plant available aluminium increases, which in small amounts can be toxic to plant roots, especially clovers and other legumes. Adding the right amount of lime can neutralise elevated levels of aluminium.

Table 1 **The primary and secondary effects of optimal pH**

Soil pH can affect...	...so applying lime to achieve optimal pH can improve...
many chemical reactions in the soil	availability of macro and micronutrients for pasture, such as phosphorus
activity of earthworms and microbes	cycling of organic matter to release plant available nitrogen (N) and increase pasture growth
soil aluminium levels/ aluminium toxicity	root growth and plants' ability to uptake moisture, essential nutrients and form N-fixing nodules
the availability of molybdenum	N fixation efficiency and cycling, and clover and pasture growth
water infiltration under dry soil conditions	soil moisture status in summer and autumn

Economics of liming

Liming to reach the optimal soil pH for pasture production of 5.8-6.0 is not always economic.

The economics depend on the cost of liming (including purchase, transport and spreading costs) versus the dollar value of the benefits (which depends on the size of the pasture response and resultant increase in animal production, and the duration of the effect of liming).

The most important factor for determining the economics of lime is the profitability of the farming enterprise or certain areas within a farm (which in turn depends on the stocking rate and the value of the animal products). This can be measured using gross margin/ha (gross revenue minus direct costs)[1]. Figure 2 shows the relationship between gross margin/ha and economic optimal soil pH.

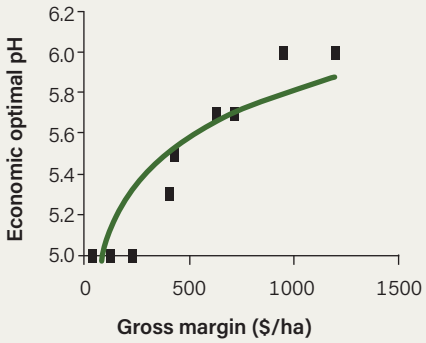


Figure 2 **The relationship between gross margin/ha and the economic optimal soil pH[1]**

Table 2 **Scenarios and recommended actions***

Scenario		Recommended action
≤ pH 5.0	Very acid and highly weathered soils	Apply both lime and fertiliser.
pH 5.0 – 5.8 and…	Goal is to maximise production	Apply both lime and fertiliser.
	Finances are limited	Prioritise nutrients (phosphorus and sulphur) as lime responses (0-10%) are generally lower than nutrient responses (50-100%).
	Sheep and beef farm with optimal fertility	See your Ballance Nutrient Specialist to determine economic optimal soil pH and how much lime to apply.

**Adapted from: 2019 Lime Use on New Zealand Pastoral Farms. Fertiliser Association of New Zealand*

For typical hill country sheep and beef operations with more than 1000 mm rainfall a year (e.g. Central North Island hill country), the gross margin will be around $500/ha for which the economic optimal pH is about 5.5-5.6. For less intensive operations (e.g. drier hill country and South Island high country) it is economic to apply capital lime only up to around pH 5.0, except on speciality pastures or crops, silage, hay and finishing pastures[1].

Lime or fertiliser or both?

Which is more important, lime or fertiliser, or are both equally important? The answer depends on which option provides the most financial gain. Table 2 outlines some possible scenarios and recommended actions.

On farms (or parts of farms) with stocking rates below 5 SU/ha due to climatic and soil limitations, soil pH is generally under 5.2. Lime application is not economic due to the lower levels of animal production, the need for aerial application and the high costs of transporting lime. In this situation:

- Lime could be targeted to south aspects and easier slopes with more legume.
- If soils are acid and rainfall low, legume species such as Lotus, and subterranean, Caucasian, Persian and gland clovers will perform better than white clover or lucerne.
- If soils are acid, aluminium levels high and rainfall is high (average annual rainfall > 1000 mm) pastures may be able to establish and be reasonably productive with low rates of lime (0.5-1 t/ha), as the high soil moisture counters some of the impact of the restricted root growth caused by the aluminium.

For more information
Contact your Ballance Nutrient Specialist.

[1] 2019 Lime Use on New Zealand Pastoral Farms. Fertiliser Association of New Zealand.

Tap into the depths with lucerne

Its high nutritional quality, persistence under dry conditions, nitrogen (N) fixing ability and versatility as a crop for grazing or conserved feed make lucerne a valuable addition to the farming system.

"Lucerne's superpower is its extensive, deep root system which allows it to extract water and nutrients from deep within the soil profile," says Ballance Science Extension Officer Grant Bickley.

"Spring sowing is ideal for lucerne. The optimal growing conditions during this period provide it with the best chance to successfully establish its root system, form a strong healthy crown and outcompete weeds."

Soil testing before sowing

Prior to establishing lucerne, soil test to a depth of 15 cm. Carrying out testing 6 to 12 months before sowing allows time to adjust soil pH to within the optimal range of 6.0-6.2.

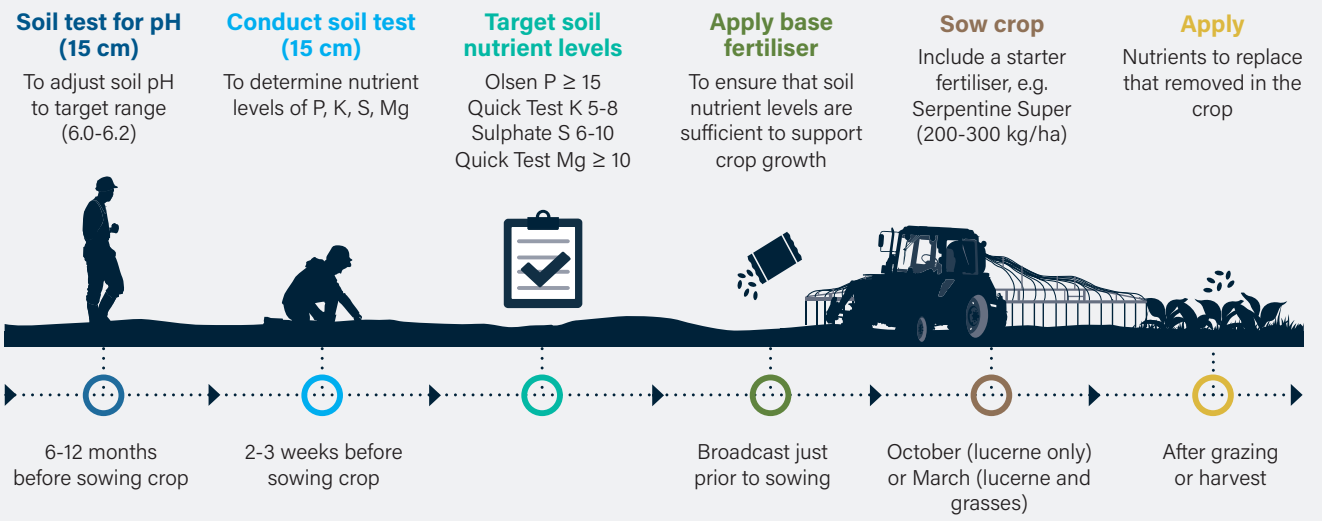
"Alkaline (less acidic) soil conditions are essential for the function and survival of Rhizobia bacteria, which are necessary for effective N fixation. Maintaining soil pH within this range also helps prevent exchangeable aluminium from restricting root growth, so improves the plant's ability to extract water and nutrients efficiently."

Nutrient requirements

Phosphorus

"An advantage of lucerne's extensive root system is its efficiency at extracting phosphorus (P) from the soil, which it requires for photosynthesis and N fixation. Phosphorus also plays an essential role in early root development and plant establishment," says Grant.

Fertiliser for lucerne



Ideally Olsen P levels should be 15–20 for sedimentary and ash soils and 20–25 for pumice and peat soils. Levels below these ranges can be raised by applying a soluble form of P (such as Super) prior to sowing. Additionally, a starter fertiliser such as Serpentine Super can be applied at sowing.

Potassium

Harvesting lucerne removes significant quantities of potassium (K), an essential nutrient for healthy plant function. The type of conserved feed has an impact on the amount of K removed. Lucerne harvested for hay removes 15 kg K/T DM, while silage removes 20 kg K/T DM.

"As plants will take up more K than they require (a phenomenon known as 'luxury uptake'), it's best to apply most of the replacement K after harvest to avoid excessive removal in the herbage."

If grazed, an application of 20-30 kg K/ha/year (applied with spring maintenance fertiliser) is typically enough to meet K requirements and maintain target Quick test K soil test levels of 5-8.

Sulphur

For optimal growth, soil sulphate sulphur (S) levels should be at least 6-10 ppm, as S is an essential nutrient for protein formation and N fixation.

"If annual rainfall is less than 1500 mm, apply sulphate S (such as Super products) in spring at a rate of 20-30 kg S/ha/year. In higher rainfall areas, or if applying maintenance fertiliser in autumn, Sulphurgain products containing sulphate S and elemental S can reduce the risk of S leaching," says Grant.

Magnesium

Most soils supply sufficient magnesium (Mg) from reserves. However, if soil Quick test Mg levels are less than 10, apply Mg (such as Serpentine Super products) at a rate of 10-20 kg Mg/ha/year.

Calcium

Calcium is unlikely to limit lucerne growth in New Zealand conditions and is generally supplied in sufficient quantities by the soil or in lime and fertiliser products to meet crop requirements.

Sodium for stock

Lucerne is a natrophobe, which means it doesn't like to take up sodium (Na). As a result, plant Na levels are low and stock that are fed on lucerne may need some form of supplementation. This can be provided as a drench, administered through the drinking water system (via a Dosatron) or from salt licks (though Na intake from salt licks may vary significantly between animals).

Micronutrients

"Micronutrient needs are best identified by herbage testing. Ideally this should be undertaken on actively growing plants during a period of rapid growth."

"Lucerne can provide high quality feed for up to 8 years, making the work that goes into establishing and managing it genuinely worthwhile."

Molybdenum (Mo) is vital for N fixation and can be supplied using NutriMax Molybdenum at a rate of 4 kg/ha either at sowing or every 4 years. Herbage testing will determine Mo requirements to meet the targets of > 0.5 ppm Mo and > 4.5% N. Boron (B) is required for the healthy formation of new plant tissue. If B content in herbage is less than 20 ppm, it can be added (at a rate of 5–10 kg NutriMax Boron/ha) to maintenance fertiliser. On pumice or sandy soils B may also be needed every 4 years.

"Lucerne can provide high quality feed for up to 8 years, making the work that goes into establishing and managing it genuinely worthwhile," says Grant.

For more information
Contact your Ballance Nutrient Specialist.

Nutrients for new pasture

What does new pasture need to establish and persist to deliver the expected production gains and economic benefits?

1 Correct soil fertility deficits

To get new pasture off to a great start, any issues need to be identified and corrected before sowing. Testing soil 6 to 12 months beforehand allows time to adjust soil pH, as it can take at least 6 months for lime application to take effect.

Low soil pH can affect the availability of nutrients and can also increase the level of aluminium in the soil solution, which can be toxic to plant roots, inhibiting root development and preventing them from penetrating to depth in soil. As a result, plants are less able to forage for nutrients and moisture. As a rule of thumb, it takes about 1 T good quality agricultural lime/ha to raise soil pH by 0.1 unit.

Soil testing early also allows sufficient time to correct nutrient levels with a suitable base fertiliser applied prior to planting. The actual product needed and the rate to be applied will depend on soil test results (see Table 1).

Products in the Super range supply most of the nutrients needed to support pasture growth, so are generally suitable. Alternatively, products in the Pasturemag or PastureSure ranges could be considered.

2 Starter fertiliser

Providing an adequate nutrient supply during the early stages of the pasture's lifecycle plays a significant role in ensuring it meets its potential. Germinating seeds benefit from applications of phosphorus (P) for early root and shoot development and nitrogen (N) which helps promote tillering and leaf expansion.

Phosphorus is essential for the formation of plant cell nuclei, cell membranes and for cell division, all of which are vital functions in the early stages of plant and root growth. As a result, it's important that plants have a steady supply of P during the initial stages of development.

Nitrogen is required by plants for the synthesis of plant proteins, DNA and enzymes. Nitrogen is also an essential component of chlorophyll, the green pigment in plant leaves that is vital for photosynthesis – the process by which the plant converts sunlight into energy.

A starter fertiliser such as di-ammonium phosphate (DAP) applied at the time new pastures are sown and ideally placed adjacent to the seed is often used, as it supplies both P and N, the two nutrients most critical to early plant growth. If fertilisers are to be broadcast, a higher application rate will be required.

3 Post-emergence fertiliser

Applying N to newly sown pastures after the first grazing, typically when the pasture is 6 to 8 weeks old, will help stimulate and encourage tillering and increase leaf expansion, enabling plants to compete and inhibit weed growth.

Relatively light rates of N (25-30 kg N/ha) can be applied using a product such as SustaiN (55-65 kg/ha). Alternatively, products in the SustaiN Ammo or PhaSedN ranges could be considered, as they also supply a form of sulphur.

New pastures particularly benefit from N applications during the first 18 months of growth, as it can take this long for clovers to become sufficiently established to fix appreciable amounts of atmospheric N.

Ensure N applications are applied when plants are actively growing; applications shouldn't be made if conditions aren't suitable to support pasture growth.

[1] Fertiliser Association of New Zealand 2023. Fertiliser use on New Zealand Dairy Farms

For more information
Contact your Ballance Nutrient Specialist.

Table 1 **Target soil test results for growing new pasture on different soil types[1]. If levels are lower than this, address with lime and/or base fertiliser applications.**

Test	Ash	Sedimentary	Pumice	Peat
pH	5.8-6.0	5.8-6.0	5.8-6.0	5.0-5.5 (0-7.5 cm) 4.5-5.0 (7.5-15 cm)
Phosphorus (Olsen P)	20-30	20-30	35-45	35-45
Potassium (QTK)	7-10	5-8	7-10	5-7
Sulphur (sulphate-S)	10-12	10-12	10-12	10-12
Magnesium (QTMg)	8-10	8-10	8-10	8-10

New tool to achieve more with less

A newly available tool can help dairy farmers optimise nutrient application.

A new digital mapping tool from Ballance is designed to optimise nutrient application on dairy farms.

The tool, expected to be available from March 2025, is suitable for ground spreaders with the capability to provide this service.

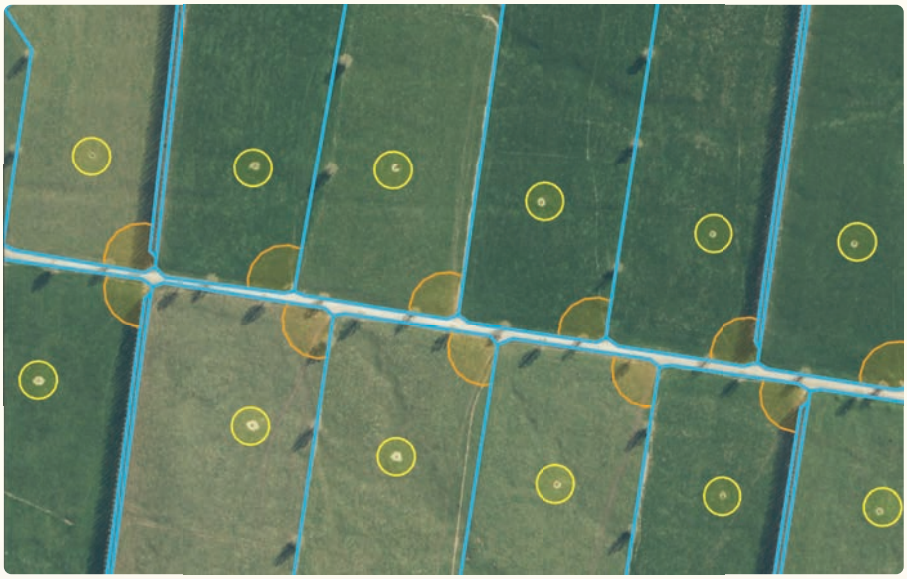
The tool identifies specific areas within paddocks where less nutrients are required. It does this based on the concept of nutrient transfer from stock movements and their congregation around gates, troughs, and other key locations. These spots, enriched by urine and dung, naturally require less nutrients. This enables precise, targeted nutrient application to improve nutrient efficiency, reduce waste and minimise environmental impact.

Benefits

Productivity: Ensures nutrients are precisely applied where your soil needs it most, reducing the spreadable area and increasing efficiency and productivity.

Environmental: Enhances nutrient use efficiency, reducing over-application and supporting compliance with regulatory requirements.

Financial: Saves on nutrient costs by reducing unnecessary inputs, increasing nutrient ROI.



The new tool maps areas such as troughs and gateways, which require less nutrients

How it works

1. The tool requires an accurate farm map, loaded into MyBallance.
2. The tool is used by Ballance to identify areas on your farm map that require less nutrients. It does this by leveraging farmer input, geospatial mapping and artificial intelligence/ machine learning technology.
3. The tool creates buffered exclusion zones on your MyBallance farm map to produce an enhanced version of your map.
4. When you use the MyBallance spread request feature, your enhanced farm map lets your spreader know exactly where (and where not) to spread fertiliser. (As spreaders have different capabilities, having a conversation with your spreader first is recommended.)

At this stage, the tool is available for dairy farms and focuses on identifying gates, troughs and waterways. Farmer feedback will help guide other key farm features to be identified and expansion into other farming sectors in future development.

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.**

For more information
Contact your Ballance Nutrient Specialist.

Getting more from N?

Recent trials by Ballance confirm that gibberellic acid and liquid nitrogen (N) do not significantly increase pasture production, despite providing other benefits.

Farmers looking for ways to increase production from their N fertiliser are reminded of the importance of science-based evidence.

"If a product claims to increase production, it's prudent to check it's been scientifically tested and proven before purchasing," says Ballance Science Strategy Manager Warwick Catto.

"Two such examples are gibberellic acid and liquid N. Both are often claimed to provide a consistent way of increasing pasture production, but this isn't backed by scientific evidence."

The plant growth hormone gibberellic acid is promoted as an enhancer of pasture production, while liquid N is sometimes viewed as providing a greater pasture response than granular N.

"Recent trials confirm what's already known about the normal effects of both these options on pasture yield. Gibberellic acid doesn't increase overall pasture yield, nor does liquid N offer any significant yield benefits over granular N."

In the trials, conducted by Ballance Agri-Nutrients in spring 2023, treatments on pasture plots included:

- control (0 kg N/ha)
- granular application of N (SustaiN at 25 kg N/ha)
- liquid application of N (SustaiN at 25 kg N/ha)
- liquid application of N (SustaiN at 25 kg N/ha) with gibberellic acid.

Pasture was first harvested about 8 weeks after application, to simulate grazing and assess the response, with two subsequent cuts approximately 4 weeks apart.

At the first harvest, the liquid N and gibberellic acid treatment produced a strong pasture response and significantly higher yields than the other three treatments. But in subsequent harvests, the yield advantage of this treatment declined, and in the final cut the yield was actually slightly lower than the control (Figure 1).

Overall, the liquid N and granular N applications produced similar responses.

Uses of gibberellic acid and liquid N

Despite not increasing pasture production, both gibberellic acid and liquid N can be useful in certain situations.

"Gibberellic acid brings feed supply forward, as can be seen in the trials, where it increased pasture yield in the short term, but at the expense of subsequent yields, which were reduced. So gibberellic acid can be helpful for shifting the timing of feed availability when you're facing a feed deficit, as long as you're not just delaying the feed deficit until later," explains Warwick.

"And while liquid N offers no significant pasture response efficiency gains compared to granular N, it can be more convenient to apply if using a sprayer or irrigation."

To avoid both disappointment and a hole in your wallet, the best advice is to always check the science behind any product claims, he says.

For more information
Contact your Ballance Nutrient Specialist.

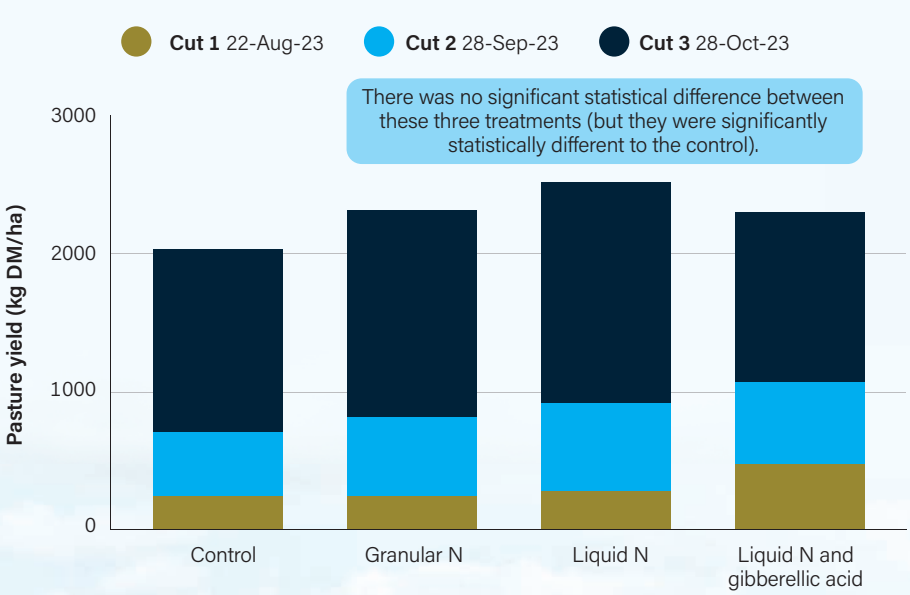


Figure 1 **Pasture yield (kg DM/ha) in response to N fertiliser applications in trials conducted in Culverden in spring 2023**

Pure Organics fertilisers

Did you know Ballance has a range of BioGro certified organic fertilisers?

The Ballance Pure Organics fertiliser range provides a variety of macro- and micronutrients in an organic form. With the entire range certified by BioGro, all products meet the standards farmers and growers expect, without compromising on performance.

The Pure Organics range is ideal for both conventional and organic farmers and growers who want convenient and practical-to-apply organic fertiliser. Pure Organics fertilisers contain a set amount of key nutrients, so you don't need to spend time and money on testing nutrient content and levels of heavy metals before applying them.

Key macronutrients

Pure N (12% nitrogen) is a granular nitrogen amino acid fertiliser, ideal for conventional and organic growers and farmers. It contains non-synthetic nitrogen, so is excluded from the synthetic nitrogen cap and can be used freely on pasture. Pure N is particularly useful for organic orchards, vineyards, and organic dairy pastures. It also provides a significant input of sulphur (8%).

Pure RPR (11.5% phosphorus) is a slow-release granular phosphorus fertiliser, which due to its citric solubility can reduce phosphate loss.

Pure BioPhos (12.1% phosphorus) is an organic reactive phosphate rock inoculated with fungi and bacteria which help to convert the phosphate into a highly plant-available form. It also contains calcium.

Pure Sulphate of Potash (42% potassium) provides a chloride-free form of potassium along with sulphur, and is safe to use on chloride sensitive crops.

Pure Sulphurgain 90S (90% sulphur) supplies fine elemental sulphur, which becomes available as bacteria in the soil convert it into plant available sulphate sulphur, and provides protection from leaching losses.

Pure Gypsum is a slow-release source of sulphur and calcium, both of which play a key role in improving soil structure, aeration and water retention.

Pure Dolomite is a slow-release source of magnesium and calcium, which also provides liming value.

Pure Salt can be applied to pasture to supply sodium for animal health and production.

Bang for buck essential micronutrients

Micronutrients are only required in small amounts but can provide a big bang for buck if a deficiency is limiting production. You'll find most of the essential micronutrients for plant and/or animal health in the Pure Organics range, and all can be applied together with fertiliser (but at lower rates than macronutrients).

Key

Essential micronutrient for animal health

Essential micronutrient for plant health

Pure Boron 10%

provides boron, essential for the healthy formation of brassicas, legumes, fruit and seed crops.

Pure Selenium 1%

can improve stock fertility and optimise milk production in the many areas of New Zealand deficient in selenium.

Pure Colbalt 10%

is needed by nitrogen-fixing bacteria, and for ruminant growth and health, particularly for synthesising vitamin B12.

Pure Molybdenum 40%

can increase clover and lucerne production, supporting production of an excellent source of high quality feed for stock.

Pure Copper 25%

promotes fertility, joint health, bone strength and immunity to disease in animals. In plants, copper ensures healthy growth rates and enzyme production.

Pure Zinc 23%

plays a role in plant functions (including protein synthesis, starch formation and seed production) and animal functions (such as protein and carbohydrate metabolism).

Pure Iron 30%

is essential for plant and animal growth and health, including photosynthesis and synthesis of glucose.

Pure Manganese 32%

is required for some enzyme reactions that regulate carbohydrate metabolism and energy transfer, and for synthesis of fatty acids.

For more information

Contact your Ballance Nutrient Specialist, or visit ballance.co.nz/pure-organics

Keeping soil safe for production

Well managed phosphorus (P) fertiliser applications can prevent cadmium (Cd) accumulating to unsafe levels in agricultural soils.

Cadmium occurs naturally in soil, and is also found in many P fertilisers, the use of which over time can lead to an increase in soil Cd.

Plants take up trace levels of Cd from the soil, so it can enter the human food chain, particularly if soil Cd levels are elevated. However, in a typical New Zealand diet Cd levels are well below the recommended WHO level[1]. An occasional mild exceedance of a food standard doesn't present a health risk, but could be a market risk for a particular food product[2].

Sensible fertiliser use and farm management keep Cd accumulation to a minimum, so soils remain safe for agricultural production, now and into the future.

The Tiered Fertiliser Management system (TFMS) is an integral part of a national cadmium strategy to minimise the potential risks of Cd accumulation in agricultural soils. The strategy aims to keep soil Cd accumulation to below 1.8 mg Cd/kg soil over the next 100 years or more.

The TFMS is non-regulatory and voluntary, and guides P fertiliser choice and rate of application based on soil Cd concentration. It has five tiers, ranging from Tier 0 (when soil Cd is in the range of natural background levels) up to Tier 4 (when no further Cd accumulation should occur without a detailed onsite investigation). Tiers 1 to 4 involve the rate and choice of P fertilisers applied.

It's recommended that all farmers, especially those applying more than 30 kg P/ha/year, use the TFMS. The first step is an initial Cd soil test to determine appropriate actions (soil testing and fertiliser use) to manage Cd. On most farms, Cd soil test results are within natural background levels of Cd (Tier 0 on Figure 1), so all that's required is retesting in 5 years.

Ballance is part of the Cadmium Management Group which implements the national cadmium strategy. We also take a responsible approach to superphosphate manufacturing. The concentration of Cd in phosphate rock varies by source, and while no viable mechanism currently exists to remove Cd entirely, we source a range of phosphate rock for manufacturing products such as superphosphate to ensure Cd levels are well below agreed industry standards (280 mg Cd/kg P).

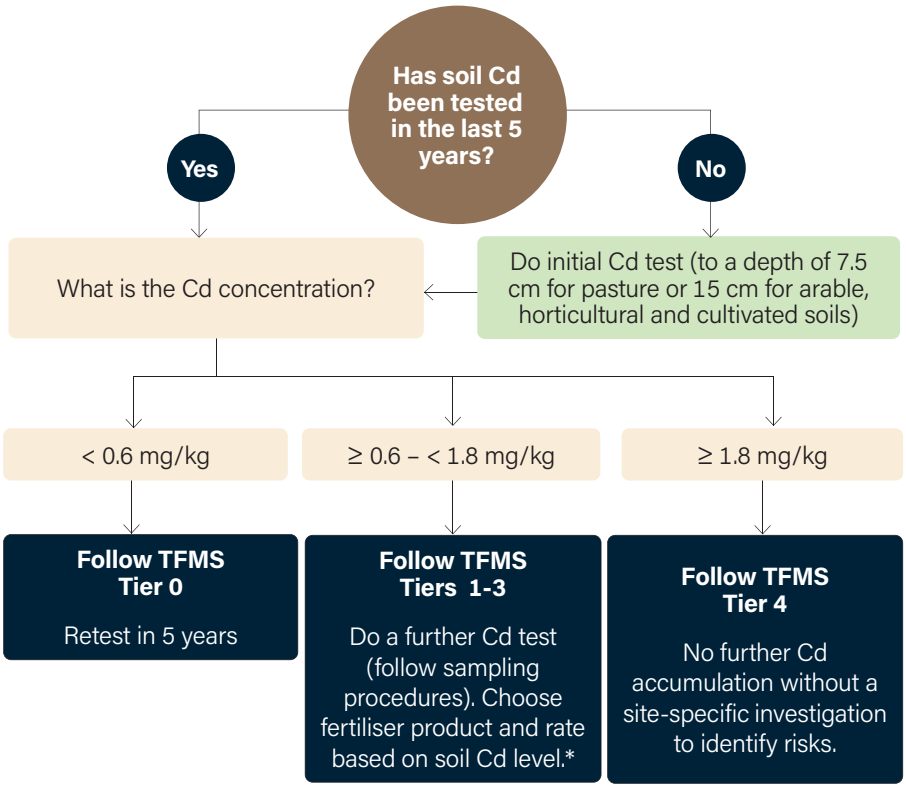
[1] Ministry for Primary Industries 2018. 2016 New Zealand Total Diet Study

[2] Fertiliser Association of New Zealand 2019. Tiered Fertiliser Management System for Soil Cadmium

For more information

See the Tiered Fertiliser Management System for Soil Cadmium booklet at bit.ly/48ETN4s or ballance.co.nz/cadmium-management

Figure 1 **The Tiered Fertiliser Management System testing and management actions (based on soil Cd concentration)**



* For more details, scan the QR Code to see the Tiered Fertiliser Management System for Soil Cadmium booklet.

Mythbusters

Shedding light on some common misconceptions

Myth

It's ideal to have at least 15 different species (such as radishes, sunflowers, swede and lucerne) in pasture swards.

Truth

The term 'regenerative agriculture' has been used around the world for a few years now, and identifies many strategies to improve or maintain soil health. One strategy discussed is to plant a variety of crops, known as 'diverse pastures.'

While diverse pastures can be beneficial, there's no magic number of species to have in a pasture, and a great range of species aren't needed for pastures to be productive and resilient.

Bringing in functional diversity can, however, provide a wide range of benefits. Functionally diverse pastures can improve pasture persistence, resistance to weed invasion, animal health, soil structure and function (erosion, nutrient loss, water infiltration and nutrient cycling) and carbon sequestration, and reduce the urinary nitrogen output of cows.

New Zealand farming systems already have a range of species in their pasture swards, including ryegrass, cocksfoot, fescues, white clover, red clover, sub-clover, plantain and chicory, all of which can provide benefits on farm.

The key to picking mixed pastures is to look at the functionality of each species, and ensure they allow you to manage the pasture without having a detrimental effect on other pasture species. Things to consider when deciding on species to add to pasture include:

- spray programmes – will any species be affected by herbicides to control weeds?
- management – what care does each species need?
- maturity date – what's the optimal harvest time of each species and how do these align?
- longevity of the species.

Photo: Agricom

Myth

Applying fertiliser in autumn is a waste of time and money, only encouraging low nutritional value summer grasses to grow.

Truth

Applying autumn fertiliser can provide quality feed at a time when pasture can be very high in fibre and lacking in protein and essential nutrients.

Fertiliser is non-selective and provides nutrients to whatever pasture species are growing. So autumn fertiliser can boost growth of desirable pasture species, as well as that of summer grasses, which also provide feed, albeit of a lower quality.

Summer grasses continue to grow in autumn, and die off after cooler temperatures or frosts. Optimal grazing management can avoid opening up of pastures which allows summer grasses, which mostly come from the soil seedbank, to grow.

Autumn soil temperatures are often warmer than spring, and although rainfall might be fickle, applying nitrogen (N) fertiliser as soon as drought-breaking rain arrives can lead to a fast pasture response (and production of highly valuable feed at a time when grass growth is minimal), according to research commissioned by Ballance[1].

Trials on drought-affected land in Hawke's Bay and the Bay of Plenty showed that moderate rates of N fertiliser (25 or 50 kg N/ha) applied after the first rainfall produced useful pasture responses only a few weeks after application. First harvests yielded between 4 and 10 kg more dry matter per kg of N applied compared to the control (no N applied), and even if another dry spell followed, the response carried on once more rain arrived.

[1] The effects on soil, herbage and dry matter responses to applied nitrogen after prolonged low soil moisture conditions, Research report for Ballance Agri-Nutrients, 2008

Clippings

Biking for a break

An adrenaline hit from mountain biking is giving rural people a mental break.

"When your mind's completely focused on doing something more adrenaline-based, you get a mental break," says Ballance Account Manager and Rural Riders Chairperson Hamish Clausen.

The Rural Riders initiative organises mountain biking for rural people across New Zealand, and is about to finish its fourth successful season.

"We don't have to do much advertising – the rural backbone of New Zealand are really good at supporting these initiatives."

Hamish first came up with the Rural Riders idea for people who live inland, and sees it as complementary to the Surfing for Farmers programme.

"Lots of people have access to a bike, and if not we can access bikes, or even an e-bike, for them."

Rural Riders events attract people of all ages and levels of experience, and are currently held in 12 locations across the country, from Southland right up to Northland. Rides typically last a couple of hours, followed by a cold refreshment and a "bit of a yarn".

The events are free of charge thanks to the support of Ballance, Rabobank, FIL, GEA Farming, Rural Support Trust, and local sponsors of each event.

For more information
Rural Riders (including local coordinator details) is on
Facebook
Instagram
nzruralriders@gmail.com

Identifying land use opportunities

An online data 'supermarket' is helping to identify land use opportunities in New Zealand.

A new website is feeding the hunger for information on the food and fibre that can grow in New Zealand, now and in the future.

The *Enabling decisions on land use opportunities for Aotearoa* website supports land use decisions, with the aim of identifying a greater range of suitable land use opportunities and benefits across the country.

The website is stocked full of datasets that provide a broad understanding of the social, environmental and economic costs and benefits of different land use options. A large team of researchers from multiple institutes and scientific disciplines and agricultural consultants produced the datasets as part of the Land Use Opportunities: Whitiwhiti Ora research programme.

The national-scale data provides users with an initial picture of information they can then use to undertake further research. For example, datasets on crop suitability and how that changes over time with climate change impacts reveal that some locations where apples, cherries or avocados currently grow well will not be optimal in the future.

The site (see 1. below for address) is free to use, and useful for mana whenua, regional councils, farm advisors, consultants, primary sector groups, investors and others who can download the information to use in third-party tools such as GIS.

Alternatively, the data can be more easily browsed without downloading (see 2. below for address). Climate change impact data will be added to this site in 2025.

This work is a collaboration between Manaaki Whenua, AgResearch, DairyNZ, Scion, Land Water People, NIWA and Plant & Food Research, with funding from the Our Land and Water and Deep South National Science Challenges.

For more information
1. landuseopportunities.nz
2. ourenvironment.scinfo.org.nz/maps-and-tools/app

Winners at managing soil

An East Coast sheep and beef farm won the Ballance Agri-Nutrients Soil Management Award in 2024.

As well as being the East Coast Regional Supreme Winner in the 2024 Ballance Farm Environment Awards, the Beamish family received the Ballance Agri-Nutrients Soil Management Award.

Simon and Josi Beamish run Awapai, a 2100 ha grazing and finishing farm 50 km west of Hastings, together with their son Hugo and daughter-in-law Pip.

The Soil Management Award focuses on soil and nutrient management, and looks for a strong understanding of nutrients and nutrient budgeting.

"We focus on the soil, where it all starts from. It's our grazing management, it's our pasture, and we think there's an opportunity out there in the marketplace for that work to be realised," says Hugo.

Their farming is guided by research, and they match land class to appropriate and sustainable use, and carefully manage their soils. This approach has resulted in forestry on their steep marginal land, and planting poplar and willow to help manage erosion-prone areas on grazed land.

Other important criteria for the Soil Management Award are understanding the impacts of nutrients and management practices on soil fertility, and surface and ground water, and managing these impacts well. Hugo and Simon strive to ensure that all water leaving the property passes through retired areas, which are closely managed to reduce nutrients and sediment.

The Beamish Family also won the Beef + Lamb New Zealand Livestock Farm Award, the Hill Labs Agri-Science Award and the New Zealand Farm Environment Trust Innovation Award.

The Ballance Farm Environment Awards are run by the NZ Farm Environment Trust and champion sustainable farming and growing.

Ballance Farm Environment Awards®
Promoting Sustainable Farming and Growing

For more information
Visit nzfeawards.org.nz for more on the Ballance Farm Environment Awards.

New earthworm test

The new Earthworm eDNA test from Hill Labs makes it easier to check you're getting the full benefit of earthworms.

Earthworms are a crucial component of soil biology, and abundant earthworm populations are recognised as an indicator of healthy soil, and can increase pasture productivity by 25 to 30 per cent, according to NZ research[1,2]. However the common earthworm species that inhabit agricultural land were introduced, so may be lacking in some areas.

Such areas would be missing out on the numerous benefits earthworms provide, which, along with increased pasture productivity, include:

- greater stock carrying capacity
- faster litter incorporation
- increased nutrient turnover and availability (especially nitrogen and phosphorus)
- increased water infiltration
- improved water holding capacity
- reduced runoff.

The Hill Labs Earthworm eDNA test is a less labour-intensive alternative to the 'dig and count' method of visually assessing earthworm populations in the field (as covered on page 19 of Grow Autumn 2024). The eDNA test detects genetic material left behind by one species – *Aporrectodea calignosa* – which lives in the topsoil and is New Zealand's most prominent and useful earthworm species.

The two methods of assessing populations are quite different – one measures the number of earthworms present in a particular spade square while the other measures the amount of DNA of *Aporrectodea calignosa* present in the soil. However, they are well correlated, with mainly pastoral soils used to develop the eDNA test.

The Earthworm eDNA test is available as standalone test or as an add-on to an existing soil testing programme. The best time to sample is during the wetter months (winter and early to mid-spring).

1 Schon NS, Mackay AD, Gray RA 2019. Changes in the abundance and diversity of earthworms in hill soils under different long-term fertiliser and sheep stocking regimes, New Zealand Journal of Agricultural Research

2 Stockdill SMJ, Cossens GG 1984. Soils: Earthworm introduction; Methods and Effects on Production. Farm Production and Practice Aglink, FPP 211, 2nd revision, Information Services, MAF, Wellington

For more information
bit.ly/3DYvG5s

agri-nutrients Ballance®

Make every bit of advice count.

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