Ballance agri-nutrients

Together, Creating the Best Soil and Food on Earth

Grow

South Island
Spring 2022

Contents

Ballance agri-nutrients

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

ballance.co.nz
0800 222 090

Super Air

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

superair.co.nz
0800 787 372

SealesWinslow

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

sealeswinslow.co.nz
0800 287 325

Animal Water Plant Soil

Ballance is leading the Future Ready Farms programme, to provide food and fibre producers with solutions for further reducing their environmental footprints. Two of the programme's 12 projects are featured on the following pages.

Soil Health Check pages 3-5

Enhanced rock weathering to offset on-farm greenhouse gas emissions page 6

FUTURE READY FARMS
Creating a lower emissions future
Brought to you by Ballance in partnership with MPI

Check your soil's health

A new test offering means you can get information on soil's biological properties as well as its fertility, quickly, easily and affordably.

Living and decomposing insects, bacteria and fungi and other organisms make up less than 10 per cent of soil volume, but can have a huge impact.

Soil's biological component affects its structure and chemical processes, with knock on effects on soil fertility, plant growth and productivity.

While healthy soil biology is resilient to changes in management practices and land use, over time it can become severely degraded by practices that impact soil's properties and overall health.

While standard fertility testing measures soil's nutrient fertility (its chemical properties), it does not check its biological properties.

A new test offering, the Soil Health Check, co-developed by Ballance and Manaaki Whenua - Landcare Research as part of the Future Ready Farms programme, provides valuable information on soil biological and chemical properties – for no extra effort and minimal additional cost.

Two dimensions from a single, standard set of samples

No change to a standard soil testing programme is required, as the Soil Health Check is specifically designed to align with standard soil fertility sampling protocols.

The only difference is that it's recommended to do the Soil Health Check every 3-5 years, compared to every 1-2 years for standard fertility testing. This is because Soil Health Check biological parameters change more slowly over time.

From just the one set of soil samples the Soil Health Check provides information on soil's biological and chemical properties. Transects for Soil Health Check sampling are based on Land Management Units, and samples are taken in the same way as standard soil fertility sampling (7.5 cm deep for pastoral land, 15 cm deep for horticultural and arable land).

If the aim is to establish a trend more rapidly, Soil Health Check sampling may be done every 1-2 years to start with, before moving to every 3-5 years once a trend is established.

More affordable

The Soil Health Check, which includes a standard fertility check, costs $140 plus GST (compared to a standard fertility check alone, including sulphate sulphur and organic sulphur, at $80 plus GST).

The Soil Health Check measures the following parameters:

- standard Soil Health Check parameters (see opposite page for more information)
  - » Total nitrogen
  - » Total carbon
  - » Anaerobically mineralisable nitrogen (AMN)
  - » Organic matter
  - » pH
  - » Olsen P
- standard soil fertility test parameters
- additional parameters
  - » Anion Storage Capacity (ASC) - a measure of the soil's ability to store phosphorus from the soil solution on the soil colloid surfaces
  - » Hot Water Soluble Carbon (HWSC) - once a target range for HWSC is established it will replace AMN as a Soil Health Check parameter
  - » Carbon to nitrogen ratio - not a direct measure but provides useful information on how a soil will function in decomposition of organic residues.

Compare your results against national benchmarks

Results from soil health check are measured against soil health target ranges used for national (and regional) soil health monitoring programmes. You can view your Soil Health Check results in your MyBallance account, and compare them against the displayed target ranges for your farm system and soil type. The target ranges have been reviewed by Manaaki Whenua - Landcare Research and adjusted for sampling depth (7.5 cm or 15 cm).

Learn how to improve biological activity, organic matter, and carbon in your soil

As Soil Health Check provides an understanding of where levels sit in relation to target ranges, management practices that may be needed to improve or maintain a given parameter can be assessed.

Ballance can also provide you with highly-informed recommendations to optimise your nutrient performance.

What about earthworms?

Many people associate earthworms with soil health, and it's easy to assess earthworm populations yourself.

Simply dig out a 20 cm x 20 cm cube of soil (a spade square) and count the number of worms.

As a rule of thumb, >20 worms per spade square is a good target. Keep in mind that worms may burrow deeper when it is dry, and some worm species may not have been introduced to the area.

View changes in your soil over time with trend view

Soil Health Check provides an indication of the impact of land use on soil health over time, and you can view trends over time for a particular paddock or farm average in MyBallance.

Standard Soil Health Check parameters

In addition to standard soil fertility parameters, Soil Health Check measures the following parameters, which account for both production and environmental goals, to indicate the biological and chemical health of the soil being tested.

Soil pH

Soil pH can affect the availability of many plant nutrients including nitrogen and phosphorus.

Olsen P

Measures the pool of phosphorus available for plant uptake.

Total nitrogen (%)

Nitrogen (N) is an essential element required by all living organisms. Total N measures all of the N in the soil, both organic and inorganic. In most topsoils, 95 per cent of the total N is in organic matter. The cycling of N between the organic pool and the inorganic (mineral) pool is necessary for supplying N for crop production and microbes. The organic N pool is also important for storing N added via biological N fixation.

Total carbon (%)

Carbon (C) is another essential element required by all living organisms. Total C measures all the C in the soil from all sources – in New Zealand this is mainly from organic C, which is the main component or building block of organic matter. Carbon is a food and energy source for microbes. Total C can only be used as a measure in mineral soils, not organic/peat soils (which by definition are very high in C).

Anaerobically mineralisable nitrogen (µg/g)

Anaerobically mineralisable nitrogen (AMN) shows the soil's ability to store N that can be supplied to plants through the decomposition of organic matter. Although more relevant for the soil health context, this test also correlates with the soil microbial biomass (bacteria, fungi etc in the soil) and is used as a proxy for measuring the health of the soil biological community. AMN is associated with organic N

What about physical parameters?

Assessing the physical state of soil is important for fully understanding soil health. If a physical diagnosis is required, a Visual Soil Assessment is recommended, with a comparative fence line assessment. For more information see bit.ly/3ySeQjR

content contained in organic matter, which provides habitat and energy for soil microbes.

Organic matter (%)

Organic matter, which includes decomposing plant and animal residues, soil biota (organisms and plants) and root exudates, is described as proportion of the overall soil. Organic matter is a very important component as it influences all of the soil's chemical, biological and physical systems. Organic matter provides the energy source for microbes which drive nutrient cycling in soil, increases the soil's capacity to retain nutrients, improves and stabilises soil structure, improves water infiltration, and increases water holding capacity. In NZ soils, all C is of organic origin so Organic matter is calculated from the Total C result (Total C x 1.72).

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist to arrange your Soil Health Check.

Soil Health Check

Capturing carbon

A Future Ready Farms project is testing enhanced rock weathering to offset on-farm greenhouse gas emissions.

It is widely accepted that atmospheric carbon dioxide (CO_2) removal is required, to avoid devastating environmental and humanitarian impacts.

Yet due to massive technological, financial, and geographic hurdles, few tenable large scale carbon dioxide removal (CDR) applications exist globally. Most techniques available or being developed are for high concentration sources of CO_2, such as a power station burning fossil fuels, and have limited application in New Zealand.

As part of the Future Ready Farms programme, Ballance is collaborating with the University of Waikato's Earth Life Interactions research group, led by geochemist Dr Terry Isson, to test a novel approach for large scale CDR in New Zealand that harnesses the natural process of rock weathering.

Terry explains: "As silicate rock weathers, it naturally captures CO_2 directly from the atmosphere. So we're testing whether this process can be accelerated by adding a soil amendment of silicate rocks to agricultural land."

Silicate rocks include basalt and dunite rock types, which are rich in silicate minerals such as olivine.

"Crushing these rocks into a fine powder and applying it to land accelerates the weathering process, and, in turn, CO_2 capture rates. Given our need for liming, the infrastructure for crushing and deploying is already in place and so adapting to a different feed stock shouldn't require massive investment."

Terry says this method of CDR could provide a number of other benefits, including:

- increased soil pH and pH buffering, in turn offsetting terrestrial (and marine acidification) associated with human induced climate change, and replacing the need for lime application to cropland
- reducing nitrous oxide emissions
- release of essential nutrients for plants (calcium, magnesium, potassium, silicon, iron and zinc and other micronutrients) and increased crop yield.

While computer modelling work suggests this approach could provide significant carbon capture potential on a global scale, currently no field data exists to corroborate the rates of capture deemed possible in models.

To determine the rates of carbon capture, Terry and his team are conducting the first ever New Zealand field trials of enhanced rock weathering across the country. Capture rates are being quantified using solid phase geochemistry, simply by monitoring the breakdown of the silicate materials added.

The first phase of field trials runs into 2023, and a second phase to further refine the methodology will start at the beginning of 2023.

With the field results, Terry's team will utilize both reaction transport and machine learning methods to scale-up the potential of enhanced rock weathering to a national scale.

In the meantime, New Zealand farmers and growers are awaiting a final decision on agricultural greenhouse gas emissions, including whether on-farm sequestration such as this can be used to offset a farm's emissions levy.

"If this works, it's a method that can be scaled-up quickly, setting it apart from other carbon capture methods."

FOR MORE INFORMATION

habitablearth.com

To get involved in this research, contact Terry on tisson@waikato.ac.nz

Dr Terry Isson

Field trials at Ngati Pukenga farm in the Bay of Plenty

Variable rate value

The latest modelling shows SpreadSmart continues to deliver better returns than fixed flow rate application.

Fertiliser prices may have changed significantly, but the value of variable rate application of fertiliser hasn't.

Precise application of fertiliser using the SpreadSmart system continues to provide higher returns than fixed flow rate application, according to recently updated scenario modelling.

New figures for single superphosphate prices, farm returns and other variables have been plugged into scenario modelling first presented two years ago in Grow Spring 2020. The updated modelling indicates that SpreadSmart can still provide potential agronomic and economic benefits (see Figure 1).

SpreadSmart combines GPS guidance and tracking systems with digital farm mapping to automate the aircraft's hopper. This ensures fertiliser is accurately applied to just the parts of the farm where nutrients are required, eliminating wastage and protecting the environment.

The computer in the aircraft adjusts the rate at which fertiliser leaves the hopper – this is known as a 'variable rate application.' The rate of fertiliser leaving the hopper can be based on soil fertility, stocking rate, slope or aspect.

Alternatively, the onboard computer can take into account the plane's speed to ensure the rate of fertiliser leaving the hopper achieves a uniform rate of fertiliser application (a 'constant rate application').

The SpreadSmart system allows a targeted application to some or all of a farm for the best agronomic return.

FOR MORE INFORMATION

SpreadSmart is exclusive to Super Air. Phone 0800 787 372 or visit www.superair.co.nz.

SPREADSMART

Figure 1 The benefits of applying P using the SpreadSmart system

The three scenarios modelled are all based on:

- a farm with a mosaic of land class: 1/6 easy (zone 1), 2/3 steeper (zones 2-5) and 1/6 hilltop/stock camp/fertile (zone 6), and non-productive exclusion zones
- almost identical amounts (90 or 91 kg) of total P applied (and stocking rates and maintenance P required)
- a plane flying from zones 1 to 6, reducing speed as it climbs.

The fixed flow rate scenario has a +/- 20% variation in the actual rate of application.

Overlapping fertiliser spread patterns prevents gaps, so that all parts of a zone receive fertiliser. The scenarios modelled assume GPS tracking is used, and that the bout width and spread pattern are good practice. Fertmark fertilisers and Spreadmark certified aircraft are recommended.

P applied (kg/ha) Net soil P change (kg P/ha)

Net improvement in gross margin over 5 years ($/ha)

Zone	1	2	3	4	5	6
SpreadSmart variable rate ($274)						
P applied (kg/ha)	25	16	16	16	16	0
Net soil P change (kg P/ha)	1	7	7	7	7	-32
SpreadSmart constant rate ($184)						
P applied (kg/ha)	15	15	15	15	15	15
Net soil P change (kg P/ha)	-9	6	6	6	6	-17
Fixed flow rate ($178)						
P applied (kg/ha)	13	14	15	16	17	18
Net soil P change (kg P/ha)	-11	5	6	7	8	-14

More wins, less loss

A game-changing fertiliser will soon be available in the South Island.

South Island farmers can soon get more wins from applying phosphorus (P), while reducing any associated financial and environmental losses.

Phosphorus fertiliser is vital for farming in New Zealand's naturally P deficient soils, but applying it without losses can be difficult. Commonly used P fertilisers such as superphosphate and diammonium phosphate mainly contain readily plant available, water soluble P, which in ideal circumstances remains in the soil for plant use.

But in less than ideal circumstances, an environmentally significant proportion of water soluble P can be lost as runoff. This can reduce the efficiency of P fertilisers, and contribute to P inputs to waterways, increasing the risk of excess growth of aquatic weeds and algal blooms.

Good management practices help to minimise environmental impacts, but minimising P losses via runoff can be challenging, as weather, timing and proximity to waterways constrain P application.

So, with the support of the Primary Growth Partnership, Ballance developed SurePhos.

Significantly reduces P loss

Many years were spent formulating SurePhos, a fertiliser designed to provide P where and when it is needed, and minimise losses to the environment and to profit, while maintaining agronomic performance.

SurePhos is a slow release P fertiliser, resulting in more P retained in the soil and less lost to the environment.

The proportion of P runoff loss from P fertiliser is directly related to the proportion of water soluble P it contains. Independent tests conducted by AgResearch show SurePhos can reduce:

- P runoff losses by up to 75 per cent compared to superphosphate products[1]
- P leaching losses by up to 83 per cent[2] (in a laboratory trial) where there is a risk of P leaching (in low ASC soils <20).

Most of the P in SurePhos is water insoluble and slowly releases over a period of months. SurePhos also contains a small amount of water soluble P which pasture can use immediately, and sulphur, calcium and magnesium (see Table 1).

Table 1 **SurePhos nutrient content***

Phosphorus	8.0%
Water soluble	1.8% (≤23% total P)
Citric acid soluble	5.6% (≥70% total P)
Sulphur	7.0%
Calcium	16.0%
Magnesium	4.0%

*subject to final analysis on product launch

Key benefits of SurePhos

Slow release, environmentally friendly phosphate

At least 70 per cent of the P in SurePhos is citric acid soluble and can be used by pasture within a year. A maximum of 23 per cent is water soluble and can be used by pasture on application. These features significantly reduce P loss from runoff and leaching.

Cost-effective

SurePhos has a higher P content than other reverted phosphate fertilisers, so less product is required and cartage and spreading costs are lower.

Flexible application

The risk of P loss is particularly high when application is less than three weeks before irrigation or heavy rainfall (an average of 30 mm within 21 days). SurePhos provides flexibility of application, with less risk of nutrients being lost via runoff.

Better spreading and mixing

Compared to other reverted phosphate fertilisers, SurePhos granules are round and free flowing, allowing it to be spread more evenly and accurately, and minimising segregation when mixed with other similar granulated products.

Highly compatible

SurePhos is compatible to custom blend with most other fertilisers. It can be mixed directly with nitrogen fertilisers such as SustaiN and urea, so maintenance and nitrogen fertiliser needs can be combined into a single application, helping to minimise the number of applications.

FOR MORE INFORMATION

SurePhos is expected to be available in the South Island in late 2022. See ballance.co.nz/surephos or contact your Ballance Nutrient Specialist.

SurePhos

1 McDowell RW, Smith C, Balvert S 2011. The environmental impact and agronomic effectiveness of four phosphorus fertilisers: Report for Ballance Agri-Nutrients, October 2011

2 Dexter M, Kear M, Lucci G 2019. P leaching from SurePhos, Superten and Serpentine Super fertilisers in a laboratory evaluation: Report prepared for Ballance Agri-Nutrients by AgResearch Limited

Super just got stronger

Ballance's new, improved superphosphate is both powerful and cost-effective.

Superphosphate is an important fertiliser for New Zealand, with many of our soils naturally deficient in phosphorus (P) and sulphur (S). Both soil fertility and pasture production decline over time when P fertiliser is withheld.

An important consideration when choosing a superphosphate fertiliser is how soon the pasture requires P and S. If these nutrients are required soon after application, a fertiliser with rapidly plant available P and S is ideal.

Ballance has recently released SuperPlus, a new, improved superphosphate that replaces SuperTen. SuperPlus contains more P, and has higher levels of rapidly plant available, water soluble P than SuperTen (see Table 1).

As most of the P and S content in SuperPlus is rapidly available, it promotes fast growth. Just 1 mm of rain will dissolve the P in a typical application of SuperPlus, and make it available to plants within one week of application. The S in SuperPlus is also available to plants within a week (after rain and under typical application conditions), making it particularly useful in spring, when plant available S levels in the soil can be low.

SuperPlus is currently the most powerful single superphosphate on the market. Its higher P content (compared to SuperTen and other equivalent superphosphates) means less product can be used to apply the same amount of P, and thus cartage and spreading costs are reduced. SuperPlus can be applied by groundspread or by aerial topdressing (but cannot be drilled).

SuperPlus also performs from an environmental perspective. It is locally manufactured, and has four times less CO_2 emissions than other phosphate sources such as DAP*.

In addition, at the time of writing, the cost per kilogram of P in SuperPlus was less than for SuperTen, and it was cheaper than an equivalent single superphosphate.

FOR MORE INFORMATION

See ballance.co.nz/superplus or contact your Ballance Nutrient Specialist.

*DAP emissions include ammonium nitrate.

Table 1 **Comparing nutrient content of new SuperPlus to its predecessor SuperTen**

	SuperPlus (new product)	SuperTen (previous product)
Phosphorus	9.5%	9.0%
Water soluble	82.0%	78.0%
Citric acid soluble	86.0%	85.0%
Sulphur	10.5%	10.5%
Water soluble	100.0%	100.0%
Calcium	21.5%	22.0%

More resilient pastures

What builds pasture resilience?

Resilient pastures can endure and recover from pressures such as climate variability, soil structural damage, pests and disease, to maintain productivity and support environmental sustainability. We look to the 2021 NZ Grassland Association Resilient Pastures Symposium for some ideas on how pasture resilience can be enhanced.

Maintain soil health and fertility

- Good soil fertility favours a productive pasture sward, promoting increased soil organic matter turnover, which includes decomposing plant residues, animal excreta, soil biota and root exudates. This increases the soil's capacity to retain nutrients, improves structure and water infiltration and increases water holding capacity, all of which strengthen pasture resilience.
- Ensuring pastures have adequate base fertility (especially nitrogen) to support pasture growth can extend pasture supply by bringing it forward in spring and extending it into summer, potentially delaying the onset of moisture stress and expediting recovery.

Avoid overgrazing

Perennial ryegrass has no perennial storage organs such as tap roots, so is particularly sensitive to multiple stresses. Thus too frequent or intensive grazing can reduce pasture resilience.

In the event of water deficits and nitrogen deficiency, maintaining recommended three-leaf grazing intervals and/or leaving higher post-grazing residuals and extending rotation lengths can support canopy recovery. Consequently, ryegrass typically translocates more carbon into roots and pseudo stems, increasing its resilience under grazing and water deficits (see Figure 1).

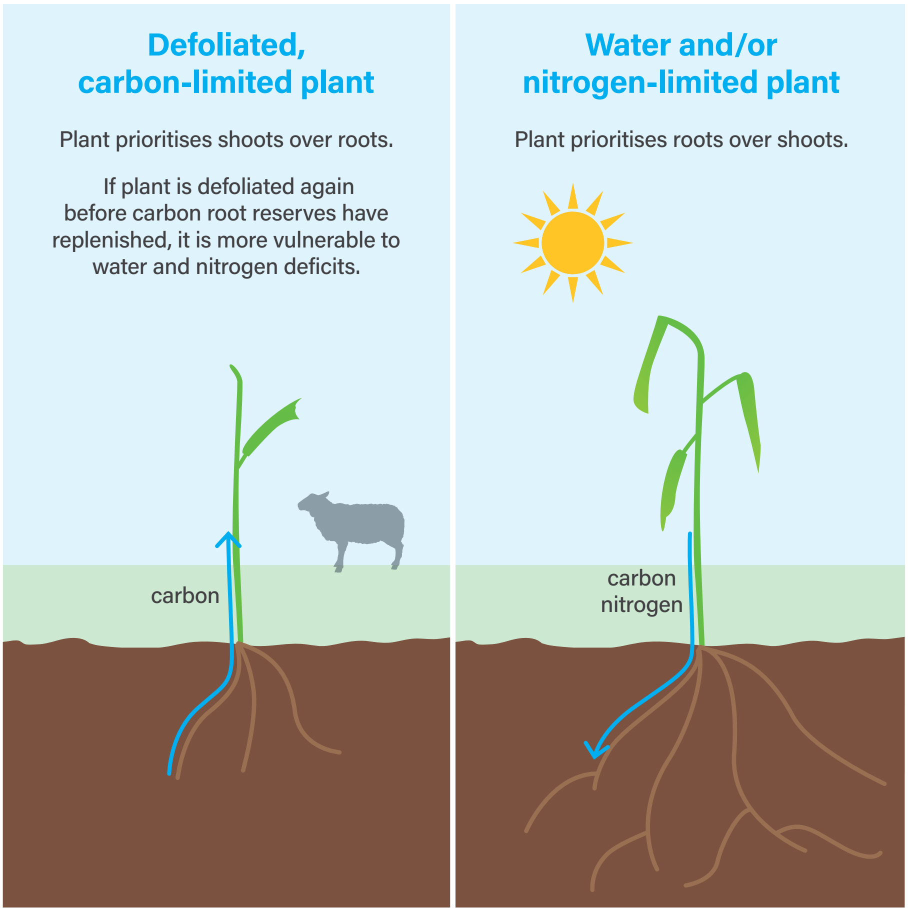


Figure 1 **Stress responses in ryegrass plants**

Use of pasture species

Species can be used in a range of ways to build pasture resilience:

- Including more than one grass species in a pasture seed mix means the species can complement each other's growth patterns and help extend pasture production.
- Adding another forage element, such as lucerne, to meet feed demands can help to restore productive pasture.
- Legumes such as lucerne, red clover and subterranean clover can provide nitrogen and increase pasture's water use efficiency.
- Species such as cocksfoot and tall fescues can provide more resilience than perennial ryegrass species, particularly in response to water deficits.

Managing insect pests

Pasture under stress is more vulnerable to insect pest damage. Insect pests can be managed by:

- using interventions such as endophyte and seed treatment to maintain both pasture and system resilience
- reducing soil tillage, to protect natural insect predator and worm populations
- using Integrated Pest Management (IPM) techniques, combining biological, chemical and cultural controls (such as crop rotation), and basing pest management decisions on pest:predator ratios. This is to maximise the use of beneficial insects and minimise unnecessary insecticide use.

In short, the resilience of pasture, and of the ongoing farm system, requires continued monitoring and adaptive management.

FOR MORE INFORMATION

Papers from the 2021 Resilient Pastures Symposium are available at bit.ly/3IeG3Ag. **See Soil Health Check on page 3.**

N reporting made easy

The MyBallance Nitrogen limit management feature makes nitrogen cap reporting easy.

If you're a dairy farmer, you'll have recently completed your first annual nitrogen (N) cap report, as required by the N cap rules.

The next N cap report, for the period 1 July 2022 to 30 June 2023, is due at regional councils by 31 July 2023, and must include the following information:

- area of grazed pasture, and how much of that is used for grazed forage crops
- area of land in other uses
- receipts for synthetic N fertiliser purchased
- types of synthetic N fertiliser applied (urea, di-ammonium phosphate/DAP, sulphate of ammonia/SOA), and percentage of N in each type (by weight)
- application dates and rates for each type of N fertiliser applied to pasture, forage crops and other land.

The rules are complex, and the MyBallance Nitrogen limit management feature makes tracking and reporting N use easy. The feature is part of MyBallance, an online secure location that keeps track of all of a farm's fertiliser information, to support nutrient management decisions.

All you need to do is enter your proof of application (POA) data, either automatically via your spreader subscription, or manually in MyBallance for self-spreads. For those looking for automatic data entry, MyBallance currently integrates directly with both Precision and TracMap. You can then use the feature to define what the N was used for – pasture, grazed crops or harvested crops. The more specific you are, the more accurate the report will be.

Once you're ready, simply click 'Generate report' and all the relevant data will be calculated automatically, ready for you to review, download and submit to your council. Alternatively, a separate feature lets you give Ballance consent to submit the report to your regional council on your behalf.

Get ready for next year's N report in three simple steps

1. **Upload:** Upload your farm map to your MyBallance account.
2. **Record:** Stay on top of your POA data using either the manual POA function or automatically through your spreader subscription view.
3. **Track:** Use the Nitrogen limit management feature to measure all N products you apply and track how you're going against the 190 kg N/ha cap through the heat map or the monthly view.

MyBallance is available exclusively to Ballance customers and can be accessed on any laptop, desktop or tablet, as well as via a mobile app. To use the Nitrogen limit management feature:

- If you're new to MyBallance, head to myballance.co.nz/register to activate your account.
- Check you have your digital farm map in MyBallance (or email gis.support@ballance.co.nz to have it uploaded).
- Ask your spreader which subscription their spreading hardware supports, and let Ballance Customer Services know on 0800 222 090.

To become a Ballance customer and gain access to MyBallance phone 0800 222 090 or email customerservices-mount@ballance.co.nz. For more information on MyBallance visit ballance.co.nz/myballance.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist or see ballance.co.nz/nitrogen-reporting.

Summer forage fertiliser

The right nutrients at the right rate and time gets the most from useful summer forage crops.

Brassicas and other forage crops offer high quality stockfeed to fill a summer feed gap, preventing overgrazing of stressed pastures.

"I commonly hear 'In a dry year I can't grow it, and in a wet year I don't need it,' but summer forage crops are always a good idea to prevent the damage caused by overgrazing existing summer pastures," says Ballance Forage Specialist Murray Lane.

Brassica forage crop growth is driven by phosphorus (P) and nitrogen (N). Soil testing will identify requirements for P, potassium (K) and lime, as well as Available N levels to help determine N application rate. Testing well in advance means lime can be applied 6-12 months before sowing if required.

Starter fertiliser

Sowing crops with di-ammonium phosphate (DAP) provides plant available P to support good early root development and N to fuel shoot growth.

Murray recommends sowing the seed with DAP starter fertiliser in the seed slot. If sowing brassicas or fodder beet, ideally use Cropzeal Boron Boost – DAP with boron in every granule to help prevent brown heart in brassicas. Boron in a granulated compound product spreads more evenly than a mix.

"Typically 100-200 kg/ha Cropzeal Boron Boost is drilled as a starter beside the seed in the furrow. If roll/seed/rolling, use 250-300 kg/ha.

"Drilling with a starter fertiliser is especially important when 'no-tillage' cropping, due to a lack of soil mineralisation with no cultivation. Phosphate isn't very mobile in the soil so drilling it close to the seed enhances establishment. Drilling with Cropzeal Boron Boost or DAP is also useful in cultivated soil, as cultivation often brings low fertility subsoil to the surface."

Potassium

Brassicas take up large amounts of K, sometimes more than needed (luxury uptake), and unless K levels are very low a yield response from added K is unlikely.

As a rule of thumb, if the soil test K is above MAF Quick Test 5, no yield benefit is achieved from adding K. However if it's below 5, 50-100 kg K/ha is required (equivalent to 100-200 kg MOP/ha).

"If you're cutting and carrying rather than grazing in situ, plan to replace the K removed prior to the next crop," says Murray.

N side dressing

Applying side-dress N early boosts leaf growth and size, so the plant has more opportunity to capture sunlight, form a full canopy and outcompete weeds, resulting in improved yield.

Targeting application to high growth periods also reduces the risk of nitrate poisoning. Nitrogen applied too late in the season, close to grazing when growth is slowing, is likely to result in limited extra yield, and could result in high nitrate levels.

"Depending on the variety, brassicas respond to a side dressing of N 3 to 5 weeks after sowing, and earlier is better than later. There's no advantage in splitting the N application, so apply all the recommended N at once, prior to canopy closure."

The Ballance Brassica Calculator can help refine yield prediction and N application rate, enabling more efficient use of N. Typical rates, depending on time of sowing, yield potential and the Available N soil test, are 150-200 kg/ha SustaiN as a side dressing.

If the ideal 5-10 mm of rainfall does not occur within 8 hours of application, the urease inhibitor on SustaiN reduces volatilisation losses, so more N enters the soil to support growth.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

Fodder beet drilled with DAP beside seed (left) and broadcast on surface (right)

N response on brassicas

How much nitrogen (N) is required for an optimal yield of brassicas?

Brassicas can produce high yields of high quality forage, but applying N in addition to overall fertiliser crop requirements does not always improve yield.

This is because crops respond to total nutrient availability from both soil and fertiliser. Soil fertility and soil N availability (as indicated by an Available N test) differ from paddock to paddock, so every crop has a different N fertiliser requirement for optimal yield and economic return.

So how much N does a brassica crop typically use? Figure 1 shows typical N uptake for kale and swedes, which is 300 and 350 kg N/ha respectively to achieve a potential yield of 15 t/ha.

Hitting the swede spot

The amount of fertiliser N that will benefit a brassica crop depends on the amount of available N already in the soil.

An Available N test prior to sowing a brassica crop helps determine the N fertiliser application to optimise yield and return. The test measures organic N that will be mineralised during the life of the crop, so indicates the potential supply of available N for the growing season.

Trials on swedes and turnips in Southland and Waikato respectively demonstrate the importance of soil testing to determine the amount of soil N, and the rate of N fertiliser for optimal yield and economic return[1].

The Southland site had high soil N, whereas the Waikato site had very low soil N. Both sites had sufficient phosphorus (P) inputs to overcome any potential P-related deficiency.

At the Southland site, varying rates of N were applied (0, 150, 300 kg N/ha) while at the Waikato site the rates were 0, 100, 200 kg N/ha.

As shown in Figure 2, at the Southland site, the crop did not respond when N fertiliser was applied above 150 kg N/ha as the site had a good soil N level (approximately 193 kg N/ha). This resulted in the crop producing a maximum of 15 t DM/ha, regardless of N applied above 150 kg/ha.

This compares to the Waikato site (Figure 3), where, due to lower soil N levels (approximately 52 kg N/ha), the crop response continued to rise to the highest N fertiliser application rate.

This shows the importance of understanding the contribution of soil N to potential yield and resulting N inputs requirements needed to optimise yield potential.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

[1] Fletcher AL, Johnstone P, Maley S, Arnold N, Read JB, Zyskowski RF, Chakwizira E, Minchin R 2011. Development of the Forage Brassica Calculators – trial results. Report prepared for Ballance Agri-Nutrients by Plant & Food Research

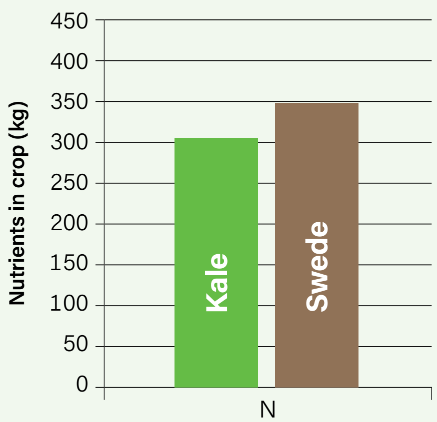


Figure 1 **Typical N uptake for a kale (20% leaf) and swede crop (35% leaf) yielding 15 t DM/ha**

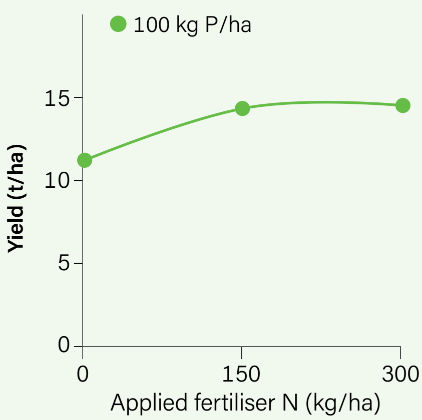


Figure 2 **Yield response of 'Aparima Gold' swedes to applied N fertiliser in Southland, 2009-10**

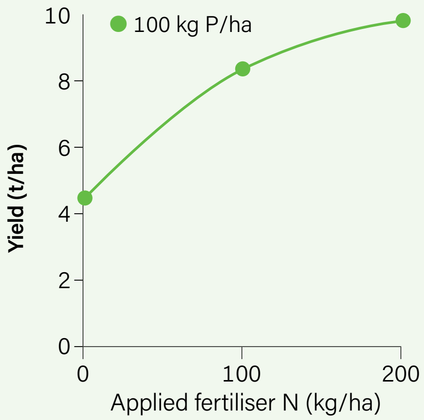


Figure 3 **Yield response of 'Barkant' turnips to applied N fertiliser in Waikato, 2009-10**

Safer with science

Knowing what to look out for can protect consumers from being misled by product claims.

Today's climate of increased regulation and escalating costs has fed a proliferation of products claiming to be a 'magic bullet' for farmers – to save money, increase production, enhance sustainability and so on.

"With the increased costs of nutrients, it's unfortunate to see people being misled and ending up with products that don't actually provide their purported benefits," says Ballance Environmental Management Specialist Ian Power.

So how can you tell if a product is going to live up to its claims?

"The main thing to look out for is if it's been scientifically tested and proven."

Scientific research is a systematic, logical approach to discovering how, and if, something works, based on fact (not opinion or preferences). Research trials test if a product works based on measurable data (known as 'empirical data'). There are also a sound hypothesis, clear objectives and detailed methodology.

"A trial should have at least one treatment and a control – the product being tested and what it's being compared to. Also fertiliser or nutrient trials usually have different rates of nutrient applied, (such as 0, 10, 30 and 50 kg nutrient/ha) and if different products are being compared they should have the same or similar rates of the nutrients you are testing applied," says Ian.

Replication, randomisation and repeatability are three key elements of scientifically designed trials.

Replication is about having several plots of each treatment within a trial. "Four to five replicates of each treatment in a trial are considered the bare minimum to obtain sound statistical calculations."

Randomisation goes hand in hand with replication and is about accounting for variables, so that, in the case of a product, a clear cause-and-effect relationship between it and a benefit can be made. One way that randomisation is built into a field trial, for example, is to locate all trial plots randomly across the trial site to reduce the impacts of variability such as soil type and soil fertility.

Repeatability is about checking the original results and seeing if the same results are achieved on, for example, the same or different soil types, locations and climates. If the same or similar results can be achieved when the trial is repeated multiple times, the more reliable the results are.

"Demonstrations, farmer trials and observations aren't proof a product works, and rarely include replication and randomisation. You may observe a benefit from using a product, but other factors such as a favourable season or fertile paddock could play a part, and what is this perceived benefit compared to? Also, when a new product's used, changes to methods and practices often occur, so it can be unclear exactly what's caused the observed benefits."

Also important is who conducted the trial. They should be independent of the organisation selling the product, and without any vested interest in making the product appear more favourable than it is.

"Look for a recognised, professional, credible research institute, such as a university or Crown Research Institute such as AgResearch, Plant & Food Research or Manaaki Whenua - Landcare Research.

"Ballance commissions independent research to validate the effectiveness of our products, so our customers can be sure that if we say something works, it will," says Ian.

FOR MORE INFORMATION

See our new Mythbusters column on page 21.

Small plot trials

Animal Water Plant Soil

Feed for ewe performance

Nitrogen (N) can provide cost-effective, quality feed for ewes.

Providing ewes with adequate nutrition during pre-lamb and early lactation majorly impacts lamb survival and growth rates, and ultimately profit.

“Having enough feed to support ewes in this critical period is a reoccurring challenge. Feed demand increases dramatically at lambing, especially for twin-bearing ewes,” says Ballance Sheep and Beef Programme Lead Richard Draper.

“Planning ahead and monitoring pasture covers are key. A good rule of thumb to support good lamb growth rates is at least 1400 kg DM/ha and rising at set stocking.”

Reviewing the feed budget 6 weeks out to identify any shortfall gives sufficient time to boost pasture growth with N if needed. The earlier in the season N is applied the slower and lower the response, which increases the cost of grass grown.

“But early season feed will have greater value if it fills a feed gap to drive animal performance.”

Table 1 provides a guide to typical pasture responses and the associated cost of N grown pasture.

"When feed is short, N grown pasture remains the cheapest form of additional feed."

Richard says balage can reach $0.40-0.50/kg DM in spring, and is typically lower quality than spring pasture (8-10 MJME rather than 11-12 MJME) so may not meet animal requirements.

Quality is particularly important pre-lamb, as feed intake can be restricted due to compression of the rumen by growing lamb(s). Concentrates such as barley may have a high energy content (approximately 13 MJME), but aren’t always practical, says Richard.

“When using N pre-lamb, extra feed is grazed as fast as it grows, so you might not see a big flush, but it’ll show up in lamb growth rates and ewe condition at weaning.”

Faster growing animals are heavier at weaning and achieve target weights earlier. For many farmers this can mean more kilos away earlier and at better prices – a real advantage in summer-dry regions and climates. "Better condition ewes at weaning also benefit the next production cycle,” says Richard.

While farmers can pull other levers to manage feed supply and demand, N remains a cost-effective and practical source of strategic feed to fill a nutritional gap and drive performance.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

Breaking even

At the time of writing, it costs around $104/ha to apply 30 kg N/ha to lambing areas. At forecast lamb schedule prices of $9/kg, this is equivalent value to selling an extra 12 kg/ha of lamb carcass.

For a typical farm, achieving this would require only a small increase in lamb survival (about 1.5 per cent) and an increased carcass weight of 1 kg per lamb.

“In many cases the opportunity from better feeding of ewes at this key time will be far greater,” says Richard.

Table 1 **Table 1 Pasture growth and applied nitrogen costs**

Pasture growth	Pasture growth (kg DM/ha/day)	Response (kg DM/kg N)	Time for full response	Cost ($/kg DM)*
Moderate	20-40	10:1	6-8 weeks	$0.35
Fast	50-70	15:1	5-6 weeks	$0.23
Rapid	80	20:1	3-4 weeks	$0.17

*Assumes cost of N is $3.49/kg N applied

Micronutrients for stock

Soil micronutrient deficiencies can impact animal health and production.

Soils in many parts of New Zealand are deficient in selenium (Se) and cobalt (Co), and despite plants not requiring these micronutrients, they are essential for animals so are often applied as fertiliser additives.

In order to support animal health, it's important to ensure pastures contain adequate concentrations of Se and Co, to help address Se and Co deficiencies or prevent them from affecting grazing livestock.

Availability of Se and Co in soil is influenced by the parent material, age of the soil and length of time the land has been under intensive farming. Production removes natural reserves of Se and Co from the soil, so unless these micronutrients are replaced, deficiencies may occur.

Selenium

Risk factors
Certain soil types and locations are more at risk of Se deficiency:

- pumice soils in the North Island's Central Plateau
- peat soils in Waikato and the Hauraki Plains
- coastal sands south of Whanganui
- light stony soils in Horowhenua, Hawke's Bay and Wairarapa.

Most South Island soils are either marginally Se deficient or have the potential to be Se deficient (see map for Se deficient areas across New Zealand).

Low levels of herbage Se can also arise when superphosphate is applied to virgin soils or to soils that are low in phosphorus and sulphur. The subsequent large increase in plant growth can dilute the concentration of Se in the herbage.

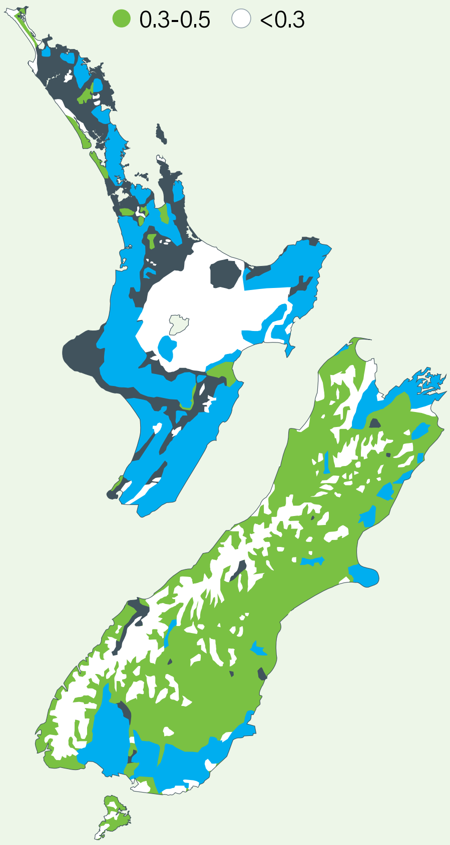
Selenium pasture content can be influenced by species – browntop has the highest concentration, followed by ryegrass and clover.

Cattle are most susceptible to Se deficiency. Calves may be born weak, premature or dead, or suffer from poor growth or white muscle disease. Adults show decreased milk production, infertility and placenta retention.

Selenium deficient areas

Total Se in topsoils (µg/g)

>0.9 | 0.5-0.9 | 0.3-0.5 | <0.3



Deficiency symptoms in young sheep include ill-thrift, poor growth, white muscle disease and impaired immune systems. Adults show increased infertility and perinatal mortality.

Preventing and addressing deficiencies
To meet animal production requirements the concentration level of Se in a mixed pasture herbage test (see box) should be at least 0.03 ppm.

Applying Se in fertiliser is usually the most cost-effective way to prevent or address a deficiency. Most Se products, such as NutriMax Selenium 1%, contain two forms of Se – slow release barium selenate and fast release sodium selenate. The product application rate will depend on the productivity of the farm, with dairy farms generally requiring 1 kg/ha and sheep and beef farms requiring only 0.5 kg/ha. Selenium content is generally maintained in herbage for a year post-application.

Testing pasture

If a deficiency is suspected, mixed pasture herbage testing is required, as soil tests are inadequate for determining Se and Co (and other micronutrient) deficiencies.

In order to get an accurate picture of the micronutrient status it's important samples are taken at the correct time, as levels vary with season and growth stage.

Testing is usually carried out before animal micronutrient demand.

For Se, this is in early autumn. If results indicate low levels of Se, further samples should be collected in spring to confirm the extent of the deficiency.

For Co, samples should be collected in mid to late spring.

Cobalt

Risk factors
Certain soil types and locations are more at risk of Co deficiency:

- yellow-brown earths in Southland
- highly weathered and sandy soils in Northland
- yellow-brown pumice soils in the North Island's Central Plateau and Nelson region.

Pasture Co uptake can be reduced by high soil pH (above 6.3), high soil manganese (above 1000 mg/kg) and high soil iron (above 250 mg/kg).

Cobalt content of pasture can also vary depending on pasture species, with legumes having a higher Co content than grasses.

Just like Se, large increases in plant growth can dilute the concentration of Co in herbage. Cobalt content of pasture tends to be lowest when pasture growth rate is highest (due to seasonal factors and/or application of nitrogen resulting in more vigorous growth).

Animals' Co intakes are lower when pasture is abundant and clovers are shaded out by taller grass species, reducing the pasture's overall Co content. Also in these conditions animals do not graze the land as hard, so ingest less Co via soil.

Weaned lambs are most susceptible to Co deficiency, followed by ewes. Symptoms include loss of appetite, impaired growth rate and wool growth, crusty ears, watery discharge from eyes, more infections, higher worm burden, and in severe cases, anaemia.

Preventing and addressing deficiencies
Cobalt concentration in a mixed pasture herbage test should be over 0.10 ppm for sheep and cattle. If a Co deficiency exists, it should be addressed with an initial capital input of 75 g Co/ha annually for approximately 5-10 years. For a product such as NutriMax Cobalt 10% (which contains 10% Co) this means applying 750 g/ha of product.

Splitting applications offers additional protection as a single application of soluble Co only elevates plant Co levels for three to four months (see Figure 1).

Once deficiencies have been addressed, Co levels should be stabilised by annual maintenance inputs of 20 g Co/ha (200 g/ha NutriMax Cobalt 10%). It's important Co is applied in a readily soluble form in order to raise plant Co levels. It should be applied in spring if a deficiency exists, as this is when soil and plant Co levels are at the lowest, so the need for protection is at its highest.

Since young stock are affected more than older animals, applications can be restricted to areas that young stock will graze during summer.

FOR MORE INFORMATION

See ballance.co.nz/nutrimax or contact your Ballance Nutrient Specialist.

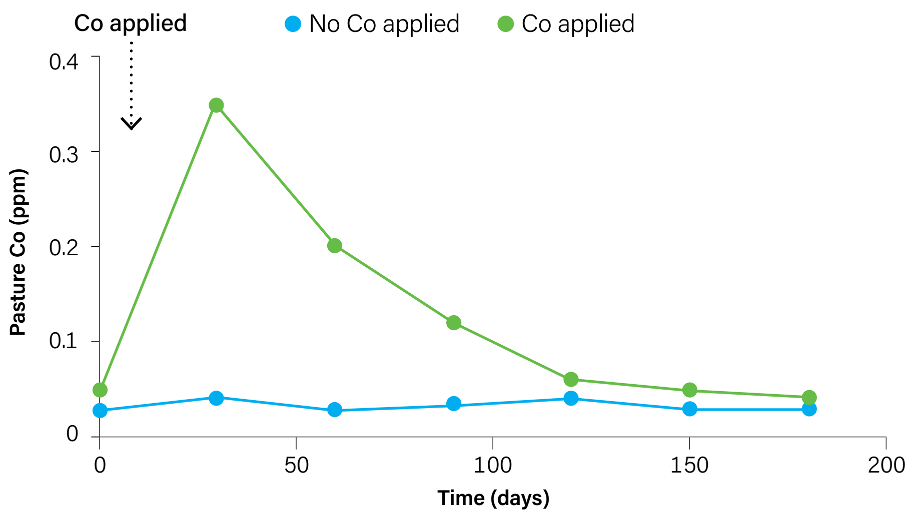


Figure 1 **Effect of cobalt sulphate (applied in late spring on a sedimentary soil) on pasture Co concentration**

Source: Use of Trace Elements in New Zealand Pastoral Farming, Fertiliser Association of New Zealand

NutriMax micronutrients

Fit fertiliser

Fertiliser Quality Council (FQC) Chairperson Anders Crofoot explains how improvements in nutrient use and application have prompted work to add physical properties to Fertmark.

At a time when precision agriculture is gospel, data gathering and analysis is a time consuming but incredibly valuable task. Nutrient use is highly monitored, given the cost to all New Zealanders if nutrients are used irresponsibly, or if user penalties are driven from incorrect data and assumptions.

The FQC, having access to a rich source of data due to its Spreadmark and Fertmark certification schemes, has recently embarked on getting a better understanding of the role fertilisers' physical properties play in the precision agriculture space.

We recently unearthed some incredible improvements to nutrient use and application over the past 16 years. After reviewing data from over 3000 spreader tests under the Spreadmark certification scheme (see opposite page), we discovered a 36 per cent improvement in the spreading capabilities of the national fleet between 2006 and 2022.

Our report shows an overall spreading performance increase of over 7 m (from 19 to 26 m) during this time. The current average certified bout width (across all fertiliser products) is now above 27 m – and still improving.

As both a fertiliser's physical properties and spreader technology improvements could play a part in this, we are working to introduce further analysis and standards to the Fertmark certification scheme around the physical properties of fertiliser.

What does this mean? Well, you can't throw talcum powder very far, so the ability to drive and spread at wider bout widths, due to better physical properties and spreading technology, means fewer trips up and down the paddock. This saves time and money, and reduces the environmental impact, with more precise nutrient distribution and less emissions and time charged by the driver, saving farmers around $170 million a year. The agronomic and environmental improvements are probably of even greater value (see box).

FOR MORE INFORMATION

fertqual.co.nz

Table 1 **Spreading improvements 2006 - 2022**

Year	Average certified bout width (m)
2006	20.15
2007	17.03
2008	21.56
2009	15.56
2010*	31.00
2012	23.00
2013	23.00
2014	24.87
2015	23.81
2016	25.40
2017	25.15
2018	24.79
2019	26.29
2020	25.40
2021	26.66
2022	27.07

*Figure significantly higher due to a lack of data in 2010.

Anders Crofoot

Unpacking $170 million of financial gain

While it is impossible to be exact with the saving, the FQC took the following into account:

- Approximately 5 million tonnes of fertiliser are spread annually in New Zealand.
- The average cost of spreading is about $160 per tonne.
- The 36 per cent increase in certified bout widths reflects actual increases in real spreading widths.
- Conservatively, about 75 per cent of the contractor's time is spent actually spreading.
- About 80 per cent of fertiliser is spread by contractors.

Therefore:

5 million tonnes x $160 per tonne x 36 per cent improvement x 75 per cent utilisation x 80 per cent spread = spreading cost savings of about $173 million per annum (and increasing)

Graeme Martin

Precision placement

Groundspread NZ President Graeme Martin looks at the ongoing development of Spreadmark.

Precision placement of fertiliser requires skilled operators, sound spreading equipment and appropriate fertilisers, and these factors are at the heart of the Spreadmark scheme.

Spreadmark, established by Groundspread NZ (NZGFA) in 1994, was born out of the groundspread industry's commitment to improving spreader performance and outcomes for their clients and the environment.

The scheme registers spreading companies that have certified spreading machinery, trained operators, and an appropriate quality management system to ensure outcomes and environmental sustainability are achieved. Overall systems are subject to an independent audit to ensure farmers, growers and regional councils can have confidence in the Spreadmark scheme.

Proper placement of fertiliser is of considerable agronomic benefit and helps protect the environment from the undesirable side effects of poor fertiliser spreading practices.

The latest data from the scheme's auditor QCONZ highlights solid growth in the bout width capabilities of spreader units.

In 10 years, spreading widths have increased from 19 m to 27 m for most products, so farmers can be assured their product placement is accurate, and that fewer runs of the paddock are required, helping to reduce application costs.

Today the Spreadmark scheme is governed by the Fertiliser Quality Council, with representatives from Federated Farmers, Groundspread NZ, the NZ Fertiliser Association, the NZ Agricultural Aviation Association and Fertmark registered fertiliser companies working together to adapt and improve the scheme.

This includes adding fine particle application, slurries and liquid fertilisers to the scheme. Currently there's no quality assurance programme for these applications, which aren't held to the same gold-standard as other fertiliser placement. Our members are seeing some bold claims made by companies which aren't always stacking up in reality, so we're looking to adapt testing methods to ensure claims have evidential proof.

Several fine particle applicator members are working with Spreadmark to find a way forward with testing their gear and becoming accredited. We fully support diversity in the industry and would love to see more people like them join us and help shape the scheme's future.

Groundspread NZ is currently supporting two important fertiliser research projects.

The first, a Sustainable Food and Fibre Futures study by Allister Holmes from Lincoln Agritech, is entitled 'Reducing off-target fertiliser application and increasing crop performance by improving blended fertiliser spread uniformity'. Blended fertilisers comprise three or more components and make up approximately 25-35 per cent of fertiliser applied annually (2018/19) to NZ pastoral and arable farms.

It's important to understand how blends spread on farms, to ensure Spreadmark principles are upheld and over-fertilising doesn't occur.

A second project is assessing the change in physical and chemical composition of fertiliser products of different origins through the supply chain to the farm gate. Despite anecdotal knowledge, there's currently no publicly available data on change in particle size in the supply chain.

Groundspread NZ members are supplying the trucks and time for nearly 1000 Spreadmark testing runs, and carrying out fertiliser checks during various stages of the supply chain.

This work is about ensuring top quality product is placed accurately and most productively on properties.

FOR MORE INFORMATION

www.groundspreadnz.com or contact Graeme on president@groundspreadnz.com or 027 293 6407

Plusses of strip tillage

Changing to strip tillage has improved yield, reduced soil erosion and slashed costs for a North Island farmer.

Paul Hunter farms around 240 ha over several blocks including Mulroy Farm in Parawera, near Te Awamutu.

Around 180 ha of the farm is in maize, which he grew on the light ash soil using full cultivation for around 35 years. Over time he came to the realisation that this was not sustainable.

"Full cultivation wasn't going to cut it for the next 50 years," says Paul.

As a result, he began to look at strip tillage, a minimum tillage technique in which narrow rows of land are cultivated (with fertiliser banded into the strip at the same time) and the areas between are left undisturbed.

Paul started by evaluating strip tillage on one block for around 5 years, before adopting it across all of his planted hectares.

Now entering his fifth year of strip tillage, he has noticed some changes.

"We've got virtually no soil erosion, because we're not doing full cultivation on our rolling contour ground. Water infiltration is working a lot better, and soil structure is improving. We're seeing the benefits of that slowly – trying to fix 35 years of full cultivation."

Other benefits have been more immediate.

"The last two harvests have been the highest average yields in 35 years at 27 and 24 t/ha, and we've halved our cultivation costs. To get ready for planting now it's one tractor and one strip tiller, and we can get 16 ha ready in a day. Previously when we were ploughing, it would have been three tractors, two ploughs, a power harrow and three guys.

"Soil moisture is also being conserved longer."

Paul is actively involved in Team Progressive – a group of maize growers working to become more cost-effective and efficient while looking after the soil.

"We challenge each other over what we're doing. It's a system that's still evolving for us, we're adding to it and trying different things. It's quite good to have something that's a challenge like this to keep you focused."

FOR MORE INFORMATION

See the Mulroy Farm Facebook page and Transitioning into profitable strip-till and no-till maize production systems at bit.ly/3O9JBFp

Strip tiller in action

Strip till maize on Mulroy Farm

Mythbusters

This new column dispels some common misconceptions.

Myth

A high soil pH (of up to pH 7.0) increases soil micro- and macronutrient availability, so is optimal for pasture growth.

Truth

For most soils (excluding peat) under New Zealand conditions a soil pH of 5.8-6.0 at 0-75 mm depth is optimal for ryegrass/white clover pasture growth, according to research. For peat soils a pH of 5.0-5.5 at 0-75 mm depth is recommended[1].

Soil pH does affect the availability of many micronutrients. For example, as soil pH rises the availability of molybdenum (Mo) also rises. However, the availability of boron (B), copper (Cu), iron (Fe) manganese (Mn) and zinc (Zn) decreases as pH rises, so liming to increase soil high pH above 6.5 could cause deficiencies of these micronutrients.

Additionally, increasing soil pH above 6.0-6.2 does not increase the availability of the macronutrients nitrogen (N), potassium (K) and sulphur (S).

Some fodder crops may require a slighter higher soil pH than pasture for optimal growth (for example, the optimal pH for brassicas is 6.0-6.2) and many vegetable crops also require a higher pH.

[1] Roberts A, Morton J 2016. Fertiliser Use on New Zealand Dairy Farms. Booklet published by the Fertiliser Association of New Zealand

Myth

Fine lime is more efficient than agricultural lime, so less is needed to achieve the same result.

Truth

While fine lime typically increases soil pH faster than agricultural lime does, over the longer term, both types of lime are equally effective.

Fine lime normally changes soil pH more rapidly as its finely ground particles mean more surface area is exposed to soil moisture, so it dissolves and acts faster than agricultural lime.

The amount of calcium carbonate, the active ingredient in lime, impacts its effectiveness. Research concludes that in the longer term when different limes are applied at the same rate of calcium carbonate, for most agricultural purposes their effectiveness is similar, as long as at least 50 per cent of the lime can pass through a 0.5 mm sieve and 95 per cent can pass through a 2 mm sieve[2]. Most limes contain a mixture of particle sizes.

Fine lime is typically more expensive than agricultural lime, so before choosing your lime consider the cost against what you are trying to achieve.

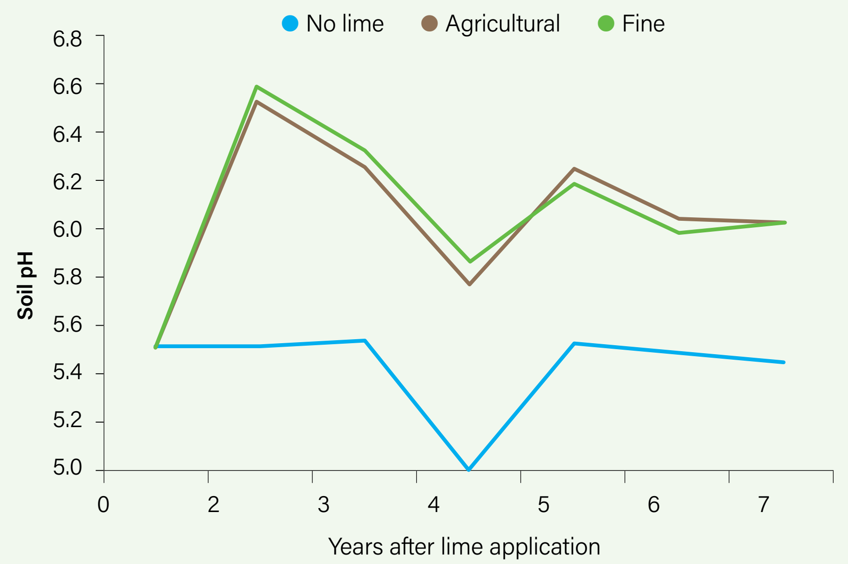


Figure 1 **The effects of agricultural and fine lime on soil pH over time[2]**

[2] Morton J 2019. Lime Use on New Zealand Pastoral Farms. Booklet published by the Fertiliser Association of New Zealand

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

The Clark family (left to right): James, Sam, Charlie, Jayne and David

Growing nutritious food

David Clark farms an arable and lamb finishing property near Ashburton and is former President of Mid Canterbury Federated Farmers. Here he shares his views on 'chemical fertilisers.'

We regularly read or hear about 'chemical fertilisers,' which levels a series of connotations as to health, risk, pollution and 'unnaturalness.'

I've heard countless speakers talk in degrading terms about 'chemical fertilisers' and the urgent need to embrace organics or regenerative agriculture.

I'm a fan of keeping things to basic concepts and fundamental principles. Once these are established, it's an individual's choice how a particular farming system is managed, and the choice of consumers to support this, or otherwise.

I'm an arable farmer growing crops and farming livestock in a continuous rotation. I grow 'nutritious food,' containing nutrients that allow your body to be nourished and perform the functions of a healthy body.

Each tonne of wheat I grow contains approximately 2.5 kg of phosphorus, 1.3 kg of potassium and 1.5 kg of sulphur (along with trace elements) and takes around 25 kg of nitrogen to grow.

So, for my 10 tonne per hectare crop of milling wheat that's made into flour to bake the toast you ate for breakfast, 25 kg of phosphorus, 13 kg of potassium and 15 kg of sulphur were removed from every hectare of that field. Removed, gone, permanently no longer there.

Likewise, 250 kg of nitrogen was used – the 'gas in the tank' that powers the photosynthetic process and forms amino acid and protein – the building blocks of life. Nitrogen is held in the soil as organic matter, but as that organic matter breaks down into nitrate, it can leach, and if used by plants, must be replaced.

Those basic elements left my field and were present in the toast you ate this morning. Your body will use them for the essential function of life and growth.

Where do those nutrients then go?

Well, they end up in an oxidation pond prior to their flow into the ocean.

So, my paddock now has less of these nutrients, and if we don't replace them, the field has been depleted.

We learnt these concepts in maths at school. If you have a set and take something out of it, you have less. You can mix up the squares or triangles in the set, but unless you put the same number of squares and triangles back, you'll always have less.

The soil and my paddock are no different. We can mulch the straw, we can graze animals, even on mixed swards of grasses, herbs or legumes, we can bury cow horns, we can direct drill, we could even dance naked on a moonlit night, but nothing will manufacture any of the nutrients a previous crop has removed.

We can spread manure or mulch from elsewhere to reintroduce nutrients, so long as we recognise that we are moving nutrients from one part of the farm or area to another. We are still not creating the nutrients that are now somewhere out to sea.

It's true that some farm practices can aid in the soil availability of nutrients, or move nutrients up from deeper in the soil profile by way of tap roots, but we still have not reintroduced nutrients removed, so ultimately the soil is being mined, or depleted. Some management practices merely delay that process briefly.

Without an external source of nutrients, the only way you can actually run a truly 'closed loop' is for the contents of those ponds to be spread where the food was grown, which is essentially what occurs in subsistence village living.

But we don't have that anymore, we have cities, or 'human feedlots.'

So where does fertiliser fit into all of this?

Fertiliser is the concentrated supply of a particular nutrient. Phosphorous is sourced from phosphate rock. Potassium is generally mined as potassium chloride, the dried salts of historic ocean beds. Sulphur is generally recovered as a by-product of the oil and gas industries, and nitrogen fertiliser is a combination of natural gas and nitrogen from the atmosphere.

As food growers, fertiliser gives us the ability to replace the same amounts of the nutrient that were removed in the food that left our field.

To date, there is currently no other time or cost-efficient method of replacing those nutrients. Even if we disregarded any time or cost constraint, other agronomic measures promoted only move nutrients from one location to another – depleting one area to enhance another.

It's a basic concept, in which we must remember the basics of sets taught over many years at school.

These basic principles of life, nutrition, and crop growth get lost when folk start throwing around emotive terms such as 'chemical fertiliser.'

Harvesting and unloading radish seed

24623

Clipping

Winter grazing update

A full suite of intensive winter grazing restrictions will come into effect on 1 November 2022.

The new set of winter grazing rules includes:

- a duty for farmers to take all reasonably practicable steps to minimise the effects of pugging on freshwater
- a requirement for farmers wanting to undertake intensive winter grazing on slopes over 10° to outline their controls to prevent soil loss and mitigate risks, either in a resource consent application or a certified freshwater farm plan, once they're available
- a requirement for vegetative groundcover to be established as soon as practicable after winter grazing
- a new condition requiring critical source areas in winter crop paddocks to be identified and protected with vegetative groundcover, and not used for winter forage crops or grazing.

The latest rules follow deferral and consultation on the set of rules originally due to come into force in 2021.

FOR MORE INFORMATION

environment.govt.nz
dairynz.co.nz/feed/crops/catch-crops