Ballance agri-nutrients

Together,
Creating the Best
Soil and Feed on Earth

Grow

Spring 2019

Contents

Walking the talk

Ballance's part in improving a demonstration dairy farm will benefit the industry.

Ballance is proud to be an industry partner of Owl Farm, a Waikato demonstration dairy farm at St Peter's school on the outskirts of Cambridge.

"We're actively involved in making changes for the better on Owl Farm," says Ballance Science Extension Manager Ian Tarbotton.

"Ballance's involvement in guiding and improving Owl Farm's farm management policies has given us the opportunity to be part of some positive changes on the farm. And best of all is knowing that visitors to the farm can in turn learn and benefit from these changes," he says.

Some of the changes Ballance has been involved in at Owl Farm are outlined below.

Before	After
Soil monitoring - The farm was divided into three blocks, with soil testing in each block conducted annually.	The three blocks were redivided into seven. Four yearly Total N testing and herbage testing (see below) were added to the soil monitoring programme.
Herbage testing - Herbage testing was not typically used.	Herbage on each block is tested every spring, and also as required on poorly performing paddocks, providing extra information for the fertiliser plan. Herbage testing revealed that selenium was low in herbage (and in young stock).
Blocking - Paddocks were grouped into three blocks (effluent and two other).	Paddocks are grouped into seven blocks, to align soil monitoring and farm management.
pH - Soil pH ranged from 5.4 to 5.9.	Capital rates of lime were applied to some blocks, and now all of blocks have a pH of 5.7 or above.
Olsen P - Phosphorus was evenly applied.	Phosphorus is applied on block by block basis, with 75 per cent of maintenance phosphorus applied on blocks above an Olsen P of 40.
Pasture renewal - Cropping and renewal was based on observation and convenience, and done by either cultivation and drilling or direct drilling without fertiliser down the drill spout.	All paddocks get Pasture Condition Scoring (1-5) every year, to guide cropping and renewal. Paddocks are being changed to no-till cropping with DAP drilled close to the seed.
Nitrogen fertiliser - Nitrogen was usually applied over the whole farm at a set time.	The farm begins the year with a fertiliser plan, which is refined based on seasonal growth, supplementary feed produced and pasture covers. Products containing nitrogen and sulphur are applied in early spring and late autumn, and nitrogen and potassium in late spring. Some blocks are prioritised for nitrogen application, based on Total N soil test results entered into My Pasture Planner (see p. 22).
Physical soil testing - No physical testing.	Visual Soil Assessment is used on poor performing paddocks. After a Ballance soil expert found a historic treading pan, half of four paddocks were sub-soiled to break the pan, as a useful trial.
Nutrient budgeting - Dairy industry one (from dairy diary compliance only) was used.	Overseer has been used for actual and predictive analysis, which is key when considering future farm system options.

For more information on Owl Farm, including information on upcoming focus days, visit www.owlfarm.nz. Ballance will be presenting at the next focus day 'Season update, farm systems update and research review, accuracy and results from fertiliser' on 25 September 2019.

Focus day at Owl Farm

Ballance CEO Mark Wynne with Hiringa Energy CEO Andrew Clennett at Kapuni

Cleaner and greener

Ballance is collaborating in an exciting new project to provide a cleaner, greener future.

Ballance Agri-Nutrients is thrilled to be a partner in a clean-tech project that is looking to use renewable energy to produce 'green' hydrogen.

Earlier this year, Ballance and Hiringa Energy confirmed a Joint Development Agreement for the $50 million project, to be based at Ballance's Kapuni ammonia-urea plant in Taranaki.

Harnessing the power of wind

Under the agreement, the two companies are planning construction of up to four large wind turbines, with a total capacity of 16MW. The turbines would supply 100 per cent renewable electricity directly to Ballance's Kapuni plant, as well as power an electrolysis plant producing hydrogen. The high-purity hydrogen produced could supply feedstock into the ammonia-urea plant or zero-emission transport fuel.

Ballance CEO Mark Wynne says this would enable Ballance Kapuni to use almost entirely renewable electricity, and hydrogen can be produced with wind power that exceeds the manufacturing plant's baseload electricity requirements. The hydrogen production alone is expected to generate sufficient 'green' hydrogen to supply up to 6000 cars, or 300 buses and trucks per year.

The project is a key step for the energy sector transition in Taranaki, with two large-scale hydrogen users - Methanex and Ballance Kapuni - already in the region that can potentially provide baseload demand for green hydrogen. The existing core competency in hydrogen production and use at Ballance's Kapuni site is an excellent platform, Mr Wynne says.

Green nutrients and jobs

While the hydrogen fuel-cell market develops, the supply can be fully utilised in the Kapuni ammonia-urea plant to

manufacture 'green' nitrogen fertilisers that will have an extremely low emissions profile. Mr Wynne says "We'll be able to offer a new choice of nitrogen fertiliser for New Zealand farmers who have sustainability front-of-mind."

The manufacture of green ammonia-urea would offset up to 12,000 tonnes of carbon emissions and avoid the import of 7000 tonnes of urea from the Middle East and Asia. Production of green urea would eliminate the equivalent amount of carbon dioxide as taking 2,600 cars off the road.

Ballance's Kapuni plant is one of the largest employers in South Taranaki, contributing hundreds of millions of dollars to the regional economy in wages and contracts work. The plant relies on natural gas for its feedstock so this project represents a way to not only futureproof a large employer but also provide additional employment opportunities, during construction and as the hydrogen market develops.

"We're thrilled to be able to bring this opportunity forward for our farmer-shareholders, for Taranaki, and for New Zealand – to create a renewable hydrogen energy hub that could enable deep cuts in emissions from our heavy transport fleets and also produce an alternative green nutrient source to help keep New Zealand growing," Mr Wynne says.

Ballance and Hiringa are looking forward to sharing the plans with Government stakeholders, Iwi and other local community and commercial stakeholders, along with discussions with potential hydrogen customers, to help realise project.

Green hydrogen facts

- Green hydrogen is produced from renewable electricity and water, through the process of electrolysis (producing hydrogen and water).
- Hydrogen has the highest energy content of any common fuel (by weight). A hydrogen fuel cell car can refuel in 3-5 minutes and travel up to a range of 600-800km.
- When used in a fuel cell, hydrogen can enable zero-emission transportation (and recombines hydrogen and oxygen to make water).
- For commercial and heavy transport, hydrogen is a zero-emission solution that enables high availability, payloads and range.
- Green hydrogen is complementary to the electrification of transport in New Zealand, with the potential to reduce emissions from heavy transport, industrial processes and chemical production.

PLANT

SOIL

Losing P and profit

Phosphorus can be lost in a number of ways, all of which can affect profits.

"Phosphorus (P) is needed for plants to grow in New Zealand's naturally P deficient soils, but too much P in waterways can cause excessive growth of aquatic plants and algal blooms," says Ballance Precision Agriculture Specialist Ollie Knowles.

"P losses to the environment, whether from losing topsoil or improperly applying fertiliser, can also affect farm profits, so it's good business sense to minimise them where you can," he says.

Runoff losses

"Most farm systems lose P, and this happens mainly via runoff. The actual amounts of P lost to waterways in runoff are relatively low, typically 0.1 to 1.7 kg P/ha/year. But most P entering waterways is from runoff," says Ollie.

Runoff from land contains soluble P (readily available to plants) and P bound to soil particles. Negatively-charged phosphate binds to positively-charged soil components such as clay minerals containing aluminium, iron and calcium in the upper layers of soil. The soil's ability to retain P in this way is indicated by its ASC (anion storage capacity).

"P bound to soil particles is the main source of loss from land, and is best managed by good grazing management, developing riparian margins and keeping Olsen P levels in the target range," says Ollie.

Conversion of excess soluble P into insoluble P is highly beneficial to farmers and the environment, as insoluble P cannot leach immediately. However, as time passes and insoluble P is released back into the soil moisture as soluble P (to replenish the soil's pool of soluble P and restore equilibrium), leaching is once again a possibility.

Leaching a lesser issue

P does not normally leach, as most soils have a moderate to high ASC, so it instead binds with minerals. In soil types such as sands and podzols with an inherently very low ASC (<10 per cent), water soluble P can move down the soil profile and leach into groundwater.

"So while P can leach in some circumstances, such as if soluble P is present on coarse textured soils with very low ASC, leaching is not really an issue for P loss," says Ollie.

Fertiliser losses

When P is applied to land, around 80 to 90 per cent is eventually used by plants, so around 10 to 20 per cent is ultimately lost.

A soluble P fertiliser, such as superphosphate or di-ammonium phosphate (DAP), spread too close to waterways or applied less than two weeks before irrigation or heavy rainfall (an average of 30 mm within 21 days) can, via runoff, contribute up to 90 per cent of total P losses from pasture. If this lost P enters waterways, it will be available to aquatic plants and algae.

The three possible forms of P in fertilisers differ in solubility, and thus their availability to plants (see Figure 1).

"The amount of P in a fertiliser is expressed as a percentage of elemental P, which gives little idea of the level of plant available P contained. As this is an important indicator of the fertiliser's effectiveness, a number of tests are used to identify solubility levels," says Ollie.

Two regularly used tests for identifying plant available P in fertilisers are:

- **Water solubility test –** indicates amount of P that is soluble in water (and most readily available to plants)
- **Citric solubility test –** indicates amount of P that will become soluble once the fertiliser reacts with soil and moisture (readily available to plants but not soluble in water)

"So using a fertiliser such as Serpentine Super that performs well in terms of high citric solubility and low water solubility is one possible way of reducing the risk of available P entering waterways," says Ollie.

FIGURE 1 Characteristics of the three forms of P in fertiliser.

Form of P in fertiliser	**Monocalcium phosphate**	**Dicalcium phosphate**	**Tricalcium phosphate**
Solubility	Soluble	Partly soluble	Insoluble
Availability to plants	Readily available	Moderate to slowly available	Not available
Examples of fertilisers	MAP, DAP, superphosphate	RPR, Serpentine Super, dicalcic phosphate	Typically found in all fertilisers containing P
When to use/not use	Establishing crops Not when high runoff risk	Maintaining soil fertility When high runoff risk	Manufacturing fertilisers to increase plant availability

Find the right phosphate

Answering the right questions makes it easy to get the right product for the job.

"Choose the right phosphate fertiliser for your farm and you'll get the most cost-effective product that's best suited to the conditions to minimise environmental losses," says Ballance Precision Agriculture Specialist Ollie Knowles.

Phosphate fertiliser is lost mainly via runoff, but also via leaching in certain conditions. To get the right phosphate fertiliser, a number of factors need to be considered including the soil's phosphorus retention (normally indicated by ASC or anion storage capacity), soil texture, annual rainfall and soil pH.

If soil testing on your pastoral farm has identified a need for phosphate fertiliser, this decision tree will help you choose the right phosphate fertiliser for your situation (see Figure 1).

Additional considerations

Ollie says a number of other things may need to be considered when choosing phosphate fertiliser:

- Organic farms – "The options for applying phosphate on organic farms are limited in New Zealand; RPR Biogro certified is the most widely used product in this situation."
- Distance between store and farm – "This is best worked through with your local Nutrient Specialist, who will be able to find the most cost-effective solution for your situation."
- Maintenance and/or capital – "If your nutrient levels are below the optimal target range for your production level on farm then a capital application may be required. This can also impact the phosphate fertiliser product that best suits your farm."
- Fertiliser compatibility – "If you need other nutrients besides phosphorus, this can affect your choice of phosphate fertiliser product, due to compatibility issues when different fertilisers are mixed together. For example, Superten and SustaiN are chemically incompatible and if combined are likely to degrade.

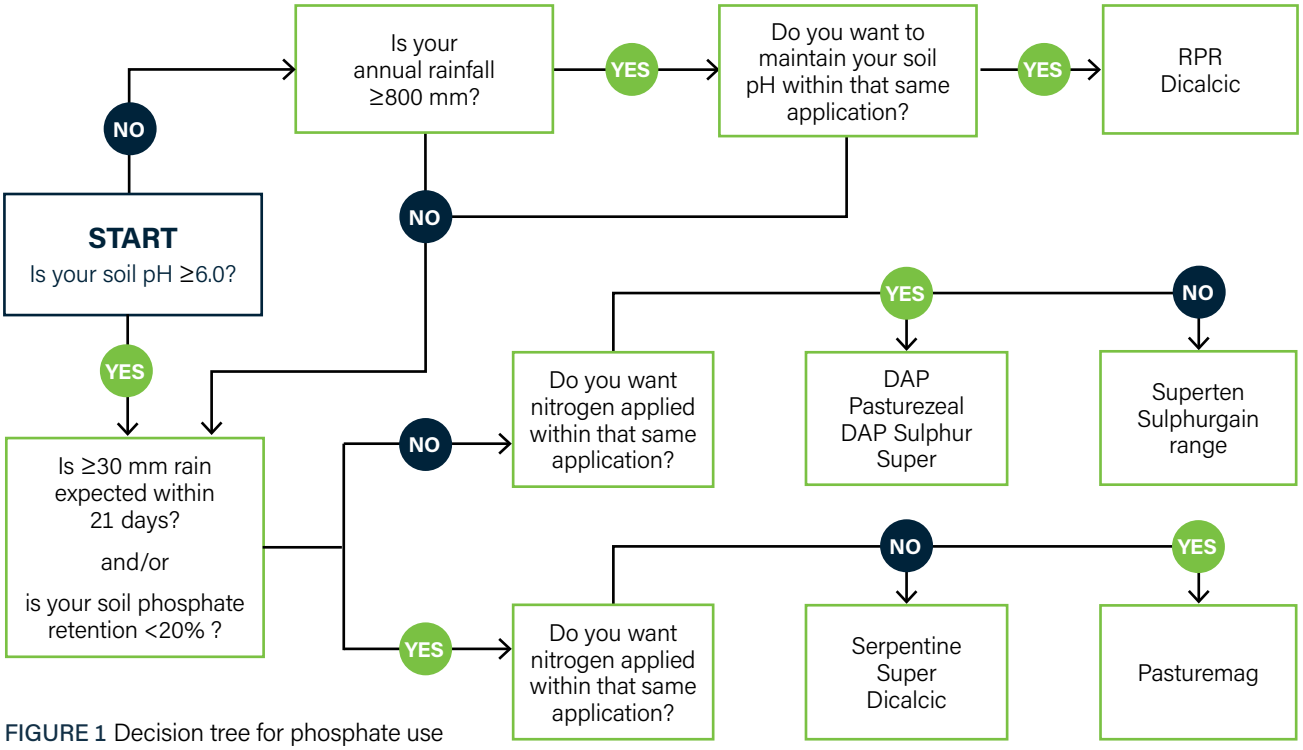


FIGURE 1 Decision tree for phosphate use

PLANT

SOIL

Precise and productive

Precise aerial application of fertiliser lifts productivity while saving on fertiliser costs.

In the past, precise aerial application of fertiliser was challenging and largely down to the pilot. Flying at 200 km/hour, the pilot had to try to open and close a fertiliser hopper at the right time and place, making it very difficult to control where fertiliser was (and was not) applied. Applying maintenance and capital rates to different paddocks in the same run was a headache.

Today, with farmers facing regulations, applying fertiliser accurately and keeping it out of areas such as waterways has never been so critical.

SpreadSmart, an innovative tool developed by Super Air, a subsidiary of Ballance, is a gamechanger for aerial topdressing.

How it works

Using SpreadSmart technology, fertiliser placement is precise, with a computer controlling hydraulics on the hopper doors, allowing constant rate and variable rate application – all the pilot has to do is fly the plane.

A digital map of the farm, specifying spreading areas and rates, is uploaded to a computer in the plane, which controls the hydraulic hopper doors, releasing fertiliser at the required rate within pre-set zones on the flight path. The computer makes a decision every 0.1 seconds, so as the plane flies over a property, the application rate can be changed, or the hopper doors opened or completely closed within a space of 6 metres.

The benefits

SpreadSmart lifts productivity without waste, by targeting different rates to different areas of the farm. It ensures that fertiliser is applied at a precise rate even as the plane climbs and descends. In the past planes applied the correct rate 'on average' whereas SpreadSmart technology allows 'constant rate' application – a big step change.

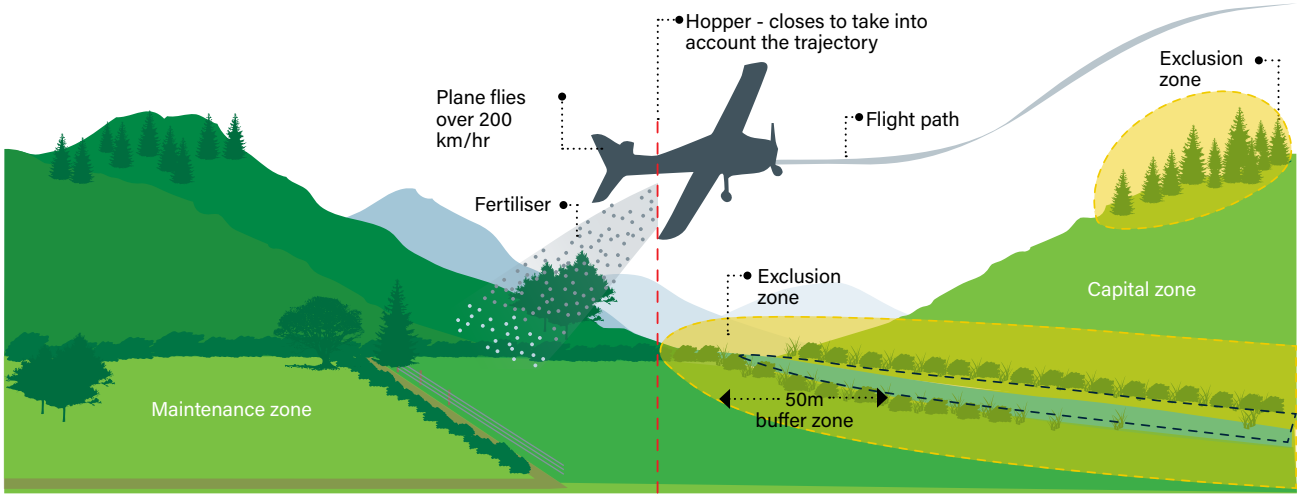
The digital farm map that guides the system also allows proof of application to be provided to the farmer showing exactly where the fertiliser has been applied.

At Tutamoe Station on the East Coast of the North Island, using SpreadSmart reduced the area sown by 16 per cent by tightening up exclusion areas; this allowed 11 per cent more fertiliser to be applied per hectare while saving 6.5 per cent on the overall amount of fertiliser required. The farm manager also observed that the process was quicker and no fertiliser was applied inadvertently to unproductive areas.

SpreadSmart was developed by Ballance through its Primary Growth Partnership research programme. It won the Innovation and Commercialisation category at the New Zealand Spatial Excellence Awards in 2016. The award judges commented that SpreadSmart demonstrated a "well-designed and rounded solution that cleverly combines positioning, GPS and aviation technology."

SpreadSmart is available exclusively through Ballance's aerial topdressing company Super Air and is currently available throughout the North Island. For more information contact the Ballance Customer Services team on 0800 222 090 or email customerservices-mount@ballance.co.nz.

How SpreadSmart™ works



P for a strong start

Phosphate near seed is important for early root development.

Regardless of how a crop is sown, drilling DAP (di-ammonium phosphate) with the seed supports early, vigorous crop establishment.

Worldwide, there is increasing recognition of soil's importance for our future, and that keeping it well fertilised, covered with vegetation and undisturbed (not cultivated) are key for its preservation. North and South America have moved strongly towards cropping with no cultivation in a bid to protect their soils.

"Crops have historically been sown with cultivation because cultivation not only helps control weeds, it also breaks up the soil leading to mineralisation (the release of nutrients into the soil solution), aiding seedling establishment. However more often than not, cultivation brings low fertility subsoil to the surface. This leaves newly sown seed germinating in a nutrient-poor environment, leading to poor seedling vigour, which can delay the crop's canopy closure," says Ballance Forage Specialist Murray Lane.

"When sowing using no-tillage, Roundup (glyphosate) controls the weeds, and as the soil's not cultivated, it's not mineralised. Drilled seed will be germinating in a nutrient-poor environment, even if fertiliser is applied to the soil surface. Seedling vigour will be affected, slowing down the development of the crop," he says.

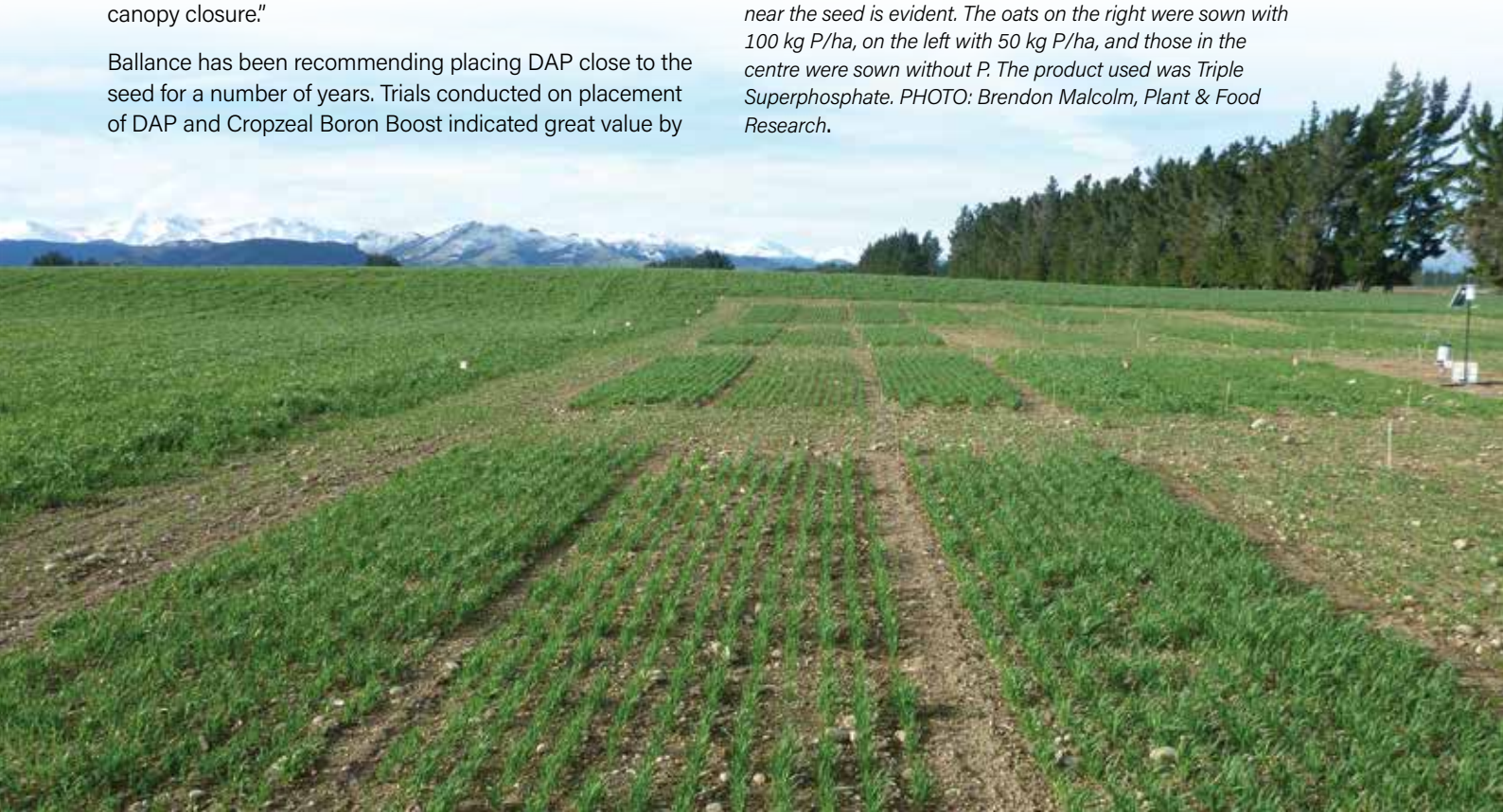
"For both cultivation and no-tillage, placing some DAP (or Cropzeal Boron Boost if sowing a brassica) in the soil near to the seed gives it its mojo. The phosphate in DAP aids early root development, fuelling plant growth, and the nitrogen aids early leaf expansion, leading to earlier crop canopy closure."

Ballance has been recommending placing DAP close to the seed for a number of years. Trials conducted on placement of DAP and Cropzeal Boron Boost indicated great value by placing DAP nearby, using perhaps 100 to 150 kg DAP/ha. "It's often assumed nitrogen is responsible for the response, but phosphate's also important. People generally opt for DAP (containing nitrogen and phosphate) over Triple Superphosphate (phosphate only) because they're similar in price, and DAP is a better product to put through a seed drill."

Recently, while investigating oats as a catch crop in a trial in Southland, Plant & Food Research Scientist Dr Brendon Malcolm evaluated the value of placing just phosphate near the seed using Triple Superphosphate.

Results clearly demonstrate that phosphate placed near the seed is important in the early stages of crop development. Twelve weeks after oats were drilled in late June 2018, near Mossburn, both with and without phosphate near the seed, the phosphate treatment had 40 per cent more dry matter yield/ha (see photo). Although this yield difference was not present when the oats were harvested, the stronger, earlier growth's better leaf cover and root growth would have provided more soil protection.

"Placing phosphate near the seed is important for early root development, and the nitrogen in DAP comes in after that to fuel canopy development. After grazing a winter crop, helicopter seeding with DAP or Triple Superphosphate may in future become standard practice as a means of protecting the soil."



Twelve weeks after oats were drilled, the value of phosphate near the seed is evident. The oats on the right were sown with 100 kg P/ha, on the left with 50 kg P/ha, and those in the centre were sown without P. The product used was Triple Superphosphate. PHOTO: Brendon Malcolm, Plant & Food Research.

PLANT

SOIL

Spare a thought for S

Important, cheap and easily incorporated into fertiliser applications, sulphur does not get the attention it deserves.

Sulphur (S) is vital in any farm setting, but often lacking in New Zealand soils, especially in spring when most needed. Despite being relatively cheap and straightforward to apply with other nutrients, S can be easily overlooked.

Vital for plants and production

To grow, plants need S. Required for clover and pasture growth, it is part of many enzymes important for biochemical processes, some proteins and vitamins, and is vital for chlorophyll production. Clover in particular needs S; the *Rhizobia* bacteria in the root nodules require it for nitrogen (N) fixation. If plant growth suffers due to S deficiency, pastures appear pale green or yellow, with clover affected first. Insufficient S can also limit pasture response to N, particularly if S levels are low after a wet winter.

Spring's S shortage

Sulphate-S in soil is often in short supply in early spring. Winter is a double blow for sulphate-S. Bacteria are less active and slower at converting organic and elemental S into sulphate-S, and sulphate-S leaches over wet winter conditions. Soil type and rainfall impact the degree of S leaching over winter; coarse soils such as sands and pumice suffer greater leaching than ash or sedimentary soils.

Elemental S, on the other hand, does not leach. As soil temperatures warm up in spring, bacteria become more active and gradually convert elemental S into sulphate-S.

Adequate levels of sulphate-S are needed for spring pasture to thrive. When sulphate-S is deficient, if N fertiliser is applied the response to N can be limited and spring clover growth patchy or poor.

To choose the right S product, consider timing of plant requirements and application, the leaching risk (taking into account the soil type and rainfall) and if it will be applied with other nutrients.

Applying early spring S

On ryegrass dominant pastures in early spring, if an immediate S deficiency (where sulphate levels are in single figures) is likely to limit pasture response to N, then sulphate-S may need to be added with N, as elemental and organic S release of S will be too slow. Consider products such as sulphate of ammonia (SOA), SustaiN Ammo (containing sulphate-S) or PhasedN Quick Start (containing sulphate and elemental S) to ensure early spring pasture has sufficient S and applied N is utilised efficiently. PhaSedN Quick Start is a good late winter to early spring option to address short and medium-to-long term S needs. It combines PhaSedN with SOA, and provides both elemental and sulphate-S.

Annual maintenance S

As a general rule, sulphate-S can be applied in spring and elemental S in autumn. The exception is high rainfall areas (>1500 mm) where a mix of sulphate and elemental S should be applied in spring.

If superphosphate-based fertiliser is applied annually to soils with low risk of leaching (<1500 mm) in spring, there is normally no need for additional S applications. If it is not applied, or if an alternative phosphate fertiliser without S is used, a separate application of S is needed, either in elemental or sulphate form.

If applying S or maintenance fertiliser in autumn, use a product containing some elemental S, as it sits in the soil over winter ready to meet spring pasture's S requirements, and provides a slow release of S over the growing season. Elemental S is also ideal for hill country where fertiliser is often applied every two to three years. For autumn application, products such as the Sulphurgain range (15S, 20S, 30S) are an effective way of applying elemental S along with maintenance phosphorus requirements. Where phosphate fertilisers are used that do not contain S, products such as Sulphurgain Pure containing 90 per cent S as elemental S, or PhaSedN containing elemental S and N (as SustaiN) are good options.

Sorts of sulphur

In fertiliser, S is either:

- sulphate S, the only form which plants can use, and which leaches readily
- elemental sulphur, which plants cannot use (until soil bacteria convert it into sulphate-S), and which does not leach

In soil, the forms of S are:

- organic S, stored in soil organic matter and making up about 90 to 95 per cent of soil S reserves
- inorganic S, present as sulphate S available for plant uptake from soil solution and sulphate-S absorbed to soil particles

Salt: fact or fiction

Are all of the beliefs about and uses of sodium on farm backed up by science?

With so much, sometimes conflicting, information out there about salt (sodium chloride - NaCl) and its use on farm, Ballance Science Extension Officer Josh Verhoek puts the facts straight.

Q Do all plants need and take up similar amounts of sodium?

Plants don't need sodium; animals do. It's needed for animal health and production, but not for pasture growth.

Sodium is taken up by some plant species, in varying amounts, even though they don't need it. These species are either natrophobes (such as lucerne and browntop) which absorb minimal amounts of sodium and store it in their roots, or natrophiles (such as ryegrass, clover and herbs) which take up more, and store it in their leaves.

Q Is 0.1 per cent sodium in a herbage sample a good rule of thumb to meet livestock needs?

Stock sodium requirements in pasture vary. For sheep it's 0.07-0.09 per cent and for cattle 0.10-0.12 per cent, with lactating cows' requirements at the upper end of this range.

Sodium levels in natrophiles (plants capable of providing it to stock) vary widely by season. If natrophiles are present, it's recommended to determine sodium levels by taking mixed pasture herbage samples in spring. If levels are below stock needs, apply salt at 50-100 kg/ha/year.

Q Does salt increase pasture palatability?

Despite some international studies showing that stock prefer grazing on salt-applied pasture, New Zealand studies have not shown this. Salt may, or may not, increase palatability, so there's no guarantee of its effect. So it's not recommended to apply salt solely to increase palatability.

Q Does applying salt to pasture increase milk yield?

This occurred in a trial near Reporoa in the 1990s, but no other trials have been able to replicate the result. For this type of response to be possible, sodium levels would have to be extremely low.

Q Does applying salt to pasture reduce the incidence of bloat?

Despite many anecdotes from farmers saying this works, results are conflicted, and it's not sufficiently backed by science.

Q Does applying large amounts of salt to pasture reduce potassium levels and associated stock metabolic disorders?

Applying high rates of potassium can replace sodium (and calcium and magnesium) in herbage concentration, but this doesn't work in reverse.

Studies have shown that even sodium applied at high rates doesn't affect potassium pastures levels, or only reduces them by a relatively small amount. So it's not recommended to use sodium to reduce pasture potassium levels, which are best managed by following good agricultural practice.

Q Is salt easily mixed with and applied with most fertiliser products?

A soil sodium deficiency is easily remedied by applying salt, with other products if required, at 50-100 kg/ha. As salt draws in moisture, once mixed spread it straight away and don't store it, as it'll become wet, lumpy and difficult to apply. Depending on conditions, unmixed, bagged sodium may be stored for a short period without any problems.

For more information, talk to your Ballance Nutrient Specialist.

Bund benefits quantified

The effectiveness of a tool to mitigate runoff's impact on waterways is being quantified.

Farmers around the country are facing regulations to manage and reduce losses of nitrogen, phosphorus, sediment and *E. coli* to waterways. Surface runoff is one way these substances enter waterways.

Detainment bunds (see box) are already recognised as a tool to capture runoff and collect these substances, but just how much they can capture has been unknown.

Results earlier this year from the Phosphorus Mitigation Project (set up to quantify how much phosphorus detainment bunds can capture and confirm how best to use them) were promising, indicating large amounts of phosphorus can be captured.

The project can now report that detainment bunds can achieve an average load reduction of between 50 and 60 per cent for sediment and phosphorus, but also for nitrogen. While the project is focused on sediment and phosphorus, it also managed to measure nitrogen reductions (but not *E. coli* reductions).

The figures stem from trials at three Lake Rotorua catchment sites over 12 months, involving 37 runoff events. The trial sites were all on free draining pumice-based soils, so a proposal is underway to carry out trials on other soil types, to quantify the effectiveness of detainment bunds on poorly and moderately drained soils. Once complete, the research will enhance output from Ballance's MitAgator model (see p. 22), which spatially quantifies reductions in sediment, phosphorus, nitrogen and *E. coli* losses at a farm scale from a wide range of mitigations. This will help farmers and landowners demonstrate how they have and can reduce losses of phosphorus and sediment from their farms.

The Phosphorus Mitigation Project started in early 2016 with a group of Rotorua Lakes catchments pastoral farmers developing a proposal to measure the benefits of detainment bunds. They have received funding from the Ministry of Primary Industries Sustainable Farming Fund and have been supported by local farmers, universities, industry, regional councils and Ballance Agri-Nutrients.

Unfortunately not all landscapes are suitable for detention bunds, so the project identified eight landscape attributes which form the basis of a predictive GIS framework to assess the suitability of land for a bund.

The project's main message to date is that installing a correctly sized detainment bund in the right location can provide significant reductions in sediment, phosphorus and nitrogen while minimising impacts on pasture production.

If you are considering installing a detainment bund, first obtain advice from your regional or district council on location of the bund, construction and maintenance requirements, to ensure you comply with all rules and regulations in your catchment.

Detainment bunds: what they are and what they do

Detainment bunds, low earth embankments built across valley floors, collect and hold passing runoff water so substances settle out before the water is released, thus stopping them from reaching waterways.

Bunds are most effective at capturing sediment and phosphorus, as these are often found in runoff. They can also capture nitrogen and *E.coli*, but in lesser amounts as their concentration in runoff is much lower.

Effective detainment bunds need to be able to capture at least 120m^3 of water/ha of land from the catchment that feeds them, and store it for three days, after which the water is released, minimising the impact of flooding on pasture growth in the area behind the bund.

Contact your Ballance Nutrient Specialist for more information.

A detainment bund filled to capacity after a storm event, with stormwater leaving the bund through a riser PHOTO: John Paterson, Rotorua

Deferred grazing plusses

A project is substantiating and quantifying the benefits seen by farmers who have deferred grazing of paddocks.

According to farmers who have tried it, deferred grazing (shutting off paddocks in spring and not opening them until autumn when ryegrass has set and dropped seed) enables better management of remaining pasture over summer, increases the deferred area's production the subsequent year and provides a valuable source of late summer feed, when feed is in short supply.

But to prove and further explore the benefits, a farmer-led group has been working with industry and the Sustainable Farming Fund. A spring 2017 trial on a Bay of Plenty sheep and beef property on the eastern side of the Lower Kaimai Ranges compared a late paddock opening deferred treatment (two grazings missed, no grazing mid-October to early February), an early paddock opening deferred treatment (one grazing missed, no grazing mid-October to early December) and standard rotational grazing. After the deferred periods, pastures in both deferred treatments were rotationally grazed, following best practice industry guidelines, to maximise pasture quality. Each treatment was replicated four times within a randomised complete block design and grazed by R2 Friesian dairy replacements.

To explore deferred grazing's effect on root growth and its potential to make pastures more persistent and resilient to climatic stresses, an aligned glasshouse study simulated the field-applied treatments manually.

The results of the trial clearly show that compared to the other treatments, the late opening deferred grazing treatment improved:

- soil bulk density, total porosity, mineral-N and anaerobically mineralisable nitrogen
- ryegrass tiller densities the following autumn and spring (Figure 1)
- the proportion of ryegrass groundcover the following autumn
- pasture production in the first eight months after deferring
- metabolisable energy content of the pasture the next autumn
- the facial eczema count (reduced the spore count)
- ryegrass root mass (Figure 2) and tillering
- farm profitability (based on initial Farmax modelling).

Overall, deferred grazing worked as predicted. Pasture quality was maintained in grazed paddocks, paddocks that were deferred showed longer-term benefits and Farmax modelling showed increased farm profitability.

Further research is recommended to quantify deferred grazing's impacts on the environment (such as nutrient losses), soil biology (nitrogen fixation rates, soil respiration and enzyme activities) roots under pastures (mass, depth, changes over time) and facial eczema.

As the project enters its final year it is undertaking a similar study in the Waikato on a summer dry farm while also continuing at the current site.

The project was funded by the Ministry for Primary Industries' Sustainable Farming Fund with co-funding and support from Ballance Agri-Nutrients, Environment Bay of Plenty, Waikato Regional Council, Beef + Lamb New Zealand, Plant & Food Research and AgResearch.

For further information contact your Ballance Nutrient Specialist.

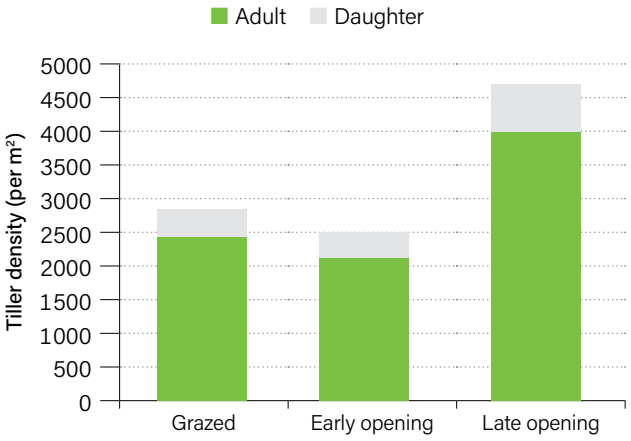


FIGURE 1
Perennial ryegrass tiller densities of three treatments one year on, in spring 2018.

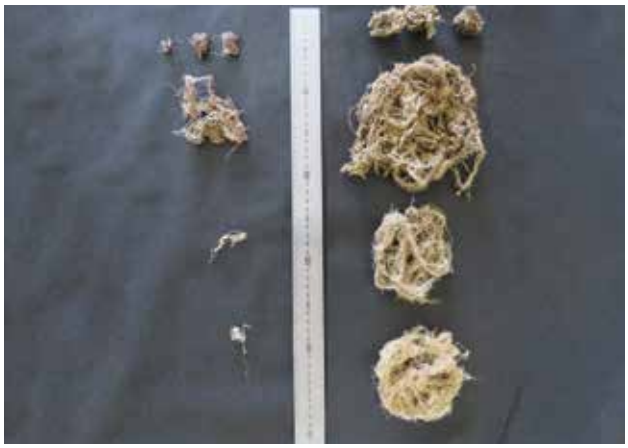


FIGURE 2
Rooting depth glasshouse study showing increased root mass at depth. On the left: roots from standard rotational grazing simulation, and on the right: roots from late opening deferred grazing treatment simulation.

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One farm, many people

Ballance Environmental Management Specialist and in-house Overseer expert Ian Power talks about OverseerFM, the update to the world-leading nutrient budgeting tool.

Q OverseerFM has replaced the online legacy software, which was retired at the end of June. What's the biggest change in OverseerFM?

OverseerFM has a centralised farm account that can be shared with multiple users. This has been developed in response to industry concerns around duplication of data collection and files. A farm account represents the farm being modelled, and the account can give permission to and receive requests from other users for access.

You don't need to worry about users making changes though, as OverseerFM has an audit log so you can see who made a change to the model and when.

Q How much does it cost?

Before you can use OverseerFM you need to register at fm.overseer.org.nz. Every user that registers is placed into an 'organisation', which can be an individual user, a user group or an actual organisation. A user can only belong to one organisation at a time, but can move between organisations.

It's free to create a farm account, request permission to access existing farm accounts, create a farm analysis and upload .xml files.

However, before you can generate results, you'll need to pay a $200 plus GST annual subscription for each farm account. There's no problem if you don't pay the subscription; your farm account stays live, and you can pay the subscription when you need access to results.

Q Is there anything people should think about before setting up a farm account?

It's important to have just one farm account per farm.

The farm account owner should be the farm owner and/or the farm manager; it's good to have more than one account owner in case one of them can't access and manage the files at any one time.

The farm account owner and administrator can grant permission to access the farm account, for example to 'organisations' (such as an individual user, a group of users, an organisation or consultancies) that they work with.

Q How is data stored in OverseerFM?

OverseerFM farm account information is stored in a central database on a secure server. The centralised data storage delivers greater auditability of analyses for quality assurance and provides an easy transition between model updates.

Q Are there any other notable features?

Easier, more intuitive data entry and sharing can save several hours per analysis. Summary screens allow farmers to engage with modelling results, ensuring the benefits of nutrient modelling can be maximised. Farmers can get information on their leaching, runoff and greenhouse gas emissions and their products' carbon footprints. They can also see the effect different management practices and mitigations and changes in farm enterprises have on nutrient flows, such as leaching and greenhouse gas emissions.

Your Ballance Nutrient Specialist can help you register, set up your farm account, create your nutrient budget analyses, interpret the results and explain how OverseerFM works.

Ian Power is a Ballance Environmental Management Specialist and in-house Overseer expert.

Keeping soils healthy

Plant & Food Research Senior Soil Scientist Trish Fraser looks at what makes a soil healthy.

How we look after soil can influence its ability to support the growth of crops and pastures. The greatest emphasis tends to get put on understanding the chemical nutrient status of a soil, with much less consideration being given to its physical and/or biological condition. Yet soils are much more likely to yield well if they are kept in all round healthy balanced chemical, physical and biological condition. Healthy soils not only supply nutrients sufficient to meet crop demands, but they also maintain a stable soil structure, provide good aeration to crops, avoid restrictions to root growth and function, as well as support beneficial soil organisms.

Soils do vary in their ability to supply plants with essential nutrients. Some soils are deficient in one or more nutrients because they are formed from rocks that contained little of those elements. Other soils are deficient because they have lost their nutrients as a result of natural soil forming processes or overuse. Soils with high clay and humus content tend to have a good ability to hold onto nutrients, but too much clay can sometimes mean that the nutrients are held on so tightly that the plant may have trouble getting access to the nutrients! Meanwhile a sandy soil has a low ability to hold onto nutrients, and may benefit from organic matter additions. It is of course a good idea to know your soil's capacity to retain nutrients, so you can try to match its nutrient content to your plant nutrient requirements. But if the soil happens to be in poor physical shape, then this can also have an impact on its ability to be able to provide these nutrients to plants.

The soil's physical condition can be damaged where, for example, too much or too intensive cultivation occurs or where animal trampling or vehicle trafficking occur under wet conditions. A soil with good structure has soil particles arranged together in an array that allows for air to still be present and for water to flow into the system. Where the structure gets broken down and these 'bones' collapse then the soil environment can become very dense, soil organisms have trouble surviving, water cannot infiltrate well and plant roots can have greater trouble penetrating the soil system. Plants then find it much harder to reach the water and nutrients that they need to grow even if the nutrients are present in the soil.

Good soil structure

Poor soil structure

Prevention is undoubtedly better than cure, since once damaged it can take three to four years to improve a poorly structured soil. The build-up of soil organic matter levels is a slow process, but ensuring a constant supply of decomposable organic materials, growing pastures, adding composts or using green manures and minimising cultivation (especially not cultivating under wet conditions) can all help to maintain and improve a soil's structure.

Visual Soil Assessments are a tool to measure and monitor soil physical characteristics. See Grow Autumn 2019 for more information on this assessment, or talk to you Ballance Nutrient Specialist about carrying one out.

Plant & Food Research Senior Soil Scientist Trish Fraser

Regulations on the radar

Be aware of nitrogen loss regulations if buying or selling property.

Nutrient loss regulations have added one more thing to the radar of property buyers and sellers.

"It's particularly important to understand current and possible future regulatory requirements covering a farm's nitrogen losses," says Ballance Environmental Management Specialist Ian Power.

"Regulations for discharge limits are already in place in many regions, and will likely be coming to other areas in the near future. Seven regional councils currently have at least one catchment under nutrient loss regulations," he says.

"While factors like soil fertility, carrying capacity, animal species and pasture production have always been standard considerations when buying and selling a farm, regulatory requirements now need to be on farmers' dashboards."

Buying a farm

If you are looking at buying a farm in an area with regulations already in place, understand the regulations and ask for information on the property's nutrient losses from OverseerFM. "In affected catchments, you'll need this sort of information in order to provide a 'nitrogen reference point' or 'nitrogen benchmark' value to the council. Make sure the information's in writing," says Ian.

If regulations are not already in place, talk to your council to find out what regulations may be imposed in the future and possible timeframes, and the years for sourcing and providing nutrient benchmark values.

Not understanding regulatory requirements could mean that if you buy a property you may find out later that your opportunity to develop the farm, change the farm system or increase production is limited.

"Regardless of whether the farm you're buying is in an already regulated or yet to be regulated catchment, if the farm has an OverseerFM account ensure the sale or purchase agreement requires the seller to set you up as the OverseerFM farm account owner, so you can access the farm's OverseerFM nutrient budget accounts."

Selling a farm

"There are a number of things you can do that will help make your farm as saleable as possible, and make the sale run more smoothly," says Ian.

"If you're selling a farm in an area with regulations requiring an OverseerFM nutrient budget, ensure it is robust, and created with sound, accurate data," he says. Farmers in non-regulated catchments should make historical farm data available to buyers to ensure that they have all the data available for benchmarking (see p. 17). Supplying an inaccurate OverseerFM nutrient budget and poor historical data when selling a farm could have serious consequences, such as legal challenges and compensation.

"It's also sensible to grant the purchaser of the farm access to, and allow the new owner to become the farm owner of the farm's OverseerFM nutrient budget accounts."

It is recommended that both buyers and sellers seek independent expert advice about how current or future nutrient loss regulations may apply to their situation.

Data for N and P loss

Collecting data now means it will be ready when you need it.

In many regions nitrogen and phosphorus losses from land are already regulated, and within the next 10 years this is likely to be the case across most of New Zealand.

For farmers and growers around the country, this means obtaining and retaining the required data to comply with current and future nutrient loss regulations.

"In concrete terms, farmers and growers will probably have to retain all the necessary data to be able to run the OverseerFM Nutrient Budgets model," says Ballance Environmental Management Ian Power.

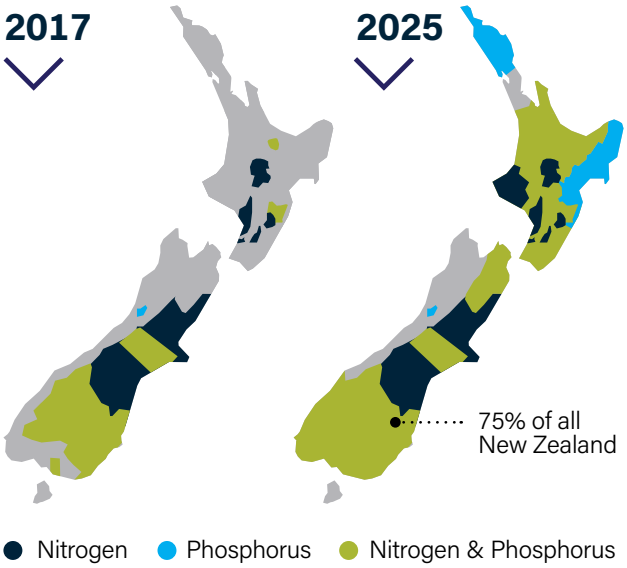
Farmers already farming under limits will typically have to produce an OverseerFM nutrient budget to obtain a nitrogen reference point, to show their farm system meets any discharge limits or targets, or to inform a Farm Environment Plan.

"Farmers in regions where regulations aren't yet in place should start collecting this data now, as it's likely they'll need it in future. Some may also need data from previous years, so it's a good idea to start collecting that now too, so it's on hand when needed. Most of the data required is on a monthly basis, but for stock movements daily is best," says Ian.

One example of where historical data is required is the Waikato's Healthy Rivers/Wai Ora Plan Change 1 catchment, where farmers need nitrogen leaching values for 2014/15 and 2015/16, and must submit the highest value to the regional council from 1 May to 30 November 2020.

"It can be tricky getting hold of historical data even from the recent past, and what you get may be incomplete. So it's sensible to start collecting data that's likely to be needed in the future to run OverseerFM now. The more you collect, the better," says Ian.

FIGURE 1
Actual nutrient compliance requirements in 2017 and estimated requirements for 2025.



For more information on current and future regulations and what data needs to be collected in your region contact your regional council.

Data to collect

Data that needs to be collected and retained includes, but is not limited to, the following:

Farm physical address	
Areas of farm	Whole farm, grazed blocks, ungrazed areas (exotic/native trees, lanes/races and yards/buildings), leased blocks
Animals on farm	Species, breeds, numbers (species, breed, class, gender), sale and purchase dates and weights (species, breed, class, gender)
Production	Milk solids/year, wool grown, velvet/antlers harvested
Fertiliser use	Products, amounts, where and when applied
Supplements	When purchased, stored feed, made on farm (types, amounts preferably by dry weight, when and where fed, amount carried over to the next year)
Effluent management (mainly dairy farms)	System type(s), area(s) applied to, depth(s) and frequency(ies) applied
Water irrigation	
Pasture species by block	e.g. ryegrass/white clover, browntop, tussock grasslands, paspalum, kikuyu, lucerne, grass only
Crops (arable, horticultural, tree/vine crops, fodder crops)	Crops grown, areas of each crop, yields in dry matter, fertilisers applied (see 'Fertiliser use' above), timing of management activities (cultivation, sowing/planting, harvest/grazing etc.)

Lucerne legwork

Lucerne needs a bit of legwork to get going, but with increasingly long, dry summers, is set to become even more popular.

"If you don't get it right, lucerne can be expensive to establish, but well managed, it lasts up to eight years. Its extensive, deep roots are good at finding water, and it fixes nitrogen from the atmosphere to power its growth," says Ballance Nutrient Dynamics Specialist Jim Risk.

"Lucerne can fix around 30 kg of atmospheric nitrogen per tonne of dry matter. For the crop to fix nitrogen, use seed with group A *Rhizobium* inoculum."

Sowing lucerne in spring gives it the best chance to successfully establish, beat weeds, form a healthy crown and put down roots, setting it up for the following year. It grows slower in autumn's decreasing daylight and temperatures, making it less competitive to weed issues.

"Before establishing, test soil to a depth of 150 mm so you can adjust pH and nutrients to optimum levels. The optimum pH, 6.0-6.2 in the top 150 mm of soil, allows the *Rhizobium* bacteria to function well and fix nitrogen. It also prevents exchangeable aluminium from restricting root growth." It generally takes about 1-2 T lime/ha to lift pH by 0.1 units. It should be applied at least 6 to 12 months before sowing, particularly if pH is low.

Lucerne is efficient at extracting phosphorus from the soil, which it needs for energy hungry processes such as photosynthesis and nitrogen fixation, as well during establishment. Olsen P levels of 15 are sufficient for lucerne, and according to research, it will not produce a yield response to higher phosphorus levels. "To raise Olsen P, apply a soluble form of phosphorus (such as Superten) at sowing to aid establishment, and then annually in spring to maintain Olsen P levels," says Jim.

Depending on yield, harvesting lucerne removes more potassium than any other nutrient besides nitrogen. Silage and hay remove 20 and 15 kg potassium per tonne of dry matter respectively. Jim recommends applying most replacement potassium after harvest, avoiding luxury uptake and removal in herbage. For grazing, replacing potassium is less of a concern and easily done together with spring maintenance fertiliser. Around 25-30 kg of potassium in grazed situations is normally enough to maintain potassium at QTK levels of 6-8.

"Most soils used for lucerne supply enough magnesium. If Quick Test results are under 10, add magnesium to the base fertiliser using Serpentine Super at a rate that supplies 5-10 kg magnesium/ha/year."

Sulphur, essential for protein formation, also enables lucerne to fix nitrogen, so sulphate sulphur levels should be at least 6-10 ppm. "If annual rainfall is under 1500 mm, apply sulphate sulphur (found in Superten) in spring at a rate of 20-30 kg/ha. In higher rainfall areas, or if applying maintenance fertiliser in autumn, Sulphurgain products containing phosphorus and elemental sulphur can be used, minimising the sulphur leaching risk."

"Testing herbage pinpoints micronutrient needs, rather than relying on standard lucerne mixes," says Jim. Lucerne needs molybdenum to help fix nitrogen (> 0.5 ppm is the target) applied at 2-4 kg/ha (granular molybdenum) at sowing, then every four to five years. On pumice or sandy soils, lucerne may need 5-10 kg/ha of granular boron every four years.

"With a bit of legwork, lucerne provides excellent feed, high in metabolisable energy and protein, from spring right through to autumn," says Jim.

Protecting the soil

A project to help farmers prevent soil loss when cropping has already had some spectacular results.

Every winter in New Zealand, around 200,000 ha of land lying bare and vulnerable to erosion after swede or kale are grazed could be protected by oversowing a cover/catch crop.

The Ballance-led Helicropping - protecting our soils project is finding the best tools for farmers to protect soil when cropping. "Cover (or catch) crops' leaves reduce the impact of rain droplets, the roots hold the soil together, and nitrogen leaching's also reduced," says Ballance Forage Specialist Murray Lane.

Trials started in July last year, when a helicopter was used to oversow a just grazed swede paddock with annual ryegrass, plantain and oat seed, both treated and bare, with 200 kg DAP/ha.

"Eleven weeks later the results from the annual ryegrass were rather spectacular. The big challenge with surface sown seed in the middle of July is hungry birds, and the larger seeded oats were easy pickings. It's thought that the colour of treated seed is important to hide the seed from birds. Smaller seeded plantain also looked promising, but was less vigorous," says Murray.

To build on last year's results, this year cover/catch crops were sown in April before grazing of swede and kale, with further sowings in July after grazing.

"Sowing before the main crop is grazed is potentially challenging for the cover/catch crops. First they have to establish under the canopy, then survive grazing to recover in just three to four weeks to act as a cover/catch crop. Last year's crops, sown after grazing, took eight to nine weeks to get up to scratch."

Rye and oat seeds sown in early April germinated well under both swede and kale canopies, but lack of light under the 1 to 1.5 m tall kale eventually led to their demise. Not so for those under swede, with good seedling establishment for both treated and bare seed by mid-May wherever groundcover (both swede and weed) protected against bird predation. "The question now is will they survive the grazing," says Murray.

"If the cover/catch crop successfully establishes from either pre-graze or post-graze sowings, in October instead of bare ground there'll be grazable pasture, that's been protecting the soil and pulling back nitrogen."

Farmers are helping to plot the course of this project, with their observations leading to interest into looking at sowing the cover/catch crop at the same time as the main crop.

Otorohanga farmer Geoff Fitzgerald sowed plantain and rape together, and the plantain was a major part of the offer for three summer grazings. The crop was then helicopter oversown with perennial pasture in early April, to become grazable perennial pasture in July. Rotorua farmer Matt O'Neil sowed plantain with a swede crop, and the plantain was a significant part of his winter grazing offer, filling any bare patches as well as being under the swede canopy.

"Sowing the cover/catch and main crop together is a key point to evaluate. We'll look at the cover/catch crop's impact on the main crop's dry matter yield, and whether it'll survive grazing to perform as a cover/catch crop. Perhaps a 20 T/ha swede crop with 3-4 T/ha dry matter plantain will be able to feed stock while keeping the soil intact. Helicropping is like aerial no-tillage, the soil's left undisturbed from the start," says Murray.

Rather spectacular results: 11 weeks after annual ryegrass surface sown with DAP (right), compared to soil left bare after grazing (left).

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Lift pasture and profit

Target the parts of your farm that are performing below potential.

When done right, using capital fertiliser to lift soil's nutrient status is a fail-safe, effective way to improve pasture productivity and increase farm profits.

"To select sites, look for areas with 10 per cent or more clover cover each year. Clover thrives in areas that hold moisture, so gentle slopes of less than 20 degrees and shady areas are a good starting point. Pasture growth on hill country farms is frequently limited by sulphur, phosphorus and potassium, so applying these nutrients will greatly improve the productive potential of these areas," says Ballance Science Extension Officer Joshua Verhoek.

Phosphorus and sulphur are needed to grow clovers which fix and supply nitrogen to the grasses that make up most of the pasture. Clover (and other legumes) are poor competitors for potassium, so it is important to ensure adequate levels.

On steep slopes and sunny aspects, grasses will dominate. The lack of clover means nitrogen levels will be low, so a nitrogen fertiliser is best used on these areas (see p. 21).

Different classes of land have different fertility targets; steep land has a lower fertility target than flat or rolling land. For example, sedimentary soils on flat land have an optimum Olsen P target of 20-30, whereas for steep land over 25 degrees it is around 12-15. On steep land factors such as temperature and moisture limit pasture growth rates, so applying phosphorus above a certain rate will not have any effect on pasture growth.

"Once you've identified sites for capital fertiliser, testing the soil will pinpoint the extent of any nutrient deficiencies," says Josh. Your Ballance Nutrient Specialist can then develop the most cost-effective fertiliser strategy for your specific farm conditions, taking into account your goals and any local environmental limits that impact fertiliser use.

"If you're thinking about improving pasture, ensure you can make the most of the extra feed. A reasonable level of subdivision means you can control and graze stock at an intensity that makes the most of the improved pasture."

When looking at phosphorus fertiliser, consider whether you need other nutrients, such as sulphur, nitrogen or magnesium. Product options include:

- the Superten range, combining phosphorus and sulphur
- DAP (di-ammonium phosphate), combining phosphorus and nitrogen
- the Serpentine Super range, containing phosphorus, sulphur and magnesium
- Triple Super, containing phosphorus
- slow release phosphorus RPR.

For potassium, MOP (muriate of potash) is the best option, and may be blended with most other products if required.

"If you're constrained by budget, just applying more fertiliser than maintenance requirements will lift the soil's nutrient status, and you'll be heading in the right direction, even if you can't get there in year one," says Josh.

Feed from the hills

Applying nitrogen to hill country can be an economically beneficial way of meeting a seasonal feed deficit.

"Rather than buying in silage or other feeds, using nitrogen (N) to promote growth can provide a cheap, high-quality supplementary feed, and have minimal environmental impacts. But it's important to get it right, from planning to implementation," says Ballance Science Extension Officer Joshua Verhoek.

"The basic principles for good practice N application apply everywhere, including hill country. Apply the right amount to the right places at the right time to get the economic benefits and minimise losses," says Josh.

"To start with, a feed budget is essential. It allows you to identify potential shortfalls, so you can better time N applications for the best possible outcome."

When it comes to application, N works best when the conditions for pasture growth are optimal. N application response rates are typically highest in spring and lowest in winter, when application should be avoided due to leaching risk. If applying N in late winter, early spring or autumn, the soil temperature needs to be 6 °C and rising at 9.00 am to get a response. On easy country, the response rate to N applications is typically given as 10 kg DM grown per kg N applied. However, in most summer-dry hill country conditions, a minimum response of 15 kg DM per kg N applied can be expected. If conditions are right, greater responses are highly probable, but budgeting on conservative numbers is sensible, says Josh.

N should be applied to hill country at no more than a moderate rate, such as a maximum of 50 kg N/ha in a single application. Application near vulnerable ecosystems such as streams and rivers should be avoided.

"As with other nutrients on hill country, you want to make sure you can use the extra feed effectively. Consider stock numbers so you don't grow more than's required. Subdividing paddocks allows you to control stock and grazing intensity, so you can get the most from the extra feed." Managing grazing also looks after clover. While N fertiliser itself has minimal effect on clover, clover can suffer when grass gets too long and shades it out. Regular grazing prevents this from occurring.

The total N levels in soil have a significant impact on the economic benefit of added fertiliser N, with greater responses occurring when soil total N levels are lower. My Pasture Planner (see p. 22) is a new decision support software tool that uses soil total N test information to improve N use efficiency on pastoral farms. It can help improve feed budgeting and economical use of N fertiliser as a low cost supplementary feed. Spreadsmart (see p. 8) allows topdressing of fertiliser exactly where it will do the most good, while keeping it off the parts of the farm where it is not wanted or needed.

Calculating the benefit

The economic benefit of using N can vary, and can be calculated on a per hectare basis as follows.

Cost of product

1000 kg (1 T) ÷ product application rate (kg/ha) = ha/T product

cost of product ($/T from pricelist) ÷ ha/T product = **cost of product ($/ha)**

Amount of drymatter (DM) grown

N application rate (kg/ha) x response rate (kg DM/kg N) x utilisation (%) = **DM (kg/ha)**

Liveweight (LW) created

DM (kg/ha) ÷ feed conversion efficiency (kg DM/kg liveweight gain) = **LW (kg/ha)**

Carcass weight (CW) created

LW (kg/ha) x dressing out % = **CW (kg/ha)**

Income created

CW (kg/ha) x schedule ($/kg CW) = **income created ($/ha)**

Net profit

income created - cost of product ($/ha) = **net profit ($/ha)**

Enhance N

More cost-effective, environmentally sustainable nitrogen (N) use is now within easy reach, thanks to a new software tool.

My Pasture Planner, an improved version of N-Guru, helps pastoral farmers make the right decisions to enhance N use, making the most of the N used on their farms. It incorporates the expertise of AgResearch scientists, to provide the best N application solutions

The software uses soil Total N test information, indicating N available for pasture growth, as well as the potential longer term supply. Test information from different farm areas allows My Pasture Planner to identify areas that will be more responsive to N fertiliser, so N application rates can be tailored accordingly. Using a Total N test and My Pasture Planner to variably apply N has been shown to reduce N loss in Overseer from between 3 and 12 per cent, with an average of 4 per cent.

Farmers can easily access output from My Pasture Planner, as it is integrated with MyBallance, an online secure place to keep farm fertiliser information. A 12 month N plan can easily be created using the mapping capability, and the MyBallance integration means easy access to a fertiliser recommendation, mapped out for the farm.

My Pasture Planner is used exclusively by Ballance Agri-Nutrients, and is available to Ballance Agri-Nutrient customers registered with MyBallance. Existing Ballance customers can register for MyBallance at myballance.co.nz. To become a Ballance customer contact the Customer Services team on 0800 222090 or email customerservices-mount@ballance.co.nz.

Put MitAgator to work

Ballance's MitAgator service is now available, using cutting-edge software to spatially identify critical source areas of contaminant losses and find the best mitigations for your farm.

MitAgator, developed together with AgResearch and incorporating around 30 years of independent research, is the first tool that singlehandedly deals with nitrogen, phosphorus, sediment and *E. coli* losses.

Operated exclusively by Ballance's Farm Sustainability Services team, the following service packages are available:

	Risk maps	Scenario analysis	Farm plan	Initial farm visit	Final farm visit
Risk maps	✓	-	-	-	✓
Risk maps and scenario analysis	✓	✓	-	✓	✓
Risk maps, scenario analysis and farm plan	✓	✓	✓	✓	✓

Risk maps - for each contaminant, showing critical source areas on your farm, to enable improved understanding of where losses occur and more strategic use of mitigations.

Scenario analysis - prioritised mitigation options, based on cost and effectiveness, for one or more scenarios (to explore different combinations of mitigations and what they can achieve, or mitigation options to reach a particular target e.g. phosphorus loss reduced by 20 per cent).

Farm plan - to meet your farm's needs, incorporating information from risk maps and scenario analysis, while considering other relevant issues on farm.

Initial farm visit - where required a Ballance Farm Sustainability Services specialist visits your farm at the start of the process to ensure full understanding of your requirements.

Final farm visit - a Ballance Farm Sustainability Services specialist visits your farm at the end of the process to explain results and ensure you fully understand them.

MitAgator®

More information on MitAgator is available at ballance.co.nz/mitAgator. To find out more about the MitAgator service phone 0800 222 080 or email farm.sustainability@ballance.co.nz.

Supporting sustainability

Meet compliance requirements and get the best from your land, now and for future generations.

Farm Sustainability Services

With farmers in most of New Zealand likely to be under nutrient compliance requirements by 2025, Ballance's Farm Sustainability Services team can help you to farm within limits and achieve ongoing profitability.

"Our team of specialists work with farmers to identify environmental risks and opportunities, and provide advice and solutions," says Grahame Fitzgerald, Ballance's National Farm Sustainability Services Manager.

"Whether it's regulations, a resource consent application or industry certification scheme requirements you need to meet, we can help. You'll deal with one person, and get ongoing support from Ballance nutrient specialists nationwide," he says.

Farm Sustainability Services include:

- **MitAgator -** a tool that identifies hotspots for the four main contaminants to water provides mitigation options to reduce losses; the service includes a property visit right through to a farm plan
- **OverseerFM year end nutrient budgets -** to provide a picture of annual nutrient inputs, outputs and losses
- **Scenario nutrient budgets -** modelling how changes to the farm system impact nutrient flows
- **Farm environment plans -** for sustainably managing soil, water and nutrients, a tailored plan to best manage environmental risks and opportunities

For more information contact Ballance Farm Sustainability Services on 0800 222 090 or farm.sustainability@ballance.co.nz.

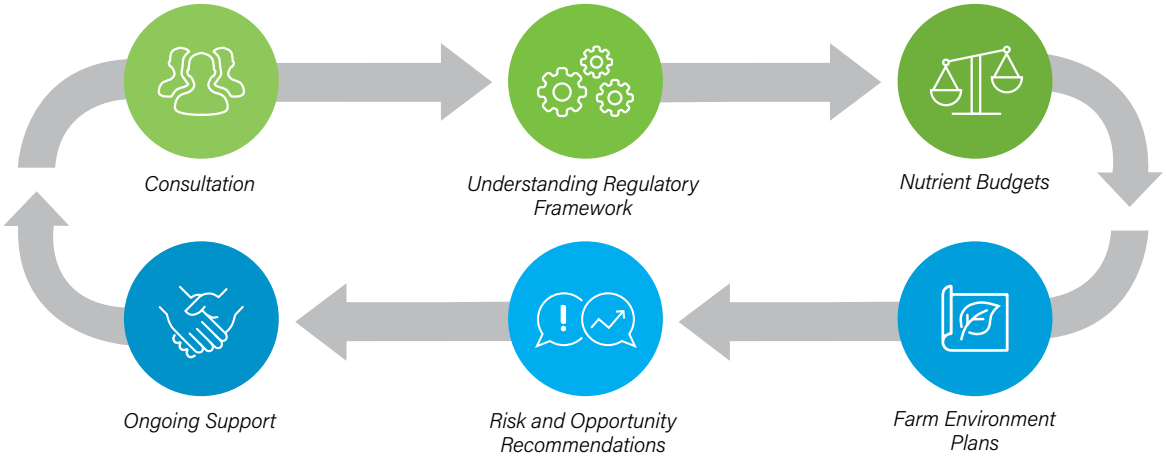
Kevin van der Poel, manager and owner of a Waikato dairy farm, says:

Farm Sustainability Services is a great tool for me and my farm. It helps me understand what we do, and what we'd like to do. It allows us to develop systems that will be sustainable. It makes what I'm doing more enjoyable because I know I'll be still doing it in the future.

We had recently purchased this farm and it was important to us to set up environmentally friendly practices that were going to be sustainable for the future. We knew we were going to push the boundaries with a higher stocking rate so I wanted an understanding of what and how we could manage/mitigate our challenges.

They came out, collected the data, and we discussed how we were planning to operate the farm. They went away and loaded the info and then came back and discussed the results with us. It was really helpful. We thought we were going to be challenged by the area that we had, and Farm Sustainability Services confirmed a lot of things for us – the loading that we had, what and how we applied our nutrients, and when we applied it. They gave us some good advice around our management and we were able to put practices in place to develop a sustainable business.

Our process



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Ballance agri-nutrients

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