Ballance agri-nutrients

Together, Creating the Best Soil and Food on Earth

Grow

South Island
Spring 2023

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

Reducing our emissions

Ballance is making significant strides towards reducing its carbon emissions.

Supporting innovation and reduction of carbon emissions in the primary sector is vital for Aotearoa New Zealand to achieve net zero emissions by 2050, and for global low emissions protein and food production.

As part of this, Ballance is making significant strides towards reducing carbon emissions associated with the manufacture of ammonia-urea. Urea is derived from ammonia, which is energy intensive to manufacture and is associated with significant carbon emissions.

Ballance is working on a programme of activity – known as Te Ata – to decarbonise the manufacture of ammonia-urea at its Kapuni site in Taranaki. The Kapuni plant is New Zealand's only ammonia-urea facility, and the only domestic producer of nitrogen-rich fertiliser, GoClear (AdBlue) and building adhesive.

The decarbonisation pathway being proposed by Ballance for the Kapuni plant could abate approximately 190,000 tonnes per annum, or approximately 90 per cent of the plant's manufacturing emissions (compared to the 2022 baseline).

The two-phase Ta Ata programme involves significant electrification of the manufacturing process and switching from natural gas to electricity as an energy source. The first phase involves reducing emissions from Kapuni utilities and ammonia manufacturing, while the second phase would reduce emissions from hydrogen production.

A joint venture with Hiringa Energy to build four wind turbines as a renewable energy source for green hydrogen production is currently on hold. A clear benefit of this project is the production of zero-emission green hydrogen for use as a heavy transport fuel.

In 2021, Ballance led the charge in helping to decarbonise the heavy transport sector when the consent to build four wind turbines was granted. The original go live date of January 2023 for this world-leading green hydrogen project has been significantly delayed by consent appeals. The ongoing impact of these delays is that Aotearoa New Zealand is missing out on significant reductions to our carbon emissions.

Currently, Kapuni uses natural gas for both fuel and feedstock purposes, and around 50 per cent of the total carbon emissions associated with the plant's natural gas intake come from using it as fuel for manufacturing.

Domestically produced urea typically has a much lower footprint than imported urea, so low emissions, domestically produced urea is crucial for enabling a low emission food supply in New Zealand, ensuring supply security and reducing reliance on high emitting offshore producers of urea. International urea shortages have highlighted the critical importance for farmers and growers to have an affordable and reliable supply of nutrients through local manufacture.

Beyond reducing its manufacturing emissions, innovative products developed by Ballance, such as SustaiN which helps to reduce nitrous oxide emissions, and the promotion of responsible fertiliser use have contributed to lower emissions and other environmental outcomes, helping farmers and growers produce more sustainably.

FOR MORE INFORMATION

Visit ballance.co.nz/our-business-and-history/manufacturing. See page 22 for more on Kapuni.

Animal Water Plant Soil

The road to recovery

Ballance is supporting farmers to get their businesses back on track.

Following this year's extreme weather events, many farmers across the North Island are hard at work getting their businesses back on track.

Given the massive impact of these events, Ballance has been helping by providing funding and advice, and sharing knowledge (see sidebars).

As farmers move past the response phases, many are in various forms of recovery mode and ticking off a list of important jobs.

For pastoral farms, the first step to recovery is about restoring operational control and grazing management, as a prelude to recovering pasture and animal productivity. For farms with hill slips, aerial mapping showing the percentage of bare ground post-cyclone can be very helpful for planning ahead.

So that impacts do not extend more than needed and key activities in the farming calendar can still be met, medium term key objectives are to mitigate further losses in production, and as much as possible, ensure what's required to secure next season's production outcomes and revenue.

The priorities for recovering a farm business after extreme weather events are in many ways similar to those of land development (see page 7). Once the urgent needs to protect people, animals and assets are over, the focus can turn to getting critical farm infrastructure back in place.

Over $1 million for the Rural Support Trust

Ballance has funded a relief package to provide on the ground support to those affected by this year's extreme weather events.

On behalf of Ballance shareholders, we donated $1 million to the Rural Support Trust to provide support to help people on their recovery journey. Ballance also matched any donations made by staff.

Tips for farm business recovery

- To restore control of animal intakes and pasture management, and effectively utilise the feed you are growing, focus first on critical farm infrastructure including access, stock water and fencing.
- Focus on the more productive areas first for subdivision, soil fertility and potentially reseeding. Flatter areas will grow more than steep hills, and are typically more cost-effective to develop.
- Re-establish feed supply demand balance using the usual tactics, keeping an eye on the future to ensure any changes to subdivision or management don't leave you vulnerable to spring deficits, for example.
- Don't ignore undamaged pastures – these are best placed for immediate growth. Use phosphorus and sulphur to optimise production and nitrogen to provide short term tactical feed.
- As much as practical, take the actions required to protect future

revenue streams to minimise overall impact on business.

- Rather than focusing on completing all tasks to the highest standards, be realistic about what is needed and what is achievable. Something functional might be perfectly adequate for now.
- The good news is that this year's weather events are unlikely to be the new normal, according to NZ weather and climate researcher Professor James Renwick. Remember that there's always a way through adversity, and you might come out the other end stronger, wiser, and more confident about the future.

Cyclone recovery events

On top of financial support, Ballance wanted to help in a more hands on way. So together with the Rural Support Trust, Ballance held a series of cyclone recovery farmer events on the East Coast.

Sessions included tips on protecting next year's production, looking after yourself, and farmers presenting on what has worked for them.

These events were supported by Beef + Lamb NZ, Ministry for Primary Industries and Gisborne District Council.

Pasture recovery after flooding

While remaining optimistic this year's events aren't the new normal, understanding the pasture recovery process means you'll feel better prepared to make decisions if you're ever in the firing line.

Pasture recovery after flooding depends on the depth of flood sediment (which can contain silt, sand, clay and gravel). With the huge amount of sediment after cyclones Hale and Gabrielle, machinery and contractors have often not been available, so broadcast sowing of ryegrass or oats with fertiliser has been a common and successful option, with the aim to sow permanent pasture as stage 2.

Flooding can be classified as minor (little to no flood sediment), moderate (sediment up to 25 cm deep) or severe (sediment 25 cm or more deep).

Pasture with less than 5 cm of silt covering it will probably survive if water drains away within 3 days. However, pasture covered by sediment won't survive and needs to be regrassed/ resown.

Flood sediment less than 25 cm deep can be incorporated into the soil, but it can be very difficult to do so if sediment is deeper than this. In both cases, where possible, sand and gravel should be removed and any debris such as trees mounded up and burnt.

As flood sediment is generally of low fertility, soil testing is important. Testing of the silt deposited in flood areas is important to understand its physical make up as well as pH and fertility level. To date nearly all have been high in pH (7.8 to 8.2) and low in fertility level, meaning a long road of building up fertility is needed. If sediment is going to be incorporated into the soil, soil testing should occur afterwards (see page 21 for more on flood sediment fertility).

The method for incorporating flood sediment into the topsoil depends on its depth. Sediment 5-10 cm deep can be incorporated via cultivation, while sediment 10-25 cm deep can be deep ploughed back into the soil. To avoid soil damage, it is important to wait until soil is dry enough before putting any machinery on the land.

It is likely that soil testing will reveal that the soil is deficient in some nutrients, so capital applications of phosphorus and potassium and regular additions of nitrogen may be required to support the new pasture.

Depending on the depth and composition of the flood sediment, perennial grass/clover, a short term ryegrass or ryegrass/clover mix or forage oats can be sown.

Pasture will need post-emergence nitrogen applications to support growth, and once established, grazing and/or mulching will help to build up organic matter.

A good news story: aerial regrassing of flooded land

Three months after floodwater covered the Armer Farms Te Puke farm in February 2023, killing the pasture, Colin Armer and his managers had re-established new pasture and were grazing it with the herd.

Putting heavy machinery on sodden land was not an option, due to time pressures, plus potentially causing soil compaction and ongoing drainage issues. So the farm management team opted to aerially regrass the flooded land with bird repellent treated seed (see Figure 1 on page 6).

Loss of pasture due to flooding over the whole farm was potentially a severe setback. Because of time submerged all pasture species died except the Mercer grass. Also thankfully there was only light sediment. In this example Armer Farms have demonstrated that aerial reseeding with bird repellent treated seed (Avipel), addressing the key establishment pests, and applying some phosphate and nitrogen fertiliser to enhance establishment, is an efficient and effective way of overcoming the challenge.

Table 1 **Cost to aerially regrass 140 ha Te Puke farm after flooding**

	Product/ha	$/ha
Helicopter spray and broadcast	-	$220/ha
DAP	150 kg/ha	$240/ha
Roundup and Pulse	10 L/ha	$140/ha
Ryegrass and clover	24 kg/ha	$350/kg
Cricket bait	11 kg/ha	$45/ha
SustaiN	70 kg/ha	$85/ha
TOTAL*		**$1080/ha**

* N.B. cost of removing pasture grass growing in house spouting not included

Figure 1 **Regrassing Armer Farms Te Puke farm**

February

11 February 2023

Farm floods under 1.5 m of water

Moved stock to other properties.

From 21 February 2023

Floodwaters recede

- Booked helicopter.
- Ordered products (grass seed treated with Avipel bird repellent, cricket bait, DAP, Roundup/ glyphosate).
- Removed sticks and logs.
- Cleared fences.
- Waited for surviving perennial weed grasses to recover and for soil to wash off leaves or new leaves to grow, mainly Mercer grass (Paspalum distichum) and some annual broadleaf species.
- Assessed slug and cricket populations.

March

4 March 2023

Helicopter sprays herbicide

Sprayed 140 ha of paddocks and drains (to control creeping Mercer grass) with Roundup (3.24 kg glyphosate/ha = 9 L/ha) and Pulse Penetrant (100 ml/100 L) to enhance rainfastness and improve results with residual dust on leaves.

5 March 2023

Helicopter broadcasts seed, starter fertiliser and bait

Broadcast Avipel treated grass (20 kg/ ha) and clover seed (4 kg/ha), DAP (150 kg/ha) and cricket bait (11 kg/ ha) in half rates/half overlap spreading technique. No harrowing required – seeds germinated on surface.

April

15-20 April 2023

Nitrogen applied

Applied SustaiN (70 kg/ha) after light grazing.

May

5-15 May 2023

Grazing

First full grazing, 8-10 weeks after sowing seed.

Late March 2023 - good brownout of weed species with new pasture seedlings emerging

Mid April 2023 - new pasture after first grazing, costing around $1080/ha (see Table 1 page 5)

Development priorities

Land development remains an effective way to lift returns from farmland.

Land development – one of the main ways of lifting productivity and returns from farmland – can seem a daunting task, especially when finances are limiting and the list of potential projects is long.

"But when done well, development can be extremely profitable, provide for easier management, and add capital value to your farm," says Ballance Sheep and Beef Programme Lead Richard Draper.

Start with the basics

Fencing, water systems, tracks and roads, drainage, fertiliser and lime, cropping and pasture renewal, riparian fencing and planting, yards and infrastructure – working out where to start can be difficult when so much is at stake.

To make the process more straightforward and help get the best returns from capital investment, Richard recommends beginning with the basics of subdivision, soil fertility, stock policies and pasture/forage species, as these usually provide the best immediate returns.

"Start by assessing the current productivity of the paddock or block against its potential, and what's holding it back," he says.

"Consider the whole picture. A lack of clover in a seemingly poorly performing paddock, for example, could be a symptom or a cause of poor performance, indicating problems with grazing management, subdivision or fertility. So assess these aspects before going for the seed bag."

Prioritising opportunities

After identifying development opportunities, they can be prioritised based on expected returns or system benefits.

"Flat land has the highest growing potential, so it's usually the first priority, followed by rolling country, then steeper hills. Start with your most potentially productive areas, and ensure they're performing optimally."

Each farm and farm system are unique, so assessing development opportunities against wider business goals and calculating the return on investment is recommended.

"On hill country properties, the most cost-effective investments tend to be subdivision, soil fertility and reticulated water, as they're relatively low cost and can be effective over a large area. On smaller more intensive blocks, establishing higher performing forage species and drainage often provide the next opportunities.

"As it can be difficult to assess each development activity's upside, you could instead work out how much extra dry matter you'd need to grow at your current gross margin for it to stack up. Often the answer is 'not much."

Subdivision

On hill country properties, prioritising subdivision to allow better pasture utilisation is recommended.

"There's no point growing more pasture if you can't effectively utilise what you've already got. With the right management, subdivision supports improved control and allocation of feed and improves feed quality, hence animal performance, and more even nutrient redistribution."

Sometimes water systems can be used instead of fencing. "Adding reticulated water to paddocks before fencing can encourage stock to graze areas of the paddock they usually wouldn't. A clean, reliable water supply also helps get the best from stock."

Soil fertility

"When you're able to manage and use what you're already producing, getting soil fertility to the economic optimum will provide a great return on investment."

Lime has diminishing returns at higher pH, and on hill country it's usually more economic to address phosphorus first. The exception is when the starting pH is <5.4 and Olsen P >15.

"The magnitude of the return will depend on the starting fertility of the land – returns from investing in capital fertiliser will be greatest when starting from a low baseline."

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

Hill country productivity

What affects pasture productivity in hill country?

Managing nutrients on hill country can be challenging. The mosaic of different slopes, aspects, soil types and depths all contribute to differences in pasture productivity.

"Understanding how these various factors affect hill country pasture production can help you manage nutrients to optimise productivity between or within blocks," says Ballance Science Extension Officer Grant Bickley.

Figure 1 provides an overview of factors and their contributing effects to variable pasture production in hill country.

Slope and pasture production

"Pasture growth variability on hill country is largely related to slope," says Grant. Steeper slopes experience increased surface runoff from erosion, resulting in reduced soil depth. As a consequence, steeper slopes have less capacity to store soil moisture.

Grant says clover growth and persistence are also indirectly impacted by slope. Soil water holding capacity decreases with increasing slope, impacting the adequate supply of soil moisture to the plant, especially from mid-spring to early autumn (see Figure 2).

Aspect and pasture production

"Aspect mainly has an effect on soil temperature and moisture, and in this way can have an effect on the seasonality of production," says Grant.

In dry hill country environments (annual rainfall of 800 mm or less) or summer dry environments, aspect can also strongly affect the growth of grasses and clovers.

"Generally in summer dry environments, there is more clover present on south facing aspects which are likely to be cooler and wetter in late spring-summer, as opposed to north facing aspects which are likely to be warmer and dryer and consist of more annual species within the pasture sward." (See Figure 3.)

Limited clover growth and persistence on summer dry north facing aspects

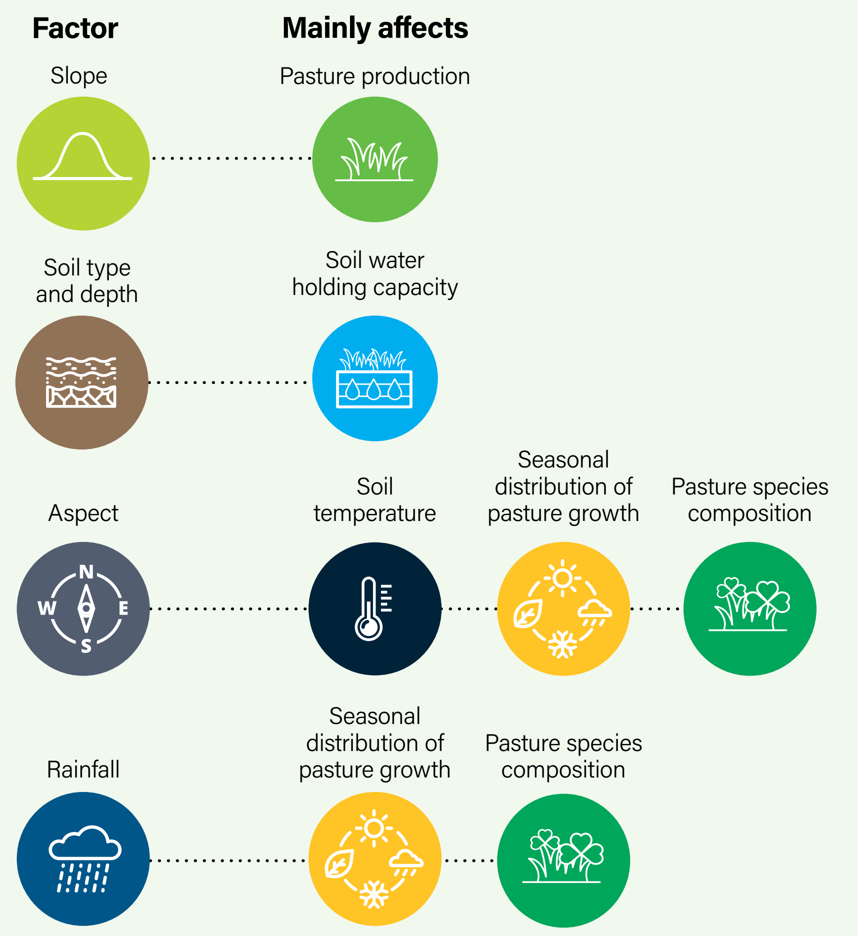


Figure 1 **Factors and their contributing effects to variable pasture production in hill country**

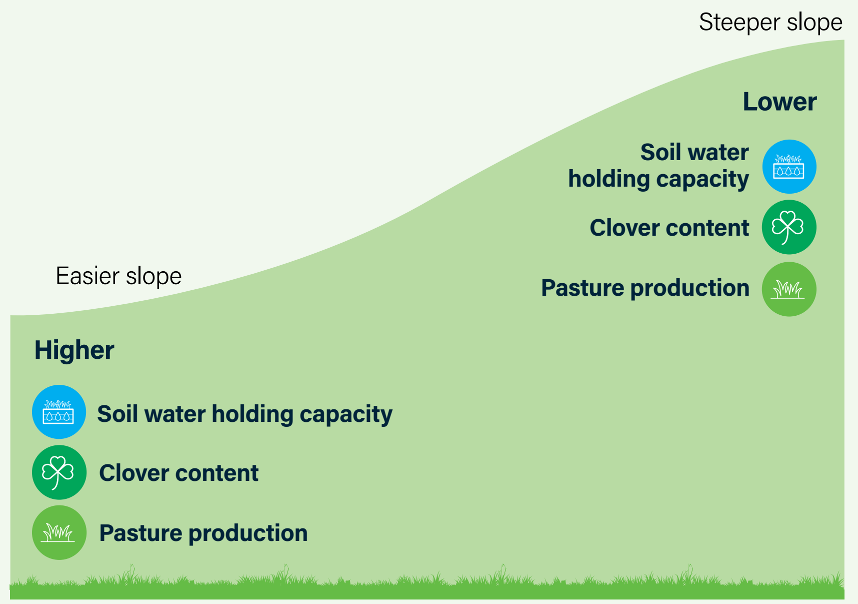


Figure 2 **The effects of slope in hill country**

due to inadequate soil moisture can reduce the supply of nitrogen (N) from clovers for predominant grasses during periods of active growth, which in turn can restrict overall pasture production.

Strategic application of fertiliser

A targeted fertiliser programme that provides the nutrients required in different areas of the farm can optimise overall pasture production both agronomically and economically. But which nutrients should be applied where to get the most efficient result?

Nitrogen

Steep slopes and sunny northerly aspects generally have low clover content so are typically lower in soil N (thus supporting lower fertility grass species). These areas are often responsive to N fertiliser. Several trials have shown a high efficiency of response in pasture production to fertiliser N in hill country, especially on steeper slopes with less soil N.

Phosphorus and sulphur

"As steep slopes and sunny northerly aspects are likely to have lower overall pasture production potential (and associated stock intensity), rates of phosphorus (P) and sulphur (S) fertiliser applied to these areas should reflect this," says Grant.

"Easier slopes and shady southerly aspects however, generally have a higher clover content within the pasture sward and as a consequence will require higher rates of P and S to support greater clover growth and overall pasture production."

FOR MORE INFORMATION

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

Morton JD, Gillingham AG 2017. Variable and differential application of nutrients to a hill country farm. Journal of New Zealand Grasslands 79: 119-124

Smith LC, Morton JD, Trainor KD, Catto WD 2004. Application of nitrogen and sulphur to sunny and shady aspects on South Island dry hill country. Proceedings of the New Zealand Grassland Association 66: 41-47

Gillingham AG, Morton JD, Gray MH 2003. The role of differential fertiliser application in sustainable management of hill pastures. Proceedings of the New Zealand Grassland Association 65:253-257

Fertiliser application technology

To get the best returns from hill country, Super Air's SpreadSmart variable rate technology allows N, P and S to be applied at different rates to different areas of the landscape.

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

SpreadSmart technology allows fertiliser to be applied exactly where it will provide the best result, and keep it off areas where it is not wanted or needed, helping you get the best return from your fertiliser spend.

SPREADSMART

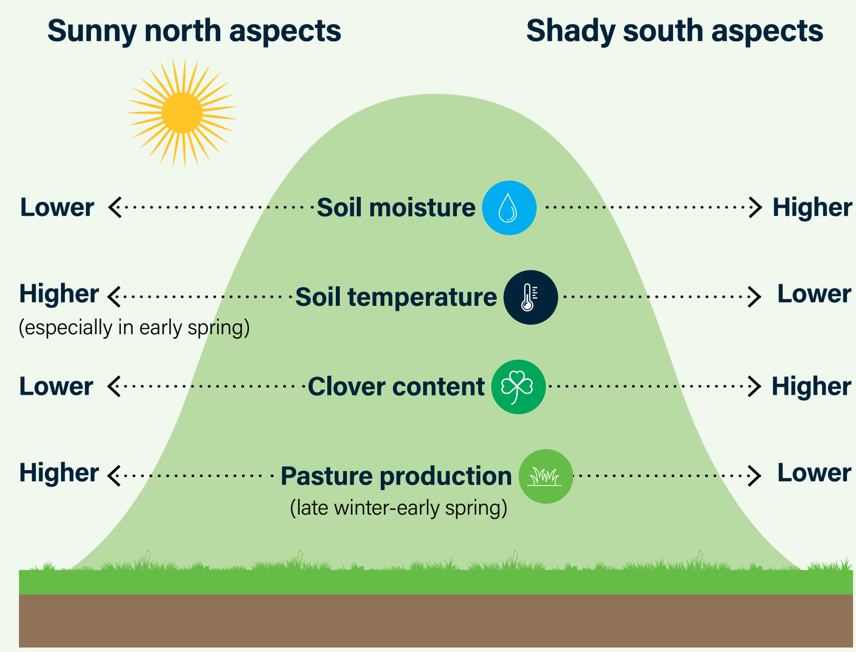


Figure 3 **The effects of aspect in summer dry hill country**

No free lunches

By Bob Thomson, Agribusiness Consultant, AgFirst

Fertiliser application must be matched to your meat production goals.

The foundational principles of good farming are based on subdivision, stock policy and soil fertility – the three big Ss. You need all three working. There's no point in piling on fertiliser if you don't have the subdivision to manage the pasture you're already growing, or in feeding stock classes that are poor converters of feed to revenue.

While building and growing farm revenue is the primary goal, strategic allocation of farm working expenses should follow closely, especially when your back's to the wall. And once your subdivision and stock policies (including genetics) are sorted, you can refocus on growing more pasture.

Fortunately, New Zealand's rich history of research knowledge on our soils and pastures provides guidance. The bottom line is that all things being equal, soil fertility is the main driver of pasture production, and well managed old pasture is very hard to beat.

Sometimes we need to be reminded that, in basic terms, we apply phosphate-based fertiliser to promote clover growth which in turn promotes the growth of grasses, notably ryegrass. Yes, there are other important elements too, but first things first. And when allocating the fertiliser spend, which often is reduced to suboptimum levels by budget constraints, we need to be thinking about getting the best return on investment.

We've learnt a lot about pasture production from monitor farms, thanks to funding from sheep and beef farmer levies (and with supplementary funding for measuring pasture production from commercial sponsors like Ballance). Over a 25 year period of pasture measures we learnt steep land grew less than half the amount of pasture of the flats, and rolling hills were intermediate in pasture growth terms. We doubled down on the fact there is no substitute for soil fertility when we want to grow more pasture.

Sure, we already knew hills grew less pasture than flats, but the actual difference was staggering. But probably the more important lesson was that we had traditionally treated our fertiliser spend with an 'on average' mentality when we needed to be much more strategic. The low hanging fruit was prioritising and optimising soil fertility on the best land first and then progressing to the steeper land.

Another big lesson was that we needed a production based approach to maintaining soil fertility whereby our fertiliser application was based on production capacity, not just on measured soil fertility. Again, sounds basic, but in essence the more meat and fibre you produce per hectare the higher your fertiliser requirements.

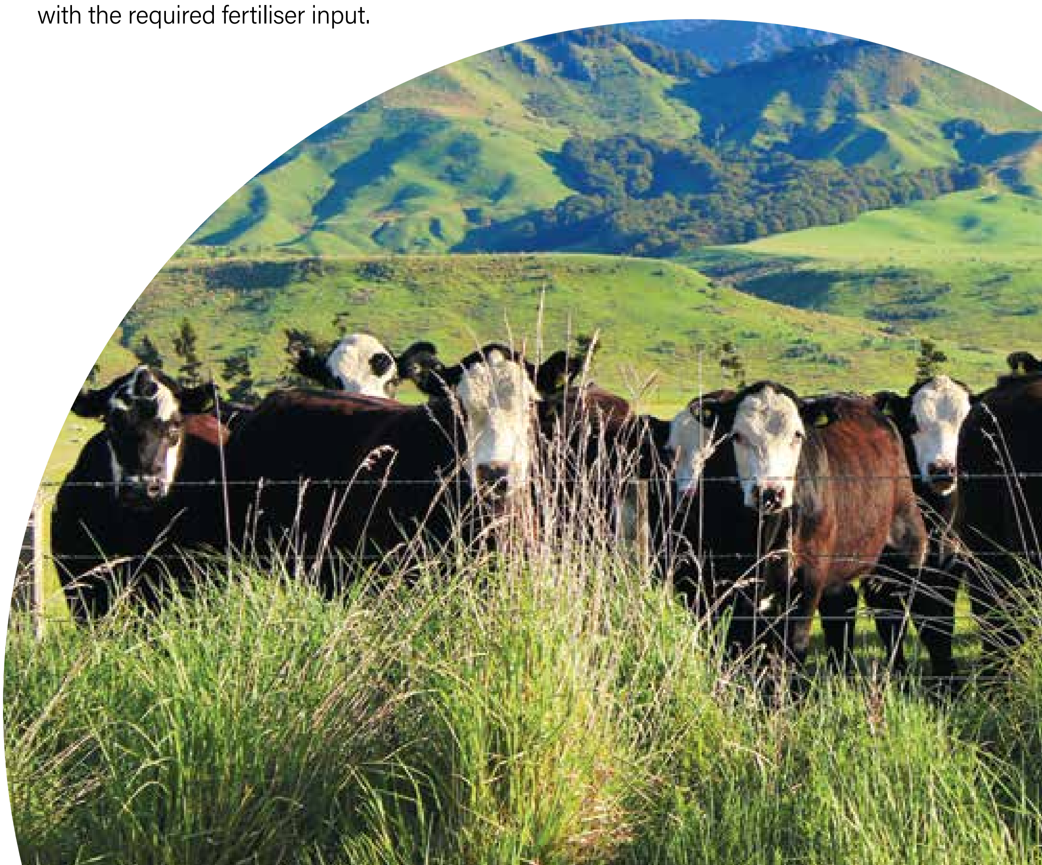
Possibly the biggest revelation was that beef systemisation doubled our farms' production and profit. There are many reasons for this amazing lift, but in essence the process of systemisation optimised the basic principles of the three big Ss – subdivision, stock policy and soil fertility. However, a few farmers hit a snag with declining performance following systemisation because they failed to support that extra production with the required fertiliser input.

As a gross generalisation every 100 kg of net carcase production must be supported with the maintenance application of 10 kg of elemental phosphate/ha (around 100 kg superphosphate or equivalent plus other elements as required). So, to sustain future production, if net carcase weight increases from 200 to 400 kg/ha, phosphate application must increase from 200 to 400 kg superphosphate/ha (or equivalent)

While there are amazing opportunities to increase production and profit, when it comes to meat production, it's not rocket science and there are no free lunches in relation to your fertiliser spend.

FOR MORE INFORMATION

Contact bob.thomson@agfirst.co.nz or your Ballance Nutrient Specialist.



Omarama Station field trial site

Deep lime for acid soil

By Daniel Hendrie, Dryland Pastures Research Group, Lincoln University

Can legume performance on acidic high country soils be improved by directly injecting lime into the subsoil?

Nitrogen (N) limits the productive potential of most high country sheep and beef farms, making legumes an important part of successful farming systems where fertiliser N use is limited.

Lucerne, a highly nutritious, deep rooted N fixing legume, has transformed some dryland high country environments, where low rainfall limits pasture growth. However, like many legumes, lucerne is highly intolerant of exchangeable aluminium (Al) which can reach toxic levels (>3 mg/kg) in soils with pH below 5.5. Aluminium toxicity restricts root growth, reducing nutrient and water uptake, and kills rhizobia, preventing N fixation.

High country soils are naturally acidic and liming soil to a range of 5.8-6.2 eliminates Al toxicity. However, in low rainfall environments lime is very slow to permeate deep into the soil profile, where Al can remain toxic.

In an effort to alter subsoil pH without inversive cultivation, researchers from Lincoln University teamed up with Flexiseeder Ltd to build a deep ripper that can directly inject lime into acidic subsoil. After initial testing, a series of 3 year experiments were set up at Omarama Station (Omarama), Glenmore Station (Tekapo), and The Dasher (Oamaru). Ripping to a depth of 30 cm at each site, pelletised fine lime was applied in concentrated bands behind the ripper tines at rates of 0 t/ha (ripping but no lime applied) up to 2 t/ha, alongside a conventional surface application of lime treatment.

At Omarama Station, deep application of the highest lime rate (2 t/ha) resulted in a doubling of lucerne dry matter production in the first 2 years of the experiment, and a tripling of it in the third. These yield responses were attributed to the 2 t/ha deep lime treatment increasing soil pH from 5.0-5.1 up to 5.8-6.0 and reducing Al from 6 mg/kg to less than 2 mg/kg at 20-30 cm depth. Smaller lucerne yield responses to deep liming were measured on the heavier textured soils at Glenmore Station and The Dasher.

Despite these successes, annual lucerne yields were lower than those of acid tolerant species grown at each site. Russell lupin was the most productive species at Omarama and Glenmore Stations, and at The Dasher it was French serradella. Across all of the sites, these species were not affected by deep liming, and were able to produce the same amount of dry matter regardless of lime application rate, highlighting their tolerance of low pH and high Al soils.

Hence, while increasing soil pH in high country soils by deep liming was demonstrated to increase lucerne growth it is a difficult process and higher yields were achieved by selecting legume species that are more acid tolerant and adapted to high Al soils.

With further development of machinery, deep liming may become a more effective, less costly practice. But for now, farmers are encouraged to utilise available acid tolerant legume species to provide quality feed and N for supporting pasture growth on areas where liming is uneconomic or logistically difficult to apply. Where practical, farmers need to have effective liming strategies in place to prevent soil acidification and increasing Al concentrations from becoming limiting to their legume production.

FOR MORE INFORMATION

bit.ly/42onSke

The lime ripper machine

Valuing mitigations

A Waikato demonstration farm has discovered the value of its environmental loss mitigations, thanks to MitAgator.

MitAgator

After investing in mitigations to better manage its losses to the environment, Owl Farm, a 160 ha demonstration dairy farm beside the Waikato River near Cambridge, wanted to find out the value of these mitigations.

"For the last 4 years, we've had quite a dedicated approach to reducing our environmental footprint, and at the same time we've looked closely at our business costs, which were about 15 to 20 per cent higher than our business as usual model. So we wanted to find out what we'd generated for our business – the value of our investment," explains Owl Farm Demonstration Manager Jo Sheridan.

The mitigations that had been implemented on the farm include constructed wetlands and fenced grass buffer strips along streams. Figure 1 provides a map of the already completed mitigations.

Ballance, an industry partner of Owl Farm, is involved in guiding and improving its farm management policies. To this end, Ballance Farm Sustainability Specialist George Hyauiason used MitAgator (see sidebar) to help Owl Farm identify the value of its existing mitigations.

As well as identifying critical source areas and the most effective mitigations to reduce losses, MitAgator can capture the value of completed mitigations. It does this by calculating the reduction in losses for nitrogen (N), phosphorus (P) and sediment, and the reduction in risk for *E. coli* losses.

On Owl Farm, sediment and *E. coli* losses pose a low risk overall, due to the primarily flat terrain and fenced waterways. Losses of N and P, however, are greater risks, especially due to the farm's free draining soils and connectivity to streams flowing directly into the nearby Waikato River.

Loss reductions achieved

MitAgator calculated existing mitigations on Owl Farm have resulted in an 8.5 per cent reduction in N losses (from 41.5 to 38.0 kg/ha/year). This reduction was achieved by fencing waterways, increased effluent pond storage and constructed and natural wetlands.

The areas of highest risk of N loss on Owl Farm are shown in purple on the MitAgator N loss risk map (Figure 2). These are effluent sprayed crop paddocks and an area next to the river on free draining pumice soil, prone to N leaching.

MitAgator calculated Owl Farm's mitigations have resulted in a 38 per cent reduction in P losses (dropping from 0.44 to 0.27 kg/ha/year). This reduction was achieved by using SurePhos, a slow release P fertiliser which can reduce phosphate loss by up to 75 per cent relative to superphosphate[1], increased effluent pond storage and fenced grass buffer strips along streams.

The MitAgator P loss risk map (Figure 3) shows the areas of greatest P loss risk (pink and purple) are steeper slopes. Moderate P loss risk areas (green) are on pumice soil or planted with summer brassica crops. This is due to the pumice soil's propensity to P loss, and the summer brassica crop area being vulnerable to soil compaction and soil and associated P loss.

A decision making tool

"We had been using Overseer as a model in the past, but it just gives you numbers. When you see your farm in an almost three dimensional model, it actually relates what you see to how you tangibly manage the land – it brings Overseer alive," says Jo.

Figure 1 **MitAgator map of completed mitigations on Owl Farm**

- Grass buffer strips
- Stream fencing
- Greater than 25 degrees slope
- Low solubility P
- Constructed wetlands catchment
- Grass buffer strips catchment
- Greater effluent pond storage
- Natural seepage wetlands catchment
- Stream fencing catchment
- Stream Fencing and Riparian Planting

"As a demonstration farm, MitAgator provides really nice visuals to help us talk about our strategies when we're talking to our farm team or others.

"MitAgator has helped us explain our investment to date, but we're looking forward to using it to understand future investment. MitAgator gives you a point in time historically but it's also a future planning tool. It's something we'll revisit when we're at a decision point. If we were to have a change in how we do things on farm, MitAgator would be one of those key tools we'd use alongside our other tools, like financial budgets and FARMAX feed modelling."

FOR MORE INFORMATION

Visit ballance.co.nz/mitAgator, or contact the Farm Sustainability Services team on 0800 222 090 or farm.sustainability@ballance.co.nz.

For more on Owl Farm visit owlfarm.nz. **See page 23 for more on 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

About MitAgator

Ballance's MitAgator service uses cutting-edge software to spatially identify critical source areas of environmental losses and find the best mitigations to reduce losses.

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

MitAgator produces detailed risk maps for your farm, showing where losses occur spatially, and identifying critical source areas across your farm. It then compares the cost and effect of different mitigation strategies so you can weigh up the alternatives and confidently choose an option that suits your situation.

Risk of contaminant loss

Very low   Low   Moderate   High   Very high

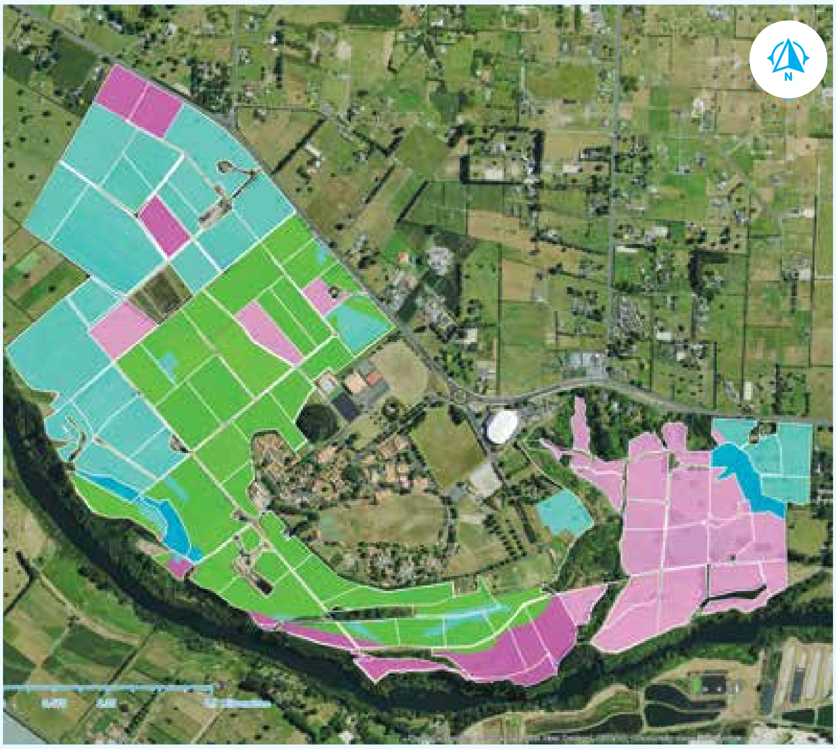


Figure 2 **MitAgator N loss risk map for Owl Farm from Ballance**

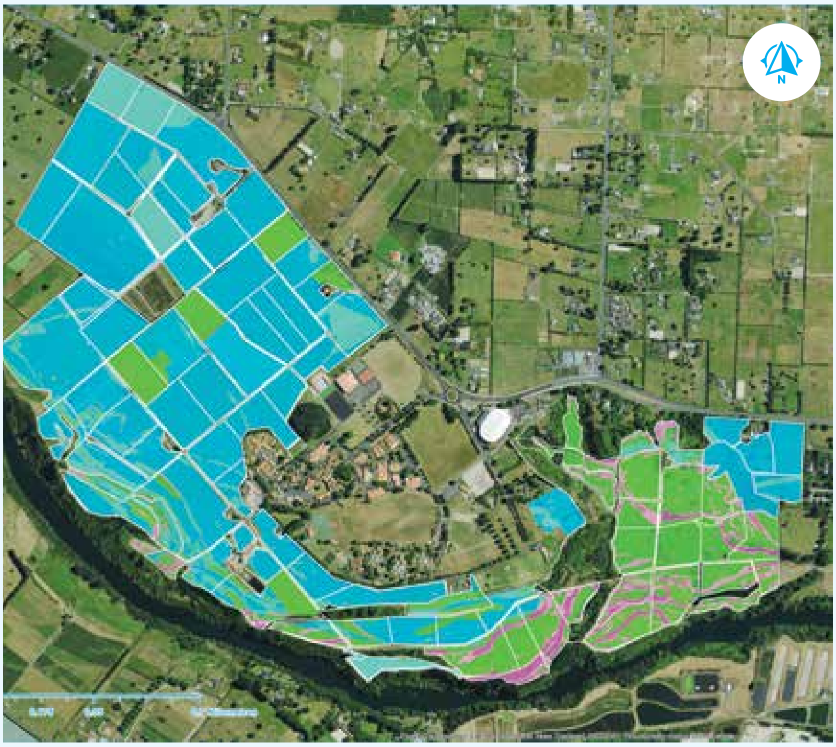


Figure 3 **MitAgator P loss risk map for Owl Farm**

Establishing maize

By David Densley, Senior Researcher - Maize, Foundation for Arable Research (FAR)

Research is underway to develop good practice principles for strip till and no-till systems for establishing maize.

A FAR long term on farm cover crop by maize establishment systems research trial. Four different cover crops are grown in winter, and three different maize establishment systems (cultivation, strip till, and no-till) are being assessed. This photo was soon after maize planting, and the green plots are the various clover by no-till and strip till treatments.

The projected increase in summer temperatures across New Zealand, coupled with the ongoing pace of yield gains from maize breeders will likely mean an increase in the area planted in maize.

Maize silage in particular is set to be grown on more farms. Along with its yield potential, its comparatively high starch content, low protein and relatively good digestibility make it an excellent complement to a pasture based dairy production system.

The deep rooting nature of a maize plant also allows the crop to pull water and nutrients from deeper in the soil profile. Recognising the value of maize to the arable industry, FAR has recently developed its five pillars of maize research programme, which includes further research into the use of strip till or no-till as an alternative to conventional cultivation systems.

This research, being undertaken at FAR's central North Island research site near Hamilton and on a number of farms throughout the Waikato, aims in part to identify good practice principles for strip till and no-till systems.

A number of research assessments are being undertaken, including maize emergence uniformity, plant spacing variability, total yield, forage and grain quality, and gross margin analysis between maize establishment system treatments. Winter cover or catch crops are also being assessed to better understand how they integrate with and complement the different maize establishment systems.

This research is about better understanding how to maximise productivity and profitability, improve systems resilience within climate change, and meet evolving environmental requirements. We have spent years refining cultivation practices to obtain a good maize crop, but little effort has been spent on identifying and developing good practice principles for a strip till or no-till system.

The evolution of strip till and planting equipment now provides the tools to better succeed when using these alternative maize establishment systems. But when transitioning from a conventional cultivation system, it is essential to use fit for purpose equipment and remain patient. The soil microbiome population and diversity are partly influenced by tillage practices, and it can take time for the soil microbiome to readjust when switching from cultivation to a reduced tillage system.

Year 1 (2021/22) relative maize yield results by maize establishment system are shown in Figure 1. The Corson Maize site is maize grain and all other sites are maize silage. The figures above each set of bars provide the average yield for grain (Corson Maize site) or silage (all other sites) across all treatments within the respective site. The Corson Maize, Dixon, Henderson and Jackson sites are in their first year of research, the Rawnsley site in its second year, and the FAR site in its sixth year.

The low no-till yields at the Jackson site, which has clay soils and has been in long term maize production, are mostly due to retained clover competing for water, coupled with the lower established maize population on the heavy setting clay soil. Strip till had the highest yield on three of the sites, and cultivation on the other three sites.

We learnt a lot of important information in the first year, and are excited to see the outcomes in the medium to long term. We look forward to sharing the journey and learnings with the arable industry as we investigate how NZ growers can successfully adopt and benefit from strip till and no-till practices.

FOR MORE INFORMATION

bit.ly/3CEoyay

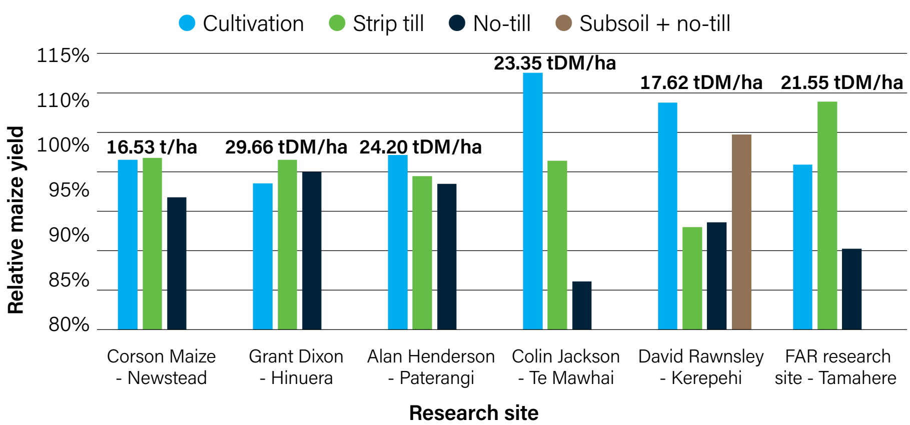


Figure 1 **2021/22 relative maize yield by site for different maize establishment system treatments. The maize production season in the greater Waikato included above average temperatures, increased evapotranspiration rates, and below average rainfall.**

Spreader calibration

Regular calibration of fertiliser spreaders helps you get more from your fertiliser spend.

Regularly calibrated spreaders apply fertiliser more accurately and evenly, providing both economic and environmental benefits.

"Spreading excess fertiliser that is poorly utilised by plants is an economic loss, and can also result in losses to the environment. But on the flipside, spreading inadequate amounts of fertiliser can result in reduced yields," says Ballance Nutrient Dynamics Specialist Jim Risk.

Calibration of equipment helps to achieve an acceptable application rate and distribution, and avoid variation in soil fertility and striping in crops and pasture, he says.

"A well calibrated spreader means the application rate set on the spreader closely matches the actual application rate." This is because the spinner speed and the feed rate onto the spinner are right for the product or mix being spread (generally based on bulk density of the product or mix).

The coefficient of variation (CV) expresses the evenness of fertiliser spreading (or how much the actual distribution of the fertiliser varies from the desired spread rate set on the spreader). A lower CV means a more even spread.

Spreading companies undertake spread testing to help calibrate a spreader and ensure the settings are correct for a particular product or mix. Products and mixes vary in how far they can be thrown (known as spread width or bout width) before the CV becomes unacceptably high and accuracy is compromised.

The Spreadmark Code of Practice (see sidebar) sets acceptable performance standards for spreading equipment. This is currently a maximum CV of 15 per cent for fertilisers containing nitrogen, and a maximum of 25 per cent for all other products. If the CV is higher than these values, the spreading accuracy is considered to be economically significant.

Figure 1 shows examples of spread testing results which can be used to calibrate a spreader.

The Good Farming Practice Action Plan for Water Quality identified 21 Good Management Practices and specifically mentions spreader calibration: 'Ensure equipment for spreading fertilisers is well maintained and calibrated'[1]. "This highlights the environmental significance of using a well calibrated spreader, in addition to the economic benefits," says Jim.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist or for more information on Spreadmark visit fertqual.co.nz.

[1] Good Farming Practice Governance Group 2018. Good Farming Practice Action Plan for Water Quality 2018

Choose Spreadmark

Look out for Spreadmark scheme registration when choosing a spreading company. This ensures their spreading machinery is certified and used by trained operators, and that quality management systems are in place so your goals as well as environmental sustainability are achieved.

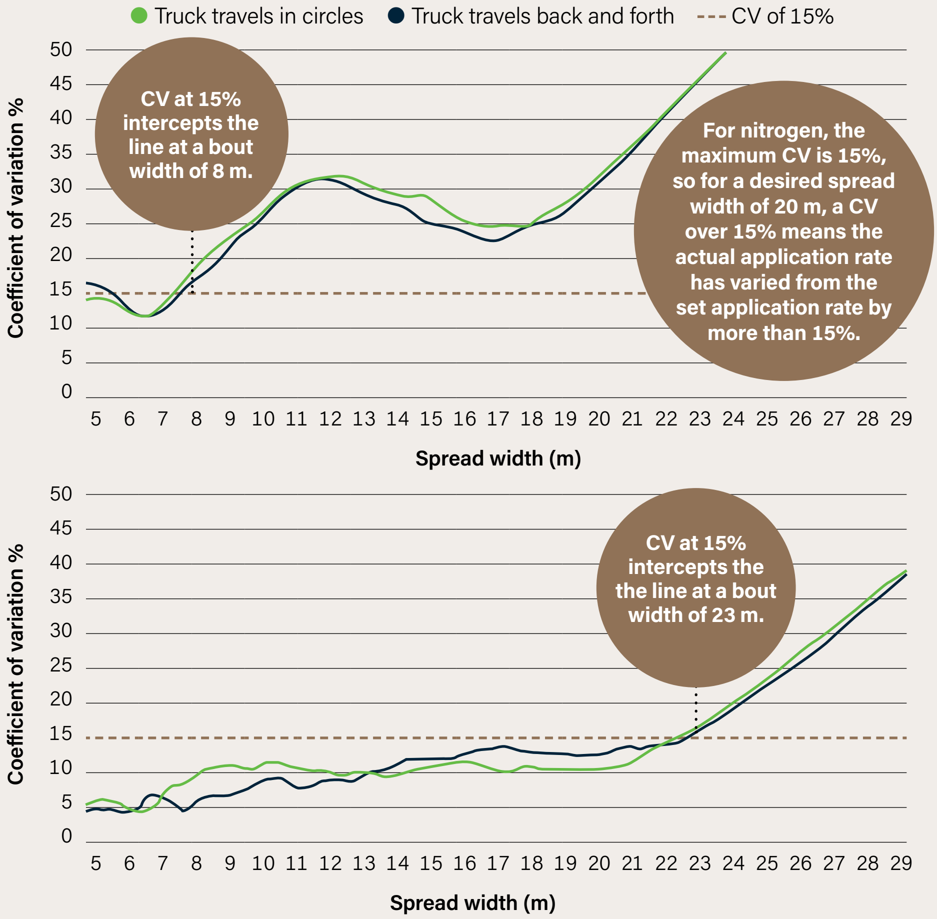


Figure 1 **Example spread testing graphs for a nitrogen product (maximum CV of 15%) for two different spreaders, showing a poor spread pattern - nitrogen will spread to 8 m (top) and a good spread pattern - nitrogen will spread to 23 m (bottom).**

The K conundrum

A recently completed trial has added to knowledge on achieving optimum potassium (K) levels.

Potassium is a tricky, but essential, nutrient.

While there is a lot of it in soil, most of it is not immediately available to plants. Soil organic matter doesn't store any K, and most of it is contained in soil minerals and released very slowly over time as they weather.

Production removes large amounts of K from the soil, so in many cases regular applications are required to replace it. Yet plants can also take up more K than they need (luxury uptake) which is a waste economically, and can potentially cause metabolic issues for grazing animals, particularly around calving. On the other hand, lack of K can easily limit clover growth which can affect longer term pasture production and quality, and nitrogen supply.

On sedimentary Brown soils, which cover 43 per cent of New Zealand, optimum K levels range from Quick Test K 5-8. A recently completed trial on a Te Anau sheep and beef farm has added to knowledge of K use by investigating how to achieve optimum levels on Brown soils, and the economic benefits of doing so.

In the 3 year trial, K (muriate of potash/MOP) was applied annually to replicated plots at 0, 25, 50, 100, 200 or 400 kg K/ha/year. All plots also received maintenance fertiliser annually to ensure no other nutrients limited production. At the start of the trial, the Quick Test K level was 3 across the trial site.

Herbage samples (for dry matter production) were collected through the growing season by mowing, with 50-60 per cent of clippings returned to the plot after each cut to simulate grazing returns. Potassium content (%) was measured in clover only samples. Soil analysis of Quick Test K levels was conducted annually at depths of 0-75 mm and 75-150 mm.

Achieving optimum Quick Test K

The application of MOP raised the soil Quick Test K from the initial level of 3, but in the first year only the two highest rates increased levels to the optimum range (5-8).

After 2 years (soil test year 3 data pending at time of writing), all MOP application rates (except for the 25 and 50 kg K/ha treatments) had raised Quick Test K to at least 5. Soil Quick Test K levels at 75-150 mm depth only notably rose at the highest application rates (200 or 400 kg K/ha).

Clover K

All treatments (except for 25 kg K/ha) notably increased the clover K levels, with the higher rates of MOP application achieving the greatest gains and rate of change. The three highest rates resulted in an immediate clover K of 2 per cent, compared to a year for the 50 kg K/ha rate to do so on average. The 25 kg K/ha treatment did not consistently increase clover K levels above 2 per cent.

Pasture yield and clover cover

Total cumulative pasture yield increased in line with MOP application rate (see Figure 1).

Compared to the control:

- after 1 year, yields on plots receiving the two highest application rates had the greatest increases
- after 2 years, yield on plots receiving 100 kg K/ha or more had the greatest increases
- by year 3 all treatments increased production by more than 20 per cent (except for the 25 kg K/ha treatment which resulted in a 9 per cent increase in pasture yield in year 3).

In year 3, as MOP application rate increased, estimated clover cover in trial plots also mostly increased compared to the control (see Figure 2).

Economic benefits

An initial economic analysis of the trial data showed that all treatments except 400 kg K/ha produced a positive net benefit for the 3 years of the trial, with the 50 kg K/ha treatment being the most economic across the 3 years.

Advice for farmers

In this trial, near maximum production was achieved between Quick Test K 5 and 7, which is consistent with the previously established recommended optimum range for K in sedimentary soils (Quick Test 5-8).

Fertiliser Association of New Zealand industry guidelines state that raising soil Quick Test K levels on sedimentary Pallic soils requires an average application of 125 kg K/ha to increase soil levels by 1 unit. However, this can be influenced by clay mineralogy, and unpublished work (Morton, pers. comm) suggests that lower rates are required on Brown soils.

Initial indications from this trial demonstrated that lower rates, more likely 50-60 kg K/ha above maintenance, were sufficient to raise soil Quick Test K levels by 1 unit on a Brown soil.

Despite the relatively shallow and stony nature of the trial site soil (Monowai silt loam), early spring applications of up to 50 kg K/ha did not provoke any significant K leaching within the soil depth measured (0-15 cm) over the first 2 years. At higher rates of application (200 and 400 kg K/ha), notable K leaching was seen across the first 2 years of the trial (and likely year 3, although this data is not available at the time of writing).

Low leaching levels may be a reflection of the moderate annual rainfall (1100 mm), medium CEC (20-25), good organic matter (12-15 per cent) and clay content in the topsoil (15-20 per cent in the top 25 cm). On this soil type, there appears to be little benefit from splitting K applications where rates are 50 kg K/ha or less.

As the risk of K leaching is low on these soils, the most appropriate strategy to manage Quick Test K levels would be to first raise them with a capital application of K, then maintain them with smaller, annual maintenance K applications. Good management practice can split initial high capital K inputs across 2 or 3 applications depending on the rate required.

In a real life farming situation, high levels of K are unlikely to be applied year-on-year; instead, an initial capital application would be followed by lighter maintenance rates, so the economic benefits are likely to be greater than those derived from this trial.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

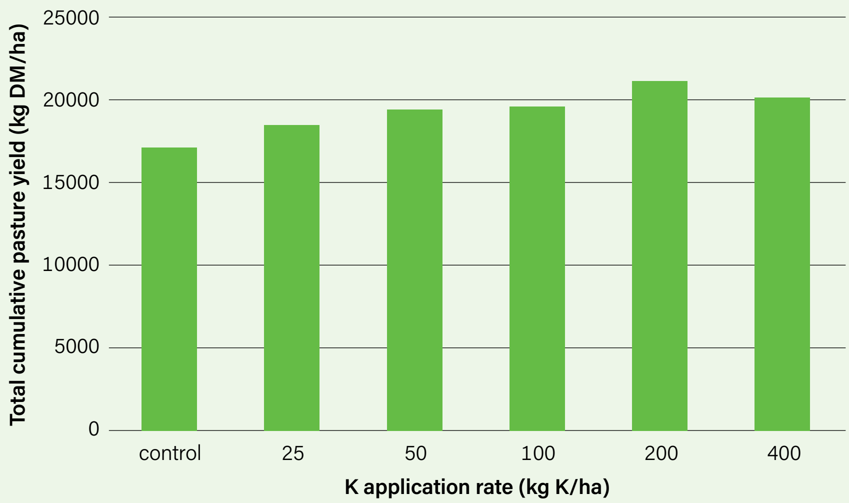


Figure 1 **Total cumulative pasture yield over 3 years**

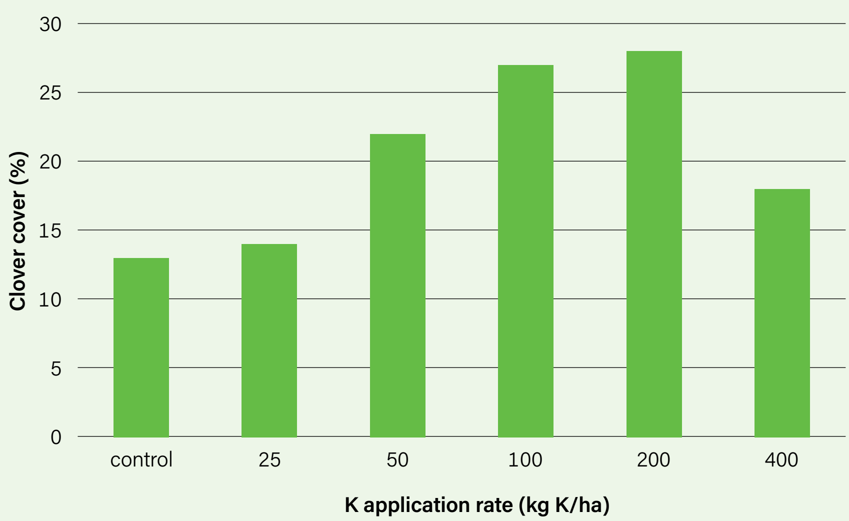


Figure 2 **Clover cover (averaged across the season) in year 3 of the trial**

Regenerative agriculture dryland experiment at Lincoln University

The regenerative reality

By Prof. Derrick Moot, Dryland Pastures Research Group, Lincoln University

Regenerative agriculture: just the mention provokes responses ranging from blasphemy to wide-eyed glee, often reflecting it means different things to different people.

Defining regenerative agriculture is the most important first step to determine if any disagreement is real. From a marketing perspective, the vagueness of the term is helpful. It sits alongside 'sustainable,' 'healthy' and 'quality' to evoke a positive psychological response but has little tangible meaning beyond the advertising hook. How regenerative agriculture is marketed to the consumers will most likely be determined by international food companies and be outside the control of NZ primary producers.

Once defined at the global level, I suspect NZ production systems will fit inside the tent or be easily adapted to meet the requirements. Whether any premium makes its way back to the farm gate is another question – the cynic in me suggests not, or not at a level that will make a substantial difference to farm income.

In New Zealand the Government has decided to hedge its bets. Spurred on by a primary producer advisory group who embraced the term about 3 years ago, MPI have invested heavily in research to identify what regenerative agriculture means to us. Indeed (disclosure) they have funded the 8 ha rainfed farmlet my Dryland Pastures Research Group is using for student research and education at Lincoln University (see photo). In our case the conventional system is lucerne for ewes and lambs in spring with cocksfoot and sub clover plus some winter feed, compared with our 'regenerative' multispecies-lucerne based pasture mix, both on high and low fertility areas and grazed for best management of each species (see photo). Our results will be put through the scientific standard of peer review publication with dissemination at field days and on our website (drylandpastures.com) to provide full transparency of what we are up to.

The science process is slow, and easily overtaken by faith-based ideas pumped up by social and mainstream media looking for a headline. To examine the scientific basis of regenerative agriculture requires a reductionist and holistic approach. Claims must be taken apart individually but within a system – which is why we ended up with a full farmlet experiment.

To define regenerative agriculture we went to the literature and specifically, the Rodale Institute of New York as published by Harwood in 1983. In summary they advocate for:

- high yielding crops produced free of agrichemicals
- increased soil productivity – depth and fertility
- soil genesis from upward flow of nutrients
- stable biological interactions – diversity of species
- no synthetic fertilisers
- self-reliant for nitrogen from N-fixation
- intimate relationship between farmer and farm
- animals free of hormones and antibiotics
- increased levels of employment.

In short, the idea is to be beyond organic (which does allow agrichemical use in certification). There are several areas and practices advocated with regenerative agriculture that we in New Zealand would consider best management practices. The high level of overlap means it is important to define exactly what is meant by regenerative agriculture before the hackles get too high. Conventional agriculture and regenerative agriculture would both advise:

- crop rotations
- cover crops
- minimum tillage – glyphosate use (?)
- controlled traffic for movement of machinery
- encourage soil organic matter for nutrient cycling
- minimize soil erosion
- use livestock in rotations.

Indeed, we can often find common ground. Regenerative agriculture has a strong emphasis on soil but there are some areas in which the ideas defy scientific credibility and that is where the strongest arguments can occur.

For example, regenerative agriculture promotes 'soil health' but this sits as one of those vague terms that can hide a lot. There is no evidence to suggest that a higher number or diversity of soil microbes (e.g. bacteria, fungi, free living microorganisms) leads to any greater soil function. Indeed, soils with high organic matter are prone to release more carbon dioxide as these bugs break down the sugars and respire. So adding organic matter, or humus to increase nutrient cycling or soil carbon in our predominantly pastoral soils is usually not required. Increased soil organic matter can increase soil carbon (permanently) in intensive cropping systems, as can introducing a pasture phase, but the soil will lose much of the carbon to the atmosphere the next time it is conventionally cultivated. In contrast in many hill country regions of New Zealand there is excessive carbon from browntop rhizomes and stolons and a thick thatch of dead material that is limiting nutrient cycling.

Equally, there is no evidence that nutrients move upwards from depth. It is sensible to encourage deep rooted species into any farm system and these can buffer against drought and the loss of mobile nutrients like nitrate and sulphate. However, most NZ soils are deficient in phosphorous and sulphur which need to be replaced as they are removed in products. The application of these nutrients has long been promoted by NZ agricultural scientists to encourage the growth of legumes that provide the nitrogen through fixation that drives our farm systems.

Having originated in the USA to combat intensive monocultural cropping systems, regenerative agriculture crossed the Atlantic to Europe. Here the proponents latched onto a desire for biodiversity in meadows. The Swiss led the research, in small leys that were never grazed. These areas are measured for their ability to attract insects, the diversity of plant species they retain and the rareness of those species. In New Zealand, many years of research have shown that our most productive pasture mix is two (grass and legume) or at most three (add a herb) species, with the addition of any more reverting to two to three dominant species within three years (see photo).

How regenerative agriculture shapes NZ agriculture will be defined by the experiments currently underway, and farmers' personal experiences of embracing some or all of the ideas. How it fares globally will very much be defined by the marketers. Over time I expect the words to become less emotive as we define what we mean. In future I suspect regenerative agriculture will sit alongside organic, grassfed and plant based proteins as another option for consumers – its longevity will depend on their willingness to pay.

FOR MORE INFORMATION

For more on the Dryland Pastures Research Group's work on regenerative agriculture visit bit.ly/3oQLrnQ

'Regenerative' multispecies-lucerne based pasture mix on high fertility area at the Dryland Pastures Research Group farmlet

Aerial view of experiment that showed two or three species is optimal for pasture mixes

Magnesium on wheat

Is magnesium (Mg) important for winter wheat yields and quality, and what's the best course of action if a deficiency occurs?

As wheat yields have increased over the years, more Mg has been removed from the soil, raising the question as to whether this impacts future yields and quality.

In wheat, Mg drives photosynthesis, protein synthesis and carbohydrate metabolism, so researchers have wanted to find out if a soil Mg deficiency could affect yield and protein content. Magnesium may also help water use efficiency.

Between 2003 and 2020, New Zealand wheat yields increased 60 per cent on average (from 7.48 t/ha to approximately 12 t/ha), due to improved cultivars and agronomic management. But as yields increased, so too did the amount of Mg removed from the soil, and anecdotal reports of Mg deficiency.

While wheat only requires a small amount of Mg which can usually be met by soil reserves, researchers wanted to know if low soil Mg levels could impact yield and quality.

What the science says

For most arable crops such as wheat, a soil Quick test (QT) of Mg > 10 has traditionally been considered sufficient. However, in research on Mg on winter wheat in 2001, even when Mg soil levels were relatively low (QT Mg of 3-4) applying Mg did not increase wheat yield or quality[1].

These results were echoed in a 2020 Mg trial, which assessed the timing (autumn/spring), type (slow/quick acting), and rate of Mg (0-75 kg Mg/ha) on yield and quality of winter wheat on soil with an average of QT 9 Mg (still below the optimum for arable production). The various Mg fertiliser treatments once again made no significant difference to yield or quality, but applying Mg fertiliser did increase Mg concentration in herbage[2].

The optimum herbage level for wheat is thought to be 0.10 to 0.16 per cent Mg, but in early spring in New Zealand it is not uncommon for Mg herbage concentrations to be below 0.10 per cent, generally due to wheat's slow uptake of Mg during the cooler weather.

Recommendations for Mg on winter wheat

When soil QT Mg levels are maintained sufficiently for other crops or pasture grown in rotation with wheat, Mg is unlikely to limit yield or quality of wheat, as wheat appears to be more tolerant of low Mg levels.

However, if farmers are concerned about a low winter wheat herbage Mg concentration they have two options. The first is to apply 50 kg Mg/ha in spring in the form of Kieserite.

Alternatively, 25 kg Mg/ha in the form of Serpentine Super can be applied in autumn and an additional 25 kg Mg/ha in the form of Kieserite in spring. Serpentine Super is 5 per cent Mg, and will also provide the phosphate and sulphur required by wheat.

Studies carried out by the Fertiliser and Lime Research Centre have shown Serpentine Super was still releasing Mg for plant uptake 30 months after application. Herbage from plots treated with Serpentine Super contained 57 per cent more Mg than herbage from control plots, indicating fertiliser Mg uptake by plants[3].

Other Mg fertilisers such as dolomite could also be considered in the autumn, depending on the cost-effectiveness of the Mg, and if liming is required.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

1 Craighead M 2001. Magnesium deficiency in crops and its relevance to arable farming in New Zealand - a review. Agronomy NZ 31: 2001

2 Brooker TP, Dawson AE, Field CG 2021. Does the timing and rate of magnesium fertilisers affect yield and quality of winter wheat? Agronomy New Zealand 51: 2021

3 Loganathan P, Hanly JA, Currie LD 2005. Effect of serpentine rock and its acidulated products as magnesium fertilisers for pastures, compared with magnesium oxide and Epsom salts, on a Pumice Soil. 2. Dissolution and estimated leaching loss of fertiliser magnesium, New Zealand Journal of Agricultural Research, 48: 461-71

Mythbusters

This regular column sheds light on some common misconceptions.

Myth

Soil organic matter levels in New Zealand's pastoral soils can easily be increased, improving soil health and productivity.

Truth

On the whole, New Zealand's pastoral soils have high levels of organic matter, and in many cases increasing the amounts already there may not be possible.

These soils' capacity to store additional organic matter is, beyond a certain point, limited. Soil organic matter is continuously being decomposed, and this natural process helps to maintain a balance between the input of organic matter (i.e. plant and animal residues) and outputs (i.e. carbon dioxide back to the atmosphere).

Soils in which it might be possible to increase organic matter levels (and its associated benefits) over time are likely to be continuously cropped, or in more arid areas such as Central Otago.

Pastoral farming adds organic matter (plant material and animal waste) to the soil. For example, research shows that nitrogen (from synthetic fertiliser or biological fixation from clover) boosts plant growth and production of dry matter, and therefore organic plant residues returned to the soil.

Myth

Silt from floods is high fertility.

Truth

The fertility of 'silt' (the term often used for flood sediment which may also contain sand, clay and gravel) depends on its source, but in most cases it is low fertility.

Studies on past flooding events in New Zealand indicate that unless flood sediment has come from a nearby fertile soil and been redeposited quickly, it is usually low in organic matter, nitrogen (N) and phosphorus (P). Flood sediment may also be low in sulphur and potassium, and its pH may differ to that of the paddock's original topsoil.

In one study, soil tests were conducted on sediments deposited after flooding in the lower North Island in February 2004. Overall, the soil test results showed that most of the silt had low levels of P, organic matter and available N, indicating little topsoil in the material[1]. These results are echoed in preliminary results from soil testing of sediment from flooding in Hawke's Bay earlier this year.

Because of its potential low fertility, soil testing flood sediment is essential, so fertiliser can be applied in accordance with soil test results to correct any deficiencies and support pasture recovery.

See page 5 for more information on soil testing and fertiliser application after flooding.

FOR MORE INFORMATION

Contact your Ballance Nutrient Specialist.

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

Ballance celebrates 40 years as New Zealand's only urea manufacturer

The contribution of Kapuni's ammonia-urea manufacturing site to New Zealand's agriculture sector was celebrated at its 40th anniversary earlier this year.

Located in Taranaki, the Kapuni plant is New Zealand's only ammonia-urea facility and produces nitrogen-rich fertiliser, GoClear and building adhesive.

A day of celebration held for the plant included lunch and a celebratory cake for staff and their families, past employees and guests of honour, face painting for younger visitors, and tours around the site.

Commissioned in 1982, the site was one of late Prime Minister Rob Muldoon's Think Big projects, which aimed to boost New Zealand's infrastructure and decrease reliance on imports.

It was envisaged the plant would help New Zealand's economy by exporting its nitrogen-rich urea product. However today, internal demand from New Zealand farmers and growers means that everything the plant produces is used domestically.

As well as supplying New Zealand's primary sector, the urea produced at Kapuni is used to manufacture industrial adhesives for wood processing and a fluid, GoClear, that reduces nitrous oxide emissions from diesel engines.

Ballance purchased the site in 1992, and has plans to reduce the plant's carbon emissions from manufacturing by 90 per cent in the next 10 to 15 years.

Urea produced domestically has a lower carbon footprint than imported urea, and international urea shortages have highlighted the critical importance for farmers and growers to have an affordable, reliable locally manufactured source.

For more information on the Kapuni plant see page 3.

Data sharing saves time on farm compliance

Ballance customers can spend less time on farm compliance by sharing their MyBallance fertiliser use data with Fonterra.

Ballance customers who supply Fonterra can now choose to have their nitrogen fertiliser data shared with Fonterra, to save time with end-of-year Farm Dairy Record reporting.

By using MyBallance to manage their farm's nutrients, Fonterra suppliers will be able to complete their fertiliser Farm Dairy Records with just one click.

"We recognise that it can be frustrating to enter the same information into multiple systems for different reporting needs, which is why we have worked with Fonterra to create a solution that streamlines the sharing of data between our two co-operatives," says Ballance General Manager Sales, Jason Minkhorst.

Opting into the data sharing means Ballance can send Fonterra information about the customer's Ballance product use on farm during the season. This will include the amount purchased per product, months of application, and maximum application rate (if known from using Ballance's nitrogen limit management tool and associated proof of application data).

The customer's Ballance data will then auto-populate their end of season Farm Dairy Record fertiliser reporting. "Our customers that opt-in to share their data can rest assured that their data will be available to be automatically populated, allowing them to focus on what matters most – running their farm," says Jason.

For more information and to opt-in to sharing your data with Fonterra for the season ahead, visit ballance.co.nz/Fonterra-Data-Sharing

Animal Water Plant Soil

Losing less P

A desire to further minimise phosphorus (P) losses to the environment has led a Southland farmer to SurePhos.

Alan Wells, who farms in Mokotua near Invercargill, started using SurePhos, a slow release P fertiliser which can reduce phosphate loss by up to 75 per cent (relative to superphosphate), when it became available in the South Island earlier this year[1].

About 20 per cent of the 200 ha farm on which Alan runs "primarily sheep with a handful of beef" is in the Waituna catchment, where nutrients, especially P, need to be carefully managed. The catchment includes the Waituna Lagoon, which provides habitat for a great diversity of flora and fauna, as well as food and recreation for the wider community. The rest of the farm runs into Duck Creek (Waimatua Creek), which eventually flows into the New River Estuary near Invercargill, which is also sensitive to nutrients.

Despite being flat, the farm's heavy clay soils mean reduced water infiltration rates and an increased risk of runoff and P (and sediment) loss. Alan has always been mindful of managing his farm's nutrient losses. "I've always used Serpentine Super so I'm conscious of P runoff," he says.

"As long as it's financially viable, it's good to be more efficient with nutrients." SurePhos has a higher concentration of P than Serpentine Super, so a lower rate can be used to apply the same amount of maintenance P/ha (see Table 1). As less product is needed, cartage and spreading costs will also be lower.

Alan also likes to apply "a bit of magnesium (Mg) for animal health" and the 4 per cent Mg in SurePhos (South Island) made it easy to continue doing this.

SurePhos also provides greater flexibility of use, and benefit to pasture and the environment. Over 75 per cent of the P in SurePhos is water insoluble which slowly releases, reducing P loss from runoff and leaching and giving pasture more opportunity to use it.

This makes SurePhos ideal for catchments such as those Alan farms in, where nutrient efficiency is a focus and P loss can lead to growth of aquatic weeds and algal blooms.

SurePhos and Serpentine Super

SurePhos has a higher percentage of P than Serpentine Super, so as shown below, a lower rate can be used to apply the same amount of maintenance P/ha.

Table 1 **Comparison of P content and cost of SurePhos (South Island) and Serpentine Super**

	SurePhos (South Island)	Serpentine Super
Phosphorus	8.3%	6.8%
Water soluble	23% or less	30%
Water insoluble (i.e. citric acid soluble)	Over 75%	70%
Cost of product*	$515/t	$460/t
Cost if applying maintenance P at 24 kg P/ha, for example	$149/ha	$162/ha

*ex GST as at 14 June 2023

[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

25489

FOR MORE INFORMATION

Visit ballance.co.nz/surephos or contact your Ballance Nutrient Specialist.

SurePhos

Ballance agri-nutrients

Together, Creating the Best Soil and Food on Earth

Together, reducing phosphate loss by up to 75%*

Now available in the South Island

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An effective and sustainable phosphate that is better for the environment.

*Relative to superphosphate products.

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