Ballance agri-nutrients

Together,
Creating the Best
Soil and Feed on Earth

Grow

North Island
Spring 2018

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 over 19,000 shareholders and sells around 1.7 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 most of the North Island.

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 Wanganui, 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

Phosphorus facts

Clarifying factors and processes behind phosphorus loss.

A common message about phosphorus is that it is very immobile in soils, hence recommendations to place it close to seed to avoid germinating plants having to 'hunt' for it. So why is phosphorus loss such a big issue?

The key reason is that aquatic environments can be extremely sensitive to even very small amounts of phosphorus. Increasing concentrations in the low parts per billion has led to high growths of algae in some waterways[1].

P losses from soil

Phosphorus can be lost from soil as:

- dissolved phosphorus, which is readily available to plants, including aquatic plants; and
- particulate-bound phosphorus, which can be:
  - » phosphorus compounds in soil particles (iron and aluminium phosphates in acid soils; calcium and magnesium phosphates in neutral to alkaline soils); and/or
  - » organic phosphorus in soils that contain a lot of organic matter (including manure and effluent) and nitrogen.

Particulate-bound phosphorus can enter waterways through erosion or in runoff containing fine sediment (including effluent runoff). It may not cause an immediate problem, as the phosphorus is not readily plant-available, but can be a long-term nutrient source for aquatic plants when it settles in still water bodies such as lakes.

Loss mechanisms

There are two aspects to the phosphorus loss 'risk picture.' The first is the availability of phosphorus, which depends on your soil's ability to retain the nutrient. If phosphorus is available for loss, then physical processes related to rainfall determine whether or not loss occurs.

Low intensity, high frequency rainfall drives P loss through subsurface flow.

High intensity, low frequency storms have more energy and drive loss by shifting P-rich topsoil as surface runoff. Surface runoff contributes more to annual P losses than subsurface flow.

Saturation (how much water the soil can hold) and infiltration (how quickly water can penetrate the soil) influence surface runoff losses. Poor infiltration will increase the potential of a high intensity storm to move soil particles.

P losses from fertiliser

Fertiliser often contributes less than 10% of total phosphorus loss from pastures, provided it is not spread too close to waterways and is applied two weeks before irrigation or heavy rainfall. However, if these guidelines are not followed then P losses from fertiliser can form the majority of farm P losses[2] – up to 80-90%.

The phosphorus in superphosphate is water-soluble and readily plant available. This is great for growing plants but if heavy rain follows application, surface runoff or drainage can cause a surge of phosphorus to enter waterways. The impact of this can be significant, especially when you consider that several farms in a catchment may be applying fertiliser at the same time.

Using less soluble products (like RPR Serpentine Super or dicalcic phosphate) can help where environmental impact, agronomic benefits, spreading practicalities and cost line up. Aside from that, it's a matter of using good land and stock management, along with best practice fertiliser application to minimise phosphorus losses.

[1] e.g. Biggs, B.J.F. (2000a) Eutrophication of streams and rivers: dissolved nutrient-chlorophyll relationships for benthic algae. Journal of the North American Benthological Society 19, 17-31.

[2] Hart, M.R., B.F. Quin, and M.L. Nguyen. 2004. Phosphorus runoff from agricultural land an direct fertiliser effects: A review. J. Environ. Qual. 33:1954-1972.

Phosphorus contributes to nuisance weed and algae growth in waterways.

Nutrients in a nutshell

A 'back to basics' look at the role of key nutrients for pasture.

In photosynthesis, the chlorophyll in green plants traps sunlight and uses its energy to combine carbon dioxide from the air with water from the soil to make glucose. Glucose is the plant's fuel. Chains of glucose form carbohydrates such as cellulose, which help form plant structures. However, plants (including those in pasture) need more than this to thrive and this is where nutrients come in.

N Nitrogen

Living things need nitrogen to make amino acids. These link to form proteins, which help build tissues. Chlorophyll contains nitrogen. In soil, organic nitrogen refers to nitrogen that is still locked up in organic matter (like crop remains or compost). As this decomposes, helped by microbes, the nitrogen is converted into plant available forms like nitrate and ammonium. In pasture and crop systems nitrogen is used as a growth multiplier to increase dry matter yields.

P Phosphorus

Phosphorus helps plants to respire (breathe), use water efficiently, utilise other nutrients, store energy and transport it to growing points. It's very important during germination, seedling development and tillering (as well as seed setting and ripening).

K Potassium

Plants need potassium to make proteins, starches and sugars and for many enzyme[1] functions. During leafy growth phases, plants need positively-charged potassium to balance the uptake of negatively-charged nitrogen. Potassium also controls stomata (pores on leaves through which plants breathe and release water vapour) and the intake of water through roots.

S Sulphur

Sulphur helps build amino acids and enzymes. It's also part of some vitamins, which help enzymes to work and protect cells from oxidation (which can damage or kill cells). While sulphur isn't part of chlorophyll like nitrogen, plants need sulphur to produce it. Plants like to take nitrogen and sulphur up in a roughly 12:1 ratio.

Mg Magnesium

Like nitrogen, magnesium is a component of chlorophyll. It also helps move the energy produced by photosynthesis through the plant.

Ca Calcium

Calcium is vital for root and tip development. It also strengthens cell walls and helps open and close the stomata in leaves.

Na Sodium

Sodium is used by plants to regulate water intake and pressure (similar to potassium). Plants are either natrophobes, which don't take up sodium (like Paspalum

[1] Enzymes are special amino acids, which trigger and accelerate vital processes within plants.

and Kikuyu) or natrophiles, which take up sodium and move it to leaves and stems (like ryegrass and white clover). Most of our soils contain sufficient sodium for plants and animals except some inland soils such as pumice soils. Very high soil sodium levels can lead to the breakdown of soil structure.

Micronutrients

In addition to the macronutrients (N, P, K, S, Mg, Ca and Na), plants need small amounts of certain micronutrients. Molybdenum (Mo) and copper (Cu) are the micronutrients most frequently applied to pasture to encourage clover growth and nitrogen fixation. Boron (B) is often added when planting forage brassicas to guard against diseases such as brown rot. Others like selenium (Se), cobalt (Co) and zinc (Zn) are sometimes applied to support animal health/production: plants don't need them.

Managing nutrient levels

We often talk about nutrient levels being deficient, optimal or in excess. Optimal, refers to the ideal level for plant growth and is usually expressed as a range (see Table 1).

If nutrient levels are in excess of this range, growth returns level off. Applying more is a waste of money as excess nutrients are not used by plants and may be lost from your soil through leaching or runoff. Excess of some nutrients can also interfere with a plant's ability to take up other nutrients it needs. For example, excess potassium can affect magnesium and calcium uptake and vice-versa; excess molybdenum can affect copper uptake.

If nutrient levels are deficient, then plant health and growth can suffer. Growth will usually be limited by the nutrient that is in shortest supply. In pasture, clovers are more sensitive to nutrient deficiencies than grasses, so a deficiency can impact on feed quality and quantity.

Excess and deficiency issues can have flow on effects on the health of grazing stock. For example excess potassium in soil can reduce plant uptake of magnesium and calcium leading to possible metabolic issues in grazing stock, especially in cattle.

Some advocate maintaining nutrients (specifically K, Ca and Mg) in a particular ratio to optimise plant growth. Research has shown this idea (known as the Basic Cation Saturation Ratio or 'balanced soil' theory) to be fundamentally flawed[2] and following it results in an ineffective use of fertiliser inputs.

Managing nutrients and pH within the target levels for maximum production is the recommended approach (see Table 1). These ranges have been extensively researched (and the soil tests well-calibrated) for New Zealand soils. Soil pH is important as if soil is too alkaline or too acid, nutrients can get 'locked up' so plants can't use them, even if they are in the optimal range.

Macronutrients not included in the table are:

- Calcium, as liming generally manages calcium levels.
- Nitrogen, as it should be applied when soil temperature and moisture levels are conducive to growth and there is a need for more feed.
- Sodium, as sodium levels are generally adequate for pasture growth.

Levels required for animal health/production may differ from those required to maximise pasture growth. Mixed pasture herbage tests show what nutrients are potentially available from pasture. Serum and tissue tests will confirm if the animals are absorbing sufficient nutrients or not.

[2] Kopittke, P.M. and Menzies, N.W. 2007. A Review of the Use of the Basic Cation Saturation Ratio and the "Ideal" Soil. *Soil Science Society of America Journal.* Vol 71, No 2, 259-265.

[3] Note clover-only herbage tests are used to determine micronutrient limitation on pasture growth. A mixed pasture herbage test is used to assess micronutrient intake for animal health.

For help managing nutrient levels in your pasture, talk to your Ballance Nutrient Specialist.

		Soil type			
Nutrient	**Test**	**Ash**	**Sedimentary**	**Pumice**	**Peat**
P	Olsen P	20-30	20-30	35-45	35-45
K	QTK	7-10	5-8	7-10	5-7
S	Sulphate-S	10-12	10-12	10-12	10-12
	Organic-S	15-20	15-20	15-20	15-20
Mg	QTMg	8-10	8-10	8-10	8-10
	pH	5.8-6.0	5.8-6.0	5.8-6.0	5.0-5.5 for raw peat or 5.8 to 6.0 for developed peat

Micronutrient	**Test**	**Critical level for deficiency**
Mo	Clover-only herbage test[3]	< 5 ppm
Cu	Clover-only herbage test	< 0.10 ppm

TABLE 1
Target nutrient and micronutrient levels for maximum pasture production

Getting it on

Broadcasting, drilling, foliar spraying or fertigation? What's the best way to apply fertiliser?

"The best method will be the one that puts the right product in the right place, at the right time and rate for your pasture or crop's needs to deliver the best growth and financial return," says Ballance Science Extension Officer Aimee Dawson. Each method has its characteristics and some are not clear advantages or disadvantages until they're seen in context. A method that can only apply fertiliser at low rates may be fine if that's all your farm needs but less effective if you need to apply capital rates. A method that requires specific equipment may be suitable if that equipment is already in place or accessible but costly if it's not. Some methods suit some products and not others.

If broadcasting is your preferred option, spreader calibration can help address one of its shortcomings. "Ensuring the spreader is well-calibrated for the product you are using will reduce the risk of uneven application and maximise bout width," says Aimee. "Different products will 'throw' differently depending on their bulk density, particle size and uniformity. A product with high bulk density and large, evenly-sized particles will have a greater bout width than a less dense product with an uneven texture. With a mix, the different components of the mix may throw differently."

Figure 1 shows what a difference calibration can make. To get calibration working for you, choose a Spreadmark certified contractor or use the resources developed by FarmWISE to calibrate your own spreader (see page 22).

Fertiliser application methods

Broadcasting: applying fertiliser by groundspreader or plane.

- Can apply over existing pasture/crops.
- Needs to be washed in with rain/irrigation (or cultivated in).
- May require/can handle higher application rate.
- Striping could occur if quality product is not used or spreader is not calibrated.

Banding/drilling: applying fertiliser next to plants or seeds.

- Improves phosphorus uptake (by placing it so plants don't have to forage for it).
- Optimal delivery of nutrients, especially for crop establishment.
- May require lower application rate.
- Risk of seed burn with some products (especially those including MOP).
- Need to use quality, non-dusty product with hard, consistent granule to avoid machinery blockages and uneven distribution.

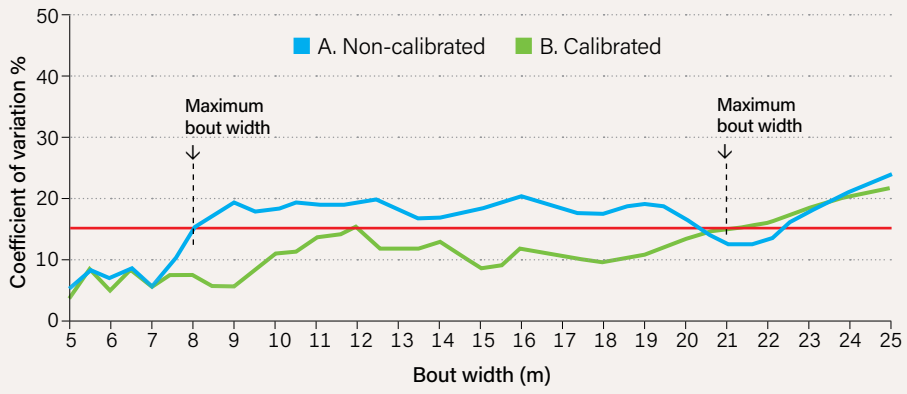
Foliar spraying: applying liquid fertiliser to leaves.

- Applies nutrients very evenly.
- Good for applying micronutrients (trace elements) to address severe deficiency.
- Can combine with fungicides to do 'two jobs in one.'
- Needs particular conditions to avoid loss (early morning, not too hot, no rain to wash application off leaves, no wind).
- Have to use low nutrient concentrations (to avoid scorching leaves).

Fertigation: applying liquid fertiliser to soil using irrigation equipment (e.g. effluent application).

- Can offer environmental benefits (e.g. when used to transfer nutrient value of effluent around the farm).
- Needs irrigation infrastructure.
- Needs products that you can inject into irrigation system.
- Uses low application rates.
- Can't apply fertiliser if it's raining or if soil moisture levels are at capacity.
- Can cause corrosion of irrigation equipment.
- Limited products available.

Figure 1. Impact of calibration on fertiliser spread



In this test PhaSedN was applied in a to and fro pattern, targeting a rate of 100 kg/ha.

When spreader settings were left as they were from the previous job the maximum bout width was 8 metres. Calibration (in this case increasing the spreader's disc speed from 900 to 950 rpm) increased the bout width to 21 metres.

No-till; no trouble

No-till farming offers huge benefits over cultivation.

As spring crops go in, large tracts of farmland go under the plough to the detriment of our soil assets. "Today there is really no sound, scientific argument for cultivation," says no-till advocate and Ballance Forage Specialist Murray Lane. "However, there are lots of myths about its advantages, which need to be de-bunked." Eventually cultivation will be seen as necessary only about 10% of the time.

MYTH 1: Cultivation stops soils from getting harder over time.

Soils under no-tillage do not become compacted. In fact the opposite is true. As soil organisms flourish, organic matter increases and the soil becomes easier to manage and pull the drill through.

MYTH 2: Cultivation helps aerate the soil.

Air is about 25% of a healthy soil. Cultivation effects soil structure, allowing compaction, reducing air supply to microbes. With cultivation, compaction and poor drainage exclude air and cause problems. Cultivation also kills the microbes that 'glue' soil particles into a friable crumb, causing fine particles to coalesce when wet or cake hard when dry. Improving drainage and/or building soil organic matter by encouraging microbes are better solutions for anaerobic soil.

MYTH 3: A clean seed bed is a good seed bed

Seeing plants spring up against a backdrop of bare soil is what we're used to but leaving plant residue is better for your soil and crop. Residues protect earthworms from birds, provide carbon for soil microbes and the next crop and retain soil moisture. Perennial weed control is achieved using herbicides.

MYTH 4: Cultivation allows seeds to be sown at a consistent depth

Cultivation levels the soil so that primitive drills can sow seed at a consistent depth. Drills designed to handle uncultivated soil, offer many advantages. The best no-tillage machines adjust for surface level changes.

MYTH 5: Cultivation maximises germination

Seeds get the water they need to germinate from contact with soil particles, which are damp from rain or irrigation and/or from air vapour in soil pores. In an undisturbed soil, pore air is at or near 100% humidity - perfect for germination. A good no-till machine will seal this humidity in with a mulch of surface residue.

MYTH 6: Cultivation makes it easier for seedlings to emerge

Untilled soil generally gives seedlings no trouble, unless the surface has been compacted by animals or vehicles. Note that with helicropping (aerial no-till) seed is placed on the surface (with N and P fertiliser).

MYTH 7: Cultivation kills weeds.

Cultivation buries and kills existing weeds but also prompts dormant weed seeds to germinate. If you don't disturb the soil, fewer weed seeds germinate, often only grass weeds.

MYTH 8: Cultivation reduces pest problems.

Cultivation does control slugs and snails, which need to be managed with bait in a no-till situation. However, cultivation also seriously depletes soil worm populations and the predators that control crop pests. In the early 1980s, AgResearch (MAF) identified that grass grub populations climb two to three years after cultivation due to reduced predator numbers.

MYTH 9: Cultivation improves infiltration

In a no-till situation, plants and residues on the soil surface reduce raindrop impact and slow down runoff, allowing more time for rain to soak in, meaning more soil water for the crop, for springs, and less soil loss. No-tillage leaves worms and other organisms intact, so there are more channels for water to travel through.

MYTH 10: Cultivation releases more nutrients from soil for growing seedlings

Cultivation does make nitrogen and phosphate available in the soil solution from the oxidation of organic matter (mineralisation). A good no-till drill makes up for this lack of mineralisation by drilling nitrogen and phosphate (e.g. DAP) near the seed. However, because cultivation often brings low fertility soil to the surface, starter fertiliser is still recommended, so this is not really a 'saving.' In addition, mineralisation uses nutrient reserves, which will eventually have to be replaced. The better option is to not disturb the soil in the first place.

Extreme no-till - helicropping is proving a successful way to establish crops on steep country.

Check your soil health

Visual Soil Assessment is an easy-to-use tool to help you diagnose soil health issues and inform management practices that will have long-term benefits for your land.

A fertile soil can still perform poorly in terms of pasture, crop and animal production and/or environmental benefits if there are issues with its physical state (see Key Soil Properties).

"Using VSA to assess your soil's physical state is a hugely beneficial complement to soil testing," says Jim. The method is easy, reliable and cheap, requiring little training, expertise or special equipment. "The only special resource required is the VSA field guide, developed by noted soil scientist Graham Shepherd, which provides scorecards, information and images to help you assess key bio-physical indicators of soil quality."

There is a guide for pastoral grazing and cropping on flat to rolling country and one for hill country. Both have a companion volume of soil management guidelines.

Indicators are underpinned by extensive research and are linked to economic performance. "The guide provides instructions and photos to help you determine your score as good, moderate or poor," explains Jim. "Once you have determined your overall rating, you can then refer to the relevant suggestions in the companion volume of Soil Management Guidelines to maintain or improve your score."

Soil indicators are generally independent of soil type. Soil type can influence the VSA score but you don't have to know the soil type to interpret what you see. "This means VSA can be used by anyone, you don't have to be a scientist or specialist," says Jim.

Guides also have indicators for plant performance. Plant scores will normally follow the soil score. If the two differ, it is usually due to weather or farm management practices. From an environmental management perspective, there are separate score cards to assess potential for nutrient loss into groundwater and waterways; potential for carbon sequestration and greenhouse gas emissions from either grazed or cropped land.

"As with soil tests, repeating the VSA process regularly can help identify soil health trends," concludes Jim.

Key Soil Properties

A. Soil structure

Good soil is friable with no significant clodding.

- Regulates soil aeration, storage of water, root penetration
- Poor structure results in:
  - More ponding and soil wetness, leading to increased nutrient and green house gas loss
  - Poor germination - waterlogging rots seeds, reduces soil temperature and excludes air
  - Poor response to fertiliser; plants can't fully exploit nutrients in soil
  - Reduced root penetration; poor emergence - soil crusts over; difficult for plants to break through
  - Reduced crop and pasture production - plants weakened by waterlogging are more prone to disease and pest attacks
  - Droughtiness and erosion, traffic damage

B. Soil porosity

Good soil needs a balance of large and fine pores.

- Controls air and water movement in soil
- Supports microbes; allows plant roots to grow and find nutrients

- Fine pores hold water; large macro-pores drain water
  - » Too fine = slow drainage leading to gleying
  - » Too large = rapid drainage and less available water

C. Soil colour.

Dark coloured topsoil indicates good soil drainage, aeration and organic matter turnover.

D. Rooting depth

Signs of a good root system

- A branching system of main roots
- Growth extends 0.5-1.0 m in depth
- White, healthy fine roots (<1-2mm) throughout topsoil

Signs of a poor root system

- Root system is horizontal, contorted or restricted to narrow zone
- Growth is shallow and clustered
- Fine roots are dead, lacking or only in the surface soil

E. Soil mottling

The more and coarser the mottles, the poorer the structure.

F. Earthworm numbers

The more earthworms, the better the structure.

G. Soil surface relief

The more broken and rough (from treading and trampling), the poorer the structure.

Figure 1: Visual indicators used in VSA to assess soil structure

GOOD CONDITION VS = 2

Soil dominated by friable, fine aggregates with no significant clodding. Aggregates are generally sub-rounded (nutty) and often quite porous

MODERATE CONDITION VS = 1

Soil contains significant proportions (50%) of both coarse clods and fine aggregates. The coarse clods are firm, sub-angular or angular in shape and have few or no pores

POOR CONDITION VS = 0

Soil dominated by very coarse to massive clods with very few fine aggregates. The clods are very firm, angular or sub-angular in shape and have very few or no pores

Get your guides

VSA guides and soil management guidelines can be purchased by emailing gshepherd@bioagrinomics.com and through some regional councils.

Free PDFs can be downloaded from the Landcare Research website (www.landcareresearch.co.nz/publications/books/visual-soil-assessment-field-guide).

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Mitigating N loss

How do you identify drivers of nitrogen loss on your farm and what are the most effective ways to address it?

"Nitrogen fertiliser is often seen as main cause of nitrate leaching but in reality it only has a small direct effect on nitrogen loss," says Ballance Nutrient Dynamics Specialist Jim Risk. "It can contribute if it is applied in the wrong place, when soil is overly wet or extremely dry and if plants are not growing but these are all avoidable scenarios. Animal urine is the most significant source of nitrogen loss. Leaching from urine patches can make up to 80% of nitrogen losses to water on a dairy farm."

Indirectly, nitrogen fertiliser contributes to this by generating more feed, which can support higher stocking rates. However, if you are looking to decrease your nitrogen loss to meet regulatory limits and are following good management practice when applying nitrogen, it's probably not the first place to start.

You need to take a whole farm view and analyse carefully where action will have the greatest impact. "Reducing stocking rate can be the most effective strategy but is generally the least appealing, due to the impact on production," says Jim. "However, there are other ways you can control the amount of nitrogen in animal urine and the amount that hits your pasture."

"Reducing the protein content of supplementary feed, using feed pads and herd shelters, timed grazing and wintering stock off-farm are all possibilities. Some of these strategies require you to collect effluent and you then need to think about how to manage its application to pasture or you can be back where you started. Matching the rate of application to the area and soil type is important to avoid loss via overland flow or bypass to drains. Exporting it off farm to one that needs its nutrient value is also an option. Just remember that you're not just exporting nitrogen when you do this but lots of potassium and smaller amounts of phosphorus and sulphur."

Feed budgeting is an important piece of the puzzle. Doing this well helps efficiently manage the need for supplementary feed and nitrogen fertiliser. "Research is constantly providing new options, such as alternative pasture species like plantain or the use of fast-growing spring crops to mop up surplus nitrogen from winter grazed forage paddocks before it drains."

"Each farm is different and not all mitigations will suit all farms. Several may be needed to meet your nitrogen loss targets. Professional advice is definitely worthwhile, especially before investing in infrastructure or making farm system changes."

For more information talk to your Ballance Nutrient Specialist or our Farm Sustainability Services team.

Nitrogen leaching Q&As

Q Can I reduce leaching by improving drainage with mole, tile or open drains?

Improving drainage in this way may offer some benefits for your farm but reducing nitrogen leaching is not likely to be one of them. Drains take water away from plants very quickly, often before they can take up any nitrogen from it. They also reduce attenuation (the process which binds nitrogen to other materials that don't leach). As a result more nitrogen can go directly into waterways, increasing your nitrogen losses to water.

Q Is little and often always the best approach? How little is little?

Applying nitrogen little and often does help plants use nitrogen more efficiently. Research has shown that the growth response to nitrogen is generally consistent to around 50 kg N/ha. Above this point the response rate decreases and the cost of the dry matter produced per kilogram of nitrogen increases.

Q How does irrigation affect nitrogen leaching?

Irrigation can indirectly improve soil water holding capacity by building soil organic matter, which can reduce the risk of nitrogen leaching. Over watering could increase drainage and nitrogen leaching risk/loss. See page 12 for more on this topic.

Q What about different products? Will DAP leach less than urea?

Form is an issue for losses to air (ammonia volatilisation losses) but not leaching losses. Soil and growth conditions and application rate determine the risk of leaching from nitrogen fertiliser. The exception is slow release nitrogen. Plants require a slow, steady source of nitrogen, so an effective slow or controlled release nitrogen product could better meet plant needs and minimise leaching losses, especially where they are more likely (e.g. in winter or in high-rainfall areas). Smartfert is a slow-release nitrogen

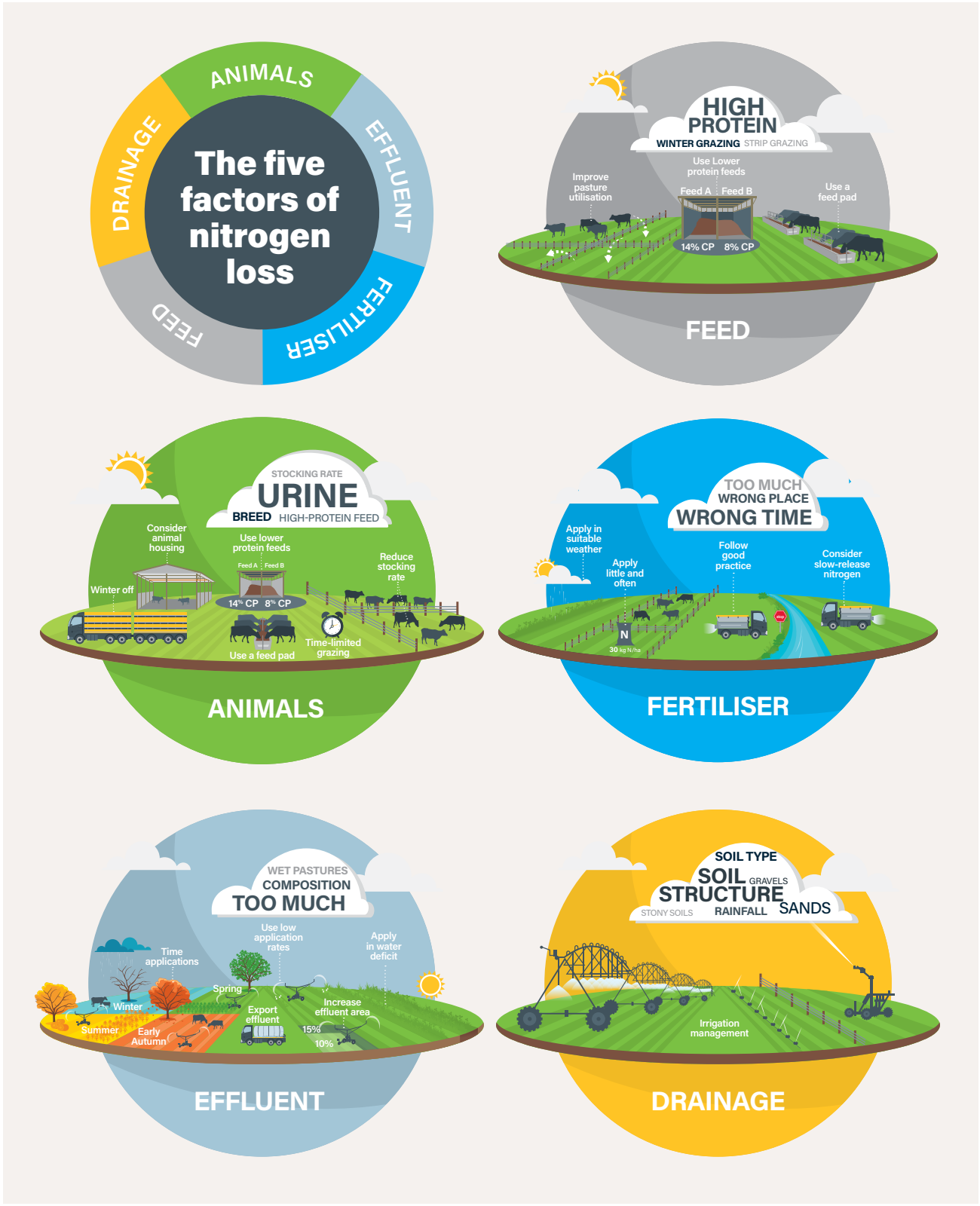
product available through Ballance for those who feel it is a viable option.

What is the limit for nitrogen application?

For a typical rye grass/white clover pasture, 200 kg N/ha/year is the practical limit for nitrogen fertiliser application. Anything higher starts to favour rye grass growth over clover, making less N available through natural N fixation and reducing feed quality. However, exact limits for nitrogen application vary according to what region you are in and the rules and consent conditions around nitrogen. Rules may have a specific limit for N application via effluent and you need to take this into account before applying fertiliser N to remain compliant.

If I winter my stock off farm or export effluent to reduce my leaching risk, aren't I just transferring the problem somewhere else?

Not if the destination property has factored in the impact and is complying with relevant regulations. If in doubt, ask.



PLANT

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Irrigation and nitrogen

Well-managed irrigation can improve plant growth and nitrogen uptake.

Irrigation has received a lot of negative press as it has been associated with intensification of pastoral land and increased nutrient losses, particularly nitrogen losses due to higher stock numbers. "High stocking rates can increase the potential for nitrogen loss," says Ballance Science Extension Officer, Aimee Dawson. "However, efficient irrigation can improve nitrogen utilisation. The key word here is efficient. The system needs to be well designed, managed and maintained to avoid ponding, which could contribute to nutrient leaching. Irrigation NZ has some good guidelines, including a bucket test app to help with annual testing."

How irrigation improves N uptake

It makes it easier to apply the right amount of nitrogen

Irrigation ensures that the plant is actively growing. "Removing this variable, and knowing how much nitrogen is available from the soil, allows you to more accurately estimate how much is needed from the bag at each growth stage, minimising waste and potential loss," says Aimee.

FAR research demonstrated that a dryland wheat crop needed 7 kg/tonne more nitrogen to optimise yield compared to an irrigated crop[1]. Often this extra 'insurance' nitrogen is not well-utilised, due to unfavourable soil and growing conditions and can then be leached by rainfall.

It improves soil water holding capacity

FAR research has also shown that irrigation increases soil carbon, regardless of how the crop is established. This in turn improves the soil's water holding capacity, which reduces drainage and potential for nitrogen leaching.

Trials at FAR's Chertsey site, showed that irrigation could achieve a 3% increase in water holding capacity, meaning soil will hold an extra millimetre of water at field capacity[2]. If there are 10 rainfall events per year where soil moisture exceeds capacity, that would mean 10 mm less water lost in drainage. Assuming average nitrogen loss from drainage is 0.5 kg/N/mm, that could stop 5 kg/N/ha being lost to groundwater[3].

It improves establishment

Irrigation promotes earlier/faster germination and growth. Building cover quickly reduces the risk of water or wind erosion and the loss of phosphorus in sediments but also means earlier development of an extensive root system and ultimately bigger plants, factors that increase uptake of nitrogen, which might otherwise be susceptible to leaching.

It can reduce volatilisation losses

You can use irrigation to apply the vital 5 to 10 mm of water within eight hours of urea application that reduces nitrogen loss to air from ammonia volatilisation. However, it still pays to consider using SustaiN, especially given the minimal cost difference. "There are still some variable factors with irrigation, for example a warm wind might evaporate some of the water. And in a pastoral context you have the practical challenge of lining up grazing, urea application and irrigation application. SustaiN gives you much more flexibility than urea."

1 www.far.org.nz/articles/986/irrigation-is-good-for-the-environment.

2 The amount of soil moisture or water held in the soil after excess water has drained away..

3 In an industry-led project measuring nitrogen concentration in drainage water, the average drainage figure from across three irrigated farms in Canterbury over two and a half years, was approximately 13mm/year and the average nitrogen loss was 6.7 kg/N/ha or 0.5 kg N/mm leached.

Supporting sound science

Every time you buy fertiliser from Ballance you help support the future of New Zealand farming.

Research, development and extension are important cornerstones of our business. "It's aout delivering value to our farmers and contributing to best practice nutrient management," says Ballance Science Extension Manager Ian Tarbotton. "We want to help farmers get the best from their land in a sustainable way; to improve efficiency by building capability and encouraging best practice based on robust science relevant to New Zealand farming conditions."

The Sustainable Farming Fund (SFF) administered by the Ministry of Primary Industries is one way we do this. "SFF has a focus on applied research and extension," says Ian. "It's not just about answering the question, it's about getting the answer out into the farming community and putting it to work." SFF projects encourage collaboration between researchers, industry organisations and end-users, which means the problem gets examined from a variety of angles and there is a strong emphasis on practical, 'real world' solutions." The team approach and government contribution (up to 80%) also stretches our research investment further.

Current SFF research collaborations	Time until complete
Can lime applications help to reduce Black Beetle numbers?	6 months
Are alternative legumes (like annual clovers) useful in Northland pastures?	1.0 years
How do you manage nitrogen and phosphorus loss in peat soils?	1.5 years
How do nitrogen, potassium and boron rates and fungicide strategies influence fodder beet yields?	1.5 years
Can detention bunds reduce sediment and phosphorus loss?	1.5 years
Can deferred grazing benefit soil microbes, moisture and pasture longevity in hill country?	2.5 years
Can optical sensors be calibrated to improve nitrogen fertiliser applications?	3.0 years
Can catch crops reduce nitrate leaching from winter forage grazing?	3.0 years
What more can we find out about establishing and managing tagasaste[1] on hill country?	3.0 years
How can we manage nutrients/mitigate losses to future proof vegetable production?	3.0 years
What are the best management practices for hill country helicropping?	3.0 years

Interest in fodder beet has prompted Ballance to enter research collaborations focused on improving yields in a New Zealand farming context.

Other research projects (non SFF)	Time until complete
What is the impact of rates and timing of potassium application on spring-sown wheat with low QTK and high TBK[2] sites?	Complete
Is there a difference between fine particle nitrogen and granular nitrogen applied at the same rates and times?	Complete
Woodlands, Southland pasture growth measurement monitoring	1 year
Can we change soil pH in peat at depth without cultivation?	3-4 years
What are the best fertiliser, lime and legume mixes for Banks Peninsula?	2 years

[1] Also known as tree lucerne (Cytisus proliferus) but not to be confused with normal lucerne (Medicago sativa), tagasaste is a high-protein feed, which thrives on steep, erosion-prone land.

[2] QTK is readily available potassium. TBK measures reserve potassium.

SpreadSmart™ savings

Improving the accuracy of aerial fertiliser application delivers financial and environmental benefits for hill country farms

Farming in hill country presents many challenges but SpreadSmart™ is addressing a few of them. "Aerial application is often the only practical option for getting fertiliser efficiently onto hill country farms," says Precision Agriculture Specialist, Ollie Knowles. "The traditional downside has been limited control over where the fertiliser is or isn't applied. Applying maintenance and capital rates to different paddocks in the same flight used to be hugely challenging. But developments in GPS and GIS[1] technology have changed the aerial topdressing game completely."

The result of one of Ballance's Primary Growth Partnership research investments, award-winning SpreadSmart™ is available in two of our Super Air planes (with further conversions in the works), making variable rate aerial topdressing available to customers throughout the North Island.

To take full advantage of variable rate application you do need to understand the variability of soil fertility on your farm. "However, it is possible to do this without adding hugely to your sampling costs," says Ollie.

Tables 1 and 2 refer to a case study on a Northland hill country farm, where information from all paddock testing was used to define application rates. "All paddock testing is more intensive than monitor paddock testing [see page 16]. However, it was known that the farm had high nutrient variability, which suggested potential for tailored fertiliser application to deliver cost savings without compromising growth."

As well as saving money (over $33,000 in the case study), tailoring inputs more precisely to soil/farm needs can reduce the risk of nutrient losses. "This makes the technology particularly valuable to farmers in vulnerable hill country catchments, where regulations are increasingly focused on nitrogen and phosphorus loss," says Ollie. "As well as reducing risk by applying nutrients in a targeted, efficient way, you can define exclusion areas, such as waterways, bush blocks or erosion-prone slopes to further enhance the environmental benefit and avoid the waste and cost of applying fertiliser where you don't need it."

To take advantage of this leading-edge service, contact Super Air or your Ballance Nutrient Specialist.

[1] GPS stands for Geographic Positioning Systems and GIS for Geographic Information Systems.

	pH		Olsen P	
	Average	Range	Average	Range
Traditional	5.6	5.5 to 5.8	7.3	6 to 9
All paddock	5.8	5.3 to 6.4	15	6 to 49

TABLE 1 Traditional and all paddock testing results on a Northland hill country farm

	Traditional	All paddock
Lime	$18,554	$5,270
Fertiliser	$37,917	$11,721
Soil testing	$195	$5,915
TOTAL COST	$56,666	$22,906

TABLE 2 Lime and fertiliser costs based on traditional and all paddock testing results on a Northland hill country farm

How SpreadSmart™ works

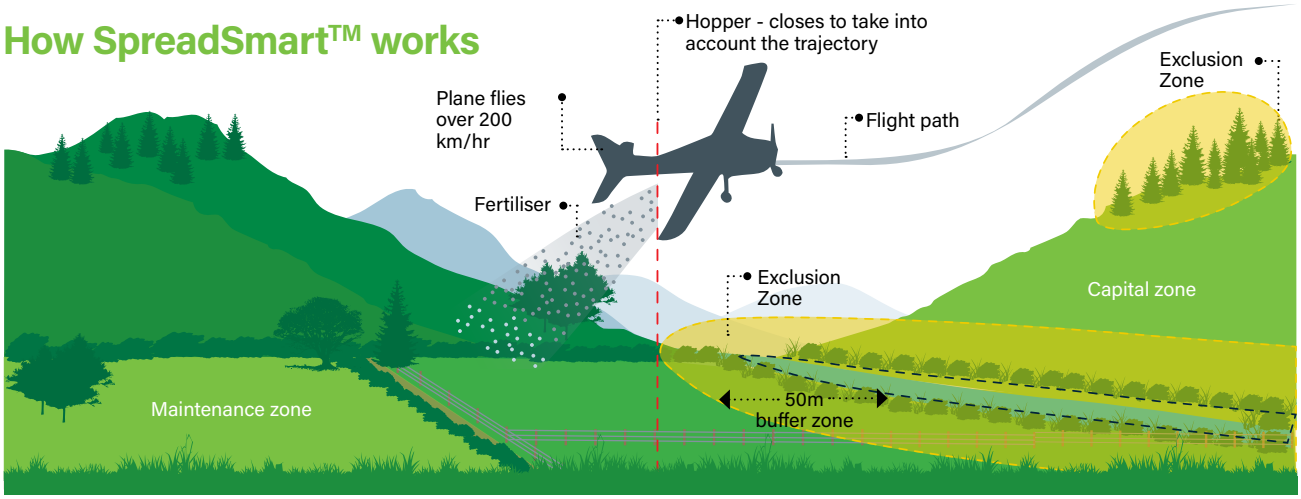


FIGURE 1 SpreadSmart™ controls the hopper using a computer pre-loaded with a digital map of the farm, specifying spreading areas and rates. A GPS tracking and guidance system pinpoints where the plane is and where the fertiliser needs to go. Different rates can be applied to different areas in a single flight.

Sweeten it up

PLANT

SOIL

Spring is often lime time. Here are ten tips for lime/pH management.

1. Clover/ryegrass pasture production is optimised on mineral soils at pH 5.8 to 6.0. On peat soils the range is lower - pH 5.0 to 5.5. Mineral soils contain more aluminium than peat soils and this becomes available to plants at low pH levels. Aluminium is toxic to plants and stunts their growth.
2. It takes one tonne of agricultural lime (calcium carbonate) per hectare to increase soil pH by 0.1 units (e.g. from 5.7-5.8).
3. It is the carbonate in lime (not the calcium ion) that reduces soil acidity, increasing pH. Good quality agricultural lime contains about 80-90% calcium carbonate equivalent.
4. Lime takes 12 -18 months to take full effect. However, agricultural lime contains a range of particle sizes with enough fine particles to have some impact on soil pH within six months. The coarser material means the effect of liming lasts a long time (usually three to five years).
5. Fine lime can induce a quicker change in pH than coarse or medium grade lime but it does not result in a bigger change in pH. Nor does it matter whether the rock used is hard or soft. Fine lime is more expensive than agricultural lime and not suitable for aerial application. Be wary of liming products that claim to achieve better results at a lower application rate. Chemically, this is just not possible. Choose a Fertmark registered agricultural lime product for best results.
6. The processes that cause soil acidity to increase happen whether you use organic or conventional farming methods. Soil may acidify more quickly on a high-input, intensive farm system.
7. Liming is a factor in nitrogen management as it increases soil biological activity, which releases nitrogen from soil organic matter.
8. If lime is applied at heavy rates (> 2.5 tonnes/ha) in early spring, watch out for hypomagnesaemia as ingested lime can suppress magnesium utilisation in animals.
9. On hill country (particularly if using aerial application) it is usually only economic to lime when soil pH is less than 5.5. Even then, if the Olsen P is less than 15 you will typically get a better return from applying phosphorus (and sulphur) than lime. Dicalcic phosphate (lime-reverted superphosphate) is another option to consider (see Autumn Grow 2018).
10. If you do not need to adjust soil pH, do not be persuaded that you need to add calcium to your soil. New Zealand's soils and pasture are rarely calcium deficient due to the age of the parent soil material. Where calcium deficiencies occur in animals it is usually due to something affecting their ability to mobilise/use calcium reserves, not a problem with pasture or soil.

Strategic sampling

How do you decide which soil sampling approach is right for you?

With more GPS-driven, variable rate application technology coming available (including aerial topdressing solutions like SpreadSmart™), there is an increasing focus on soil sampling techniques.

"Information from your soil testing programme provides the guide for variable rate spreading, so is the key to getting the most out of it," says Ollie Knowles, Ballance Precision Agriculture Specialist. "However, you don't want to over-invest in sampling or it will cancel out the financial benefits of applying fertiliser or lime at a variable rate."

Traditional soil sampling (or monitor paddock sampling) selects and tests monitor paddocks that represent land management areas across the farm. It is the simplest and cheapest strategy but can sometimes result in over or under estimating soil fertility levels.

All paddock testing (APT) identifies each paddock's soil fertility allowing tailored recommendations, sometimes paddock specific ones. The greater the variance between paddocks, the larger the return on your investment. The key to APT is to identify a variation in the first place to justify the higher soil sampling investment.

Grid soil sampling requires Geographic Information Systems (GIS) and Global Positioning Systems (GPS) technology to accurately map soil sampling locations and create prescription maps for fertiliser spreading that can respond to variation of soil fertility within the paddock. There are two methods of grid soil sampling, cell sampling and point sampling (see Figure 1).

Directed sampling (also called zonal sampling and targeted sampling) uses information such as management history, yield maps, soil maps and soil properties to define zones where growth/yield limiting factors are likely to be similar. Unlike traditional sampling or APT it can define in-paddock variability but it requires less samples than grid soil sampling.

"The degree of variability in soil fertility and value of your crop should determine which approach is best for you," says Ollie. The flowchart in Figure 2 is a helpful guide.

For help designing a soil sampling strategy for your farm, talk to your Ballance Nutrient Specialist.

References

Knowles, O. & Dawson, A., 2018. Current soil sampling methods - a review. In: *Farm environmental planning – Science, policy and practice.* (Eds L. D. Currie and C. L. Christensen). http://flrc.massey.ac.nz/publications.html. Occasional Report No. 31.

Dawson, A. & Knowles, O., 2018. To grid or not to grid – a review of soil sampling strategies. In: *Farm environmental planning – Science, policy and practice.* (Eds L. D. Currie and C. L. Christensen). http://flrc.massey.ac.nz/publications.html. Occasional Report No. 31.

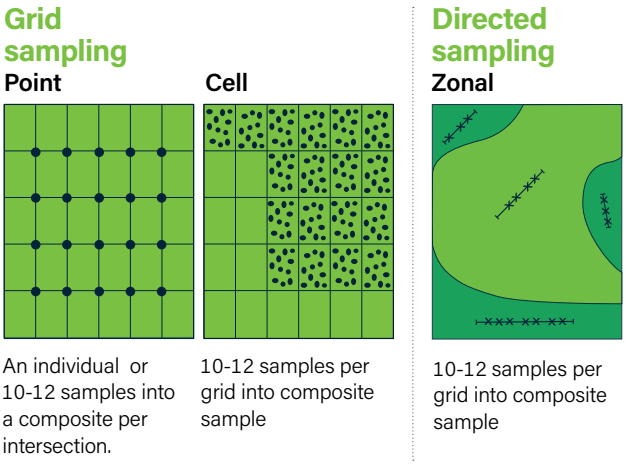


FIGURE 1 Grid and directed sampling

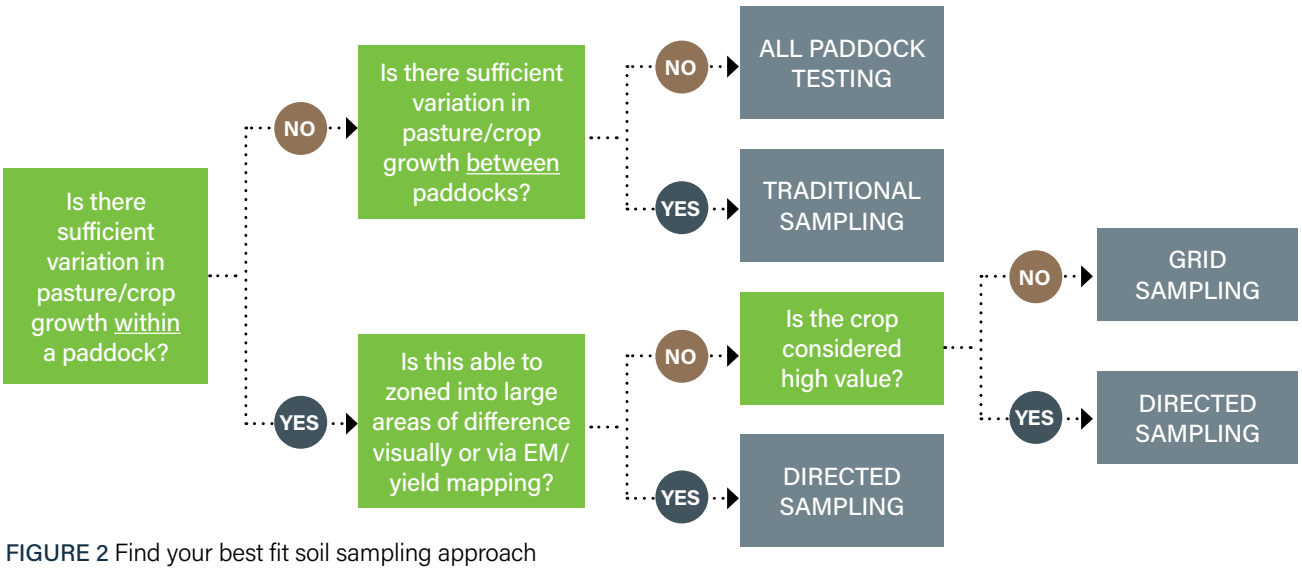


FIGURE 2 Find your best fit soil sampling approach

Boost growth with cobalt

Mid to late spring is the perfect time to address your pasture's cobalt levels.

Correct levels of cobalt (Co) in the diet of grazing animals help them achieve growth and production targets. Your pasture's cobalt levels can be checked with a herbage test. The herbage test results you are aiming for are:

Sheep 0.10 parts per million (ppm)
Cattle and deer 0.06 ppm

Young animals are most susceptible to deficiency. In New Zealand, cobalt deficiency is most commonly seen in lambs: it is fairly rare in cattle[1]. Beef & Lamb NZ estimate about 13% of New Zealand pastures will not provide an adequate cobalt intake for lambs[2].

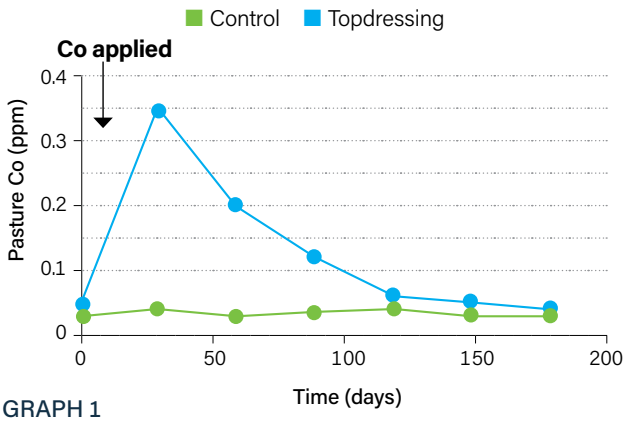
Cobalt deficient soils occur in several regions of NZ; the central North Island where the soil is largely formed from rhyolitic ash or pumice, the north-west Nelson area where the soil is largely granite, and in Southland where some leached brown soils occur. Deficiencies can also occur in soils that are acidic, highly leached, sandy or peaty.

Applying cobalt

Applying cobalt fertiliser can be a cost effective way of ensuring pasture levels are adequate, reducing the potential need for direct-to-animal cobalt supplements. Pasture concentrations increase rapidly four to six weeks after application (see Graph 1) and typically herbage levels stay elevated for around three months (90-100 days). If cobalt is needed, it is ideal to apply it in mid to late spring, just before weaning.

NutriMax Cobalt (10% Co) can be applied at 0.75 kg/ha to correct a deficiency (with the effect lasting five to 10 years) or at 0.2 kg/ha annually to maintain cobalt levels.

Effect of cobalt topdressing on pasture concentrations



GRAPH 1

For more information on cobalt and other micronutrients for animal health, talk to your Ballance Nutrient Specialist.

What does cobalt do?

Cobalt is converted to vitamin B_{12} in the rumen of grazing animals. Vitamin B_{12} helps release energy from food. As energy is released, the animal becomes ready to eat again. As well as promoting a healthy appetite, vitamin B_{12} helps produce red blood cells and supports the nervous system.

The live weight of animals (lambs) low in vitamin B_{12} increases when given adequate levels of cobalt in their diet. The effect tails off as levels of B_{12} increase.

Signs of cobalt deficiency

- Loss of appetite
- Missing growth milestones
- Watery eye
- Anaemia (in sheep)
- Dull, harsh coats (in cows)
- Reduced milk production (in cows)

[1] Trace Element Nutrition of Cattle. Beef & Lamb NZ Fact Sheet, May 2012

[2] Trace Element Nutrition of Sheep. Beef & Lamb NZ Fact Sheet, February 2007

Copper and deer

The copper status of deer can be easily improved using fertiliser, avoiding the time and effort required for other supplementation methods.

If a pregnant hind's copper levels are good, the micronutrient can be passed to the fawn through the placenta, improving copper stores in the fawn's liver from birth to weaning. This demand for copper peaks in autumn and winter when pasture is least able to supply it. Consequently, many deer farmers dose stock with bullets, boluses or injections to avoid deficiency.

Serum and liver samples must be tested before giving any direct-to-animal supplements. This, plus delivery of the supplement itself requires animal handling, which adds to the time and cost of supplementation and can stress stock. Dosing trough water is not a feasible alternative, as deer (like other animals) don't drink enough during autumn and winter to make this effective.

However, research has shown that adding 12 kg/ha of copper sulphate (3.0 kg Cu/ha) to pasture in autumn is a cost effective and easy way to increase and maintain the copper status of yearling hinds during gestation and lactation as well as the copper status of their fawns from birth to weaning. The impact can last for 10 months or more if pasture copper concentrations reach at least 45 mg Cu/kg DM and remain at this level for at least 60-100 days[1]. A later study suggested that applying copper as a liquid achieved similar success, with lower application rates of copper[2] required.

With either approach, it is important to:

- Monitor pasture copper concentrations with herbage tests every four to six weeks for three to four months to see whether this approach is suitable for your deer farm. Soil type and pasture composition can influence effectiveness (see Feed value, at right).
- Keep deer off the treated area for three to four weeks after application to allow for pasture uptake and avoid deer ingesting too much copper. Don't graze sheep on the copper-treated pasture as the rates used will be toxic for them.

To plan ahead for next autumn, talk to your Ballance Nutrient Specialist.

[1] Grace, N.D. 2002. Effect of the application of copper to pasture in the copper status of grazing weaner, yearling and mature hinds. *Report for New Zealand Fertiliser Manufacturers' Research Association Inc.*

[2] Smith, L.C. 2004. The effectiveness of autumn spray applications of cobalt sulphate, copper chelate and copper sulphate on Southland pastures. *Proceedings of the New Zealand Grassland Association 66:* 171–176.

Feed value

Pasture species can affect copper uptake. Legumes such as red clover and herbs such as chicory contain up to three times as much copper as conventional ryegrass/white clover pasture. Grazing fawns and weaners on these feeds over summer and autumn will prepare them for winter. Feeding red clover hay during winter is another option.

Copper can interact with other nutrients. For example, soil ingestion can increase iron intake, interfering with copper absorption in the animal's gut. High molybdenum levels in combination with high sulphur in pasture can also reduce copper absorption.

What does copper do?

Copper helps form:	Related deficiency symptoms
The collagen matrix that keeps bones strong.	Weak bones prone to abnormalities and fractures (osteochondrosis in young stock).
Enzymes that control nerve signals.	Lack of coordination in hindquarters, wobbly gait (swayback (enzootic ataxia) in older stock).
White blood cells, which are vital for the immune system.	Susceptibility to diseases like yersiniosis.
Melanin, which makes coats dark.	Faded-looking coats.

Cereal intent

Nitrogen at sowing and key growth stages maximises cereal yields.

Most New Zealand wheat is sown in autumn, as this tends to support better yields in our climate, so this article focuses on spring-sown barley and maize. However, the same general principles apply to autumn-sown wheat.

Start strong

"As with any crop, tending to your spring-sown cereal's nutrient needs at establishment is critical," says Ballance Science Extension Officer Aimee Dawson. "Regardless of your base fertiliser application, using a starter fertiliser will set the crop up well, ensuring germinating seed has a ready supply of nitrogen and soluble phosphate to support early root development and growth. "

Drilling fertiliser alongside seed places nutrients right where they are needed.

Test for success

It's important that your pre-establishment soil tests include the right nitrogen test for your crop.

Spring sown barley is fast growing and will need one third of its nitrogen at sowing. A mineral nitrogen test (also called a deep nitrogen test), preferably to 60 cm, will tell you what is immediately available to the crop, so you can see what needs to be added from the bag at sowing and in later side-dressings. Barley needs around 25 kg of nitrogen per tonne of grain/ha from the soil and/or the bag.

For maize, an available nitrogen test is best to guide nitrogen side-dressings. Your maize will need just under 13 kg N per tonne of DM or grain/ha for a silage or grain crop.

"Be realistic about potential yield to get the best return from your nitrogen investment," says Aimee.

N on the side

Nitrogen side-dressings at key growth stages will optimise yield. Your barley crop will need the remaining two-thirds of its nitrogen applied by the end of the tillering stage (GS 20-29). Maize needs its side-dressing of nitrogen once plants have six fully emerged leaves (growth stage V6).

SustaiN is a good option for side-dressing spring-sown cereals as it gives you the flexibility to apply nitrogen exactly when the crop needs it, even if rainfall looks uncertain. That five to 10 mm of water within eight hours of urea application is vital to reduce nitrogen loss to air from ammonia volatilisation. "Even under irrigation, you can't always be certain of applying exactly the amount of water you need," says Aimee. "Spring-sown cereal crops use large volumes of nitrogen, so the potential for loss is high. Given the minimal price difference between urea and SustaiN, it's good insurance."

For more advice on nutrients for spring sown cereals, talk to your Ballance Nutrient Specialist.

The lowdown on lucerne

High in metabolisable energy and protein, lucerne is an excellent feed from spring through to autumn.

Like clover, lucerne is a legume capable of fixing nitrogen from the air to power its growth. "It's extremely good at it," says Ballance Science Extension Officer Aimee Dawson. "Its productivity actually exceeds white clover. Lucerne's deep tap root also makes it very good at foraging for water[1] and it recovers quickly from dry spells by rapidly mobilising nutrient reserves from its roots."

Lucerne can be incorporated into dryland pasture mixes. However, it is mainly planted as a pure sward for grazing or conserved feed on dryland farms.

A well-managed stand can last up to eight years.

Spring stocktake

Lucerne is dormant over winter, so is better established in spring than autumn. It prefers a soil pH of 6.0-6.2, an Olsen P of 15 and Sulphate S of 6-10 ppm. Check micronutrient levels through spring herbage testing. Lucerne needs molybdenum and boron in small amounts to help it fix nitrogen. Test to 150 mm, where roots will be searching for nutrients. Testing to this depth will also reveal whether high aluminium levels will limit root and nodule growth.

Spring is also a good time to assess the impact of winter on existing stands. "Herbage test to find out exactly what nutrients are needed; don't rely on standard lucerne mixes," says Aimee. Check waterlogged spots. "These areas may not recover. Re-sow them after spring weed control to avoid bare patches and weeds."

Replacing K

If harvesting lucerne, apply potassium after every second cut to account for the amount removed. If grazing, replacing potassium is less of a concern unless site levels are low.

Crop use	Replacement K
Grazed in-situ	0 to 30 kg K/ha
Harvested for hay	15 kg K/ha per tonne of DM harvested
Harvested for baleage	20 kg K/ha per tonne of DM harvested

Good grazing

Lucerne expert, Lincoln University Professor Derrick Moot offers some advice on grazing lucerne.

Typically lucerne is grazed rotationally from tailing or when plants reach 15-20 cm. This 'magic height' will keep stems productive and weeds out. If you start the first block too late, plants will be too tall and stalky by the time you get to the fourth or fifth block. Stock at 12-14 ewes/ha for five to seven days before moving on to the next block.

Don't attempt to set stock ewes to lamb on lucerne unless you are very familiar with the plant's response to grazing. It is possible by dropping the stocking rate to 7-10 ewes/ha with lambs and keeping them on for three to four weeks. Starting with early lambers and getting them onto the lucerne when it's approaching 15 cm and growing well is a good option. But get it wrong and you risk having to move stock or over-grazing and shortening the life of your stand. Set stocked lucerne needs an extended rest in autumn to recharge.

Lucerne doesn't take up sodium, so provide a salt lick for grazing stock. Animals may also need a bit of fibre (like hay), especially if they have come off hard hill country.

Find more tips on Lincoln's dryland pastures blog: https://blogs.lincoln.ac.nz/dryland/

[1] Trials at Lincoln showed that it extracts water to a depth of 2.3 metres compared to chicory and red clover at 1.9 metres.

Micronutrients for crops

To guard against micronutrient (trace element) defiencies in spring sown crops you need to "test and address" at the right time.

Boron for brassicas and fodder beet

Boron must go on at sowing or as close to sowing as possible to avoid brown heart in brassica crops and fodder beet. Once brown heart rot is found there is no way back: boron cannot be applied to alleviate symptoms. A boron soil test greater than 1.1ppm is your goal.

Use an immediately plant available boron so that the crop can access it straight away. NutriMax Boron 15% is readily available granular boron which can be easily added to a mix. Cropzeal Boron Boost combines readily available boron with nitrogen and phosphorus into a compound fertiliser, which helps to deliver the vital micronutrient very evenly. The phosphorus and nitrogen support early root development and seedling growth.

Other crop needs

Micronutrients won't typically be required by crops unless there are localised micronutrient deficiencies or if soil pH is above 6.5. Maize grown on peat soils can show micronutrient issues.

Leaf (herbage) tests are the best way to see if micronutrients are needed. Timing is important. Test too early and the crop may not have had time to take up available micronutrients. Too late and you may not have enough time left in the growing season to address any deficiency you find and improve yield. For crops like brassicas and maize, test in December/January. For spring sown cereals, test during mid to late tillering.

Compare leaf/herbage test values with a deficiency level to identify whether or not you will get a yield response to micronutrient application.

Applying micronutrients

Aside from boron, micronutrients are often applied in solution to leaves. Foliar application:

- applies micronutrients very evenly, so the whole crop benefits
- allows for rapid uptake, to correct any deficiency quickly
- avoids other nutrients in the soil or pH interfering with micronutrient uptake.

Use products specifically designed for foliar application as they contain additives to help the product stick to leaves and deliver the micronutrient effectively. If fungal disease is a risk, fungicide can be combined with the micronutrient spray to tick off two jobs in one hit.

Apply foliar sprays in the correct conditions to avoid product loss and reduce the risk of leaf damage: not too much sun (early morning is good), no rain to wash the application off leaves and no wind to evaporate the solution.

Quick crop checklist

If you have been advised to apply micronutrients, check that you're not wasting time and money by asking these questions.

- Has a leaf test been taken?
- Was it taken at the appropriate time?
- What are the deficiency levels for micronutrients in the crop?
- Is there enough time for a micronutrient application to have an impact on yield?
- Was the soil pH high?
- Is there a history of past micronutrient deficiencies?

Clippings

ANIMAL

EFFLUENT

PLANT

SOIL

N-Guru re-invented

Ballance is working with AgResearch on an update to the nitrogen planning tool My Pasture Planner (previously known as N-Guru). My Pasture Planner uses total soil nitrogen test information to determine where nitrogen will have the biggest impact on-farm and support variable rate application. "We're looking to enhance the tool with an annual nitrogen planning function and mapping capability, as well as integrating it with the MyBallance platform," says Precision Agriculture Specialist Ollie Knowles. The re-vamped tool will be revealed later this season. The existing tool can still be used to tailor your spring nitrogen use – talk to your Ballance Nutrient Specialist for more information.

MitAgator launch

MitAgator – the breakthrough farm environment planning tool – was formally launched at an event in Wellington on 7 June. Ballance CEO Mark Wynne spoke about the tool and its ten-year development journey to an enthusiastic audience, including Minister of Agriculture, Hon Damien O'Connor.

Find out more (and watch the informative video) here: www.ballance.co.nz/MitAgator

MitAgator

Spread it right

Ballance is a supporter of LandWISE, established in 1999 to coordinate on-farm research and development for the arable and cropping industry. Specifically we sponsor the MicroFARM, LandWISE's demonstration site on the Heretaunga Plains, Hawke's Bay, showcasing techniques and technology to maximise food production, while looking after soil and using water and nutrients efficiently.

One project that has emerged from LandWISE, FAR, Fertiliser Association of NZ and the Sustainable Farming Fund is the development of fertiliser spreader calibration procedures for farmers who use their own spreading equipment. The project has resulted in guidelines and a calculator field sheet to help with the calibration process. Proper calibration supports even nutrient application and crop growth. It's a major factor when following the 'Four Rs' of effective nutrient management: right time, right place, right rate, right product/source.

Calibration resources are available here: www.fertspread.nz

Or read more about LandWISE here: www.landwise.org.nz

MyBallance for the win!

Ballance's online fertiliser management platform has scooped a global innovation award but the real winners are the farmers using it.

New Zealand farmers have been quick to take to their keyboards and touchscreens to order and manage their nutrients online, with over 3,500 users registered since MyBallance launched in March.

Those using MyBallance love its convenience and simplicity and are already coming up with ideas for tweaks and new features. That's a sign of success for the Ballance team, who see digitisation as key to supporting the future competitiveness of New Zealand farming. Another is the system's win at this year's SAP Innovation Awards. The prestigious competition attracts entries from around the world to be considered by a panel of international judges. MyBallance competed against 170 organisations and was awarded the "Best Run" Award for Digital Innovation.

But the development team is not resting on its laurels. "MyBallance is a winner, but we will keep working on making it better," says Chief Digital Officer David Scullin. New functionality includes the ability to:

- add 'other' inputs (such as effluent, lime, whey and compost) as a recommendation within the My Plan section of MyBallance and complete a manual proof of application for these inputs;
- copy and edit Nutrient Specialist Recommendations within the Plan when your needs change. This gives you more control of your Plan and a complete view of the nutrients you plan for and apply, along with proof of application; and
- single sign on capability for those that have a Precision Farming subscription (required to receive GPS-driven proof of placement information).

What farmers are saying

Farmers told the MyBallance development team that what they wanted most was time. MyBallance carves time out of busy days to invest in other things.

Canterbury dairy farmer, Darcy Bishop milks 900 cows at his Oxford farm with his wife Ina. The couple has three young children, Quade (7) Grayson (2) and Sophia (11 months). "Spending a bit more time with our kids is always a bonus," says Darcy. "MyBallance is easy. I'm lucky to be able to get home a bit earlier now and it's amazing being at home with these guys."

"MyBallance is technology that we've got to take grasp of, with farming it's the future," Darcy continues. "This way you can…order the fertiliser for the paddocks you need with the touch of a finger, it's great!"

Sam Spencer-Bower is the operations manager at Claxby Farms, milking 3,340 cows across three farms and a run-off block at Swannanoa. "With MyBallance you have everything in one place in terms of fertiliser, which is really good," says Sam. "Our Ballance nutrient specialist introduced me to it and showed me how easy it is to use." Dad to Chloe (5), and Ruby (2), Sam also appreciates the extra family time MyBallance creates. "Every day's a rush and any extra moments I can have to spend with Jo and the kids are well worth it."

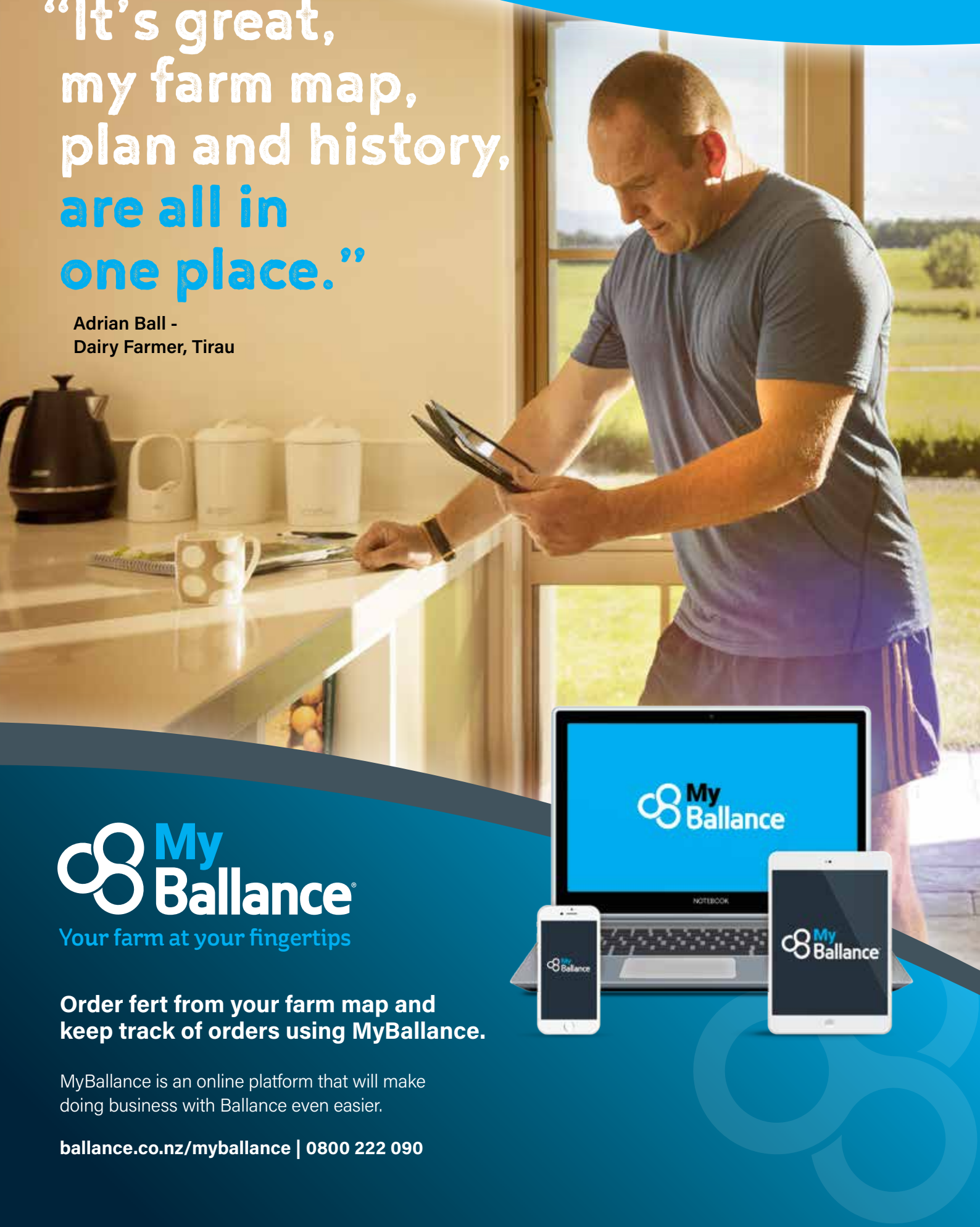
Register now to start your MyBallance journey. You will need your Ballance Customer Number, phone number and email address.

Ballance agri-nutrients

Together,
Creating the Best
Soil and Feed on Earth

"It's great, my farm map, plan and history, are all in one place."

Adrian Ball -
Dairy Farmer, Tirau



My Ballance

Your farm at your fingertips

Order fert from your farm map and keep track of orders using MyBallance.

MyBallance is an online platform that will make doing business with Ballance even easier.

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