

**ravensdown** 

INSIGHT AND ACTION FOR AGRICULTURAL SUCCESS

# ground

## EFFECT

AUTUMN 2016  
EDITION 2

"It's not just a job  
to us, we love it."

Alice Reilly,  
Dos Rios Dairy Ltd.

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### Soil Sampling

How well are we managing  
the fertility of our soils?

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### Winter is Coming

Tips on nutrient losses.



# WELCOME TO THE SECOND EDITION OF GROUND EFFECT FROM RAVENSDOWN

**We've had great feedback about the Ground Effect magazine from around the traps. Readers responded well to the blend of agri-science and farming insight and the contribution of both to the New Zealand economy.**

I received positive comments from policymakers, regulators, scientists, shareholders and even farmers who are not yet customers of Ravensdown.

A recurring theme in this second edition is the resilience that is a characteristic of successful farming operations. Whether it's the relatively young Alice Reilly and Stewart Watson (page 10) or the experienced Neil and Dot Smith (page 32), their persistence in the face of adversity is an inspiration.

Many of the issues covered are bigger than one co-operative or even the fertiliser industry. Indeed Dr William Rolleston, who is national president of Federated Farmers, writes about the importance of a scientific versus "snake oil" mindset on page 24.

Other major issues facing New Zealand farming such as drench resistance and phosphate run-off are covered on pages 39 and 30. On page 16, we discuss the value of our team of environmental consultants, pointing out the connection between the land value, bank loans, nutrient budgets and property sales. Also in this edition we get a great insight into the farming passions of our chairman, John Henderson (page 18).

But it's not all about "big picture" topics. There are outlines of the work being done on variability of Olsen P levels and research into potato yields, pea production and precision aerial spreading. Our technical experts offer some guidance around lime, regrassing, selenium and coated urea and examine the practical limits of groundspreading trucks' bout widths.



There are several products on the market to reduce volatilisation (nitrogen losses to the atmosphere). They are almost identical in terms of active ingredients in the urea granules' coating and they all come at a premium to "standard" urea. Our chief scientific officer Dr Ants Roberts looks at whether the more expensive product is worth paying for, when lost N naturally reduces in the cooler wetter months.

New Zealand agribusiness faces some of the "great uncontrollables" such as weather, exchange rate and global price trends for inputs and outputs. Whatever the ups and downs, you can be certain that trained people armed with farm data, a scientific approach and a willingness to help will go a long way.

Don't forget you can email me at the address below if you have any thoughts or ideas for future items. Let's keep sharing the insights for the benefit of New Zealand.

Best Regards  
**Greg Campbell**  
Ravensdown Chief Executive

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CEO@RAVENSDOWN.CO.NZ

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# BEHIND THE SCENES

## Ravensdown is collaborating for a sustainable future



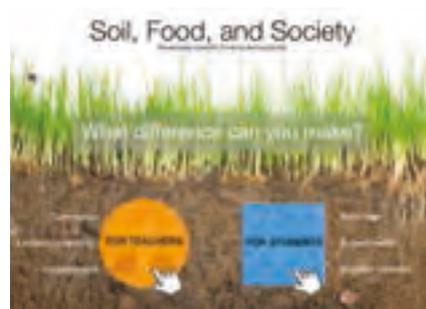
### Pasture with precision

Ravensdown, the Ministry for Primary Industries and DairyNZ have co-funded an AgResearch study of Lincoln University Dairy Demonstration Farm which assesses effective practices when it comes to yield mapping of pasture.



### E-book emerges

As part of a Sustainable Farming Fund programme, Ravensdown is a co-funder of an e-book aiming to help school children learn more about "Soil Food and Society"<sup>1</sup>.



### Pea for productivity

Ravensdown and Process Vegetables New Zealand commissioned Plant and Food Research to review the latest scientific information on trace element use in peas. Data on responses to trace elements showed more research was needed.



### Checking aerial precision with ground truths

In Ground Effect #1, the principles of more precise aerial application were explored. Ravensdown's Primary Growth Partnership programme, which is supported by the Ministry for Primary Industries, is now in full testing mode. To calibrate the automatically-adjusting aircraft door and check predictive

models, researchers place hundreds of buckets across a farm and measure where actual fertiliser amounts land. This "ground truth data" is vital in the quest for aerial spreading precision. More to come in Ground Effect #3... See the latest coverage on TVNZ's website<sup>2</sup>.

1,2. See Source Code on page 40

# Building a more resilient future

**2015 will have gone down in most farmers' memory banks as a pretty challenging year. Thank God for the Rugby World Cup, for giving us some happy hours between outbursts of gun fire. Whether it was the low dairy price, adverse weather events with flooding in some places and drought in others, happier days must be ahead.**

The Government's vision to double the "value" of agricultural exports by 2025 is a worthy goal in my opinion, however we have some work to do to make sure this is achieved. I feel equipped to comment on this subject because between 2008 and 2010 we doubled the value of products for sale at Bonavaree, and between 2010 and 2013 we doubled that value again.

Working harder will never achieve this result, it's all about working smarter, with "value" being the key word. Admittedly at Bonavaree we started this journey from a fairly average base, but there was always a design and vision to follow through. Things don't just happen, they are driven, and this process happens when you develop a resilient emotional, financial and environmental state. It's about banking the good times, so you can get through the hard times, and rise again to achieve your next life goal.

There are many areas in which we can "bank" our future. Going into 2015 at Bonavaree our financial, fertiliser, emotional, stock condition and relationship banks were full. Over the years we have targeted all these banks to deposit our success so when things are a little less favourable we're ready to draw down, as required, to get through.

## What determines a resilient future?

**50%**

Genetics

**10%**

What happens to you

**40%**

How you **choose** to deal with it



(2005) Pursuing Happiness:  
The architecture of sustainable change<sup>3</sup>.

**“Success is not the key to happiness, happiness is the key to success. If you love what you do, you will be successful.”**

For most humans, the expectation and most-desired emotion is to be happy. We all want to be happy. However, we so often focus on the wrong end goal. Success is not the key to happiness, happiness is the key to success. If you love what you do, you will be successful. Reality shows us happiness is something we get when lots of great processes have been delivered. It's a feeling we get when we have planned, worked, given and delivered. It's not an emotion that is ours by right. I imagine permanently happy Homo erectus got eaten centuries ago while they sat about content in their previous achievement.

Accepting that life is hard and winning is hard was a great turning point in my life; moving my thinking to my opportunities and points of influence, rather than wasting hours thinking about my "concerns" which life has presented. When we turn all our thoughts and energy to what we can "influence" in our own life, we start to create an environment for growth, well-being



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**RAVENSDOWN SHAREHOLDER, DOUG AVERY IS A SHEEP AND BEEF FARMER AT BONAVAREE IN MARLBOROUGH. RECENTLY HE HAS BECOME WELL KNOWN FOR HIS WORK IN RURAL MENTAL HEALTH, SETTING UP THE RESILIENT FARMER ORGANISATION TO BUILD RESILIENCE IN THE FARMING COMMUNITY.**

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and happiness. Happiness is the side effect from good process. If you're good to the world and good to others, some of the happiness generated will be yours to share.

I like to think of life as a journey of peaks and valleys. We have all been on a peak, when things are just great, and we've all been in a valley when things have gone wrong. The trick is to realise no one can stay on a peak. We all must return to the valley and know that, between them, there is always another peak to climb. Understanding the lows are a necessary part of life and appreciating the opportunity to rest and rebuild and plan for your next peak will see your valleys become shallower and your peaks higher. This thinking starts the process of continuous self-improvement, one of life's great treasures.

Reducing the depths of your valleys means you're better prepared to climb higher peaks. Processing your life in this way will make you feel stronger. It will build your confidence and

increase the time where you feel positive and happy about your life. Positive thinking is an infectious process, and other positive thinkers will soon be attracted to you.

Smart farmers will have taken the opportunity to re-evaluate their lives, their business and their future direction. They'll have thought hard about what is right and wrong with their current life and processes, accepting change, with the most progressive seeking it. They'll have also made sure the challenges delivered in 2015 are faced off against if it happens again.

The great power any nation holds is how it deals with its peaks and valleys. Resilient people create resilient communities, which are the back-bone of opportunity and how we build a more resilient country. Right now collaborating our energy to double the value of our national export earnings must surely be one of the most worthy goals with which we can all engage.

# THE NEXT BIG THING IS HERE WE ARE JUST IGNORING IT!

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By 2025, the Government wants to see the value of agricultural export earnings doubled. Could better soil nutrient management, grounded on sound science, contribute towards this goal? You can bet your doubled export dollar it can!



Soil nutrient management in essence is making crop-specific fertiliser recommendations in accordance with sound soil nutrient guidelines, based on soil test results. Without soil test results, or sound guidelines, this becomes a difficult task. Fortunately for pasture in New Zealand, we have robust guidelines established through more than 3000 field trials (Edmeades, FLRC 2012)<sup>4</sup>.

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DR VENTER IS A TECHNICAL DIRECTOR  
AT RAVENSDOWN, ANALYTICAL RESEARCH  
LABORATORY (ARL)

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## Optimum yields

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At ARL, we have accumulated historical soil test data for sedimentary soils under pasture, from both islands that can be utilised to show trends. It provides a bird's eye view of how well soil nutrient levels are being managed.

Managing nutrient levels close to the optimum ranges is economically and environmentally justifiable because at these levels, optimum pasture growth for the fertiliser dollar is obtained.

The following pages show results of over 250,000 soil test results on sedimentary soils for pH, Olsen P, MAF QTK and sulphate sulphur, collected between 2005 and 2015 from North and South Island dairy, sheep and beef farms. ▶

# How well are we managing the fertility of our soils?

The Next Big Thing is Here *continued*

**Olsen P** – Phosphate is the most expensive macro nutrient to apply on our farms. North Island dairy farms showed no major changes from year to year in each value class for Olsen P (Figure 1).

Only 25% of paddocks tested remain below the optimum range while nearly 40% of paddocks could have less than full maintenance P applied for one or more years without loss of production (Table 1).

The same consistency and low degree of annual change in soil Olsen P is also observed for South Island dairy farms except that around 37% of paddocks sampled are below optimum levels and less than 20% are above the optimum levels (Table 1).

There is little difference in the soil Olsen P ranges between North and South Island sheep and beef farms. On average 41% of all Olsen P soil test results were below optimal levels for pasture production while only 25% of samples overall had above-optimum P levels. While the science clearly shows the productivity benefits of investment in fertiliser P, the economics of sheep and beef farming over the last several decades has not always encouraged its widescale use.

**Table 1.** Mean values for Olsen P value classes for the period 2005 to 2015.

Island and stock type	% Low	% Below optimal	% Optimal	% Above optimal	% High
South Island dairy	8	29	43	12	7
North Island dairy	6	19	38	18	18
South Island sheep & beef	9	39	32	14	8
North Island sheep & beef	13	39	26	13	9

**pH** – Soil acidification, like rust, is an ongoing process. The regular application of liming materials on pastoral soils is required to reverse this process, however over-use can decrease the availability of some trace elements such as zinc, copper, and iron. Less than a third of all dairy farm samples are below pH 5.8, which indicates that regular use of lime by dairy farmers is managing soil acidification well (Table 2). However, 55% of soil samples from North Island sheep and beef farms and over 30% of South Island sheep and beef farm samples have pH values below optimal (Table 2).

Again, the cost of carting and spreading lime by aerial application to hill country sheep and beef farms means there is less investment in this product, despite the importance of pH management for pasture and crop production (see pages 36-37).

**Table 2.** Mean values for pH value classes for the period 2005 to 2015.

Island and stock type	% Low (<5.5)	% Below optimal (5.5-5.8)	% Optimal (5.8-6)	% Above optimal (6-6.3)	% High (>6.3)
South Island dairy	4	19	27	34	16
North Island dairy	5	23	26	31	16
South Island sheep & beef	9	23	25	28	15
North Island sheep & beef	17	39	22	16	6

**Potassium** – Low soil potassium supply is likely to impact on yield, while over-supply can affect stock health with no yield increase expected. A surprisingly large percentage of soil samples from South Island dairy farms recorded MAF QT Potassium values below 4 (Figure 2), which may be an opportunity cost in lost production.

Some South Island soils have K reserves that supply plant available K over time, but this supply may not be fast enough when there is high demand caused by rapid spring growth rates and/or summer irrigation.

In contrast, the optimum range for sheep and beef is lower than for dairy resulting in less than 4% of soil samples for the South Island being in the low class, while more than 40% of the samples are consistently recording above optimal K levels (Figure 3).

Similar trends were also observed for soil samples from the North Island.

**Sulphate-Sulphur** – For all the years and farm/island combinations, the sulphate-sulphur levels are volatile with significant changes between years. This is due to the mobility of sulphate-sulphur in sedimentary soils (Figure 4).

On average, more than 50% of all soils had sulphate-sulphur levels below the optimum range, which can affect yields, with only 12% of samples within the optimum range (Table 3). This highlights the necessity to ensure continued annual sulphur inputs to match the requirements of the farm system on sedimentary soils.

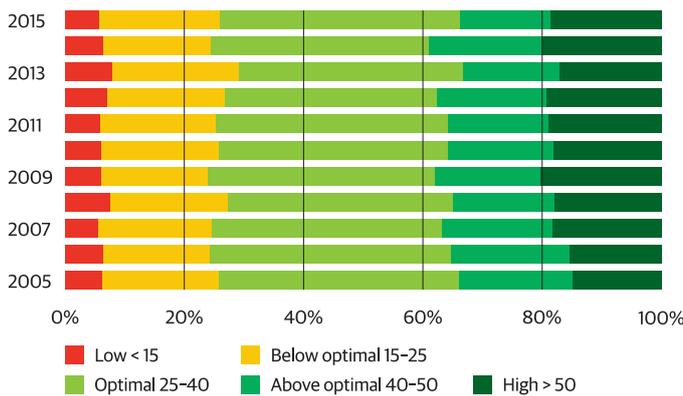
**Table 3.** Mean values for sulphate-sulphur value classes for the period 2005 to 2015.

Island and stock type	% Low	% Below optimal	% Optimal	% Above optimal	% High
South Island dairy	14	39	11	12	24
North Island dairy	13	36	11	11	30
South Island sheep & beef	14	40	12	12	21
North Island sheep & beef	14	47	12	11	17

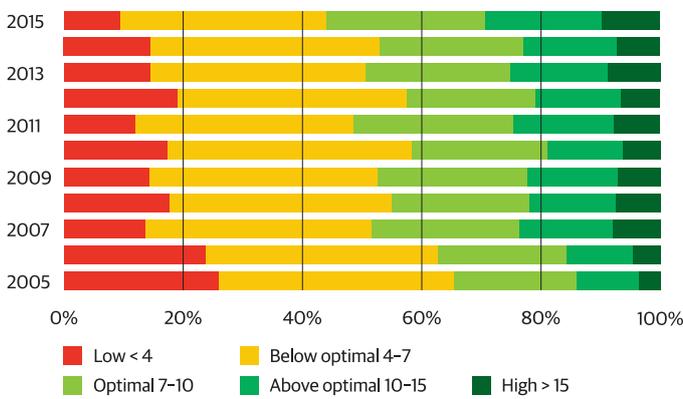


WE'RE CONSTANTLY LOOKING FOR WAYS TO CREATE EFFICIENCY IN WHAT WE DO. OUR NEW SOIL TESTING BAGS ARE LOADED WITH 2D MATRIX BARCODES THAT WE SCAN IN THE FIELD AND THE LAB, PROVIDING TRACEABILITY AND SOIL SAMPLE MANAGEMENT IN A FRACTION OF THE TIME.

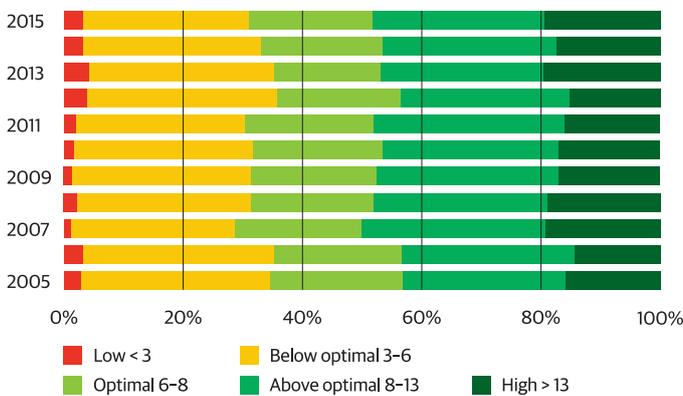
**Figure 1.** Olsen P value classes for North Island dairy farms on sedimentary soils.



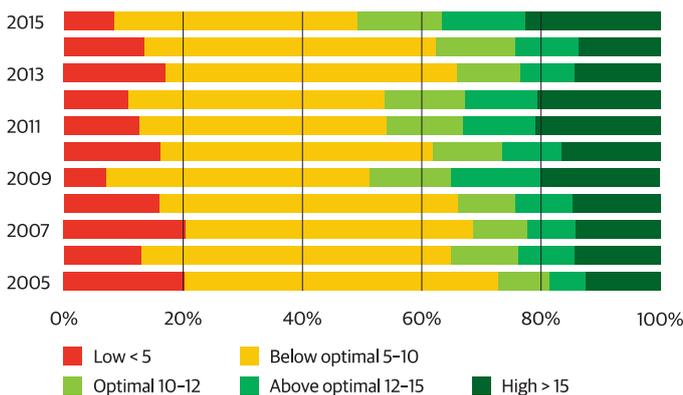
**Figure 2.** MAF QT K value classes for South Island dairy farms on sedimentary soils.



**Figure 3.** MAF QT K value classes for South Island sheep and beef farms on sedimentary soils.



**Figure 4.** Sulphate-sulphur value classes for North Island sheep and beef farms on sedimentary soils.



## Can we pat ourselves on the back?

- **Yes** - given that our soil fertility appears to have been managed consistently over the last 11 years with no major changes from year to year, or strong trends existing.
- **No** - for not having more samples closer to the optimum ranges for the different nutrients.
- **Yes** - the number of samples falling short of above optimum ranges tells us we are generally not over-applying fertiliser.

This information is revealing because, when nutrient levels are low, there is an opportunity cost through loss of potential pasture production, and if too high an unnecessary expenditure and potential environmental cost from nutrient losses into rivers and lakes.

## Sample frequency

Interesting metrics about the data used:

### Dairy 2014:

1 soil sample for every 29ha.



### Sheep and Beef 2014:

1 soil sample for every 184ha.



## The next big thing is: more frequent soil sampling

The infrastructure, knowledge, guidelines and expertise are there to take hold of the next big thing. More frequent soil sampling will increase production and profits, while taking care of the environment. With even more hands-on nutrient management, we'll be able to correct low nutrient levels and reduce nutrients applied to areas with high nutrient levels.

**Whole-farm (all paddocks) testing offered by Ravensdown is a systematic approach to improve nutrient management. The additional cost of soil sampling is surpassed by the potential benefits when used in conjunction with our Agri Managers' recommendations.**

# GETTING THE BEST OF BOTH WORLDS

New to their careers, but not new to farming life, Alice Reilly and Stewart Watson are combining their passions and interests to get the best out of their cows and life.

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ALICE REILLY

**Alice and Stewart started their farming careers together when they met on a farming exchange in Canada. Like all good relationships the couple has compromised between farming in Stewart's home county, Cumbria, in Northern England, and now farming in Alice's home patch in Takaka, New Zealand.**

Now in their fourth season on a two-unit dairy farm, Dos Rios Dairy Ltd, Alice is managing one of the dairy units and Stewart is 2IC on the other and managing the run-off operation. Alice says driving past the farm growing up, she'd never looked at it with farmer eyes, but knowing it as intimately as she does now, there was a lot of work to do on one of the dairy units.

"The farm is really beautiful, but one unit was quite under developed. It needed fencing, irrigation and generally a bit more love."

Stewart laughs. "For the first six months I hadn't seen much apart from the farm and the house, so I didn't realise how much more there was to this country."

The 177 hectare farm runs 600 cows over two milking platforms, split over two terraces, with a forgiving climate.

The couple's initial focus on arrival was building up the farm's soil fertility. They put the farm under an intensive lime regime to get the pH levels right and reworked a lot of the paddocks.

"The farm started with pretty poor pastures. It was about 30 percent rock and the soil was pretty acidic. The pH levels were also really low, but we've got them up in the optimum range now," says Stewart.

They reworked 10-15% of the paddocks into perennial ryegrass and did a lot of oversowing to get them through the season.

"We had to do some intensive regrassing with the oldest grasses, by running a cropping rotation of fodder beet and chicory. Now we've done 35% regrassing in the last three seasons, we're in a much better position with better quality pastures."

Alice and Stewart's passions and skills complement each other well on the farm. Alice's love of dairy farming, working with the younger heifers and getting the most out of them, works well with Stewart's passion for cropping and pasture renewal as well as breeding good quality heifers.

Their business goal is to breed the ultimate milking herd, crossing the Jersey breed with the Friesian to get the hybrid vigour and higher milk solids.

"We want to grow our young stock to their potential to get the most out of each cow. We need to make sure the cows are in good condition to get a high conception rate so we've got more flexibility to be selective with our herds." Alice says.

She says the key to getting the most out of their cows is managing the grazing themselves on the farm's 105ha leased run-off block.

"We wanted to get a head-start on achieving our target weights for our young stock so we could start getting good production from them straight away."

**"The farm is really beautiful, but one unit was quite under developed. It needed fencing, irrigation and generally a bit more love."**

"It's our second season doing it and it has made a huge difference. The stock are head and shoulders above the cows that had come from the graziers the year before."

Stewart's cropping experience from back in the UK has brought new insights and techniques that aren't used in New Zealand Alice says. He runs a comprehensive winter cropping programme using specialist fertiliser from Ravensdown.

"The shareholder owners have been great, they're really open to trying new things," Stewart says.

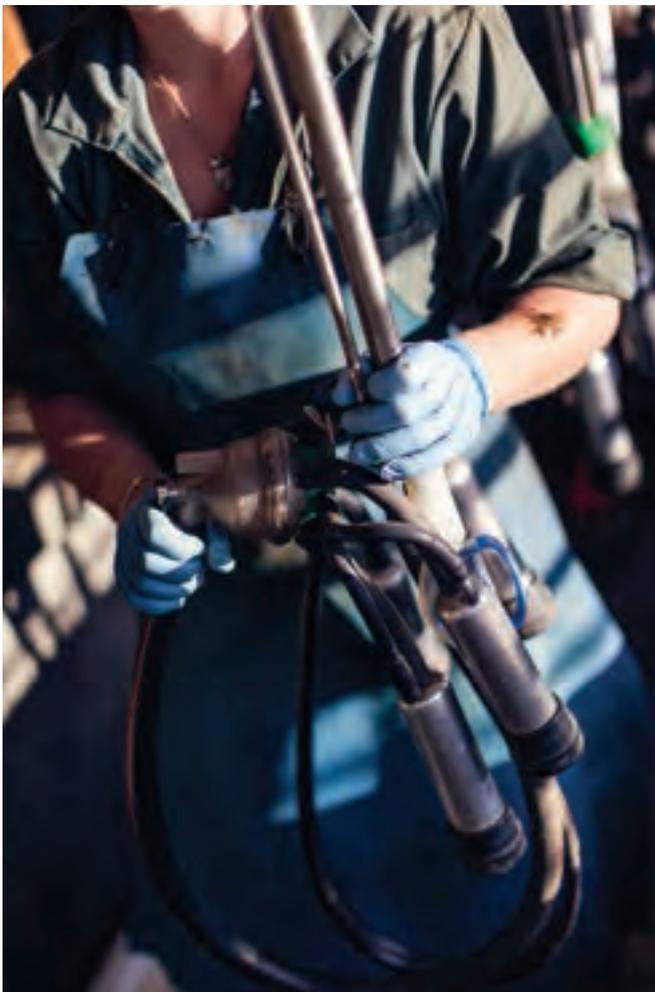
"It's not the traditional owner-worker relationship, they've got much more of a flat structure where we can talk about problems and throw ideas at them."



STEWART WATSON



RIPARIAN PLANTING ON THE PROPERTY



**“We wanted to get a head start on achieving our target weights for our young stock so we could start getting good production from them straight away.”**

Stewart came up with a plan, which he put to their Operations Manager, John Bryne, to economise their feed for the drought.

“We made heaps of medium square bales of silage last summer because we didn’t know what the run off was going to grow, but this summer we grew much bigger bales and ran the second cut as pit silage which is even cheaper, and used forage boxes that can take a lot more than the standard trailer. We’re now using half as many people and half as many implements to do the job in the same time,” Stewart says.

With the increasing dry summers and lower dairy pay-out, having the ability to make educated changes to plans has been really important.

“We’ve been able to modify our plans by conducting a whole-farm (all paddocks) test on our Olsen P and pH levels (see page 8), which Ravensdown contributed half the cost through sponsoring DairyNZ’s monitor farm initiative.”

Now they have a few seasons under their belt, Alice and Stewart are able to chase the elusive work life balance and think about their future.

Alice accompanies Stewart on his hunting expeditions, which she says is more of a tramp with a gun.

“Stew’s inner MasterChef comes out when he’s got some game to cook,” Alice quips.

“We’d like to go travelling again too. The way we met was travelling and it’s a mutual passion we enjoy, but for the meantime we’re still very happy here.”

The two have both delved into the extra-curricular side of farming with both entering the New Zealand Dairy Industry Awards and placing regionally.

## “Stew’s inner MasterChef comes out when he’s got some game to cook.”

“It’s a really rewarding experience, because it forces you to know your stuff a bit better; you’re always learning and it’s nice getting off farm, meeting people and networking,” Alice says.

Looking ahead, Alice says they have big plans to run both a sheep and beef farm and a dairy farm, to satisfy both their passions.

“It’s not just a job to us, we love it. We love working with the animals and being outside and we’ve realised we can have both. With the beef farm complementing the dairy farm, we’d be a self-servicing unit.”



PERENNIAL RYEGRASS IS BEING REWORKED INTO THE PADDOCK



ALICE AND STEWART ARE AIMING TO CROSS BREED THEIR JERSEY COWS WITH FRIESIANS

# Regrassing

## OLD AND NEW CULTIVARS FACE-OFF



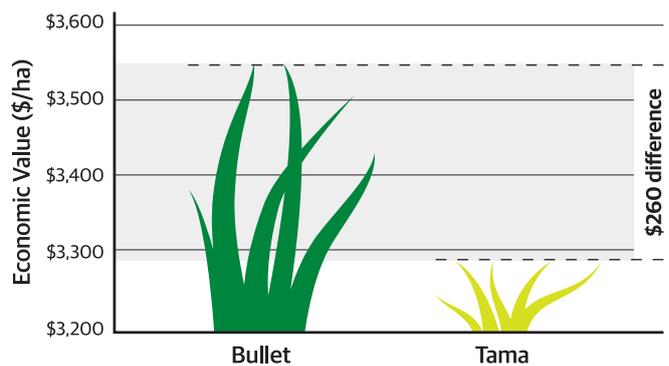
New Zealand research shows that the advances over the last 60 years in plant breeding have lifted forage production by more than 1% a year<sup>5</sup>. Forage quality has also improved through the development of tetraploid ryegrass, increased disease tolerance and the focus on summer quality through lower aftermath seeding.

Combined with improvement in animal breeding in terms of feed conversion efficiency and more focus on effective pasture and stock management, this has delivered significant productivity gains across the decades.

The increase in forage production can be readily seen in trial work, but what does that actually mean? Below is a comparison between the economic values of one newly-bred annual ryegrass (Bullet) compared with an older type (Tama) using the DairyNZ value of forage production for each season, and taking into account the difference in the seed cost of the two cultivars.

The economic value in forage production is \$260 per hectare over the nine months' lifetime of the pasture when using a newer annual ryegrass compared to an older one.

**Figure 1: The economic value return (\$/ha) from two annual ryegrasses based on NFVT trial information (1991 - 2014) over nine months - including the difference in the cost of the seed.**



## Pasture Condition

It's time to condition score your pastures just like you do for your stock. Condition scoring every paddock on the farm will help determine your under-performing paddocks and identify those which may need to be renewed.

The tool to the right is an example to rank every paddock on the farm from best to worst. Then look at underlying reasons for poor performance, and make the best decisions on actions to restore these paddocks back to full production.

Paddocks are scored from 5 (best) to 1 (worst) using the photos and descriptions below to make accurate decisions.

It's designed to assist with plans for short, medium and long term pasture renovation and renewal strategies, depending on the farm system and feed requirements.

Note: This ranking is indicative only and may need to be modified for your farm location. Weed content is a vital aspect to inspect as weed species vary between regions and farms.



### Description

Entire paddock severely damaged

### Suggested Action

Sow into summer crop in spring, and plan to sow in perennial pasture in the autumn



### Description

Parts of the paddock have severe damage, a lot of weeds and bare ground

### Suggested Action, Either:

Sow in perennial ryegrass in autumn, or:

Undersow with Italian ryegrass in autumn and plan to renew in following 6-12 months, or:

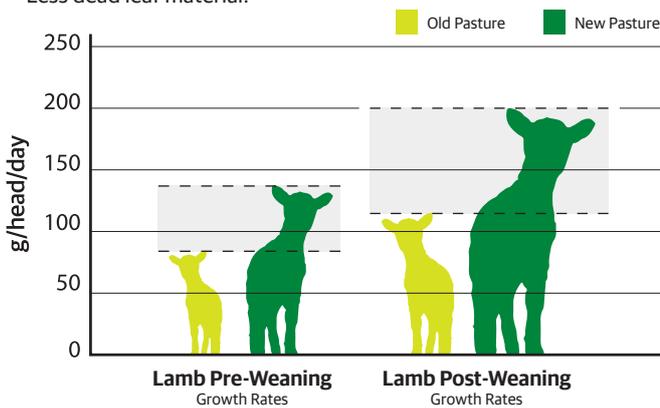
In spring oversow chicory with fertiliser, or undersow paddocks with chicory, and plan to renew in 6-18 months

# Pasture renewal pulls its weight

There are not too many investments that give an average Internal Rate of Return (IRR) of 25.7% in less than two and a half years<sup>6</sup>. But this is what new pastures can do for a sheep, cattle or deer farms based on trial work from the Pasture Renewal Charitable Trust. This return is based on an increase in total farm pasture production and the lift in quality of the pasture on animal performance.

Trial work has shown pre-weaning lamb live-weight can lift 80g/head/day to 135g/head/day going from old run-out pasture to new pasture. Post-weaning live-weight gain was shown to increase from 110g/head/day to 200g/head/day. This is because the higher energy, in terms of megajoule of Metabolisable Energy per kg of Dry Matter, of the new pasture has the following:

- Higher proportion of desirable species
- Later and more uniform flowering
- Leafier sward, with fewer seed heads produced
- Less dead leaf material.



Ravensdown is a member of the Pasture Renewal Charitable Trust, an industry-funded organisation promoting the economic benefits of increased re-grassing, not only for individual farms but for the country as a whole. The Trust's website contains useful resources such as pasture scoring guides and cost-benefit calculators ([www.pasturerenewal.org.nz](http://www.pasturerenewal.org.nz)).



3.

### Description

Majority of paddock has low-level damage, weeds, and less vigorous grasses

### Suggested Action

Apply summer N. Undersow in the autumn with perennial ryegrass containing appropriate endophyte



4.

### Description

Parts of the paddock show signs of low-level damage, less vigorous grasses and some weeds

### Suggested Action

Check fertility. Apply summer N to encourage tillering. Paddock probably OK for coming season



5.

### Description

Whole paddock has dense sward of desired grasses and clovers

### Suggested Action

No action required. Would be happy if whole farm in this state

## Key recommendation

– choose the best performing cultivar and endophyte for your locality to ensure longevity of pastures and sow treated seed for proven results.

Credit:  
Pasture Renewal Charitable Trust,  
Dairy NZ, Beef and Lamb NZ.

# The nature of farm sales has changed. Are you prepared?

**Selling and purchasing farms today can be based as much on a farm's nutrient value (losses) as it is on the farm's physical properties.**

Being armed with as much information about the farm's nutrient profile is crucial for navigating the increasingly complex consent process. Farmers don't have to do it on their own, there are specialists out there they can seek advice from, Ravensdown's Environmental Consultants being one such group.

Ravensdown's environmental consultancy was set up in 2013 to arm farmers with the relevant information, resources and advice to farm within the limits. Ravensdown consultants are all qualified under the Nutrient Management Advisor Certification Programme, which ensures farmers are getting a consistently high standard of advice.

For farmers it has become increasingly difficult to understand the impact their properties' nutrient losses has on the value of their property and how that can impact the sale process.

Dryland farms in red zones have been impacted the most; however, farm sales are also being affected by challenging consent conditions and new rules and regulations making it too complicated or limiting.

Real Estate Agent, Ruth Hodges, from Colliers says it's certainly becoming a critical nature of the farm sale process, adding another layer of complexity that they need to work through.

"Anecdotally, we've definitely seen offers not proceed where nutrients have been an issue. It's now more about what the buyer can do with the farm. Even if the farm has room to move it's dependent on the system that the buyer wants to bring in."

**"Anecdotally, we've definitely seen offers not proceed where nutrients have been an issue."**

Through accurate modelling, the team at Ravensdown Environmental assist by demonstrating different farm scenarios. This process identifies ways a farmer can achieve an optimal balance of environmental management and production, while farming within the caps or constraints.



For example, switching from border-dyke irrigation to centre pivot reduces N and P loss and conserves water. This reduction in impact allows the farmer to look at developing or intensifying other areas of the farm while still farming within regulatory limits.

Banks are becoming more hesitant to lend money to farmers who are unable to demonstrate they can farm within the limits.

Land value can hinge on the farm's potential for change. Without a nutrient budget, bankers are unlikely to lend money to purchase a property and real estate agents therefore will be unlikely to be able to sell the property. Seeking advice, and keeping good information on your farm's systems is how farmers can get ahead.

## Ravensdown's Environmental Consultant at work

A prime example of where our Ravensdown Environmental Consultants can help in the farm sale process, happened recently in Culverden.

Brad Sutton approached Ravensdown to run some scenario modelling before he and his father and their syndicate group put an offer in on a dairy farm in the area.

"We wanted to make sure we could farm within the limits and rules, and Anna (Ravensdown Environmental Consultant) was able to get us there successfully with a clear picture of what our developments would look like as an environmental report," Brad says.

Following the purchase of the property, the equity partners identified further areas of development for the property.

The farm had to look at increasing the number of peak cows for the new effluent consent from 2000 to 2400 to give some flexibility within the farm system and to offset the risks of high infrastructure costs and potentially reduced milk pay-outs.

With additional cows the phosphorus loss risk was really tight, which presented two options - to reduce cow numbers slightly or continue modelling and utilise the then, newly-released Overseer version 6.2.

Anna explained her advice was to update the work in the new version as the new irrigation model was likely to better represent P losses, which was confirmed and the consent was granted.

Brad said having the help was crucial to them to get through the process.

"I'm a rural professional myself and have a broad understanding of Overseer and the rules, but you need that specialised knowledge. For the farm sale, Anna gave us the imperative info that we needed to make decisions. Basically the sale wouldn't have gone ahead without that input and ability to drive the process."

He adds that having a Farm Environmental Consultant as an advocate helps turn a farmer's ideas into a workable compliant solution and takes a lot of stress out of the process.

For farmers looking to purchase or sell a farm, it is imperative they do the nutrient work first.

**"Having a Farm Environmental Consultant as an advocate helps turn a farmer's ideas into a workable compliant solution."**

While the rules and nutrient management challenges can be off-putting, farm systems are flexible and can deliver many different options. Keep collecting good information and seek advice from your Ravensdown Environmental Consultant when you have questions or concerns.



# Bloodlines & thoroughbreds spotting the winners among horses, cattle and business



JOHN WITH HIS HORSE, MOLLY



**From his home in the Rangitikei, Ravensdown Chairman John Henderson describes how he used to ride horses to school with his friends. "My favourite memories of growing up here are the river and being able to enjoy what it offered and to ride our ponies everywhere. There were plenty of kids - none of us had a lot, we just made our own fun."**

He learnt his passion for farming from his father who passed away when John was just 22 years old.

"Farming was all dad ever wanted to do his whole life - he was an excellent judge of stock. My father had a huge influence on me. He was very open and to the point. You always knew where you stood with him and he liked to keep things simple."

A principle that John lives his life by, to this day.

"The moment you start complicating things, you lose track yourself and anyone working with you loses track too, so just keep it simple and do it well.

"Dad also encouraged me to have a crack at getting a law degree, which I enjoyed so I found a way to work law and farming together. But I knew that if I didn't give the law 100%, it wouldn't work, so the law has always been the primary focus and I have had someone to help me on the farm."

**"The moment you start complicating things, you lose track yourself and anyone working with you loses track too, so just keep it simple and do it well."**

John started with 160 acres and has built from there - now running 20,000 stock units over 5200 acres.

"We always seemed to be winning one year and losing the next when we were reliant on purchasing stock to finish. We had to find a way to level out the ups and downs - so we invested in Hinau Station as a breeding block - that strategy has worked well."

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JOHN HENDERSON LIGHTS UP WHEN HE TALKS ABOUT HORSES AND BLOODLINES. AS A FORMER CHAIRMAN OF RACE INCORPORATED AND SHEEP AND BEEF FARMER IN OHINGAITI, HE HAS HAD THE CHANCE TO INDULGE HIS CHILDHOOD PASSION.

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John says he first got involved with Ravensdown in the 70s when he went along to a meeting at the Marton Football Club. He had a few questions and that curiosity has spanned nearly 40 years.

“I wanted to know why I couldn’t buy their fertiliser directly and why I couldn’t get a price list so I could work it all out first before I made any commitments.”

Now of course the direct-to-farm model and website price lists are a natural part of Ravensdown’s offer. “The co-operative has moved with the times and listens to its shareholders more so than in the past – the culture has really changed.”

## Here and now at Hinau

“We’re seeing good results from improving our pastures, allowing improved stock-carrying capacity and better management of our stock. We’ve initiated a hill country cropping programme and have been growing very successful swede and pasja crops prior to returning to a rye and clover pasture.”

He appreciates the help he gets from his Ravensdown advisors. “The farm team sees them as friends. For example, Ryan Tate our Agri Manager comes to our farm Christmas party. It’s about trusting the guys we are dealing with. There’s a clear ethic that the Ravensdown people we are working with are buying into our business, they’re part of the farming family.”

He says his staff value the My Ravensdown website where they can order product that gets delivered straight to the farm.

“Our managers are good planners and rather than wondering whether we’ve got any drench for the day, we always have a stock of it. They also love the Customer Centre, they can’t believe how good it is! They ring up, get what we want and get quick and accurate answers to their questions.”

John is a firm believer in the spreading maps and gets them religiously from his spreaders, RBS and Aerowork.

“We’ve seen a huge difference on Hinau through Ravensdown soil testing and spreading maps. The soil P was about 8 when we bought it in 1999 and now it averages around 20.”

John says he and his wife Sally are now in a phase of consolidating the family farm, preparing to hand over the torch to their sons, Jack and Patrick; but he’s still enjoying himself in a similar fashion to his father.

**“It’s about trusting the guys we are dealing with. There’s a clear ethic that the Ravensdown people we are working with are buying into our business, they’re part of the farming family.”**

The Ravensdown Chairman still has his energetic curiosity, the inclination to keep things simple and a passion for livestock.

“I love drafting cattle. If you said to me go and enjoy yourself today, I would love nothing better than to round up those steers and draft them into lines.”

# Putting world-leading research into practice

**Thanks to pioneering farmers, pilots, scientists and Ravensdown's research commitment, with a dollop of development funds from the Ministry for Primary Industries, a new precision aerial application service is being launched.**

Topdressing for hill country farms used to mainly be about blanket application when it came to the soil fertility needs across the entire farm. Until now.

Through its computer-controlled precision aerial application, Ravensdown's IntelliSpread™ system will be ideal if you're a hill country farmer who needs to:

1. Produce more
2. Waste less
3. Reduce your environmental impact.

The system is the first offshoot of the Pioneering to Precision Primary Growth Partnership programme. On successful completion of the research phase, IntelliSpread™ will be the only fertiliser delivery system with AirScan™ remote sensing and placement verification technology.

## What this means for you

**Precision aerial application is becoming a reality.**

IntelliSpread™ is about ensuring the right amount of the right fertiliser is placed where it's needed instead of where it's not.

The standard IntelliSpread™ system will enable a "Do Not Apply" instruction to ensure the automated doors are closed over areas where aerial spreading would be wasteful or environmentally inappropriate.

The advanced IntelliSpread™ system will vary the rate of fertiliser applied through computer-controlled hopper doors that are working to a map, which has been wirelessly uploaded to the plane. In the future it is envisaged that



TERESA TARR, RAVENSDOWN AGRI MANAGER, TALKS TO LOCAL HILL COUNTRY FARMERS

the map itself will be created utilising the unique AirScan™ sensing technology (after being validated) which creates a representation of the farm's soil fertility to a much higher resolution than is current practice.

### But wait there's more!

We know soil fertility is highly variable across a hill country farm, but trekking across that terrain to get the number of soil samples required would be impractical.

Breakthroughs in hyperspectral imaging have now placed the solution in the skies for hill country farms through Ravensdown's AirScan™. This technology was originally developed to help the military find things such as camouflaged tanks and is also being used to figure out the mineralogy of Mars.

Experts at Massey University are training the sensors on hill country farms as part of the PGP programme.

The plane-bound sensor scans the soil across 2500 wavebands. Different objects generate different spectral signatures based on the various wavelengths of light that they reflect or absorb and it is these signatures that ultimately enable the soil diagnosis.

By conducting the equivalent of up to 10,000 soil tests per hectare the whole landscape can be mapped with NPKS and other deficiencies and surpluses highlighted.

The intelligence behind Ravensdown's AirScan™ is the same way a trained nutrient management adviser can use OVERSEER and other decision support tools to generate a map file that is wirelessly sent to the plane. The file is what automatically drives the plane doors to dynamically modify fertiliser rates for targeted placement.

It is early days for the prototype IntelliSpread™ system, but the potential for these cutting edge technologies to transform hill country farming is significant.

### Verifying the aerial placement

For auditing and planning purposes, Ravensdown is developing placement verification technology (PVT) which will provide a graphic overlay to the Smart Maps system.

This is important for a farm's records and for future compliance purposes. PVT is different to other options because "proof of placement" with other aerial spreading services only means proving that the door had opened when it should.

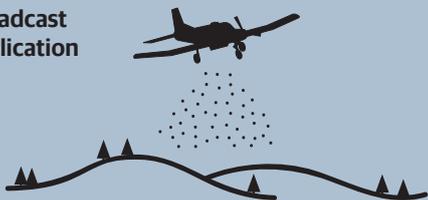
By contrast, Ravensdown's vision for placement verification technology is that it will account for variables such as:

1. Plane speed
2. Product ballistics (density and size).

# Soil testing from the sky

## Current situation

**1** Broadcast application



**2** Average production



**“Breakthroughs in hyperspectral imaging have now placed the solution in the skies for hill country farms through Ravensdown’s AirScan.”**

## New approach

**1** Remote sensing



**2** Integration of remote sensing data into Decision Support Package



**3** Upload computer file to plane



**4** Precision application



**5** Greater production/profitability and less nutrient wastage



# Research farms benefit with soil tests from the air

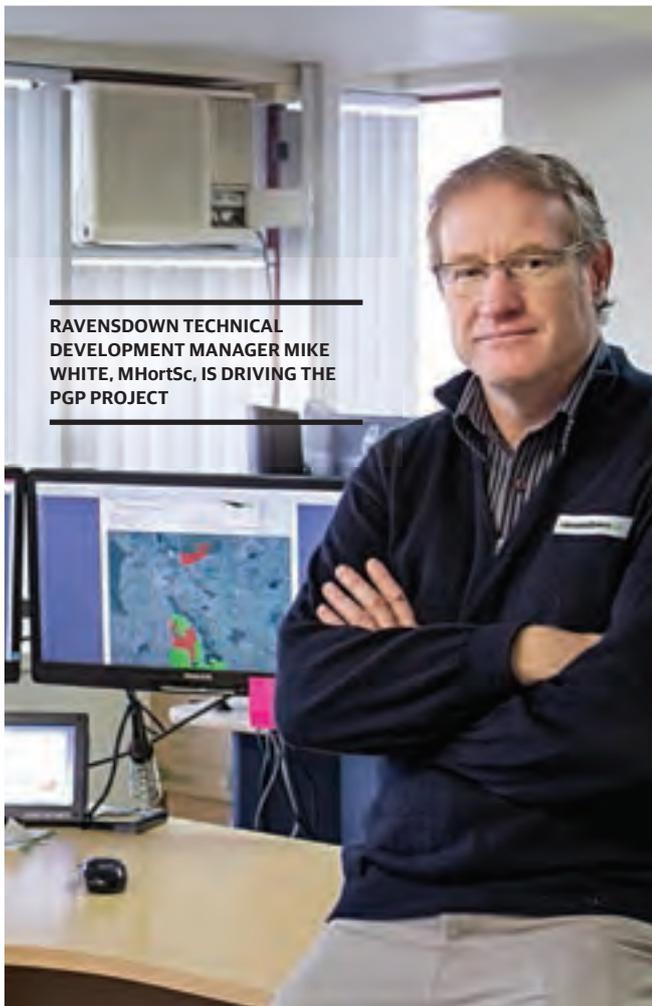
**Hill country farmers being presented with the opportunity to precisely manage their fertiliser programme will be the pioneers of Ravensdown's precision aerial spreading advances.**

East Otago farmer Rob Lawson and Mid Canterbury farmer Ben Todhunter are the latest of the eight farms spread across New Zealand to take part in the programme, Pioneering to Precision Primary Growth Partnership. The Ravensdown initiative aims to improve the use and application of fertiliser and is run in conjunction with the Ministry for Primary Industries and supported by Massey University and AgResearch.

Ben and his wife Donna, who run a foothills breeding and finishing property in the Rakaia area, were approached this year and are looking forward to seeing the results of the research on their farm.



**BEN TODHUNTER HOPES TO SEE ECONOMIC BENEFITS FROM THE TRIALS**



**RAVENSDOWN TECHNICAL DEVELOPMENT MANAGER MIKE WHITE, MHortSc, IS DRIVING THE PGP PROJECT**

"I'm most looking forward to better understanding the soil variability of soil fertility across the property, and being able to be more precise with our fertiliser application, improving targeting applications to optimise distribution and improving accuracy away from waterways and conservation areas."

Ben says that the technology will be key to continuing their conservation work on their hill country farm and will enable them to more effectively grow pasture and convert that into better end product.

"I'm hoping to see better economic benefits come out of it. It will potentially provide some major breakthroughs for precision agriculture. If the technology works, it'll improve the efficiency of our fertiliser application and provide us with better data on our soil fertility."

Michael White, Ravensdown Technical Development Manager, adds that the PGP trial farms are a national network of research farms so that the remote sensing technology can be tested for a range of geographical landscapes and New Zealand conditions.

"In the future, once we've calibrated the sensor we hope to use more affordable sensors with the algorithms that are being developed."

Michael says when the technology is proven, it will be a game changer for hill country farming, especially when accompanied with the specially modified planes operating computer-controlled hopper doors showing the increase in precision that map-driven dynamic fertiliser placement can achieve.

"We've been running the aerial spreading part of the programme for over a year now and the efficiencies gained from the spreading technology are already showing its value."

He says the efficiencies gained from coupling remote sensing technology that assesses soil fertility from the air with practical fertiliser applications has simply not been seen before.

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**“The system provides the farmer with the ability to prove he is complying with any rules by delivering precise measurement and data analysis to demonstrate fertiliser has been applied at the correct rate and in the right place.”**

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**ROB LAWSON BELIEVES THE TECHNOLOGY WILL REMOVE SOME OF THE BURDEN OF BECOMING COMPLIANT**

In East Otago, Rob Lawson is looking forward to the reduced workload on their 2330ha hill country property, south of Waikouaiti.

“Fertiliser is an essential tool to boost pasture production,” Rob says, “but it can be tricky working out how best to apply fertiliser to get the best out of the land and our animals without running over the margin on the cost-to-benefit ratio.”

Rob says the challenge is getting the fertiliser regimes right, when the old blanket approach to fertiliser application - put the same amount everywhere and hope you got it right - is no longer viable.

He’s keen to participate in Ravensdown’s trial, which combines aerial sensing technology to soil test the farm with their smart application technology to deliver precise targeted fertiliser application.

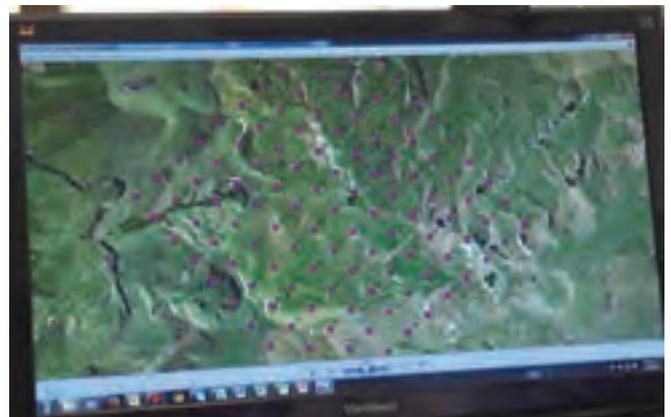
“We’ve only been in the programme a few months but already we’re seeing promise in the technology to reduce our costs. With a recipe specific to the differing areas on the farm, it will make it easier to meet resource consent requirements for nutrient management and run-off into waterways.”

Rob believes regional councils will welcome this technology as an effective tool to mitigate potential nutrient losses to waterways.

The system provides the farmer with the ability to prove he is complying with any rules by delivering precise measurement and data analysis to demonstrate fertiliser has been applied at the correct rate and in the right place.

“There’s clearly going to be a real benefit from an environmental point of view, but I’m also hoping that it’ll mean we can also save money by avoiding using fertiliser where it’s not needed.

“From what I can see, it is all going to end up being a lot less burdensome for the farmer as well.”



# Investment in Ag Science ensures future capability

**New Zealand has a proud history of world leadership in agriculture. We have been successful where other developed countries have struggled.**

We have an opportunity as the world population continues to climb, and the rising middle classes demand more animal protein and safer food. However, science in society lies at the heart of our freedom to operate and grasp opportunities. We have seen this in the water debate and we are also seeing it in the use of technologies such as genetic modification and gene editing.

To date New Zealand has invested heavily in agricultural science and it has paid off. Our animal and plant breeding has made us among the most efficient farmers in the world. While we didn't invent the green revolution - the use of fertilisers, pesticides and modern hybrids - our scientists were able to adapt these developments to our advantage.

Now other game-changing technologies are creating a new revolution in agriculture. I was particularly impressed with the self-steering tractors, GPS, drones on display at National Fielddays, and the use of computer technology to turn big data into useful information.

The biological revolution is also charging at us, with an enhanced understanding of genetics applied to breeding taking us a long way. Genetic modification (GM) has been successfully used

**“New Zealand has invested heavily in agricultural science and it has paid off.”**

overseas in crops such as cotton, papaya, corn, soy and canola. GM is also moving into apples, with the non-browning Arctic Apple, in an attempt to reverse the diminishing popularity of that fruit. The point of breeding programmes is to create plants or animals that have a superior mix of genes - therefore the attributes which are desirable to the breeder and consumer. New gene editing techniques such as CRISPR-Cas9 offer breeding precision, which once could only have been dreamed of by conventional and GM breeders alike.

**“We need agricultural science to develop new products, add value to our current products, improve our productivity, while reducing our environmental footprint.”**

Agricultural science in New Zealand helps us make sense of these technologies, informs society as to their cost and benefits and gives us the ability to adapt them to our own situation. We need agricultural science to develop new products, add value to our current products, improve our productivity, while reducing our environmental footprint and the risks we face such as biosecurity, the climate and our social licence to operate.

That is why it is disappointing to see the continuing retrenchment of AgResearch with their announcement of staff reductions. AgResearch needs to look at its own systems and ability to make its case for funding - but their situation is part of wider issues in agricultural science.

A chronic lack of funding has seen our capability in New Zealand decline. Our science system is also over-governed and micro-managed. While the government has been focused on the commercialisation of science, and this part of the development pipeline is important, it has not paid so much attention to the basic capability we need.

Basic capability is not just a nice to have, it is a must have. It is the foundation on which the translation and commercialisation of science are built. Answering the fundamental questions in soil health, plant and animal performance, and environmental impact and mitigation are investments which need to be made for the benefit of farmers and the country 15 to 20 years down the track.

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RAVENSDOWN SHAREHOLDER DR WILLIAM ROLLESTON IS FEDERATED FARMERS' PRESIDENT AND VICE PRESIDENT OF THE WORLD FARMERS ORGANISATION. HE IS ALSO A SOUTH CANTERBURY FARMER AND FOUNDING SHAREHOLDER AND DIRECTOR OF SOUTH PACIFIC SERA, RECOGNISED AS THE WORLD'S PREMIER SOURCE OF ANIMAL DERIVED BIOREAGENTS.

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Having a strong agricultural science sector encourages our scientists of the future to choose it as a career. It helps train our teachers to create a population who grow up understanding the principles of science and can pick when someone is selling snake oil.

The art of the activist is to create fear in the population and, in doing so, limit farmers' freedom to operate. Science needs to counter this but that relies on a population who can think like scientists - who can take all the information into account rather than picking and choosing to suit a preconceived view.

The genetic modification debate is starkly illustrative of the power of a social licence to operate.

Create enough fear about food and environmental safety, limit sciences' social licence to operate, and pretty soon what was fear will be morphed into ethics. We are left with a religious view and the science of safety then no longer matters.

Water is more subtle, but the use of fear and uncertainty to reduce the social licence to operate for farming is the same.

If we get this wrong then the outrage factor will trump science and translate into regulation, even legislation - the formal curtailment of our social licence to operate.

The Prime Minister's Science Advisor, Sir Peter Gluckman, is concerned that decisions made without the proper application of science can entrench policies which are of little value and are

**“If we get this wrong then the outrage factor will trump science and translate into regulation, even legislation - the formal curtailment of our social licence to operate.”**

not easily reversible, because there may be a popular or political perception that they are effective when in fact they are not. I share his concern.

So our challenge is to keep agricultural science at the top of the government's agenda. We need to ensure regulators, politicians and the judiciary make decisions that are in line with the science, reflecting the uncertainty of our time but not be paralysed by it.

## SOLVING THE MYTHS OF FERTILISER SPREADING IN LESS THAN IDEAL CONDITIONS



**We can determine the best width to achieve an even spread of fertiliser in optimum conditions, but what if there is a wind blowing - say 22 km/h or you're spreading on a paddock with a slope of 10 or 12 degrees?**

We wanted to know the answer, so during the summers of 2013 and 2015, work was undertaken by Professor Ian Yule and Dr Miles Grafton of Massey University, Fertiliser Association NZ, and Ravensdown to examine that very question.

We first spread fertilisers (urea, superphosphate, DAP and nitrophoska) in flat paddock conditions with little or no wind and then the same fertilisers were tested with a 10-12 degree slope and also with a 22 km/h crosswind.

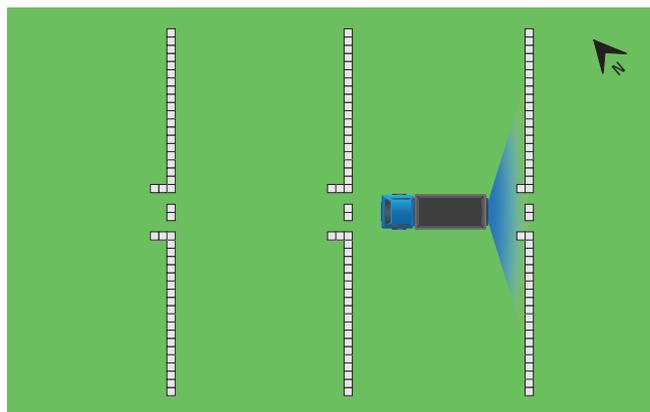
The results for nitrogenous fertilisers were a little unexpected. The effect of wind and/or paddock slope meant that to achieve an even spread then a significantly reduced bout width between consecutive runs of the spreader was needed to achieve the target CV (Coefficient of Variation) of 15%.

Superphosphate had the most robust spread pattern because it had the widest range of particle sizes. Very little, if any, changes in the bout width were required to achieve the target CV of 25%.

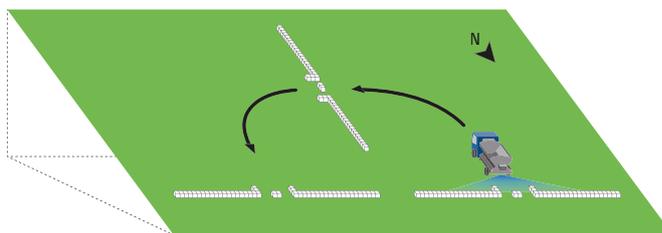
So what is it about Superphosphate's airborne properties that gives it that advantage?



TRAYS LINED UP READY FOR THE FIELD TRIAL



**FIGURE 1:** Scheme of the set used for our Spreadmark tests in flat paddocks, displaying the three rows of trays, driving direction and orientation of the paddock?



**FIGURE 2:** Scheme of the set used for our Spreadmark tests in a slope of 10-12 degrees, displaying the three rows of trays and the driving direction?

Fertiliser's airborne properties in general are dependent on the particle size, density and shape (spherical or otherwise). They are in order of importance in terms of the distance potentially travelled by the particle. Superphosphate had the largest mean particle size, the highest particle density and spherical shape and, therefore, had the most robust spread when field conditions were not ideal.

In less than ideal conditions, which is most often the case on New Zealand farms, spreading width distances for nitrogenous fertilisers (Urea) needed to be reduced. Without adjusting to the conditions such as wind, uneven surfaces and/or moderate slopes, uneven spreads are likely with financial consequences.

For Superphosphate however, we are fortunate that the range of particle sizes, density and shape attributes meant that little to no difference in spreading width was required.

# Spreading with confidence

## Spreading Canterbury's Mike Miller says today's ground spreading technology has given him more confidence to do his job.

"When I first started about 10 years ago we didn't have the information we have now. Technology has come a long way and it gives me more confidence knowing I've spread the right product where it needs to be at the right rate evenly for the farmer."

All Ravensdown spreaders are fitted with the DGPS systems (Differential Global Positioning System) which are accurate to

20cm and use SmartMaps, which allows farmers to access real-time information on what has been spread.

Mike says farmers enjoy talking to him about the technology and are able to download what and where they've spread onto their cell phone through SmartMaps not long after the job is done.

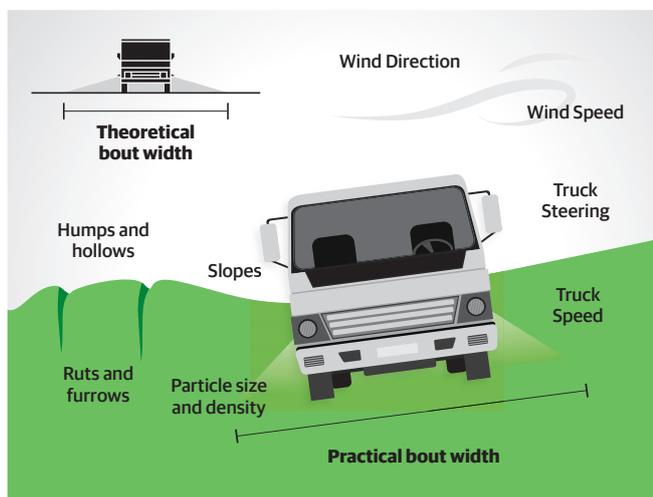
Mike adds that testing the spreading widths has been vital to make sure they're adapting and refining their gear to get the best and most even spread.

"Proof of placement is key to putting money in the bank for the farmer. From the spreading tests with the Ammo products we have now refined the spreading widths in our trucks from 24 metres to 18 metres, and we're getting a much more even cover."



MIKE MILLER, SPREADING CANTEBURY

### THEORETICAL BOUT WIDTHS ARE RARELY MATCHED IN PRACTICE



**"Technology has come a long way and it gives me more confidence knowing I've spread the right product where it needs to be at the right rate for the farmer."**

# WINTER IS COMING

**With winter around the corner, it is time to start thinking about managing and minimising the risk of excess nitrogen (N) and phosphorus (P) loss to the environment.**

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**Our aquatic systems are sensitive to nitrogen and phosphorus, particularly in the wetter months of autumn and winter. With the increased risk of phosphorus and nitrogen loss from farmed land during these months, there is potential to encourage excessive growth of weeds and algae in streams, rivers and lakes; a process of eutrophication.**

Sources of P loss from farmed land vary in risk depending on the soil type, farm system, slope and rainfall. On average, in decreasing order of contribution, P losses to water are associated with:

- Soil erosion (from stream banks, cultivated ground, hill slopes, pugged soil)
- Animal dung (dung pats and effluent)
- Fertiliser application.

There are various ways that P can reach waterways. It can reach the water by attaching itself to the soil particles in fine clays and soil organic matter which with heavy rainfall can lead to surface run-off. However, the rainfall intensity has to be high enough for run-off to occur before the fertiliser or dung particles have had the opportunity to be absorbed into the soil. Even then, surface run-off travels only about 20 meters in a worst-case scenario, with heavy rainfall meeting dry summer and sometimes water-repellent soil.

Among the first of the regional councils to include phosphorus in their Resource Management Plan is Hawkes Bay, which has introduced for landowners in the Tukituki catchment the requirement of a phosphorus management plan within the farmers' Farm Environmental Management Plan. So now more than ever, mitigation techniques need to be considered.

Colin Tyler, Hawkes Bay Regional Council Senior Land Management Advisor, says the high concentrations of Dissolved Reactive Phosphorus (DRP) in the region are promoting rapid weed growth, algal blooms and affecting ecosystem health.

He says they'll be focusing on high-risk farmers first, but all farmers in the catchment will need to have met stock exclusion rules by June 2020 and have a Farm Environmental Management Plan by June 2018.

Ravensdown is currently developing a phosphorus mitigation tool that will help farmers mitigate those risks, and which is likely to be available later this year.

## Going spatial!

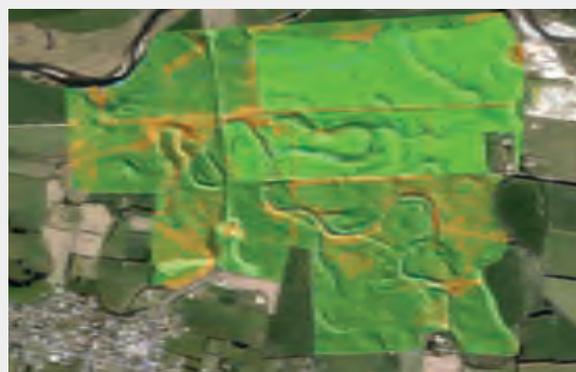
New P-loss mapping tool on its way

The OVERSEER® nutrient budgets model is increasingly being required by regulators to provide an estimate of the nutrient loss footprint from farms.

While OVERSEER® is widely regarded as the best tool available for predicting nitrate leaching losses from pastoral farming systems, it is not a spatially-explicit model. A spatially-explicit model takes into account the variables, inputs and explicit locations in the process being modelled. This means while the risk profile of blocks in terms of N and P loss can be determined, "hot spots or critical source areas" cannot be so easily identified. This arguably is more important for P nutrient management within a New Zealand context.

This is why Ravensdown has partnered with Victoria University to improve an existing spatially capable hydrology model, affectionately termed LUCI (Land Utilisation and Capability Indicator), to identify and estimate N and P losses from critical source areas within farm blocks.

LUCI will also identify appropriate mitigations such as timing of fertiliser application, fencing or riparian plantings and can evaluate their effectiveness in reducing nutrient losses. LUCI has already been used extensively in the UK and New Zealand over a number of years in the context of modelling water flow, so has considerable standing behind it already. It is expected that a LUCI farm nutrient model will be available this year.



- Low to moderate load
- High to very high load
- Moderate to high load
- Water bodies

**“Ravensdown has partnered with Victoria University to improve an existing spatially-capable hydrology model, affectionately termed LUCI.”**

# Managing P loss

By Thomas Taylor, Ravensdown Senior Agri Manager



Understanding how phosphorus is lost to the environment is essential in mitigating the risks. Because the majority of phosphorus (P) is lost through soil movement, it's all about understanding the ways to mitigate that risk, especially in the wetter and colder months ahead.

The soil structure and type, as well as cover are important factors in how phosphorus is lost, such as pasture, crop and bare land.

Essentially the more soil disturbance caused by stock or machinery you have on paddocks near waterways, especially sloped ones, means you're going to see more soil movement and ultimately P loss. It only takes a small amount of phosphorus to increase algal blooms in our waterways so even the smallest adjustment on-farm can have significant results.

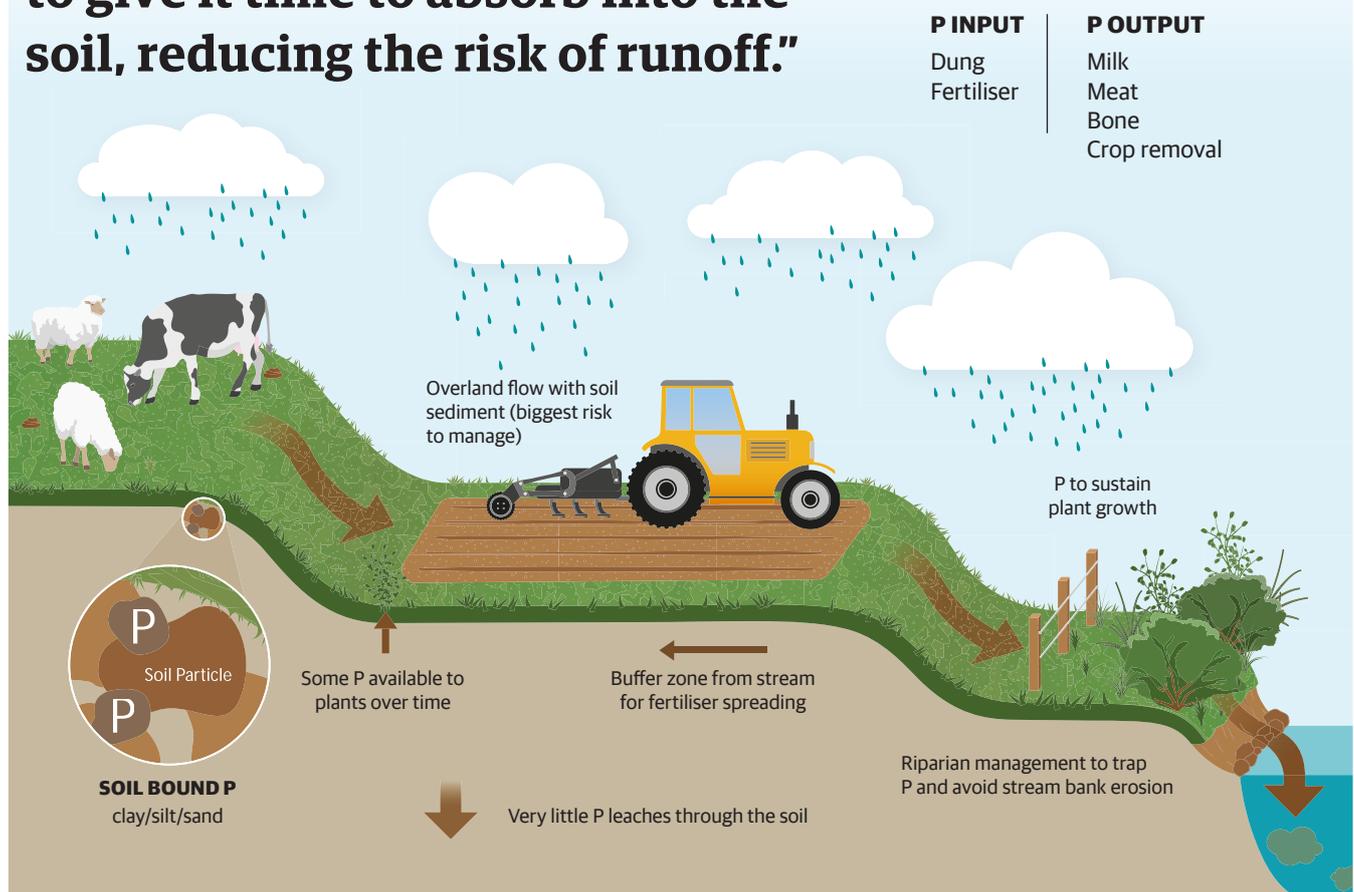
Reducing stocking rates, pugging and avoiding putting stock on sloped paddocks near waterways is a great start for autumn and winter. However these aren't always easy options for some farm practices. Whether operating at a higher stocking rate or putting stock on sloped paddocks, there are still ways to manage the risks.

- By putting younger lighter stock on sloped paddocks
- Choose flat paddocks away from waterways for heavier classes of stock
- Have a stand-off zone during the higher risk rainfall times
- Create a riparian stock exclusion zone along waterways.

Applying phosphate fertilisers outside the winter months is also a good option to give it time to absorb into the soil, reducing the risk of runoff.

Reactive Phosphate Rock (RPR) with its low water soluble phosphorus is often positioned as a fertiliser source that could reduce losses compared with high water-soluble P fertilisers. However, losses are driven by fertiliser P losses directly entering the stream. So avoiding entry to the stream in the first instance is the best mitigation.

## “Applying phosphate fertilisers in early autumn is also a good option to give it time to absorb into the soil, reducing the risk of runoff.”



# Managing N loss

By Mark Crawford, Ravensdown Senior Environmental Consultant

**Many of you may be wondering how you might reduce the risk of nitrogen (N) loss during the autumn/winter months.**

The biggest risk of nitrogen loss is from the unused N that sits in the soil solution, due to the inability of the crops or pastures to use it during slow-growing conditions.

Animal urine is by far the biggest contributor to nitrogen in pastoral soils, followed by crop residue and finally, fertiliser, which has a minimal impact.

## Urine

The general rule of thumb is the higher the stocking rates, the higher N-loss risk numbers will be, especially over the critical autumn/winter period.

Farmers who wish to extend their milking period, generally do so by applying autumn nitrogen (urea) and/or using supplementary feed. This will continue the number of lactating cows urinating and maintain a higher stocking rate into a period when pasture growth is slowing, and so the N-loss risk will be higher.

So it's critical to know what areas on farm have a greater ability to buffer these losses as well as having options to reduce them, such as:

- Reduce your autumn stocking rate by culling early and drying off poorer-producing cows
- Use a feed pad and/or herd homes to feed supplements
- Use your heavy soils, prone to pugging but with an ability to leach less N, earlier in the winter when they're drier
- Stop applying the effluent earlier in autumn, store it and apply it in the spring when pastures are able to use it
- Use feed that has a lower concentration of N e.g. whole crop cereal silage
- Use high quality feed supplements to reduce wastage.

## Winter crops

We know grazed winter crops are a large source of N-loss as are fallow areas after arable crops are harvested in autumn. Some options to keep in mind during and after winter grazing:

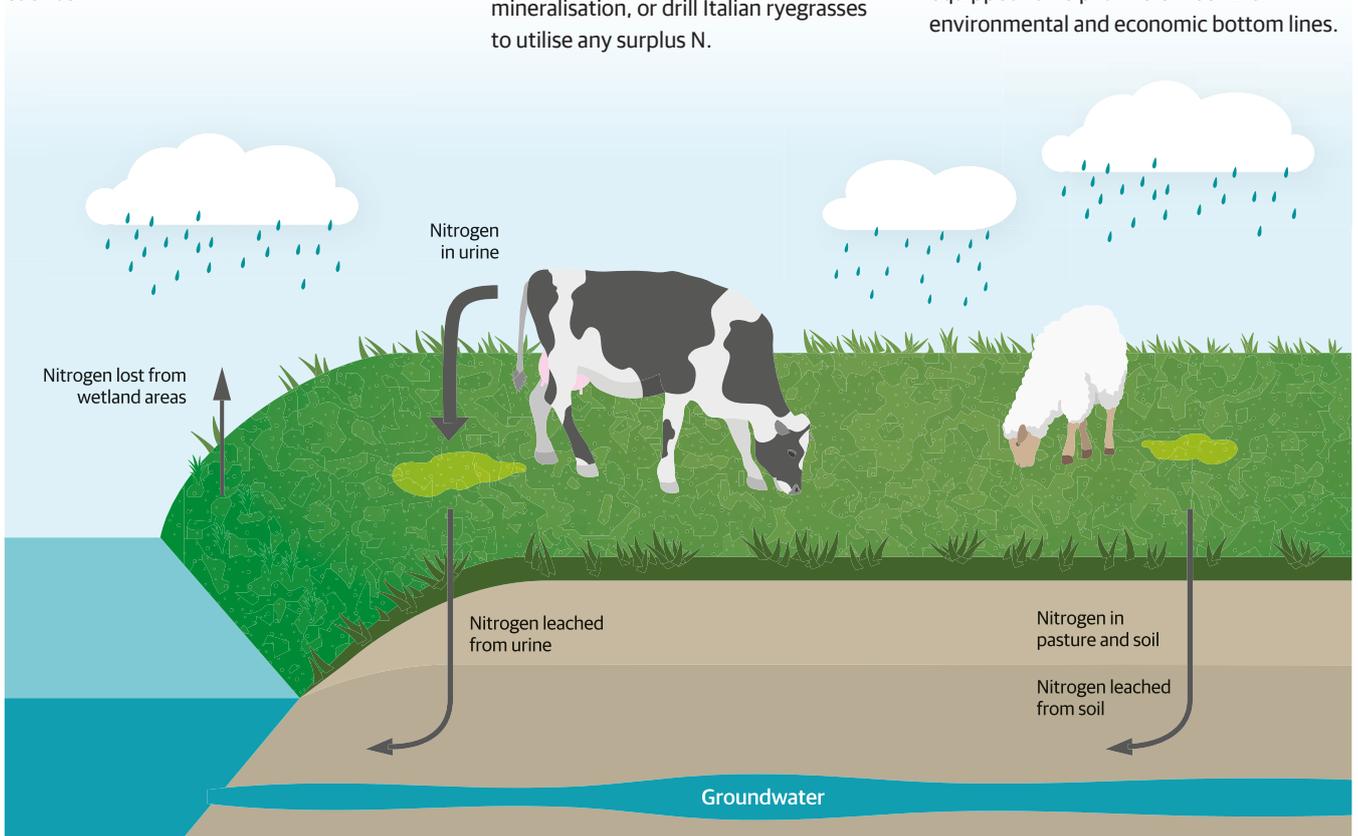
- Stand stock off winter crops when it's really wet e.g. feed pad or using your laneways
- Break feeding: Leave the crop at the bottom of the hill (critical source area) till last when it's drier and warmer
- Plant cover crops to reduce mineralisation, or drill Italian ryegrasses to utilise any surplus N.



The science is evolving and in time, forage species will likely be developed as a tool to reduce your farm losses.

While the effect of fertiliser on N loss is minimal compared to urine, there are still good ways to minimise its impact. Spreading early in autumn when plant uptake is greater due to the warmer weather – a week or so after the first autumn rain is ideal. Using OVERSEER combined with our Smart Maps tool is also a good way to ensure you're spreading accurately and away from waterways.

Nutrient losses are now a crucial part of your farm business. Between your Ravensdown Agri Manager and Environmental Consultant, we're well equipped to help farmers meet their environmental and economic bottom lines.



# Rocks as a hand-brake on pasture productivity



NEIL SMITH RIVERSTONE  
FARMS DIRECTOR

**With several successful dairy farms under their belt, large vege gardens, gift shops, restaurant and a castle on the way, Neil and Dot are a far cry from the days of when they had to walk their cows for two days to get to their winter grazing.**

Neil and Dot Smith arrived on the North Otago Plains in 1982, faced with spartan rocky soil that would break your wrist trying to drive a standard into it.

The two Northland dairy farmers had just bought and leased the first converted dairy farm on the North Otago plains, with dreams of drought-proofing their business. Arriving with their two boys to a farm barely fenced, with rocks the size of footballs and not a tree to be seen, they embarked on a 33-year journey that is truly inspiring.

Having never dealt with rocky ground before, Neil and Dot proceeded to build their soil organic matter through trial and error, with years of cow manure, straw and fertiliser.

"When we first arrived, there were rocks everywhere. I took Dot and the two kids down in the car with a trailer on the back and we spent the afternoon picking up rocks. We got about four trailer loads, but by

smoko the boys had lost interest; we could see it was a hopeless endeavour," Neil says.

Dot describes the struggle they had with getting their heads around using irrigation in the barren conditions, during the Rogernomics era, as unforgiving.

"We had dreadfully drying winds back then. Because there were no trees on the plains it blew the top soil away. If anyone ploughed, it ended up in the sea, so we had to learn how to irrigate fast. It was simply no water, no grass, no milk - no money."

"We hadn't used irrigation before, when the first bit of water came down the race we didn't know what to do with it. The rocks made it near impossible to get water out of the raceway. With no top-soil it disappeared through the rock soak holes."

**"We had dreadfully drying winds back then. Because there were no trees on the plains it blew the top soil away!"**



ORIGINAL SOIL STRUCTURE NEIL AND DOT WERE FACED WITH

Neil says they were heavily reliant on what they learnt from the locals and describes the heavy rolling technique following irrigation as a pivotal moment for them early on.

"To be effective we learnt that you needed to heavy roll after irrigating, when the ground was softer so you could then push the rocks down. It took us years to get them all down, because we didn't learn about direct drilling until the farmers from the North Island arrived, so we kept ploughing the rocks back up."

**"Enthusiasm got us into a lot of trouble, but it also got us out of a lot of trouble!"**

"We were also wintering the cows to get the organic matter going which was hard because they'd flick the rocks back out with their feet. So it's taken us 10 heavy rollings over the past 33 years to get them all down," Neil says.

"Enthusiasm got us into a lot of trouble, but it also got us out of a lot of trouble!"

Another way they broke the mould was with their fertiliser application. Starting with P levels at 10 and pH levels at 5.5, they took advice from Ravensdown to raise their superphosphate application from 50kg to 750kg per hectare as well as applying two tonnes of lime per hectare every four years.

"It made a hell of a difference, it was a game changer for us. We saw a lift in production in 12 months, though nothing visually because it was such a spartan environment.



NEIL AND DOT SMITH

“But for that we just had to observe what was happening under the cow pat and wonder why it was doing so well then apply that over the whole paddock.”

Over the next 10 years they went from an average of 600-900 kgs of milk solids per hectare (kgMS/ha) shooting up to 1,300 by the mid-90s, doubling their production in 15 years.

“The wheel really turned for us when people started to spray with Round-Up and drill with ryegrass and clovers. That made a 360 degree difference.”

Dot says cow manure has been their best friend.

“Because of the cows, we’ve managed to build up a top soil with manure straw and silage and all those things that have been fed out. That’s what got us through Rogernomics and where we are today.”

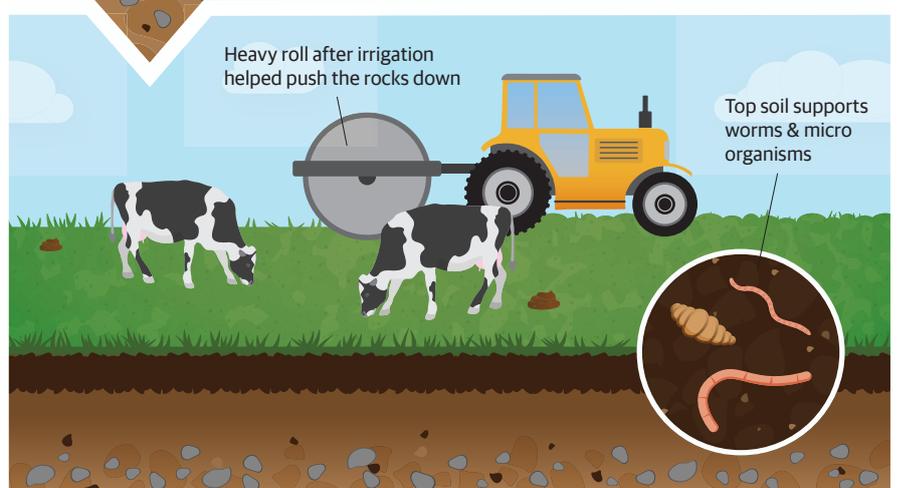
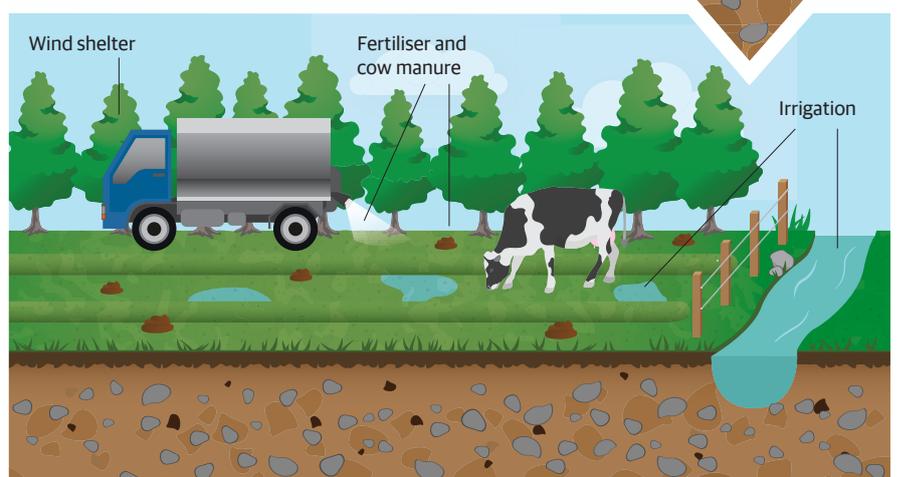
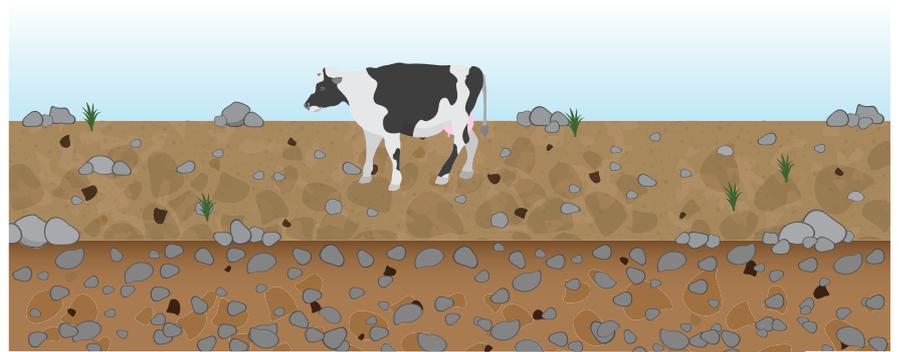
**“Cow manure has been our best friend. Because of the cows, we’ve managed to build up a top soil.”**

The pair are now currently averaging P levels of 40 and a pH of 6 producing 285,000kgMS/ha and have no plans to slow down. While no longer putting in 100-hour weeks (while not far off) they’re constantly looking to innovate and learn new ways of doing things utilising new technology (such as Ravensdown’s Smart Maps) – a testament to how they built their Riverstone brand.

Neil sums their journey up pretty well. “This isn’t a dress rehearsal. You’ve just got to take a few hits and keep going.

“Take every opportunity that comes your way. We are lucky to be alive!”

## Organic matter builds up as top soil and accumulates over rocky terrain



NOW BENEFITTING FROM THEIR YEARS OF HARD WORK

# Ammonia gas volatilisation from urea

## How much gas do you get in winter?

DR ANTS ROBERTS  
RAVENSDOWN CHIEF SCIENTIFIC OFFICER

**Urea application to pastures in winter is not best practice. This is because of the usually slow pasture growth, hence low nitrogen (N) demand, coupled with the increased risk of soil drainage and direct loss of N from the fertiliser. Despite this, some farmers will still apply N fertilisers over the winter months when trying to bridge predicted feed deficits.**

Given that conditions are generally cold and wet in winter, are these urea applications subject to volatilisation losses?

The answer is yes, however these losses are generally smaller than other seasons. A 2011 summary of New Zealand pastoral field trials indicated that average volatilisation losses in winter were 8% with a range from 4 to 12%<sup>8</sup>.

As urea is hydrolysed to ammonium ions by the urease enzymes in the soil, and the pH of the solution immediately around the dissolving granule increases, some of the ammonium ions convert to ammonia gas dissolved in the soil water. In warm conditions, some of this dissolved ammonia turns into gaseous ammonia and is volatilised into the air. For every 10°C increase in temperature, it has been reported that there would be a threefold increase in the formation of ammonia gas from dissolved ammonia or ammonium ions. So under the colder winter temperatures, there is likely to be less ammonia gas generated that is prone to volatilisation.

If you are wondering whether or not to use a urease inhibited urea, such as Ravensdown's N-Protect over the winter months, let's do the sums:

Say you apply 65kg urea/ha, which is 30kg N/ha. On average, you could lose 8% of the N you applied as ammonia volatilisation. This equates to 2.4kg N/ha. Urease inhibitors are on average 50% effective at reducing volatilisation, which means that you would retain 1.2kg N/ha by using urea treated with a urease inhibitor

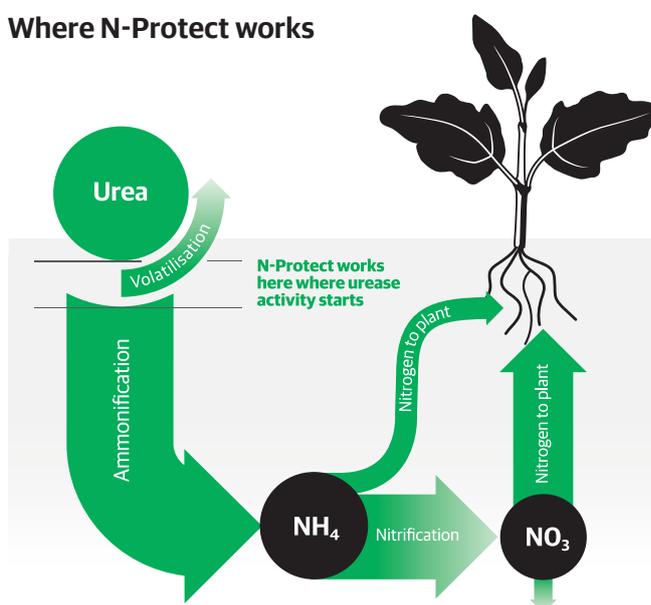


(N-Protect). At the time of writing (December 2015) the direct price of urea was \$575/t and for N-Protect was \$625/t. The cost per kg of N works out to be \$1.23/kg N for urea and \$1.36/kg N for N-Protect.

If you apply 30kg N/ha this would cost \$37.50 for urea or \$40.76 for N-Protect, with the price difference of \$3.26/ha. Using N-Protect therefore saves 1.2 kg N/ha, which is worth \$1.50/ha for a cost of \$3.26/ha. Based on these figures, it would be a waste of money to use coated urea products in the winter months.

**ANY "GAIN" OF UREASE INHIBITORS IS REDUCED IN COOLER AND WETTER CONDITIONS. THE AMOUNT OF N RETAINED FOR THE PLANT BECOMES LESS AND LESS WORTH THE PREMIUM THAT IS PAID FOR A COATED AREA.**

### Where N-Protect works



## MIXING FERTILISERS ARE THEY COMPATIBLE?

**Mixing fertiliser materials is not as straightforward as one may think, and mixing the wrong ones can produce undesirable results.**

**Three main considerations for compatibility of solid fertilisers are:**

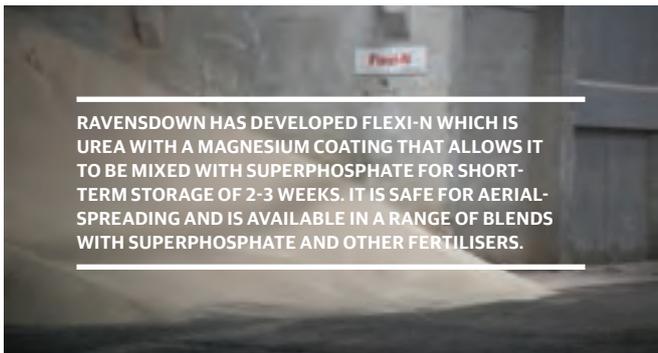
1. Safety aspects e.g. chemical reaction causing release of harmful gases
2. Production problems e.g. stickiness causing handling difficulties
3. Quality aspects e.g. high tendency for caking, or the formation of lumps.

Chemical compatibility in dry fertiliser blends is the ability of two or more materials to remain dry and free flowing when blended together. Incompatibility is evidenced by wetting, caking, or particle degradation.

Combinations of urea and superphosphate are not compatible. The urea reacts with the water content in superphosphate often creating a wet sticky mess. Additionally, urea and some sulphate-based micronutrients can exhibit wetting.

DAP is not compatible with superphosphate unless spread immediately as it initially forms a slush then goes hard. DAP should not be mixed with lime or with magnesium oxide as ammonia gas may be given off.

Production problems arise as many fertiliser materials are hygroscopic, which means they can pick up moisture from humid air. Nearly all fertilisers are hygroscopic to some extent because of their normally high water solubility. The more hygroscopic a fertiliser is, the more problems you can expect during storage and handling.



RAVENSDOWN HAS DEVELOPED FLEXI-N WHICH IS UREA WITH A MAGNESIUM COATING THAT ALLOWS IT TO BE MIXED WITH SUPERPHOSPHATE FOR SHORT-TERM STORAGE OF 2-3 WEEKS. IT IS SAFE FOR AERIAL-SPREADING AND IS AVAILABLE IN A RANGE OF BLENDS WITH SUPERPHOSPHATE AND OTHER FERTILISERS.



LLOYD GLENNY,  
RAVENSDOWN FERTILISER  
PRODUCT MANAGER

A major quality aspect is the formation of a solid mass or lumps of fertiliser from individual particles, known as 'caking'. Caking can cause many handling and application problems and is considered to be the single biggest physical quality problem in fertilisers.

The effect of caking can be minimal when the lumps break easily back into original individual particles with normal handling. Conversely, caking can be extremely severe, forming a solid mass that can no longer be broken back down into its original particles.

**Characteristics of a fertiliser that can have an impact on its tendency to cake include:**

- Moisture content
- Humidity
- Product temperature
- Particle size
- Particle hardness
- Chemical composition
- Pile or stack pressure
- Storage time
- Curing time.

For example, ammonium sulphate mixed with superphosphate is best spread promptly as it will cake and go hard in storage.

Ravensdown store managers will happily discuss characteristics and compatibility with you before proceeding.

## DETERMINING THE QUALITY OF LIME KNOW WHAT YOU'RE PAYING FOR

### The science of lime

Aglime is essential to the sustainable productivity of New Zealand farming systems and an important element in optimising pasture growth on your farm.

As a general guide, if you want to maintain the optimum pasture pH between 5.8 and 6.0 then an annual application is required for:

- Dairy 350-500kg lime per ha
- Dairy Support 250-400kg per ha
- Dry Stock is 100-300kg per ha.

### The Quality of Lime

The key factors for determining the quality of aglime are the calcium carbonate ( $\text{CaCO}_3$ ) percentage, how finely it is ground and the moisture content of the product on purchase. The hardness and porosity of the lime have a lesser influence.

$\text{CaCO}_3$  varies across the country from 99% to 65%  $\text{CaCO}_3$  often dependent on the location and geology of the area. All limes will raise soil pH and limes with a lower  $\text{CaCO}_3$  will need a higher application rate to achieve the same effect. Lime with an 80% value will need to be applied at a 12.5% higher rate than a lime with a 90% value to achieve the same effect.

### Fineness

The solubility or dissolution rate of the  $\text{CaCO}_3$  is largely dependent on the particle size of the lime - the finer the particle the quicker it will react. Some suppliers promote their lime as being 'softer' therefore much more reactive. Whilst the hardness and porosity of the lime rock type does have an influence, the major factor in the dissolution rate is the fineness of the particle applied.

The quicker the lime reacts however, the quicker it is consumed. Promoters of fine lime products have been known to claim that their lime has a far greater liming effect and less product is required. This claim needs to be treated with caution as there is a basic chemical balance at play here. The amount of  $\text{CaCO}_3$  required to neutralise a unit of acidity in the soil is fixed. Yes, the fine lime will react more rapidly but once that has been consumed, then the natural soil acidification process continues again.

Aglime produced to the Fertmark specifications is a combination of finer particles that are available to lift the pH rapidly and the coarser particle range continue to neutralise the acidity over an extended period of time.



CRAIG HENDRY, RAVENSDOWN LIME OPERATIONS MANAGER



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## Moisture Content

Although most limes are geologically in a 'rock form' many have a relatively high naturally-occurring water content. In the South Island a number of the Ravensdown quarries need to dry the raw lime prior to processing to allow it to be crushed to required specifications. This results in a low water content in the final product often around 1 to 2%.

The North Island quarries have a different geology and many don't require drying, however the water content of the final product is slightly higher.

When assessing the level of  $\text{CaCO}_3$  in lime, you should also consider the percentage of water content in the product you are purchasing. A good analysis of lime will state the  $\text{CaCO}_3$  on a dry basis, the percentage of moisture and the calculated  $\text{CaCO}_3$  w/w ( $\text{CaCO}_3$  weight over total weight) which factors in the amount of water in the product - this is the  $\text{CaCO}_3$  you are purchasing.

Some suppliers will provide an analysis, which will state the  $\text{CaCO}_3$  but it could be presented on a dry basis. If there is 10% water in that lime, then you are effectively buying 10% less than has been stated and you'll be purchasing 100kg of water in every tonne. It pays to find out the water content of the lime you are purchasing.

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## How do you know your lime is the quality that is stated?

Fertmark is an independent system that verifies the quality of lime that the 'seller' has declared or stated. The Fertmark management system ensures that a robust sampling system is in place so that samples collected and analysed are representative of what is being sold. Monthly testing is carried out, the results reviewed and independent samples are collected and tested by a Fertmark Auditor.

All Ravensdown Lime Quarries have retained Fertmark certification for the last 10 years. It provides assurance to our customers and shareholders that the aglime they purchase 'is what we say it is'. We encourage all lime quarries to become Fertmark Certified to provide assurance to their customers.



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### DIPTON LIME QUARRY

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## Selenium (Se) an essential player in animal health



JULIE WAGNER, RAVENSDOWN ANIMAL HEALTH MANAGER, VETERINARIAN

**Selenium is a trace element that plays a pivotal role in the metabolism of your stock. It is vital for stock life, with severe deficiency being fatal, and is of considerable economic importance to New Zealand.**

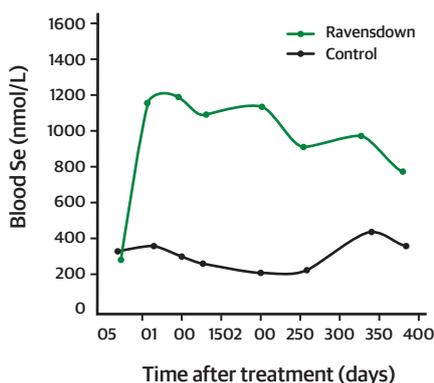
Selenium deficiency in New Zealand's farm animals has been recognised for over 50 years. The deficiency limits production in ruminants through disease, including white muscle disease in lambs and calves, infertility of ewes and ill-thrift in cattle. More difficult to see are the sub-clinical deficiencies which result in decreased growth rate, milk production and lambing percentage.

Ravensdown's Selprill Double® successfully maintains blood and liver selenium levels of grazing animals above the established deficiency range for 12 months after application.

It is a slow release 2% selenium prill that is applied blended with fertiliser at a rate of only 0.5kg per hectare; half the rate of all other selenium prill products on the market. Preferably, it should be applied to soils in spring during periods of good pasture growth rates where selenium is taken up by the growing pasture.

After applying Selprill Double®, pastures should not be grazed for 3-4 weeks, to allow at least 20mm of rain to wash the selenium into the soil and be taken up by the herbage. This uptake is dependent on soil type, botanical composition and climate.

After initial grazing when the pasture selenium levels are high, the animals store it in their liver. So even with the declining pasture levels, the animals have enough selenium for 12 months when grazing pastures<sup>9</sup>.



It is important that the livestock remain on the selenium-topdressed pasture for as long as possible, as short-term grazing will lessen the benefit to the animal. For example, if ewes were grazed on pasture for only 11 weeks (three weeks pre-mating and eight weeks post-mating) on pastures topdressed with selenium in autumn, their lambs may need additional selenium at the time of docking in order to maintain an adequate selenium status up to weaning.

In contrast, if the ewes remained on the selenium-topdressed area then an adequate selenium status would be maintained during gestation and lactation, and in the lambs from birth to weaning (Metherell et al 1996)<sup>10</sup>. To avoid overdosing, care should be taken when configuring other forms of selenium supplementation when animals are already grazing selenium top-dressed pasture.

# Fly and lice resistance

## Can we apply lessons from worms?



PAUL MCKEE, RAVENSDOWN ANIMAL HEALTH TECHNICAL MANAGER

**Flystrike is the second most costly parasitic disease of sheep in New Zealand. It is estimated that the parasites of sheep (blowflies and lice) cost the New Zealand farming industry an estimated \$60 million each year<sup>11</sup>. The good news is that development of modern-day insecticides (dips) for the control of fly and lice infections has significantly reduced the costs associated with treatment and protection of stock.**

From the amount of dips currently being used, it is reasonable to conclude that they have become the preferred method of stock protection from these external parasites. However, with every dip application the likelihood of chemical resistance increases. The discovery of resistance to one or more of these dips suggests that many have developed an

over-dependence to chemical control.

To slow the development of resistance in flies and lice, farmers need to develop integrated pest management strategies that reduce their dependence on dips. This will require a good understanding of parasite/host interactions, control options and how these impact on the development of resistance. For internal worms, significant research efforts have resulted in the development of a set of best practice guidelines to slow the development of drench resistance. Unfortunately, little work is being done to develop similar strategies for flies and lice.

**Generally, best practice guidelines can be separated into two broad categories:**

Non-Chemical Options	Chemical Options
Genetic selection for host resistance	Reduce the use of chemicals
Introduction of biological controls	Avoid repeated use of one active
Reducing parasite challenge	Target treatments for specific parasites
Optimisation of shearing/crutching times	Use correct dose rates
Provide refugia	Use combinations

Both industry and producers will need to take an active involvement in developing sustainable fly/lice control programmes; where ultimately we maximise the effective use of chemicals and at the same time minimise the selection for resistance. In the absence of evidence to suggest otherwise, applying the principles of worm management to fly/lice management may help us achieve these outcomes.

When it comes to the use of combinations, the same considerations for their use with worms are applied to fly and lice. Parasites are less likely to survive treatments of multiple actives applied simultaneously compared to a single active.

The use of combinations is most likely to be successful when:

- No resistance already exists
- A significant amount of refugia exists
- The component actives have different modes of action.

Saturate® Gold and Fleeceguard® are unique combination dips developed exclusively for Ravensdown to control fly and lice in sheep. Used correctly as part of an integrated control programme, they provide protection from flies and lice, while delaying the development of chemical resistance.

# Source Code

In case you would like to learn more, we have collated this list of sources cited in our articles. Most of these are available online. If you'd like more information, or you'd like to discuss an article written in Ground Effect by any Ravensdown specialist, give the Customer Centre a call on 0800 100 123 to arrange a chat.

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IT WAS A DAY OF  
ANIMAL WRANGLING  
AND TILLY FELT SHE WAS  
MISSING OUT

## The Last Word

We hope you enjoyed the second edition of Ravensdown's Ground Effect. Let us know what you think or if you'd like to contribute to the next edition. Email us or share your thoughts online through our social media channels.

Tel: 0800 100 123  
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Twitter: @RavensdownNZ  
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Instagram: @ravensdown

On behalf of New Zealand, we'd like to thank those who are doing the agri-science and capturing insights for the good of the country.

## Contributors

The Ravensdown Editorial team would like to thank:

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Nick Staveley, Tony Stewart, Kerry Crosland, Kate Taylor, Kevin Bills and Holly Cholmondeley for capturing the Ravensdown team perfectly in their photographs and for the stunning landscapes and portraits used throughout this magazine.

Neil and Dot Smith, from Riverstone Dairy, who took the time out of their hectic schedules to tell us about their rocky journey and sportingly took our editor through their castle with its own secret tunnel.

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Simon Thornely and Samantha Cawthorn who designed and laid out Ground Effect and Spectrum Print for producing this publication to a high standard.

Best Regards  
**Penny Clark-Hall**  
Editor

## Ground Effect

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# N-Protect™

**More N in the soil.  
Less in the air.**

N-Protect reduces losses due to ammonia volatilisation.

**Hot, dry or windy conditions can play havoc with your urea programme.**

N-Protect puts more nitrogen where it's needed – into the soil.

We can help you decide if your losses are high enough to use N-Protect or stick with straight urea.



**ravensdown**

Call your Agri Manager or the Customer Centre on 0800 100 123 about whether N-Protect is right for you.

[ravensdown.co.nz](http://ravensdown.co.nz)

**Driven. For your success.**