

# ground

## EFFECT

Autumn 2019  
EDITION 8

## Pride in the Pomahaka Catchment

**Otago farmers Judy Miller and Clark Scott talk environmental leadership**

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### Fine particle application

Debunking the myth

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### Super subterranean

Encouraging sub clover in dryland pastures

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# WELCOME TO THE EIGHTH EDITION OF GROUNDEFFECT® FROM RAVENSDOWN

We have been producing this publication for the benefit of the agrisector and scientists working in it since 2015. Since then we have showcased many examples of farmers and growers who have taken steps to reduce their environmental impacts including lowering risk of nutrient losses in the form of leaching or greenhouse gas emissions.

Ravensdown created this publication and continues to invest in its production because enabling smarter farming is why we exist. Ground Effect gives us the chance to show what smarter farming looks like.

Responsible nutrient stewardship has been such a big part of smarter farming, but these days it's more important than ever.

In this Ground Effect, as we have done in past editions, we celebrate such stewardship. Farmers like Otago-based shareholders Judy Miller and Clark Scott, who are taking a lead in restoring water quality in their catchment, are great examples on page 8. The Pati Tapu Station team who are using Ravensdown technology for more precise nitrogen application on page 18 are another.

We give space to those who champion responsible nutrient stewardship including Massey's Professor Russ Tillman on page 6 and our very own Dr Ants Roberts on page 33. Lincoln's Professor Derrick Moot outlines the importance of sub clover and how 90% of its dry matter is produced in the spring on page 20.

We commit to research and tools that will help with responsible nutrient stewardship. This includes studies on smart irrigation on page 22, algorithms that can help farmers make better decisions on page 24 and maps that demonstrate compliance with regional nutrient rules on page 16.

We advise about responsible nutrient stewardship – take a look at our Agri Manager Courtney Morton's take on potato nutrients on page 34 and Ravensdown's environmental consultants give real examples of farmers they have helped on page 30.

AgResearch and DairyNZ scientists discuss how nutrient losses can be mitigated – including reducing the total amount of nitrogen



- on page 14. While scale does bring efficiencies, as a co-operative, Ravensdown is not here to maximise applied tonnages. We are science led, not sales led. Our aim as nutrient efficiency specialists is to supply the necessary amount of nutrients to nourish the soils – no more, no less.

The food creation system in New Zealand is the envy of so many in the world. Ravensdown is an important part of this vital challenge and Ground Effect is just one example of how seriously we take it.

And because we welcome scrutiny, comments and criticism, you can send any and all feedback to the email address below.

Best regards  
**Greg Campbell**  
Ravensdown Chief Executive  
**CEO@RAVENDOWN.CO.NZ**



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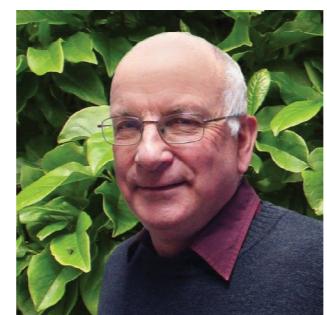
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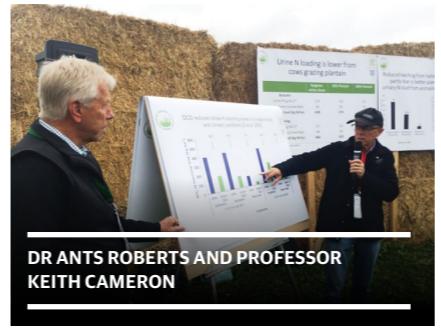
## BEHIND THE SCENES

Ravensdown is enabling smarter farming for a better New Zealand

BOG ROY STATION, GRASSLAND CONFERENCE 2018

## Pasture Summit Conference

Ravensdown was a proud sponsor of the inaugural Pasture Summit conference, held in Ashburton and Hamilton in November 2018. Pasture Summit welcomed delegates from around the world to discuss the future of pastoral dairy farming.



## Dr Ants Roberts honoured

Congratulations to Ants as the recipient of the New Zealand Society of Soil Science's (NZSSS) award, The Norman Taylor Memorial Lecture, awarded in recognition of outstanding contributions to soil science in New Zealand.



## Grassland Conference 2018

The theme of the 2018 Grassland Conference held in Twizel was 'Balancing The Extremes'. Delegates enjoyed a number of thought-provoking presentations about the challenges of farming in this unique region and heard about how innovative high country farmers are integrating tourism into their farming operations.



## Massey Uni Ag Awards

The Massey University award for the most proficient third-year student in 2018 went to Mathilde van Baarle, Bachelor of AgriScience. The awards are sponsored by Ravensdown, with the top three students receiving a share of \$1,500 prize money.

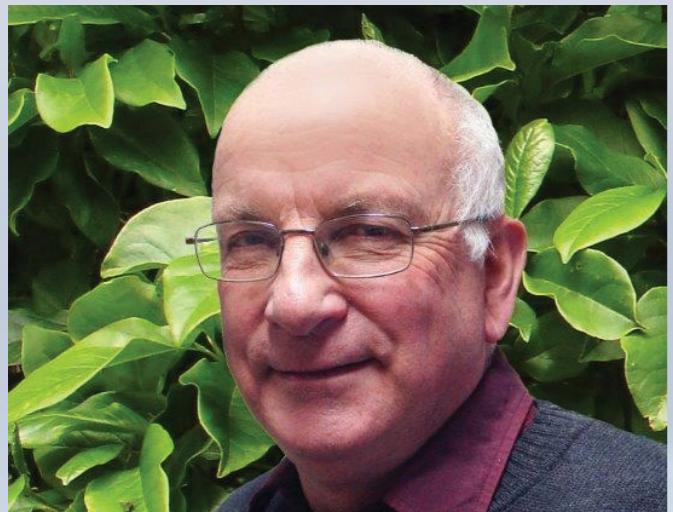


## First-class honours for masters students

Congratulations to Maggie Rogers, Alicia Taylor and Ray Mohan for completing their masters studies while in the Ravensdown Graduate Programme. Maggie and Alicia completed their respective masters degrees with first-class honours on the way nitrogen and phosphorus are managed on farm using Ravensdown and Victoria University's Land Use Capability Indicator (LUCI) model. Ray completed her Master of Business Studies (MBS) with distinction, looking at the use of Life Cycle Assessment (LCA) to facilitate continuous improvements of on-farm environmental performance.

# THE FUTURE OF NEW ZEALAND AGRICULTURE

By Russ Tillman, Professor Emeritus, Institute of Agriculture and Environment, Massey University



**What will the future of New Zealand agriculture look like? No one knows for sure because, as the famous physicist Neils Bohr said, "prediction is very difficult, especially if it's about the future". Indeed, in this age of fake news, even predicting the past is quite a challenge. Nevertheless, there are two current trends that will almost certainly impact on New Zealand agriculture in the future.**

First, the world's population will continue to increase and become wealthier for at least the next 30 years. As people grow richer, their focus shifts from getting *enough* food to eat to a greater emphasis on the *type* of food they eat. In the past, this has usually resulted in the inclusion of more animal products, notably meat and dairy, in diets that were previously almost entirely plant-based.

Then, as people become even more wealthy, the focus changes again to include other intrinsic and extrinsic attributes of food. The intrinsic attributes depend on the composition of the food itself and often include the effect of the food on health and wellbeing. The extrinsic attributes do not depend on the actual composition of the food, but instead focus on how it is produced. Examples include concerns about animal welfare, the environmental footprints of the farming systems, and the back-story of inputs such as fertilisers and supplementary feeds (eg Palm Kernel Expeller (PKE)).

The second important trend that will continue into the future is the ongoing development of new technologies. Some of these technologies will assist New Zealand farmers to become more efficient. But others, such as technologies that enable industrial scale production of "artificial" meat and dairy products from plant protein, will pose a threat to the viability and profitability of New Zealand farming. These "artificial" foods will be cheaper to produce than conventional animal products and will have no

animal welfare issues associated with them. They will probably also have lower environmental footprints.

Faced with the opportunities offered by a wealthier global population and the competition from manufactured foods, New Zealand's best strategy will be to target the top end of the international market, with high quality and high value products. Interestingly, much of this increased value will be added behind the farm gate through the farming operation itself, rather than in the factory or slaughterhouse. Synlait provided a glimpse of this future recently when they announced a premium for milk produced without using any PKE, and a series of targets for their suppliers to reduce their environmental footprints.

To succeed in this future world, New Zealand will need to strengthen greatly its environmental and quality brand. Our current "clean, green" image will not cut it. Quite simply, New Zealand farmers will need to be the "best in the world". Moreover, the criteria for judging what constitutes the "best in the world" will be decided by wealthy consumers, not by farmers themselves. In such a world, expenditures on initiatives to improve animal welfare and reduce environmental footprints will become investments in a brand rather than compliance costs.

Differentiated payout systems, similar to that proposed by Synlait for milk produced without the use of PKE, will be adopted by other processors, and extended to other indicators of farm performance - most notably greenhouse gas (GHG) footprints and measures of animal welfare. Such payout systems provide a financial incentive to good farmers without imposing a cost on the industry as a whole. Central government when implementing a carbon tax could use a similar approach. All the carbon tax collected from dairy farms, based on their GHG emissions, could be paid back to dairy farmers as a tax refund, but with the

**"Our current "clean, green" image will not cut it. Quite simply, New Zealand farmers will need to be the "best in the world."**

payment made per kg of milk solids (MS). This would reward farmers with a low GHG footprint per kg MS, at the expense of farmers with a higher GHG footprint.

A future such as that outlined above will have major implications for service industries, such as suppliers of fertiliser and supplementary feeds, animal transport operators and animal processors. Much greater emphasis than previously will be placed on how these service industries enhance or detract from New Zealand's premium quality brand. While cost to farmers will still be important, a small reduction in cost may not justify a risk posed to the brand. The concerns expressed in recent years by both Fonterra and Synlait over the increasing use of PKE is an example of this.

As noted at the start of this article, the future is difficult to predict. However, a future such as that outlined above is perfectly feasible. The main source of uncertainty is whether we in the agricultural industry collectively have the courage and leadership necessary to grasp the opportunities before us. Our response to the government's zero carbon initiative will be an interesting early test. ■



# PRIDE IN THE POMAHAKA CATCHMENT

In the way it takes a village to raise a child, it takes a community to drive change. In West Otago, Ravensdown shareholders Clark Scott and Judy Miller are part of that change - a collective drive to improve the water quality of the Pomahaka River and its tributaries. Ground Effect visited to see the methods Clark and Judy are employing to help counter the environmental impacts of farming.

Looking to the northwest, gentle green hills roll back into the distance towards the snow-capped peaks of the Umbrella Range. Lambs play in the warm spring sunshine while ewes pay no mind, heads buried in the flush of spring grass. On a day like this, it's not hard to see why Clark Scott and Judy Miller are passionate about protecting and enhancing their 247ha patch of Heriot farmland.

Clark and Judy moved back to lease Judy's family property in 2013 after farming at Lawrence, and have since moved into an equity partnership. The north-facing property runs 3,100 stock units which includes a Dorper and Texel stud and 30 stud Limousin cows.

The farm is characterised by broad-top spurs running down into deeper gullies, many of which are the starting points for the five feeder creeks that run into the Spylaw Burn - a tributary of the Pomahaka River.

"The Spylaw doesn't have very good water quality, not yet," says Judy. "Sediment and phosphorus are the main challenges, which is probably quite common for sheep and beef farmers in this area. But the benefit of all the water testing we've done is that we know what our issues are."

Clark and Judy are part of the Pomahaka Water Care Group, a collective initiative to improve the water quality of the Pomahaka River and its tributaries. The group's vision is for the Pomahaka River to be recognised as having the absolute highest feasible water quality - allowing future generations to enjoy the river as past generations have.

The group has around 160 members and has gone from strength to strength. Judy says one of the reasons why the group has been so effective is down to the leadership shown by a core group of farmers on the committee, and also the support and guidance of Group Facilitator Craig Simpson from the NZ Landcare Trust. Part of their view is to provide farmer-to-farmer mentoring within the catchment, helping to identify and work towards solutions.

"Having good leadership is so important - groups need that leadership or they stall," says Judy.

"The last meeting I attended was about getting farmers involved in helping other farmers in areas where we might see a problem within a catchment. It's a mentoring kind of thing - it's about going to see someone before they get a call from the council, and working with them [on the issue]."



## Sediment solutions

Over the last four years, Clark and Judy have been monitoring and recording the condition of the feeder creeks as well as fencing off and planting native riparian strips along waterways. Recently they have put in sediment traps around existing culverts on their farm to help combat the issue of sediment loss and phosphate (P) runoff.

In most cases, sediment traps are excavations in the bed of a watercourse designed to limit the downstream movement of sand, silt and gravel from upstream sediment sources. Depending on trap design and stream characteristics, lesser amounts of fine sediments (the fine sand, silts and clays that move in the flow rather than along the bed) can be trapped and removed.

The sediment trap initiative stemmed from a trial the Pomahaka Water Care Group were undertaking on the effect of wetlands on the surrounding area. Pomahaka Water Care Group past chairman and driving force Lloyd McCall, mentioned building sediment traps that could be managed by a farmer.

"We got thinking about that, and we got a digger in to make these sediment traps around a culvert," says Judy.

They undertook compliance measures with the council based on creating works around an existing structure, and built one sediment trap next to a wetland and the second on an existing culvert in a feeder creek.

"It's been 15 months and we've cleaned out probably a tonne of dirt. It's surprising how much dirt is coming down," says Clark.

"And we've had no cropping paddocks in that catchment, so it shows how much of a challenge [sediment control] is for farmers," says Judy.

The next steps will be to identify more places on the farm where traps can be installed and how the design can be tweaked.

The Pomahaka Water Care Group has gained plenty of information on the water quality with the installation of the sediment traps and riparian buffer area.

"There was a 90% average decrease in *E. coli* leaving the buffer area," says Judy. For suspended solids or turbidity [cloudiness] - there was a 95% average decrease of contamination leaving the buffer area. But for dissolved reactive phosphorus (DRP), there was no specific increase or decrease - it's just all over the place."

"That's the one we can't get right," says Clark. "Whether it's a legacy effect of high soil phosphates (P) naturally across these alluvial soils, you're always getting the reading in the water sample because it's already dissolved."

For this very reason, Clark and Judy are careful with their use of nutrients on the farm. Agri Managers Jess Williams and latterly Eugene O'Neill have worked with them on their nutrient plans for the property, building up their soil test data which they track through Ravensdown's HawkEye software. They say establishing a baseline for their fertility from the get-go has been beneficial - particularly when it comes to managing P-loss.

"When we first came here we did the Whole Farm Soil Test (WFST) with Ravensdown which was really valuable, as it showed us what our nutrient starting point was," says Judy. "This allowed us to target the fertiliser into the places that need it rather than where we've already got good levels."

Their target Olsen P levels are around 20, which they say is sufficient for their on-farm production targets.

"The best thing to do is to stop the phosphate getting in the water," Judy says. "Keeping it on the paddocks is what we think about. We've got all these things [like riparian planting] at the bottom of the cliff, but really, we need good management to keep nutrients where we want them."

She says this means taking care with what stock are grazed where, and how cropping is undertaken. It also has them thinking about which areas of the farm may benefit from retirement, particularly wetter areas.

"If we want to carry on farming, we have to recognise that some parts are good for farming and some aren't. We have to come around to that idea," says Judy.

**"When we first came here we did the Whole Farm Soil Test (WFST) with Ravensdown which was really valuable, as it showed us what our nutrient starting point was."**



CLARK, RAVENSDOWN AGRI MANAGER EUGENE O'NEILL AND JUDY DISCUSS NATIVE PLANTINGS

## Native niche

The valley floor that runs alongside the Spylaw Burn is productive, but at times prone to flooding. This is where Judy has concentrated a lot of her riparian planting effort to help ensure life prospers in the streams. The other benefits they have identified include stock shelter and sediment control from streambank erosion.

"We'd been planting trees at Lawrence and I was enthusiastic about planting more so we planted about 300 natives in this riparian buffer area," says Judy.

After undertaking a Level 1 Land and Environment Plan (LEP) through Beef + Lamb New Zealand, they identified fencing off their five creeks as top priority. Three creeks are now completely fenced.

Fences are mainly permanent but temporary fences are erected where necessary to keep stock out of waterways in flood-prone areas.

"We've got creeks but we've also got ditches," says Clark. "In the old days they ditched the creeks, which created some challenges - it completely changes the way the stream was."

"It's the sort of thing a sheep would get in and get stuck," Judy says. "We lost about six sheep in our first year so we fenced it off."

Based on nursery advice they have worked on establishing the lower tier of native species to help facilitate the filtering of the streams and prevent streambank erosion. These include toe toe, purei (*Carex secta*) and red tussock (*Chionochloa rubra*).

"We've decided for the future to put Carex secta in first and get the stream shaded and protected to start," says Judy.

For height and shelter they have planted ribbonwoods (*Plagianthus regius*) and tree daisies (*Olearia lineata*), mingimingi (*Coprosma propinqua* and *Coprosma rugosa*) and kahikatea. The plants have established well and grown quickly following dedicated weed control.

Part of the idea of riparian planting is to create a safe place for species to breed and prosper.

"We've had the Department of Conservation come look into our streams and they have found some *Galaxiidae*, (a whitebait species) koura (freshwater crayfish), and eels in these tiny little creeks," says Clark.

"We have a weed like a water cress, which covers the whole [creek bed], and invertebrates struggle to find places to live and nest," he says. "We're trying to shade one of our creeks out with plantings to see if we can get it running again."



SEDIMENT TRAPS HAVE BEEN A SUCCESSFUL SOLUTION ON THE PROPERTY



## Farm future-proofing

Looking to the future, Clark and Judy are keen to keep learning and evolving to improve their farming operation.

"Up until now the industry has had an emphasis on production, but we now need to focus on and be the best at the environmental aspects of our farming businesses," says Judy.

"Sheep and beef farmers' production levels are up there, we now need to carry on while being environmentally sustainable."

She says their LEP has also helped them identify their on-farm targets.

"LEPs are great to get you thinking about the environmental priorities on your farm. I've reviewed our plan over the last three or four years and it has evolved as our thinking has evolved, and as you get to know more you change your priorities as well."

Their advice for those who are unsure about the on-farm requirements from an environmental standpoint is to get involved in local catchment groups.

"It's great to be involved with a catchment group as there's so much learning, even just from the conversations with other farmers," says Judy. "Questions like 'where should we be water testing?', terms like DRP and turbidity - it's not until you get involved in those conversations and listen 10 times over, that it all starts to make sense."

"It's important not to just bury your head," says Clark. "You might not be in the right direction initially but it is important to make a start."



## Travelling phosphate - what's the story?

By Ravensdown Chief Scientific Officer Dr Ants Roberts

The sediment trap work discussed by Clark and Judy is an excellent way to reduce 'particulate phosphate' (P).

Particulate P comes from naturally occurring P minerals in the soil, dung P and added fertiliser P. It attaches to the fine clays in sediment, so it is important to remove as much particulate P as possible from surface water, since this represents a source of P that may be released from the clay particles into the water itself as dissolved reactive phosphate (DRP) under certain conditions.

The DRP issue that Clark refers to could be assisted by introducing another trap containing a cost-effective P sorbing material such as alum (potassium or aluminium sulphate) immediately downstream from the sediment trap, with the P sorbing material helping to reduce DRP.

The source of the DRP will be from the water that flows across the land surface to the streams during rainfall-induced runoff

Clark and Judy have high praise for the leadership and initiative shown by the Pomahaka Water Care Group. Judy says getting involved has been highly beneficial for their own growth as farmers.

"When you drive round the catchment you see people have thought about how they graze their crops using practices such as top-down grazing and fencing waterways where necessary ... the people who have led the charge like Lloyd McCall, they're inspiring with what they've done.

"Seeing these people around the table, seeing their enthusiasm, it's incredible. It's quite unique," she says. ■

**"It's great to be involved with a catchment group as there's so much learning, even just from the conversations with other farmers."**

## Thought Leader: Dr Gwyneth Verkerk

# SHADE AND SHELTER: ESSENTIAL FOR SUSTAINABLE PASTORAL INDUSTRIES

By Dr Gwyneth Verkerk, Chairperson, National Animal Welfare Advisory Committee (NAWAC), Ministry for Primary Industries

**As we contemplate changes to farming systems to meet environmental challenges, we must ask ourselves what our pastoral livestock farms will look like in 2040.**

Despite efforts to limit global temperature increases, as temperatures rise and weather patterns are more turbulent there will be increased pressure to provide for the shade and shelter needs of pastoral livestock. Is it time to review your farming practices and develop a risk management plan?

Our animal welfare standards require that shelter is provided in proportion to an animal's needs. We generally view well-fed healthy adult ruminants as robust to dry cold weather; the imperative is for additional shelter for the young and unwell, and when the weather is wet and windy. Providing protection from heat is more problematic in the pasture environment but is likely more important, especially for dairy cows.

Television weather presenters delight in announcing that each summer is hotter than the last; while this is fine for beach lovers, it's not so good for our animals.

Risk of heat stress is usually defined by the temperature-humidity index (THI), but in New Zealand significant heat is also acquired from solar radiation which is more intense here than in many countries\*. Poor quality summer pasture can increase heat loading\*\*, as does the exercise from walking, especially for our dairy animals going for milking\*\*\*. Production losses occur when heat loads are high, but heat stress may compromise welfare before affecting production.

Farm Environment Plans need to consider how shade and shelter are provided for livestock as part of farm system design. While our farms will still contribute food to support the planet's population, by 2040 they may look very different from now. The farms of the next generation will depend on the willingness of increasingly discerning customers to spend their money, and while pastoral farming systems are seen favourably for their 'naturalness', inadequate provision of shade and shelter is their Achilles heel!

Change takes time and so we need to start planning now. It is all about providing livestock with resources that enable them to deal with changes in their environment.

Some ideas to consider:

- Examine your farm for opportunities to develop more shade and shelter using natural resources - trees can provide shade but take time to grow. If you find few opportunities then consider options for artificial shelter such as shade cloth cover over dairy yards and feed pads.
- In extensive situations we often see animals using the land's contours to find shelter. Observe their behaviour to find where they choose to shelter and rest, and consider how you might enhance these areas.
- Provide opportunities for animals to have voluntary access to shade and sheltered areas; for example install electronic gates that will open at a pre-determined time so dairy cows can move to a shaded area near the dairy.
- Have a plan for dealing with storm conditions - identify the well-sheltered paddocks and give access to these when storms are imminent or animals are at risk, eg sheep immediately after shearing. ■

(\*; \*\*; \*\*\*) Source code see page 42.

# IT'S ACHIEVABLE: PROFITABLE FARMING WITH A LOWER ENVIRONMENTAL FOOTPRINT

By Dr Robyn Dynes (AgResearch), Dr Dawn Dalley and Dr Ina Pinxterhuis (DairyNZ)



DR INA PINXTERHUIS, DAIRYNZ, AND DR ROBYN DYNES, AGRESEARCH



DR DAWN DALLEY, DAIRYNZ

**Reducing a farm's environmental footprint without sacrificing profitability is a major challenge for pastoral agricultural systems. But scientists, armed with fresh insights into the effects of farm system change, say win-win scenarios are achievable.**

As part of the Forages for Reduced Nitrate Leaching (FRNL) programme, we have been studying various farm system changes and how they affect nutrient losses to both water and air. Implementing these changes while continuing to operate profitable farm systems will likely result in new levels of complexity for farmers and may require new feed and fertiliser strategies, and for some, capital investment.

## The challenge

- Environmental regulation requires farmers to reduce losses of nutrients (nitrogen (N), phosphorus (P), sediment and faecal micro-organisms) from their farms to water
- Impending greenhouse gas (GHG) emissions policies will require a reduction in losses to air.

There is unlikely to be a silver bullet when it comes to reducing all contaminants in all catchments. Our recent research has shown

several options that, when put together, could go a long way to getting the kinds of results farmers and society are looking for. What is crucial is that farmers know the specifics of the nutrient limits they are targeting, because different targets will require different strategies.

Some important metrics for understanding the opportunity to reduce N loss to water and air include N surplus (kg N/ha) which is N inputs (eg fertiliser and supplementary feed) minus N outputs (eg milk, meat, crop); and N use efficiency (NUE %; N outputs/N inputs).

Total feed consumed per hectare (feed grown plus supplements) is an important metric for GHG emissions since methane emissions increase with increasing feed consumed. Approximately 80% of biological GHG emissions on farm are from methane, with the remainder from nitrous oxide.

## The research

In searching for solutions for farmers, FRNL research has investigated practices at a component level that include:

- Plants with reduced Crude Protein (CP, and therefore N) content and improved Metabolisable Energy (ME) to maintain animal performance and reduce urinary N excretion;

A diet of 40% fodder beet with grazed perennial ryegrass/clover pasture almost halved the urinary N concentration in a late-lactation cow compared with pasture only.

- Plants with diuretic effects, eg plantain to reduce urine N concentrations;  
A diet of perennial ryegrass/white clover pasture and 30% plantain reduced urinary N concentration in a late-lactation cow by a third compared with perennial ryegrass/clover only. The reduction was 55% with 50% plantain in the diet.
- Plants with greater rooting depth and cool season growth to increase N uptake and reduce residual soil mineral N, eg plantain, Italian ryegrass, winter cereals;  
N leaching from a urine patch was 25-35% lower under Italian ryegrass-based pastures than under other types of pastures due to cool-season N uptake of Italian ryegrass.  
Following a grazed fodder crop, a winter-sown catch crop (oats) reduced soil mineral N and N leaching from simulated urine patches by 22-40%.

## In conclusion

A win-win profitable farming system with a lower environmental footprint can be achieved. However, the solutions are not simple and can bring new levels of complexity, require different feed and fertiliser use strategies, or require capital investment. The relative profitability will be sensitive to milk payout and input costs.

A silver bullet, or even one mitigation or farm management system that will deliver all the necessary reductions for all contaminants in all catchments is highly unlikely. However, recent research has identified several options that when combined will go a long way to achieving desired outcomes. Identifying practices where potential pollution swapping may occur should be the focus of future research, especially considering potential regulation for greenhouse gas emissions.

Finally, the options available to individual farmers must be assessed against overall farm performance and efficiency and tailored to meet the goals of continued business viability and improved water quality for their farm and region.

**Forages for Reduced Nitrate Leaching** is a DairyNZ-led collaborative research programme across the primary sector delivering science for better farming and environmental outcomes. The aim is to reduce nitrate leaching through research into diverse pasture species and crops for dairy, arable and sheep and beef farms. The main funder is the Ministry of Business, Innovation and Employment, with co-funding from research partners DairyNZ, AgResearch, Plant & Food Research, Lincoln University, Foundation for Arable Research and Manaaki Whenua - Landcare Research. ■

## The opportunities

The main options available for farmers to reduce N surplus and therefore nitrate ( $\text{NO}_3^-$ ) and nitrous oxide ( $\text{N}_2\text{O}$ ) losses and/or increase NUE are:

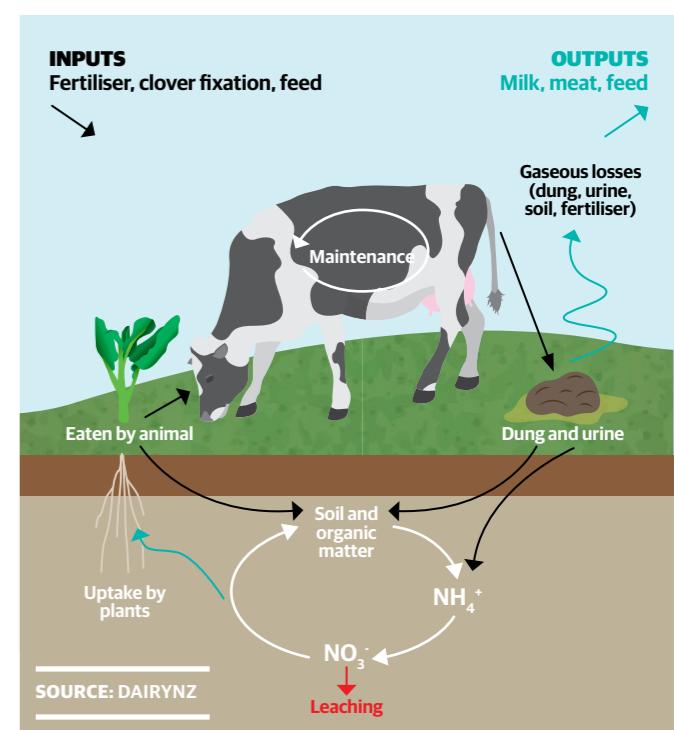
- Improve the efficiency of converting N inputs to product; higher genetic merit cows, reduced replacement rates, better timing of N fertiliser applications, better pasture and feed utilisation, alternative pastures and crops
- Reduce N inputs - amount of N fertiliser; amount and/or N content of supplementary feed, especially in autumn
- Reduce the number of milking cows in autumn
- Capture a proportion of the surplus N excreted by cows and redistribute this at times and in places that increase N utilisation - off-paddock facilities for autumn and/or winter use; improved effluent management.

To reduce P, sediment and faecal micro-organism loss, focus on practices that:

- Reduce the risk of soil damage (ie pugging) - duration-controlled grazing, off-paddock wintering, strategic grazing of critical source areas
- Minimise the amount of bare soil (especially during periods of high rainfall) - use of catch crops, not overgrazing pastures in autumn, winter, or early spring
- Provide physical barriers (bunds, wetlands), or vegetation changes (riparian buffer strips, long grass) that slow water flow or trap sediment.

Reducing methane ( $\text{CH}_4$ ) emissions is more challenging but options include:

- Reduce feed inputs and adjust stocking rates to match supply and demand
- Reduce replacement rates
- Use alternative feed sources with high ME - forage rape, fodder beet.



# AN EYE ON HAWKEYE®

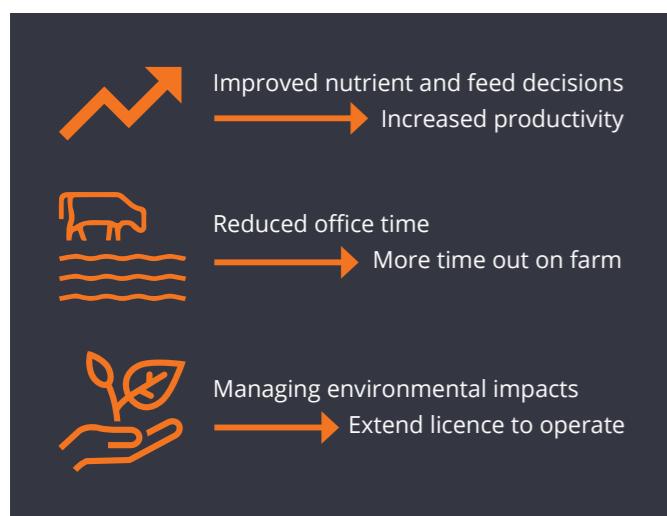


TIM ROULSTON, RAVENSDOWN NATIONAL SERVICES MANAGER

**HawkEye® is focused on delivering solutions for some of the biggest challenges farmers are facing - better management of nutrients, pasture, crops and the on-farm environmental footprint.**

Ravensdown has been involved with farm productivity software since 2005, recognising early the potential it held for shareholders.

Through consultation with HawkEye's users, we have developed a strategic direction for the software that not only builds on the current functionality of the available tools but also adds more options to automate data in and out of the platform. Working with our industry partners, our aim is to provide a user-friendly tool that can be embraced by all farmers across a range of farming operations.



## How HawkEye can help

There is no point having the fanciest technology if it doesn't add value to your farming operation, or if it's too complicated to use. Farmers have told us they're having to spend an increasing amount of time in the office, and that's not why they chose to farm. We recognise that for new technology and science to be successful, it has to free up people from the paperwork and get them back out on farm, where they really want to be.

Part of our role as a co-operative is not only to provide nutrients for our customers but also to help them with tools to manage those inputs and support on-farm decision making.

HawkEye helps to keep you on track. You have a record of work – what's been done and what hasn't – so you know where you sit in your plan for the year. While HawkEye is recording your data, it's also building a compliance history as evidence of your actions.

HawkEye is also about enabling our people – giving them the tools they need to do their jobs and exceed our customers' expectations.

## Industry collaboration

We believe the future of on-farm data management lies in collaboration. Our intention is to continue to partner with others in the industry for the greater good of all farmers in New Zealand. HawkEye's cutting-edge technology is the key to this integration. With HawkEye, we are in for the long haul – we see it as the vehicle that will allow us to deliver a significant amount of Ravensdown's evolving services and smarts.

## What are customers using HawkEye for?

- Ordering fertiliser and spreading directly from their HawkEye farm map to allow automated nutrient placement and reporting. This is achieved through integration with Ravensdown joint-venture spreaders and spreaders enabled with TracMap technology
- Digital record-keeping of farm inputs and activities
- Mapping their farms with simple and effective mapping tools
- Comparing their planned vs actual nutrient use on farm
- Creating paddock, block and farm nutrient reports Using pasture measurement, including C-Dax to manage feed
- Feed budget predictions for the next 14 days using FARMAX algorithms
- Identifying fertility issues and opportunities through mapped soil-test results.



## An example of how HawkEye works



## What's next for HawkEye?

- Mobile applications so farmers and their staff can record, access and order in the field
- Automated feeds from effluent and irrigation to complete the nutrient compliance loop
- Improved customer interface delivering our emerging science, such as hyperspectral scanning of soil fertility and IntelliSpread®
- Better processes and insights for HawkEye by continuing to build industry partnerships.

## Will there be charges?

HawkEye will always have free core features for Ravensdown shareholders.

From June 2019, premium features may be charged for, such as predictive feed budgeting and future enhanced compliance reporting. Those using these features will be notified of charges in plenty of time.

Some of our partners may charge fees for access to data collected by them (the example currently is TracMap). We will pass on those fees with a small administration charge to cover our costs. ■

*With HawkEye, we're working alongside our farmers to deliver truly useful, time-saving technology that enables them to farm smarter for a better New Zealand. We love it when farmers work with the team, so if you are interested, let us know on 0800 737373 or go to [hawkeye.farm](http://hawkeye.farm)*

# PIONEERING TO PRECISION CONFIDENT NITROGEN APPLICATION ON HILL COUNTRY

**Confidence to apply appropriate rates of nitrogen (N) to more defined areas has been a key outcome for Ravensdown shareholders Doug and Bruce McKenzie, following a variable rate (VR) application trial on the family property Pati Tapu station in the Wairarapa.**

The 2,550ha property near Alfredton has been in the McKenzie family since 2000, first farmed by Bruce and Sue and latterly by Doug and Jo. Pati Tapu is a focus farm for Ravensdown and the Ministry for Primary Industries Primary Growth Partnership (PGP) programme 'Pioneering to Precision', investigating how remote sensing technology coupled with VR fertiliser application can result in improved outcomes for aerial application of fertiliser on hill country. The PGP is specifically focussed on economic and environmental gains for hill country - applying the right amounts of fertiliser in the right places, at the right times for the right purpose.

Effective land area on Pati Tapu is around 1,760ha, with 136ha of cultivatable flat balanced by medium to steeper hill country. The property is highly variable in terms of contour, aspect, soil type,

altitude and climate, all factors that make it an ideal choice for a PGP focus farm.

Combining the natural physical aspects of the property with farm economics, a trial in August 2018 on variable rate N application looked at how to get the best 'bang for buck' from N by selecting areas on the farm most likely to have the best response to its application. Doug says he made the decision to target the twinning ewe blocks based around market pricing, current stock condition and pasture condition at the time.

Areas on the property likely to have the best response are identified using Ravensdown's specially developed predictive N pasture response model.

The model takes into account landform features such as slope, aspect, altitude, soil type, soil fertility along with climate. In addition, sensitive areas to avoid (such as bush and waterways) are considered. This then predicts and spatially defines the areas where the best pasture response can be expected.

The resulting mapped data is then sense-checked with the farmer so they can apply their local knowledge to the predicted

scenario. In Doug's case, the primary editing was around the gullies on the property.

"Essentially these were areas that the model would predict you were going to get a growth response on, which you probably would, but you wouldn't get the utilisation out if it because of stock grazing preferences. That was the key difference between the model and my final plan."

Once the plan is ready, the variable rate fertiliser plan is loaded into the Ravensdown Intellispread® aircraft. At Pati Tapu, this was a variable rate urea application of between 50 -100kgN/ha. A proof of release map from the aircraft can then be compared to the plan once the spreading has been completed.

Doug says targeting higher rates onto smaller areas means you have to be agile around stocking and pasture management to make the most of the returns.

"The key thing that comes out of consolidating higher rates onto smaller areas is that there is much more of an onus on me as the manager to differentiate my stocking rates and feeding regimes.

"In the past where we might have blanket-applied to an area at 50-70kgN/ha on target areas then we might have lifted the stocking rate in that area by 0.2 or 0.3 stock units per hectare. But [following the targeted application] we were much more ruthless around the differentiation between the urea country and non-urea country, so instead of 0.3 stock units per hectare, we were talking more like 1-1.2 stock units per hectare."

Ravensdown Technical Development Manager Mike White says taking this approach to N application results in better N use efficiency by pasture - which in turn improves stock performance.

"Maximising pasture response to N can have real benefits for stock - for example, the improved feeding of maternal stock can mean lambs are finished earlier, adding the potential to capitalise on early market prices."



DOUG AND BRUCE MCKENZIE ARE TARGETING PRECISION N USE

Doug is positive about the benefits of using N in a targeted and efficient way in hill country.

"One of the key things that came out of the variable rate N trial was that it gave us the confidence to consolidate our N applications, upping the rate on more defined areas," says Doug. "That is one of the key differences, because in the past we have applied a lower rate over a bigger area and accepted the fact that that was the way to do it. The fundamentals of variable rate N application make sense."

Mike agrees. "If we can do this successfully, it is not only a better economic outcome for the farmer but also a better outcome for the environment as targeted N application means nutrients are only applied where and when they are best utilised."

**"Targeted N application means nutrients are only applied where and when they are best utilised."**

# SUPER SUB – ENCOURAGING SUB CLOVER IN DRYLAND PASTURES

Lincoln University's Dryland Pastures Research (DPR) team, led by Professor Derrick Moot, recently completed the 'Sub 4 Spring'\* research programme that investigated how best to manage and optimise the production of resident and introduced cultivars of subterranean (sub) clover for dryland pasture production. Their research found that actively managing sub clover in dryland pastures can greatly increase the legume content and the feed value in spring.

Sub clover is an important legume in dryland pastures because it grows through the winter and produces 90% of its dry matter in the spring, making it an excellent high-value feed for lactating ewes and lambs. A winter annual species, sub clover survives in low-rainfall environments where pastures dry off completely for two to three months in most years. It fixes nitrogen (N) at around 25 kg N/t of clover DM, improves pasture palatability and, if managed carefully, will survive the summer dry and reseed on bare ground, with new seeds germinating each autumn.

There has been a renewed interest in sub clover in New Zealand for several reasons:

- Legumes are a vital component of dryland pastures for both N fixation and superior nutritive value
- Recent expansion of lucerne and clover/herb pastures on sheep and beef farms has resulted in increased productivity, particularly in summer
- Summer-dry hill country, where lucerne and clover/plantain are difficult to establish and manage, requires improvement so that hill pastures can complement the improved flats and terraces



- Sub clover is the earliest spring-growing legume (figure 1) and has a competitive advantage in the cool season over perennial legumes. A new generation of farmers is learning what their grandparents knew – the benefits of sub clover.
- Sub clover can best exploit sites that have a long dry season and where perennial white clover fails.

Farmers can check their pastures to see if sub clover already exists; in the east of New Zealand sub clover is often the main legume on the drier north and west facing slopes of hill country, while white clover may be found on the wetter southern slopes. Resident sub clover populations can be managed to expand or, if populations are low (< 1 plant/patch every 2m), seed can be sown in autumn to increase the spring legume content.

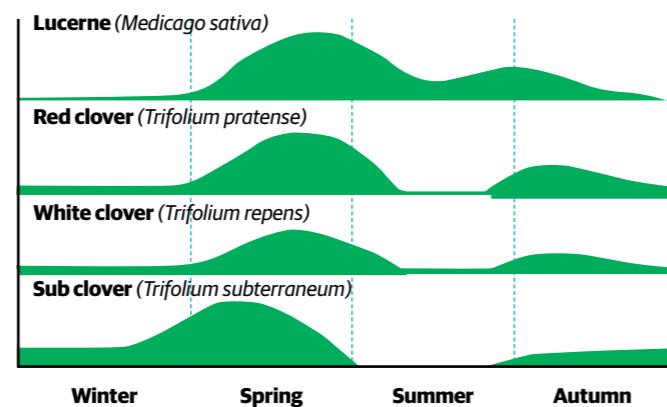


FIGURE 1: DIAGRAMMATIC GENERALISATION OF SEASONAL BIOMASS PRODUCTION OF COMMON PASTURE LEGUMES UNDER SUMMER DRY CONDITIONS.\*\*

## Sub clover life cycle

The life cycle begins with germination following rainfall event(s) of more than 20mm from February through to May (figure 1a). When conditions are favourable (ie sufficient ongoing soil moisture) the plants establish (figure 1b), grow slowly through winter and then rapidly in early spring – a month earlier than lucerne or white clover. With the onset of flowering, sub clover produces runners that can extend more than 60cm from the centre of the plant (figure 2). Flowers are produced along the runner from mid-September to late October. The self-fertile flowers become burrs containing three to four seeds, which may bury themselves in the soil (figure 1C). One plant may produce up to 500 seeds, but if overgrazed may fail to produce seed. As the summer dry begins, the plant dies off leaving the buried seeds ready to germinate in autumn.



FIGURE 2: A SUB CLOVER RUNNER WITH FLOWERS AND DEVELOPING BURRS PUSHING INTO THE GROUND TO BURY SEEDS.



FIGURE 1A: NEWLY EMERGED SUB CLOVER AT THE COTYLEDON STAGE; B: ESTABLISHED SUB CLOVER PLANT AT THE FOUR TRIFOLIATE LEAF STAGE; C: IMMATURE SUB CLOVER BURR.

## Liveweight gain

In dryland pastures, sub clover offers the greatest potential for maximising spring growth before water stress slows growth rates during the drier summer months.

At Lincoln in Canterbury, the MaxClover experiments showed that the superior clover content in sub clover/cockfoot pastures gave greater liveweight gain per hectare from August to October than white clover/ryegrass or white clover/cockfoot pastures. With over 50% clover on offer, the liveweight gain (LWG) of twin lambs pre-weaning was more than 300g/head/day at a stocking rate of 12 ewes/ha with twins. This occurred because bite size (DM intake) was not limited so ewes always ate pasture at a mass greater than 1,200 kgDM/ha.

## Grazing management

The long-term aim of sub clover grazing management is to have 80% ground cover of sub clover in the spring to provide 40-50% clover dry matter in the sward.

To ensure persistence, sub clover has to re-establish plants in autumn and be allowed to periodically set large amounts of seed in late spring/early summer to maintain the seed bank in the soil. At these times the paddock should be spelled from grazing during flowering, or lightly grazed with cattle.

Autumn: from early February check for sub clover emergence four to five days after a rainfall event of 20mm or more. Once sub clover has emerged, spell paddock until the plants have three to four trifoliate leaves (figure 1B). Then, if required, graze in autumn to limit grass competition.

Late winter/early spring: there should be a high legume content for lactating ewes and lambs. Until tailing, set stock, then start a three to five paddock rotation where the aim is to graze no lower than 1,200 kgDM/ha.

Late spring: an established sub clover pasture should be spelled to set seed at least once every five years – remove sheep and shut the paddock up or lightly stock with cattle for four to five weeks during seed set. After this, cattle are preferred for grazing as sheep will target the runners and burrs that contain seeds.

Summer: cattle and sheep can be used to control the grass by grazing down to ~ 700 kgDM/ha, opening up the pasture for autumn germination of the buried sub seeds.

Aim to graze sub clover pastures so grass (or herb) does not shade clover. Do not graze lower than 1200 kgDM/ha. Set stock for lambing. For paddocks that require sub clover enhancement, spell to get maximum seed set from about two weeks after the start of flowering. Newly established sub clover pastures should be grazed lightly in the first year, preferably with cattle, and kept above 2,000 kg DM/ha. ■



# PATTERNS, PREDICTIONS, ACTIONS – ALGORITHMS AND MACHINE LEARNING IN AGRICULTURE

By Dr Rob Murray, Ravensdown Technology Innovation Manager



Algorithms and Machine Learning (ML) are popular terms in the age of cloud computing and big data. While the terminology seems complex, what those in the field are trying to do is imitate human thinking and provide computers with the ability to learn without being explicitly programmed by pre-defined algorithms. In an ML scenario a task will begin with a generic formula but, after every attempt, that formula will be adapted by the machine to improve the outcome.

For example, take the following sequence of numbers. What is the unknown value?

1–1  
2–4  
3–9  
5–?

How is it that you come to the value of 25? We see the pattern of the relationship between the two numbers and follow that same pattern to find the solution. This is a simple example of the behaviour we are trying to teach our machines. We have learnt patterns through experience and we want ML to find natural patterns in data and provide predictions and insight so we can do things smarter.



It will be no surprise to you that Apple, Amazon, Alphabet (Google), Microsoft and Facebook, all prolific consumers and developers of ML and artificial intelligence (AI), rank in the top five most valuable brands on the latest Forbes listing. For those of us who use the Gmail app, we are interacting with ML every time we receive an email addressed directly to us. Gmail's Smart Reply service uses two sophisticated ML techniques to suggest replies to emails so that we can simply choose one of three scripted options that ML has generated from the content and intent of the incoming email. Alphabet, Google's parent company, are into ML in a big way and use it extensively within their businesses; more recently however, they and several other companies have made cloud-based ML tools available as a service to their customers, which is part of the reason for the increase in exposure and understanding of the technology.

At Ravensdown we continue to make farming smarter with information, technology, research and empowered people. An example of this occurred more than two years ago when the first commercial spreading jobs were completed by our own XC10 spreading platform. XC10 was created to provide transparency, data gathering capabilities and a new level of customer-driven automation possibilities in both ground and aerial spreading in New Zealand.

Figure 1 illustrates how the system begins with the HawkEye customer interface. This is where the customer can order applications of their chosen nutrient from their agronomy plan, and get it spread by their preferred spreading operator at a date agreed by the customer and spreading company. In the case of an XC10-equipped spreader, rate, product and paddock data is incorporated into a series of algorithms that send instructions via the HawkEye Electronic Control Unit (ECU) to each electrohydraulic component of the spreading vehicle without human intervention. Our aim is to get the right product in the right place, at the right rate, at the right time.

Data analytics and algorithm development work gives us accurate, transparent data that we can use to find patterns, make predictions and gain new actionable insights. One such insight was revealed after exploring data gathered by XC10-equipped spreading trucks over several weeks. It showed that sometimes fertiliser bulk density varied from load to load, and sometimes even variability within each load was observed. Through our transparent XC10 data layers we could determine the magnitude of variability and take action through the integrated control system to adapt for changes in bulk density. By utilising a data feed from on-board load cells, the XC10 uses a high-level algorithm to select a mode of operation to measure the weight of product remaining in the fertiliser bin several times a second. It then applies some filtering criteria and compares the actual weight of material remaining with the predicted/modelled weight remaining to determine a new adapted flow algorithm which it applies to correct discrepancies. This is just one example of how we are using new techniques and capability to measure, understand and develop methods for nutrient delivery. Due to the improved performance of these self-adapting algorithms, they are now being repurposed for use in XC10-equipped topdressing aircraft, which are soon to commence trials. ■

FIGURE 1: SPREADING PLATFORM AUTOMATION





DESIREE AND ASH WHITAKER  
WITH BABY REID AND SON  
RITCHIE (SUPPLIED)



## WHISKY IN THE VALLEY

Born amongst the rosehips and rabbits of the Cardrona Valley, the Cardrona Distillery and Museum is a testament to the vision and dedication of Desiree Whitaker, her husband Ash and her parents and business partners, Ravensdown shareholders and South Canterbury dairy farmers Alvin and Judy Reid. Ground Effect visited the distillery to see how whisky is derived from water, barley and yeast in this unique Central Otago setting.

The path that led Desiree Whitaker to her dream of whisky making was by no means a conventional one. She spent eight years dairy farming in South Canterbury, working her way up from sharemilking to farm ownership. Armed with a first-class honours degree in business from Massey University, she was the youngest member on the Fonterra shareholders' council in 2006 and a recipient of a Nuffield Scholarship. While distilling seems a world away from her dairy farming roots, Desiree says there are some odd synergies between the two.

"I know it sounds really bizarre, but we are effectively milking yeast," says Desiree. "The yeast eat the food you give them and produce alcohol instead of milk. And like the cows, the yeast perform well under good conditions."

The sea change for Desiree came following the break-up of her first marriage. "I did a lot of soul searching after that," she says. "I made lists of ideas, then shortlists, then researched them all, scrapped the lot and started over."

Incidentally, it was perfume-making that provided the spark.

"I was researching perfume and how to make it from scratch. Most of a bottle of perfume is alcohol so I started researching how to make the alcohol - and then that idea really took hold; it surpassed the perfume in terms of interest."

On a quest for knowledge she travelled far and wide, visiting the US and Scotland to visit distilleries and train in her craft.

In 2013 she decided to take the leap into whisky making, selling her dairy farm to move to Wanaka and find the perfect site for the distillery.

"When I moved to Wanaka I thought I would have quite an easy task to find the land to build the distillery, but it was actually very difficult," says Desiree.

She needed solid ground and water - key for any distillery - but found many of the potential sites lacked the access to water.

Those she found with water access had been dredged for gold, rendering the land unstable up to 10 metres, completely unsuitable for a heavy building housing volatile gasses.

"I was calling the council a lot about each piece of land, and in the end I think they got a bit sick of me," says Desiree with a laugh. "A lady said to me one day, 'look the man you need to find is John Lee, and no, we don't have any contact details for him, but you will find him'."

A local Cardrona tourism visionary whose developments include the Cardrona Skifield and Snow Farm, John Lee's family farm was Waiorau Station in the Cardrona Valley.

"Two hours after the call I was at the Cardrona hotel having a bowl of soup for lunch, and this older gentleman came and sat down at the table next to me and struck up a conversation. He wanted to know what I was doing because he had seen me in and out of the hotel and around the place. So I told him and we talked for an hour. In the end he asked for my business card, and he turned it over and wrote John and Mary Lee with his contact details. The upshot of that was John helped me look for the next five months."

But still the perfect plot remained elusive, leading Desiree to search the Gibbston Valley, Cromwell and the shores of Lake Wanaka.

"It just didn't feel right, but I had to start looking wider," she says.

John agreed the site needed to be in Cardrona.

"He went to his daughter (Joanna Jones, the now-owner of the family property) and said 'you need to open your farm map,'" says Desiree. "He basically drew where we were going to go, they subdivided and we bought it. This was their best hay paddock!"

The distillery design is loosely based on a US bourbon distillery, Woodford Reserve in Kentucky, and the building was designed by local architect Sarah Scott.



CONCERTO BARLEY IS USED IN THE DISTILLING PROCESS



THE REID'S  
RAVENDOWN  
AGRI MANAGER  
PHOEBE JAMES  
FILLS A WHISKY  
BARREL

There are three key ingredients in whisky-making - malted barley, yeast and water.

The soft water they use for production comes from an underground alpine stream that runs from Mount Cardrona into the Cardrona River via 'Alvin's Well' named for its constructor, Desiree's father Alvin.

"It is very interesting, the world of whisky, because water is such an important part. In Kentucky where they make bourbon whisky, they swear by needing hard water. Then in Scotland, they swear by soft water for their single malt - there is only one distillery in the whole of Scotland that uses hard water and that is Glenmorangie."

Water usage is an important consideration in the distillery operation, given the propensity for dry conditions in the valley.

"Most of the water we just borrow - it is used for cooling just like in a dairy shed," says Desiree. "We are very careful about not using too much water, particularly during summer."

All waste from the distilling process is recycled back into the environment in some shape or form. The pot ale (left over from the first pot still distillation) is fed to cows on Cardrona Valley Farms, as is the husk and hard material waste from the mash tin, known as draff. The waste from the stills at the end of the process is a natural fertiliser, for which they are consented to spread on local land. Alvin is keenly soil testing to measure the effects it has on the nutrient composition of the soil.

For the barley inputs, they currently import malted barley from the UK, however there is a view to making locally grown barley part of their story in future.

"New Zealand grows fantastic barley, but at the time we set up the varieties grown were either beer varieties or animal feed, and distilling varieties are quite different to beer varieties," says Desiree.

The current variety they use is Concerto. Important specifications include the size of the grain, low nitrogen (N) content and the strength of the husk.

"The husk is really important in distilling. If it comes off or it shatters easily, then that isn't good for the distilling process."

But the real challenge came with the malting side of the process.

"We had approached the two biggest malting companies in New Zealand, Malt Europe near Marton and Gladfield at Dunsandel, but it just didn't make economic sense for them to put a distilling variety through their plants.

"We had a really big decision to make, which was whether we put a beer malt through our distillery - for which we have done everything properly and cut no corners - or source and bring in a proper distiller's malt from the UK."

This has led them to their "mid-term audacious goal" of constructing their own malting plant on the site at Cardrona.

"That will complete the circle for us," says Desiree. "We are getting closer every day."

The malting plant will be around the same size as the current distillery building, and will feed straight into the current silos.

"We have big dreams of completing that New Zealand story, and while we are a pinprick - we are absolutely tiny in the world scheme of things - we are the biggest users of malt in New Zealand.

"I guess someone always has to start and lead the way, and as more distilleries are built and the industry gains some scale, there will be a demand for farmers to grow distillers' varieties, so we are very excited about that." ■



COPPER POT STILLS FROM SCOTLAND



HEAD DISTILLER SARAH ELSOM CHECKS THE ALCOHOL STRENGTH



SOUTH CANTERBURY  
DAIRY FARMER AND  
PART OWNER OF THE  
DISTILLERY, ALVIN REID

# FARM ENVIRONMENTAL PLANNING – A PROACTIVE APPROACH

Farm compliance and planning can seem bigger than Ben Hur, but that doesn't always have to be the case. Consultants from the Ravensdown Environmental team discuss how some of the proactive farmers in their regions are approaching their environmental compliance and farm planning requirements.



**Ravensdown Environmental Principal Consultant Adrian Brocksopp - Wainui Farms, Waikato**

Wainui Farms has a number of properties in the Waikato, all of which will require Farm Environment Plans (FEPs) to meet the upcoming Waikato Regional Council (WRC) local compliance requirements for Plan Change 1 - Waikato and Waipa river catchments. Wainui Farms has been proactive in getting the FEP for their dairy farm completed as part of a Ravensdown and WRC study to look at the practical implementation of the FEP process on farm.

Wainui Farms Manager James Kay says the completion of the FEP to meet compliance requirements and ensure good management practices across all their farming activities has allowed them to assess where it is logical to go beyond the minimum expectations, and they now recognise the whole team has an integral part to play in meeting this aim.

So far, James has found the FEP process has validated their direction in terms of mitigating risk, and in many cases, common-sense solutions that parallel good management practice. A good example is the management of overland water and sediment movement at high-risk points (critical source areas) on farm races and around the shed, instigated through an appropriate track repair and maintenance programme. Having a functioning track for both stock and vehicle movement 12 months of the year makes daily management tasks easy, but it also serves to provide a significant reduction in runoff and long-term track maintenance costs.

Many of the on-farm actions required to meet compliance can be implemented with little investment in infrastructure. In many cases just maintaining or improving the infrastructure already in place can help reduce risk on a farm.

The completed plan will provide Wainui Farms with a road map for future actions to be undertaken on farm, with actions prioritised according to risk and timeframes required. This will help enable any future planning of capital investment to be built into the assessment process that the FEP provides.



**Ravensdown Environmental Senior Consultant Mark Crawford - Salvation Army Jeff Farm, Kaiwera, Southland**

To ensure a comprehensive and proactive approach to managing environmental performance on the Salvation Army's Jeff Farm, a 2,440ha sheep, beef and deer breeding and finishing station, Farm Manager John Chittock is front-footing compliance requirements by putting in place an FEP.

FEPs are an effective way to outline the farm's environmental vision, under which key actions, risks, farm-specific information and best management practices will be combined into one document. This document can then provide information about the property to a range of stakeholders - including employees, industry representatives and regulatory bodies.



**Ravensdown Environmental Principal Consultant Colin Tyler - Brantford Ltd, Tikokino, Hawke's Bay**

Hawke's Bay farmer Richard Jull of Brantford Ltd in Tikokino recently completed a Farm Environmental Management Plan (FEMP) for the company's 910ha sheep and beef property as required under the Hawke's Bay Regional Council's (HBRC) Tukituki plan change.

While the legal requirement to complete a farm plan was a new concept for Richard, the upshot is that he has found many of the future actions required to meet the regional environmental rules are very much in line with historical activities he has undertaken to improve farm management.

For instance, the need to exclude livestock from waterways has been an ongoing concern for Richard and many other sheep and beef farmers in the Tukituki. This meant Richard had already fenced off waterways to avoid stock losses and improve grazing management, and he'd also retired steep country from grazing, replacing it with forestry. Although the FEMP identified that there were sizeable areas of additional fencing required, to Richard's credit, rather than wait to be told he had to complete the fencing, the work was already in place to complete the exclusion of cattle from all relevant waterways on the property.

Other practical actions to limit contamination of waterways include instigating good management practices for cropping, stockyard management, farm infrastructure such as tracks, bridges and crossings, all of which have been identified within the farm plan. Again many were not a large departure from the day-to-day practices implemented on farm for ease of management and improved productivity.

An OVERSEER® Nutrient Budget was completed to understand the property's nitrogen losses in relation to the HBRC's outlined allowance. It identified that although currently compliant, ongoing record-keeping and monitoring will be required to understand the impact on the property compared to others, not just within the Tukituki, but within the Mangaonuku subcatchment where N levels have been identified as a significant issue.

In future, the farm plan will play a key role in not just celebrating the great work Richard and his family have already done to reduce their environmental impact, but also to assist them to meet ongoing legal and market requirements. ■

# REVIEW OF THE EFFECTIVENESS OF FINE PARTICLE APPLICATION FERTILISERS

By Jeff Morton, MortonAg



JEFF MORTON, MORTONAG

**The fertilisers applied to New Zealand pastures are nearly all in the solid granular form. Starting back in the 1990s, some people have elected to use these granular fertilisers, mainly urea but also di-ammonium phosphate (DAP), which are then finely ground and mixed with water to be applied as Fine Particle Application (FPA) fertilisers.**

Various benefits for FPA over granular fertilisers have been claimed over the years. These benefits include more efficient uptake of nutrients through the leaves by avoiding soil losses, more uniform coverage and less direct leaching and volatilisation of nitrogen (N) from the fertiliser.

Several trials have been carried out to investigate these benefits and Professor Russ Tillman (soil scientist), Dr Alan Morton (plant physiologist) and I were commissioned to review these and publish the results in a peer-reviewed science journal paper. Scientific journal papers that are independently refereed by other scientists have much more integrity than

where data is reported without going through this robust process.

We reviewed 22 sets of trial pasture production results in total, comparing FPA and liquid (completely dissolved in water) with standard granular fertilisers (mainly urea). Of the 13 trials comparing FPA and granular urea, only two sets of results that had been statistically analysed showed a significant pasture production response to FPA urea. The two exceptions had the FPA urea intensively sprayed on to a much smaller area of pasture than the other field-trial plots, so there could have been more fine particles adhering to the leaves.

Of the nine trials comparing pasture production responses from liquid and granular fertilisers, none showed a significant difference between the two forms.

A search of the literature showed some evidence for direct foliar uptake of urea molecules, but if this had occurred for FPA urea in the field trials then it would have been more likely to have taken place for the urea applied in the liquid form. In this liquid form the leaves would be more uniformly covered with fertiliser than in the FPA form. Any gain in the efficiency of N uptake should have been reflected in more pasture production, but this was not measured.

Again, if it were true that better coverage of pasture with FPA compared with liquid urea leads to greater root uptake of N, more pasture production would have been expected, especially for the liquid with its complete cover of the ground compared with granular and even FPA urea.

**"From this extensive review of the valid research on pasture production responses from fertilisers applied in the fine particle form, we found insufficient evidence to recommend its use over the granular form."**

# FINE PARTICLE FINAGLING DEBUNKING THE FINE PARTICLE APPLICATION CLAIMS

By Ravensdown Chief Scientific Officer Dr Ants Roberts



DR ANTS ROBERTS,  
RAVENDOWN CHIEF SCIENTIFIC OFFICER

**Just as the old English proverb says, 'Fine words butter no parsnips', so too has fine particle application (FPA) of urea or DAP granular fertilisers been shown to produce no more pasture than the equivalent rate of the same nutrients applied in solid form. This has been demonstrated in robust fully replicated field trials comparing the same rate of nutrient applied either as FPA or granular fertiliser with no other additives.**

(\*) see Source Code page 42

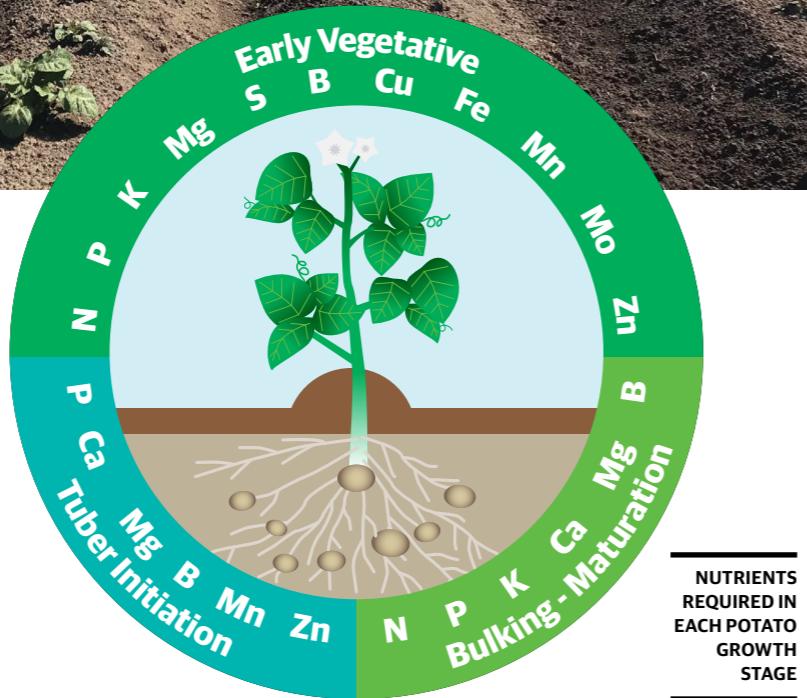
Proponents of the FPA spreading methodology insist that by finely grinding perfectly soluble granular fertiliser (such as urea and DAP) and suspending the resultant fine particles in water and spraying onto pasture soils will improve the efficiency of the response. In other words, you will get more (pasture) from less (fertiliser). The FPA applicators rely principally on a large number of unreplicated demonstration plots that they have established on customers' farms to show the benefit of FPA-applied nutrients versus the standard product. A claim is that the response to FPA relative to the same rate of granular fertiliser nutrient is two to three times greater\*. Given that the nutrient cost applied on farm by FPA is at least three times the cost of applied granular nutrients, you would want to be assured that the claimed benefit is correct. If plant growth regulators (such as gibberellic acid) are also added to the suspension before application, then it is reasonable to expect a greater response

than where the granular nutrient has been applied on its own.

It is alleged that by creating a suspension of finer particles that are spread over a greater surface area of the soil compared to the spread of larger granular fertilisers, this allows more of the pasture plants an opportunity to take up the nutrient applied. I cannot accept this explanation, because plants don't just have a single root below the above-ground pasture plant, they have an inverted cone of roots that go down through the soil profile. Many of the surface roots radiate out in a circle from the plant and the roots of neighbouring plants intersect underground. Just because you put a granule in the middle doesn't mean to say that each of those plants is going to miss out, they're all going to have a chance to get those nutrients. Nutrients like N diffuse across and through the soil for a distance of about 10cm, and while phosphorus doesn't normally move nearly as far, the roots intersecting under the ground will have access to the nutrients. ■



# HOT CHIPS THE RIGHT NUTRIENTS FOR POTATOES



COURTNEY MORTON,  
RAVENSDOWN AGRI MANAGER

To ensure potatoes in Canterbury reach their optimum quality for the process or chipping market, the right inputs are needed. Research shows that a well-balanced fertiliser helps ensure high-quality potato production.

A more specialised compound for potato planting was something Ravensdown was missing three years ago. Following discussions with growers, agronomists and the wider Ravensdown research and development team, Ravensdown worked with our Korean manufacturers to create a compound product containing nitrogen (N), phosphate (P) potassium (K) and sulphur (S), resulting in an NPKS of 8-10.6-19.9-4.3. This blend is also flexible enough to meet the needs of other vegetables grown in Canterbury.

It is important that a compound fertiliser applied at the planting stage will meet plant-nutrient uptake demands at critical growth stages.

K plays a fundamental role in the process of tuber development in potatoes. This compound includes a substantial proportion of K in the potassium sulphate form (50%) which has been linked in some studies with reducing internal darkening of the tubers. Potassium chloride is found to increase yield, and potassium sulphate is beneficial in maintaining quality and keeping the tuber dry matter up. Potato tubers with a low dry matter content can often show an undesirable browning when fried. In the case of crisps, the colour is lighter and the retention of oil is reduced, providing a healthier product for the consumer.\*

While there is still conflicting evidence around whether potassium sulphate or potassium chloride gives the best finish for potatoes\* (ref to P&F Study), there are growers who firmly believe the best finish is achieved with potassium sulphate. In addition, the potassium sulphate form allows for use in other vegetable crops which

do show sensitivities to the use of chloride.

N is important to fuel potato growth and ensure high yields. A significant portion of N needs to be applied prior to tuber development as an undersupply of N can reduce the tuber weights. P is important for root and shoot development, and ensures an optimum number of tubers are formed.

Over the past few seasons, use of the product in the local market has grown and we are proud to now supply a stable, uniform and firm granule that flows well in planters and gives adequate nutrition in the early stages of potato production. The product can be used in other horticultural markets and is shipped pre-bagged with a plastic lining to ensure quality is maintained during shipping and storage.

*For more information and to register your interest regarding the potato compound, get in touch with your local agri manager.*

# NUTRIENT DEFICIENCY OR VIRUS? WHAT'S WRONG WITH MY BEET, BRASSICA OR CEREAL CROP?



MARK BRAITHWAITE,  
PLANT DIAGNOSTICS LIMITED

Part of responsible and sustainable crop management often involves digging deeper to pinpoint why limitations in crops occur. Accurate diagnosis of plant pests and diseases is critical, as this helps avoid the misdiagnosis of plant diseases as nutrient deficiencies and vice-versa, in turn preventing unnecessary nutrient applications and reducing both environmental and financial impacts for our shareholders. Consulting Diagnostician Mark Braithwaite of Plant Diagnostics Limited\* in Templeton, Canterbury discusses how he works with Ravensdown to provide the science behind the crop solutions, specifically around the Beet Western Yellows Virus and its variant.

Beet Western Yellows Virus (BWYV) in beet, or its variant Turnip Yellows Virus (TuYV) in oil seed rape and other brassicas, can cause symptoms that can be easily mistaken for crop nutrient deficiencies,

plant stress or natural ageing. An accurate and early identification of whether a virus is present is therefore critical in the management of the crop.

Plant Diagnostics at Templeton provides an identification service for these two viruses and many other diseases that affect our beet, brassica and cereal crops. Testing enables Ravensdown field staff to determine which crops are infected with a virus or pathogen and which crops would benefit from a nutrient application, ensuring a science-based solution is behind their recommendations.

## What is wrong with my beet or brassica?

BWYV and TuYV viruses occur in all cropping areas and are spread and introduced into crops by several aphid species, especially the green peach aphid (*Myzus persicae*). The severity of virus infection greatly depends on how early in the season plants are infected. Infection of



FIGURE 1: BWYV SYMPTOMS ON FODDER BEET

very young plants leads to the greatest yield loss. The viruses and aphids overwinter on volunteer hosts, weeds and overwintering crops. Disease can be especially severe following a mild winter when high numbers of aphids survive.

Beet symptoms express as a yellow mottling between the leaf veins, especially towards the leaf tip (figure 1). Leaves become very brittle and can easily shatter. Also, secondary infections by fungi such as *Alternaria* often occur. In oil seed rape, similar symptoms of leaf mottling occur with yellowing, reddening or purpling (figure 2).

## What can I do?

These viruses can be difficult to avoid but damage can be minimised by planting later in the season to avoid aphid flights, early aphid control to prevent very early infections, crop isolation and weed control. ■



FIGURE 2: TUJV ON OIL SEED RAPE

# FROM FOOD TO CLIMATE CHANGE: WHY PLANTING NATIVE TREES REALLY COUNTS

By Adele Fitzpatrick, Chief Executive, Trees That Count



**It won't come as a surprise for the chief executive of a charity called Trees That Count to say "I love trees". But I do. Our native trees are a special gift, and we all have a responsibility to restore and protect them.**

At Trees That Count we talk a great deal about the importance of planting native trees as part of the fight against climate change.

But carbon offsetting is just one of many reasons why our native trees are so important. It's something many people know but struggle to articulate. We know we love trees, we know they're important in many ways, but how can we measure and explain that to people who might not?

Thanks to our partners at Tāne's Tree Trust and forestry scientist Dr Jacqui Aimers, we now have a wonderful piece of research that speaks to the ways in which our native trees are important. Here are just a few key outtakes from this research:

- Honey production accounted for \$316 million of our national exports in 2016\*. Mānuka honey is especially popular, and mānuka trees provide the added benefit of nurturing other native forest species as they grow, all whilst feeding bees and creating a valuable economic export
- Trees such as mānuka and kānuka are important in a growing skincare industry. Their oils have anti-microbial effects, and growers can obtain as much as \$600/t for raw foliage for mānuka oil extraction
- If you like whitebait sammies, then you should know it's our native forests that will continue to make whitebaiting possible. Native trees help provide suitable habitat conditions and clean the streams where whitebait breed
- Native trees contribute to nutrient recycling by absorbing nutrients from intensive agriculture. They are also vital for stabilising soils, reducing sedimentation, moderating water flows, and protecting downstream ecosystems and infrastructures. Approximately one million hectares of land is at serious risk of erosion\*\*, and this can be reduced by native tree planting.



## Matching trees with landowners and planting groups

Trees That Count is counting the number of native trees being planted in New Zealand each year and is helping to increase this number with funds we raise through our digital marketplace\*\*. We match the trees that are funded through our programme with planting groups or landowners throughout New Zealand who have applied for trees - like Waikato dairy farmers and local conservation heroes, Kim and Stu Muir. The Muirs have cleared many kilometres of the Papa and Mangati waterways, turning them from choked waterways into vibrant living streams. They've created tidal whitebait habitat spawning ponds and planted 40,000 native trees and plants. This year Trees That Count supported the Muir's vision with another 4,000 native trees to plant.

## Future-proofing your business

With changes to the Emissions Trading Scheme on the way, we're hearing that farmers are feeling talked at rather than worked with, so we're working on ways in which we can help farmers plant more natives to meet any changes to legislation. This work is still underway and we'll have all the latest information about how we can help on our website as it develops.

For more information on Trees That Count head to [treesthatcount.co.nz](http://treesthatcount.co.nz)

ADELE FITZPATRICK

(\* see Source Code page 42)

# ENVIRONMENTAL DUE DILIGENCE A FARM REAL ESTATE REALITY

By Mark Fitzpatrick, Ravensdown Environmental Business Manager



**There once was a time when you could comfortably buy a farm or a neighbouring block safe in the knowledge that your only constraints were the agronomic potential of the land and your capability to capitalise on it. Those times have gone. The new reality is environmental limits can affect farm values in the order of 20%.**

Imagine buying a property and then finding out your production had to be 30% lower than you had budgeted due to a rule you didn't know about. It could be financially devastating. And yet it's happening.

## Before you buy - assess your risk

Our advice is simple – consider your environmental risk factors in the same way you would consider your financial risk factors. An awareness of environmental obligations around land use is now a key part of sound farm business management.

## Your roadmap to sale and purchase

### Key factors to look out for:

- The farm's current nitrogen-loss limit status, whether it's a benchmark number, a reference point or baseline (normally shown as kg N/ha)
- Review of regional plan provisions for current and future land use and any associated nutrient management constraints
- Assessment of the farm's current practices compared with industry-agreed Good Management Practice
- Future infrastructure changes required to meet upcoming compliance requirements, eg installing a feed pad, changing irrigation methods, increasing effluent pond storage
- Future physical changes to meet future compliance requirement, eg waterway or wetland fencing requirements, retirement of high-risk erosion areas
- Greenhouse gas foot-printing and accounting to help understand potential future tax requirements under the Emissions Trading Scheme\*.

Lenders will be looking for information about how the property and its planned management will perform in terms of an investment.

Rabobank Sustainability Analyst Blake Holgate specialises in sustainable farm systems. He says banks are increasingly incorporating an applicant's ability to meet

required environmental standards into their lending considerations.

"Where relevant, we want to see evidence that the client is fully aware of the key environmental risks relevant to their application, and have an appropriate plan in place for dealing with those risks (if necessary)," says Blake. "This evidence then forms part of the total information package that enables lenders to comprehensively assess whether it's appropriate to approve a proposal."

## Buying and selling with confidence

If you are looking to buy or sell a farm, the Ravensdown Environmental team can ensure safe navigation of the environmental landscape and help identify any potential fishhooks buried in the fine print.

For the vendor: The team can complete an overview of the environmental limits for a property so purchasers are made aware of the regulations. The ability to demonstrate the investment you have already made towards meeting your environmental obligations will count as an asset when your property goes to market.

For the purchaser: The team can do a full assessment to ensure the farm you wish to purchase and your proposed management system can operate within the legally enforced environmental limits. In addition, undertaking multiple scenario analysis testing can help determine limitation and profitability of future farm-system change.



**Agricultural aviation has a key role to play in the present and future of New Zealand farming. It has opened up possibilities for farming New Zealand's hill country, and with smarter technology it allows for more precise application of nutrients.**

However, the efficiency and safety of the work is dependent on having a well-maintained, easy to access airstrip with good storage facilities. Ensuring your airstrip infrastructure is up to the required standards means your aerial spreading job, and those of the farming community around you, can be completed in a timelier fashion.

"Health and safety is always at the forefront of our minds," says Dougal Smith, Pilot and Aerowork Area Coordinator for Taihape. "Airstrips have a huge influence on how Aerowork operates. We adhere to Civil Aviation Authority standards, and there are airstrips in this country that are marginal when we bring those guidelines into play."

## Common issues

While there will always be variables beyond human control, there are also many incidences where accidents could have been prevented by addressing common airstrip or bin issues. On agricultural airstrips these tend to be the surface condition and obstructions such as trees, fences or stock.

Before the pilot arrives for a job it's good practice to inspect the strip and check it hasn't been damaged by pests, pugged by stock or become overgrown with rushes, grass or thistles. Weather conditions leading up to the day also play a role, as they may mean the access and strip are too soft for use.

The condition of storage facilities should also be considered. Product needs to be free flowing to prevent the hopper from being blocked. Moisture, excessive fineness, or foreign material can all



cause a hopper throat blockage which can present a hazard for the pilot.

"We say the minimum requirement [for a storage facility] is a concrete pad with two sides, but in fact that's pretty primitive," says Dougal. "The ideal is a bunker with a roof on it which is weather-tight, so we can get the product carted in on the days leading up to when we need to use the airstrip and know that it's safe and sound. Then we're not tossing and turning at night worrying that the product isn't in safe storage, or we're having to fly in marginal conditions to get in quick before the weather really turns for the worse."

## Awareness and responsibility

At every step in the chain there are different responsibilities to ensure the safety of the job.

The manufacturer must supply clean, dry product, the transporter must keep it in good condition and it must be stored well once delivered then checked prior to application. It is the farmer or airstrip owner's responsibility to ensure the airstrip and product meet guidance criteria.

Finally, the pilot must inspect the airstrip and product. If they find that it is not fit for purpose, then they have the right to refuse to fly.

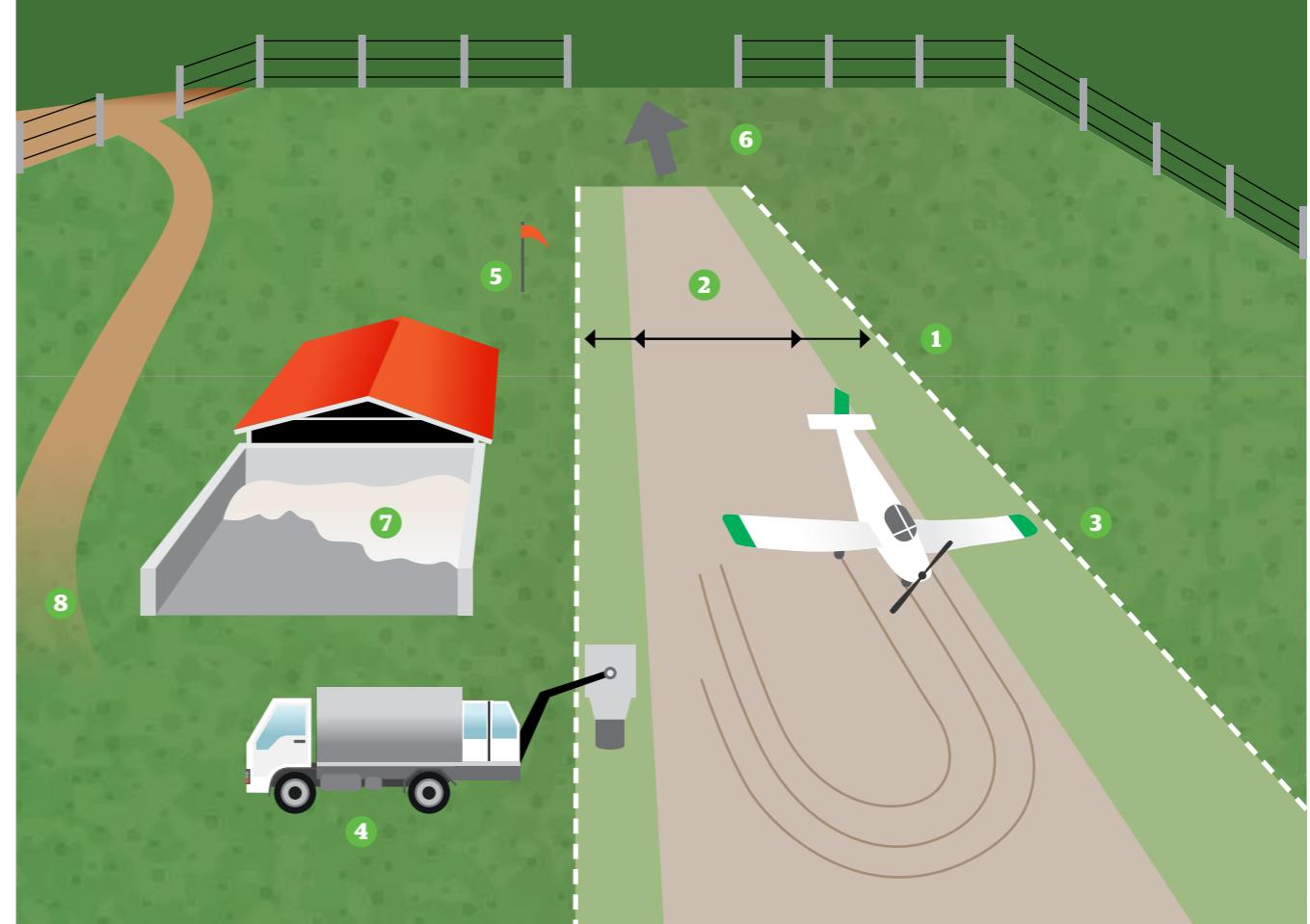
"I've been topdressing in New Zealand for over 15 years and have refused to fly the product on several occasions. It's usually a case

where I've been able to talk to the airstrip owner about changing what needs to be changed and/or waiting for the right weather conditions," Dougal says.

With single strips often servicing many farms in an area, this can cause significant backlogs and delays. In spring, timing is essential and if facilities are inadequate then it can easily be a month before a pilot can return to do the job, and in that time the benefit of applying that product may be diminished.

"Airstrip health and safety is a priority in the industry," says Dougal. "It's up to everyone involved in the process to adopt a sense for airstrip safety and do their part to keep our pilots safe and their airstrips clear for take-off." ■

### TOP-DRESSING AIRSTRIPO STANDARDS AND SPECIFICATIONS SOURCE: CIVIL AVIATION AUTHORITY



**1 Airstrip width – Minimum 30m**

**2 Runway width – Minimum 15m**

**3 All stock removed – cattle 2 weeks prior to operation**

**4 Loading area**

**5 Wind indicator**

**6 Drop down fence at end of strip**

**7 Dry free flowing fertiliser (covered bin)**

**8 Strictly no admittance to work area**

**Strip length:** Please check strip length requirements with your aerial operator. Fertiliser application costs will increase on airstrips of marginal length due to the need to carry smaller loads.

# CONTROLLING THE WORM BURDEN ON PASTURE - PART TWO

By Dr Julie Wagner, Ravensdown Product Manager Animal Health and Dr Mark Vickers, Veterinary Parasitologist



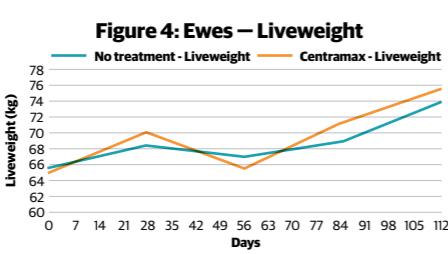
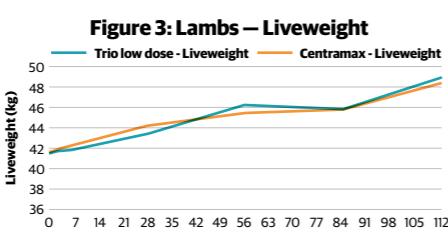
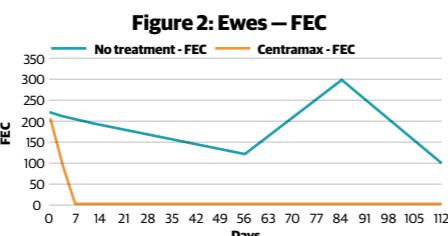
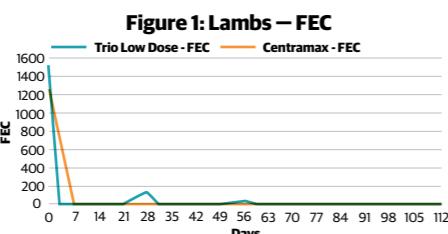
In the Spring 2018 edition of **Ground Effect**, the article 'Are your ewes controlling your worm burden?' considered the role adult ewes play in controlling and reducing the contamination of worms on pasture. This article follows the second round of trial work from this study.

In February 2018, an investigation into a suspected triple drench failure on a Southland farm found that the worm population was not in fact drench-resistant as originally suspected, but remained susceptible to almost all drenches. The underlying problem appeared to be that the ewes failed to control the pasture larvae as expected, and that it was the ewes, not the lambs, that were heavily contaminating the pasture. The resulting impact of ingesting high numbers of infective larvae and the resulting worm burdens was believed to be the reason behind the poor performance of many of the ewes.

Following on from this discovery, we carried out a second weight gain and egg count study in April 2018. In this second study, 60 poorer ewes were individually ear tagged, weighed and then split into two groups by weight. The 40 ewes allocated to group one remained untreated, while 20 ewes allocated to group two were treated

with a Centramax capsule. In lambs, the allocation was identical but the 40 lambs in group one were treated with the triple oral drench, Trio® Low Dose at 28 days, while the 20 lambs in group two were treated with a Centramax capsule.

In the lamb (figure 1) and ewe (figure 2) groups treated with capsules, no eggs were found to Day 112, and no larvae except Trichostrongylus were detected in lambs at Day 112. In untreated ewes, the mean egg count declined slowly to be 100



eggs per gram (epg) with a range of 0-200 epg at Day 112. In the triple oral treated lambs, egg counts were zero or low positive 28 days after treatment.

There was no weight gain difference in lamb treatments (figure 3), with a 4.25kg gain for the triple oral and 4.15kg for the capsule over the 85 days.

In contrast, the capsule-treated ewes gained 6.15kg compared to a 3.31kg gain in the untreated controls (figure 4). The Centramax capsule stopped/prevented worm eggs going onto the pasture for more than three months. The improved weight gain in the ewes was most likely due to the control of their worms, and hopefully they will be able to better manage their parasites burden in the future.

## Next steps

This trial work has shown that targeted anthelmintic treatment of adult sheep for the good of the whole farming system may be required on occasions, and that FEC monitoring in ewes, not just young stock, is something that needs to be considered as part of good farming practice.

Recognising when adult sheep are not controlling worms in the way they normally should is important. Equally important is providing a treatment that not only gives immediate parasite control, but also helps reduce the contamination on pasture over time. Low pasture contamination will be beneficial for all sheep classes grazing that pasture in the future. ■



# AGRICATION OPENING OUR EYES TO THE POTENTIAL OF AGRIBUSINESS

A clever initiative to bring agriculture into New Zealand classrooms is helping educate students about food and fibre production, as well as showcasing viable career options in the primary industries. Brad Markham from NZ Young Farmers explains.

Jordan Harrison leans over into a weathered wooden drafting race to push up a stubborn lamb. He's one of 40 Whangarei Boys' High School science students who are on a field trip to Greg Lovell's Northland farm.

"We got to help weigh and draft a mob of ewes and lambs in the yards," says his classmate 15-year-old Taine Beardsell. "It was quite cool to see how technology is used to record and monitor weight gain."

The teenagers are studying the nutritional requirements of ewes and the factors that influence sheep growth rates. Their teacher downloaded the free learning resource from the Agrication website\*, which is run by NZ Young Farmers and funded by the Red Meat Profit Partnership (RMPP).

"It was great to get out of the science lab and go on a field trip," says 15-year-old Jack Bowering.

Whangarei Boys' High School is one of 215 schools across New Zealand that have downloaded resources.

"They're a great way of injecting real-world farming and food production into the mainstream curriculum," says Trevor McIntyre from NZ Young Farmers.

"More than 2,500 students are now studying the resources."

The website is one of a number of projects NZ Young Farmers is spearheading to get students excited about career opportunities in the primary industries.

"The primary sector needs another 50,000 qualified workers by 2025. We have reshaped our organisation to help achieve those targets," says Trevor.

NZ Young Farmers has a dedicated team of 10 staff - many are former teachers - who are familiar faces in schools. Some even teach lessons.

This year Young Farmers organised a major national project getting students from 100 primary schools onto sheep and beef farms.

"We want to get the industry on the radar of students and teachers, so they're aware of the opportunities," says RMPP's Di Falconer.

Argyll East School was the first Hawke's Bay school to take part.

"It was heaps of fun," says Year 6 student Kaela Brans. "I'm considering becoming a vet or a farmer when I'm older."

More than 4,500 primary school students have already visited farms as part of the project.

NZ Young Farmers' efforts to educate and inspire don't stop there.

In November, almost 300 teachers got out of the classroom and into fields and factories as part of Teachers' Day Out. The development days play a massive role in changing perceptions of the agri-food sector.

"It's certainly made a difference to the way I talk about agriculture in the classroom," says Albany Senior High School commerce teacher Kaye McKean.

Six events were held in Auckland, Raglan, Hawke's Bay, Palmerston North, Christchurch and Invercargill. ■



JORDAN HARRISON HELPS DRAFT SHEEP

# 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.

## REFERENCES

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DPR blogs: <http://blogs.lincoln.ac.nz/dryland/>

DPR YouTube videos: [www.youtube.com/DrylandPastures](http://www.youtube.com/DrylandPastures)

DPR Facebook: @DrylandPasturesResearch

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- \* Note that at the time of writing this article the Emissions Trading Scheme and farm-scale requirements were not confirmed by the government.

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### PAGE 37 ENVIRONMENTAL DUE DILIGENCE - A NEW REALITY FOR FARM SALES AND PURCHASES

- \* Note that at the time of writing this article the Emissions Trading Scheme and farm-scale requirements were not confirmed by the government.

### PAGE 41 AGRICATION - OPENING OUR EYES TO THE POTENTIAL OF AGIBUSINESS

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## The Last Word

We hope you enjoyed the eighth edition of Ravensdown's Ground Effect®.

If you'd like to contribute to the next edition please contact us on any of the details below.

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On behalf of Ravensdown, we'd like to thank you for your valuable contribution to our primary industry. We continue to invest in and develop our agri-science, technology and innovations to capture insights for the good of your business and the country. Keep up the good work of smarter farming for a better New Zealand.

Mark Braithwaite (Plant Diagnostics); Trees That Count; Blake Holgate (Rabobank); Trevor McIntyre and NZ Young Farmers.

A big thank you goes to the Ravensdown team of Tim Roulston, Dr Rob Murray, Colin Tyler, Adrian Brocksopp, Mike Manning, Mike White, Greig McLeod, Mark Crawford, Mark Fitzpatrick, Dr Ants Roberts, Courtney Morton, Eugene O'Neill, James Goosen, Dougal Smith, Brent Robertson and Andy Bourne for their contributions to Ground Effect 8.

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Victoria O'Sullivan  
Editor

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