

ravensdown

INSIGHT AND ACTION FOR AGRICULTURAL SUCCESS

ground

EFFECT

SPRING 2018
EDITION 7

Avocado Dream

From dairy to horticulture in the Kaipara Harbour

ClearTech®

Technology changing effluent management

The greenhouse gas challenge

Understanding the place of pasture in the carbon cycle





WELCOME TO THE SEVENTH EDITION OF GROUND EFFECT® FROM RAVENSDOWN

This edition of Ground Effect® is packed with real examples from farmers and interesting perspectives from thought leaders. As usual, the focus is on smarter farming and we hear from a variety of industry voices and authorities about where we can all do better.

Ravensdown has just joined 60 other large New Zealand companies on the Climate Leaders Coalition so we are especially pleased to bring you Dr Jacqueline Rowarth's take on greenhouse gases on page 18.

Another multi-agency initiative we support is the Action Plan for Water Quality which outlines Good Farming Practice. The Ministry for Primary Industries, Ministry for the Environment, Federated Farmers, Horticulture NZ, DairyNZ, Irrigation NZ and Beef + Lamb are all to be commended for coming together on this. Ground Effect® has a role to play in sharing the great examples that shareholders and scientists are working on in this area.

One such example of this is ClearTech® which has the potential to transform how farm dairy effluent is managed and water is recycled.

DairyNZ's Logan Bowler, Lincoln University professors Keith Cameron and Hong Di as well as our own Jamie Thompson have joined together to explain the potential of this exciting technology on pages 6 to 11.

Another innovation – precision aerial spreading and soil testing from the sky – is explored in a real farm setting on pages 12 to 16. Ātihau Whanganui Incorporation are taking some bold steps and showing how a cultural connection to the land and improved productivity can go hand in hand when new technology is there to help.

The horticultural sector features prominently in this edition. This is justified as everyone in the agrisector has much to learn from their recent successes. Kiwifruit, avocados and apples are all featured.

On page 33, Plant and Food Research's Roger Robson-Williams bangs the drum for precision agriculture as a way to achieve our environmental goals. Our Senior Agri Managers Andrew Airey and



Dan Copland back this up with some insight on Precision Nutrient Management before shareholder Eric Watson gives a tour around his record-breaking operation on page 36.

We know biosecurity remains our readers' number one concern so I hope you find the page 31 profile on the Bio-Protection Research Centre interesting. Dr Ants Roberts discusses the emerging research into Biostimulants on page 20.

And when it comes to smarter approaches, we take a look at smarter spreading on page 17, smarter pasture management on page 32 and page 39, smarter management of ewes' worm burden on page 28 and smarter tackling of thistles on page 30.

Thanks for giving Ground Effect® your attention and, as usual, you can give your feedback on the email address below.

Best regards
Greg Campbell
Ravensdown Chief Executive

CEO@RAVENDOWN.CO.NZ

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BEHIND THE SCENES

Ravensdown is enabling smarter farming for a better New Zealand

WINTER FEED COMPETITION,
MID CANTERBURY

ClearTech® Launch

Ravensdown and Lincoln University's effluent technology was released 3 May, drawing a large crowd to the demonstration day on the Lincoln University Demonstration Farm. Read more about ClearTech® on page 8.



Massey University Research Scholarship Awarded

Gere Geretharan is the recipient of Massey University's 2018 Ravensdown Agricultural Research Scholarship at Massey University. Gere's research project is "Does fluorine added to soil through superphosphate fertiliser use have a detrimental effect on soil microbiology?"



GREG DOW AND
GERE GERETHARAN

FMG Young Farmer of the Year

Congratulations to Logan Wallace from Otago/Southland region who won the 50th FMG Young Farmer of the Year in Invercargill. Logan also took out the Ravensdown Agri-Skills prize valued at \$6500.



Mike Petersen is the Ravensdown Agricultural Communicator of the Year 2018

New Zealand Special Agricultural Trade Envoy and Hawke's Bay farmer Mike Petersen has been named as 2018's Ravensdown Agricultural Communicator of the Year. The award honours those who make a significant contribution towards making New Zealand world leaders in primary production.



Hugh Williams Ravensdown Memorial Scholarship

**Ravensdown shareholder?
Passionate about the future of
smarter farming?**

Applications for the 2019 Hugh Williams Ravensdown Scholarship are now open.

For more information or to apply go to careers.ravensdown.co.nz

New Zealand Dairy Industry Awards

The dairy industry's brightest stars descended on Invercargill in May for the 2018 Dairy Industry Awards. Northland's Dan and Gina Duncan took out the Share Farmer of the Year title and the Ravensdown Pasture Performance Award (see page 32). Dairy Manager of the Year was named as Hawke's Bay/Wairarapa's Gerard Boerjan and Dairy Trainee of the Year went to Simone Smail from Otago/Southland. The Ravensdown Feed Management Award was won by Dairy Manager of the Year Runner Up Will Green, Canterbury/North Otago.



GREEN WATER WASHING A WIN-WIN

By Logan Bowler, DairyNZ environmental extension specialist

Using recycled effluent (green water) for washing the yard can be a great way to use less water on farm, halve the required effluent storage and achieve a 50% reduction in time spent managing effluent.

When calculating how much effluent storage is required on individual farms, there are a number of options for reducing storage requirements. Using recycled effluent for yard washing is one option with many benefits, in addition to reducing storage size.

The volume of water used in the dairy shed and yard has a large impact on storage requirements. In general, for a normal herringbone shed using 70l water/cow/day, 10% of the water is used for plant washing, 25% is used for hosing out the bail area and the rest (65%) is used to hose the yard. Therefore, by washing the yard with recycled effluent, daily water use in and around the farm dairy can be slashed by up to 65%.

There are many benefits that add up to a compelling reason to seriously think about implementing this on farm. These include electricity saved from pumping less water from its source (surface water or bore), reduced pumping time for effluent irrigation, labour-free washing of the dairy shed yard, and, in an example Waikato farm, a whopping 74 fewer effluent runs (200m runs) with the effluent irrigator.

In the example 400-cow Waikato farm using 70l water/cow/day for cleaning, total annual effluent generation (water use, excreted effluent and rainfall landing on the concrete and the pond surface) is about 10.7 million litres per year. Recycling effluent reduces this to around 5.5 million litres. That's a saving of 74 times someone needs to turn the irrigator around and set up a new run. On top of this, there is a significant drop in required storage volumes and the cost associated with that. If you are winter milking, then the benefits are even greater.





Reduced storage

Depending on soil risk in the effluent block, an average Waikato dairy farm implementing recycled-water yard washing will reduce effluent storage requirements by approximately 50%.

Their modelled pond dimensions go from 50m x 46m x 4m to 36m x 36m x 4m and their annual effluent production (including rainwater landing on the pond) goes from nearly 11 million litres to approximately 5.5 million litres.

Effluent irrigation onto pasture also becomes more efficient. With increased concentration of effluent, each litre becomes more valuable. There has been no reduction in the amount of nutrient being captured – just the water the nutrient is suspended in has been reduced.

If the idea of smell or attracting flies has put you off in the past, new technology being developed can significantly reduce odour, suspended solids and pathogens. This means there is no reason to ignore the potential use of green water.

If you commit to using recycled water for the first three months of the season and the last six weeks of the season, you will still get the full benefit of storage reduction. There is no real reason not to do this. Once you have tried this out and are experiencing the benefits, using recycled water all season on your farm will become the norm.

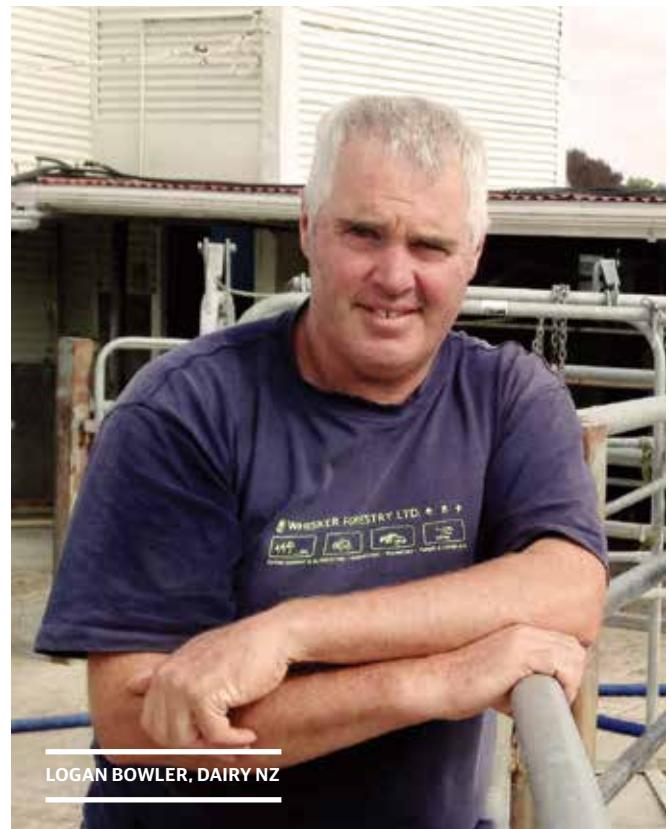
The rules for recycled water yard washing

There are rules* to be met on how you use untreated recycled water for washing the yard. Talk to your accredited effluent designer, your milk company or go to DairyNZ's website** for the actual rules.

The main rules are:

- The recycled water must be free from sediments and solids
- It can only be applied at low pressure to eliminate any aerosols
- It can only be applied no higher than 300mm from the yard surface
- It must not be used within 5m of any milk-harvesting equipment
- It cannot be used when cows are on the yard
- You need to have the ability to wash the yard with clean water (this may just be from a handheld hose).

Further processing of green water may well allow us to have fewer



LOGAN BOWLER, DAIRY NZ

limitations. With reduced risks from *E. coli* and other pathogens, and elimination of suspended solids, it may well be feasible in the future to use treated green water much closer to the bail area and potentially even through a hand held hose.

For those with flood wash, it's simply changing the filling of the tanks from clean water to recycled water. Farms with under-gate washing systems need to organise a separate effluent line to the backing gate that enables getting the recycled water into the washing system with no chance of contamination of the shed's fresh water supply.

If you are looking at putting storage on farm, the cost of implementing recycled water may well be met by the money saved from smaller storage. ■

(*.) see Source Code page 42



CLEARTECH® MAKING THE CLOUDY CLEAR

By Jamie Thompson, Ravensdown Effluent Technology Manager



JAMIE THOMPSON, RAVENSDOWN EFFLUENT TECHNOLOGY MANAGER

ClearTech® is an emerging effluent treatment technology that recycles water, increases effluent storage capability and reduces the environmental and safety risks associated with farm dairy effluent.

With environmental pressures mounting and concerns growing around water quality, industry stakeholders agree that ClearTech® is a step in the right direction and a technology with huge potential.

Turbidity, or 'cloudiness' in water is measured by Nephelometric Turbidity Units (NTU). Table 1 represents the results of ClearTech® technology used on the Lincoln University Dairy Farm (LUDF) effluent.

Table 1: Results of ClearTech® technology used on effluent from Lincoln University Dairy Farm (NTU) and volume recycled (l).

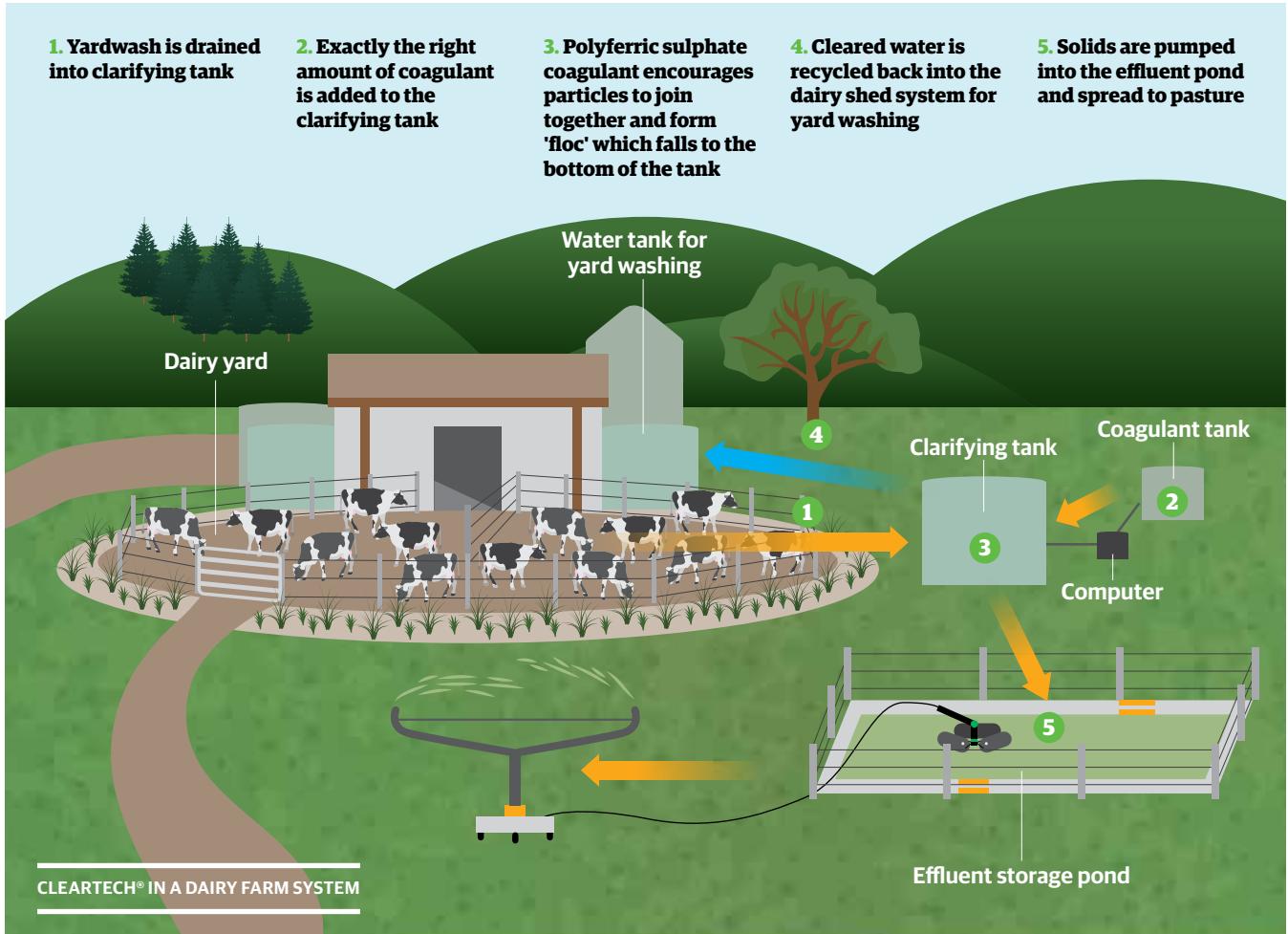
Date	Start NTU	End NTU	Total volume of water recycled (l)
22/03/18	1560	16	7000
26/03/18	2500	17	14,000
27/03/18	2200	14	11,500
04/04/18	3000	45	8500
06/04/18	3500	45	7000
09/04/18	3100	8	7000
10/04/18	3983	5.3	8300
11/04/18	3345	17	11,500
Average	2899	21	9350

The ability to reduce NTU levels from an average of 2899 NTU (raw effluent) down to an average of 21 NTU is remarkable. An average of 9350 litres of clear water a day is being recycled for re-use at LUDF, which equates to 9350 litres less water each day entering the effluent pond and requiring distribution to land.

At a time when there is such public pressure on water quality, reducing the volume of effluent produced each day by recycling up to 50% of the water portion has tangible benefits for both on-farm storage capability and risk control.

The next step is to install and test a pilot plant in the North Island later this year. ■

See the ClearTech® effect and register your interest at cleartech.co.nz.



THE CLEARTECH® PROJECT TEAM L-R
 ROGER ATKINSON, CAROLE BARLOW,
 PROFESSOR KEITH CAMERON (LINCOLN
 UNIVERSITY); SAM LOGAN (WATERFORCE);
 JAMIE THOMPSON (RAVENSDOWN).
 ABSENT: JAMES HARDISTY (CONTROL
 FOCUS); PROFESSOR HONG DI
 (LINCOLN UNIVERSITY) ANGUS MCLEAN
 (YARDMASTER)





CLEARTECH® THE SCIENCE BEHIND THE TECHNOLOGY

By Professor Keith Cameron and Professor Hong Di,
Soil and Environmental Research, Lincoln University

ClearTech® is based on sound science and engineering principles that underpin the treatment of human drinking water and municipal wastewater around the world. The Lincoln University and Ravensdown joint research project has applied and adapted these fundamental principles to treat farm dairy effluent. ClearTech® is designed to separate out clear water from effluent solids and produce clear water that can be recycled to wash the dairy farm yard and reduce the volume of effluent to be managed.

Algorithms and coagulants

Farm dairy effluent generally contains about 99% fresh water and about 1% solid material (dung, soil, plant material, etc). Although the sand and silt particles can settle out of the effluent relatively quickly, the finer particles in dairy effluent (called colloids) are too light to settle out of the water under gravity. These particles cannot coagulate to form larger heavier particles because they have a small negative electrical charge on their surfaces and these negative charges cause the particles to repel each other.

Adding the 'coagulant' (polyferric sulphate) to the effluent neutralises these negative charges allowing the particles to join together to form larger heavier particles (called 'floc') that have sufficient mass to settle out of the liquid under gravity. The polyferric sulphate also reacts with hydroxyl ions in the water to

produce an insoluble sticky gel (ferric hydroxide) which also helps to create flocs that can settle out of the liquid in a process called 'sweep floc'. The chemical reaction is illustrated below:



To be successful, the addition of the coagulant must be delivered at exactly the correct dose to ensure the colloids coagulate. Too little, the colloids stay suspended in the liquid. Too much and the particles again repel each other causing them to stay in suspension. A considerable amount of laboratory work was undertaken to identify the correct dose of coagulant to use as well as identify the best type of coagulant to use. Because the amount of solids in farm dairy effluent varies, the research team developed a mathematical relationship (an algorithm) to enable the ClearTech® computer

"Adding the 'coagulant' (polyferric sulphate) to the effluent neutralises these negative charges allowing the particles to join together."

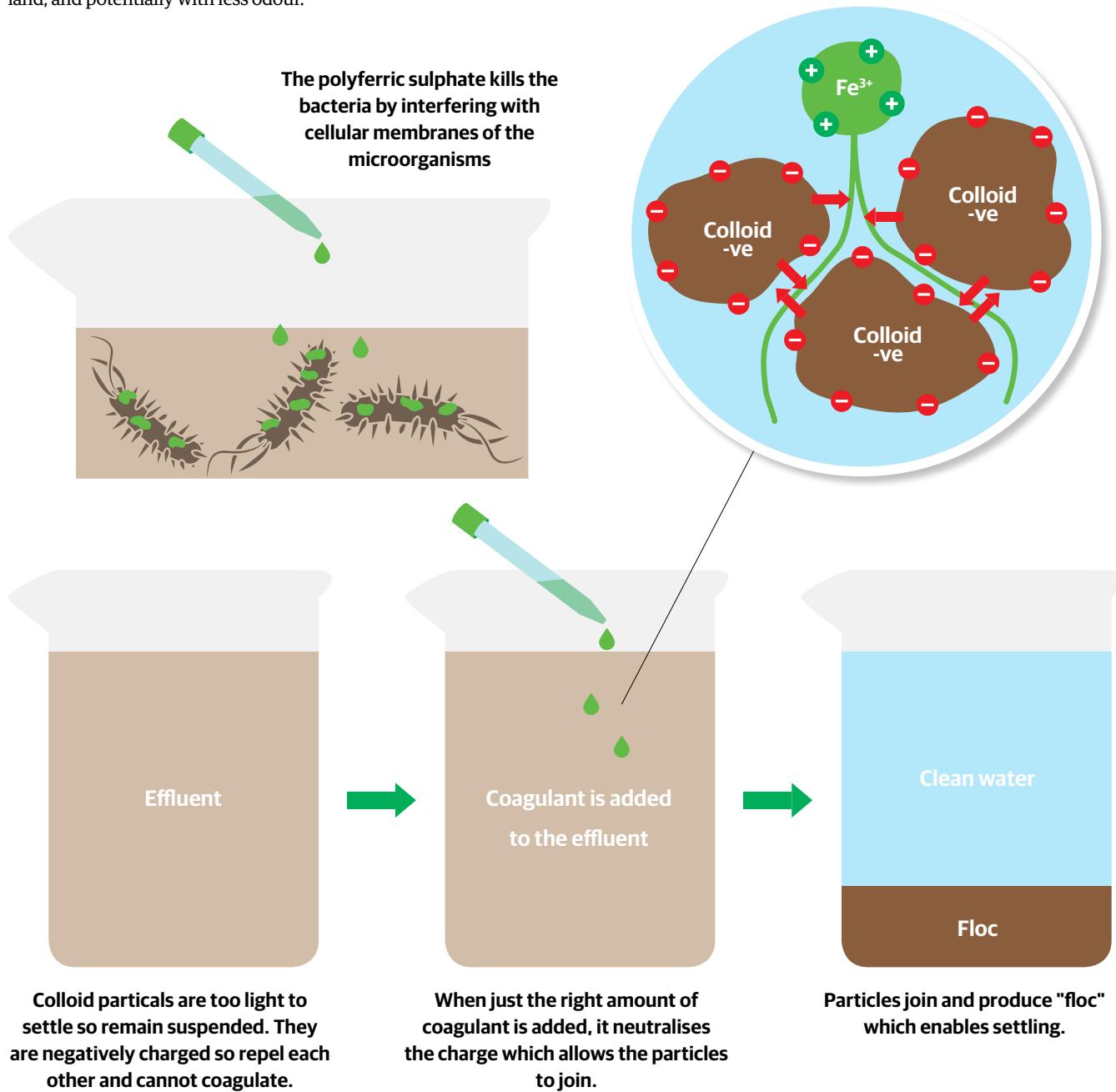
control system to match the coagulant delivery rate with the solids' content (or turbidity) of the effluent.

Bacteria begone

The ClearTech® system reduces the bacterial count in treated clear water and effluent. During treatment, bacteria such as *E. coli* become trapped within the 'flocs' as the flocs form and these bacteria are then removed from the liquid. The polyferric sulphate also kills bacteria by interfering with the cellular membrane of the microorganisms. Research results show that a 99% reduction in *E. coli* counts in the clear liquid has been achieved using the ClearTech® system. This enables the clear liquid to be recycled more safely than if using normal 'green water' for yard washing. In addition, the research team has found that the *E. coli* concentration is also reduced in the treated effluent that remains after the clear liquid has been removed, making it potentially safer to use on the land, and potentially with less odour.

A better kind of P

In addition, the researchers found that the coagulant reduced the amount of the mobile 'dissolved reactive phosphate' in the clear liquid and in the treated effluent. The ferric ions bind with the phosphate ions to reduce the immediate solubility, thus reducing the risk of P losses to the environment through runoff or leaching. Excessive phosphorus can cause eutrophication in rivers and lakes, so reducing the amount of dissolved reactive phosphate may help to reduce this risk. The research team is currently conducting studies to measure the effects of land application of treated effluent on P leaching loss compared to P loss from standard untreated effluent.



STRIKING THE SWEET SPOT WITH ĀTIHAU WHANGANUI INCORPORATION

Covering an area the size of Lake Taupō and running from Tongariro National Park to Whanganui National Park, Māori farming group Ātihau Whanganui Incorporation (AWHI) is working to establish strong environmental stewardship principles into its farming practices, while creating a culture of care for its people, land, animals and the consumer too.

The word 'care' forms the foundation of the Ātihau Whanganui Incorporation's philosophy. Even the incorporation's acronym and customer-centric brand, AWHI, is a Māori word meaning 'to embrace, support and care for'.

"A key priority for us has always been care," says CEO Andrew Beijeman. "To treat people and nature as whānau. We are all connected, everything we do has an impact on the environment, on our animals and on people, we need to look after each element. It's about staying true to that value."

AWHI runs multiple sheep and beef breeding/finishing properties, a dairy farm, apiary and forestry operations. They have nearly 9000 shareholders and employ about 50 staff, and also run an annual training programme 'Awhiwhenua' which takes on farm cadets. Grants and scholarships are available to shareholders and their families to support education, sporting and cultural endeavours, including the Ātihau Ravensdown tertiary education scholarship established in 2011.

Looking after the land is a big focus for AWHI. The incorporation's history dates back to 1970, when it was formed to take back 42,000ha of land vested into the Aotea Māori Land Council by Whanganui Māori in the early 1900s. These leases have been progressively resumed, beginning with Ohorea Station near Raetihi. The resumption of land required AWHI to purchase the improvements from lessees as well as restock the properties. In some cases the properties were in a state of disrepair.

"Some of the (resumed) blocks were a single lease with only one paddock. There was no fencing, or the fences had fallen down," says Andrew.

With so much potential to increase the production of the properties, the way forward for AWHI is about how best to manage the components of their farming systems within their mandate.

"It's about striking the balance - reducing our impact environmentally whilst still getting better production out of the farms."

Across the properties, \$13 million is forecast for subdivision, fencing and reticulation. The first cut of the plan calculated 300km of fencing alone - a distance equalling Whanganui to Hamilton.

"We want to get the (farm) facilities up to a standard where you are proud of them and happy to show them off," Andrew says. "And at the same time we're tying in care for the environment and animals - making sure animals have clean water and shade, and fencing off waterways."

In addition, money is being spent on fencing off native bush. They apply for grants where possible and work closely with Horizons Regional Council.

"Wherever we can put a fence in next to a stream we do, and if a piece of bush is never going to be cleared or used for mānuka honey then it may as well be protected," says Andrew.

"We are really appreciative of our regional council here because they are very good, and they're very supportive of the work we are doing."



OHOREA STATION MANAGER REX MARTIN
WITH HILL COUNTRY-CROPPED CHOU (KALE)



"It's not just about the plane with the sensor that can soil test every square metre ... it's about the maps which indicate where the sensitive areas are, so we are not putting fertiliser on those areas."

PGP initiative

AWHI's Ohorea Station is both a research and a focus farm for the Ravensdown-led Primary Growth Partnership (PGP) programme, working to improve productivity of hill-country sheep and beef farming through more efficient use of fertiliser.

Ohorea Station covers 4300ha of rolling to steep hill country spanning both sides of SH4 in the Parapara Ranges. The property runs 17,000 breeding ewes and 1000 Angus cows with replacements, using hill-country cropping to grow swedes, chou (kale) and new grass.

Resumed leases make up two-thirds of the station and require ongoing infrastructure and capital fertiliser inputs to bring them into line with the original home block. Manager Rex Martin employs six staff on the property, including two permanent fencers and four general shepherds.

The PGP initiative ties in well with AWHI's environmental goals. GPS-guided aircraft use remote sensing to establish the nutrient status of the soil and determine where nutrients should be targeted, avoiding critical areas such as waterways and stands of native bush.

"Really it's about looking after what we do on our land and that is a big part of where the PGP comes in," says Andrew.

"It's not just about the plane with the sensor that can soil test every square metre ... it's about the maps which indicate where the

sensitive areas are, so that we are not putting fertiliser on those areas, and also about the plane technology turning it on and off at the right time."

Andrew says it has been a great initiative for AWHI and that they can't wait to roll it out across all their farms.

"At some stage this year we are going to use the PGP technology to re-map all the farms to find out where our manuka is, improve the recording of our effective areas, get better slope data and records of sensitive areas. Then we can get a bit smarter about these areas - knowing that's an area not to be cropped."

AWHI is looking to improve its cropping practices, particularly in regards to grazing management, run-off and sediment loss on heavy Papa soils.

"We are looking at (cropping) to see where we can make changes, either with best-practice grazing so we can mitigate the effect on the environment or just (avoiding) areas of the farm because they are not suitable."

They are also undertaking water monitoring across some of their internal catchments. This will provide a starting point for their water quality and hopefully over time reflect positive improvement in line with changing management practices.

"We chose three [waterways] that start and end with us, so it will be interesting to see what the outcome of that is," says Andrew.

Protecting the native elements

Unproductive land including steep faces and stands of native bush have been protected as part of Ngā Whenua Rāhui - a 25-year covenant programme geared towards the protection of indigenous ecosystems on Māori-owned land. Ten per cent of AWHI's total landholding is now protected - around 4000ha.

"Some of it is coming away quite nicely, because it all would have been logged at some stage," says Andrew. "The trees are getting taller and it's getting to that next tier. You can see that in 50 years time, it will [represent] what New Zealand used to be like."

A future goal of AWHI's is working towards the establishment of a bird corridor across their properties.

"We link two national parks - Tongariro and Whanganui. Through all the native bush we have protected we almost have a corridor to Whanganui from Mount Ruapehu. Over time we will scope that corridor a little better and increase our pest control, so it is as pest-free as possible."

A special part of Ohorea Station is the 700ha kiwi sanctuary, for which pest control is administered by Horizons Regional Council, while AWHI maintains access tracks.

"Horizons did some monitoring and found that a patch of bush on Ohorea had a lot of kiwi in it, so they came to us and asked if it could become a kiwi reserve," says Andrew.

He says they have spent over \$1 million in the past ten years on protecting native bush.

"It's a key part of the organisation and a key part of who we are, and it does dovetail nicely into our value-add strategy.

"Our consumers want to know we are looking after the environment, that we are not doing anything harmful and their food is coming from a good place."





PREMIUM BEEF MARBLING
IS A VALUE-ADD FOCUS

International buzz

AWHI's mānuka honey operation provides a good diversification strategy for the business.

"This year has been great for the farmers, green all the way through, but the honey has been a bit down because it's been so wet," says Andrew.

"It is perfectly diversified from a production point of view, which means we're a bit more consistent with our business. That was the whole purpose of going into the honey in the first place."

There are seven people in the bee team running 2400 hives. Owning the bees and the associated apiculture plant means they can be responsive to opportunity and get full value out of the business.

"We know the bees are going to be there when we need them there, they are not going to show up two weeks late, which can happen."

Medical grade mānuka honey is popular in the US due to its natural antibiotic properties. The best honey will fetch over \$100/kg in the current market.

"We are doing quite a bit of testing in markets to see what the honey story could look like. Mānuka honey is just starting to take off in the US so we are hoping to catch the wave and ride it. Not that we produce much, we have 80t of honey...but all we need is one or two distributors or retailers over there and we can go direct to market."

While some of the mānuka for honey production is on retired country, they are also trialling nursery-sourced varieties on Ohorea. Planting is going on in the riparian strip areas, which is vitally important to prevent the areas reverting to blackberry.

Looking to add value

While Ātihou Whanganui is still their trade name and ownership structure, they have developed a customer-centric brand -AWHI - and are looking into local and international trade opportunities for their produce. At the same time they work with other businesses to

MĀNUKA HONEY
PRODUCTION IS A
DIVERSIFICATION
STRATEGY FOR AWHI



market their produce, including Angus Pure and Merino NZ.

"The business is changing, we still focus on production, because production is good to have, but we are now very much focused on value - getting more for our product."

Wool from the farms goes into Glerups shoes and into carpet manufacture. On the beef side, they concentrate on good genetics to ensure premium marbling in their beef.

"We hosted some distributors the other day as part of Angus Pure ... we got them out on farm and sat down in front of the cattle, which they loved.

"We were able to show how well we care for the animals and the river, and protect bush on the farm, and how we manage soils when they're wet. Then we took them over the other end of the farm where a talented local chef did our beef six ways for us. They saw the tables all lined up with the platters and the open bar - it was such a wow!"

For AWHI, the future lies in smarter farming.

"It's about using the same amount in inputs in a much more effective way, which is where working with Ravensdown on the PGP comes into it," says Andrew.

"Doing things the right way with individual treatment rather than a blanket approach, and using information to get a better result, which in the long run is more cost-effective as well." ■



SMARTER SPREADING FOR YOUR FERTILISER SPEND

By Stephanie Laird, Ravensdown Ground Spreading Manager



STEPHANIE LAIRD, RAVENSDOWN GROUND SPREADING MANAGER

Farm environmental plans, nutrient loss baselines and nitrogen reference points are all regulatory factors that our environmental consultants can help you quantify. But how do we ensure we are maximising every dollar spent on fertiliser, while maintaining environmental responsibility? The answer is precision agriculture.

Using precision agriculture, we can ensure every fertiliser application is the right amount, in the right place, spread at the right time and in the right manner. There are three specific areas to consider:

- Fertiliser is being applied at an optimal rate and distribution pattern with an appropriate overlapping swath width.

Smarter proof of placement

A significant part of a Farm Environmental Plan (FEP) is reviewing past years' performance, and ensuring the property is meeting the components of its FEP. At the core of this process is nutrient proof-of-placement and traceability.

Utilising Ravensdown's HawkEye® technology, NPKS reporting is available per paddock, block and farm environmental management zone. The process is seamless when adopted by our integrated solution.

Ravensdown's solution starts with your FEP. It then incorporates soil testing and fertiliser recommendations, ordering and application from farm plans, and finally proof of placement from our integrated spreading providers.

Our solution allows tracking of fertiliser applications versus fertiliser plan, incorporation of application exclusion zones, and where requested, variable rate applications within the paddock. Using the HawkEye® technology can save you time and money and increase the efficiency of your fertiliser spend, with the added advantage of records being in one place.

Smarter standards

The industry standard for fertiliser application (both ground and aerial) is Spreadmark*, a fertiliser placement quality assurance programme.

Every two years, spreading equipment is tested across a range of products to ensure accurate and even fertiliser placement is being achieved across the overlapping swath, at the required rate. This testing also allows for continuous improvement by altering some of the machine designs to spread more consistently. As part of the process, each bin has its own unique identifier, which tracks past and present results to allow for a robust auditing process long term.

Operators are required to be trained as part of the Spreadmark scheme. This ensures competence in fertiliser knowledge, spreading skills, communication skills and environmental awareness. Competency is assessed using written, verbal, and practical assessments, to better enable every Spreadmark-certified applicator to apply nutrients in the most productive manner.

In a nutshell, if an operator has the Spreadmark tick, farmers know that:

- Spreader operators have been trained
- Equipment is independently assessed and systems audited

Smarter applications

Managing under an FEP and ensuring nutrient application is even, accurate, and traceable is the first part of the puzzle. What about at farm level?

Many shareholders already use their nutrient knowledge to help ensure their fertiliser application is efficient.

Gateways, for example, are areas of high fertility and compaction, so it makes sense to exclude them from application.

A gateway exclusion zone is typically a 50m radius circle. Based on this radius, the exclusion zone equates to 0.2ha - an application saving of \$10.26 per gateway for an 80kg/ha urea application (including product, cartage and spreading).

Other areas to avoid include stock camps, raceways and riparian strips. The same process is utilised by our spreading technology to reduce application on these areas. ■

Thought Leader: Dr Jacqueline Rowarth



THE GREENHOUSE GAS CHALLENGE

Dr Rowarth holds a PhD in Soil Science and has been analysing agri-environment interaction for several decades. She has a 5% share in a 56ha dairy farm in the Waikato.

The government has launched an initiative to plant one billion trees over ten years to offset our greenhouse gas emissions (GHGs).

This works because as trees grow they continually capture carbon (actually carbon dioxide) from the air - the carbon can be seen as the tree trunks increase in size each year. When the tree stops increasing in size (ie when it matures), dies or is cut down, no more sequestration occurs.

Pastures also capture carbon, but do not offset our GHGs because 'maturity' occurs quite quickly - the pasture plants grow and are grazed, therefore recycling the carbon back into the atmosphere, every few weeks.

In a mature pasture, the amount of carbon at the beginning of the year will be similar to that at the end. The carbon fixed through photosynthesis by the plants is similar to the amount released through respiration of the plant and soil. The system is in dynamic equilibrium (just like a mature tree, which is no longer increasing in size).

Consider a pasture fixing 20t of carbon annually. Around 10t will be respired (lost back to the atmosphere as carbon dioxide), while approximately 5t of carbon will drop to the soil as litter or decay in situ (as roots do).

Another 5t will be consumed by the animals grazing the pasture. About 1.6t of the carbon eaten by the animals will be returned via dung. The litter, roots and dung feed the soil micro-organisms, and as long as oxygen is available, carbon in the form of carbon dioxide

will be released through the processes of respiration and decay involving soil micro-organisms.

Within the animal, the 5t of carbon consumed in pasture, minus dung, is respired (2.7t), turned into meat and milk (0.5t) and belched as methane (0.2t).

The animal protein is eventually consumed, usually by humans, and respired and excreted in dynamic equilibrium (as long as the human is not gaining weight).

All the carbon is cycling through the atmosphere, plant, soil, animal, and back to the atmosphere in balance. Carbon in equals carbon out; over a year there is little change in any pool (soil, plant or atmosphere), unless some factor in the carbon-in-or-carbon-out equation changes.

For example, an input change could be applying nitrogen or water to overcome limitations to photosynthesis. An output change would be decreasing consumption of the pasture so that more litter is returned to the soil.

A practical example is the use of irrigation and fertiliser (following dairy conversion) on the Canterbury Plains. The increase in organic matter (approximately 58% of which is carbon) is a result of overcoming the three months or so of 'drought' that used to occur. The build-up of carbon in organic matter will continue until the soils reach a new dynamic equilibrium, when the soil micro-organisms respire the carbon at the same rate as it is entering the soil.

The output rate is affected by the grazing regime. Increased stocking rate, which usually accompanies irrigation and fertiliser, is associated with more pasture removal; whether soil carbon decreases or increases will depend upon the farm manager. Destocking, which might reduce carbon offtake, will probably result in increased soil carbon initially, but again the result will depend on the other factors affecting photosynthesis and soil micro-organism activity. Just as with any other change, a dynamic equilibrium will be reached at some point.

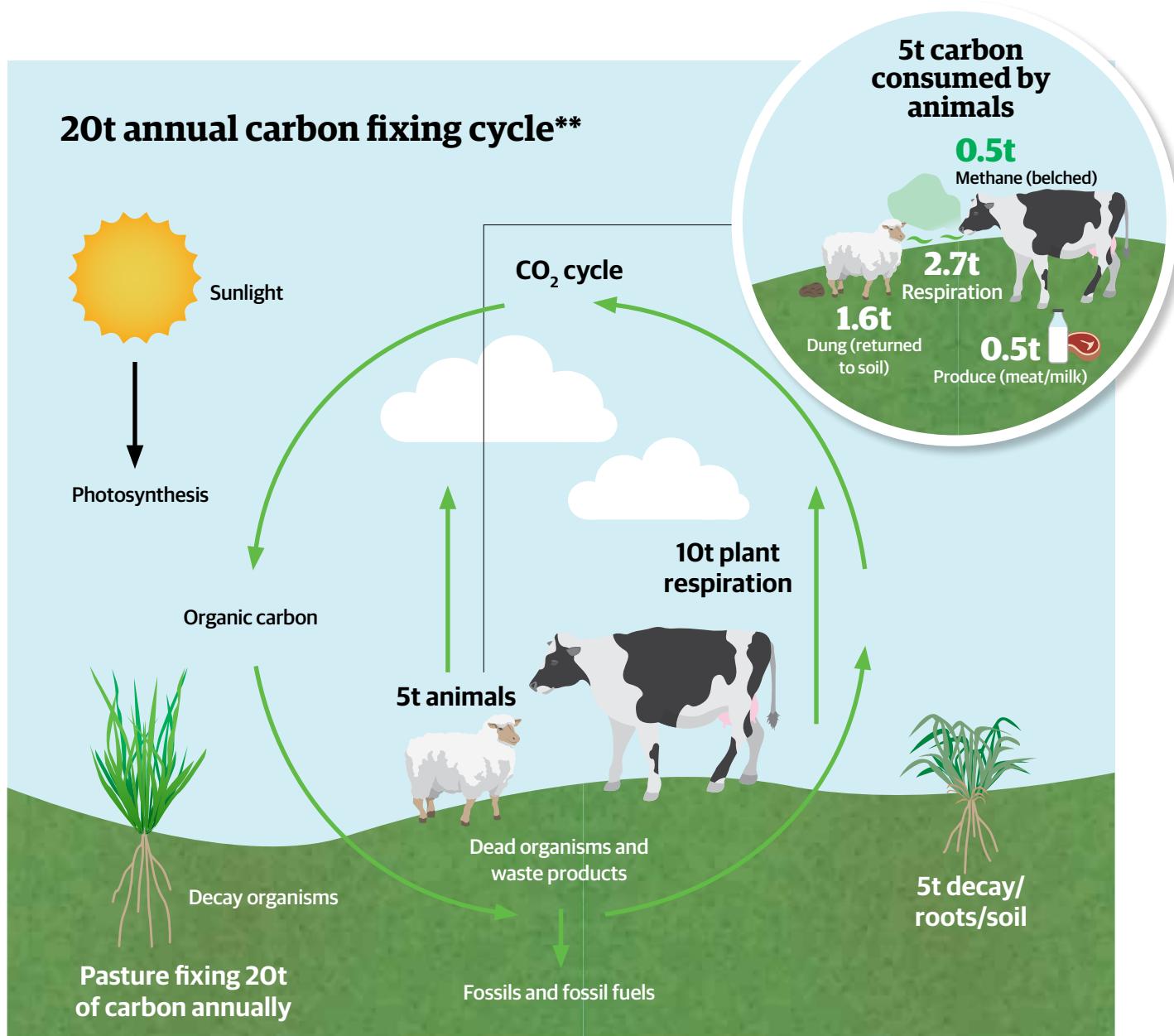
Including soil carbon in the Emissions Trading Scheme has been promoted by various groups and individuals. However, the New Zealand Agricultural Greenhouse Gas Research Centre (NZAGRC)* points out that although soil carbon has the potential to offset emissions, 'realising this mitigation potential is technically challenging when soil carbon stocks are already high (as they are in New Zealand), potential changes in soil carbon are small and spatial variability is high'. The big concern is that soil carbon losses contribute to emissions and so would incur a tax.

Another point of contention for New Zealand is the small quantity of carbon (0.2t per year in the example) belched as methane.

Methane absorbs more heat radiation than the carbon dioxide from which it was formed.

Although it lasts only a decade or so in the atmosphere, (in contrast to the hundreds of years for carbon dioxide) during that time it is extremely active in trapping heat - 25 times more active (in the 100-year accounting calculations) than the carbon dioxide from which it was formed. Reducing the timeframe for calculating impact would very much increase the factor - not 25 times more active but over 100 times.

In summary, trees cycle carbon over several decades and lock carbon up; whereas pastures cycle carbon over several weeks with ruminant animals belching carbon - adding to emissions. This is New Zealand's GHG challenge and research is continuing to find options for mitigation. ■



(*,** see Source Code on page 42

PLANT BIOSTIMULANTS BENEFITING YOUR FARM?

By Dr Ants Roberts, Ravensdown Chief Scientific Officer



DR ANTS ROBERTS, RAVENSDOWN CHIEF SCIENTIFIC OFFICER

Worldwide, growing interest in biostimulants has resulted in complex studies of plant and microbial physiological and biochemical behaviour. This is encouraging because it will lead to better understanding of ways to increase plant production without increasing nutrient inputs. This will be valuable for nutrient-constrained farming systems, as is becoming increasingly typical in New Zealand regions faced with water quality challenges.

As I learnt recently, when I attended the Third International Congress on the Use of

Biostimulants in Agriculture, there is a wealth of complex plant physiological and biochemical studies being undertaken by university and institutional scientists in Europe and the Americas, all trying to understand and explain how a vast range of biostimulant compounds work.

What is a plant biostimulant?

In 2013 the European Biostimulant Industry Council defined these products as "a material which contains substance(s) and/or microorganisms whose function when applied to plants or the rhizosphere is to stimulate natural processes to benefit nutrient uptake, nutrient use efficiency, tolerance to abiotic stress and/or crop quality independently of its nutrient content".

Some of you have already used biostimulants - for example, plant growth regulators like gibberellic acid for pastures and horticulture, straw shorteners in the arable industry and urease inhibitors coated on urea fertiliser. However, there is a huge range of other substances that also have

potential, including humic and fulvic substances, microbial and plant extracts, inorganic salts and nitrogenous compounds such as peptides and amino acids, as well as living micro-organisms.

Overseas, biostimulants are used mostly in arable and vegetable systems. They are often applied as in-furrow live organisms or alternatively as foliar or seed treatments.

Typically, these substances work through:

- Biocontrol (eg of plant disease)
- Biostimulation (eg up and down regulation of genes controlling enzyme systems)
- Biofertility (eg P solubilising bacteria, other microbes and root exudates which increase nutrient availability in the rhizosphere)

Pleasingly, from the scientific research organisations and some of the larger companies, very advanced multi-analytical and experimental techniques, including gene expression and regulation studies, are being used to investigate the modes of action of the various categories and how they affect plant function.

"Some of you have already used biostimulants - gibberellic acid for pastures and horticulture, straw shorteners in the arable industry and urease inhibitors coated on urea fertiliser."

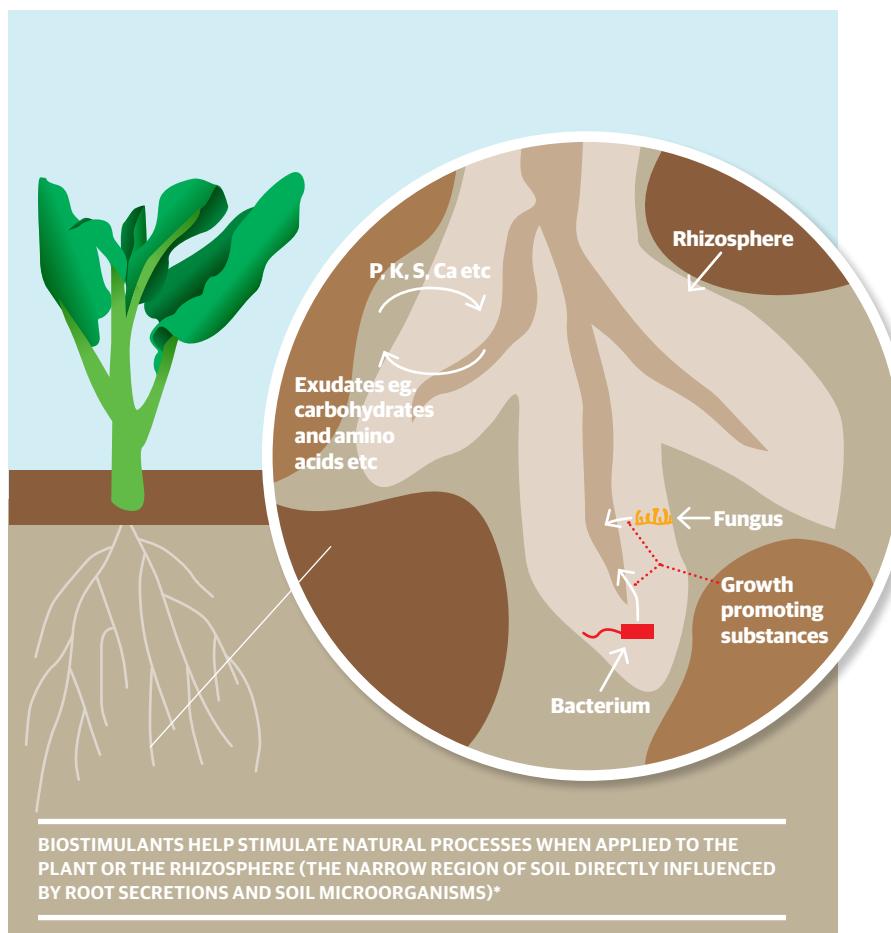
Not silver bullets

Many marketing claims are made about the potential increase in plant productivity through the use of commercial biostimulants. Often this is extrapolation from laboratory or glasshouse trials.

Many of the functional benefits appear to be relatively small, even if they are statistically significant and it is unknown how, or if, they will transfer to the field.

However, the conference audience was told by at least three speakers that 80–90% of the successful lab-based results failed in the field because of the heterogeneous nature of the soil/plant/climate interactions, so we still have some way to go.

I am confident that all this scientific endeavour will increase our understanding of how plants and soil microbes (a fancy name for which is phytomicrobiomes) influence each other's functions. The development of useful on-farm technologies will assist us in increasing plant-based farming system productivity and sustainability. Two field-tested products of interest include one that increases nitrogen use efficiency and yield (tested on grasses) and another that increases photosynthetic efficiency and yield in maize. Watch this space! ■



(*) see Source Code on page 42

Thought Leader: Dan Mathieson

ZESPRI GREEN KIWIFRUIT CREATING OUR POINTS OF DIFFERENCE

By Dan Mathieson, Chief Executive Officer, Zespri



Zespri Green kiwifruit earns a premium over our nearest competitors and for good reason. Some of the principles of the value-adding strategy might be applied beyond kiwifruit to other agricultural sectors to create more benefit for both producers and consumers.

The Hayward variety of kiwifruit was developed in New Zealand but today is grown around the world. Most of the competing kiwifruit grown outside of China is Hayward, with production across many countries, including Chile, France, Italy, Greece, Turkey and Iran. In many instances, Hayward is a commodity product; unbranded and with little product differentiation. Zespri markets the variety as Zespri Green and has a different approach to stand out from the competition.

It would be wrong to think that our approach is simply about investing in our brand. Building an emotional connection for consumers to our product through excellence in marketing is important, but it has to be backed up through excellence in our product.

Optimising taste is the most important aspect of differentiating Zespri Green from competitor Greens and maintaining our price positioning. Zespri completed an extensive consumer sensory study in 2014, which led the New Zealand kiwifruit industry to increase the minimum taste standards for Green. This was done with grower support to improve the financial incentives for growing better-tasting fruit.

Our quality and food safety standards are of critical importance. So too is convenience, with consumers needing to be able to enjoy the product when they purchase it, not having to wait long for it to ripen. We work hard to ensure that Zespri Green arrives in market in great condition, ready to eat immediately, or as close to it as we can get. Achieving this requires very strong relationships with our supply chain partners, including growers, post-harvest handlers, shippers, distributors and retailers.

Another source of value is to communicate the tremendous health benefits of Zespri Green kiwifruit, which helps us to recruit more regular eaters. Consumers need to know that our claims are credible and proven, so we invest in world-class research and engage with dieticians and health practitioners. Digestive health is at the core of our communication in synergy with the excellent nutritional components of kiwifruit.

A final point worth mentioning is the basic value of physical availability when working with a seasonal product. Zespri invests in 12-month supply, with production sourced from Italy, France, South Korea and Japan. We do this to try to serve our consumers Zespri Green all year long through as many retail outlets as possible. We also invest in broadening our distribution base and in developing more sales channels to reach more consumers.

Taken altogether, our approach is to create value by delivering the best experience to consumers and growing strong partnerships with customers. We want to connect our growers and industry to the consumers we serve, so we can better meet their needs and preferences for the great taste, quality, safety, sustainability and freshness of Zespri kiwifruit. ■





AVOCADO DREAM

The humble avocado has widespread appeal. Whether smashed, spread or simply sliced, its good looks and health benefits are driving demand into new markets and supporting orchard expansions in New Zealand. Ground Effect® talks to businessman and Ravensdown director Glen Inger about his avocado dream.

Avocado dream

On a small peninsula in the Kaipara Harbour, the landscape is changing.

Dairy farms are making way for avocado orchards as international demand for the popular fruit increases and growers go large-scale to meet growth in export markets.

Tipped at the time to be the largest avocado orchard development in New Zealand, businessman and Ravensdown Director Glen Inger teamed up with capsicum grower Hamish Alexander of Southern Paprika to form their joint venture - Harbour Edge Avocados - in 2016.

The beginning of the big dream, says Glen, was the acquisition and conversion of their 405ha dairy farm on the Okahukura Peninsula near Tapora, 30km west of Wellsford.

"Hamish first came up with the initial idea to plant avocados on our Tapora dairy farm," says Glen.

"After further discussions we incubated, then hatched the enlarged dream of the \$27 million joint venture scaled-up conversion."

So far, Harbour Edge has planted 100ha out of a projected 300ha, or in avocado terms, 80,000 trees.

"The (growth) outlook for avocados is enormous," says Glen.

"Avocados keep a lot of people employed and are a valuable international crop that will add to New Zealand's income. Compared with dairying, they are way ahead in terms of value per hectare, and of course they are evergreen. We haven't got the effluent issues ... we are growing a healthy fruit."

With less than 1% of New Zealand's area suitable for avocado production, demand for land in proven areas with a mild climate and free-draining soil is increasing. The Bay of Plenty is most often associated with avocado production, however skyrocketing land prices under competition from kiwifruit orchards and urban



MULCH SOURCED FROM
CO-OWNER HAMISH
ALEXANDER'S CAPSICUM
OPERATION FUELS
AVOCADO GROWTH

expansion have served to limit the scale of orchards in the area. Other large developments are taking place at Houhora in the Far North, five hours drive from Auckland.

"The beauty here at Okahukura is that we are on a peninsula and we are quite deserted, yet we are only an hour-and-a-half to Auckland, which is your main export and consumption market."

The returns stack up well in favour of the avocado orchard, although there is a three-to four-year lead-in time for production. Full production is expected when the tree reaches six or seven years old, and while industry average yield is around 11t/ha, Harbour Edge will target around 20t/ha.

"I think it's pretty exciting, we are pretty upbeat about it. You've just got to wait a few years to get your income, that's always the hard bit!" laughs Glen.

Developing the dream

Harbour Edge Orchard Development Manager Nick Common has a background in irrigation technology and design, having cut his teeth on the development of large-scale Indian Sandalwood plantations in Western Australia's Ord River region. A Hawke's Bay native, he grew up on an apple and stonefruit orchard, returning to New Zealand in 2016 to join Harbour Edge Avocados.

There are seven staff employed on the orchard, with contract workers employed at busy times like harvesting. Typical day-to-day jobs on the orchard include irrigation maintenance, fertigation, spraying, mowing and tree husbandry.

The bulk of the avocado trees are sourced from nurseries in Whangarei and Gisborne, for which there is a two-year wait time.

These are double-grafted rootstock of the Hass variety, preferred for their vigorous growth, better disease resistance and earlier production.

"Our two-year-old trees are hanging a lot of fruit on them," says Nick. "Our one-year-old trees would be producing, but we took the fruit off so it didn't slow them down."

Coupled with careful management, the use of grafted plants helps mitigate the irregular (biennial) bearing of the avocado tree, one of the biggest issues the New Zealand industry grapples with. The further north the tree is grown, the less of a problem biennial bearing is.

Around 11% of the orchard is made up of polliniser trees which only produce flowers. Beehives are brought in to aid pollination, and at peak production Nick expects they will have about five hives per hectare.

"It is imperative to get a good pollination," says Nick. "If you get a cold spring, you don't get the male and female flowers crossing over, and pollination doesn't work very well. The incorporation of polliniser trees and lots of hives helps to mitigate this."

Soil-borne disease *Phytophthora* is the biggest risk to production, thriving in anaerobic, waterlogged soils.

"Avocados have a primitive root structure - they don't have fine root hairs so they are not good at absorbing oxygen out of the soil," says Nick. "Hence we grow on this incredibly free draining sand."

A special mulch sourced from Hamish's capsicum operation provides the rocket fuel for growth, counteracting the low cation exchange capacity (around 7%) of the sandy soils.

"We have a huge stockpile of cocoa peat from the capsicum glasshouse operation. We compost that down with the capsicum plant green material for six to eight months, and then we spread it



ORCHARD DEVELOPMENT
MANAGER NICK COMMON
HAS CUSTOM-DESIGNED
THE SPRINKLER
IRRIGATION SYSTEM

out with a feed wagon to build up organic matter in the profile. The avocado roots actually grow up into it, they like the aeration of the mulch so much."

Winter earthworks are undertaken to prep the land for avocados. Topsoil is scraped away and stockpiled, and the peaks of the rolling sand dune country are redistributed into the hollows to improve the contour and bring the land above the water table. The topsoil is laid back down and grassed immediately to prevent wind erosion.

Next, the blocks of trees are laid out, the irrigation system is installed and rows of pine shelterbelt trees are planted. Bana grass and artificial windcloth are also included to provide fast shelter from the wind and help ensure the trees establish well.

"Wind is our biggest issue, predominantly westerlies," says Nick. "Avocados are sensitive to wind, but in the right conditions they are very vigorous and will double in size every summer. It's about getting them through that early stage to when they start self-sheltering each other -then everything is away."

The trees are irrigated via Nick's custom-designed irrigation sprinkler system, drawing water from three bores. Maintenance fertigation occurs year-round through the sprinkler system and is an NPK and trace element blend. Application is to the root



ONE-YEAR-OLD AVOCADO TREES HAVE HAD THE FRUIT REMOVED TO AID GROWTH

RAVENDOWN DIRECTOR AND HARBOUR EDGE AVOCADO JOINT OWNER GLEN INGER



area of the plant with a philosophy of little and often to ensure the best utilisation of nutrient and to minimise potential leaching in the sand.

"Really it is a hand-to-mouth system as we are only putting on a little bit of nutrient as the tree needs it," says Nick.

For irrigation purposes they are currently investigating an infiltration dam in a lower area of the orchard which will allow the use of the high water table and reduce their reliance on deep-water aquifers. With a significant amount of water already in the dam, this experiment is looking promising.

Glen says farming smarter and utilising technology for inputs is key.

"Using that modern thinking is the way forward . . . It all makes a lot of sense as opposed to the old days when you may have put fertiliser on everywhere."

There are some stringent monitoring conditions on water usage including electrical conductivity (EC) monitoring for saline intrusion. Nick says they expect nitrate testing of drain water will become part of the conditions as well.

"Obviously with the fertigation we can control that a lot better. We know what we are putting on and we know it's going to be utilised by the tree, it isn't going through the profile."

Exciting times ahead for avocados

Touted as the fruit for millennials, the avocado has seen a rise in popularity over recent years, propelled by its good looks, versatility and healthy qualities - they are nutrient dense, high in 'good' fats and low in carbohydrates.

The industry is targeting a lift in total earnings from \$146 million to over \$200 million* in the next five years, driven by large-scale developments, improved yields and reduced biennial bearing.

Seasonal fluctuations and the biennial bearing of avocado trees in the Bay of Plenty region pushed avocado prices higher this season, however the national production outlook for the 2018-19 season beginning in August is for 3.5 million trays, 1.3 million trays more than 2017-18**.

Subsequently, avocado growers have found themselves in the strongest position the industry has ever seen, with record prices and the recent opening of the market into China for 2018-19, for which only Mexico, Chile and Peru have previously had access.

"These young Chinese who are travelling out to New Zealand, they are all connected," says Glen.

"They come down here or to Australia and have smashed avocado on toast, and go back and say, "we are going to eat this now".

"If they go home and decide they are going to eat it, then with more disposable income, it doesn't matter what the price is. They are also converting their families as they come back. New Zealand doesn't actually have to do the marketing - these tourists are doing it for you."

"Chinese think nutrition first then food second," says Hamish Alexander of Southern Paprika and Harbour Edge Avocados.

"Nutrition is their first goal and then food ... so for the Chinese you are already way ahead because they are looking for that nutrition.

"They say 75% of older people are suffering from nutritional deficits, and I know in Japan avocados are a big part of that trying to lift those nutritional values with the good fats, density and various other things," says Hamish.

Mexico is the largest producer of avocados in the world but they struggle to embrace technology and with social issues around gang money.

"The Chileans have done it but they have had huge problems because they don't have water. Peru is the next big hope, they have diverted the Amazon to give them water," says Hamish.

"And even the Australians have their own problems," adds Glen. "They get up the Hydralada and there is a big tree snake looking at you! And the cockatoos can swarm in and take a hectare out in a day."

Going forward, both Glen and Hamish believe there is a bright future for New Zealand avocado growers.

"You look at how many people will get employed, how much more intensive it's going to be," says Glen. "I think New Zealand has enormous potential to do these crops." ■

ARE YOUR EWES CONTROLLING YOUR WORM BURDEN?

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



Worm drench practice on New Zealand sheep farms reflects the way our traditional sheep breeds develop immunity to worms as they age. A critical, but often overlooked part of this worm control system has been the important role adult ewes play in controlling and reducing the pasture contamination of worms on pasture, with ewes effectively "mopping up" infective larvae present on the pasture without the need for regular drenching.

Without unduly affecting their performance and body condition, ewes can ingest large numbers of worm larvae from pasture while keeping their worm-egg output onto pasture low, reducing pasture contamination over time.

This reduction of pasture contamination has production benefits, particularly in lambs and younger sheep, as these infective larvae can cause gut damage, scouring and ill-thrift without ever developing to the adult worm stage.

This was highlighted in a recent Ravensdown farm investigation for suspected triple drench resistance undertaken in collaboration with veterinary parasitologist Dr Mark Vickers.

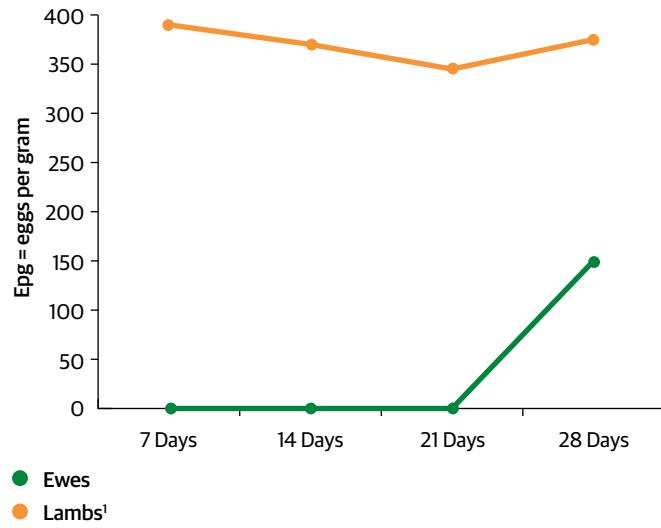
A Southland sheep farmer reported that the triple drench he was using was not working as expected, with ewes and lambs underperforming. His animals were a composite meat breed (Romney x Polled Dorset x Texel), on good pasture and nutrition.

However, further testing revealed it was not drench resistance as first suspected, instead the ewes were not as resistant to parasites as could be expected. On this farm, it was the ewes, not the lambs that

were found to be the major worm contaminants of the pasture. Ewe faecal egg counts were high, which was unusual as the ewes were well-fed.

It also appeared that the large numbers of infective larval worm stages on the pasture, which had originated from the ewes, appeared to be causing suboptimal performance in both the ewes and lambs, the latter receiving an effective triple drench at 28-day intervals (figure 1).

Figure 1: Monthly pattern of mean faecal egg counts in lambs and ewes



¹ Drenching of lambs at Day 0 and Day 28 with an effective triple drench

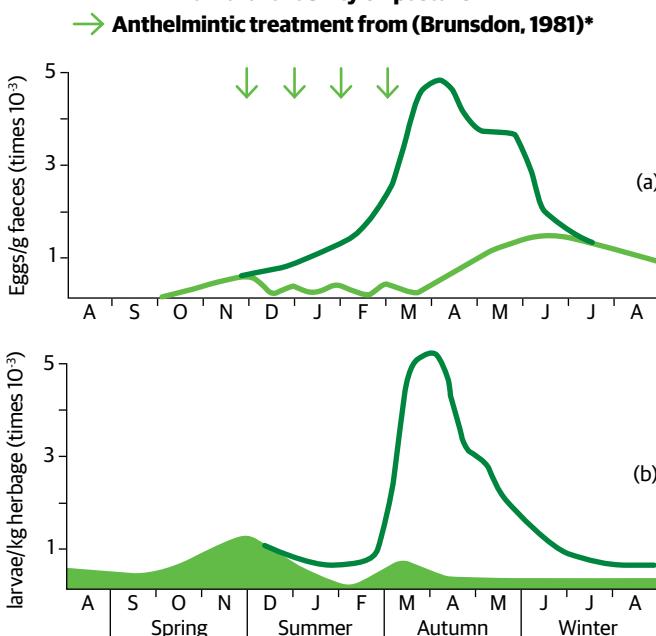
Summary of trial data

A Faecal Egg Count Reduction Test (FECRT) was carried out in both the ewes and the lambs, with eight drenches tested in the lambs and three drenches in the ewes. Lambs are the best group for testing as they do not have good natural immunity against worms, with immunity generally showing up around nine months of age.

All the sheep in the investigation were tagged, weighed and faecal sampled before treatment and eight days later. There was a control group for both the ewes and lambs that received no drench.

The faecal egg counts and quantitative larval cultures showed that the worms were all impacted by the drenches being used on the farm, in a similar manner to the preventative drenching study shown in figure 2 undertaken by Brunsdon in 1981. The dark green line on figure (a) represents untreated lambs and on (b) represents the generalised seasonal pattern of infective larvae on pasture arising from untreated sheep.

Figure 2: The effect of four monthly drenches from weaning on (a) the faecal egg output of lambs and (b) the pattern of larval availability on pasture.



The reduction in worm eggs after drenching showed that all single, active white, clear and 'mectin' type drenches were still effective at 97% or greater, and that all dual and triple combinations of these drench families were highly effective (figure 3). This confirmed that the drenches were working well and there was no evidence of an ineffective drench being the explanation of the observed illthrift.

A study of the egg output from both poorer ewes and lambs over the month of the study showed these ewes had positive egg counts, including some above 1000epg (eggs per gram) with a mean egg count of 375 over the month. In contrast, the lambs had no egg counts following treatment, and five weeks after dosing the mean egg count was 315epg with the highest at 500epg. The ewes produced more dung than the lambs resulting in higher pasture contamination.

The drenching programme for the lambs is three-to-four weekly drenchings until they reach one year of age, while the ewes receive up to two drenches each year.

So when the drenching programme seems reasonable and there is a good level of feeding, can there still be a worm problem?

The answer is yes, we think there is a worm problem with the ewes being the cause of the heavy pasture contamination. The high level of worm larvae being eaten is resulting in gut damage, depressed appetite and the sheep not being able to achieve their potential performance.

The ewes are not performing their job which is to use their age-acquired immunity to drop their egg count as adults and mop up the larvae on the pasture. They need to behave as dampers not amplifiers with respect to pasture contamination.

Figure 3: Drench effectiveness

Drench	Efficacy %
White Drench (oxfendazole)	100
Clear Drench (levamisole)	97
Mectin Drench (abamectin)	97
Dual White+Clear (oxfendazole+levamisole)	100
Dual Clear +Mectin (levamisole+abamectin)	100
Triple White+Clear+Mectin (oxfendazole+levamisole+ abamectin)	100

Next steps

We know that short-acting oral drenches, including the common triple drenches, only kill worms for one to two days after treatment as designed, therefore have limited impact on larval worm stages.

Control of these incoming larval stages is possible but only with products that have persistent activity or "protection period", such as the 100 day capsules. We will carry out another investigation using capsules to help mop up the pasture contamination and see whether this was a one-off issue or failure of the ewes to control their parasite burden. ■



THISTLES: A PAIN IN THE GRASS



BRUCE WILLS

It's a common story, especially on hill country - decades of grubbing and spraying but the thistles keep bouncing back. That's certainly what Hawkes Bay farmer Bruce Wills found on his family farm, Trelinnoe, near Napier.

Following regular droughts, Bruce had nodding thistles covering paddocks and in areas growing up to two metres tall. Often a tractor and mower were used to chop away forests of thistles to clear gateways for stock.

The conventional methods of spraying were failing him and Bruce says he saw no future in continuing to apply expensive chemicals to his farm. Looking for an alternative, he became interested in the work being done by Manaaki Whenua - Landcare Research on biological controls and thought this had to be a better way.

In 2004, Bruce introduced the gall fly and two weevils, the Crown and the Receptacle, to his farm. These three beetles all feed on the thistle seed head, significantly reducing the seed source for ongoing re-establishment.

"With that triple attack over ten years we have virtually wiped out what was a significant weed problem, and it was done purely and simply with the release of a handful of insects," Bruce says.

Won the battle, not the war

Managing thistles is a continuous process, unfortunately as soon as the Nodding thistle was getting under control, the Californian thistle began to fill its space.

"Effectively what I ended up doing was replacing one thistle with another!" says Bruce.

He then introduced a new beetle to combat the Californian thistle; the Cassida, or green thistle beetle. Unlike his other beetles, the Cassida strips the chlorophyll off the leaves reducing the plants' ability to photosynthesize. The thistle loses the necessary energy to grow and ultimately dies. Seven years on and Bruce has had success with the Cassida beetle, finding them across the farm and feeding on all his thistle species.

"We still have a good number of thistles around and it'll be some years yet before I get to the stage where I've got largely clear paddocks and can declare the battle won," he says.

To ensure the ongoing survival of these beetles, a base number of thistles will be required to support a population sufficient to combat the inevitable re-infestation.



Growing pains

Biological controls are slow to build their populations to levels where they make a significant impact. For Bruce, it was five to six years before he saw noticeable improvement. His advice to the farmers who come and collect his beetles is that "you have to give them time, you've got to be patient".

Doing the same thing year after year with the same poor results is futile. Smarter farming means looking to new sustainable, and successful, ways of doing things; biological controls are one tool in a long list of possibilities, Bruce says.

"It's exciting, and to me it's a much more sustainable way of tackling an ongoing weed problem on our light pumice soils. It's a more enduring answer for the pests and diseases we have - if we can find something that can feed on them and take them out of our systems, that's got to be a better way than the continued use of chemicals." ■

AHEAD OF THE GAME WITH THE BIO-PROTECTION RESEARCH CENTRE

By Professor Travis Glare, Director, Bio-Protection Research Centre

As a country whose economy depends largely on primary industries, New Zealand is under continued threat from invading pests, diseases and weeds.

Myrtle rust, Chilean needle grass, the tomato-potato psyllid (TPP), Psa, and the Argentine stem weevil are here. The battle is on to stop the brown marmorated stink bug, among others, from joining them.

While agrochemicals are a vital weapon in the war against pests and diseases our choices are reducing. Fewer new synthetic pesticides are being developed and others, such as many organophosphates, are being banned worldwide.

Public concern about potential toxins in food production - because of possible human and environmental harm - affects domestic and export markets. So focus is turning to sustainable bioprotection solutions that boost primary industries while maintaining the natural and farmed environments.

The Bio-Protection Research Centre is at the forefront of developing those solutions. Founded in 2003 as a Centre of Research Excellence, it is based at Lincoln University but has scientists working around the country. Partner institutions are Massey University, the University of Canterbury, the University of Otago, AgResearch, Plant & Food Research and Scion.

Its scientists have produced results that go a long way to improving the bottom line for New Zealand's primary industries.

For example:

- In 2016, Dr Robert Hill was a finalist in the KiwiNet Commercialisation Awards for work on the beneficial fungus Trichoderma that increases pine tree growth by up to 20% and decreases crop mortality from root disease by 33%.
- Also in 2016, PhD student Mauricio González-Chang showed that a crushed mussel shell mulch reduced grass grub feeding damage on grape vines by two-thirds.

- In 2017, Zespri and Kiwifruit Vine Health endorsed Kiwivax for managing *Pseudomonas syringae* pv. *actinidiae* (Psa) in kiwifruit. This biological product was developed from research led by Dr Hill in the Bio-Protection Research Centre, and is now produced by Agrimm Technologies.

Among other projects, scientists are now investigating why dock is more of a pest here than in its European homeland; why and how the Argentine stem weevil developed resistance to its introduced parasite; and how interactions between introduced and native plants, their competitors, predators and pathogens cause pastures to succeed or fail.

But the Centre's strongest value lies in fundamental research, which provides the understanding to develop new pest-control tools and strategies, and trains the next generation of researchers.

As world markets demand higher-quality produce, with favourable environmental credentials and fewer synthetic chemical inputs, the Bio-Protection Research Centre's research is helping New Zealand's primary producers to stay ahead of the game.

You can find out more about the Bio-Protection Research Centre at <https://bioprotection.org.nz> ■

About the Bio-Protection Research Centre

The Bio-Protection Research Centre is a Centre of Research Excellence funded by the New Zealand Government. It was established in 2003 to drive innovation in sustainable approaches to pest, pathogen and weed control. The Centre has six partner institutes: AgResearch, Lincoln University, Massey University, Plant & Food Research, Scion and the University of Canterbury, with members throughout New Zealand.



PROFESSOR TRAVIS GLARE



PASTURE PERFORMERS

Recent New Zealand Dairy Industry Award (NZDIA) Share Farmer of the Year and Ravensdown Pasture Performance Winners, Daniel and Gina Duncan, explain the importance of good pasture management on their Northland dairy farm.

The New Zealand Dairy Industry Award judges summed up Daniel and Gina in just three words; passionate, professional and committed. It's an apt summary.

Six years into the dairy game after starting out as rural valuers, the Duncans are 50:50 sharemilkers for the Pouto Topu A Trust. They milk 1020 cows on the 460ha property at Pouto, on the northern end of the Kaipara Harbour.

Dan's first dairying job was with Edward 'Wynn' Brown, the recent recipient of the Fonterra Farm Source Responsible Dairying Award. He told Dan that pasture management is a fundamental part of farming; if you want to be a good farmer in New Zealand, you must get a handle on pasture.

"Pasture management is definitely at the forefront of what we consider good farming," says Gina. "It's something we looked for

when we were looking for a 50/50 job. We wanted to work with someone who had a grass-based system."

There are plenty of challenges. In Northland, dry summers are guaranteed, and the kikuyu pasture was a real game changer after starting out in South Waikato.

Kikuyu grass has advantages - it's more drought tolerant and pest-resistant - but Dan says it's a low-energy feed in comparison to ryegrass and it loses quality over autumn and winter.

"The main challenge we have faced with kikuyu is keeping the cows in milk on a low-energy all-grass diet. But on the other hand, we also recognise the advantage kikuyu has offered with rapid recoveries from the short, sharp droughts we've had."

One of the challenges of a grass-based system is the variation in summer/autumn growth.

"We can very quickly go from a major feed deficit in mid-summer, where we are making early decisions on culls and drying cows off, then two to three weeks later after rain not having enough mouths to keep quality with high growth rates," Dan says.

They minimise risk by growing turnips and maize as summer crops, going to

once-a-day milking early, and scanning early to inform their culling decisions. "We do what we can to get as many cows through the summer in milk and in good condition."

Share Farmer Judge Matt Richards says the NZDIA judges noted how impressive the couple's attention to detail was when judging the Ravensdown Pasture Management Award.

"A good example of their pasture management is a comparison report on what quantities a cow would need to eat in kikuyu grass versus ryegrass to receive enough energy to make milk. It just made it real," he says.

"They had calculated all the [key performance metrics] of their pasture and they were benchmarking with the rest of Northland, and had picked appropriate benchmarks to compare themselves with."

Daniel and Gina thoroughly enjoyed their NZDIA experience. "It's not often you get a third party come in and critique your business. It's good to see that we're excelling in areas that we think are important and we're still doing well in other areas. There's definitely room for improvement and we'll be taking on all of their advice," says Gina. ■

HOW CAN PRECISION AGRICULTURE HELP US ACHIEVE OUR ENVIRONMENTAL GOALS?



By Roger Robson-Williams, Chairman of Precision Agriculture New Zealand and General Manager of Science – Sustainable Production at Plant & Food Research

At the end of April, the Productivity Commission released its draft report* on how New Zealand should transition to a low-emissions economy. With almost half our greenhouse gas emissions coming from agriculture, the transition is going to have a big impact on farming.

Precision farming could play a key role in mitigating that impact and helping New Zealand agriculture reduce its greenhouse gas emissions. For example, accurate placement and timing of nitrogen fertiliser can reduce overall fertiliser use and lower nitrous oxide emissions from the soil. Guidance technology can improve the efficiency of a range of operations, especially in annual crop production, thereby reducing fuel, inputs and emissions. Variable rate irrigation can minimise energy used in pumping and help avoid the risk of

conditions conducive to nitrous oxide emissions. The list goes on.

If these benefits sound familiar, it's because in many cases what is good for a low greenhouse gas-emissions' agricultural sector is also good for our rivers, lakes and groundwater quality. So we're heading inexorably towards a future with two compelling environmental reasons for adoption of precision farming approaches.

To date, uptake of precision farming technologies in New Zealand has been patchy and this will be in part because it's notoriously difficult to quantify the benefits and because sometimes, in financial terms alone, the benefits can be rather modest. Confronted with the double challenge of meeting community aspirations for freshwater quality and national targets for greenhouse gas emissions, the case for adoption of precision farming is about to become a whole lot stronger.

So what can be done to support and stimulate adoption of precision farming in New Zealand? Firstly, we need to re-evaluate the scale of benefits in the context of increasing pressure to reduce emissions to both water and atmosphere. Secondly, we need to de-mystify the technology and show how components of precision farming

can be adopted in a phased process rather than as an all-or-nothing system. Thirdly, we need to ensure reliability and ease of use of the technology. And finally, we need to adapt precision farming to meet our unique needs in New Zealand. All this is going to need a team-NZ approach involving farmers, equipment and service providers, the research community and regulators. The Precision Agriculture Association of New Zealand could play a key role here as connector.

April this year also saw the release of a Westpac NZ report** setting out the case that early action on transitioning to a low-emissions economy could save New Zealand \$30 billion in GDP growth by 2050. In particular, the report links the agriculture sector's ability to decarbonise with its potential for future growth. The faster and further we reduce greenhouse gas emissions from farming, the greater the scope for future growth.

The path to decarbonisation must surely include precision farming, and all the indications suggest we need to dramatically accelerate uptake if we're to reduce agriculture's 48% share of New Zealand's greenhouse gas emissions and position farming for future prosperity. ■

KNOW WHAT'S UNDER THE SURFACE WITH PRECISION NUTRIENT MANAGEMENT

When it comes to managing fertiliser application, it makes sense to apply the right amount of nutrient to the right place at the right time.



DAN COPLAND, RAVENSDOWN
SENIOR AGRI MANAGER



ANDREW AIREY, RAVENSDOWN
SENIOR AGRI MANAGER

Working to reduce variability within soils at a paddock level can not only improve yield, it's also a more environmentally sustainable and cost-effective approach to managing soil fertility.

Precision Nutrient Management (PNM) is a nutrient input approach developed by Ravensdown and Methven-based precision agriculture specialists Agri Optics to help farmers achieve these objectives.

Senior Agri Managers Dan Copland and Andrew Airey have been working with several Canterbury farmers to drill down and really understand what's going on with soil fertility at a paddock level.

"Understanding soil properties and fertility is an important part of profitable and environmentally conscious crop production," says Dan.

New research and precision agriculture technologies have advanced the understanding that precise application of nutrients

and soil conditioners have on crop performance. This has led to far more efficient and precise use of fertiliser and soil conditioners."

Why Precision Nutrient Management?

Andrew says the first step in the process is a discussion with farmers about the yields they are targeting for their particular crop and the soil nutrient status they wish to achieve.

Next is gaining some context around the current variability within the paddock. Typical areas where variability is most often seen include old fencelines where paddocks have been merged, treelines, stock camps and where soil types change. Variability is also seen where there has historically been border dyke irrigation.

Methven-based precision agriculture specialists and Ravensdown partner Agri Optics create a GPS grid plan that details soil sampling points. One test per hectare is typical for an arable or horticulture situation, however the pattern can be adjusted to suit a pastoral situation or smaller paddock sizes.

The information from Agri Optics is fed into the hand-held Garmin GPS unit and soil tests are taken at the GPS points identified, then sent to the lab at Analytical Research Laboratories (ARL) in Napier. ARL supply the soil tests back to Agri Optics, with results associated with each GPS point.

This allows Agri Optics to create a smoothed colour-zoned map of the paddock based on each test, which is the basis for the recommendations to come.

Using this information, the Ravensdown Agri Manager creates a fertiliser programme that addresses the maintenance, capital and crop nutrient requirements.

Dan says it's important to get the fundamentals right - the pH and Olsen P - as these can take the longest time to change if they are not optimal. Elements such as potassium and magnesium can be more easily managed depending on the crop being grown.

"There are a couple of ways of doing it," Dan says. "You can work out what your optimum Olsen P needs to be at the end of the crop and then work out what the requirement for that crop is."

"Once the Olsen P and pH levels have hit the predetermined targets, we use modelling created from yield data to make sure the levels are maintained. This modelling is generally used for two to three years before the paddocks are tested again."

Once the programme has been reviewed by the farmer, Agri Optics create a spreading file. The enabled spreader can then let the variable-rate spreading technology work its magic. Areas that read above the target levels will be avoided by the spreader, making it a cost-effective way to apply nutrients and even out variability.

Once the spreading is complete, a proof of placement map can be generated and uploaded into Ravensdown's decision support tool, Hawkeye.

"The ultimate goal is to squeeze up that variability in results," says Dan.

"The Ravensdown Precision Nutrient Management process is a very precise way of applying nutrients, and it helps give our customers and an agronomic and economic advantage."

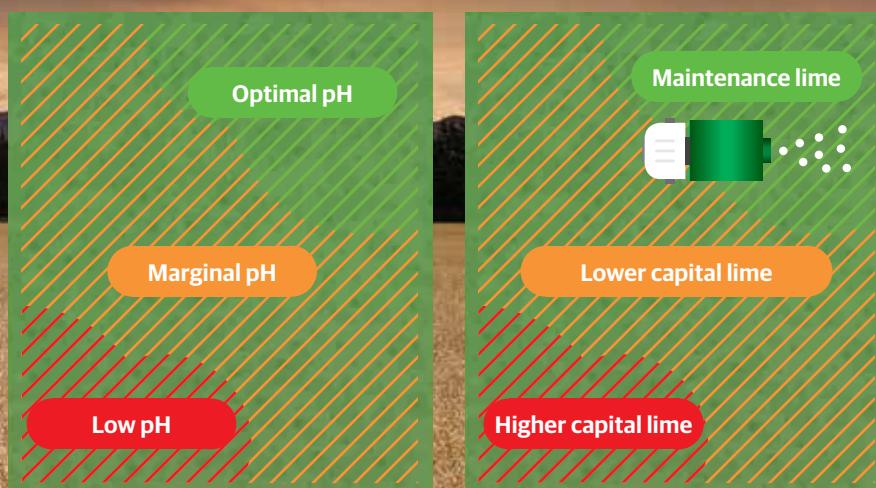
Key benefits gained using Precision Nutrient Management:

- Nutrients and soil conditioners are only applied where they are required; an environmentally sustainable and responsible way to apply fertiliser
- Regular soil testing and associated data collection over a period gives a far more accurate assessment of in-paddock nutrient variability
- It helps understanding of individual crop and pasture demands which in turn achieves higher yield potential
- It ties in with other precision ag and digital tools such as yield monitors on harvesters
- It leads to potential cost savings - fertiliser is a big investment so it makes economic sense to use it as efficiently as possible.

Precision Nutrient Management

Soil tests confirm pH spectrum.
AgriOptics create map.

Instructions are sent to
Variable Rate Spreader.





A PASSION FOR PRECISION

Talk to Ravensdown shareholder Eric Watson, and you are left in no doubt about the meticulous arable operation he and wife Maxine run. After all, you don't become the world record holder of the highest yielding wheat crop (16.791t/ha) purely by accident. Ground Effect® talks to Eric about how precision farming has helped the couple achieve their yield goals.

Precision farming is an ethos woven into the fabric of Eric and Maxine Watson's 490ha Wakanui property, Rangitata Holdings, east of Ashburton. Eric says it is part of his nature to plan for high yields, and the precision agriculture technology helps achieve them. He strives continually to improve, believing he can always do better when it comes to crop production.

They grow a range of arable crops including cereals (wheat, barley, triticale) vegetable seed (radish, spinach, pak choi, red beet) alternative pasture species (chicory, plantain) and grass varieties (perennial ryegrass, forage and amenity fescues, timothy and cocksfoot).

The property is entirely dedicated to arable production and there are few fences to be seen. Soils vary from premium Wakanui silts and clay loams to lighter soils bordering the Ashburton River. The property is 97% irrigated by lateral irrigators.

Early adopters of precision-farming technologies, there are elements utilised across all facets of Eric and Maxine's farming system.

GPS guidance, auto-nozzle shutdown and autosteer were introduced a decade ago, and soon after came variable-rate

irrigation technology, of which they were the first arable users in New Zealand. The entire farm has been mapped using whole-farm soil testing and electro-magnetic mapping to help establish the soil characteristics and water-holding capacity.

Neutron probes measure soil moisture in their crops. These are read once a week to help guide their water usage and maintain efficiency, or as Eric says "avoid the cost of over-watering".

In terms of fertility management, they use the Precision Nutrient Management approach to ensure fertiliser and lime is going on only where it is needed. Working with Ravensdown Senior Agri Manager Dan Copland and Methven-based company Agri Optics, Eric says this approach has helped them even-up fertility across the farm.

Building a picture of farm fertility

The Watsons began variable rate spreading phosphate, potash and lime ten years ago in a bid to even out their soil pH and build Olsen P levels. Many of the smaller paddocks had been combined to create larger ones, leading to the pH variation seen. He says pH is an important component of healthy crop growth - a high pH

Rangitata Holdings soil pH results 2012 vs 2016

Figure 1: pH 2012

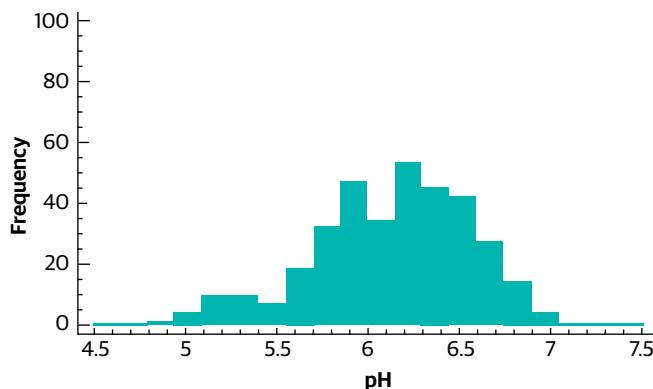
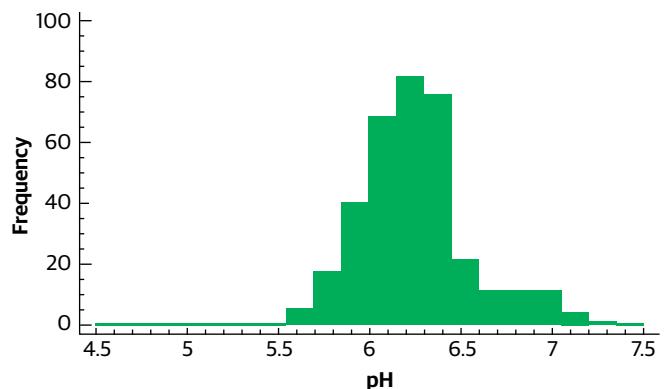


Figure 2: pH 2016



Rangitata Holdings soil Olsen P results 2012 vs 2016

Figure 3: Olsen P 2012

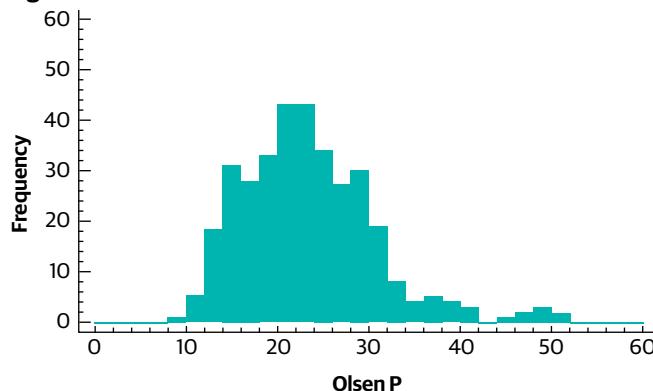
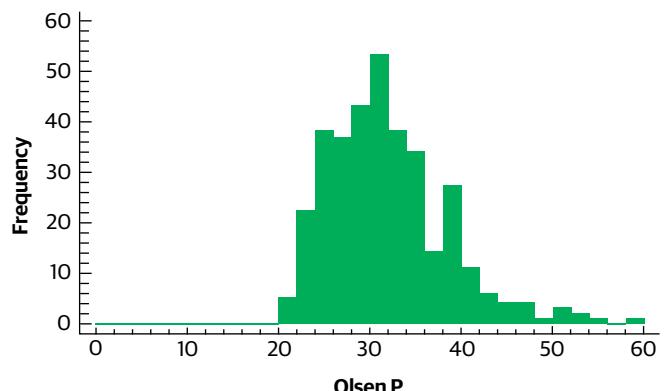


Figure 4: Olsen P 2016



and you can run into issues with manganese deficiency.

They are now on their fourth cycle of intensive soil testing, from which they have built up a comprehensive data set. Eric says there was a big range seen for both pH and Olsen P the first year they tested (figure 1 pH, figure 3 Olsen P, 2012). They are now running a pH of around 6.2 to 6.4 (figure 2, 2016), and the Olsen P has evened-up at around the high twenties (figure 4, 2016).

"Variable rate application has certainly evened up the paddocks, and there is a cost saving - you are not putting fertiliser where you don't need it.

"If you are not over-using your nutrients or the phosphate, you have less potential for environmental damage...not only within your own system but for the larger environment as well."

They have also employed deep soil nitrogen testing for a number of years, and Eric says it has become vitally important in their system.

"Deep soil nitrogen testing is something I can't function without today. Having a good idea of what is available in the soil and knowing how much a given crop requires, tells us how much N we need to apply - I think that's a big environmental benefit.

"The only thing we don't know is the mineralisation we are getting through the growing season. For the record wheat crop we only put on 258kg of nitrogen per hectare ... if you work it out at 22kg N per tonne of grain yield, that is not enough. But there must have been a lot in the soil - a lot of mineralisation."

Deep soil nitrogen testing is undertaken in late winter and early spring across the farm with the exception of the lighter stony soils.

The next step will be to look at overlaying the soil mapping results on to yield maps. With the amount of data they have

already collected on the soils, the plan will be to dial down future soil testing.

"Hopefully we can do less soil testing, as it is quite a cost, but to my way of thinking it has been a benefit because the paddocks have certainly evened up a lot," says Eric.

In the near future, Eric will be undertaking some travelling to Europe and the Ukraine to keep abreast of the technology and innovation on distant shores. He also speaks at international field days in his capacity as the wheat world-record holder.

"I'm looking forward to my trip. It will be a lot of industry places we are visiting. These opportunities don't come along often, you need to make the most of it," Eric says.

"You're bound to pick up something, you're always learning."

"If you are not over-using your nutrients or the phosphate, you have less potential for environmental damage ... not only within your own system but for the larger environment as well."

THE SEASONED TRAVELLER FODDER BEET SEEDS' JOURNEY FROM FRANCE TO NZ

By Callum Davidson, New Zealand Sales Manager, Cropmark Seeds



Fodder beet is a valuable high-yielding forage crop, not only for winter feed, but also as a late summer/autumn feed option on farms throughout New Zealand. But for the seed to reach our shores it must first pass a series of rigorous tests before making the journey from the far-flung fields of France.

In recent years, New Zealand has become a major user of fodder beet seed and has looked to Europe to supply this highly specialised product.

Cropmark Seeds has a strong relationship with Momont Seeds in France who have been breeding, producing and marketing fodder beet varieties for over 100 years. There are very few companies involved in the breeding of fodder beet worldwide, with the majority of beet breeding centred on sugar beet, largely for sugar production.

Momont has the experience, expertise and resources in Europe to produce a high-quality product that meets biosecurity and farmer requirements. As with the breeding of any plant species, it takes many years to breed a new variety. But this is only part of the story - the seed production, cleaning and quality control process undertaken by Momont is stringent and thorough.

The seed production process for fodder beet is more complex than other forage crops. Basic seed (parent seed) is sown in summer and after a period of vernalisation is harvested in winter. These young plants are referred to as "stecklings" and are graded and immediately replanted with pollinator lines of seed. The stecklings are the mother lines, which bolt, flower and are pollinated by the pollinators to form viable seed. Seed is then harvested in summer once ripened and then sent for machine processing.

The fodder beet seed marketed by Cropmark goes through a rigorous series of screening tests before it is released to the market. Cropmark does not import "freshly harvested" seed; it takes only seed that has been subjected to a year's worth of quality testing post-harvest. These tests include taking every seed line through at least two screening tests to limit bolters (fodder beet plants that go to seed), and at least three germination and purity tests before it is released to New Zealand's farmers.

Specialist coatings are applied to the seed to ensure optimal sowing quality as precision planting equipment should be used to sow fodder beet seed. There is a range of coatings available with various fungicide and insecticide treatments applied.

Farmers should ask for seed quality information (purity, germination and bolting test results) for the product they are purchasing and ensure the seed is certified.

The cost of growing a fodder beet crop is significant, but the returns are there if done well. By choosing a variety that covers all the points above, you will have the best start to growing a successful crop. ■

Fodder Beet Checklist:

- Is the seed certified?
- Does the seed have recent purity and germ tests?
- Does the variety have a bolting test?
- Is the seed pelleted and does that coating contain seed treatment?
- Does the dry matter percentage of the variety match your requirements?



GETTING YOUR SPRING PASTURE COVERS RIGHT

By Tim Russell, Ravensdown Technical Manager Agronomy, Upper North Island



TIM RUSSELL, RAVENSDOWN TECHNICAL MANAGER AGRONOMY, UPPER NORTH ISLAND

Managing pasture surpluses or deficits throughout spring is key to maintaining quality and persistence going into summer.

The trick is to get your pre-grazing and post-grazing covers right - it's best not to let your pre-graze covers get above 3200kgDM/ha and aim to leave consistent post-grazing residuals of 1500kgDM/ha.

For perennial ryegrass pastures it's important to understand what's happening with your pastures and how the individual plants are reacting to grazing management.

Perennial ryegrass plants are made up of individual tillers of which each tiller can only have three leaves at any one time. Once a tiller starts producing a fourth leaf the first

leaf starts to die away - sacrificing both pasture yield and quality.

The value of 3000-3200kgDM/ha is used as it typically represents the two-and-a-half to three-leaf stage for ryegrass and is optimal for maximising quality and yield, with the oldest leaf providing 50% of the total tiller yield.

Ryegrass tillers only have a life expectancy of one year, so establishing strong new tillers in the spring is essential for ryegrass survival through the summer. This ensures that the plant is set up to successfully re-establish itself come autumn.

During spring and autumn, perennial ryegrass plants produce daughter tillers. These need to be looked after and provided with enough light and nutrients to strongly establish.

During late winter and early spring you may run into a pasture deficit. Depending on your situation, strategic nitrogen applications in conjunction with Express® gibberellic acid can be a great way to turn a deficit around.

There are a number of factors that are important to ensure the best pasture response to gibberellic acid, so follow the label instructions and/or discuss with your agri manager.

On the other hand, it's equally important to identify and manage pasture surpluses early.

If pasture covers are too high, subsequent growth rates can be significantly reduced. If covers do get away, consider topping to reset, grazing with dry cows or closing the paddock for silage.

Spring pasture covers exceeding 3200kgDM/ha can mean that daughter tillers are starved of light, causing them to die out. This can lead to poorer persistence of the ryegrass plant, so when faced with a surplus only select established paddocks with good plant numbers to shut up. If young or open pastures are selected this will inevitably mean that these pastures may be up for renewal sooner than expected. ■

"Ryegrass tillers only have a life expectancy of one year, so establishing strong new tillers in the spring is essential for ryegrass survival through the summer."

A LEAF FROM THE APPLE TREE PIPFRUIT'S EXPORT SUCCESS STORY

By Alan Pollard, Chief Executive of New Zealand Apples & Pears Inc



Despite facing some tough times, the apple remains a popular Kiwi lunchbox staple. Careful market development, increased orchard efficiencies and the breeding of new varieties are just some of the ways the industry has propelled itself forward - doubling its annual export returns in just four years.

In 2018, the World Apple Review* named the New Zealand apple industry the world's most competitive for the fourth year running. That's an outstanding achievement for a country that produces only 0.5% of the world's apples and pears.

Between 2012 and 2016 the industry increased its annual export returns from \$360 million to \$720 million, with approximately 75% of this increase value-driven rather than volume-driven. The industry has successfully reinvented itself from a commodity producer to a niche premium product producer. All with fewer growers: the peak grower base has declined from 1600 in 1995 to just 350 growers today.

How did they achieve this?

Breeding

The New Zealand industry invested in a joint venture breeding programme that has delivered popular apple varieties such as Jazz™ and Envy™. Breeding focusses on size, colour, taste and texture, as well as sustainable production, product safety and freshness.

Orchard practices

The apple and pear industry is committed to achieving sustainable production:

- Environmentally - through low chemical intervention and best practice soil and water management
- Socially - through responsible employment practices
- Culturally - consistent with the principles of Kaitiakitanga, growers seek to leave their land better than they "found" it for future generations.

Apple production in New Zealand averages 65t/ha, almost 50% higher than our nearest competitor. We have some of the best apple-growing conditions in the world, both climatically and geographically - cool nights, warm days, and an environment isolated from many of the pests and diseases found in other apple-growing countries.

In 2008, an integrated fruit production programme was introduced. Broad spectrum sprays were replaced with selective sprays targeted at specific pests, while the use of biological control agents increased. New Zealand apples now have the lowest residue profile of any other producing country which gives us access to markets other apple exporting countries can't access.

Harvest labour

The industry priority is to encourage New Zealanders into work and to take them from seasonal to permanent jobs. While there are a number of schemes to teach people the skills to do this, there are not enough people at the peak of the season. The balance is delivered by the Recognised Seasonal Employer (RSE) Scheme, which brings more than 7000 Pacific Islanders to the apple and pear industry each year. The scheme has been recognised internationally as the world's most ethical migratory labour scheme and has transformed both the apple industry and Pacific Island communities.

Post-harvest innovation

New Zealand-developed post-harvest camera and infra-red technology ensures that only fruit with the right attributes enter the right markets at optimum quality.

Quality assurance is provided via GlobalGAP certification, the world's leading farm assurance programme. Unless a grower passes their independent GlobalGAP audit, they cannot export their product to a number of our key markets.

Innovative marketing

Consumers are more discerning, focusing on quality, taste and food safety. Understanding and predicting customer preferences and focusing on best-practice fruit production allows the industry to exceed customer expectations.

New market access

New Zealand government officials working with the industry have a successful track record of negotiating some of the world's highest quality trade and market access, and the industry offers support to domestic apple industries in other countries in return for a more welcoming trade and market access environment.

In 2005, just 13% of exports went to Asia. In 2017, 45% of total exports went to Asia and the Middle East. This shift from west to

east reflects a move to regions with significant GDP and population growth, a large shift from low to middle income, and increasing demand for fresh and quality produce.

Risks

- Biosecurity - as a trading nation, huge quantities of cargo and freight cross our borders each day. The growth in tourism increases the risks of a biosecurity breach.
- Access to labour - as production increases, the industry needs access to a reliable labour force, sufficiently skilled and motivated for a physically demanding job. Assisting unemployed New Zealanders into work is one solution; expanding the RSE scheme is another.
- Climate change will impact growing conditions and may have consequential environmental effects such as access to water. It may also increase the risk of pests and diseases from tropical climates establishing themselves in New Zealand.

The apple and pear industry is in good heart, and is forecasting continued and sustainable growth in production and returns. With significant new investment being made into new plantings and in capital infrastructure, this can only be positive for provincial New Zealand. ■

Alan Pollard is Chief Executive of New Zealand Apples & Pears Inc, based in Hastings. Email: alan@applesandpears.nz.



"Apple production in New Zealand averages 65t/ha, almost 50% higher than our nearest competitor."

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

PAGE 7

GREEN WATER WASHING A WIN-WIN

- * Operational Code: NZCP1: Design and Operation of Farm Dairies. 2017. <http://www.mpi.govt.nz/dmsdocument/1367/loggedin>
- ** Using recycled farm dairy effluent water for yard wash-down (6-65). 2012. https://www.dairynz.co.nz/media/255570/6-65_Using_recycled_farm_dairy_effluent_water_for_yard_wash_down.pdf

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CLEARTECH - MAKING THE CLOUDY CLEAR

cleartech.co.nz

PAGE 10

CLEARTECH -THE SCIENCE BEHIND THE TECHNOLOGY

cleartech.co.nz

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SMARTER SPREADING

- * Spreadmark, New Zealand Fertiliser Quality Council. 2018 <http://fertqual.co.nz/understanding-the-marks/spreadmark/>

PAGE 19

THE GREENHOUSE GAS CHALLENGE

- * New Zealand Agricultural Greenhouse Gas Research Centre, Soil Carbon. <https://www.nzagrc.org.nz/soil-carbon>
Further reading:
https://www.grassland.org.nz/publications/nzgrassland_publication_70.pdf
- ** Carbon Cycle (infographic base). University Corporation for Atmospheric Research (UCAR), <https://scied.ucar.edu/>

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PLANT BIOSTIMULANTS - BENEFITING YOUR FARM?

- * TRENDS in Biotechnology (infographic base), The 3rd World Congress on the use of Biostimulants in Agriculture. November 2017, USA.

PAGE 27

AVOCADO DREAM

- *,** ANZ Agri Focus. March 2018. Feature Article: Avocados - Holy Guacamole! <https://www.anz.co.nz/rural/rural-news-insights/agri-focus/>

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ARE YOUR EWES CONTROLLING YOUR WORM BURDEN?

- * Wormwise Handbook. July 2017. The effect of four x monthly drenches from weaning on (a) the faecal egg output of lambs and (b) the pattern of larval availability on pasture Anthelmintic Treatment from (Brusdon 1981), page 17. <http://wormwise.co.nz/wp-content/uploads/2014/06/wormwise-handbook-JULY-2017-web.pdf>

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HOW CAN PRECISION AGRICULTURE HELP ACHIEVE ENVIRONMENTAL GOALS?

- * The New Zealand Productivity Commission, April 2018, Transitioning to a low-emissions economy. https://www.productivity.govt.nz/sites/default/files/Productivity%20Commission_Low-emissions%20economy_Draft%20report.pdf
- ** Westpac NZ Climate Change Impact Report, April 2018. https://www.scribd.com/document/375407665/Westpac-NZ-Climate-Change-Impact-Report#from_embed

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A LEAF FROM THE APPLE TREE - PIPFRUIT'S EXPORT SUCCESS STORY

- * World Apple Review 2018, Belrose Inc., WA, USA



The Last Word

We hope you enjoyed the seventh edition of Ravensdown's Ground Effect®. Let us know what you think by filling out our quick survey at this link <https://www.surveymonkey.com/r/GroundEffect>

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

Tel: 0800 100 123

Email: newsletter@ravensdown.co.nz

Twitter: [@RavensdownNZ](#)

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On behalf of Ravensdown, we'd like to thank you for your valuable contribution to our primary industries. We continue to invest in developing 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.

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Victoria O'Sullivan
Editor

Contributors

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Our team stands alongside you - the guardians of the land.

We're here to help you reduce environmental impacts and optimise value from the land.

Through science, innovation and exceptional customer service, our local experts can help you achieve greater efficiencies, insights and sustainable growth for your farm.

Together, we're building a better future for New Zealand farming.

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