An Introduction to Sustainability for New Zealand Farm Veterinary Practice

A case study series originally compiled by the Vet Sustain Food & Farming Working Group

Adapted for a New Zealand audience by VetSalus

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Introduction

Environmental issues, particularly those linked to agriculture, are high on the current political agenda in New Zealand. As a result of this, matters which should be subjected to a logical, science based debate have become sensitive and emotional discussions, which frequently bridge that fundamental of New Zealand society: the rural/city divide. However there can be little debate that the veterinary profession, whether internationally or within New Zealand, sits at the intersection of human, animal and environmental health. As trusted advisors, veterinarians are often best placed to address many of the issues faced by their farming clients.

This document is based on papers which originated in the United Kingdom, produced by the Vet Sustain Food & Farming Working Group. VetSalus (1), a working member of this group, has adapted the document, to provide a more New Zealand perspective. The papers are intended to provide background information and examples of areas where clinical veterinarians can contribute to the reduction of greenhouse gas emissions and more sustainable farming practices. It seeks to highlight steps already being undertaken by vets in practice, to assist their clients towards a more sustainable future, for all.

New Zealand finds itself in something of an environmental quandary, particularly post the Glasgow COP26 meeting, at which its government signed off on a methane reduction commitment which will be difficult, if not impossible, for the country to deliver (2).

Internationally, the country is renowned for its “clean green image”; economically New Zealand relies heavily on the export of agricultural products and a growing world population does need to be fed. In contrast, while New Zealand farmers claim to be amongst the greenest in the world, there is growing concern about nitrate leaching from pasture.

As many hectares of good agricultural land are being increasingly planted with trees and the country commits to the United Nations scheme of monitoring, which overestimates the impact of methane and makes limited allowance for the many hundreds of kilometres of recent riparian plantings by dairy farmers and the positive impact of carbon sequestration from livestock generally. These are all complex and controversial issues which are explored more fully in the first few articles below. The second part of the document provides practical examples of the impact and animal health and management on farm sustainability and greenhouse gas emissions.

In concluding, it must be remembered that this document is "what it says on the tin": **an introduction**. VetSalus and Vet Sustain are currently completing an in-depth course for veterinarians and their teams on sustainability and related issues. This will be launched early in 2022. As trusted farm advisors, much veterinary dialogue is looking at the performance of businesses today, whilst also ensuring their longer term success and viability. This document demonstrates that, even when the environmental impact of decisions are not always at the forefront, a progressive animal health strategy can have reciprocal benefits for animal health and welfare, the environment and ultimately the financial success of the farm business. VetSalus is aware that this document cannot possibly cover all aspects of farm animal practice, but its intent is to illustrate a few of the areas where veterinarians can raise awareness and positively influence, as well as serving to stimulate further thought and debate within the profession.

Reference materials:

1. For more information on VetSalus see www.vetsalus.com
2. See, for example, https://vetsalus.com/news/2021/11/vetsalus-perspective-cop26

VetSalus is a global network of veterinary consultants working with food producers to improve animal health, welfare and sustainability.
www.vetsalus.com

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Produced in partnership with **Vet Sustain** - UK-based social enterprise working to enable and inspire veterinary professionals to help secure the wellbeing of animals, people and the natural world. www.vetsustain.org

Talking all things Carbon

Credit: Alasdair Moffett BVMS, MSc, MRCVS, Veterinarian at Synergy Farm Health, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS, Veterinarian at VetSouth and Mark Bryan BVMS MACVSc (Epi) MVS (Epi) and Lewis Griffiths BVMS MBA MRCVS, Directors at VetSalus

New Zealand is heavily reliant on primary industries. They contribute 20% of the country's GDP and create 1 in 10 jobs. Agriculture and livestock produce approximately 50% of NZ's total GHG emissions, which is unusual for a high income nation (1). Most of this is estimated to be methane but carbon dioxide and nitrous oxide are also contributors. The main sources of greenhouse gases (GHGs) arise from enteric methane, feeding, manure management and fertilizer application, followed by primary energy use (diesel and electricity). It is Interesting to note that when comparing methane emissions from agricultural sources, New Zealand and the United Kingdom have almost identical figures. Both emit approximately 28 million tonnes CO2e (2). (See below for a fuller discussion on CO2e) But New Zealand's farming systems are firmly based on pasture farming and thus differ considerably in the sources of their GHG outputs when compared to some overseas systems, where animals are housed for most or all of the year and manure management becomes a significant contributor.

A further level of complexity can be introduced when considering the efficiency of producing these emissions. While it might be argued that it is the total output into the atmosphere that is critical, when emissions are measured per unit of output, New Zealand's claim to be greener begins to look more debatable. For example, a paper from FAO (3), provides a life cycle analysis for milk production (corrected for fat and protein content) in a number of differing farming systems. In this study, grassland systems have the highest GHG emissions/Kg milk with yield and digestibility of food being important factors in the analysis. It has been demonstrated that well-managed grazing lands generally maintain or even increase soil carbon accumulation compared to native ecosystems (4).

There is considerable debate currently around methane's contribution, because while it is undoubtedly a potent greenhouse gas, it is short lived compared to carbon dioxide. Some authorities suggest that the contribution of methane, as measured by the common metric of GWP100 CO2e is an overestimate and that a revised metric, GWP* should be adopted (5). Methane forms part of a biogenic cycle whereby plants, animals and the environment cycle carbon in a process that is millions of years old. This cycle should be contrasted to the generation of methane (and carbon dioxide) from the burning of fossil fuels. In addition, little work appears to have been done on carbon sequestration into New Zealand soils from grazing animals.

The topic of methane from grazing animals is complex and controversial. It is beyond the scope of this document to fully present all the information. The references below provide further background.

Much of the political debate in New Zealand has been centred on nitrate leaching into waterways and rivers and the concomitant emissions of nitrous oxide, a potent greenhouse gas. This is a consequence of New Zealand's pasture based system and while undoubtedly changes in pasture management can lead to reduced use of nitrogenous fertiliser, many farmers find themselves in a "Catch 22 quandary", whereby taking animals off pasture to reduce nitrogen contamination, can lead to increased greenhouse gas emissions from manure management. The recent changes in environmental contamination legislation in New Zealand are the subject of a more detailed article below.

There is no doubt that there are many opportunities for vets to work with their clients to reduce the output of GHGs. The recommendations for reducing GHG emissions are not unfamiliar to production animal vets. Improving efficiency of production, whether by ensuring dairy heifer liveweight targets are met prior to calving at 2 years, maximising fertility and reducing reproductive wastage, reducing days to finishing (i.e. improving Daily Liveweight Gain) can all help improve the carbon footprint per unit of production. Improvements in animal health can also make significant gains – for example lambs infected with Teladorsagia circumcincta can result in an increase of GHG emissions of up to 33%, and BVD can increase suckler herd's GHG emissions by over 100% (6). Reducing the use of inorganic fertilisers when producing forage, and effective utilisation of manure are additional key areas to target. Finally, improving genetic selection of ruminant livestock to boost fertility, feeding efficiency and health through improved immunity to common diseases can contribute to a reduction in carbon emissions, combined with gains in profitability.

Reference materials:

1. RNZ article, available from: https://www.rnz.co.nz/news/national/440352/nz-greenhouse-gas-emissions-agriculture-energy-sectors-biggest-contributors-in-2019
2. Methane emissions from agriculture, Our World in data, available from: https://ourworldindata.org/grapher/methane-emissions-agriculture?tab=chart&country=NER~NGA~SDN~KOR~ZAF~NZL~GBR~USA
3. Greenhouse gas emissions from the dairy detector, FAO, available from: https://www.fao.org/3/k7930e/k7930e00.pdf
4. Follett, R.F., J.M. Kimble, and R. Lal. 2001. The Potential of U.S. Grazing Lands to Sequester Carbon and Mitigate the Greenhouse Effect. Boca Raton, FL: Lewis Publishers.
5. Cain, M., Lynch, J., Allen, M.R. et al. Improved calculation of warming-equivalent emissions for short-lived climate pollutants. npj Clim Atmos Sci 2, 29 (2019). https://doi.org/10.1038/s41612-019-0086-4
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7. Ministry for Primary Industries. (2021). Climate change and the primary industries | Funding and rural support | NZ Government. Retrieved November 11, 2021, from MPI website: https://www.mpi.govt.nz/funding-rural-support/environment-and-natural-resources/climate-change-primary-industries/
8. He Waka Eke Noa, Our Future in Our Hands. (2019). Retrieved from https://beeflambnz.com/sites/default/files/Primary Sector Climate Change Commitment.pdf

End Note: Measuring methane and its carbon equivalence is a topic of hot debate, relating to the relatively short half-life of methane, which is not captured by current metrics. For those interested, see Frontiers | Agriculture's Contribution to Climate Change and Role in Mitigation Is Distinct From Predominantly Fossil CO2-Emitting Sectors | Sustainable Food Systems (frontiersin.org), and Climate change, ruminant methane and GWP* — Vet Sustain for further discussion on this topic.

Regenerative agriculture, agroecology, and the veterinary profession

C**redit:** Alexandra Tomlinson MA Vet MB MSc PhD Dip ECZM *(Wildlife Population Health)* MRCVS, Chair of the Food and Farming Working Group, Vet Sustain, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS, and Mark Bryan BVMS MACVSc (Epi) MVS (Epi), Veterinarians at VetSouth, Southland

Regenerative Agriculture is gaining momentum in New Zealand. It is viewed by many as a potential solution to some of the most pressing environmental challenges including the health of fresh waterways, soil quality and the wellbeing of rural communities. Research into the concept has focussed on aspects of social wellbeing, soils, integrated production systems and marketable regenerative produce; but more work is required in a New Zealand specific setting. The interaction between land, water, sky and people in the production of food is also closely aligned with a Te Ao Maori worldview. Recognition of these values and the aim to improve not solely environmental, but also social and economic outcomes is an important aspect of implementing regenerative agricultural practices in NZ.

Defining regenerative agriculture can be challenging- but essentially it is an approach to farming that seeks to continue to improve (or restore) soil quality, biodiversity, water quality and ecosystem health. Because of the largely pasture-based approach to livestock management within New Zealand, and the changes within the industry over recent years, many New Zealand farmers already practice this approach to land management. Regenerative agriculture is a continuum, and many of our existing clients will be well along this journey.

Truly regenerative agriculture is not a step back to past practices. It is a step forwards to integrative practices that recognise and understand the importance of the connectedness of soil health, plant health, animal health and human health. Key principles include minimising soil disturbance, maximising pasture biomass and diversity, maximising positive effects of animal impact, overall managing for greater biodiversity both above and below the ground. Crucially, regenerative systems measure success across environmental, ethical and economic domains, giving both animals and humans a good life.

Off the cuff snippets that are often voiced relating to regenerative agriculture include reductions in veterinary medicine usage, antibiotics and drenches/wormers in particular, and a reduced need for emergency or reactive veterinary interventions. Instead of viewing this as a closing door, VetSalus seeks to embrace these principles, and to celebrate the role of the vet as the go-to adviser specialising in livestock health and welfare, but with a whole farm understanding. A core VetSalus aim is to help equip the profession to be able to engage confidently with the principles of regenerative agriculture, so that the door to clients who are considering or already practising regenerative agriculture is not closed – quite the opposite.

Applying context-specific regenerative agroecological principles to conventional farm production models involves a system transition, which, by its very definition, can be challenging. It can be our role as vets to support and assist farmers during these transitions to safeguard and optimise livestock health and welfare. But to be effective in this role we need to be fully equipped to do so.

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Agricultural Environmental Legislation Changes in NZ

Credit: Eleanor Robertson BVSc MSc MRCVS, Veterinarian at VetSouth, Southland

Within the veterinary community there is a growing appreciation of the focus our clients and governments are placing on food security and the climate. The veterinary industry has an important role to play in supporting the achievement of these new targets and making changes economically, environmentally and socially sustainable.

The agricultural industry in New Zealand is hugely important to the economy, contributing approximately 5% (over $10 billion) to the country's GDP. It is also export dependent, with 95% of dairy products traded overseas in 2019, supplying ⅓ of global trade. This reliance on primary industry exportation has led to pressure on the agricultural industry to move forward quickly on environmental policy, as ‘sustainability’ becomes a baseline for trade agreements and no longer a premium.

The NZ developments in legislation are largely focused on two areas:

1. Preventing the degradation of freshwater and making immediate improvement of water quality
2. Monitoring and reducing carbon based emissions

They build upon national and international commitments, including the Treaty of Waitangi and The Paris Agreement. Alterations include restrictions on land use changes, more stringent rules on stock holding and exclusion areas, a ‘sinking lid’ on animal numbers, restrictions on Nitrogen and Phosphate applications, specification of winter grazing rules, wetland management and taxation of emissions.

The progressions in policy will have dramatic consequences at the individual farmer level. In the 1980’s the NZ government eliminated agricultural subsidies which initially devastated the farming community, but the response of farmers was rapid and effective. It is predicted that these policies will be their next big adaptation and farmers certainly have a challenge ahead, as they change the framework of what a productive farm looks like.

The implementation process has not been without turbulence. At one point, over 100 pieces of farm machinery were used to clog a southern city's main streets to portray some farmers' dissatisfaction towards the new rules. Subsequent consultation with industry groups should have eased this transition. However, there is still a feeling that these pro-environment regulations need to be more pragmatic and need to allow farmers and businesses adequate time to adjust.

Ultimately, it is the responsibility of the land owner to understand, and use these changes to build resilience and therefore value into their properties. However, the lag in investment and return from planting out wet areas of farm or reducing total cow numbers makes the transition unsettling, to say the least. Support and funding is available to help ease the initial financial commitment, although the associated paperwork required is reported to be not insignificant. It would be ideal to engage the wider community in helping. Farmers could consider inviting school groups to plant trees or approach corporate sponsors to provide technology required. These changes in regulation are for the good of the entire country and so the process could also be shared.

Evolution of agricultural systems is the only option as the social expectation is for the agricultural sector to continually improve their environmental management. Farmers are frustrated that this process seems to be one-sided: that the focus is always on rural areas when urban impacts on waterways and the environment are overlooked. To some extent this is a valid criticism, and the importance of continuing to produce quality food for global consumption is sidelined by these new rules. But this is also an opportunity for New Zealand farmers to continue to lead in the food production space in terms of producing the best food with the most sustainable practices.

Active multidisciplinary cooperation between neighbours and within catchment groups will continue to be vital as the industry protects the nation's natural resources. Local veterinarians will have much to offer and should be a part of this change process. As non-regulatory rural professionals that are on farms regularly, vets should be aware of the changing regulations and work with their clients to find methods to optimize production while balancing environmental responsibilities. We are often involved in policy discussions with our clients such as tail docking regulations and travel regulations; environmental legislation is no different and vets have many of the skills required to rise to this challenge.

An important role for us as veterinarians is to support farmers through these inevitable changes, without getting dragged into polarising debates. Farmers look to us for advice and sometimes to paint a broader picture; and whilst they may have strong views when they feel their livelihoods are threatened, we have a unique role in supporting and guiding them successfully through changes, whilst at the same time constructively challenging conflicting viewpoints.

The environmental impact of antimicrobials

Credit: Alasdair Moffett BVMS, MSc, MRCVS, Veterinarian at Synergy Farm Health, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS and Mark Bryan BVMS MACVSc (Epi) MVS (Epi), Veterinarians at VetSouth, Southland

Antimicrobial resistance (AMR) has been defined as our next global challenge. Antimicrobial use is the key contributory factor in the risk of AMR developing, and globally, around 80% of all antimicrobials produced are used on animals. There is therefore a global imperative for considering the impact of antimicrobial use in animals on our global One Health, which includes the environmental burden of antimicrobials.

Multiple pathways exist for antibiotics to enter the environment. A ‘One Health’ perspective that incorporates the complex relationship between animals, humans and the environment is therefore essential to tackle AMR effectively. The whole AMR story has driven the sort of veterinary practice we all aspire to do, and the approach which should form part of our future. Working together with farmers to produce healthy productive livestock, whilst minimising the need for antimicrobial intervention is the goal for each and every one of us.

Antibiotic use in animal agriculture

There is currently limited data indicating strong linkages between on-farm use of antibiotics and the development of resistance genes in bacterial communities (the resistome) in the immediate farm and wider environment. However, limiting the use and types of antibiotics in animal production, particularly those of greatest importance to human health, is the most direct mechanism for controlling agricultural antibiotic release into the environment, and likely also antibiotic resistance.

Although New Zealand ranks low in antimicrobial use in agriculture, being the third lowest user globally, when considered per unit of output we are less impressive. Furthermore, there are significant opportunities to further reduce our antimicrobial use without compromising animal health and welfare or productivity.

Animal Health

Keeping animals healthy is key to reducing the necessity for antibiotic treatment. Knowledgeable animal husbandry is cited as the most important factor in reducing antibiotic use, but other management practices, such as correct stocking density, improved nutritional programmes, vaccination strategies, optimal housing and ventilation, effluent management and genetic selection can all be adopted to minimise the need for antibiotic use. Reducing prophylactic use also has a key role: for example the last 5-10 years have seen a shift from routine antimicrobial intramammary treatment of all cows at dry-off, to selective treatment based on various cow factors including pre-existing mammary infections.

Antibiotic alternatives

Metals such as copper, zinc, or arsenic are commonly used in animal feeds as alternatives to antibiotics. However, antibiotic resistance can be co-selected by metals, and the bio-accumulation in soils (notably of copper) both potentially limit the contribution of their use in tackling AMR. Other alternatives, such as herbal materials, may be worth pursuing, although by definition, their antimicrobial activity can also select for resistance.

The use of probiotics to control enteric infections, particularly in poultry, are showing significant potential. Management using vaccination is also a consideration. Advances in approaches to prevention are increasing as the respective industries focus on lowering antimicrobial use.

Animal waste

A significant proportion of antibiotics (17%–90% for livestock) are excreted directly into urine and faeces, unchanged or as active metabolites. These antibiotics may persist in the environment for periods that can range from a few days (e.g. beta-lactam antibiotics) to several months (e.g. fluoroquinolones). Livestock effluent is therefore a potential source of environmental antibiotic contamination. Composting can alleviate the problem, with degradation primarily occurring during the thermophilic phase in the first two weeks. Containment of animal wastes is a further practical strategy with the additional advantages of nutrient management and protection of soil and water quality. Effluent management strategies include prevention of pond spills and seepage, and manure application to land only when crop demands for water and nutrients are high, to limit surface runoff.

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Sustainable heifer rearing for a longer productive life

Credit: Charlotte Debbaut DVM MRCVS, Veterinarian, Synergy Farm Health, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS, and Mark Bryan BVMS MACVSc (Epi) MVS (Epi), Veterinarians at VetSouth, Southland

One of the pillars of a sustainable dairy industry is efficient heifer rearing. Efficient rearing will not only reduce the cost and resources used but will also prolong the heifer's productive lifetime in the milking herd. The goal is to grow a healthy heifer that is 90% of mature body weight at 22 months (pre-calving).

Calving heifers down at the right age and size gives them a solid base to start a longer productive life. The figures in Table 1 indicate that the optimal age for calving is between 23- 24 months. This increases lifetime production, and reduces methane produced during the rearing period.

Whilst for most New Zealand dairy production systems, the goal of calving heifers down at 23-24 months is key due to our seasonal production, the extrinsic value of this approach in terms of GHG production and overall productivity is often overlooked and rarely highlighted as a benefit of the New Zealand system.

Age at first calving	Lifetime production (kg)	Total methane produced (kg)
22 months	31,230	76.77
23 months	38,345	82.12
24 months	36,154	87.92
25 months	32,085	93.86
26 months	21,465	99.96
27 months	19,960	106.22

Table 1. Heifer age at first calving, in association with lifetime milk yield, and total methane emissions. Adapted from CowSignals®

Reaching a target of 90% of adult bodyweight by 22 months of age rests on two principles: optimising growth rates, and reducing production loss through disease. There are several tools available to achieve this and a few easy to implement examples are discussed below.

Feed conversion is highest during the first few weeks of life, so to reach an average growth rate of 0.8kg/day throughout the rearing period, the milk phase needs to be optimised. Furthermore, it has been shown that a 100g increase in average daily gain during the first months of life leads to an extra 225 litres of milk (equivalent to around 20kgMS) produced during the first lactation (1). A minimum of 1000g daily of good quality milk replacer is needed for optimal calf immunity and health. To achieve the target of doubling the birth weight by 8 weeks for weaning, it is advisable to go up to 1200g of milk replacer daily.

Scours is one of the main causes of calf mortality in New Zealand; it also reduces growth rates and has long term detrimental effects on productivity. Scouring refers to a clinical presentation with a range of underlying causes which result in calves rapidly dehydrating and often results in significant losses.

Decent housing is pivotal for scours prevention and there are many aspects to this. Without getting the sledgehammer out, scours rates can be reduced by addressing stocking density and group sizes. In a group of unweaned calves, providing 2.5m square per calf should be a minimum. Grouping calves with an all in - all out method will also reduce the prevalence of scours. Long term effects of scours can be reduced greatly by prompt detection and proper treatment.

Importantly, we can only monitor progress through good record keeping, an area often neglected in heifer rearing. Recording growth rates, colostrum quality and colostrum intake is key however not all farms engage in this. A lot of information can already be obtained from accurate disease and treatment records for individual age groups, helping us to focus on problem areas that require further investigation. Tools are available for digital youngstock record keeping, but this could be a hurdle on some farms. As vets we can help by providing templates with the records we are interested in, tailored to the age category we want to focus on.

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The Environmental impact of Mastitis in the Dairy Herd

Credit: Rachel Hayton BSc (Vet Sci) BVM&S Cert CHP MRCVS, Veterinarian at Synergy Farm Health, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS, Veterinarian at VetSouth, Southland

Mastitis is just one example of an endemic disease with both direct and indirect impacts on greenhouse gas (GHG) emissions. Losses include reduced yield, involuntary culling, discarded milk, vet and medicine costs, labour, penalties and knock on effects, usually on fertility. But while the losses add up, the inputs tend to remain the same. The cost of mastitis in the New Zealand dairy industry has been estimated to be $180 million per year (1), and the environmental cost can be attributed to increased resource use and GHG emissions per unit of output. Antimicrobial use also adds to the impact on the ecosystem and is a significant contributor to the antibiotic treatments administered to dairy cows. Mastitis is also a painful condition leading to compromised welfare.

It has been calculated that reducing the incidence of clinical mastitis from 25% to 18% and reducing sub-clinical mastitis incidence from 33% to 18% yielded a 2.5% decrease in GHG emissions (2). Therefore, vets have a vital role to play in mastitis control in order to reduce the environmental impact of dairy production through improved efficiency.

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Beef Fertility, Breeding, Advanced Breeding and Genomics

Credit: Paul Kirkwood BVMedSci BVM BVS MRCVS, Annie Kerr BVSc BSc MRCVS, David Black BVM&S DBR DVetMed FRCVS, Veterinarians, Paragon Veterinary Group, adapted for a New Zealand audience by Eleanor Roberston BVSc MSc MRCVS, Veterinarian at VetSouth, Southland

Optimising fertility is critical to the success of any beef herd, and many aspects are in the veterinary arena including nutrition, health, breeding and genetics. Livestock vets are integral to work alongside their clients in order for them to be productive, profitable and efficient. Ways in which efficiency can be optimised include herd health plans, preventing infectious diseases, bull fertility testing, mobility scoring, pregnancy diagnosis and body condition scoring. Maximising efficiency will result in measurable success for a beef farmer; for example kg of beef sold per cow.

Artificial insemination (AI) provides access to the best bulls in a biosecure way, underpinning its success. However the limitation lies in the ability to only get one calf from heifers or cows with fantastic potential; 'flushing' cows, and subsequent embryo transfer (ET) into recipients was the first method developed to overcome this hurdle. More recently embryos have started to be produced by ovum pickup (OPU - a vet only procedure), *in vitro* fertilisation (IVF) and *in vitro* production (IVP). As the success of both methods improves, cost subsequently falls; research is ongoing to refine biopsy techniques of embryos, allowing their genomic evaluation prior to transferring. Once commercial, breeders will be able to acquire sexed embryos with specific traits, whether that be high immune status, longevity, health characteristics, productivity disease resistance, production potential, liveweight gain etc.

Genomics links directly with sustainability through:

- Production efficiency - particularly solids, growth rates and carcass kill out percentage
- Feed efficiency - including nitrogen utilisation and methane reduction
- Maintenance requirements - smaller animals need lower maintenance for the same production
- Improved fertility and disease resilience

Genomic screening advances are resulting in improved and more specific indexes, including looking at the likelihood of common diseases in heifers. In the future it is likely we will have genomic indices that are proxies related to climate change and the environment, for example methane emissions.

When talking about “precision agriculture” many papers focus on arable systems; if livestock are mentioned it is only usually as biosensors or diagnostics. Yet the most precise thing we could do is to breed more efficient and healthier animals. By using technologies like genomics, ET, OPU/IVF we can amplify the genetic gain by producing embryos from the most suitable animals and by these means rapidly improve the genetics of the national herd.

Reference materials:

- AHDB Better Returns Programme: https://beefandlamb.ahdbdigital.org.uk/returns/breeding/

The Sheep Health Plan and the Environment: Adversary or Advocate?

Credit: Emily Gascoigne MA VetMB Dip.ECSRHM MRCVS, Veterinary Surgeon, Synergy Farm Health, adapted for a New Zealand audience by Eleanor Roberston, Veterinary Surgeon at VetSouth and Lewis Griffiths BVMS MBA MRCVS, Director at VetSalus

Sheep rearing systems in the United Kingdom and New Zealand contrast significantly and as a result their carbon footprints are also markedly different. The often more intensive nature of sheep husbandry in the United Kingdom means that housing at lambing and concentrate feeding are more common, contributing to an increased level of carbon inputs when compared to New Zealand's extensive practices. Against this, the higher lambing percentages and reduced losses at lambing that are achieved, can be suggested to justify the systems employed.

The health of the environment and the health of the business are intertwined. When considering the carbon footprint of lamb we know that key drivers of greenhouse gas cost include: reduced number of lambs reared per ewe to the ram, reduced growth rates in lambs, dry ewes per annum (linked to ewe and hogget fertility) and increased concentrate usage. Equally these metrics are units of assessing the physical performance of the mob. For many sheep health conundrums, we can demonstrate an economic and environmental benefit. Here are just two examples:

Anthelmintic resistance is widespread in the sheep sector with multi-anthelmintic resistance frequently demonstratable on farms. Reducing the need to use anthelmintics, the frequency of use and proportion of sheep treated are key in reducing the rate of resistance development. By utilising pasture rotation strategies, maximising immune capability through general health, genetics and nutrition, exposure of sheep to parasite burdens can be reduced.

Positive environmental impacts include: improved growth rate, reducing the carbon cost of production, reducing the number of anthelmintic doses used per annum and reducing environmental exposure of invertebrates to anthelmintics.

Footrot was cited as the second most important disease behind gastrointestinal parasitism in a recent survey carried out within the Merino industry, with 80% of respondents experiencing footrot in the last 5 years. Economic impact varies greatly with seasonal weather patterns, despite this the total annual cost of footrot to the NZ Merino industry is estimated to be in excess of $9 million, including treatment and lost production. Although little information regarding the impact on coarse wool breeds, clinical footrot leads to weight loss and serious animal welfare implications. No single treatment is 100% effective therefore a number of strategies should be implemented including; footbathing, culling infected sheep, selective breeding, vaccination and quarantine of newly purchased stock.

Preventative strategies positively affect the environment because: they maintain animal health and welfare ensuring reduced performance wastage and the need for reactive whole mob treatment.

Robust treatment strategies positively affect the environment because: they permit recovery of performance (body condition, milk yield, growth rates etc) and improved efficiency of production reducing carbon cost of lamb produced.

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Veterinary Engagement with the Organic Sector – Lessons We Can Learn From Each Other

Credit: Eleanor Roberston BVSc MSc MRCVS and Mark Bryan BVMS MACVSc (Epi) MVS (Epi), Veterinarians at VetSouth, Southland

One of the tenets of organic farming is a reduction or absence of antimicrobials. New Zealand farmers typically have low levels of antimicrobial use, whether organic or conventional. This is a reflection of management practices and an extensive approach to agriculture with limited housing. New Zealand has ranked as the third lowest agricultural user of antimicrobials in the world for a number of years, and our mean use measured in population corrected units (PCU) remains stabilised around 10.

In 2015, the New Zealand Veterinary Association issued their aspiration statement that *'by 2030, antimicrobials will not be needed for the health and welfare of animals.'* Since then, veterinarians working with all species have made significant changes to antimicrobial use in their respective areas, leading to the stabilisation of antimicrobial use.

Retailers have also started to lead the way in pushing their producers to adopt husbandry methods which use much fewer antimicrobials. How can we as vets remain at the centre of the One Health movement, advocating for higher welfare, minimal need for antibiotics and diets which are healthy for people and the planet?

Organic farming can contribute to reductions in antimicrobial use, although of course they remain essential for use where animal welfare may otherwise be compromised. Organic farming can also lead to a significant reduction in GHG emissions. A study of dairy farming in Southern New Zealand demonstrated that converting from conventional to organic resulted in a 44% reduction in CO_2 equivalents per year; and a 40% reduction in antimicrobial use.

The farming sector needs to embrace environmental programs such as He Waka Eke Noa and the Essential Freshwater Package to build productive and resilient farms for the future. Regenerative agriculture, carbon sequestering and pro-biodiversity practices have key roles to play in achieving these targets and we have an opportunity, as trusted advisors, to equip ourselves with knowledge to support them. Opportunities to engage with organisations such as the regional environmental councils, and Manaaki Whenua (Landcare Research) with their depth of resources and experience in these areas will help us meet these fulfilling goals.

Reference materials:

- Agricultural Compounds and Veterinary Medicines Team, 2020. *Antibiotic Sales Analysis 2018*. New Zealand Food Safety Technical Paper No: 2020/24. [online] Available at: <https://www.google.com/url?q=https://www.mpi.govt.nz/dmsdocument/42075-Antibiotic-Sales-Analysis-2018-Technical-report&sa=D&source=docs&ust=1637207228417000&usg=AOvVaw1U9OqnMDWM12t48ujh3MA3> [Accessed 18 November 2021].
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Closing comments

VetSalus, in partnership with Vet Sustain, has a growing leadership and educational role in sustainable farming, as well as seeking to provide opportunities for vets to work in this area. As part of this VetSalus is developing a training course tailored to the veterinary community to drive effective change towards more sustainable food production practices, by understanding the complex drivers and needs of both veterinarians and farmers. This course will be available early in 2022.

The course aims to empower veterinary professionals working with farm animals to unlock their unique toolbox of skills and knowledge to help producers attain multiple sustainability objectives – for the benefit of the animals under our care, rural communities, wildlife and the wider environment.

Many of the issues linked to sustainable farming in New Zealand are complex and remain politically sensitive. Veterinarians working on farms need to be informed about these issues and willing to engage in discussions with their clients. This introductory document has highlighted some of these issues but there is much more work to be done in this area.

For more information on the work of VetSalus please visit our website or follow us on Twitter or LinkedIn.

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